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DRAFT
SOUTH KING COUNTY
GROUND WATER MANAGEMENT PLAN

GRANT NO. 2
BACKGROUND DATA COLLECTION AND MANAGEMENT ISSUES
VOLUME III



June 1993

Prepared By

South King County Ground Water Advisory Committee
Economic and Engineering Services, Inc.
Hart-Crowser, Inc.
Pacific Groundwater Group
Robinson & Noble, Inc.

A Project Funded In Part
Through The
Centennial Clean Water Fund

 WASHINGTON STATE
DEPARTMENT OF
E C O L O G Y



ECONOMIC AND ENGINEERING SERVICES, INC.

P.O. Box 976 • 626 Columbia St. NW • Suite 2-A
Olympia, Washington 98507
(206) 352-5090 • FAX (206) 357-6570

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Mr. Gary Cline, Chairman
Ground Water Advisory Committee
P.O. Box 4249
Federal Way, WA 98003

Subject: Draft South King County Ground Water Management Plan
Grant No. 2 - Volume III

Economic and Engineering Services, Inc. (EES) in association with Pacific Groundwater Group, and Robinson & Noble, Inc., is pleased to submit documentation for the Draft South King County Ground Water Management Plan (GWMP), Grant No. 2 activities.

Grant No. 2 activities focused upon developing a comprehensive management strategy, and continuing to refine and implement the programs begun during Grant No. 1.

Grant No. 2 information is presented in two volumes, Volumes III and IV. This letter transmits Volume III, Comprehensive Management Strategies. Volume IV will provide supporting documents and data for Volume III. Volumes I and II were completed under Grant No. 1.

Sections I, II, and III of this draft are essentially complete, although further refinement is necessary. Portions of Section IV will be completed later as information becomes available.

We have enjoyed working on the GWMP and look forward to refining and completing the Plan.

Sincerely,

John M. Maxwell
Vice President

JMM:da:w

Enclosure

**DRAFT
SOUTH KING COUNTY
GROUND WATER MANAGEMENT PLAN
GRANT NO. 2
COMPREHENSIVE MANAGEMENT STRATEGY
VOLUME III**

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SECTION I

SECTION I

INTRODUCTION

1. PURPOSE AND SCOPE

This document culminates activities for the second of two grants provided by the Department of Ecology (Ecology) which, in part, have funded the preparation of a Ground Water Management Plan (GWMP) for South King County. The document has been prepared under a program initiated by the Washington State Legislature in 1985 wherein they directed Ecology to establish a process of designating groundwater areas for development of groundwater management programs.

Preparation of the GWMP has been done in accordance with the requirements of Chapter 173-100 WAC, Ground Water Management Areas and Programs. These regulations led to the designation of South King County as a Ground Water Management Area (GWMA) on October 7, 1986. The GWMA used for the study is bound by Puget Sound on the west; Pierce County on the south; Green River, Black Diamond on the east; and the Cedar and Duwamish Rivers on the north.

An Interlocal Agreement was entered between the Seattle-King County Health Department (SKCHD) and South King County Regional Water Association (SKRWA) on December 17, 1986. This Agreement established both entities as co-lead agencies for the evaluation and preparation of the GWMP.

The GWMP document is presented in three volumes. Volume I provides a summary of the major findings, conclusions, and recommended implementation efforts needed to continue development of the GWMP in the second grant activities. Volume II provides technical supporting data and additional information developed for the study and each of the study's four individual subareas. Volume III provides recommendations for action on a variety of management issues and policies deemed appropriate by the Ground Water Advisory Committee (GWAC) in order to provide a comprehensive management strategy for groundwater resources throughout South King County. Volume IV provides supporting data and additional information developed for Volume III.

This completed GWMP will be submitted for reviewed and accepted by the GWAC and its policy, technical, and public involvement subcommittees. The eventual adoption of the completed GWMP under both grant activities will lead to certification of the GWMP by the Ground Water Advisory Committee (GWAC). Certification will be required of all participating GWAC members

and State agencies. Affected local governments will eventually need to adopt or amend regulations or ordinances implementing the provisions and recommendations of the GWMP.

Development of the complete GWMP, as required by Ecology, includes five major phases of work: Phase 1 - Program Development/Grant Application; Phase 2 - Public Involvement/Administration; Phase 3 - Data Collection/Analysis; Phase 4 - Management Alternatives and Implementation Plan; and, Phase 5 - Public Review and Adoption.

Grant No. 1 activities focused primarily on work elements in Phase 3, with initial efforts in Phase 4. The essence of Grant No. 1 was to analyze and trend existing information characterizing the topography/geology, climate, water quality, and water resource requirements of the GWMP. Grant No. 2 activities focused primarily of planning policy and implementation.

2. HISTORY

South King County is a rapidly growing area which is heavily reliant upon groundwater resources. The issue of water resource management, both in quantitative and qualitative terms, is a concern shared by the citizens, municipalities, utilities, and County agencies who live in and serve the South King County area. The ever increasing demands for irrigation, agriculture, municipal, industrial, domestic, recreation, and aesthetic enjoyment have raised questions regarding the adequacy of existing resources to meet the combined demands of all groundwater resource users. In addition, examples of water quality contamination at specific sites within South King County and elsewhere throughout the State and nation create interest in evaluating the water quality of the groundwater resources throughout the area.

The SKRWA consists of major water purveyors within the South King County area who are interested in evaluating and managing the water resources within the area. Their interest has stimulated the preparation of this document, a Coordinated Water System Plan (CWSP), a companion evaluation of groundwater resources by U.S. Geological Survey (USGS), and independent investigations by the separate utilities.

A GWAC was formed in accordance with WAC 173-100-050, to guide development of the GWMP. The GWAC is composed of a variety of public and private interest groups. The GWAC submitted a grant request to Ecology on January 30, 1987, for assistance in preparing this document. Notice to proceed on the GWMP was provided by Ecology on July 31, 1987. In view of limited grant funding, preparation of the GWMP was segregated into two grants. Activities of the first grant have focused on collecting and evaluating background data regarding the quantitative and qualitative aspects of the

groundwater resource, along with identifying resource management and strategy issues which need to be addressed in Grant No. 2.

Key activities in development of the GWMP document were guided by the GWAC and its three subcommittees. The GWAC met approximately 20 times during preparation of the GWMP and several times previously during development of the Scope of Work and grant application. The Technical Subcommittee met approximately 15 times to review the technical approach, findings, and recommendations within this document. In addition, the Policy Subcommittee met approximately 12 times to address potential management issues, strategies, and policy requirements that will require further refinement in Grant No. 2. The Public Involvement Subcommittee met approximately 10 times to establish a means of advising the community of the ongoing effort, its findings, and generally creating a public awareness of groundwater management goals and responsibilities. During Grant No. 1, the Public Involvement Subcommittee prepared a Public Involvement Plan. This Plan incorporates a variety of media and public education activities including newspaper articles, speakers bureau at local civic groups, releases for radio and television, and various public workshops during Grant No. 1 activities. Several of the above actions were pursued, including presentation of four different groundwater fairs at Federal Way, Auburn, Kent, and the Covington area.

The GWMA used for the study is bound by Puget Sound on the west; Pierce County on the south; Green River, Black Diamond on the east; and the Cedar and Duwamish Rivers on the north. This area closely coincides with that used by USGS in a concurrent study which also addressed regional groundwater conditions in South King County. These two study area boundaries were coordinated to ensure the availability and utilization of common data for each study. The GWMP has expanded on information provided from USGS and provided a more detailed evaluation of four subareas within South King County. These four subareas include: Des Moines Upland, Federal Way Upland, Green River Valley, and Covington Upland. Areas further south and east of the study area on the Enumclaw Plateau were not included in the GWMA.

A master database of hydrogeologic information was developed for the South King County area. This database relied upon data provided by USGS for approximately 780 wells which were field checked throughout the area. Data for an additional 180 wells was added from reliable data obtained from records maintained by the hydrogeological consultants on the project. Geologic logs for approximately 700 wells were also computerized. The information on the database has also been digitized to facilitate computer mapping as generated from information within the database.

Information on water rights and water quality were also entered on the database and correlated to individual wells where sufficient location information allows

such correlation to occur. Water quality analysis were evaluated for over 450 wells reported for public and private uses by SKCHD, Ecology, Department of Health (DOH), Environmental Protection Agency (EPA), or other entities. Statistical analyses were conducted on over 200 of these wells for results of key indicator parameters tested since 1970 to evaluate regional trends in water quality.

A. Related Studies

Simultaneous to the development of the GWMP, several other ongoing local activities have complimented the GWMP effort. Major activities are summarized below.

- In 1985, the USGS initiated efforts related to an evaluation of groundwater resources in South King County. A joint funding agreement was reached in the spring of 1986 to coordinate the activities of USGS and the GWMP. The USGS effort focused more upon a regional evaluation, whereas the GWMP focused upon regional and subarea concerns. Water resource information for approximately 2,100 wells was computerized by USGS. Field verification for approximately 780 wells was accomplished by USGS through well inventory.
- The SKRWA worked cooperatively with King County Parks, Planning, and Resource Department in preparation of a CWSP for South King County. The CWSP study area is nearly identical as that for the GWMP except for the inclusion of the Enumclaw area and the elimination of the West Seattle area. The CWSP presents an assessment of municipal and industrial water supply needs in South King County and a program to effectively provide supply and service to customers throughout the area.
- A variety of drilling activities occurred during the development of the GWMP which provided useful data to the study. These drilling activities were sponsored by individual utilities throughout the study area. All of these wells were predominantly for test purposes.
- The City of Seattle has initiated a five-year demonstration project on the use of artificial recharge at its Highline Well Field located north of the SeaTac Airport.
- The City of Tacoma has pursued construction of Pipeline No. 5 transmitting water from an intake on the Green River through South King County, and eventually supplying potable water to the Tacoma Tidelands.

- SKCHD has also conducted water quality monitoring studies of landfill operations in the Kit Corners area.
- King County Surface Water Management (SWM) has also conducted an extensive evaluation of the geology characteristics throughout South King County.
- Finally, other studies conducted in relation to the Midway Land Fill investigation, Western Processing contamination site, and other site-specific investigations provided useful information in the preparation of this document.

3. GOALS AND OBJECTIVES

One of the first activities of the GWAC was to establish goals and objectives to be used as guidelines in development of the GWMP. A general program goal and several specific program objectives were identified by the GWAC. The general program goal for the GWMP was the following:

"General Program Goal - Establish and implement groundwater management procedures and functional responsibilities that will protect existing water resources and prevent the future degradation of water quality or inefficient utilization of groundwater resources within South King County. In addition, ensure the development of the GWMP is appropriately integrated with the CWSP for South King County."

Exhibit I-1 provides a complete listing of all program goals and objectives developed by the GWAC for preparation of Volume I.

4. PROGRAM TEAM AND RESPONSIBILITIES

This GWMP was developed jointly by Economic and Engineering Services, Inc. (EES), Hart-Crowser and Associates, Inc. (HC), Pacific Groundwater Group (PGG), and Robinson and Noble, Inc. (RN). The Consultant team prepared this document under the direction of the co-lead agencies and the GWAC.

5. DESCRIPTION OF PUBLIC REVIEW, ADOPTION, AND IMPLEMENTATION

A. Public Review

Upon completion, the Draft GWMP shall be subject to public review after Ecology holds a local public hearing for comment and review

B. Adoption

Following the hearing, each affected agency and government will have 90 days to evaluate the plan and either concur or disagree with the plan. The GWAC will negotiate with nonconcurring agencies and governments to reach agreement. After concurrence, and the GWAC finds the plan to be consistent with the intent of Chapter 173-100 WAC, Ecology will certify the plan.

C. Implementation

Affected agencies and jurisdictions are responsible for implementing the plan following certification. The implementation process and schedule is described in Section IV. The GWAC has provided a mechanism for modifying the plan to adapt to changing conditions under the supervision of the [Area] Management Committee. This Committee will advise and oversee groundwater management activities that take place under this plan. The Committee will also review new issues and programs that had emerged during and after Plan preparation. The Management Committee will develop methods to incorporate the new issues and programs into the implementation of the plan. [This text optional depending upon what happens with the future of the committees]

EXHIBIT I-1

SOUTH KING COUNTY GROUND WATER MANAGEMENT PROGRAM

PROGRAM GOALS AND OBJECTIVES

WHEREAS, South King County is primarily dependent upon ground water for the continued viability of water supply to its existing and future citizens, and

WHEREAS, Several existing and potential impacts on the quality and quantity of ground water resources in South King County have been identified; and

WHEREAS, it is desirable to identify ground water management procedures that are consistent with both local needs and state water resource policies and management objectives including the protection of water quality, assurance of quantity, and efficient management of water resources to meet future needs; and

WHEREAS, the Department of Ecology pursuant to RCW 90.44.00 and its implementing rules, in Chapter 173-100 WAC has designated South King County as a Ground Water Management Area; and

WHEREAS, a Ground Water Advisory Committee has been formed to oversee the development of the Ground Water Management Program, review the work plan, budget, and assure that the program is functionally sound;

NOW THEREFORE, the Ground Water Advisory Committee endorse the general goal and specific objectives listed below to be used in the development of the Ground Water Management Program:

General Program Goal

Establish and implement ground water management procedures and functional responsibilities that will protect existing water resources and prevent the future degradation of water quality or inefficient utilization of ground water resources within South King County. In addition, ensure that development of the Ground Water Management Program is appropriately integrated with the Coordinated Water System Plan for South King County.

Specific Program Objectives

1. Prepare a Ground Water Management Program and Implementation Plan that is consistent with RCW 90.44.410, with specific emphasis on the objectives listed below.

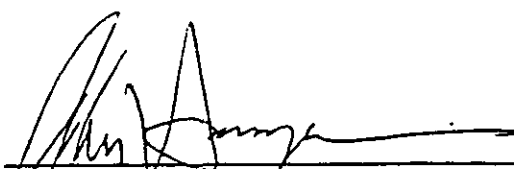
Problem Definition

2. Define hydrogeology of the area's aquifers and determine water availability and water levels within aquifer systems.
3. Assess and identify existing water quality conditions and existing or potential degradation trends.
4. Identify, correlate and assess known or potential sources of contamination with "recharge" areas.
5. Identify current and future water uses and evaluate pumpage impacts upon ground water quantity and quality, taking note of surface water relationships.

Management Issues

6. Identify and establish protection procedures for aquifer "recharge" areas.
7. Evaluate the benefits and viability of various management options to improve ground water quantity and quality.
8. Suggest the limits of acceptable future ground water quality.
9. Suggest the long-term priority of use for ground water.
10. Identify land use and water use policies, actions, and activities which are inconsistent with the above goal and objectives and recommend needed changes/modifications.
11. Identify the existing and recommend future responsibilities of local, state, and federal agencies, groups, or individuals regarding long-range ground water resource management, including procedures to continually update and manage ground water resource data.

The above Ground Water Management Program Goals and Objectives are hereby formally reviewed and adopted by the South King County Ground Water Advisory Committee on January 28, 1987.



John Sawyer, Chairman, South King County
Ground Water Advisory Committee

SECTION II

SECTION II

AREA CHARACTERIZATION

1. INTRODUCTION

The project area, shown in Exhibit II-1, encompasses approximately 260 square miles in the southwest portion of King County. It is bounded on the north by the Duwamish and Cedar Rivers, on the east by the Black Diamond area, on the south by the Green River and Pierce County, and on the west by Puget Sound.

There are three principal physiographic features within the area including the Des Moines Upland, the Covington Upland, and the Green River Valley. The Des Moines and Covington Uplands are drift plains whose surfaces generally lie about 400 to 600 feet above mean sea level. The uplands are predominantly recharge areas in which water percolates downward to water bearing strata and eventually migrates to discharge areas. Numerous small to moderate sized drainage features provide internal drainage for the shallow groundwater systems that occur within the uplands. Soos, Jenkins, and Covington Creeks are the principal internal drainage features within the Covington Upland. Hylebos, Des Moines, and Miller Creeks are the principal internal drainage features with the Des Moines Upland.

The larger drainage features within the area such as the Green, Cedar, and Duwamish Rivers and Puget Sound are predominantly regional discharge areas for the deep percolation that originates within the uplands.

2. GROUND WATER MANAGEMENT AREA BOUNDARIES

Within this study, the major physiographic features have been used to define four project subareas. The subarea boundaries generally coincide with hydrogeologic boundaries. The project subareas include the following:

- Des Moines Upland is bounded by Seattle on the north, Midway on the south, the Green/Duwamish River Valley on the east, and Puget Sound on the west. The Green River Valley, the Duwamish River and Puget Sound are major discharge features that serve as natural boundaries for the Des Moines Upland. A topographic low and a groundwater divide separate the Des Moines Upland from the Federal Way Upland.
- Federal Way Upland is bounded by Midway on the north, Pierce County and the Puyallup Valley on the south, the Green River Valley on the east, and Puget Sound on the west. The Green River Valley, the

Puyallup Valley, and Puget Sound serve as natural boundaries for the Federal Way Upland.

- Green River Valley is bounded by Renton on the north, Pierce County on the south, by the Covington Upland on the east, and the Des Moines Upland on the west. The Green River Valley is almost entirely a discharge area. The Valley walls serve as the east and west margins of the subarea. Bedrock deposits which outcrop in the upland west of Renton serve as the northern boundary of the subarea. A groundwater divide occurs in vicinity of the Pierce-King County boundary and separates subsurface flow to the Puyallup Valley from subsurface flow to the Green River Valley.
- Covington Upland is bounded by the Cedar River on the north, the Green River on the south, the Black Diamond area on the east, and the Green River Valley on the west. The Cedar and Green Rivers and the Green River Valley serve as natural discharge boundaries. Bedrock deposits that occur east of the Black Diamond area provide a natural barrier to the east.

A series of five base maps are used to characterize the study area within this report. All the base maps and accompanying information in Volume II are presented at a scale of 1:48000 (1 inch = 4000 feet). A single base map is used for each of the Des Moines, Federal Way, and Green River Valley subareas. Two base maps were required to provide full coverage of the north and south zones of the Covington Upland.

3. POLITICAL JURISDICTIONS

There are numerous agencies at the local, State, and federal level which operate programs with the potential to affect groundwater quality and quantity. On the local level, these jurisdictions are divided mainly among King County, municipalities, and local water and sewer districts. The primary state agencies with programs affecting groundwater are the Department of Ecology (Ecology) and the Department of Health (DOH). The Departments of Agriculture, Natural Resources, and Fisheries and Wildlife play supporting roles in protecting groundwater quality. On a federal level, the U.S. Environmental Protection Agency (EPA), the U.S. Geological Survey (USGS), and the Department of Agriculture are the key agencies in groundwater protection. These agencies support a wide variety of programs which deal with groundwater quality and quantity.

A listing of these agencies, with descriptions of their jurisdictions and programs can be found in Table II-1 through Table II- 3. A more detailed description of each agencies responsibilities can be found in Volume I Section IV.

A summary of their jurisdictional areas can be seen in Exhibit II-2.

4. LAND AND WATER USE

The quality and quantity of both surface and groundwaters is known to be impacted by the type and intensity of land use activities that occur in a water shed or recharge area. This involves correlating land use evaluation with corresponding water quality assessments to arrive at a determination on contamination potential.

A. Land Use

A survey of existing and historical land use activities was completed within the Ground Water Management Area (GWMA). Land use categories within the GWMA were patterned after the EPA's Office of Technology Assessment's (OTA) system for categorizing various sources of groundwater contamination. These source classifications were used as a guide in researching activities within South King County. The results of the investigation were then graphically displayed to correlate the location of potential contamination sites with quality of the groundwater. These overlays of land use activity along with more specific descriptions of potential impact on groundwater are contained in the discussions for each subarea in Appendices A through D (Volume II).

From a regional viewpoint, the South King County area contains a number of hazardous waste transporting, storage, and disposal facilities, particularly within the Green River Valley and along the industrial corridor of the Duwamish River. There are also a total of 10 abandoned landfill sites, and three transfer stations. There are over 2,000 reported underground storage tanks located at approximately 700 sites throughout the GWMA. The majority of the underground tanks are for storage of gasoline, diesel, and used oil. However, there are also materials such as aviation fuel, undefined hazardous waste, and kerosene. Agricultural activity is currently not extensive in the study area although there are significant dairy and truck farming operations in the Green River Valley.

B. Water Use

A summary of average and peak day water demand for the South King County GWMP study area by subarea is provided in Table II-10 and graphically depicted in Exhibit II-6 of Volume I. The water demand projections shown include all of the above reference demands, i.e.

municipal and domestic, commercial/industrial, irrigation, fish propagation and heat exchange. All total, municipal and domestic water demand accounts for approximately 93 percent of the existing average day water demand during the irrigation season. During the non-irrigation season, municipal and domestic water demand accounts for about 96 percent of the existing average day water demand. Monthly, quarterly, and seasonal fluctuations in water demand beyond average and peak daily usage patterns were considered but found to be of small impact. This is particularly true where irrigation and commercial/industrial process activities are small outside the summer period.

The total average day existing water resource requirement is about 78 MGD for 1989. It is projected to increase to approximately 147 MGD in 2040, assuming water consumption habits and lifestyle does not change from existing conditions. If an increase in multi-family housing units is assumed to occur in the transitional and urban areas of South King County, and a municipal and domestic water conservation program is initiated at the County and local utility levels, then the anticipated average day demand in 2040 is projected to be about 126 MGD. Hence, and additional average day water resource requirement of 48 to 69 MGD would be necessary by the year 2040.

Total peak day demand is estimated to be about 175 MGD for 1989. By 2040 this demand is anticipated to range from 288 to 338 MGD depending on the scenario assumed. Hence, the additional water resource requirement during a peak day even would be about 113 to 163 MGD by 2040.

5. CLIMATE, TOPOGRAPHY, AND SURFACE WATER FEATURES

A. Topography

The South King County study area can be considered as a single glaciated upland plane bisected by the valley of the Green/Duwamish River (and White River in the south). The result is an eastern and a western upland separated by a central north-south trending lowland valley. The western portion of the upland includes the Highline and Federal Way subareas. These subareas are bounded on the west by steep sea cliffs and the Puget Sound. The eastern upland area, the Covington Upland, extends to the Valley of the Cedar River to the east and north and the Upper Green River Valley to the south. The elevations of the uplands are generally between 200 and 400 feet with some hills reaching above 500 feet. The Green River Valley Subarea consists of a low lying Valley filled with recent alluvial deposits. It extends from 75 feet

elevation in the south to sea level as it gently slopes to Elliot Bay in the north. Most of the Green River Valley Subarea lies between 30 and 60 feet elevation.

B. Climate

The climate of the study area is typical of the Puget Sound Lowland with cool dry summers and mild rainy winters. The majority of the rainfall pertinent to groundwater systems falls between October and March. Average annual precipitation averages 39-inches near Puget Sound to 60-inches at the eastern margin of the study area (Luzier, Water Supply Bulletin 28, 1969).

C. Surface Water Drainages

In addition to the Green River several other drainages are significant within the study area. Some such as the Soos Creek system on the Covington Upland are related to the Green River drainage. Many such as the Hylebos Drainage in the Federal Way Area are separate and drain directly to Puget Sound without confluence with the Green. Both the eastern and western upland areas are dissected by stream systems which escort much of the surface flow to the Puget Sound. Fourteen significant drainages have been identified in the study area. Some of the upland areas drain to closed basins which retained the water and allow it to either evaporate (or transpire) or to infiltrate to the groundwater. The study area contains many minor drainages which shed water off the steep slopes that bound the uplands.

6. GRANT II DATA COLLECTION

A. Introduction

The South King County Ground Water Management Plan (GWMP) Grant I studies identified an abundance of hydrogeologic data with which to define aquifer systems, production potential, and resource vulnerability. To some extent, the available data needed for characterizing groundwater resources and establishing management strategies was generally satisfactory. However, in many ways, data were relatively sparse or absent, and there was general agreement among most planners and scientist involved in the program, that additional data would be required to properly manage the resources in the south County area. A significant shortcoming of the Grant I study was a general absence of data for assessing long-term trends; particularly those related to stream flow, water use, water levels, and water quality. In addition, some areas of the hydrostratigraphic framework was poorly defined because there was an absence of deeper well information.

The Grant II studies were directed towards establishing a comprehensive monitoring network to assess long-term trends as well as installing deeper exploratory wells in key areas to better understand the occurrence and nature of the principal aquifers in the area.

Many of the data deficiencies that were identified in the Grant I effort are described in detail in a Data Collection and Analysis Plan (1989). This report addresses the results of the data collection efforts related to water level monitoring and water quality sampling. In addition, the report describes the finding obtained from test well drilling that was performed as part of project "match" activity.

B. Monitoring Network

(1) Objectives

The primary objective of the monitoring network was to establish a system of wells that could be used to assess long-term changes in water levels and water quality. Water level trends provide a means of evaluating impacts to the hydrologic system that may be related to changing landuse patterns, recharge, groundwater pumpage, and climatic conditions. Water quality data provides a means to evaluate the overall quality of the resource and to identify problems such as groundwater contamination and sea water intrusion. Water quality trend information can provide insight as to the possible impacts that landuse activity may be having upon the groundwater resource.

(2) Network Design

A network of 80 wells was selected for the South King County area based on the following criteria:

- Broad coverage throughout all five subareas including the Des Moines Upland, the Federal Way Upland, the Green River Valley, the North Covington Upland, and the South Covington Upland.
- Representation of all principal aquifer zones (Qal, Qvr, Qva, Qc(2), Qc(3), Qc(4), and Qc(u)).
- Wells that have supporting documentation such as construction and geologic data.
- Wells that are accessible for water level measurements, and sampling.

A listing of the wells including ownership, wellhead elevation, depth, completed aquifer, miscellaneous construction details, and monitoring activity (water level and water quality) are presented in Table II-4. The well locations are presented in Exhibit II-3.

All of the wells that were incorporated into the network were initially screened through a field survey. In addition a notebook of data was assembled for each of the site. The notebook information included:

- Drillers log
- Site sketch
- Descriptions of measuring points and sampling taps
- Well location map
- Field inventory form
- Pictures of the site, measuring point, and sampling tap

The notebooks are stored at Seattle-King County Health Department (SKCHD) offices.

The responsibility for monitoring was shared between seven of the larger water purveyors of the area and the SKCHD. The water purveyors that participated in the program included:

- Seattle Water Department
- Federal Way Water & Sewer
- Highline Water District
- City of Kent
- City of Auburn
- King County Water District 111
- Covington Water District

The water purveyors assumed responsibility for all of the public supply wells that exist in or near their service area. The SKCHD assumed responsibility for privately owned wells that occur through the project vicinity.

Monitoring and sampling equipment were purchase with program monies and provided to each of the seven water purveyors as well as the SKCHD. The equipment included such items as electric well sounders, ph/conductivity meters, tape measures, etc.

Several training sessions were provided to all of the water purveyors on the use of the equipment as well as procedures to be employed in water level measurement, water quality sampling, and data management.

C. Water Level Monitoring

(1) Historical Data

Historical water level trend information for the South King County area was review and summarized during Grant I activities. The data were obtained from the USGS, water purveyors, and consultant files. Historical water level trends were plotted for each of the subareas to evaluate long-term changes in water levels and their relationship to pumpage and precipitation patterns.

A summary of the trend analysis can be found in the GWMP Report Volume II. In general, significant water level declines were identified in the Qc(4) aquifer in the Des Moines area and within the Qc(3) aquifer of the Federal Way Upland. Water levels in most other areas appear to be relatively stable.

A significant amount of historical water level data were available for the Federal Way subarea. However, very limited long-term data were available for the other three subareas.

(2) Grant II Water Level Monitoring

Additional existing wells were targeted for long-term water level monitoring as part of the Grant II activity. These well were selected to provide general coverage within all of the subareas and all the principal aquifers.

During Grant II, water level measurements were collected approximately once per month by water purveyors and SKCHD personnel. In some cases, water purveyors would make more frequent visits to wells and would correspondingly collect more data.

Water level data collected by the water purveyors were forwarded to the SKCHD where it was entered into a project database management system.

Wellhead elevation information was obtained from the water purveyors for most of the sites, entered into the database, and then used to reduce water level depth data into water level elevation data.

(3) Water Level Trends and Analysis

Water level trends for 60 of the monitoring wells are presented in Volume IV. The plots are organized by the public land survey numbering system (i.e. township, range, and section). Plots were only prepared for wells that had more than one year of data. Several different scaling factors had to be used for both the time axis and the water level elevation axis in order to accentuate the trend information. Well ownership, well number, altitude, and depth information is also included on each plot.

The following conclusions can be drawn from the data:

- Significant water level declines occurred within the Federal Way upland during the 1980's. The decline included wells in the Qc(2) aquifer (Well 21N/04E-07R01), wells in the Qva aquifer (Wells 21N/04E-07Q06, 21N/04E-18C01, 21N/04E-19B01), and to a lesser extent, the Qc(3) aquifer (Well 21N/04E-07Q06). However, water levels within most of these areas have stabilized in the past few years. The water level trends observed within the Federal Way area during the Grant II monitoring period are generally consistent with the historical trends presented in the Grant I report.
- Water levels within the Qc(u) or deep aquifer system that underlies portions of the Federal Way upland may be exhibiting some water level decline at the present time (Well 21N/04E-19B03). Water level declines in this zone may be of concern given the potential for salt water intrusion.
- Approximately five feet of water level decline may have occurred in since 1990 within the Qal and Qvr aquifers that underlie the Auburn area (Wells 21N/05E-30L03, 21N/05E-30L04, 21N/05E-30J03). A similar pattern of decline may have occurred in Qvr and Qc(2) aquifers

within the east Covington Upland (22N/06E-28J02, 22N/06E-36A02, 21N/06E-07P01, 21N/06E-11H01). The declines may be a result of lower than normal precipitation patterns that have occurred in recent years or may possibly be related to pumpage patterns in the area. The water level decline should be closely monitored in the next five years.

- Pumpage data should be compiled from all of the water purveyor files and compared to the water level trends to assess their significance.
- Many of the wells that are included in the monitoring network are used for production purposes and as such exhibit large fluctuations in water levels due to pumping (Wells 21N/04E-25M01, 21N/04E-29D01, 21N/05E-19A02, 21N/05E-30B03). The effects of pumping make it more difficult to interpret water level trends. Future monitoring should try to make use of nonpumping wells to the extent possible.

D. Water Quality Monitoring

(1) Historical Data

Historical water quality information regarding the occurrence of potential groundwater contamination in South King County was reviewed and summarized during Grant I activities. Data was gathered from several sources including Ecology, SKCHD, and USGS. Historical water quality data gathered since 1970 was plotted and evaluated for trends, in order to determine if aquifer conditions were changing as a result of human activity in each sub-area. Results of known contamination sites were not included in the statistical trend analyses so that background results would not be skewed and regional trends in water quality could be evaluated.

A summary of the trend analyses can be found in the GWMP Report Volume II, Appendix H. In general, no significant trends in any of the indicator parameters were found. Very few parameters were measured at levels that exceeded MCLs with the exception of naturally occurring iron and manganese.

Historical information regarding the occurrence of organic indicator parameters was virtually non-existent in the data base, and additional data gaps in each sub-area were identified.

Existing wells were identified and targeted for future water quality and water level monitoring under Grant II, to more accurately assess the subareas' aquifer characteristics and their relationship with land surface activities.

(2) Grant II Sampling Program

A data collection and analysis plan for water quality data was developed for each subarea within King County. Predominant land use activities and sensitive areas were identified and specific subarea monitoring needs were incorporated in the recommended sampling program carried out under Grant II.

Water quality monitoring was conducted in two phases, during 1990 and 1991, so that conditions during relatively dry periods (August) and periods of high recharge (April) could be evaluated. A listing of wells sampled by subarea is provided in Table II-5. Exhibit II-3 shows the location of each of the wells monitored during Grant II sampling events.

A water quality monitoring program was developed such that adequate background information could be collected and updated, and the potential impact from land use activities could be identified. Indicator parameters were selected based on predominant land uses within each subarea, and remaining Safe Drinking Water Act (SDWA) contaminants were also measured to form a basis for continued monitoring efforts.

Monitoring for selected categories of regulated chemicals was divided between the two sampling events as outlined below:

<i>Sampling Date</i>	
<u>August 1990</u>	<u>April 1991</u>
Regulated Inorganics	Regulated Inorganics
Additional Inorganics	Additional Inorganics
Coliform Bacteria	Coliform Bacteria
	PCBs
	Pesticides
	Volatile Organics
	Semi-Volatile Organics

All sites were analyzed for inorganic parameters and coliform bacteria. In addition, field measurements of pH, conductivity, and temperature were gathered at all 47 sites. Additional water quality analyses were conducted from wells in areas where contaminant sources could potentially pose a hazard to Group A

and Group B public water supplies and individual wells. These sites were sampled for volatiles and semi-volatiles as well. Twelve sites were also sampled for the remaining priority pollutants, including pesticides and PCBs. A breakdown of water quality analyses conducted by well location is provided in Table II-5.

(3) Water Quality Data and Analysis

Water quality parameters were measured from 47 wells distributed throughout the four subareas of interest (Exhibit II-3). Samples were collected on two different dates: the August 1990 sampling event represented dry weather conditions and the April 1991 event represented wet weather or high recharge conditions. Samples from all of the wells were monitored for inorganic and bacteriological parameters during both sampling rounds. Samples from selected sites were analyzed for organic contaminants including volatiles, semi-volatiles, pesticides, and PCBs, during the April sampling round only. An evaluation of the results obtained during both sampling rounds is presented in this section. All results are included in Appendix B.

(a) Inorganics and Bacteria

Inorganic analyses were conducted to screen for potential contamination from metals and nutrients associated with human activities and land use practices. Bacterial analyses were conducted to determine if aquifer conditions are suitable to promote the proliferation of pathogenic organisms, should they be introduced to the subsurface environment. The results of analyses for both monitoring rounds within each subarea are presented.

Des Moines Upland

Ten existing monitoring wells were located and sampled within the Des Moines Upland subarea. All of the wells were completed in either the Qva, Qc(2), Qc(3), or Qc(4) aquifer zones. Of these zones, the Qva is the most susceptible to land use impacts given its shallow occurrence and general absence of low permeability zones. However, most groundwater supplies are obtained from the Qc(3) (intermediate) and Qc(4) (deep) aquifers.

Results of both sampling rounds indicate that the Qva, Qc(3), and Qc(4) aquifers are relatively free from contamination due to human land use practices. Concentrations of all the anthropogenic metals and nutrients tested were well below

MCLs, with the exception of mercury at site 16N01. A concentration of 0.0045 mg/L was measured, and the MCL for mercury is 0.002 mg/L. Mercury may be introduced to the subsurface environment as a result of construction excavation, urban runoff, industrial activities, or from hazardous waste leachate. Various generators or transporters of hazardous waste were identified to the southwest of site 16N01 during Grant I investigations, and the Sunset Park Landfill is in the immediate vicinity of the well. Mercury levels were non-detectable during the April 1991 sampling round, indicating that a persistent source of the metal is not present near the site. This well is completed in the shallow Qva aquifer in the Highline area.

Iron and manganese levels consistently exceeded their respective secondary MCLs of 0.3 mg/L and 0.05 mg/L from all three aquifers during both sampling events. Both of these metals are currently regulated for aesthetic purposes only. Although iron and manganese are naturally occurring metals, their presence in excess of MCLs can render water undesirable or unusable. Furthermore, it is possible that manganese will be regulated in the future for health purposes as well as for aesthetics. The anticipated primary MCL for manganese may be set at 0.2 mg/L. Sites with iron and/or manganese levels in excess of MCLs are shown in Exhibit E-2.

Total Coliform bacteria were detected at sites 16D02, 16K01, and 21C02 during the August 1990 sampling event only. Fecal Coliform were also present at site 16K01. The presence of total and fecal coliform may indicate the presence of septic tank or wastewater effluent, urban runoff, animal rearing facilities, among other activities. At the time of sample collection, the regions surrounding the well sites were unsewered. Each of these wells are located just north of Sea-Tac airport, near the source of Miller Creek. Land uses consist primarily of single family units, with some agricultural and industrial activity. This area was designated as being locally sensitive during Grant I investigations since the soil was classified as having high to medium permeability.

The excessive levels of total coliform (2000 MPN/100 mL) at sites 16D02 and 21C02 indicate that conditions may be suitable for proliferation of other pathogenic microorganisms. The presence of greater than 2000 MPN/100 mL in the Qva aquifer at site 16D02 suggests that either contamination occurred during sampling or that a high degree of subsurface percolation is

occurring at this location. No coliform bacteria were detected at any sites during the April 1991 sampling event.

Green River Valley

Inorganic and coliform bacteria samples were collected from nine sites in the Green River Valley subarea. The wells sampled from this subarea were completed in the Qal, Qvr, and Qc(3) aquifers. Inorganic parameters were collected to monitor the impact of industrial/commercial activity in the northern and southern sections of the valley, as well as urbanization throughout the subarea.

Lead was detected at levels in excess of the 0.05 mg/L MCL at sites 19A02 during both monitoring rounds. Levels were measured at 0.094 mg/L and 0.064 mg/L during the August and April events, respectively. Well 19A02 is completed in the Qvr aquifer, in an area classified as having high soil permeability. The area is primarily zoned as residential with single family units, however, some manufacturing/industrial activities do occur in the immediate vicinity of the well. The well site is bordered to the east by agricultural activity. Additionally, chromium levels equal to the 0.1 mg/L MCL were measured at site 25Q03, adjacent to the Pacific Landfill. This well was completed in the shallow Qal aquifer.

Detection of heavy metals at these locations indicate that both the Qvr and Qal aquifers are vulnerable to water quality degradation resulting from human activities. However, the vast majority of identified hazardous waste generators, storers, and transporters are located in the northern portion of the subarea, and evidence of contamination was not observed during either monitoring round.

Nitrate was detected in various wells (Exhibit II-6), however all levels were below the 10 mg/L (as N) MCL. Sites with nitrate levels greater than 2 mg/L (as N) are listed below:

<u>Well Site</u>	<i>Sampling</i>	
	<u>Nitrate (mg/L N)</u>	<u>Date</u>
19A02	2.4	8/14/90
19A02	2.4	4/01/91
19E01	3.0	8/15/90
19E01	4.1	4/04/91
09N01	2.8	4/03/91

Nitrate levels appear to have increased at site 19E01 between 1990 and 1991. This well is completed in the shallow Qal aquifer and observed nitrate levels may be a result of nearby agricultural activity. According to the results of the Grant I investigation, the general area surrounding site 19E01 is sewered, however, 19.4 percent of Auburn is unsewered. Coliform bacteria were not detected at any of the locations from which elevated nitrate levels were measured. Simultaneous presence of coliform bacteria would indicate that nitrate levels are a result of septic tank discharge.

Extremely high levels of iron and manganese were measured from several locations in the Green River Valley subarea. Iron concentrations at site 26R01 (Qal aquifer) were an order of magnitude greater than the 0.3 mg/L secondary MCL, and manganese levels were between four to eight times greater than the 0.05 mg/L secondary MCL. Although iron and manganese are naturally occurring metals, it is very likely that water from this region would require treatment if it were to be used as a public supply.

Federal Way Upland

All of the well test sites in the Federal Way Upland subarea were completed in the Qva, Qc(3), or Qc(4) aquifers. The Qva aquifer is relatively permeable and supports most of the production wells in the area.

Little evidence of contamination from human activity was observed, with the exception of mercury measured near the MCL at site 07R01. A level of 0.0018 mg/L was detected during the August 1990 sampling event and the MCL for mercury is 0.002 mg/L. The area surrounding the well site consists primarily of single family units, with interspersed industrial and agricultural activities. It is possible that elevated mercury levels are associated with the near-by Redondo Pit. The mercury source does not appear to be persistent since mercury levels were below detection during the April 1991 sampling event.

Covington Upland

Twenty-one well sites in the Covington subarea were completed in the Qvr, Qva, Qc(2), Qc(3), and Qc(4) aquifers, with two of the wells reaching bedrock. Although two-thirds of the study area are unsewered, nitrate levels were typically undetectable with the exception of a 2.5 mg/L (as N) measurement at site

13G03 during April 1991. Neither total or fecal coliform were measured at any of the sites during either sampling round.

Very few hazardous waste transporters or generators were identified in the study area during Grant I investigations, and subsequently, very few of the heavy metals associated with such activities were detected at or near MCLs during either sampling event. Only arsenic was found at excessive levels in one sample (site 36A02) at 0.118 mg/L during the April 1991 sampling event. This site is situated in the Qc(2) aquifer, adjacent to areas that receive pesticide applications. Arsenic has been used as a component of pesticides and may enter groundwater as a result of agricultural drainage (USGS, 1992). The MCL for arsenic is currently set at 0.05 mg/L.

(b) Volatile and Semi-Volatile Organics, Pesticides and PCBs

Results of Grant I activities identified large water quality data gaps with respect to contamination from organic compounds. Although available data and test results from USGS investigations did not reveal any excessive concentrations of organic contaminants, a wider sample base was required to more thoroughly assess the vulnerability of the region to contamination from industrial, commercial, and agricultural activities.

Indicator parameters for industrial and urban land uses were identified and wells which were strategically located were targeted for sampling. The general criteria used for selecting monitoring sites for organic contamination included:

- Monitor shallow Qva aquifer in the Des Moines subarea to assess potential impacts related to urbanization.
- Monitor shallow Qva aquifer (Redondo-Milton Channel) since it serves as the principle source of water in the Federal Way subarea.
- Monitor intermediate and deep aquifers to provide baseline water quality data.
- Monitor the shallow Qal aquifer since it serves as a significant groundwater source in the southern portion of the Green Valley subarea.

- Monitor Qvr aquifer in Auburn area since it is highly productive, occurs at relatively shallow depths, and recharge to the aquifer is relatively high.
- Monitor the Qc(2) aquifer under the Covington Upland since it is locally susceptible to contamination where the overlying till unit is absent.
- Monitor deep Qc(3) aquifer to provide baseline data.

As a result of the above criteria, approximately 26 of the existing monitoring wells were sampled and analyzed for the complete suite of volatile organics. Eleven of the 47 sites were also analyzed for semi-volatiles, pesticides, and polychlorinated biphenyls (PCBs). A complete list of sites sampled for each parameter is provided in Volume IV. Samples for organic parameters were collected during the April 1991 sampling event only.

(c) Volatile Organics

Methylene chloride and chloroform were detected in many of the samples analyzed for volatile organics. However, review of QA/QC data revealed that both of these compounds were detected in the method blanks and trip blanks as well. Therefore, it is not possible to determine if methylene chloride and/or chloroform were actually present at detectable levels in the groundwater samples or if the measured levels resulted from laboratory contamination.

Chloroform (trichloromethane) is a common groundwater contaminant resulting from its wide range of possible uses. Chloroform may be used in the following processes: as a refrigerant, in plastic manufacturing, as a solvent in analytical chemistry, as a soil fumigant, as an insecticide, and as an industrial solvent. Therefore, the possibility of chloroform contaminating groundwater is relatively high in both industrial and agricultural areas (Montgomery and Welkom, 1990).

Methylene chloride (dichloromethane) is also commonly found in groundwater. It may be used as an industrial solvent, in paints and varnishes, as a degreaser, as a fumigant, in the manufacturing of aerosols, and in analytical chemistry involving organic synthesis (Montgomery et al., 1990).

(d) Semi-volatiles, PCBs and Pesticides

Eleven sites were selected to be sampled for semi-volatile organics, PCBs and pesticides. Three of these sites were located in the Green River Valley subarea and the remaining eight were distributed among the other three subareas, as shown in Table II-5. None of the parameters were detected in any samples. All trip blanks and method blanks were satisfactory, verifying the accuracy of the reported results.

(e) Conclusions

Two rounds of water quality monitoring were conducted on 47 wells throughout the South King County study area. Samples were analyzed for a series of parameters that would indicate whether or not identified aquifers were vulnerable to contamination from human activities. The data were reviewed for detectable levels of heavy metals, bacteria, organic contaminants, and pesticides. The persistent presence of any of these categories of contaminants would indicate that a source of contamination is near by, and that local aquifers are susceptible to contamination and water quality degradation.

Very few samples contained contaminant levels in excess of MCLs, as determined under the SDWA, suggesting that water quality has not been greatly impacted by industrial, residential, or agricultural activities. Sites that contained contaminant levels of concern are summarized below:

Parameter	Units	Level	MCL		Collection Site #	Subarea		Date	Aquifer
Mercury	mg/L	0.0045		0.002		16N01	Des Moines	8/90	Qva
Total Coliform	MPN/100 mL	>2000	1	16K02	Des Moines	8/90	Qva		
Total Coliform	MPN/100 mL	2000	1	21C02	Des Moines	8/90	Qva		
Total Coliform	MPN/100 mL	22	1	16K01	Des Moines	8/90	Qva		
Fecal Coliform	MPN/100 mL	2	1	16K01	Des Moines	8/90	Qva		
Lead	mg/L			0.094	0.05	19A02	Green River	8/90	Qvr
Lead	mg/L			0.064	0.05	19A02	Green River	4/91	Qvr
Chromium	mg/L		0.1	0.1	25Q03	Green River	4/91	Qa1	
Arsenic	mg/L			0.118	0.05	36A02	Covington	4/91	Qc(2)

Semi-volatile organics, pesticides and PCBs were not detected at any of the sampling sites. Methylene chloride and chloroform

were detected in most of the samples, however, trip blanks and method blanks also contained detectable levels of these contaminants. It is not possible to verify the presence of these compounds without additional sampling. Overall, water quality in each of the aquifers tested appears to be relatively free of inorganic, microbiological, and organic contamination.

E. Matching Fund Drilling Projects

Several drilling projects were accomplished as matching fund efforts within the GWMP study. The information gained and the monitoring capabilities established by these programs enhanced the ground water management capabilities in the South King County area. A total of nine drilling projects were included in the study. Seven of these consisted of exploration/monitoring well drilling, two were exploration/production well projects and one was an exploration well only. The accompanying table lists the responsible entity, the project name, and the date of completion of each of the matching fund projects. A brief discussion of each project is then presented in the order in which the projects was completed.

District	Project Name	Date
Federal Way Water and Sewer District	Exploration/monitor Wells 25T1 & 25T2	Dec., 1987
King Co. Water District 111	Exploration/production Well 7	Aug., 1988
Covington Water District	Exploration Well - Tank 2 Site	April, 1989
King Co. Water District 111	Exploration/production Well 9	July, 1989
King Co. Water District 111	Exploration/monitor Well 8	Oct., 1989
Federal Way Water and Sewer District	Exploration/monitor Well 26T	March, 1990
Federal Way Water and Sewer District	Exploration/monitor Well 17T	May, 1990
Seattle Water Department	Exploration/monitor Well, West Seattle	May, 1990
Covington Water District	Exploration/monitor Well - Wax Road	July, 1990

(1) Federal Way Water and Sewer
Exploration and Monitoring Wells 25T1 AND 25T2

Federal Way Water and Sewer District recognized a need to define the eastern extent of its Mirror Lake Aquifer and at the same time address a need for further definition of the Federal Way Deep Aquifer. The project to accomplish this consisted of

drilling an exploration well to 1200 feet at the site of their storage tanks 1 & 4 (SE 1/4 of NW 1/4 of Section 8, T.21 N., R.4 E.). The drilling, which included cable tool and mud rotary methods, culminated in the placement of two monitoring wells. The first tested three distinct zones of the Deep Aquifer between 850 and 1020 feet below land surface (elevation 448 ft) and was completed as a Deep Aquifer monitor well with screens from 847 to 872 feet. The second well is a 6-inch monitor well placed by air rotary methods to a depth of 420 feet which provides the capability of monitoring the Intermediate - Mirror Lake Aquifer. These wells provided much needed information for the definition of the lateral extent of both the Intermediate and the Deep aquifer systems. In addition, they have provided monitoring capabilities which have helped to define the dynamic response of these aquifers. Both wells have been essential in the evaluation of artificial recharge plans at this site. Additional information regarding the project is available in the Robinson & Noble Test Drilling Report 78-48L.

(2) King County Water District 111
Exploration and Production Well 7

King County Water District 111, in response to a need to define the aquifer conditions in the Southwest portion of its service area and to develop further production capacity, undertook an exploration drilling project. The drilling took place in section 34, T22N, R5E near the southeast corner of the Reber Ranch. A 12-inch diameter well was drilled to 255 feet where an aquifer capable a sustained yield of about 250 gpm was identified. Drilling encountered predominantly glacial outwash sediments typical of the Covington Upland area. The well provided information that clarified the water resource situation in a critical demand area for the District and discovered a source of higher quality water than is found in most production wells in the area. Though the aquifer is of only moderate transmissivity (1500 - 2000 gpd/ft) it represents a significant resource in the management of the water quality of the delivered water and in the operation of the system. Additional project information is available in Robinson & Noble Construction and testing report 80-56D.

(3) Covington Water District
Exploration Drilling at Tank Site 2

In response to a need to define the production potential of its northern service area, Covington Water District initiated a test drilling program at its Tank 2 Site (north central section 29, T22N, R6E). An 8-inch well was drilled using cable tool methods to a depth of 350 feet. The well was then drilled to a total depth of 1213 feet using direct circulation mud rotary methods. All materials encountered were fine grained unconsolidated sediments. No significant aquifer was penetrated and the hole was subsequently abandoned. This test drilling program provided important information regarding the depth to which unconsolidated sediments extend in this area and demonstrated that the area has significant limitations as far as water production potential. Though the results were negative they enhanced the ability of the District to plan for future demands and to manage the ground water resources of its northern service area.

(4) King County Water District 111
Exploration and Production Drilling of Well 9

Well 9 was drilled with the intention of defining the production potential of the glacial sediments that lie above a regional clay unit in the eastern portion of the service area. The well is located in the NW 1/4 of the NW 1/4 of section 35, T22N, R5E at 152nd Ave. SE and SE 275th Street. Subsequent to initial drilling to 319 feet with cable tool methods, exploration to 410 feet was accomplished with mud rotary methods. Drilling stopped due to excessive mud loss in a highly permeable unit encountered from 366 to 417 feet below land surface. The well was completed and tested in this zone. The information gained in the project has demonstrated the presence of an aquifer that represents the best production zone found in the District to date. Additional information is available in Robinson & Noble Construction Report 80-56E.

(5) King County Water District 111
Exploration and Monitoring Well 8

Well 8 was drilled with the intention of defining the deep production potential in the SW portion of the service area. The well is located in the SW 1/4 of the SW 1/4 of section 34, T22N, R5E near Well 7 on the Reber Ranch Property. Drilling reached

a total depth of 1200 feet using a combination of cable tool and mud rotary drilling methods. One deep potential production zone (915-925) was identified and tested. Testing indicated a transmissivity of less than 1000 gpd/ft which is insufficient to support any practical production from the zone. The well was ultimately completed as an observation point for Well 7 at a depth of 248 feet. In this capacity the well provides significant management information for the shallow aquifer system of the area and provides for proper resource management of the Well 7 aquifer. Additional information for this project is available in the Robinson and Noble Construction Report 80-56D2.

(6) Federal Way Water and Sewer District
Exploration and Monitoring Well 26T

This project was accomplished in order to demonstrate the presence or absence of the Intermediate and Deep Aquifers in the SW portion of the District. The well was drilled to 1115 feet through a sequence of unconsolidated sediments which was predominantly fine grained low permeability material. No significant water producing zones were encountered beneath 630 feet. Testing of the sand and gravel units between 630 and 420 demonstrated that only marginal production of up to 400 gpm was likely from the site. Since the water quality would probably require treatment for iron and manganese the zone was not pursued as a production site at this time. The well was completed as a regional water level monitoring well at a depth of 477 feet. The drilling demonstrated a western boundary to the Federal Way Deep Aquifer and showed that the Intermediate Aquifer System at the site has significantly different geologic and water quality characteristics than are found to the north. The project was valuable in defining the deeper aquifer geometry and the resultant well provides a monitor site remote from production sites. This will provide much needed regional response data which will enhance the resource management capability of the District. Additional information about the project is available in Robinson & Noble Report of Test Drilling 78-48M.

(7) Federal Way Water and Sewer District
Exploration and Monitoring Well 17T

This project was designed to expand the definition of the Federal Way Deep Aquifer northward. The exploration well was located at an existing Redondo-Milton Channel Aquifer production site (Wells 17 & 17A). The site is located in the NW portion of the

service area in the NE 1/4 of the NW 1/4 of section 18, T21N, R4E. The drilling identified a significant presence of the sand facies of the Mirror Lake Aquifer which is part of the Intermediate Aquifer System of the region as well as identifying the Deep Aquifer. The well was completed in a gravel portion of the Deep Aquifer between 925 and 950 feet below land surface (approximately 625-650 ft below sea level). In addition to aquifer definition, the well serves as an observation point for a production well which was subsequently drilled to the Deep Aquifer at the site. Information regarding this project is available in the Robinson and Noble Inc. - Report of Test Drilling 78-48N.

(8) Seattle Water Department
West Seattle Exploration and Monitoring Well

The Seattle Water Department, in response to a need to define the northern extent of the Highline Aquifer Complex, drilled an exploration well in the Beverly Park area of West Seattle (SW 1/4 of section 5, T23N, R4E). The well was drilled to a total depth of 488 feet using cable tool drilling methods. The project demonstrated that the Intermediate Aquifer was present, though of limited production potential. The Project culminated as a monitor well which serves as part of the resource management network for the Highline Aquifer Recharge Program. The Highline Aquifer is the key element of Seattle's conjunctive use program and as such, is a major factor in the ground water resource management of the South King County area. Additional information about the project is available in the CH₂M Construction and Testing Report SEA18810.1E, Beverly Park Observation Well.

(9) Covington Water District
Exploration and Monitoring Well at Wax Road Site

The Wax Road Well was designed as an exploration/monitor well to identify and evaluate a suspected shallow aquifer in the NE 1/4 of the SW 1/4 of section 36, T22N, R5E. It was drilled by cable tool methods to a depth of 187 feet and was completed between 74 and 100 feet below land surface. A production potential of 500 gpm was identified on this site. The project was subsequently expanded to include deeper exploration. An 8-inch nominal hole was placed to 1200' using mud rotary drilling methods. This resulted in considerable information regarding the hydrogeologic characteristics of this strategic area of the Covington Upland. Further information on this project is

available in the Robinson and Noble, Inc. Construction and Testing Report 5417D.

7. RECOMMENDATIONS FOR FUTURE MONITORING AND DATA COLLECTION

A. Introduction

Long-term monitoring is an essential requirement for proper management of the areas resources. The Grant II monitoring effort was largely oriented towards establishing a network of wells for water level and water quality monitoring.

In the future, the monitoring program should be expanded to include a wider range of water resource information such as stream flow, water use, climatic data, etc. A substantial amount of additional data collection is not necessarily warranted; rather the coordination of existing data collection programs and the development of data management systems and protocols would be highly desirable. A considerable amount of data collection is occurring within the area; unfortunately much of the data collection is not coordinated or shared between the parties. Streamflow data are routinely collected by King County Surface Water Management (SWM) as part of watershed management studies; King County Solid Waste and other collect a large amount of data in vicinity of landfills; water purveyors collect water use and water quality data from their supply wells as part of regulatory monitoring efforts; King County Health Department collects water quality data on small public water supply systems; Ecology collects well construction and water rights data; METRO collects water quality data; NOAA collects climatic data; etc.

The recommendations presented within this Section recognize that some additional information and a comprehensive monitoring program are warranted throughout all areas, not just those of known or existing major supplies or suppliers. The list of activities was also developed with the knowledge that sources of funding for implementing these recommendations are unresolved, as yet. However, exploratory drilling and other data collection activities by State and local agencies, private interests, or public purveyors should hopefully be influenced by this list of recommended actions.

B. Hydrogeologic Data Collection

The general recommendations for hydrogeologic data collection within the South King County planning area are summarized in the following:

Specific recommendations for each of the subareas are then presented.

- In general, dedicated monitoring wells throughout the area are preferred for long-term monitoring of water levels and water quality. Many wells that are included in the existing monitoring network are used for production purposes and consequently, it is very difficult to identify static water level trends. Several of the private wells used in the study are also strongly effected by pumping. Dedicated monitoring wells that are located somewhat distant from the pumping center provide much better definition of regional water level changes.
- Dedicated monitoring wells will likely be installed in the future by many of the local water purveyors as part of developing monitoring networks for local Wellhead Protection Programs. These monitoring wells should be incorporated into the regional network as they are installed.
- Water level monitoring and reporting by local water purveyors should be expanded in the future. The participation of water purveyors in the program was generally good; however, very little data was obtained from the Seattle Water Department. The Seattle Water Department is collecting a substantial amount of water level data as part of their artificial recharge program. Unfortunately, most of these data are not being forwarded to SKCHD for inclusion into the GWMA database. The City of Renton also collects a large amount of water level data from the lower Cedar River area. Arrangements should be made to have Renton's participation in the program.
- DOH representatives should meet periodically (annually) with water purveyor representatives to discuss data collection issues and to verify that the equipment is properly calibrated and functioning.
- An Ecology unique well ID number should be placed on all of the existing monitoring wells. The six digit ID number will serve as a future standard within the State. The database should be modified to accommodate this well numbering system and where possible, all future data collection should adhere to this system.

- Many of the wells of record have not been computerized given the limitation on project resources. In addition, many of the wells that were received from the USGS database system (WATSTOR) have not been field checked. Field survey of wells would provide accurate definition of well location, elevation, construction details, water levels, and ownership. At a minimum, all public water system wells should be field checked and incorporated into the database.

Specific recommendations for continued or expanded monitoring in each of the four subareas are presented below:

(1) Des Moines Upland

(a) Water Level Measurement

- Extensive water level monitoring is occurring within the Highline wellfield area north of SeaTac airport as part of Seattle Water Department's artificial recharge testing program. Unfortunately, very little of this information is being forwarded to SKCHD for incorporation into the GWMA database. The list of Seattle Water Department wells include:

09N01	Qva
16N01	Qva
16D01	Qc(3)
16D02	Qva
16K01	Qva
16K02	Qc(3)
16K03	Qc(4)
21C02	Qva
21H07	Qva
27C04	Qc(3)

- A cluster of wells installed by Seattle for the artificial recharge testing program at the northern end of the wellfield (wells OW-8S, OW-8I, and OW-8D) should also be incorporated into the monitoring network.
- In addition to the Seattle wells, an existing well owned King County Water District No. 49

(23N/04E-19B01) should be incorporated into the monitoring network. This well lies on the western edge of the Highline aquifer system and would be a useful control point for the Qc(3) aquifer. Several attempts were made to coordinate access to this well with District No. 49, but a satisfactory agreement could not be reached.

- Water level data for the southern portion of the Des Moines upland are relatively good. Many of the sites that are currently being monitored in this area are used for production purposes and static water levels to some extent show the effects of this pumpage. Efforts should be made to locate wells in this area that could be used for dedicated monitoring.
- The lower portion of Des Moines Creek would be the preferred area for additional monitoring; particularly within the Qc(3) and Qc(4) aquifers where there is a greater potential for salt water intrusion. Salt water intrusion parameters such as conductivity, TDS, and chloride should also be monitored in the deeper wells in this area.
- Continue water level monitoring in the southern portion of the Des Moines upland at the following sites:

03K01	Qc(3)
8A03	Qc(4)/Qc(u)
08K05	Qc(3)
08K07	Qc(4)
08K08	Qc(3)
09A04	Qc(4)

(b) Stream Gaging

- Miller Creek - Maintain the existing stream gaging station - 42A
- Des Moines Creek - Establish a new stream gaging station near the mouth, downstream from existing stations 11B and 11A.

(c) Lake Level Measurement

Tub Lake - Use existing staff gage to monitor lake levels to evaluate possible impact on wetlands from development in the Highline area.

(d) Pumpage

Although all public water systems routinely collect pumpage information, a system for standardizing data gathering and recording efforts should be created and implemented throughout the subarea. A protocol from forwarding pumpage data to SKCHD and incorporation into the project database should also be developed.

(e) Exploratory Needs

The sites shown below are recommended for exploratory drilling:

- West of SeaTac Airport in the Qc(3) and Qc(4) aquifers approximately 200 feet below sea level.
- Additional wells in the West Seattle area at depth of 100 to 200 feet below sea level.
- South of Des Moines and east of Salt Water State Park into the Qc(3) and Qc(4) aquifers.

(2) Green River Valley

(a) Water Level Measurement

- Water level monitoring within the southern portion of the Green River Valley is generally adequate. There are several dedicated monitoring wells that provide good definition of seasonal and long-term water level trends in the two principal aquifer (Qal and Qvr) that are used for public water supply in the area.
- A few sites that are currently being monitored in this area are used for production purposes and static water levels to some extent show the effects of this pumpage.

- Very little monitoring is occurring in the central and northern portions of the Green River Valley. Addition sites should be identified in the valley sediments in the vicinity of Kent (Township 22N, Range 4E, Sections 23 - 26).
- The City of Renton collects considerable amount of water level data from a network of dedicated monitoring wells in the Cedar River Valley and north Green River Valley area (Township 23N, Range 5E, Sections 17 - 18). Efforts should be made to establish procedures for periodically transfer these data to SKCHD.
- Recent water level declines in the Qal and Qvr aquifers in the Auburn vicinity need to be monitored closely. Pumpage patterns in the area need to be examined and correlated to the water level declines. Approximately three to five years of additional monitoring data will be needed to assess the significance of these declines.
- Continue monitoring of water levels in the Green River Valley at the following sites:

Township 21N, Range 4E

25M01	Qal
25Q02	Qal
25Q03	Qal

Township 21N, Range 5E

08M02	Qvr
08M03	Qal
12P01	Qvr
24E01	Qvr
07E01	Qvr
18B01	Qvr
19A02	Qvr
19E01	Qal
30B03	Qvr
30L04	Qvr
30L03	Qal
31Q01	Qc(u)

Township 22N, Range 4E

26R01 Qal

(b) Stream Gaging

The USGS station No. 113000 on the Green River near Auburn should be continued.

(c) Lake Level Measurement

No lake level measurements were identified for the Green River Valley subarea.

(d) Pumpage

Although all public water systems routinely collect pumpage information, a system for standardizing data gathering and recording efforts should be created and implemented throughout the subarea. A protocol for forwarding pumpage data to SKCHD and incorporation into the project database should also be developed.

(e) Exploratory Needs

The sites shown below are recommended for exploratory drilling:

- New monitoring wells east of the City's development in Auburn for water level and water quality in the upgradient direction.
- New well west of Auburn Well No. 1 site drilled into the Qvr aquifer to provide seasonal and long-term water level trends.
- Exploratory drilling at the Valley's East Hill to establish relationship of valley wall to valley fill at Pacific and to define production potential of valley wall material.
- Upgradient of Coal Creek Springs for water quality information.
- Deep exploratory/monitoring wells in the central and north valley area (Kent vicinity and north to Renton).

- Proposed water level measurement wells in the upper Green River Valley are discussed in the Covington Upland subarea since these wells are hydrogeologically connected.

(3) Federal Way Upland

(a) Water Level Measurement

- Water level monitoring within the Federal Way upland is relatively extensive and a good long-term record exists from which to evaluate the effects of pumpage and other management activity.
- Federal Way Water & Sewer (FWWS) collects water level data for a number of wells that are not included in the GWMA monitoring network (e.g. Wells 2, 8, 9, 10, 10A, 15, 15A, 16, 18, 20A, 23, and 23A. Data for these sites should be forwarded to SKCHD for inclusion into the project database.
- Continue monitoring of water levels in the Federal Way area at the following sites:

Township 21N, Range 3E

12J02

Township 21N, Range 4E

07R01	Qva
08F03	Qc(u)
15L02	Qc(3)
18C01	Qva
19B02	Qc(u)
19B03	Qc(u)
19B04	Qva
29D01	Qva
32P01	Qva
34P01	Qc(3)

Township 22N, Range 4E

27M01 Qc(4)

(b) Stream Gaging

- Existing King County Surface Water Management (SWM) stream gaging sites should be equipped, maintained, or relocated to a stable nearby location. These locations are as follows:

24B - Hylebos Creek
3C - Redondo Creek
33B - Lakota Creek

- A stream gaging station should be established in the upper reaches of Hylebos Creek to define baseflow conditions.

(c) Lake Level Measurements

Lake level measurements should be performed at the following locations:

Mirror Lake - Install and monitor staff gage (this gage may exist).

Panther Lake - Install and monitor staff gage.

Brook Lake - Install and monitor staff gage.

(d) Pumpage

Although all public water systems routinely collect pumpage information, a system for standardizing data gathering and recording efforts should be created and implemented throughout the subarea. A protocol from forwarding pumpage data to SKCHD and incorporation into the project database should also be developed.

(e) Exploratory Needs

The sites shown below are recommended for exploratory drilling:

- Exploratory drilling to 1,200 feet at FWWS site 17/17A for intermediate and deep aquifer definition.
- Exploratory drilling to 1,000 feet at Brook Lake for deep aquifer definition.
- Exploratory drilling to 1,200 feet at FWWS 21st Avenue Tank site for deep aquifer production.

- Deep exploration near South 305th Street Tank site and Star Lake.
- If the existing FWWS well and/or the three wells below Brook Lake prove to be inadequate, monitoring wells should be drilled south of Brook lake and north of Mirror Lake to monitor Redondo-Milton channel aquifer (Qva), remote from pumping centers.

(4) Covington Upland

(a) Water Level Measurement

- The water level monitoring network for the Covington Upland should be expanded to incorporate more sites within the areas west of Lake Youngs (Sections 3, 4, 9, 10 of Township 22N, Range 5E) and the lower Soos Creek area (Sections 9 - 16, Township 21N, Range 5E).
- Additional monitoring sites should be established within the Green River Valley upstream of Auburn. Water level trends within the valley aquifer would be useful in evaluating stream aquifer continuity and instream flow impacts. Water level monitoring in this area should be coordinated with the Muckleshoot Indian tribe.
- Water levels in many of the Water District 111 wells appear to be strongly effected by pumpage (e.g. 22N/05E-35D01). The district should make efforts to locate other wells in the area that could be used for dedicated monitoring.
- Recent water level declines in the Qvr and Qc(2) aquifers in the East Covington area need to be monitored closely. Pumpage patterns in the area need to be examined and correlated to the water level declines. Approximately three to five years of additional monitoring data will be needed to assess the significance of these declines.
- Continue monitoring of water levels in the Covington Upland area at the following sites:

Township 21, Range 5E

13G03 Qc(3)

Township 21, Range 6E

07P01 Qvr
11H01 Tbr
17R01 Qf(3)/Qu
20Q01 Qal
23B02 Qu

Township 22, Range 5E

07J01 Qc(3)
17K03 Qc(3)
20E03 Qc(3)
28E01 Qc(2)
36A02 Qc(2)
36M01
21Q04 Qc(2)
23M01 Qc(2)
33J02 Qc(3)
34N01 Qc(3)
35D01 Qc(4)

Township 22, Range 6E

06Q03 Qva/Qc(2)
16D03 Qc(3)
26P04 Qvr
33P05 Qvr

Township 23, Range 5E

25F01 Tbr
27K02 Qc(3)

(b) Stream Gaging

- Equip and maintain the following stream gaging stations:

Big Soos Creek - 54A
Covington Creek - 09A
Jenkins Creek - 26A
Panther Creek - 03A

Springbrook Creek - 03B

- Establish stream gaging station on Martinez Creek downstream from the private trout farm near Kent Springs. A location near the railroad bridge is recommended. Martinez Creek is tributary to Jenkins Creek.

(c) Lake Level Measurement

Lake level measurements should be performed at the following locations:

Lake Morton - Install and monitor staff gage.

Lake Wilderness - Install and monitor staff gage.

Lake Meridian - Install and monitor staff gage.

Lake Sawyer - Generate a stage/discharge curve for the outfall weir and monitor discharge through the weir.

Lake Youngs - Perform a water balance on the lake to assess seepage losses and recharge to the aquifer system.

(d) Pumpage

Although all public water systems routinely collect pumpage information, a system for standardizing data gathering and recording efforts should be created and implemented throughout the subarea. A protocol from forwarding pumpage data to SKCHD and incorporation into the project database should also be developed.

(e) Exploratory Needs

The sites discussed below are recommended for exploratory drilling:

- In the south service area of Covington Water District, A site near Getty Oil test well is under consideration.
- Drilling and testing to establish the production potential of the recently discovered aquifer near Kangley.
- Exploratory drilling to define the shallow aquifer systems east of Lake Sawyer.
- Exploratory drilling in an as yet undetermined location east of Wilderness Lake.

- Exploratory drilling near Lake Nielson in the southwest portion of the Covington Water District.
- Deep explorations in the northeast and southwest corners of Section 34, Township 22N, Range 5E.
- Deep explorations at as yet unspecified sites in the southwest and southeast portions of King County Water District 111 service area.
- Deep exploration east of 212th/208th Street wells to establish the eastern extent of the aquifer system.
- Exploration wells drilled to bedrock in areas that lie west and south of Lake Youngs.
- Exploration drilling in Hazelwood School area.
- Deep exploration 1,000 feet or more to explore the Qc(4) and Qcu aquifers along the Pipeline 5 alignment.
- Quadrant well site located in Section 15, Township 21N, Range 5E.
- Exploration near Lake 12 well, Section 6, Township 21N, Range 7E, under BPA powerlines.
- Exploration in Section 20, Township 21N, Range 7E, southeast of Green River near Hyde Lake.
- Exploration near Lake Devine and Shady Lake.
- Exploration near Covington Water District office or shop area.
- Deepen the Grandon well. Well site location needs to be confirmed.

C. Water Quality Data Collection

Historical water quality data were analyzed during Grant I activities. Water quality trends were evaluated and no significant trends were observed. Data gaps were identified, and a monitoring program was developed to provide additional baseline data, assess conditions on a regional basis, and fill known data gaps. Analysis of the water quality data gathered during Grant II activities suggests that land use practices

have had little measurable impact on water quality conditions throughout the study area.

(1) Indicator Parameters

Amendments to the SDWA have resulted in changes to the lists of regulated inorganic and organic parameters. New contaminants have been added, MCLs have been adopted, and certain MCLs have been changed to reflect the most recent updates on health effects. MCL changes that have occurred since water quality parameters were measured throughout the SKCGWMA are listed below.

<u>Parameter</u>	<u>Old MCL (mg/L)</u>	<u>New MCL (mg/L)</u>
Silver	0.05	0.1
Selenium	0.01	0.05
Barium	1.0	2.0
Cadmium	0.01	0.005
Chromium	0.05	0.1

Recommendation:

- Evaluate future data in relation to the new MCLs listed above.
- Update parameter lists on an annual basis to ensure complete analysis of required parameters.

(2) Data Gaps

Trend analysis of historical data gathered during Grant I identified various indicator parameters for which no previous data existed. These parameters included:

- Aluminum
- Calcium
- Cyanide
- Copper
- Sulfate
- Zinc
- Methylene Chloride
- Trichlorethylene
- Tetrachloroethylene
- 1,1,1-Trichloroethane
- pH

Samples were collected and analyzed for each of these parameters (in addition to all other regulated inorganic and organic contaminants) during Grant II. Satisfactory data was gathered for each parameter with the exception of methylene chloride. As

discussed previously, methylene chloride contamination of trip blanks and method blanks resulted in inconclusive analyses for this compound and chloroform.

Recommendation:

- Collect samples from selected high vulnerability wells and analyzed for regulated volatile organics to verify the presence or absence of methylene chloride and chloroform.
- Ensure that trip blanks are carried to all sampling sites for QA/QC verification.
- Communicate concern over laboratory contamination to the analytical facility prior to sample collection.

(3) Monitoring Program

Historical water quality analyses and sampling events conducted during Grant II activities have provided an expansive baseline of information regarding conditions in the six aquifers identified in the study region. In order to continue to monitor the impacts of land use activities on regional water quality, it is necessary to periodically collect additional samples for chemical analysis.

Many of the well sites targeted during Grant II also serve as public water supply wells. Under the SDWA, these wells are regularly monitored for inorganics, volatile organics, PCBs, and certain pesticides. This regulatory compliance data should be transmitted from the DOH files to local County Health departments for evaluation under WMP activities. Coordination between the programs would greatly reduce additional monitoring needs.

Additionally, most utilities are beginning detailed monitoring programs in response to the EPA Wellhead Protection Program. This program typically involves the development of detailed hydrogeologic and water quality profiles, requiring extensive groundwater monitoring programs. Any data generated under the Wellhead Protection Program by each utility should also be used at the regional level to supplement the WMP database.

Results of Grant I and II water quality investigations suggest that regional groundwater quality would meet most drinking water criteria under the SDWA. With the exception of lead levels at

site 19A02 in the Green River Valley subarea, elevated chromium and levels at site 25Q03, and elevated mercury levels as site 16N01 in the Des Moines Upland subarea. Contamination from any of these metals indicates that localized groundwater is being impacted by industrial activity. Additional monitoring of these well will help to verify the persistence of the potential contamination sources.

Recommendations:

- Coordinate the transfer of regulatory compliance monitoring data at all public water supply wells within the study area for incorporation with regional databases.
- Supply data collected under the GWMP to those utilities conducting Wellhead Protection Programs, and coordinate the integration of results from monitoring conducted under the Wellhead Protection Program.
- Resample the wells discussed above and analyze for inorganics above to determine if contamination from heavy metals is present. If results are positive, investigate and determine the sources of contamination.

In summary, there appears to be little degradation of regional water quality resulting from human activities. The efforts and expenses associated with continued extensive monitoring do not seem warranted at this time, provided that regulatory compliance data and any other related resource information is made available, evaluated, and incorporated into the regional database. A minor monitoring effort is justified for the purpose of determining heavy metal levels (lead, mercury, and chromium) at spot locations. Additionally, if regulatory volatile organic chemical data indicate that contamination from methylene chloride or chloroform has occurred, further monitoring may be required.

TABLE II-1

KING COUNTY AGENCIES/CITY
SOLID WASTE PROGRAMS

Name of Agency	Completed By	Description of Agency's Areas of Jurisdiction	Controlling Documents, Statutes or Ordinances	Description of Activities Potentially Affecting GW	Name of Program or Projects in King County	Responsible Office/Individual	Phone No.
LOCAL							
King County Council	Bob Bruce	Unincorporated King County	King County Charter - Article 7, Section 220.20 WAC 173-100-090, RCW 9A.46.010 Washington State Constitution RCW 16.70 King County Ordinance 717B	Legislative Authority enactment of ordinances and regulations governing protection of ground water resources, including land use provisions.	Water Resource Program Land Use Program Community Plan Review Open Space Program (Hollands) Staff Advisor, K. C. Council's - Parks, Planning & Resources - Councils	Robert W. Bruce Michelle McFadden Vaughan Morris Gene Duvrney Molly Kean	(206-1673) (206-1677) (206-1676) (206-1690) (206-1672)
King County Public Works Department Roads Division (Maintenance)	Dan Willott	King County Roads, Streets, and County Right-of-Way	RCW 36 RCW 70.95 Primarily King County Code Chapters 12, 14, 17, and 19	Road Construction/Maintenance Herbicide Application Drainage System Construction and maintenance, construction plan review	Numerous construction and maintenance related projects, primarily relating to road maintenance and drainage program	Low Matt Doug Mattson Shed Mattson	(206-4590) (206-2531) (206-2531)
Seattle/King County Health Department	Bill Lasby	King County	RCW 70.05, 70.12, 70.110 WAC 173-303, 304, 160 WAC 240-50, 54, 84, 86, 98 Rules & Regulations 3, 8, 9 (13 - Onsite Sewage Disposal) (18 - Solid Waste) (19 - Water Supply)	Regulatory and Advisory Water System/Water Siles Sewage Disposal Solid Waste Permits Sludge Application Sites	Drinking Water Program (Priv/Pub) Liquid Waste Program Solid Waste Program Hazardous Waste Program	Bill Lasby Maryann Buchard Greg Bishop Gary Irvine & Wally Swafford	(206-2705) (206-2704) (206-2705) (206-2704) (206-4003)
King County Planning and Community Development (Parks, Plan. & Res.)	Paul Reitenbach	Unincorporated King County	Zoning Codes Community Area Plans Land Development Standards Comprehensive Land Use Plan	Implementation of King County Comprehensive Plan Develop land use policy plans Develop zoning plans	Enclave Community Plan Soos Creek Community Plan Hobbes/Haven Heights Community Plan Federal Way Community Plan Northeast Highline Community Plan	Carol Lueb Sue Enger Paul Reitenbach Anne Knapp Anne Knapp	(206-4671) (206-4676) (206-4684) (206-4266) (206-4266)
King County S&D (Parks, Plan. & Res.)	Dave Feltman	Unincorporated King County	King County Code WAC	Land Development Zoning Plan Preparation and Implementation	Utility Planning Subdivisions Development Control Commercial Permits Residential Permits Sensitive Areas SEPA	David Feltman Julian Miraki Jerry Marshall Don Mc Donald Gary Kehler Ralph Colby Ralph Colby	(206-7140) (206-7140) (206-7140) (206-7140) (206-7140) (206-7140) (206-7140)
King County Resource Planning (Parks, Plan. & Res.)	David Masters	Unincorporated King County	King County Comprehensive Plans King County Code	Research --- Interaction of Wetlands & Surface Water Runoff Technical Assistance --- Land Use Controls Subdivision Technical Review GM Tech Advisory Committee Environmental Review of Plans Basin Planning	Basin Planning Non-Point Source/Watershed Planning Community Plan Assistance Environmental Review/Subdivision Groundwater IAC/Land Use Controls Wetlands research MPD Research Late Seasonish Study	Bill Eckel Steve Wells Riley Atkins David Masters David Masters Rich Warner Klaus Richter David Masters	(206-2544) (206-2545) (206-2070) (206-4685) (206-4685) (206-4689) (206-2540) (206-4685)
King County Basin Planning (Parks, Plan. & Res.)	Berak Booth Bill Eckel	Western King County Surface Water Management - Program Service Area	King County Code 9.08	Stream Gaging Basin Plans including data - analyses, recommendations for projects, land use changes, regulations, and Water Quality Programs.	Soos Creek Basin Plan Hylebos Basin Plan Stream Gaging Basin Planning Program	Amy Moorehead Debra Frazzetti John Zoon Bill Eckel	(206-2544) (206-2544) (206-2544) (206-2544)
King County Public Works SNW	Dave Clark	King County River Facility Maint. Prog. Flood Control Management Prog. SNW Service Area Surface Water Management - Program	King County Ordinance 2500 - (SNW Program) King County Code 9.0 - (Drainage Code) Interlocal Agreements - (Basin Planning) (Capital Improvements) Drainage Manual	SNW CIP Projects Basin Plans Drainage Enforcement Drainage Facility Maint. Prog. Drainage Annual Regulations Stream Improvement Construction Stream Gaging Program Community Involvement - Public Education Program	Soos Creek Basin Plan Hylebos Basin Plan Bear Creek Basin SNW CIP Projects SNW Facility Maintenance SNW Drainage Enforcement Flood Control Comprehensive Plan	Amy Moorehead (Lead Planner) Dick Thomas (Lead Engineer) Debra Frazzetti (Lead Planner) Doug Chin (Lead Engineer) Ray Weller (Lead Planner) Doug Chin (Lead Engineer) Lorry Gibbons Jerry Creek Bill Davis Dave Clark	(206-2544) (206-2546) (206-2544) (206-2341) (206-2544) (206-2341) (206-2544) (206-2531) (206-4634) (206-2619)
King County Public Works Solid Waste	Kevin Kierman		WAC 173-304 (Minimum - Functional Standards) Rules & Regulations 10 (King County Health Dept)	Landfill Operation/Maintenance Conduct ground & surface water monitoring at landfill sites. Geotechnical investigations	Enclave Landfill Cedar Hills Landfill Hobart Landfill Cedar Falls Landfill Vashon Landfill Burrall Landfill	Neil Fujsi Shirley Jorgensen Kevin Kierman Kevin Kierman Kevin Kierman Neil Fujsi	(206-4111) (206-4111) (206-4111) (206-4111) (206-4111) (206-4111)
Fire Districts			RCW 52, 9A.10, 39.16, 46.16, and 70.103				

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TABLE II-1
KING COUNTY AGENCIES/CITY
GROUNDWATER PROGRAMS

Name of Agency	Completed By	Description of Agency's Area(s) of Jurisdiction	Controlling Documents, Statutes or Ordinances	Description of Activities Potentially Affecting GW	Names of Programs or Projects in King County	Responsible Officer/Individual	Phone No.
LOCAL							
Water and Sewer Districts							
1. KCMU 105							
2. KCMU 75	Shane Husley	Bounded by Sea-Tac Airport, Federal Way, Green River and Puget Sound	KCMU, Chapter 57	Monitoring 2 wells Pipeline work Retention Ponds: Angle Lake Well Other activities in the areas Midway & Kent Highlands Des Moines SD dewatering Street Drainage	Midway Landfill Off-site Drainage Des Moines SD Dewatering Street Drainage Street Drainage Street Drainage	Nathy Orst Jim Henry City of Des Moines City of Marysville City of Kent City of Tukwila	1884-3191 1876-1968 1874-4628 1874-3602 1851-3383 1431-1834
3. KCMU 54	Rolle Pederson, Mgr.	Greater Des Moines Business Community, Downtown Core	KCMU, Chapter 57			Rolle Pederson, Manager	
4. KCMU 111							
5. Val-Vue SD		See Map	KCMU 54	sanitary sewer construction	N/A		
6. Rainier Vista SD	Melen Davis, Manager	Bordered by Duwamish River and Valu-Vue SD on the east, S. 144th St. on the South, SW Suburban SD on the west, and approx. S. 10th St on the north.	KCMU 54	sanitary sewer construction	N/A	Melen Davis, Manager	
7. Des Moines SD	J.A. Henry	(Returned Questionnaire without completing)					
8. SW Suburban SD	Steve Sandelius	See Map	KCMU 54	sanitary sewer construction secondary treatment plants (2 - discharge to Puget Sound) septic tank policy to connect as early as possible, temporary services policy of allowing failed septic system to connect at current assessment		Steve Sandelius	246-9575
1. Federal Way V & S	Lissa Obermayer	Bordered by Pierce County, Puget Sound, north ranging from S. 262nd to S. 378th, East to western boundary of Green River Valley	Water MAC 57.00.010 Sewers Mac 56.00.010	Construction of Facilities Maintenance of Facilities Test/Production well drilling Herbicide Use on District Property Possibility of failing septic tank and underground storage tanks.	Water Quality Protection Program Permits Issued here	Lissa Obermayer	161-7200
2. Soos Creek SD	(no response)						
Cities							
1. Seattle	Bob Schwartz	Seattle direct service areas and outside purveyors.	SDWA Water Resource Act of 1971	Two water wells ground water recharge project Reviewed/Approved by Water Quality, Environmental Section, Director of Water Quality, and Superintendent of Water.	Cedar River Ground Water Recharge Study Chemical or fertilizer use on SWD property	Dave Parkmann Paul Blum	1884-3932 1881-5925
2. Algona	Greg Villanueva	Corporate Limits of Algona	KCMU 56, KCMU 35.67.010 KCMU 35.67.020, Algona Municipal Code	Two gravel mining projects	Valley Top Soil Pit Quadrant Pit City Permits the following: sewer, building, plumbing, burning, land clearing, grading, fill, construction, culvert (etc), and overloaded vehicles.	Pat Foley Randy Hasbun	1919-6886 155-2960
3. Pacific		Corporate Limits of Pacific					
4. Black Diamond		Corporate Limits of Black Diamond					
5. Kent		Corporate Limits of Kent					
6. Renton							
7. Des Moines							
8. Auburn							

TABLE II-2

STATE AGENCIES
GROUNDWATER PROGRAMS

Name of Agency	Completed By	Description of Agency's Area's of Jurisdiction	Controlling Documents Statutes or Ordinances	Description of Activities Potentially Affecting GW	Names of Programs or Projects in South King County	Responsible Office/Individual	Phone No.
STATE							
Department of Agriculture C. Alan Pellibone, Director	Art Schreuniger, Asst. Dir. Agri. Dev. Don Alexander, Nuisance Needs/ Art Loser, (Chemical) & Plant Div		RCM 17.21 RCM 15.30 Various MAC's	Licensing and permitting of pesticide applications on agricultural lands of both farmer and seller.	Dairy Livestock Services Agriculture Development Chemical and Plant Services Nuisance Needs Statistical Division		
Washington State Conservation Commission	Robert P. Boltan, Admin. Officer/ Sue	Responsible for guiding and assisting state's 40 local conservation districts.	RCM 89.08	No direct activities, except awarded grant to WICD to do work relating to non-point source pollution.	Nonpoint Water Quality Information, Education, and Technical Assistance Program	Marlin Boon, Chairman WICD	875-2310
Environmental Hearings Office	Nick Dufford, Chairman/ Not Returned	Appeals from Ecology and Shorelines actions			Pollution Control Hearings Board Shoreline Hearings Board Forest Practice Appeals Board Hydraulic Hearings Board		
Department of Ecology (3 surveys completed)	Carol Jolly, WD Chris Haynes, Hazard Media Adelson, Waters Rod Huck, Shorelines Stu Clark, Air John Luffin, USF's Dave Saunders, Hazardous Waste	Water Quality Protection thru waste discharge permits, enforcement of discharge regulations, and spill response activities. Water Resource Management thru water right permits, regulation of water well construction. Underground Storage Tanks Hazardous Waste Management	RCM 90.10 - Water Pollution Control RCM 90.03 - Water Code 90.44 - Reg. of Public GW 90.51 - Water Resource Act 90.14 - Water Rights 10.101 - Well Construction 43.21C - SEPA RCM 70.105 - Hazardous Waste MAC 173-303 - Dangerous Waste SD 4005 - Pending Laws of 1987	Regional Offices issues waste discharge permits, enforces permit conditions, inspects municipal and industrial, responds to pollution incidents and spills to monitor clean-up activities. Regional Offices issues water right permits, regulates against illegal water users and regulates water well construction.	Northwest Regional Operations and Enforcement Water Resources Program Point, Non-Point Source Program Lake Protection, stormwater abatement Solids and Hazardous Waste Program Underground Storage Tank Program Well Drilling	Nancy Ellison Media Adelson Carol Jolly Chris Haynes John Luffin Bill Miller	
Department of Fisheries	Joe Nobel Regional Habitat Joseph A. Blum, Director	Preserves, protects, perpetuates and manages the food fish and shellfish in state waters and off shore waters. Nellie Perimeter	RCM 75 RCM 74.20.100 - Hydraulic Codes (Fisheries and Hydraulic Codes enclosed with survey)	Regulatory authority under the Hydraulic Code	Regional Habitat Manager-Marine Regional Habitat Manager-Freshwater	Joe Nobel	753-5752 339-4710
Department of Parks and Recreation							
Department of Natural Resources (DNR)	Mike Griggs Regional Manager Brian Boyle, Commissioner of Public Lands/ Don Innes, Forester	Statewide Natural Resource Administration of Non Federal Lands.	Revised Code of Washington Washington Administrative Codes	Surface Mining Logging Wildfire Slash Burning Chemical Vegetation Control	State Land Management Forest Practices Private Lands Wildfire Control Surface Mining		
Department of Social and Health Services (DSHS)	Eric Stagle, Chief Environmental Health Not Returned		Revised Code of Washington Washington Administrative Codes Rules and Regulations adopted by the State Board of Health	conducts or coordinates water system plan review well site approval water quality monitoring and analysis for drinking water constituents enforces drinking water standards investigates public health risks due to drinking water contamination			

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TABLE II-2
 STATE AGENCIES
 GROUNDWATER PROGRAMS

Name of Agency	Completed By	Description of Agency's Area's of Jurisdiction	Controlling Documents Statutes or Ordinances	Description of Activities Potentially Affecting GW	Names of Programs or Projects in South King County	Responsible Office/Individual	Phone No.
STATE							
Department of Transportation (DOT)		All the state highway routes and right-of-way located in King County, including	RCM's for DOT right-of-way. Within cities modified. For non-limited access vested in the City as specified in RCW 47.24.	State Highway planning, location-design, construction and activities assoc. with roadway maintenance incl. resurfacing; shoulder and ditch maint.; brush, tree and noxious weed control.	State Highway Maintenance State Highway Construction State Highway Plans Preparation State Highway Accident Report DOT Marine Division	Pat Foley	
Department of Wildlife	Joan Keller, Regional Manager/ Not Returned						
Northwest Air Pollution Control Authority (NWAPCA)		Air pollution control	Washington Clean Air Act Federal Clean Air Act Ecology Admin. Codes - MAC 173 NWAPA Regulation	Regulatory agency, conducts air quality monitoring, new source permitting, handles citizen complaint, inspects industrial sources, and enforces air pollution regst	None listed.		
Puget Sound Water Quality Authority (PSWQA)	Josanne Richter "State of the Sound Report"						

TABLE II-3

FEDERAL AGENCIES
GOVERNMENT PROGRAMS

Name of Agency	Completed By	Description of Agency's Areas of Jurisdiction	Controlling Documents, Statutes, or Ordinances	Description of Activities Potentially Affecting GV	Name of Programs or Projects in King County	Responsible Officer/Individual	Phone No.
FEDERAL							
Dept of Agriculture-USDA	Ken Shanblin, State Director of Agri Gary Oldenburg, State Director of Animal Damage	Provide assistance to land-owner and communities in municipal sludge applications, livestock, crops, irrigations, design and certify wildlife and animal waste ponds as shared with ASCS. Woodland assistance, too.	SCS/non-regulatory agency of the USDA. PL 46, 76th Congress 16 USC 390 a-1, a-1, a-1, a-1, a-1 12 USC 3271-3274 7 USC 2701		Technical Assistance Soil Surveys Plant Materials Watershed Projects River Basin Surveys Resource Construction & Developments Emergency Watershed Protection Resources Conservation Act Fish & Wildlife Conservation Woodland Conservation	Dept. of Agriculture Olympia, WA	
Soil Conservation Service (SCS)	Wyle Pitt			Federal cost sharing for construction of animal waste storage facilities, ponds, underground drains, shallow wildlife ponds on farms, thinning forestry stands, tree plantings, and erosion control.	Agriculture Conservation Program ASCS Committee		
Agriculture/Stabilization and Soil Conservation (ASCS)		Administration of Federal farm and agriculture programs	Numerous Federal Register regulations and Executive Orders				
Corp of Engineers	A.P. Soltevoild, Chief of Engineering Div. Ray Fawc, Chief of Construction Div. Vernon Cobb, Chief of Operations Div. Warren Basler, Regulatory Branch	All activities in, under or over navigable waters of the US (Section 10) Discharge of dredge or fill materials in waters of US, including wetlands.	Section 10 of Rivers and Harbors Act of 1899. Section 404 of the Clean Water Act.	Regulatory jurisdiction over wetlands.	Regulatory Program Maintenance Dredging The Corps is responsible for all navigable waters including shorelines, as well as wetlands. The Corps handles construction and disposal of dredge material permits. Permits are handled through the regulatory branch.	Corps of Engineers Department of the Army Seattle District	
Environmental Protection Agency (EPA) Region 10	Robert Durd, Dir. of Water Division Chuck Findley, Dir. of Waste Division Gary O'Neal, Dir. of Insects Division/ Robert Durd	Hazardous Waste - Superfund and Generators Municipal Facilities Pesticides Underground Storage Tanks Sole Source Aquifer Program Region 10 includes: Washington Oregon Idaho Alaska	CERCLA/SARA, Section 120 Navy's VI Current Situation Report and Pending Workplans Development & Pending RI/FS Clean Water Act as amended. Fed. Insecticide, Fungicide, and Rodenticide Act CERCLA Section 142(a) of the Safe Drinking Water Act	Provide technical assistance to the State, Regulatory Agency, as well as research and monitoring programs. EPA is responsible for governing the Safe Drinking Water Act and the Clean Water Act. The Underground Storage Tank program is for the entire Pacific Northwest. Hazardous waste is divided into Superfund and hazardous waste. Wellhead and Sole Source Aquifer programs are both under the Office of Groundwater.	Oversight for Remedial Investigations / Feasibility Studies (RI/FS) Sludge Disposal, Treatment and Land Spreading Pesticide Registration Pesticides in Ground Water Survey Agricultural Chemicals in Ground Water Strategy Underground Storage Tanks Sole Source Aquifer Program Water Division Ground Water Coord.	Bob Laiselle Dick Netherington Chuck Shank Steve Bubnick Gary O'Neal Jonathan W. Vizaras Steven Roy	442-1847 442-1944 442-8574 442-1349 442-4132 442-1541 442-2118
Farmer's Home Administration (FmHA)		Single & Multi-Family Housing Water & waste systems, community facilities, and rural business projects financed by FmHA.	U.S.D.A. rules and regulations drafted as a result of congressional proceedings.	Construction of multi-family housing projects w/ parking lots and single-family w/ on-site storage disposal.			
US Geological Survey (USGS)							

TABLE II-4
Summary of GWMA Monitoring Wells
South King County Ground Water Management Program

Local Well Number	Site ID Number	Well Owner	Site/Mailing Address	Principal Aquifer	Site Elevation (ft-MSL)	Elev Code	Well Depth (ft)	Water Level Depth (ft)	Water Level Date	Well Diameter (inches)	Monitoring Activity		Status Codes	Respon. Party
											Water Levels	W.Q.		
23N05E-25F01	472701122062701	MAPLE VALLEY CHRISTIAN SCHOOL	16700 - 174th Ave SE, Renton, WA 98058	Tbr	656	M	203	26	1954/12/09	6	X	X	P	SKC
23N05E-27K01	472701122090001	FAIRWOOD GOLF CLUB, Well 1		Qc(3)	494	M	249	100	1986/04/28	8	X			SKC
23N05E-27K02	472701122085401	FAIRWOOD GOLF CLUB, Well 2		Qc(3)	475	M		126.2	1990/07/13	8	X			SKC
23N04E-09N01	472932122183001	SEATTLE WATER DEPT., OW-7S	1509 South Spokane St., Seattle, WA 98144	Qva	345	M	71			0	X	X	M	SWD
23N04E-16D01	472918122182601	SEATTLE WATER DEPT., OW-2I	1509 South Spokane St., Seattle, WA 98144	Qc(3)	363.00	L	300.5	81	1986/11/13	2	X		M	SWD
23N04E-16D02	472919122182501	SEATTLE WATER DEPT., OW-2S	1509 South Spokane St., Seattle, WA 98144	Qva	362.70	L	75	61	1986/11/13	2	X	X	M	SWD
23N04E-16K01	472842122175801	SEATTLE WATER DEPT., OW-3S	1509 South Spokane St., Seattle, WA 98144	Qva	400.25	L	109	84	1986/11/13	2	X	X	M	SWD
23N04E-16K02	472842122175701	SEATTLE WATER DEPT., OW-3I	1509 South Spokane St., Seattle, WA 98144	Qc(3)	400.73	L	320	120.00	1986/11/13	2	X		M	SWD
23N04E-16K03	472842122175601	SEATTLE WATER DEPT., OW-3D	1509 South Spokane St., Seattle, WA 98144	Qc(4)	399.82	L	523	162.00	1986/11/13	2	X		M	SWD
23N04E-16N01	472831122183101	SEATTLE WATER DEPT., OW-6S	1509 South Spokane St., Seattle, WA 98144	Qva	344.56	L	47	29.00	1987/12/07	2	X	X	M	SWD
23N04E-21C02	472821122181001	SEATTLE WATER DEPT., OW-5S	1509 South Spokane St., Seattle, WA 98144	Qva	432.44	L	149.5	124.00	1986/11/13	2	X	X	M	SWD
23N04E-21H07	472810122173701	SEATTLE WATER DEPT., OW-4S	1509 South Spokane St., Seattle, WA 98144	Qva	405.27	L	107.5	95.00	1985/07/18	2	X		M	SWD
23N04E-27C04	472733122175901	SEATTLE WATER DEPT., OW-1I	1509 South Spokane St., Seattle, WA 98144	Qc(3)	423.21	L	328	155.00	1985/06/24	8	X		M	SWD
23N04E-30F02	472655122204501	SWSUBURBAN SEWER DISTRICT		Qc(3)	26		38.5	10.00	1986/08/28	8	X	X	P	SWD
22N05E-21Q04	4722301222101401	KCWD 111, Well 5	27239 - 132nd Ave. SE, Kent, WA 98031	Qc(2)	517.8	L	368	142	1982/02/15	12	X	X	P	WD111
22N05E-23M01	472757122082701	KCWD 111, Well 3	27239 - 132nd Ave. SE, Kent, WA 98031	Qc(2)	350.8	L	79	1	1982/12/01	12	X	X	P	WD111
22N05E-33J02	472058122095401	KCWD 111, Well 6	27239 - 132nd Ave. SE, Kent, WA 98031	Qc(3)	371.50	L	215	27	1984/12/05	12	X	X	P	WD111
22N05E-34N01	472039122093601	KCWD 111, Well 7	27239 - 132nd Ave. SE, Kent, WA 98031	Qc(3)	345	M	255	34.5	1988/08/29	0	X		P	WD111
22N05E-35D01	472148122081901	KCWD 111, Well 9	27239 - 132nd Ave. SE, Kent, WA 98031	Qc(4)	346.90	L	438.7	9.1		0	X	X	P	WD111
22N04E-08A03	472457122190201	KCWD 75 DES MOINES	23828 30TH AVE S. KENT 98032	Qc(4)	189.80	L	362	72	1983/07/06	24	X	X	P	WD54/WD7
22N04E-08K05	472430122191701	KCWD 54, NO.3	922 SO. 219TH ST. DES MOINES 98198	Qc(3)	150	M	200	42	1955/06/03	12	X		M	WD54/WD7
22N04E-08K07	472433122192101	KCWD 54, NO.4	922 SO. 219TH ST. DES MOINES 98198	Qc(4)	150	M	328	79	1967/06/13	16	X	X	P	WD54/WD7
22N04E-08K08	472421122190501	KCWD 54, NO.5	922 SO. 219TH ST. DES MOINES 98198	Qc(3)	150	M	244	46.3	1982/05/06	12	X	X	P	WD54/WD7
22N04E-09A04	472452122174101	KCWD 75 ANGLE LAKE	23828 30TH AVE S. KENT 98032	Qc(4)	337.63	L	485	202	1983/08/30	30	X	X	P	WD54/WD7

1) Responsible parties include:

- C - Consultant
- K - Kent
- S - Seattle Water Department
- A - Auburn
- P - Pacific
- FWWS - Federal Way Water & Sewer
- WD75 - Water District 75
- WD111 - Water District 111
- WD54 - Water District 54
- SKC - Seattle-King County Health
- CWD - Covington Water District

2) Status Codes:

- M - Monitoring Well
- P - Production/Supply Well

3) Site Elevation Codes:



- A - Elevation Determined with Altimeter
- L - Elevation Determined with Level or Surveying Method (King County Datum)
- M - Elevation Determined from Interpolation from Topographic Map

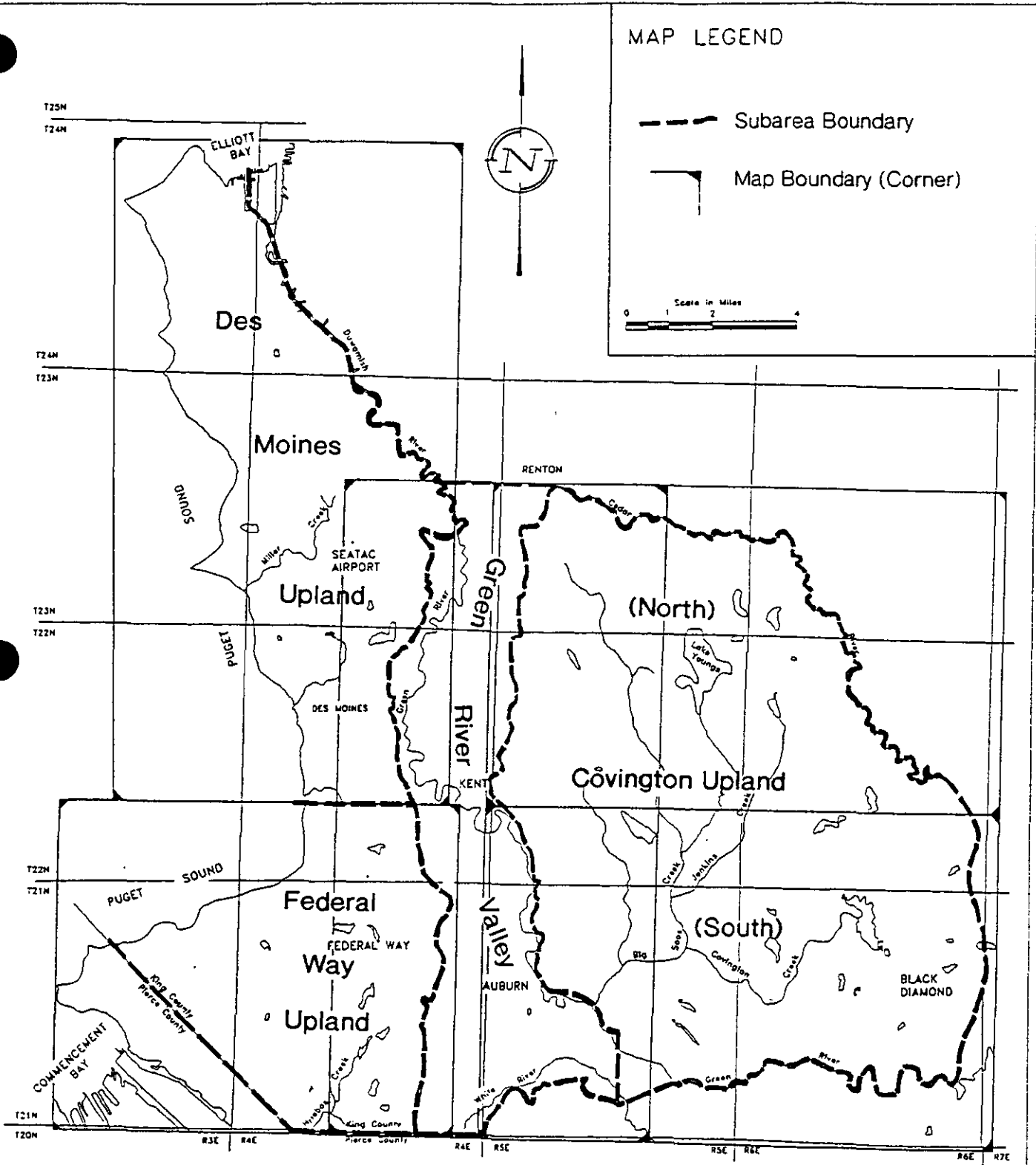
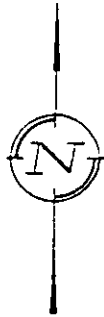
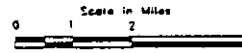
TABLE II-5

Analytical Parameters
by Subarea

Sample ID	Owner	Owner ID	Inorganics	Coliform Bacteria	Volatile Organics	Semi-Vol. Organics	Pesticides	PCBs
Des Moines Upland Subarea								
23N/04E-16D02	Seattle	OW-2S	yes	yes	yes			
23N/04E-16K01	Seattle	OW-3S	yes	yes	yes	yes	yes	yes
23N/04E-21C02	Seattle	OW-5S	yes	yes				
23N/04E-16N01	Seattle	OW-6S	yes	yes	yes			
23N/04E-09N01	Seattle	OW-7S	yes	yes				
22N/04E-08K07	KCWD 54	Well 4	yes	yes				
22N/04E-08K08	KCWD 54	Well 5	yes	yes	yes			
22N/04E-09A04	KCWD 75	Angle Lake	yes	yes				
22N/04E-08A03	KCWD 75	Des Moines	yes	yes				
23N/04E-30P02	SW Suburb. Sew.		yes	yes				
22N/04E-03K01	Pittenger		yes	yes	yes			
Federal Way Subarea								
21N/04E-07Q06	FWWS	Well 23A	yes	yes				
21N/04E-07R01	FWWS	Well 20	yes	yes				
21N/04E-15L02	FWWS	Well 10B	yes	yes	yes			
21N/04E-18C01	FWWS	Well 17	yes	yes	yes			
21N/04E-19B03	FWWS	Well 19	yes	yes				
21N/04E-29D01	FWWS	Well 21	yes	yes	yes	yes		
21N/04E-34P01	FWWS	Well 22	yes	yes				
21N/03E-14A01	Twin Lk. CC		yes	yes	yes	yes	yes	yes
Green River Subarea								
21N/05E-19A02	Auburn	Well 1	yes	yes	yes	yes		
21N/05E-30B02	Auburn	Well 4	yes	yes	yes		yes	yes
21N/05E-31Q01	Auburn	Well 5	yes	yes	yes			
21N/04E-25M01	Algona	Well 1	yes	yes	yes			
21N/04E-25Q03	Pacific	Well 1	yes	yes	yes	yes	yes	yes
21N/05E-19E01	Holy Family		yes	yes				
22N/04E-26R01	Smith Dairy		yes	yes	yes	yes	yes	yes
21N/05E-30J03	Bailey		yes	yes	yes			
Covington Upland Subarea								
22N/05E-21Q04	KCWD 111	Well 5	yes	yes				
22N/05E-23M01	KCWD 111	Well 3	yes	yes	yes	yes	yes	yes
22N/05E-33J02	KCWD 111	Well 6	yes	yes	yes			
21N/06E-04B08	CWD	Well A	yes	yes	yes			
22N/06E-28J03	CWD	Witte Rd.	yes	yes	yes			
22N/06E-36A02	CWD	Ravensdale	yes	yes	yes			
22N/05E-07F02	Kent	212th St.	yes	yes				
22N/05E-07J01	Kent	Garrison Cr.	yes	yes				
22N/05E-20E03	Kent	East Hill	yes	yes				
22N/06E-26P03	Kent	Clark Sprs	yes	yes	yes	yes	yes	yes
22N/05E-28E01	Kent	Soos Cr.	yes	yes				
22N/06E-33P05	Kent	Kent Sprs	yes	yes	yes	yes	yes	yes
22N/05E-36a03	Kent	Armstrong Sprs. 2	yes	yes	yes	yes	yes	yes
22N/06E-06Q03	Schelhase		yes	yes				
22N/06E-16D03	David		yes	yes				
23N/05E-25F01	Maple V. Christ. Sch.		yes	yes				
21N/06E-07P01	Kuhlmann		yes	yes	yes	yes	yes	yes
21N/06E-11H01	Reichert		yes	yes				
21N/06E-20Q01	Benz		yes	yes	yes			
21N/05E-13G03	Hammons		yes	yes				
	Ulleland							

MAP LEGEND

-  Subarea Boundary
-  Map Boundary (Corner)



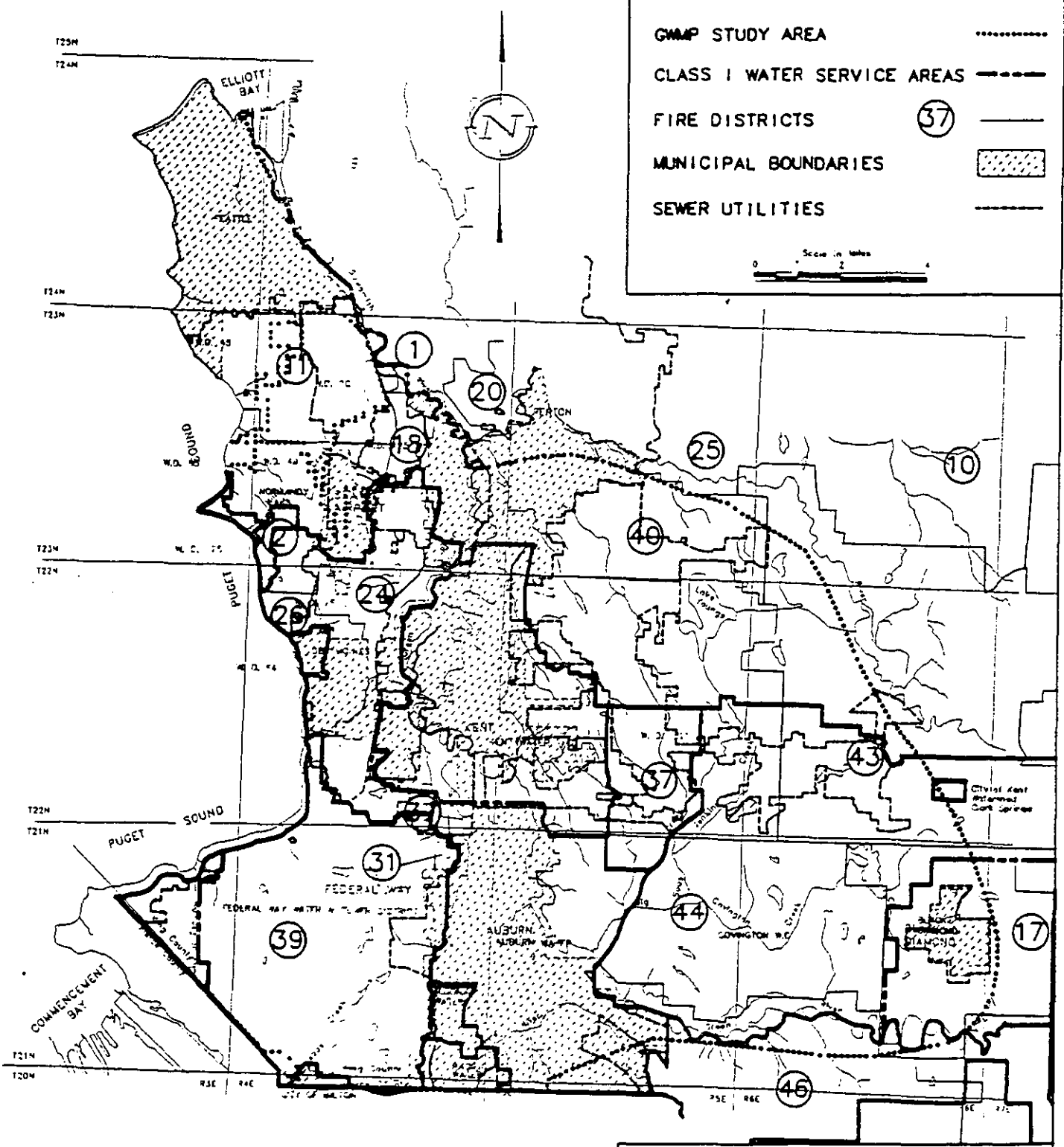
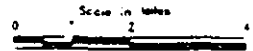
South King County
Ground Water Management Plan

EXHIBIT II-1
Subarea and Map
Area Boundaries



MAP LEGEND

- GMMP STUDY AREA -----
- CLASS I WATER SERVICE AREAS - - - - -
- FIRE DISTRICTS (37) ———
- MUNICIPAL BOUNDARIES [Stippled Box]
- SEWER UTILITIES - - - - -



South King County
Ground Water Management Plan
 EXHIBIT II-2
JURISDICTIONAL
BOUNDARIES



EXHIBIT II-3

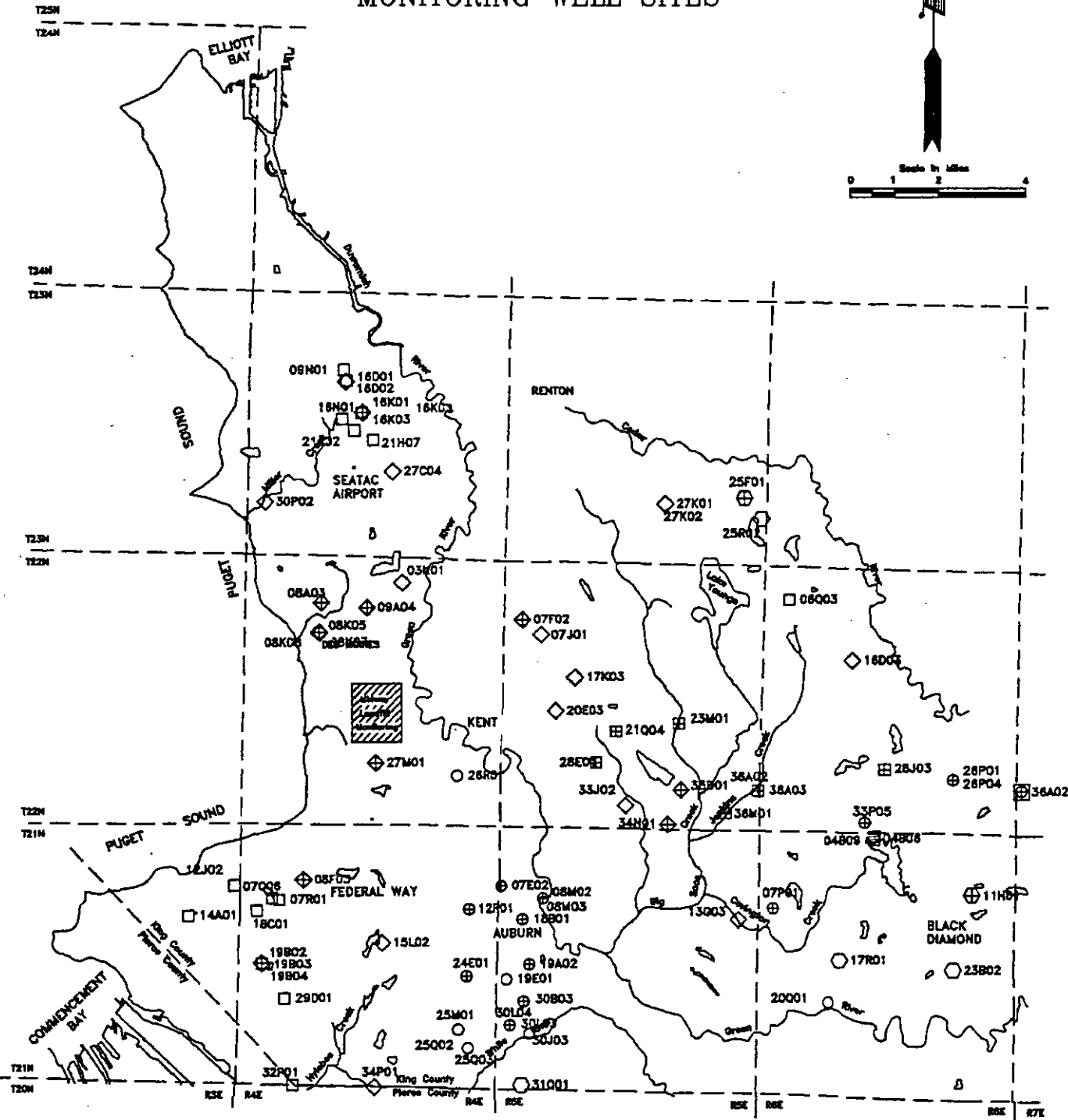
SOUTH KING COUNTY

GROUND WATER MANAGEMENT PLAN

LOCATION OF RECOMMENDED MONITORING WELL SITES



Scale in Miles
0 1 2 4

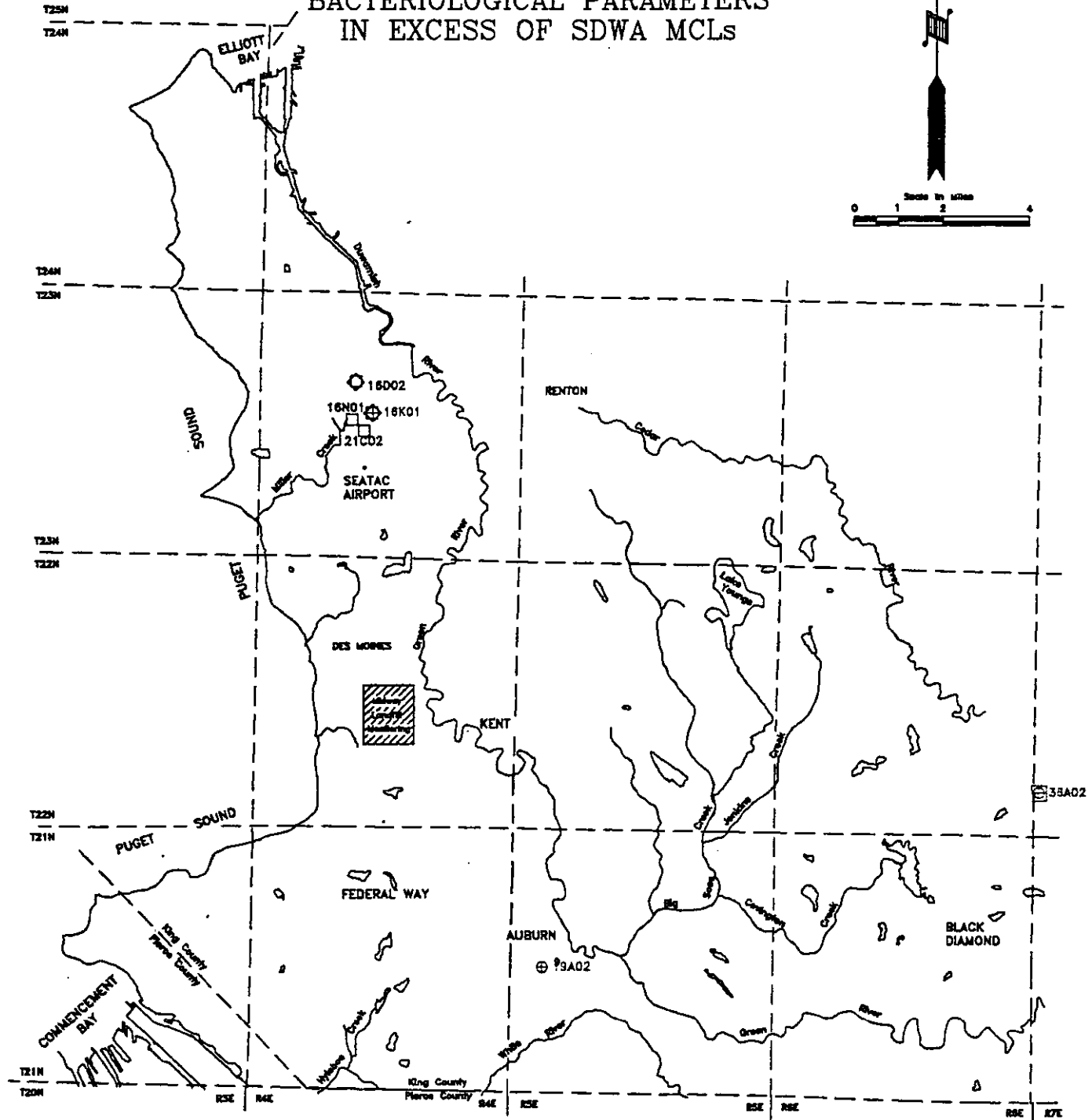


MAP LEGEND			
Principal Aquifer for Well Completion			
○	◇	□	⊕
Qal	Qc(3)	Qva	Tbr (bedrock)
⊕	◇	⊞	○
Qvr	Qc(4)/Qc(u)	Qc(2)	Undifferentiated



ECONOMIC AND ENGINEERING SERVICES, INC.

EXHIBIT II-4
SOUTH KING COUNTY
GROUND WATER MANAGEMENT PLAN
SAMPLING LOCATIONS WITH INORGANIC OR
BACTERIOLOGICAL PARAMETERS
IN EXCESS OF SDWA MCLs



MAP LEGEND

Principal Aquifer for Well Completion
 (Color may vary)

○ Qal	◇ Qc(3)	□ Qva	⊕ Tbr (bedrock)
⊕ Qvr	⊕ Qc(4)/Qc(u)	⊞ Qc(2)	○ Undifferentiated

COLOR CODE

RED = MERCURY BLUE = LEAD ORANGE = ARSENIC
 GREEN = TOTAL FECAL & COLIFORM MAGENTA = TOTAL COLIFORM



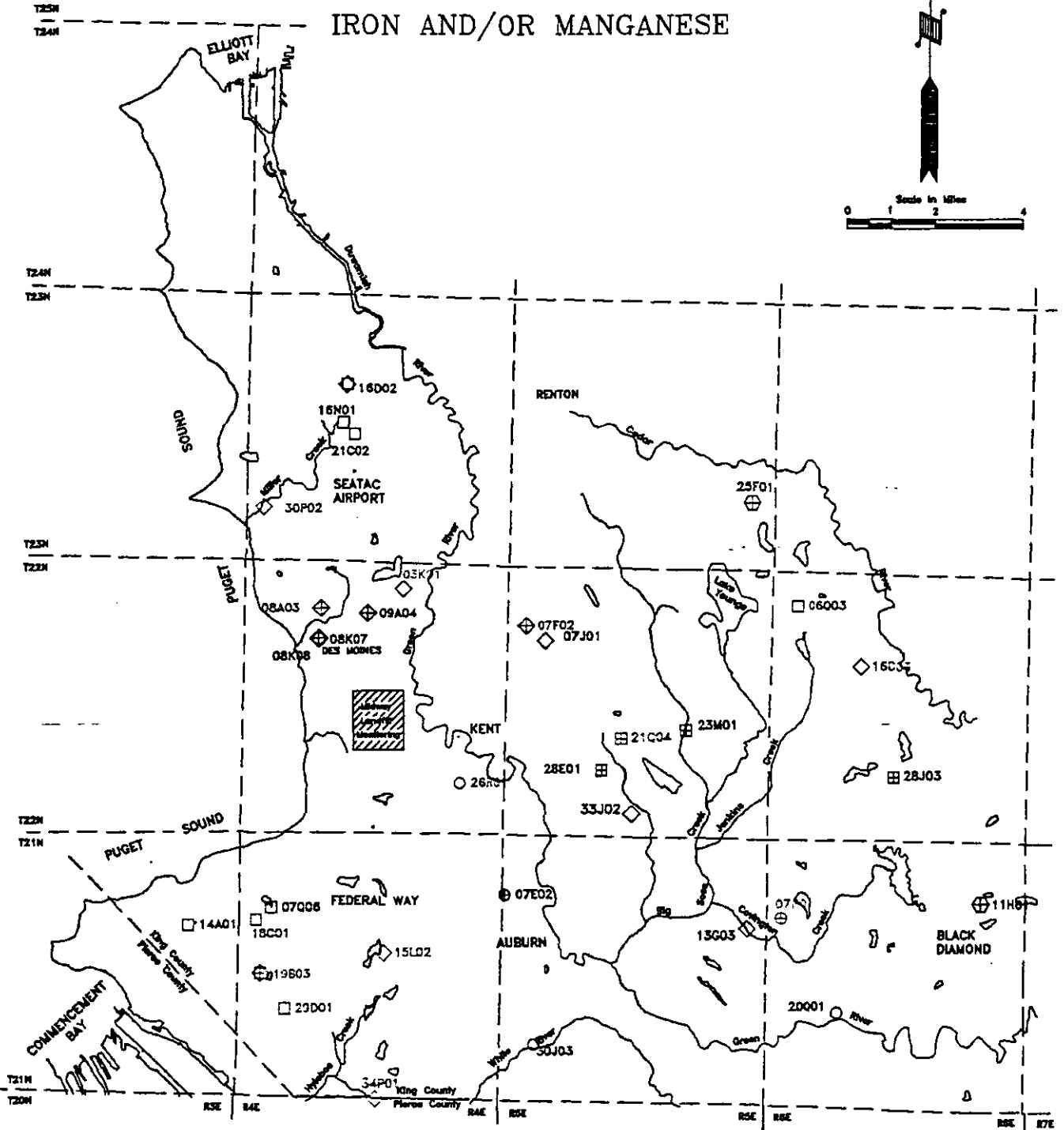
EXHIBIT II-5

SOUTH KING COUNTY

GROUND WATER MANAGEMENT PLAN

SAMPLING LOCATIONS WITH EXCESSIVE

IRON AND/OR MANGANESE



MAP LEGEND

Principal Aquifer for Well Completion
(Color may vary)

○ Qal	◇ Qc(3)	□ Qva
⊕ Qvr	⊕ Qc(4)/Qc(u)	⊕ Qc(2)
		⊕ Tbr (Bedrock)
		○ Undifferentiated

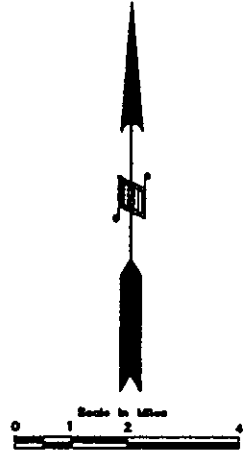
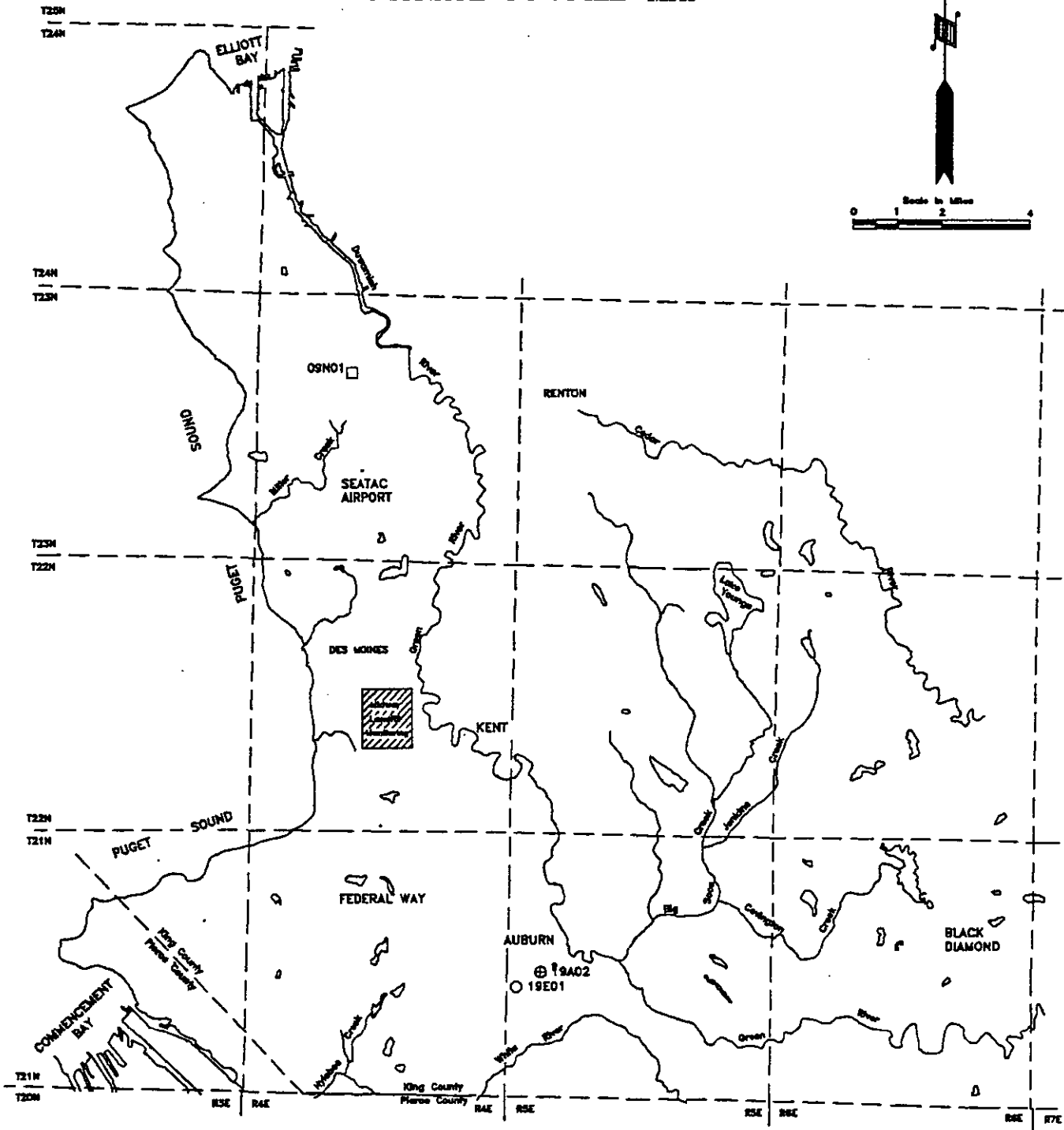
COLOR CODE

RED = IRON BLUE = IRON AND MANGANESE GREEN = MANGANESE



EXHIBIT II-6

SOUTH KING COUNTY GROUND WATER MANAGEMENT PLAN NITRATE PROFILE MAP



MAP LEGEND

Principal Aquifer for Well Completion
(Color may vary)

○ Qc1	◇ Qc(3)	□ Qva
⊕ Qvr	⊖ Qc(4)/Qc(u)	⊞ Qc(2)
		⊕ Tbr (bedrock)
		○ Undifferentiated

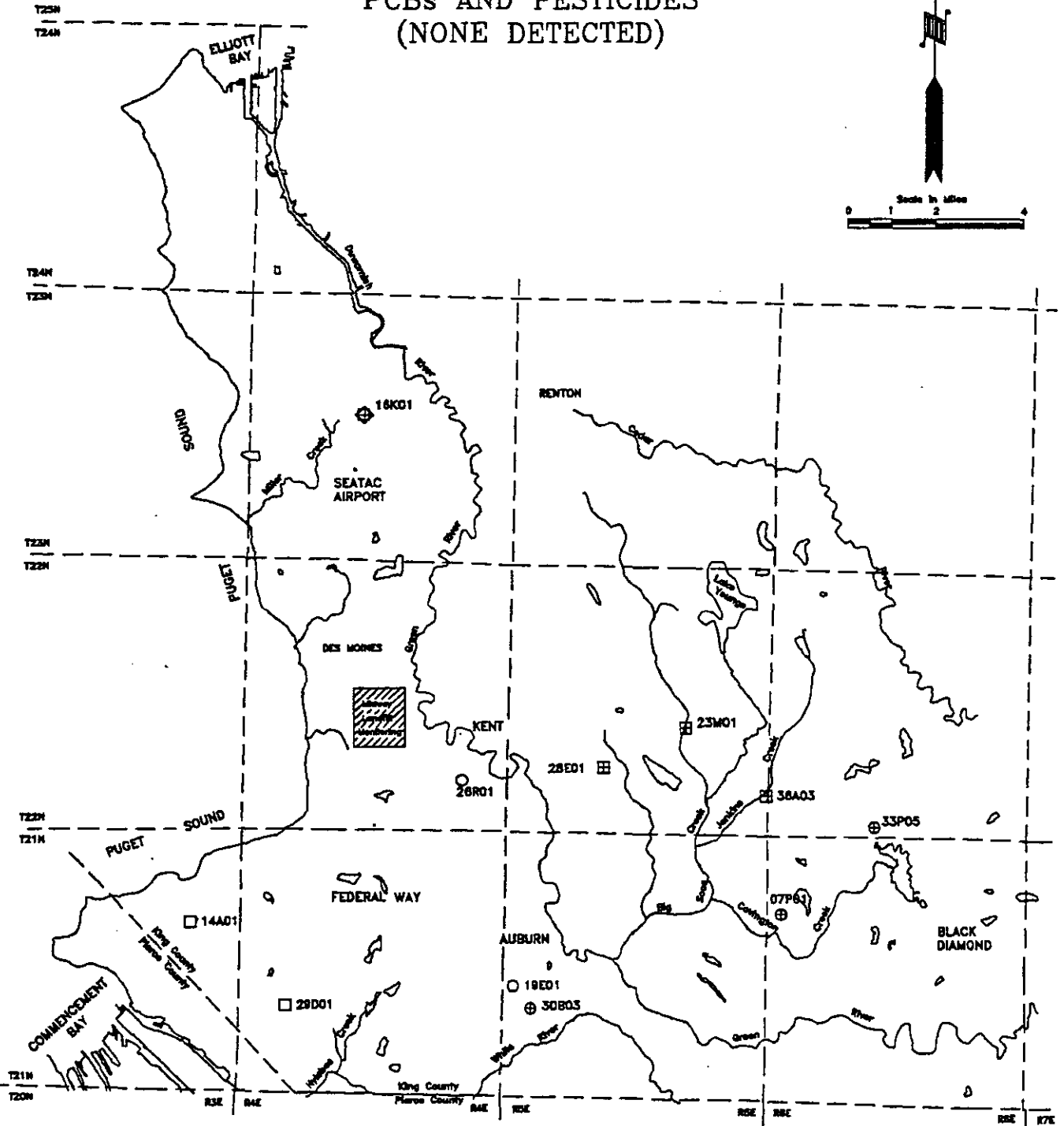
COLOR CODE

RED = 0-2 mg/L-N GREEN = >2-5 mg/L-N



ECONOMIC AND ENGINEERING SERVICES, INC.

EXHIBIT II-7
SOUTH KING COUNTY
GROUND WATER MANAGEMENT PLAN
SITES SAMPLED FOR SEMI-VOLATILES,
PCBs AND PESTICIDES
(NONE DETECTED)



MAP LEGEND

Principal Aquifer for Well Completion

○ Qa1	◇ Qc(3)	□ Qva	⊕ Tbr (bedrock)
⊕ Qvr	⊕ Qc(4)/Qc(u)	⊕ Qc(2)	○ Undifferentiated



ECONOMIC AND ENGINEERING SERVICES, INC.

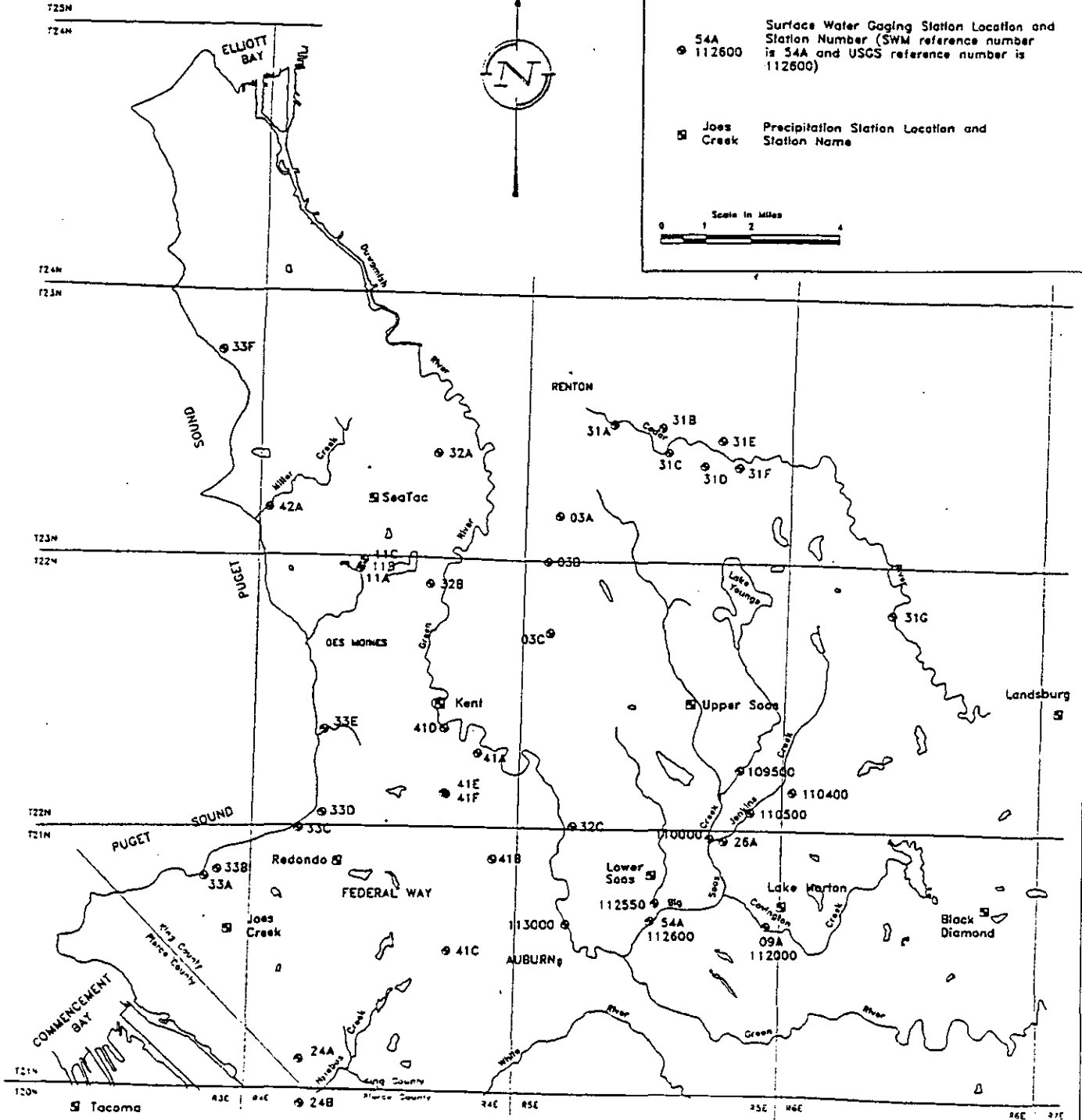
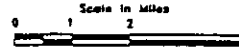
MAP LEGEND

54A
112600

Surface Water Gaging Station Location and Station Number (SWM reference number is 54A and USGS reference number is 112600)

Joes Creek

Precipitation Station Location and Station Name



South King County Ground Water Management Plan

EXHIBIT II-8 Surface Water and Precipitation Gaging Stations



SECTION III

CHAPTER 3 MANAGEMENT STRATEGIES

Explanation of text changes and editing marks.

Changes have been made to the original issue papers to preparing them for Chapter 3 format:

1. The background sections have been shortened, and new information added if necessary.
2. The Goal, Issue and Actions sections are usually presented as in the original paper. Many goals, issues and actions have staff recommendations for changes. These changes are proposed because of changes in regulations, programs or technical information.
3. The action statements have been changed to a stronger statement, that an agency will do something. This will provide list of actions for each agency, that they have committee to and for which they may receive funding. If the GWMP just says "petition" or "recommend" then agencies could concur, but would not be bound to actually do anything.
4. Actions that previously recommended that a legislative body (State Legislature, King County Council, King Count Board of Health) adopt a rule or ordinance are changed. This is because these bodies would not be able to agree to adopt something that they had not seen or had the public hearing on. These actions now say that they will consider adopting the rule.

Text editing marks:

1. Small changes to text are shown as strike out (~~strike-out~~) or underline.
2. Changes to large parts of text are shown with boxes around the text. Text that is proposed for deletion has a thick black line around it. Text that is proposed to be added has a dashed line around it. Example:

The text in this box is new, and is recommended for adoption.

The text in this box is proposed for deletion.

3. Each major change has an explanation near it, that starts with "NOTE:".
4. The GWAC's original adopted action is shown for comparison with the recommended version, usually after the recommended version. Sometimes the GWAC position was long. Then, a double line box was added around it to separate it from the rest of the text. This box looks like:

GWAC Action 1. Text of adopted action one here.

5. Some changes were so extensive that it was not possible to insert the committees previously adopted actions for a side-by-side comparison. This was the case in Special Areas (previously Federal and State).

Pre Draft Ground Water Management Plan

Chapter 3

Recommended Ground Water Management Program

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CHAPTER 3

3.1 INTRODUCTION

DRAFT

[Bruce's ideas] Every effort was made to:

1. maximize existing regulatory structures/programs
2. full research completed on above and incorporated into draft
3. cost of implementation kept as low as possible while still providing an aggressive plan/program
4. make it a citizen friendly, supported and preferred program

[From Thurstons GWMP:]

It should be noted that the Ground Water Management Plan is the first comprehensive assessment of the ground water conditions [in about 30 years] and is intended to provide a framework to assist implementing agencies selecting the most appropriate ground water protection measures (recommended management strategies). Measures identified in the plan are intended to either prevent contamination of ground water or the lowering of ground water levels in King County.

As alternatives were evaluated to address the goals and objectives, it became apparent that certain basic assumptions, or a program philosophy, were emerging. This philosophy developed as the GWAC tried to identify workable solutions to existing and potential contamination programs. The philosophy included the following elements:

5. Maximize existing regulatory structures/programs
6. Build on current protection efforts
7. All and uses impact ground water quality/quantity
8. Mitigate and use risks rather than prohibit land uses
9. Increased agency responsibility must be accompanied by increase funding

The GWAC realized that the Preferred Program would not totally prevent contamination problems from occurring in the CCC Basin but that it should greatly limit the frequency and severity of such problems.

In developing the means to protect and manage the ground water resources of the CCC Basin, the GWAC attempted to make maximum use of existing governmental programs and regulatory structures. The GWAC was determined to build on existing efforts rather than developing new and potentially duplicative programs.

#2 GWMINTRO.CH3

3.2 PROGRAMS RELATED TO BOTH GROUND WATER QUANTITY AND
QUALITY

3.2.1 SPECIAL AREA DESIGNATIONS TO ENHANCE GROUND WATER PROTECTION

There are a number of special federal, state, and local area designations that may be used to enhance a Ground Water Management Program (GWMP). Incorporating them may offer such benefits as a source of funds to implement ground water protection measures, enhanced eligibility for grant funds, or expanded review of development proposals. Increased public recognition of the value of an aquifer may be an important result of a special area designation.

The special area designations discussed in this chapter are:

1. Areas with a critical recharging effect on aquifers used for potable water per RCW 36.70A Growth Management;
2. Wellhead Protection Areas per the 1986 amendments to the federal Safe Drinking Water Act;
3. Environmentally Sensitive Areas per WAC 197-11 State Environmental Policy Act Rules;
4. Special Protection Areas per WAC 173-200 Water Quality Standards for Ground Waters of the State of Washington;
5. Sole Source Aquifers per the federal Safe Drinking Water Act of 1974;
6. Aquifer Protection Areas per RCW 36.36.

Areas with a critical recharging effect on aquifers used for potable water per RCW 36.70A Growth Management Act

The Growth Management Act (GMA) of 1990 requires all counties and cities in Washington to plan in order to manage growth. This act, much of which is codified in RCW 36.70A, requires that the largest and fastest growing counties (and the cities within them) plan extensively in keeping with the following goals:

1. Conservation of important timber, agricultural and mineral resource lands;
2. Protection of critical areas;
3. Planning coordination among neighboring jurisdictions;
4. Consistency of capital and transportation plans with land use plans;

5. Early and continuous public participation in the land use planning process.

Counties and cities must adopt comprehensive plans and regulations to protect designated critical areas and timber, agricultural, and mineral resource lands. The GMA requires the designation and protection of the following "critical areas": wetlands; areas with a critical recharging effect on aquifers used for potable water; fish and wildlife habitat conservation areas; frequently flooded areas; and geologically hazardous areas. The GMA also requires that the comprehensive plans contain land use controls to protect quality and quantity of ground water used for public water supplies (RCW 36.70A.070(1)).

The GMA requires that the comprehensive plans of adjacent jurisdictions or those who share related regional issues must be coordinated and consistent - a requirement of utmost importance for effective ground water protection. Meaningful protection of a dynamic resource that is shared by several jurisdictions is impossible without the cooperation of these jurisdictions.

Chapter 365-190 WAC, Minimum Guidelines to Classify Agriculture, Forest, Mineral Lands, and Critical Areas (Guidelines) were adopted by the Washington Department of Community Development (DCD) pursuant to the GMA. The Guidelines, which are advisory in nature, provide a general framework for classification, designation, and regulation of critical areas.

The Guidelines define "areas with a critical recharging effect upon aquifers used for potable water" as "areas where an aquifer that is a source of drinking water is vulnerable to contamination that would affect the potability of the water". Although this definition is somewhat circular, it is clear that aquifers used for drinking water are deserving of particular attention. In addition, it is suggested that those aquifers that are vulnerable to significant contamination be targeted.

The Guidelines refer frequently to "aquifer recharge areas" without defining the term. The term is used very generally and appears to refer to the entire drainage basin in which an aquifer is contained and from which it receives water due to infiltration of precipitation, runoff, and other surface water.

Mapping known critical areas is encouraged as the best way to communicate to developers and regulators the location of the protected lands. It is recognized, however, that mapping wetlands and aquifer recharge areas can be difficult and imprecise. Section 040(2)(g) of the Guidelines recommends that changes in designated areas be allowed as new information is available and errors are found.

The Guidelines suggest that the following be included in local government designation of critical areas that are to receive protection under the GMA:

1. Sole Source Aquifer recharge areas designated pursuant to the Federal Safe

Drinking Water Act of 1974;

2. Special Protection Areas designated pursuant to RCW 90.54, Water Resources Act of 1971, and RCW 90.48, Water Pollution Control; and
3. Wellhead Protection Areas designated pursuant to the 1986 amendments to the federal Safe Drinking Water Act.

King County and cities have adopted at least interim criteria for designating aquifer critical areas in order to meet deadlines contained in the GMA. Interim regulations have been adopted or existing authority to regulate has been clarified. Comprehensive interjurisdictional coordination envisioned by the GMA has not occurred although a lot of discussion between local governments has taken place.

The Wellhead Protection Program under the federal Safe Drinking Water Act

The 1986 amendments to the Safe Drinking Water Act established a Wellhead Protection Program (WHPP) intended to safeguard ground waters that are tapped by public water supply wells. Each state is required to develop and implement a WHPP in accordance with criteria established by the Environmental Protection Agency (EPA).

A state WHPP must:

1. Specify the roles and duties of state agencies, local government entities, and public water suppliers in a wellhead protection;
2. Provide the criteria for delineating the boundaries of Wellhead Protection Areas (WHPAs);
3. Establish procedures for identifying sources of contamination within each WHPA;
4. Develop management programs to protect ground water supplies within each WHPA from sources of contamination;
5. Develop contingency plans for each public water supply system to respond to well contamination;
6. Provide siting criteria for new public water system wells to maximize yield and minimize contamination; and
7. Ensure public participation.

A WHPA is defined in the Safe Drinking Water Act as "the surface and subsurface area around a well or wellfield supplying a public water system through which contaminants are

reasonably likely to move toward and reach such water well or wellfield" (42 U.S.C.A. 300h-7(e)). The first step in the implementation of a WHPP is to delineate the WHPA boundaries.

The Washington Department of Health (DOH) has been designated by the governor as the lead agency for developing and administering the WHPP in this state. Approximately 12,000 public water systems (PWS) in the state will eventually be included in the WHPP. The Drinking Water Regulations (WAC 246-290) will be revised to contain the WHPP requirements.

Due to the nature of wellhead protection, much of the actual implementation efforts will be done by public water systems, local governments and by those agencies with source-specific jurisdictional responsibilities. For example, the Washington Department of Ecology (Ecology) regulates underground storage tanks while the Washington Department of Agriculture regulates pesticide use. Those agencies would be responsible for emphasizing protection of the WHPA within their jurisdictional authority.

The following are highlights of the preliminary draft WHPP for Washington:

8. Delineation of WHPAs primarily based on the area immediately surrounding the well casing and areas describing the 1, 5, and 10 year time of ground water travel (TOT) to the well from the recharge area;
9. Inventory of potential sources of ground water contamination within the WHPA;
10. Development of management strategies to eliminate or minimize the possibility that these potential sources contaminate ground water.

PWS purveyors are responsible for delineating the WHPA and inventorying sources of contamination within the WHPA. State agencies are responsible for integrating wellhead protection measures into their existing programs. In many cases, this will primarily be done by placing a priority on existing activities to emphasize protection within the WHPA. Local land use authorities (cities, counties) are responsible for zoning controls and pollution sources outside the authority of the federal or state government. Local governments, where necessary, may also be responsible for developing more stringent programs than federal and state governments currently provide.

It is clear that a WHPP will be of particular value to municipal water systems whose WHPAs are located completely or primarily within their boundaries. A number of municipalities including the City of Renton and the City of Tacoma have already successfully implemented a form of wellhead protection. The effectiveness of these programs was largely predicated on the ability of the municipal well owner to directly regulate land-use in all or a large portion of the zone of contribution.

However, where PWS do not control surrounding land-use, the success of the WHPP will depend on the willingness of other city and county governments to impose necessary land-use or other restrictions.

Considering that there are approximately 1700 large and small public water system wells within King County, individualized land-use controls for each public well or wellfield in the county would be unworkable for King County. However, it should be possible to develop a generic, county-wide WHPP under which water purveyors could apply to the county for protection. This type of WHPP could be implemented under the auspices of the aquifer recharge area provisions of the Growth Management Act. The preference towards county-wide requirements is reinforced in situations where well or wellfield owners lack sufficient resources to develop an individual WHPP. The state Wellhead Protection Program recommends a county-wide approach to wellhead protection although it is not required at present. While a cooperative, multijurisdictional program would, by definition, involve compromise, individual PWS could build upon the basic program at their discretion.

Development of minimum county-wide WHPP strategies involves an investment of time and money by the county, cities, and PWS purveyors. It will be technically demanding and politically challenging to develop a program that both provides necessary protection for WHPAs and complements the GWMP and other existing ground water protection efforts. The way would be made easier, however, by taking advantage of the recent experience gained in many cities and states around the nation. There are now many models for wellhead protection to be studied.

Local jurisdictions in Washington are beginning to develop programs to facilitate the development of individual WHPPs. There are also some efforts to develop coordinated approaches. For example, the adopted Northern Thurston County Ground Water Management Plan (GWMP) contains a provision for joint development of a county-wide WHPP by the County and cities. Jurisdictions will establish by interlocal agreement a committee to cooperatively develop the WHPP.

Clark County is also making headway towards the cooperative development of WHPPs. It has been awarded a Centennial Clean Water Fund grant to convene and staff a process to develop a minimum county-wide WHPP.

Environmentally Sensitive Area Designation Under the State Environmental Policy Act.

The State Environmental Policy Act (SEPA) (RCW 43.21C) is intended to provide decision makers and the public with sufficient information to evaluate the environmental consequences of proposed land, air, or water-use activities when those activities involve an action by a governmental agency. Such an action could range from the issuance of a building permit to undertaking a major construction project such as a dam or a highway. The procedural provisions of SEPA attempt to outline a process for distinguishing between actions that are likely to have a significant adverse environmental impact and those that are

not. In cases where significant adverse impacts are anticipated, an environmental impact statement (EIS) must be prepared.

The State Legislature authorized the Department of Ecology to develop rules for the implementation of SEPA. The rules that were subsequently developed and adopted by the Department of Ecology, WAC 197-11 SEPA Rules, are intended to provide a uniform environmental review process in all political jurisdictions within the state. They are also intended to help define what constitutes a significant adverse environmental impact and to outline the content of environmental documents prepared under SEPA.

The SEPA rules are implemented in unincorporated King County through Chapter 20.44 of the King County Code, "County Environmental Procedures". The SEPA Section of the Department of Development and Environmental Services is responsible for environmental review in King County. Municipalities within King County have either adopted the SEPA rules by reference or have developed their own regulations that incorporate the SEPA rules. Municipalities conduct environmental review for projects occurring within incorporated boundaries.

In developing the SEPA rules, the Department of Ecology determined that some classes or types of activities, because of their size or nature, are not likely to represent a significant environmental impact and should, under ordinary circumstances, be exempt from SEPA requirements. Section 197-11-800 (WAC) of the SEPA rules contains a list of these exempted types of activities, termed categorical exemptions. The categorical exemptions include some activities that could potentially represent a significant adverse environmental impact in areas of unusual ground water sensitivity.

These activities include:

11. The installation of underground chemical storage tanks with a capacity of less than 10,000 gallons;
12. The construction of commercial buildings of less than 4,000 square feet and associated parking for up to 20 automobiles;
13. The construction of parking lots for up to 20 vehicles;
14. The construction of agricultural structures of under 10,000 square feet;
15. The periodic use of Washington Department of Agriculture approved chemicals to maintain a utility or transportation right of way in its design condition;
16. The appropriation of 2,250 gallons per minute (GPM) of ground water for any purpose.

Local governments have the authority to lower thresholds for requiring environmental review by designating certain portions of their land use jurisdiction as Environmentally Sensitive Areas (ESAs). These areas are generally more vulnerable to the adverse affects of land and water-use activities. The SEPA rules state that ESAs may include

"but [are] not limited to areas with unstable soils, steep slopes, unusual or unique plants or animals, wetlands, or areas that lie within flood plains".

In designating a portion of its jurisdictional area to be an ESA, a county or city can eliminate many of the categorical exemptions found in Section 197-11-800 (WAC), including all but one of the land and water uses listed above. Categorical exemptions regarding appropriations of ground water cannot be revoked.

An ESA designation may provide several important benefits for an area that is susceptible to ground water contamination. First, it would assist in raising the level of awareness of both the public and governmental agencies regarding the sensitivity of the aquifer system to contamination from overlying land-use activities.

Secondly, designation would permit the King County Council and city councils to eliminate many of the categorical exemptions from environmental review that are currently allowed under the SEPA rules. As a result, certain exempted land-use activities that pose a relatively high risk of contaminating ground water, such as installation of underground chemical storage tanks of under 10,000 gallons, could be required to undergo environmental review.

In determining the number of categorical exemptions to be eliminated, caution should be taken to revoke only those exemptions that bear a direct and significant relationship to ground water quality. A wholesale elimination of categorical exemptions might result in an unfavorable public reaction since many relatively innocuous activities such as adding a recreation room to an existing house or constructing a garage would require environmental review. Not only would such a broad-brush approach add an unnecessary burden on the public, but it would potentially create a glut of environmental checklists that would significantly add to the workload of agencies that must review or process environmental documents without actually affording better ground water protection.

One significant shortcoming of the SEPA process is that while environmental review assists the public and decision makers in identifying the probable adverse environmental impacts of a proposed activity or action, it does not provide basis for mitigation of the adverse impacts. Mitigation measures cannot be imposed unless some legally adopted ordinance, regulation, or policy exists that supports the requirement for mitigation. Adoption of the GWMP will provide the County and cities in the GWMA's legal basis for requiring mitigation because it contains policy for lands within the GWMA. This policy would be in addition to any existing regulations or policies already adopted.

Special Protection Areas Established Under Washington Water Quality Standards for

Ground Waters

WAC 173-200-090 outlines procedures for Ecology to designate Special Protection Areas within the State of Washington. The purpose of designating Special Protection Areas is to identify portions of the state with ground waters that require extraordinary consideration or increased protection because of one or more unique characteristics.

Such characteristics include, but are not limited to:

17. Recharge areas and wellhead protection areas that are vulnerable to pollution because of hydrologic characteristics,
18. Ground waters that support a beneficial use or ecological system requiring more stringent ground water quality criteria than those based primarily on drinking water standards,
19. Sole Source Aquifers.

Ecology will grant a Special Protection Area designation if an area contains one or more of the three aforementioned characteristics and such a designation is deemed by Ecology to be in the public interest.

Ecology can designate a Special Protection Area at its own discretion or at the request of a federal agency, another state agency, an Indian tribe, or local government. Requests for designation prepared by entities other than Ecology must provide sufficient information in support of the request to demonstrate that the designation would be appropriate under the conditions set forth in WAC 173-200. At a minimum the following information is required:

20. A rationale for the proposed designation,
21. Supporting technical and hydrogeologic data,
22. A description of proposed boundaries for the Special Protection Area, and
23. Documentation of coordination with affected state and local agencies, tribes, and water users.

Compliance with general procedures for public hearings, public involvement, and notification of affected governments including tribes is required before Ecology renders a decision concerning a request for designation of a Special Protection Area.

Ecology will consider the unique characteristics of a Special Protection Area when developing regulations, guidelines, and policies; when regulating activities; and when prioritizing department resources for ground water quality protection programs. Within Special Protection Areas, Ecology can choose to establish more stringent ground water

quality criteria and contaminant enforcement limits.

In addition, Ecology can impose special requirements for permits issued under authority of Ecology administered programs. Examples would be the State Waste Discharge Permit Program (WAC 173-216) and permits for the withdrawal of ground water (water rights) issued pursuant to RCW 90.44 (Regulation of Public Ground Waters).

Sole Source Aquifer designation under the federal Safe Drinking Water Act

The Sole Source Aquifer Program was established under section 1424 (e) of the Safe Drinking Water Act of 1974 and is administered by the Environmental Protection Agency (EPA). The primary intent of the program is to prevent projects that receive federal financial assistance from contaminating aquifers representing the sole or principal source of drinking water for an area. Projects that receive a portion, but not 100%, of their funding from the federal government are affected. An example would be a highway construction project funded jointly by the federal and state government. By contrast, a military installation is wholly financed by the federal government and thus is not restricted by the provisions of the Sole Source Aquifer Program.

In order to qualify for Sole Source designation, an aquifer must meet the following basic criteria:

24. It must supply 50% or more of the drinking water consumed within the area for which the aquifer is supplying water, and
25. Alternative sources of drinking water must be of inadequate quantity or not be economically feasible to develop as a replacement for the aquifer.

The EPA is authorized to declare a ground water system to be a Sole Source Aquifer upon receipt of a satisfactory petition requesting such a designation. A petition can be submitted by any individual, corporation, company, partnership, municipality, state, or federal agency. The petition must contain sufficient technical documentation to demonstrate that the aquifer meets the criteria for Sole Source designation (U.S. Environmental Protection Agency, February 1987).

There is currently one Sole Source Aquifer in King County - the Cedar Valley. EPA has been petitioned to designate Vashon Island as a Sole Source Aquifer.

There are a number of positive aspects of a Sole Source Aquifer designation, the most important of which is its public awareness value. Sole Source Aquifer designation helps people realize that an aquifer is unique or valuable and is worthy of protection. The designation can serve as kind of rallying point around which support for ground water protection and management efforts can coalesce. Because of the attention that a Sole Source designation draws to an aquifer, new land development projects that may potentially

harm underlying ground water may be more closely scrutinized by the public and by government agencies.

As discussed previously, the primary purpose of the Sole Source Aquifer Program is to prevent contamination of aquifers representing the sole or principal source of drinking water for an area. Once a Sole Source Aquifer has been designated, EPA will review all projects in the "project review area" that are partially funded by the federal government. The project review area encompasses the surface area above the aquifer and the basin from which water potentially drains into the aquifer. EPA will determine whether projects pose a potential threat of contamination to the aquifer. Should it be determined that a project may contaminate the aquifer, the commitment for federal financial assistance may be withdrawn unless mitigation measures are implemented.

Sole Source Aquifer designation also has an impact on future solid waste landfill siting efforts, not as a result of provisions of the Safe Drinking Water Act, but due to requirements of the Washington Department of Ecology's Minimum Functional Standards for Solid Waste Handling (WAC 173-304). The 1985 revision of the Minimum Functional Standards prohibited the construction of new or expansion of existing landfills over a Sole Source Aquifer in spite of the fact that Sole Source designation is not based upon the susceptibility of the aquifer to contamination. As a result, Sole Source Aquifer petitions have been submitted to EPA by citizen groups as a means of preventing construction of a new landfill or the expansion of an existing landfill in their community.

In response to concerns expressed by solid waste utilities and some county governments, Ecology modified its position concerning the prohibition of new landfills or the expansion of existing landfills located over a Sole Source Aquifer. A variance procedure has now been developed to allow the siting of new landfills or expansion of existing landfills overlying a Sole Source Aquifer if it can be demonstrated that ground water will not be adversely impacted.

Aquifer Protection Areas per RCW 36.36

The Washington State Legislature passed legislation in 1986 which provided the authority for creation of local Aquifer Protection Areas (APAs). The purpose of an APA is to establish a funding base for ground water protection, preservation, and rehabilitation programs. APAs are established through an election ballot issue requiring approval from a simple majority of voters within the proposed APA. If voters approve the APA, the county can collect modest water and septic system user fees. Fees may only be collected from users of water withdrawn from an aquifer as opposed to a surface water source (RCW 36.36).

In 1987, voters in a portion of Spokane County established the first APA in Washington State. The water user fees established by the voters of Spokane County amount to \$1.25 per month per residential equivalent. Septic tank user fees are also \$1.25 per month per residential equivalent.

Until recently, the use of revenues generated from an APA has been limited to ground water protection planning, ground water treatment facilities, and wastewater treatment facilities. As originally adopted, the law did not authorize use of the APA revenues for a full spectrum of ground water protection activities. For example, regulatory programs aimed at controlling pollution from underground storage tanks, hazardous wastes, or on-site sewage disposal systems were not covered.

However, the 1991 Legislature rectified this shortcoming through passage of Substitute House Bill (SHB) 1019. SHB 1019 amends RCW 36.36 to allow APA revenues to be used to fund the following activities in addition to those described above:

1. Monitoring of ground water quality and quantity;
2. Ongoing implementation of comprehensive plans to protect, preserve, and rehabilitate ground water, including Ground Water Management Programs;
3. Enforcing compliance with standards and rules relating to the quality and quantity of ground water; and
4. Public education related to protecting, preserving, and enhancing ground water.

Thus, with these amendments, APA funding can support virtually all activities associated with the implementation of a Ground Water Management Program.

Potential drawbacks to the use of an APA to fund the implementation of the GWMP include the following:

1. Lack of flexibility in use of funds - must describe specific use in ballot measure - changes in specific uses require voter approval;
2. Large startup costs to educate the public regarding ground water protection;
3. Difficulty in adjusting fee over time - must be approved by voters; and
4. Inequities in fee assessment:
 - a. Assumes that septic users are more significant contributor to potential ground water pollution than other sources such as underground chemical storage and hazardous waste;
 - b. Assesses fees only to households; businesses are not assessed;
 - c. Fee is not related to amount of water used.

SPECIAL AREA DESIGNATIONS TO ENHANCE GROUND WATER PROTECTION

GOAL

To use available special area designations in conjunction with local regulations and policies to enhance ground water protection efforts in the [insert name] Ground Water Management Area.

SOUTH KING COUNTY: To use available Federal or State programs or designations to enhance ground water protection efforts in the South King County Ground Water Management Area.

[Note to GWAC: Proposed goal is simpler; avoids confusion of trying to specify whether federal, state, or local designations are being considered. Some of the designations fall into more than one category.]

ISSUES

[Note to GWAC: New language is proposed below for the ISSUES section. All previously-adopted GWAC positions are listed following the proposed text.]

Issue 1. General protection of aquifers. Effective aquifer protection requires cooperation between land use jurisdictions because aquifers do not coincide with jurisdictional boundaries. General policies that provide guidance for land use decisions could be adopted by King County and cities in the GWMA to provide a basic level of protection for aquifers.

SA-1A. Designation of Environmentally Sensitive Areas. King County and cities within GWMA's designate GWMA's to be Environmentally Sensitive Areas as authorized by the State Environmental Policy Act (SEPA).

SA-1B. Elimination of categorical exemptions to SEPA. King County and cities within GWMA's will jointly determine categorical exemptions to SEPA that should be eliminated in the GWMA's, especially in ground water recharge areas as mapped by the GWMP.

SA-1C. Adoption of general aquifer protection policies. King County and cities within GWMA's adopt the following policies for GWMA's.

1. Ground water based public water supplies should be protected by preventing land uses that may adversely affect ground water quality or quantity to the extent that the supply of high quality drinking water to present and future populations might be jeopardized.
2. Protection and sustainable use of ground-water based drinking water supplies in the GWMA is preferred over importing water from sources outside of the GWMA.
3. In the ground water recharge areas that are mapped for the GWMP per SA-1E:
 - a. Rural land use designation incorporating clustered development is preferred.
 - b. In urban areas:
 - i. Low density (one acre) urban residential densities incorporating clustered development are preferred;
 - ii. High intensity (commercial, industrial) land uses that may have significant impacts upon ground water quality and quantity should be avoided when possible.
4. Wellhead protection programs will provide direction for focusing intense

SA-1D. Enhanced environmental review to protect aquifers. King County and cities in GWMA's will jointly develop guidance to assist environmental reviewers to:

5. Identify proposed development that may significantly impact ground water in aquifer recharge areas mapped by the GWMP;
6. Recognize and require adequate information to assess impacts upon ground water; and
7. Recognize and propose effective mitigation.

SA-1E. Ground water recharge areas. King County and cities will place a priority on implementation of the GWMP in ground water concern areas. These areas include aquifer recharge areas and areas of unusual susceptibility to ground water contamination. These areas are defined as follows:

8. High potential recharge areas mapped according to the following criteria:
 - a. Soil permeability - Soil units are defined by the Soil Conservation Service in the Soil Survey of the King County Area (SCS 1973). The units are rated high, moderate, or low permeability according to the description in the Survey.
 - b. Geologic materials - United States Geological Survey maps provide information on surficial geology. High, moderate, or low permeability is determined by professional judgement.
 - c. Depth to water - Drillers logs and previous investigations are used to determine depth to water. Existing water table elevation maps are used, if available. High (0-25 feet from surface), moderate (25-75 feet from surface), and low (>75 feet from surface) contamination potentials are assigned.
 - d. Topography - Percent slope is obtained from topographic maps and the SCS Soil Survey. High (0-40 percent), moderate (40-80 percent), and low (>80 percent) recharge potentials are assigned. The intent with the slope factor is to exclude an area from a "high" rating only if it has what would be generally considered a very high slope. Consequently, the "high" category is quite inclusive at 0-40 percent.

Areas receive overall ratings by use of an overlay map that incorporates ratings from the four physical parameters. All parameters are assigned equal weight. A combined rating score is assigned to each portion of the mapped area.

conservative interpretation of the combined rating. For example, a combined rating score of high-high-moderate-moderate is given an overall rating of high while a rating of high-moderate-low-low is given an overall rating of moderate. A composite map shows the overall ratings.

9. Significant net recharge areas: That portion of the drainage basin in which significant net saturated flow of groundwater is directed away from the water table.

[Note to GWAC: Four GWACs have adopted the method described in 1. above which was proposed by EMCON Northwest Inc. to identify areas of high potential recharge. [East King County GWAC has not voted on this yet.] Maps were prepared by consultants for the Redmond and Vashon Island GWMPs according to the criteria above. A slightly different technique was used for the Issaquah and South King County GWMPs because work had already commenced or was completed prior to the adoption of criteria. All maps will be refined and standardized during implementation of the GWMP to be consistent with criteria adopted by the GWACs.

Maps for significant net recharge areas are not yet prepared. Preparation of these maps requires additional data collection and analysis. Maps will be prepared during implementation of the GWMP.]

Discussion. Actions 1A through 1E provide broad protection for aquifers. Actions 1A and 1B will provide protection by bringing projects through SEPA review that are now exempt but that may have significant impacts upon ground water. It will be important to determine which categorical exemptions should be eliminated so that minor projects that would have little effect upon ground water will not require SEPA review. A two-tiered approach to categorical exemptions could be considered. For example, more categorical exemptions could be eliminated in ground water recharge areas.

Action 1C provides a general policy framework for aquifer protection. A commitment to protect public water systems is expressed followed by a stated preference for protection and use of local supplies rather than importing from outside the basin. Land use preferences are stated for recharge areas. A context for addressing the potential for aquifer contamination from the existing built environment is provided. This context is the Wellhead Protection Program that each public water system purveyor will be required to develop by state regulations.

Wellhead Protection Programs will consist of a core of county-wide protection strategies supplemented by water-system specific strategies developed by individual purveyors. Strategies to protect water systems may include such measures as education, technical assistance, regulation, monitoring, emergency response, business relocation assistance, and land acquisition. Efficiencies will be achieved by making full

of existing programs and initiating new programs only as needed.

Action 1D provides a means for the County and cities to jointly develop guidance documents and informational materials for optimal environmental review. The purpose is to raise the level of understanding of aquifers among environmental reviewers. Maps of aquifers, aquifer recharge areas, and high potential recharge areas will be refined and presented in an easy-to-use format.

Action 1E provides for identification of those areas in the GWMP that are particularly important to protect. Maps of these areas will primarily be used to determine priorities for implementation of the GWMP. For example, the GWAC has adopted a policy of monitoring for pesticide and fertilizer contamination in agricultural areas. The maps of aquifer recharge areas will be used to determine where to focus this effort. Maps will also be used to educate and assist the public, elected officials, land use planners, environmental reviewers, and others who make decisions that may affect ground water quality or recharge. These maps will also be valuable to purveyors who are determining wellhead protection priorities.

All of the actions proposed under Issue 1 are joint actions recognizing that aquifer protection cannot be accomplished by one land use jurisdiction alone. Joint action by the County and cities is consistent with Growth Management Act requirements to coordinate protection of aquifers. Joint action is practical because costs can be reduced and the regulated community will experience consistent policy towards protected areas. This is particularly important with an area that is large and located in more than one land use jurisdiction.

Implementation plan for SA-1A through 1E.

Task 1. Designate Environmentally Sensitive Areas.

King County and cities initially accomplish this task by concurring with the GWMP.

Task 2. Amend local environmental ordinances to reflect the adoption of Environmentally Sensitive Areas.

Who: King County and cities.

When: Year 1.

Cost: [1 staff per local government; 12 local governments involved. About 3 months of work. Cost estimates to be developed during concurrence.]

Task 3. Determine which of the existing categorical exemptions to eliminate.

Who: King County and cities via the Management Committee.

When: Year 1.

Cost: [1 staff per local government; 12 local governments involved. About 3 months of work. Cost estimates to be developed during concurrence.]

Source of funds: Aquifer Protection Fund.

Task 4. Adopt general aquifer protection policies.

This task is accomplished by concurring with the GWMP. At their discretion, King County and cities may wish to amend comprehensive land use plans.

Task 5. Develop guidance to assist environmental reviewers.

Who: Seattle-King County Health Department (SKCHD) for the approval of the Management Committee.

When: Year 2.

Cost: 1 staff for 6 months at SKCHD [insert cost estimate]. The cost of review, amendment, and approval of the guidance will be included in the cost of participation in the Management Committee. See Chapter 4.

Source of funds: Aquifer Protection Fund.

Issue 2. Wellhead protection. Public water system purveyors are required to meet federal Wellhead Protection requirements to delineate and adopt measures to protect wellhead protection areas (WHPA). The GWMP will fulfill some wellhead protection needs. However, specific strategies to provide an increased level of protection to public water systems will be required by the Washington Department of Health. In order to accommodate the needs of hundreds of large system purveyors, King County needs the purveyors to assist in developing a basic approach to wellhead protection in the unincorporated areas.

SA-2. King County, cities, public water system purveyors, and others jointly facilitate wellhead protection in King County by assigning to the Ground Water Management Committee (Management Committee) the following tasks:

10. Develop and recommend for adoption by the King County Board of Health

b. Those serving from 2 to 1000 connections.

11. Incorporate minimum wellhead protection strategies into the GWMP in order to allow for their implementation to be eligible for funding by the Aquifer Protection Fund.

Discussion. In the context of the larger aquifer protection program, wellhead protection can fill a vital need to focus intense aquifer protection efforts in those areas, usually urban, where there are existing sources of contamination that present very significant risks to public drinking water supplies.

Minimum wellhead protection strategies developed by the Management Committee will build upon the GWMP. Some of the issues considered by the GWAC will probably be considered by the Management Committee. A determination should be made as to whether additional protective strategies are needed within a certain zone around the well in relation to these issues. The need for additional protection may be dependent upon the hydrogeology of the zone.

Additional protection may include such measures as education, technical assistance, regulation, monitoring, and emergency response. Business relocation assistance and land acquisition may be considered on a case-by-case basis. Efficiencies will be achieved by making full use of existing programs and initiating new programs only as needed.

Minimum county-wide wellhead protection strategies will not address delineation or contaminant source inventory requirements of the state Wellhead Protection Program. The Management Committee effort will focus instead upon steps taken to protect the well once the Wellhead Protection Area has been delineated and potential sources of contamination have been inventoried. Cooperative efforts by purveyors in the delineation and source inventory phases are encouraged, however.

It is expected that individual purveyors will have system-specific needs that they will want to include in individual wellhead protection programs. The funding proposal outlined in Chapter 4 includes financial support for those programs.

Active participation by the Washington Department of Health (DOH) will be sought in developing minimum wellhead protection strategies. Inclusion of a minimum program that has the support of DOH will speed approval by DOH of wellhead protection programs of individual purveyors.

It is possible that certain aspects of a minimum wellhead protection program may be amenable to codification in county laws. This will be explored by the SKCHD in the course of development of the wellhead protection strategies.

The Management Committee should address the issue of overlapping wellhead protection areas (WHPA). It will not be unusual for a number of smaller WHPAs to be contained within the protection area for a larger system. There are also situations in which the protection areas for very large systems will overlap. Protection Zones 1, 2, and 3 will be designated within the wellhead protection areas. Zone 1 (requiring the highest protection standard) for one system may be located in zone 3 of a second system. The area should be protected to the higher of the two standards. Perhaps management of the area could be the responsibility of the purveyor for whom the area has a higher protection standard. A shared management strategy might also be possible. This, however, is an issue that should be considered by the Management Committee.

Implementation plan for SA-2.

Task 1. Develop minimum wellhead protection strategies and recommend for adoption by the King County Board of Health.

Who: King County and cities via the Management Committee.

When: Year 1 and 2.

Cost: Included in the cost of participation in the Management Committee. See Chapter 4 for estimate.

Source of funds: Aquifer Protection Fund.

Task 2. Incorporate minimum wellhead protection strategies into the GWMP.

Who: King County and cities via the recommendations of the Management Committee.

When: With the first GWMP update or sooner by special action taken by elected official.

Cost: Included in the cost of participation in the Management Committee. See Chapter 4 for estimate.

Source of funds: Aquifer Protection Fund.

[Note to GWAC: The following is a discussion of some special areas designations that have not been included in the proposal above.

Re: Growth Management Act. No actions are proposed to implement the Growth Management Act requirements to designate areas with a critical recharging effect on aquifers used for potable water. It was determined that county-wide criteria to implement the Growth Management Act are outside of the scope of the GWMP. Since the subject is, however, so closely related to the goals and policies of the GWMPs in King County, an alternate method of dealing with this matter will be pursued by SKCHD concurrent with release of the draft GWMP for public review. SKCHD will propose to the King County Council that the following areas be considered critical for purposes of compliance with the Growth Management Act: GWMPs, Sole Source Aquifers, and Wellhead Protection Areas. It will be further proposed that the Council contact cities in King County and suggest that the same areas be included in their critical areas designation. These proposals will be presented to the Council when the GWMP is presented for concurrence.

Re: Aquifer Protection Area funding: An alternate method to Aquifer Protection Area funding is proposed in Chapter 4. Some of the drawbacks of APA funding were outlined in the text of the issue paper. The primary reason for pursuing a Board of Health fee is that it would provide greater flexibility for implementation of the GWMP.

Re: Special Protection Area status: Special Protection Area status is not proposed for the initial GWMP for several reasons:

1. It is not certain that significant benefit would accrue from obtaining this designation. Ecology permit reviewers know where GWMPs are located and they pay particular attention to ground water concerns in those areas. Funding priority is already given to Wellhead Protection Programs by the Water Quality Financial Assistance Program. SPA designation for Wellhead Protection Areas would, in terms of funding priority, be redundant.
2. There is concern that too many special area designations would create more confusion than protection. SPA designation may be less important than some of the other designations that are proposed.
3. Considerable effort is necessary in order to obtain this designation. It would take away from important efforts that the GWMP proposes.
4. Ecology is nearing completion of its guidance for applicants. We do not have the experience of other applicants to draw upon because there have been none.

[Note to GWACs: This concludes the proposed new language for issues, actions, discussion, and implementation plans. Previously adopted GWAC positions are listed below. Staff comments are inserted in parentheses.]

SOUTH KING COUNTY

Issue: This paper described five programs or designations which the South King County Ground Water Management Program could attempt to incorporate into its ground water protection strategy.

[Note to GWAC: Proposed new ISSUE section breaks down into three specific issues rather than one all-encompassing issue.]

Action 1: Petition the cities and water districts within the GWMA to delineate Well Head Protection Areas for major production wells and among other tasks to: 1. develop specific strategies to protect the zone of contribution for these wells; and 2. negotiate protective land use strategies for the zone of contribution for these contribution of these wells with the County as needed; and 3. implement the program so developed.

[Note: Suggest delete because items 1-3 are included in the required Wellhead Protection Program.]

Action 2: Petition the County to negotiate with the purveyors developing Wellhead Protection Areas as provided in Action 1 regarding land use measures to protect the wells. Petition the County to implement the land use measures agreed upon.

[Note: Concurrence with the process proposed in SA-2 and in Chapter 4 that brings water districts, cities, King County, and others together for wellhead protection planning makes this petition unnecessary.]

Action 3. Provide letters of support to water purveyors within the GWMA who are applying for grants or other funding of any kind for the purpose of delineating Well Head Protection Areas and developing and implementing protective strategies.

[Note: Suggest delete. This is a good idea and it is important that the GWAC do this but it could be considered a given. It is probably not the sort of routine action that the GWAC needs to seek concurrence on from elected officials in the draft GWMP.]

Action 4. Petition the County and cities to jointly: 1. Declare and map critical aquifer recharge areas as Environmentally Sensitive Areas under SEPA; 2. Amend environmental checklists to ascertain necessary information regarding impacts on aquifer recharge; 3. Determine which categorical exemptions should be deleted in these areas; and 4. Implement via SEPA review the policies of the adopted GWMP which are relevant to these areas.

[Note: #1. is still included but new criteria are proposed. The new criteria are proposed because all of the water entering the basin potentially recharges aquifers.]

[Note: Suggest delete #2 for now. Since local governments are required to use the existing checklist under state administrative rules, we would like to get a better understanding of this issue before pursuing a change in state regulations. We will get a better understanding to what extent the environmental checklist might be deficient during the process of developing guidance materials for environmental reviewers.]

[#3 and #4 are still in the proposed strategy.]

Action 5. Petition the County, cities, and local governments to prepare an application for Special Protection Area status for the GWMA or portions of the GWMA under Chapter 173-200 WAC Water Quality Standards for Ground Waters of the State of Washington.

[It is suggested that SPA status not be pursued at this time. Please see discussion regarding this topic towards the end of proposed new wording.]

Action 6. Petition King County to consider preparation of a ballot measure which proposes an Aquifer Protection Area for the South King County Aquifers as provided by RCW 36.36. This action would be initiated only after adoption of the GWMP and completion of development of wellhead protection strategies pursuant to Action 2 above. Among uses of funds generated by the Aquifer Protection Areas would be implementation of the GWMP and WHPA protective strategies.

[Note: An alternate funding mechanism is proposed in Chapter 4.]

3.2.2 DATA COLLECTION AND MANAGEMENT PROGRAM

3.2.3 GROUND WATER QUALITY AND QUANTITY ISSUES ASSOCIATED WITH STORM WATER MANAGEMENT

Storm water is water which runs off impervious surfaces when it rains. Past and present storm water management practices often cause ground water quantity and quality problems. Ground water quality may be impacted if storm water containing contaminants is recharged intentionally or inadvertently. The most serious concern over recharge of storm water is, from a public health standpoint, possible effects on the quality of drinking water. Also, precipitation is diverted to surface water that, under natural conditions, would be recharged to ground water. As a result, there is a decrease in the quantity of water recharged to ground water.

The continuity of surface and ground water is an important concept in understanding the effects of surface water contamination on ground water. It is also important in making decisions regarding the most efficient way to protect both surface and ground water. Ground water and surface water cannot be considered two separate hydrologic systems because they are inextricably entwined.

King County has experienced the effects of urbanization and deforestation. Growth of King County's urban area has resulted in more impervious surface, more runoff, stream damage, and a reduction of recharge to ground water. Deforestation, the removal of vegetation and the subsequent compaction of soil, may also reduce ground water recharge.

Storm water management facilities can be designed to maximize infiltration into the ground thereby increasing recharge to aquifers. However, an obvious concern is the potential to contaminate ground water with pollutants carried in storm water. In the past, storm water management emphasized flood control and was not particularly concerned with water quality. More recently, however, concern has shifted to the quality of storm water and how it can impact receiving waters, including ground water. Storm water management practices include source control and treatment facilities.

Storm water management facilities vary in the degree to which these mechanisms take place. The most common methods used for both flow control and water quality improvement are detention basins, infiltration facilities, biofilters, and coalescing plate oil/water separators.

Storm Water Management Programs and Regulations

Numerous federal, state, and local programs and regulations govern the management of storm water and the control of point and nonpoint pollution. However, there are no programs and regulations which solely relate to the issue of effects of storm water management upon ground water resources.

State Programs

Puget Sound Water Quality Authority (the Authority) adopted the Puget Sound Water Quality Management Plan (PSWQMP), which forms the foundation of the storm water program at Ecology which affects cities, counties, and the Washington State Department of Transportation (WSDOT). The Plan focuses on protection of surface water in its efforts to protect Puget Sound. Little attention is paid to the continuity of surface and ground waters. The protection of ground water afforded by the many activities fostered by the Plan is often noted but is secondary to protection of surface waters.

Washington State Department of Ecology. Coordination of surface and ground water management is included in two Ecology programs, Local Planning and Management of Nonpoint Source Pollution and Ground Water Management Programs. Local Planning and Management of Nonpoint Source Pollution requires affected counties to convene watershed ranking committees to rank watersheds in need of protection. It also encourages coordination and integration of local ground and surface water protection planning efforts by stating that: "To reduce duplication of effort, Ecology shall also be responsible for coordinating the activities of the watershed management committee with other existing water management programs (e.g. groundwater). Coordination and integration of local efforts related to ground and surface water is strongly encouraged. If a joint ground water and watershed management program is established, the county shall be the lead agency for the joint program.

The law creating Ground Water Management Programs (GWMPs) contains less specific language but does encourage coordination. However, there are several reasons why this integration at the local level seldom occurs:

- The state treats surface and ground water quality protection programs as separate. The programs are administered by different sections within Ecology. Grants are also managed differently.
- Centennial Clean Water Funds are categorized in a way which discourages integrated plans. Because of intense competition in the nonpoint category, a proposal which emphasizes ground water protection will be placed in the ground water category. This practice discourages joint watershed/ground water nonpoint source pollution control plans.
- Ground water planning is usually seen as a public health issue and local public health departments usually serve as lead agency. Watershed planning is usually seen as a surface water issue and is usually addressed by a branch of public works or planning department.
- Local lead agencies, faced with short timelines and limited resources, are answering to different programs at Ecology and responding to different regulations which guide their planning processes. The magnitude of the problem of trying to coordinate in the face of the confusion generated at the state level proves daunting. Lack of coordination between agencies is often the unfortunate result.

It is possible that budget cuts at Ecology and declines in the amount of money generated by the cigarette tax (Centennial Clean Water Fund) will force a resolution to inefficiencies in water quality planning at the state level. Despite staff recommendations favoring consolidation, there has not yet been concrete progress in this direction.

Another State program which relates to stormwater is The Stormwater and Combined Sewer Overflows (CSOs) Program. The program goal is to protect shellfish beds, fish habitat, and other resources, to prevent the contamination of sediments from urban runoff and CSOs, and to achieve standards for water and sediment quality by reducing pollutant discharges from stormwater and CSOs. Ecology is developing model ordinances, a technical manual, and numerous other guidance documents to assist cities and counties.

Ecology is also directed by the Program to 1) work with WSDOT on a program to control runoff from state highways in the Puget Sound basin and 2) to develop a technical manual to assist local governments which establishes best management practices for stormwater management.

Ecology's Draft Stormwater Management Manual for the Puget Sound Basin (Draft Manual), developed to assist local governments in meeting the storm water management rules, was released for public and agency review on June 10, 1991. It is expected by Ecology that a final version would be completed by early 1992. This manual addresses erosion and sedimentation control, runoff control and control of pollution from urban land uses. The manual relates to impacts on ground water:

- Infiltration is the preferred method of volume control and other methods are allowable only after infiltration has been ruled out for technical reasons.
- The Ecology manual requires that a certain volume of runoff be infiltrated or detained. This is in contrast to the King County manual which requires only that peak runoff rates not be altered by the development. This is of major significance when considering volume of water to be potentially recharged to ground water.

Local Programs

King County, Surface Water Management Division (SWM) of the Department of Public Works has broad responsibility for management of storm water in King County. SWM conducts routine maintenance of drainage and pollution control facilities, constructs facilities to control runoff and protect natural drainage systems, conducts needed engineering and habitat analyses, and responds to both complaints and emergencies involving flooding, erosion, and water quality. The program's goal is to minimize the personal, financial, and environmental costs associated with flooding and erosion by providing a comprehensive approach to surface water management. SWM has presented the King County Council with the King County Surface Water Management Strategic Plan. The

Strategic Plan emphasizes an acceleration of the current program along with new emphasis in water quality and "off road" storm water facilities. SWM also addresses ground water quality and quantity in its planning processes.

An important feature of the SWM program has been its design manual completed in 1990. The King County Surface Water Design Manual (Design Manual) contains requirements and standards for designing surface and storm water management systems in King County. King County requires that impacts on existing artificial and natural drainage systems be mitigated prior to permit approval for certain developments. While the Design Manual requires water quality treatment best management practices comparable to the Ecology Draft Manual, King County's Design Manual does not require infiltration as the method of choice for volume control. Rather, infiltration is allowed in certain soil types. It is generally not allowed in soils that would be considered moderately permeable. Additionally, the King County manual does not require infiltration or detention of a certain volume of water. It requires that peak runoff not be altered by new development. (If the Ecology Draft Manual is adopted as presently written, King County will be required to amend its Design Manual.)

SWM and Seattle-King County Department of Public Health Environmental Health Division coordinate to some extent on planning activities but not as much as is needed to effectively avoid redundancy or conflicting goals and products. Coordination between SWM and Seattle-King County Department of Public Health Environmental Health Division is far from comprehensive and the potential for conflicting goals and products exists. A thorough analysis of the existing degree of agreement between the planning processes has not been carried out.

The Building and Land Development Division of the Parks, Planning, and Resources Department implements King County Code Title 21 Zoning (the zoning code) which, to some extent, regulates the degree of impervious cover allowed for developments. Proposed changes establish, for the first time, limitations on impervious cover for development. They would prevent extreme cases of lot coverage by impermeable surfaces. The draft code is now being reviewed by a technical review committee established by the Council.

Cities in King County have developed programs varying in their comprehensiveness based on state and local programs.

Metro is currently assisting jurisdictions in King County in establishing surface water utilities by providing technical information about surface water quality.

Land Use In Critical Aquifer Recharge Areas

Research has shown that nearly all land uses associated with human activity significantly affect ground water quality due to the effects of nonpoint sources of pollution. It has also been shown that the degree of contamination increases with the intensity of development.

It becomes a public policy question as to how balance land use demands with the need to protect ground water.

Studies demonstrate that certain land uses contribute to contamination of ground water from nonpoint sources. The land uses that were shown to result in the highest concentrations or detection frequencies of a variety of chemical contaminants are generally agriculture, residential (especially high density), and industrial/commercial. It is difficult to extrapolate the findings of these studies to another geographical area. However, perhaps the most valuable conclusion to the GWMP is the evidence that all land uses compromised ground water quality and that contamination increased with intensity of land use.

In order to address the land use question in these areas from a water quality basis in relation to stormwater management, we would need to increase our understanding of effects on ground water quality of stormwater source controls, treatment, and infiltration. We would need to better understand the effectiveness of the best management practice (BMP) currently supported by experts. Additional study including modeling and field testing of this BMP (lined wet pond - lined bioswale - infiltration basin in series) is needed. Stormwater strengths and constituents representative of various land uses should be tested so that, using study results, planners would be able to recommend compatible land uses to elected officials.

A Ground Water Management Plan should address the question of appropriate land use for high potential aquifer recharge areas. In particular, it is important to make recommendations regarding appropriate residential densities and commercial and industrial uses. Answers to these questions are not fully available. Research into the effectiveness of storm water treatment is in early stages. Practical problems associated with the application of this technology on a wide scale are yet to be determined. Many studies of this technology are planned or underway, some of them in King County. Infiltration technology is fraught with problems but, given Ecology's emphasis on infiltration, we are about to find out how effective this technology is in the Puget Sound region. Thus, the question of appropriate density and land use in high potential aquifer recharge areas should be answered with some degree of validity soon. Until such time, it may be the best policy to maintain low densities in these areas to avoid irreversible adverse impacts. It is possible that water quality and source controls will prove to be inadequate in themselves to address concerns for ground water quality. In this case low density and limited land uses may be the only feasible alternative.

GOAL

To promote stormwater management practices that provide the greatest amount of recharge while protecting ground water quality. ~~To promote management of storm water in a manner which prevents degradation and depletion of ground water.~~

NOTE: Staff recommends new goal because it emphasizes quality and is a positive statement.

SOUTH KING COUNTY To promote management of stormwater in a manner which protects groundwater quality and quantity.

ISSUES

Issue 1. Runoff Versus Recharge. The King County Surface Water Design Manual does not limit runoff volumes. Rather, the Manual requires that there be no increase in peak runoff rates. Potential ground water recharge is lost to runoff causing depletion of aquifers. Many cities in Ground Water Management Areas (GWMAs) have adopted or use the King County Manual for reference in their stormwater management programs and are, therefore, likely following the same policy towards infiltration.

ST - 1A Runoff Versus Recharge. King County and cities will amend/adopt surface water design manuals to require that runoff be infiltrated when site conditions permit except where potential ground water contamination cannot be prevented by pollution source controls and stormwater pretreatment.

SOUTH KING COUNTY (needs to adopt action)

Discussion. Impacts from development on ground water can be partially mitigated by infiltrating stormwater rather than discharging it to surface water bodies. This practice partially compensates for the loss of natural recharge caused by impermeable surfaces. Some areas of King County with glacial outwash soils are particularly suited to infiltration. In these areas, infiltration should be used to mimic the natural recharge patterns present prior to development as closely as possible. While infiltration is encouraged in King County and, presumably, in some cities, taking a stronger position in favor of it should result in greater use of this technique.

Infiltration of stormwater presents a threat to ground water quality. Stormwater should not be infiltrated where the risk of ground water pollution cannot be mitigated by pollution source controls and stormwater pretreatment. Ecology provides guidance in regard to adequate source control and pretreatment in regard to specific development types in the Stormwater Management Manual for the Puget Sound Basin. Some local jurisdictions are developing similar manuals that are at least as stringent as the Ecology manual. Ground water quality concerns associated with the infiltration of stormwater are addressed further in Issue #2.

Infiltration of roof runoff, while allowed in King County and presumably cities, could be used more extensively or required in appropriate settings including single-family residential development. Consideration should be given to water quality before adopting requirements to infiltrate roof runoff. Certain roofing materials and associated treatments to retard moss growth could result in the introduction of hazardous substances to ground water. In addition, roof runoff may be too contaminated to infiltrate without treatment in highly urbanized areas subject to relatively heavy air pollution. These issues should be more thoroughly explored by King County and the cities as they develop specific requirements for infiltration. The King County manual does not presently contain any restrictions on infiltration of untreated roof runoff other than limiting the soils in which infiltration is allowed.

If the Ground Water Advisory Committee (GWAC) decides to take no action it is probable that King County and cities will gradually increase the use of infiltration technology because of the emphasis placed on it by the Stormwater Management Manual for the Puget Sound Basin (the Ecology Manual).

Development is, however, proceeding rapidly and many opportunities to use infiltration technology may be lost. It may result in more rapid implementation of the Ecology Manual's provisions if the GWACs request early action in favor of the use of infiltration whenever possible in all jurisdictions in the GWMA's.

Implementation:

Who: King County and cities

Task(s): amend/adopt surface water design manuals

When: Year __, or when agencies would normally amend/adopt surface water design manuals

Cost: to be determined during concurrence.

Fund Source: cities and King County general funds.

Issue 2. Ground Water Quality Concerns. It has been demonstrated by numerous studies that nonpoint source pollution is a major contributor to ground water degradation. Water quality controls and infiltration of stormwater will increasingly be used to reduce nonpoint source pollution effects upon both surface and ground water resources. Technology associated with these practices is in early stages and long term effects on ground water quality are unknown. While water quality controls will improve the quality of the water discharged to the ground, the increasing emphasis on infiltration poses risks. Infiltration will be employed most often in areas with glacial and alluvial soils associated with high potential aquifer recharge areas. Regardless of the comprehensiveness of new requirements, treatment systems will sometimes fail for a variety of reasons and they cannot be expected to function optimally at all times. Additionally, nonpoint source pollution that is not borne by stormwater will infiltrate and reach ground water regardless of stormwater management techniques.

NOTE: THIS IS SIMILAR TO OLD ISSUE 4 AS NOTED BELOW.

Alternative 2. Ground Water Quality Concerns. Adopt actions to ensure that high potential aquifer recharge areas are protected from nonpoint source pollution to the greatest extent feasible, that stormwater infiltration best management practices are used, and that further information is sought on the long-term effects of this practice upon ground water quality.

ST - 2A Ground Water Quality Concerns - Zoning. King County and cities within GWMA's will maintain rural and low density urban residential zoning (one acre lots) and open space in high potential aquifer recharge areas where more intensive land uses have not already been zoned. King County and cities will change zoning for more intensive land uses in these areas to the above zoning whenever possible during land use plan updates.

[NOTE: Similar to old Issue 4.2.1: "Action 1. Petition King County and cities within Ground Water Management Areas (cities) to encourage low density development (one or fewer residences per 5 acres) in high potential aquifer recharge areas and to avoid commercial, industrial, and multifamily zoning in these areas."]

ST - 2B Ground Water Quality Concerns - Facility Requirements. King County and cities within GWMA's will require the following stormwater facility in high potential aquifer recharge areas for new construction and water quality retrofit to existing facilities (where possible): wet pond, bioswale, infiltration basin in series (treatment components and conveyance lined to preclude infiltration).

[Note: Similar to APO requirement in old Issue 4.2.2.a: "a. Require tightlined conveyance and an impermeable pretreatment system consisting of a wet pond and biofiltration prior to infiltration in high potential aquifer recharge areas. Require that the wet pond be fitted with a mechanism to shut off flow to the infiltration facility in order to contain hazardous material spills. This would be required for new construction and water quality retrofit to existing facilities, including roads."]

ST - 2C Ground Water Quality Concerns - Study. King County and cities will jointly sponsor study of the effectiveness of the facility described in ST - 2B (above).

NOTE: Similar to old Issue 4.3.b: "b. King County and cities to jointly sponsor study of effectiveness of storm water management programs in preventing adverse effects on ground water quality and quantity via the Center for Urban Water Resources Management at the University of Washington. Centennial Clean Water Funds should be sought for a major study on this topic. A study should be designed which will benefit all Puget Sound jurisdictions who are both responsible for ground water protection under the Growth Management Act and the Ground Water Quality Standards (WAC 173-200) and for requiring infiltration of storm water under Ecology rules. The study should address and make recommendations regarding appropriate land use in high potential aquifer recharge areas, both from the standpoint of density and type of development."

ST - 2D Ground Water Quality Concerns - Facility Monitoring. King County will monitor a sample of the facilities described in ST - 2C in actual use and prepare a report of findings.

NOTE: Similar to old Issue 4.3.a: "a. King County Surface Water Management Division to monitor the effectiveness of the system described in Issue 4. Action 2. a. in protecting ground water quality."

NOTE: Staff recommendation to delete Issue 4 Alternative 2 Action 2 below because we don't need a separate ordinance to implement the program since other actions require amending existing and creating new regulations as needed. The Special Areas paper now provides for development of SEPA review guidance documents.

Alternative 2. Action 2. Petition King County and cities to jointly develop an Aquifer Protection Ordinance (APO) for submittal to and approval by the King County Board of Health. The ordinance should contain measures related to all issues addressed by the Ground Water Management Program (GWMP), as appropriate. (Note: This is the initial introduction to the alternative of developing an aquifer protection ordinance that encompasses many regulatory aspects of the GWMP. Subsequently, as actions are presented, those which should be included in the ordinance will be noted as such. All other issue papers will be reviewed for inclusion of action items in the APO and this will be noted in the final GWMP.) The ordinance should contain the following measures:

a. Require tightlined conveyance and an impermeable pretreatment system consisting of a wet pond and biofiltration prior to infiltration in CARAs. Require that the wet pond be fitted with a mechanism to shut off flow to the infiltration facility in order to contain hazardous material spills. This would be required for new construction and water quality retrofit to existing facilities, including roads.

b. Require a hydrogeological assessment for proposed development in CARAs which is subject to SEPA review and which is found to potentially affect ground water quality or quantity. The assessment will be reviewed by SEPA personnel and Seattle-King County Department of Public Health Environmental Health Division (within King County) to determine effects on ground water quality and quantity can be adequately mitigated. Advisory review by Seattle-King County Department of Public Health Environmental Health Division will be provided to city SEPA reviewers as requested. The assessment will include but is not limited to:

- 1) Geologic setting including well logs, borings, and other information used to make this determination;
- 2) Background water quality;
- 3) Ground water elevations including location and depth to perched water tables;
- 4) Ground water flow direction, velocity, and gradient;
- 5) Attenuation potential of soils and aquifer materials as well as the ability of affected aquifers to dilute contamination;
- 6) Surface water bodies and their degree of continuity with local ground water;
- 7) Potential use of ground or surface water by the proposed development;
- 8) Discussion of the potential effects of the proposed development on ground water quality and quantity;
- 9) Other such information as is deemed pertinent to a determination of the effects of the proposed development on ground water resources.

NOTE: Staff recommends deleting Issue 4 Alternative 2 Action 4 because all WHPP policies have been moved to the Special Areas paper. This task will be included in the list that the Management Committee will address.

Issue 4 Alternative 2. Action 4. Encourage efforts by utilities undertaking Wellhead Protection Area delineation and study to determine whether vulnerability of the zone of influence warrants prohibition of infiltration of storm water in a defined area.

SOUTH KING COUNTY Issue 4 (Potential Groundwater Contamination),
Alternative 2, Action 1:

Action 1. Petition King County and cities within Groundwater Management Areas to encourage low density development and open space in CARA's and to avoid commercial, industrial, and multifamily zoning in these areas.

Action 2: (Aquifer Protection Ordinance) Petition King County and cities to jointly develop an Aquifer Protection Ordinance (APO) for submittal to and approval by the King County Board of Health. The ordinance should contain measures related to all issues addressed by the Ground Water Management Program (GWMP), as appropriate. (Note: This is the initial introduction to the alternative of developing an aquifer protection ordinance that encompasses many regulatory aspects of the GWMP. Subsequently, as actions are presented, those which should be included in the ordinance will be noted as such. All other issue papers will be reviewed for inclusion of action items in the APO and this will be noted in the final GWMP.)

The ordinance should conform to the current Stormwater Management Manual for the Puget Sound Basin. ~~The ordinance should contain the following measures:-~~

~~a. Require tightlined conveyance and an impermeable pretreatment system consisting of a wet pond and biofiltration prior to infiltration in CARAs. Require that the wet pond be fitted with a mechanism to shut off flow to the infiltration facility in order to contain hazardous material spills. This would be required for new construction and water quality retrofit to existing facilities, including roads.~~

SOUTH KING COUNTY [NOTE: GWAC VOTED TO MOVE THIS (B.) TO FED STATE PAPER]

b. Require a hydrogeological assessment for proposed development in CARAs which is subject to SEPA review and which is found to potentially affect ground water quality or quantity. The assessment will be reviewed by SEPA personnel and Seattle-King County Department of Public Health Environmental Health Division (within King County) to determine effects on ground water quality and quantity can be adequately mitigated. Advisory review by Seattle-King County Department of Public Health Environmental Health Division will be provided to city SEPA reviewers as requested. The assessment will include but is not limited to:

- 1) Geologic setting including well logs, borings, and other information used to make this determination;
- 2) Background water quality;
- 3) Ground water elevations including location and depth to perched water tables;
- 4) Ground water flow direction, velocity, and gradient;
- 5) Attenuation potential of soils and aquifer materials as well as the ability of affected aquifers to dilute contamination;
- 6) Surface water bodies and their degree of continuity with local ground water;
- 7) Potential use of ground or surface water by the proposed development;
- 8) Discussion of the potential effects of the proposed development on ground water quality and quantity;
- 9) Other such information as is deemed pertinent to a determination of the effects of the proposed development on ground water resources.

SOUTH KING COUNTY Action 3. Petition King County and cities to jointly study the effectiveness of water quality and quantity controls and infiltration in protecting groundwater quality and quantity.

~~The following is requested:~~

~~a. King County Surface Water Management Division to monitor the effectiveness of the system described in Issue 4, Action 2, a. in protecting ground water quality.~~

~~b. King County and cities to jointly sponsor study of effectiveness of storm water management programs in preventing adverse effects on ground water quality and quantity via the Center for Urban Water Resources Management at the University of Washington. Centennial Clean Water Funds should be sought for a major study on this topic. A study should be designed which will benefit all Puget Sound jurisdictions who are both responsible for ground water protection under the Growth Management Act and the Ground Water Quality Standards (WAC 173-200) and for requiring infiltration of storm water under Ecology rules. The study should address and make recommendations regarding appropriate land use in CARAs, both from the standpoint of density and type of development.~~

~~Action 4. Encourage efforts by utilities undertaking Wellhead Protection Area delineation and study to determine whether vulnerability of the zone of influence warrants prohibition of infiltration of storm water in a defined area.~~

Discussion. ST - 2A is proposed because of the sensitivity of high potential aquifer recharge areas to contamination, the increasing importance of protecting drinking water aquifers, and the difficulty, if not impossibility, of cleaning up contaminated aquifers. The wording of ST - 2A is identical with proposed actions in both the Water Quantity and Hazardous Materials issue papers. The reason for the action in the case of the Water Quantity issue is to promote recharge. The reason for the action in relation to the Hazardous Materials issue is because of the threat of chemical spills and improper materials management. Please refer to those papers for further discussion. For a variety of reasons then, land use controls should be considered in high potential aquifer recharge areas.

Management of stormwater, even if done according to best management practices, will not be perfect. Indeed, considerable difficulty has been experienced with stormwater infiltration facilities. It should be expected that systems will sometimes fail for structural, maintenance, or weather-related reasons.

King County already requires lined treatment facilities in excessively permeable soils but does not require conveyance systems that preclude infiltration. It is expected that cities in King County, some of whom have adopted all or part of the King County Manual, have similar requirements. Adoption of ST - 2B will generate discussion during the concurrence process and enable the GWAC to understand the cities' existing requirements. It will also provide an opportunity to seek concurrence with GWAC proposals to improve existing programs where appropriate.

Even as new requirements are instituted, stormwater managers do not have adequate information to determine long term effects of new requirements on ground water quality.

Monitoring the new facilities and additional study will enable us to determine whether long term effects are acceptable using best management practices.

The Center for Urban Water Resources Management (the Center) at the University of Washington or Metro may be possible coordinators of a multi-jurisdictional study. The Center was formed, in part, to address questions regarding appropriate management of stormwater. Numerous local jurisdictions are financial contributors to the Center's operations, including King County.

The Center has expressed interest in doing the type of study described in ST - 2C and feels it is warranted. The Center serves as a facilitator for local governments interested in solutions to common problems. If, for example, King County were to propose a study, the Center would then contact its members to determine if they would support it.

A study should be designed which will benefit all Puget Sound jurisdictions who are both responsible for ground water protection under the Growth Management Act and the Ground Water Quality Standards (WAC 173-200) and for requiring infiltration of stormwater per the Ecology Manual. The study should determine whether certain land uses make stormwater infiltration particularly threatening to ground water quality. For example, the study should compare rural and urban uses of land in regards to the potential to recharge stormwater safely. Residential and commercial uses of land should also be compared.

Funding. There is no cost associated with King County and cities maintaining specific zoning designations in high potential aquifer recharge areas. (ST - 2A).

The cost of using the best management practice described in ST - 2B will be borne by developers and, ultimately, consumers.

Funding for ST - 2C should come from the aquifer protection fund. Alternatively, ST - 2C could be funded by a Centennial Clean Water Fund grant if the aquifer protection fund is not approved. If that is the case, King County, cities, and the Center for Urban Water Resource Management or Metro should make a strong bid for Centennial Clean Water Fund money to carry out a study. Local governments should emphasize in a grant application that local ground water resources may be at risk from the new emphasis by Ecology on infiltration of stormwater. Local governments should be supported in their effort to study the effects of state requirements. King County and cities would need to pool financial resources to provide for local match for a grant. Other grant sources besides CCWF could also be considered. If no grant monies are available, the County and cities would have to pool resources to fund the full cost of the study.

Seattle-King County Department of Public Health Environmental Health Division will seek support from SWM to monitor stormwater infiltration facilities (ST - 2D). It is anticipated that the monitoring can be done under existing budgets because SWM's recently adopted Strategic Plan indicates that a certain amount of utility fees are dedicated to monitoring the effectiveness of stormwater management facilities. Seattle-King County Department of Public Health Environmental Health Division will seek an agreement with SWM to monitor a minimum number of facilities and provide reports on facility effectiveness.

Implementation Plan:

- Tasks: 1. Maintain zoning in high potential aquifer recharge areas (ST - 2A)
2. Change zoning in high potential aquifer recharge areas during land use plan update (ST - 2A)
3. Require stormwater facilities (ST - 2B)
4. Sponsor study (ST - 2C)
5. Monitor some facilities and report (ST -2D)

Who: King County, tasks 1 - 5, Cities, tasks 1 - 4.

When: Year __

Cost: Task 1: none. (ST - 2A)

Task 2: minimal, but may need money to compensate land owners (ST - 2A)

Task 3: costs for regulation change to be provided by cities during concurrence. (ST - 2B)

Task 4: Unknown, the program needs to be developed to determine costs. (ST - 2C)

Task 5: SWM to provide information during concurrence, but is expected to be done under existing budget. (ST -2D)

Funding Source: costs for regulation change to be provided by cities during concurrence. (ST - 2B); SWM to provide information during concurrence, but is expected to be done under existing budget. (ST -2D)

NOTE: All Education actions will be combined under Education, Chapter 3. In the draft Plan, this issue will be stated, and the reader will be directed to that Chapter for actions and discussion.

Issue 3. Education. Considerable effort is underway to educate the public regarding the prevention of nonpoint pollution and improper disposal of hazardous materials. Agencies or jurisdictions involved include King County (SWM, Seattle-King County Department of Public Health Environmental Health Division, Cooperative Extension, Environmental Division, BALD), cities, PSWQA, Ecology, Metro, King County Conservation District, Soil Conservation Service, public and private schools and others. ~~The scope of this paper does not allow detailed discussion of all ongoing efforts.~~ We do not know if existing educational materials stress the connection between surface and ground water pollution. Nor do we know if educational materials address ways in which the public can encourage recharge of precipitation rather than contribute to problems associated with excess runoff.

Alternative 2. King County and cities will jointly carry out a ground water education program. In regards to stormwater management, this effort will ensure that educational activities are adequate to communicate to the public: 1. how ground water may become contaminated via surface water pollution, and 2. ways in ground water recharge may be encouraged.

~~Alternative 2. Petition King County to take steps to ensure that educational activities are adequate to communicate to the public the connection between surface and ground water pollution.~~

ST - 3A ~~Action 1.~~ Education. Seattle-King County Department of Public Health Environmental Health Division) will review ~~major applicable~~ educational efforts underway to determine whether the protection of ground water is emphasized. Seattle-King County Department of Public Health Environmental Health Division will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs.

ST - 3B ~~Action 2.~~ Education. Seattle-King County Department of Public Health Environmental Health Division will report to the GWMP Management Committee on the adequacy of existing educational programs to address ground water concerns. This report will include proposed changes as a result of review and discussions carried out in ST - # (1) above. ~~Seattle-King County Department of Public Health Environmental Health Division will report on the adequacy of existing educational programs to address ground water concerns subsequent to carrying out Action 1 above.~~

ST - 3C ~~Action 3.~~ Education. Seattle-King County Department of Public Health Environmental Health Division will develop a supplemental educational program to address deficiencies identified above, if necessary and present it to the Management Committee for review and adoption.

ST - 3D Education. Seattle-King County Department of Public Health Environmental Health Division will coordinate implementation of the program which may involve actions by Seattle-King County Department of Public Health Environmental Health Division and other agencies and jurisdictions.

SOUTH KING COUNTY Issue 1 Alternative 2. Petition King County, the cities and the above agencies to take steps to ensure that educational activities are adequate to communicate to the public the connection between surface and groundwater and the migration of pollution between the two.

Action 1. Seattle-King County Department of Public Health (SKCHD) will review major educational efforts underway to determine whether the protection of groundwater is emphasized, report on the adequacy of existing educational programs to address groundwater concerns, and will develop a supplemental educational program to address deficiencies identified if necessary. SKCHD will seek the cooperation of the parties involved to include groundwater information and concerns in the educational programs. Funding should be done on a pro rata basis from revenues generated from surface and groundwater programs.

Discussion. Prevention of pollution is the best approach from the standpoints of cost and environmental impact. Education is the best prevention because it creates an awareness and concern in individuals which accompanies them throughout their lives. This awareness and concern prevents pollution in countless small and large ways as individuals make everyday decisions.

Seattle-King County Department of Public Health Environmental Health Division will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs.

Developing an independent educational program to address this issue would probably be largely redundant. It would not likely be supported financially by elected officials in a time of lean budgets. We can use scarce resources more efficiently by reviewing and updating existing programs. Funding for staff at Seattle-King County Department of Public Health Environmental Health Division is necessary to carry out the review, coordination, report, and development of a supplemental program, if needed. It is possible that enhancing existing programs will require that funds be provided to the relevant agency or jurisdiction.

Funding. The funding source for this effort will be aquifer protection funds. If the aquifer protection fund is not approved, grants will be sought in two phases. Phase 1 will involve initial review of educational programs and coordination with other agencies and jurisdictions to address ground water concerns. Phase 1 will also include a report outlining remaining deficiencies. Phase 2 will seek funds to provide enhanced programs at both other agencies and jurisdictions and to develop a supplemental program, if needed. Centennial Clean Water Funds will be initially sought but if that is not successful, all other reasonable sources of grants will be explored.

Implementation Plan:

Who: Seattle-King County Department of Public Health Environmental Health Division

Task(s): 1. Review educational programs

2. Report to Management Committee

3. Develop program

4. Coordinate/implement

When: Year 1 and on going.

Cost: to be determined during concurrence.

Funding Source: Aquifer protection fund.

Issue 4. Coordination Between Surface and Ground Water Planning Efforts. Surface and ground water planning efforts should be effectively coordinated in order to make the best use of limited resources.

NOTE: This is the same as old Issues 2 and 3, except for changes as noted below.

~~Issue 2. Coordination. Ecology and the Puget Sound Water Quality Authority treat watershed and ground water planning as separate activities. Further, there is a lack of coordination at the state level between sections at Ecology responsible for watershed and ground water planning. Centennial Clean Water Fund grant categories and match requirements encourage separate efforts. Valuable grant funds are being used inefficiently and, in some cases, being used to fund efforts that are unintentionally at odds with each other.~~

Alternative 2. Adopt a series of actions that promote optimal coordination between surface and ground water resource planning efforts.

ST - 4A Coordination Between Surface and Ground Water Planning Efforts: Ecology Programs. ~~Action 1. Petition Ecology will~~ assess surface and ground water quality planning programs to determine how they could be combined or coordinated in a way which is both scientifically justified and which provides for greater efficiency.

~~b. revise Centennial Clean Water Fund categories so as not to discourage joint ground and surface water quality planning efforts.~~

NOTE: Staff recommends deleting b. because we don't know enough about revising the Fund categories to recommend this. There has been conflicting information about this; it is probably not necessary to recommend.

ST - 4B Coordination Between Surface and Ground Water Planning Efforts: Puget Sound Water Quality Authority. ~~Action 2. Petition The Puget Sound Water Quality Authority to~~ recognizes that surface and ground water form a continuous and dynamic system which must be comprehensively protected ~~in order to protect Puget Sound. Request that~~ The Puget Sound Water Quality Management Plan will be revised to address all water quality issues in the Puget Sound drainage basin, including ground water.

ST - 4C Coordination Between Surface and Ground Water Planning Efforts: King County. King County will assess its water resource planning efforts to determine how to effectively coordinate them to provide the best possible protection of water resources.

~~Issue 3. Coordination. Coordination between local agencies responsible for watershed and ground water planning is inadequate.~~

~~Alternative 2. Petition King County to assess its water quality planning efforts to determine how to effectively coordinate them to avoid duplication and conflicting goals and strategies.~~

~~Discussion. Lack of coordination results in inefficient use of scarce resources for~~

~~environmental protection. Conflicting planning documents could serve to interfere with the implementation of one or both. County staff, developers, and the public have difficulty determining County policy. While a coordinating process will initially be time consuming it will save resources in the long run. Coordination will also serve to meet more closely the intent of state regulations.~~

NOTE: Staff recommends deleting Issue 3 as it is now included in Issue 4 ST - 4C. This reflects what the Issaquah and Redmond GWAC adopted.

SOUTH KING COUNTY Issue 2 Action 1. Petition Ecology to:

- a. assess surface and ground water quality planning programs to determine how they could be combined in a way which is both scientifically justified and which provides for greater efficiency;
- b. revise Centennial Clean Water Fund categories so as not to discourage joint ground and surface water quality planning efforts.

Action 2. Petition the Puget Sound Water Quality Authority to recognize that surface and ground water form a continuous and dynamic system which must be comprehensively protected in order to protect the Puget Sound. Request that the Puget Sound Water Quality Management Plan address all water quality issues in the Puget Sound drainage basin.

~~SOUTH KING COUNTY Issue 3. Coordination. Coordination between local agencies responsible for watershed and ground water planning is inadequate.~~

Discussion. State law encourages coordination of nonpoint and ground water protection plans. In reality, this has been difficult for local governments to achieve. There are many underlying reasons why this integration at the local level often doesn't occur. Reasons include:

1. Administration of surface and ground water protection grants by different sections at Ecology;
2. Separate state regulations guiding planning processes;
3. More favorable funding rules with the Centennial Clean Water Fund for planning processes that do not address water quantity issues, a crucial element of a ground water plan;
4. Lack of recognition of the need to protect surface and ground water concurrently as part of a continuous dynamic system;
5. Planning processes carried out by different lead agencies at the local level;
6. Lack of a proactive program to coordinate at the local level.

Alternative 2 offers the GWAC an opportunity to bring their concerns regarding this issue to the three major entities involved in multi-jurisdictional surface and ground water planning: Ecology, the Puget Sound Water Quality Authority, and King County. The cities in the GWMA are effectively reached by this alternative because cities are members of the multi-jurisdictional planning efforts. The GWAC will seek a commitment by these entities to take steps to evaluate the effectiveness of existing water resource protection planning processes and to make improvements to them where needed.

Legislation is not needed to make administrative changes at Ecology. Relevant regulations addressing ground and surface water planning already encourage coordinated or joint efforts. How the regulations are implemented will be one determining factor in whether water resource protection planning processes continue to diverge on somewhat separate tracks.

The Puget Sound Water Quality Authority's priorities should continue to be those issues which have the greatest impact upon the quality of Puget Sound waters. The Authority should explore, however, the importance of the ground water contribution to Puget Sound. It is encouraging that ground water protection is listed in the Plan's Unfinished Agenda. GWAC input may be enough to cause a shift in perspective at the Authority and thereby move ground water protection up the scale of priorities.

Changes at the state level would necessitate close cooperation with local governments currently involved in planning activities. Innovation should be encouraged in implementing water resource plans in order to alleviate redundancies which may exist between surface and ground water planning efforts.

3.2.3 GROUND WATER QUALITY AND QUANTITY ISSUES ASSOCIATED WITH STORM WATER MANAGEMENT

Storm water is water which runs off impervious surfaces when it rains. Past and present storm water management practices often cause ground water quantity and quality problems. Ground water quality may be impacted if storm water containing contaminants is recharged intentionally or inadvertently. The most serious concern over recharge of storm water is, from a public health standpoint, possible effects on the quality of drinking water. Also, precipitation is diverted to surface water that, under natural conditions, would be recharged to ground water. As a result, there is a decrease in the quantity of water recharged to ground water.

The continuity of surface and ground water is an important concept in understanding the effects of surface water contamination on ground water. It is also important in making decisions regarding the most efficient way to protect both surface and ground water. Ground water and surface water cannot be considered two separate hydrologic systems because they are inextricably entwined.

King County has experienced the effects of urbanization and deforestation. Growth of King County's urban area has resulted in more impervious surface, more runoff, stream damage, and a reduction of recharge to ground water. Deforestation, the removal of vegetation and the subsequent compaction of soil, may also reduce ground water recharge.

Storm water management facilities can be designed to maximize infiltration into the ground thereby increasing recharge to aquifers. However, an obvious concern is the potential to contaminate ground water with pollutants carried in storm water. In the past, storm water management emphasized flood control and was not particularly concerned with water quality. More recently, however, concern has shifted to the quality of storm water and how it can impact receiving waters, including ground water. Storm water management practices include source control and treatment facilities.

Storm water management facilities vary in the degree to which these mechanisms take place. The most common methods used for both flow control and water quality improvement are detention basins, infiltration facilities, biofilters, and coalescing plate oil/water separators.

Storm Water Management Programs and Regulations

Numerous federal, state, and local programs and regulations govern the management of storm water and the control of point and nonpoint pollution. However, there are no programs and regulations which solely relate to the issue of effects of storm water management upon ground water resources.

State Programs

Puget Sound Water Quality Authority (the Authority) adopted the Puget Sound Water Quality Management Plan (PSWQMP), which forms the foundation of the storm water program at Ecology which affects cities, counties, and the Washington State Department of Transportation (WSDOT). The Plan focuses on protection of surface water in its efforts to protect Puget Sound. Little attention is paid to the continuity of surface and ground waters. The protection of ground water afforded by the many activities fostered by the Plan is often noted but is secondary to protection of surface waters.

Washington State Department of Ecology. Coordination of surface and ground water management is included in two Ecology programs, Local Planning and Management of Nonpoint Source Pollution and Ground Water Management Programs. Local Planning and Management of Nonpoint Source Pollution requires affected counties to convene watershed ranking committees to rank watersheds in need of protection. It also encourages coordination and integration of local ground and surface water protection planning efforts by stating that: "To reduce duplication of effort, Ecology shall also be responsible for coordinating the activities of the watershed management committee with other existing water management programs (e.g. groundwater). Coordination and integration of local efforts related to ground and surface water is strongly encouraged. If a joint ground water and watershed management program is established, the county shall be the lead agency for the joint program.

The law creating Ground Water Management Programs (GWMPs) contains less specific language but does encourage coordination. However, there are several reasons why this integration at the local level seldom occurs:

- The state treats surface and ground water quality protection programs as separate. The programs are administered by different sections within Ecology. Grants are also managed differently.
- Centennial Clean Water Funds are categorized in a way which discourages integrated plans. Because of intense competition in the nonpoint category, a proposal which emphasizes ground water protection will be placed in the ground water category. This practice discourages joint watershed/ground water nonpoint source pollution control plans.
- Ground water planning is usually seen as a public health issue and local public health departments usually serve as lead agency. Watershed planning is usually seen as a surface water issue and is usually addressed by a branch of public works or planning department.
- Local lead agencies, faced with short timelines and limited resources, are answering to different programs at Ecology and responding to different regulations which guide their planning processes. The magnitude of the problem of trying to coordinate in the face of the confusion generated at the state level proves daunting. Lack of coordination between agencies is often the unfortunate result.

It is possible that budget cuts at Ecology and declines in the amount of money generated by the cigarette tax (Centennial Clean Water Fund) will force a resolution to inefficiencies in water quality planning at the state level. Despite staff recommendations favoring consolidation, there has not yet been concrete progress in this direction.

Another State program which relates to stormwater is The Stormwater and Combined Sewer Overflows (CSOs) Program. The program goal is to protect shellfish beds, fish habitat, and other resources, to prevent the contamination of sediments from urban runoff and CSOs, and to achieve standards for water and sediment quality by reducing pollutant discharges from stormwater and CSOs. Ecology is developing model ordinances, a technical manual, and numerous other guidance documents to assist cities and counties.

Ecology is also directed by the Program to 1) work with WSDOT on a program to control runoff from state highways in the Puget Sound basin and 2) to develop a technical manual to assist local governments which establishes best management practices for stormwater management.

Ecology's Draft Stormwater Management Manual for the Puget Sound Basin (Draft Manual), developed to assist local governments in meeting the storm water management rules, was released for public and agency review on June 10, 1991. It is expected by Ecology that a final version would be completed by early 1992. This manual addresses erosion and sedimentation control, runoff control and control of pollution from urban land uses. The manual relates to impacts on ground water:

- Infiltration is the preferred method of volume control and other methods are allowable only after infiltration has been ruled out for technical reasons.
- The Ecology manual requires that a certain volume of runoff be infiltrated or detained. This is in contrast to the King County manual which requires only that peak runoff rates not be altered by the development. This is of major significance when considering volume of water to be potentially recharged to ground water.

Local Programs

King County, Surface Water Management Division (SWM) of the Department of Public Works has broad responsibility for management of storm water in King County. SWM conducts routine maintenance of drainage and pollution control facilities, constructs facilities to control runoff and protect natural drainage systems, conducts needed engineering and habitat analyses, and responds to both complaints and emergencies involving flooding, erosion, and water quality. The program's goal is to minimize the personal, financial, and environmental costs associated with flooding and erosion by providing a comprehensive approach to surface water management. SWM has presented the King County Council with the King County Surface Water Management Strategic Plan. The

Strategic Plan emphasizes an acceleration of the current program along with new emphasis in water quality and "off road" storm water facilities. SWM also addresses ground water quality and quantity in its planning processes.

An important feature of the SWM program has been its design manual completed in 1990. The King County Surface Water Design Manual (Design Manual) contains requirements and standards for designing surface and storm water management systems in King County. King County requires that impacts on existing artificial and natural drainage systems be mitigated prior to permit approval for certain developments. While the Design Manual requires water quality treatment best management practices comparable to the Ecology Draft Manual, King County's Design Manual does not require infiltration as the method of choice for volume control. Rather, infiltration is allowed in certain soil types. It is generally not allowed in soils that would be considered moderately permeable. Additionally, the King County manual does not require infiltration or detention of a certain volume of water. It requires that peak runoff not be altered by new development. (If the Ecology Draft Manual is adopted as presently written, King County will be required to amend its Design Manual.)

SWM and Seattle-King County Department of Public Health Environmental Health Division coordinate to some extent on planning activities but not as much as is needed to effectively avoid redundancy or conflicting goals and products. Coordination between SWM and Seattle-King County Department of Public Health Environmental Health Division is far from comprehensive and the potential for conflicting goals and products exists. A thorough analysis of the existing degree of agreement between the planning processes has not been carried out.

The Building and Land Development Division of the Parks, Planning, and Resources Department implements King County Code Title 21 Zoning (the zoning code) which, to some extent, regulates the degree of impervious cover allowed for developments. Proposed changes establish, for the first time, limitations on impervious cover for development. They would prevent extreme cases of lot coverage by impermeable surfaces. The draft code is now being reviewed by a technical review committee established by the Council.

Cities in King County have developed programs varying in their comprehensiveness based on state and local programs.

Metro is currently assisting jurisdictions in King County in establishing surface water utilities by providing technical information about surface water quality.

Land Use In Critical Aquifer Recharge Areas

Research has shown that nearly all land uses associated with human activity significantly affect ground water quality due to the effects of nonpoint sources of pollution. It has also been shown that the degree of contamination increases with the intensity of development.

It becomes a public policy question as to how balance land use demands with the need to protect ground water.

Studies demonstrate that certain land uses contribute to contamination of ground water from nonpoint sources. The land uses that were shown to result in the highest concentrations or detection frequencies of a variety of chemical contaminants are generally agriculture, residential (especially high density), and industrial/commercial. It is difficult to extrapolate the findings of these studies to another geographical area. However, perhaps the most valuable conclusion to the GWMP is the evidence that all land uses compromised ground water quality and that contamination increased with intensity of land use.

In order to address the land use question in these areas from a water quality basis in relation to stormwater management, we would need to increase our understanding of effects on ground water quality of stormwater source controls, treatment, and infiltration. We would need to better understand the effectiveness of the best management practice (BMP) currently supported by experts. Additional study including modeling and field testing of this BMP (lined wet pond - lined bioswale - infiltration basin in series) is needed. Stormwater strengths and constituents representative of various land uses should be tested so that, using study results, planners would be able to recommend compatible land uses to elected officials.

A Ground Water Management Plan should address the question of appropriate land use for high potential aquifer recharge areas. In particular, it is important to make recommendations regarding appropriate residential densities and commercial and industrial uses. Answers to these questions are not fully available. Research into the effectiveness of storm water treatment is in early stages. Practical problems associated with the application of this technology on a wide scale are yet to be determined. Many studies of this technology are planned or underway, some of them in King County. Infiltration technology is fraught with problems but, given Ecology's emphasis on infiltration, we are about to find out how effective this technology is in the Puget Sound region. Thus, the question of appropriate density and land use in high potential aquifer recharge areas should be answered with some degree of validity soon. Until such time, it may be the best policy to maintain low densities in these areas to avoid irreversible adverse impacts. It is possible that water quality and source controls will prove to be inadequate in themselves to address concerns for ground water quality. In this case low density and limited land uses may be the only feasible alternative.

GOAL

To promote stormwater management practices that provide the greatest amount of recharge while protecting ground water quality. ~~To promote management of storm water in a manner which prevents degradation and depletion of ground water.~~

NOTE: Staff recommends new goal because it emphasizes quality and is a positive statement.

SOUTH KING COUNTY To promote management of stormwater in a manner which protects groundwater quality and quantity.

ISSUES

Issue 1. Runoff Versus Recharge. The King County Surface Water Design Manual does not limit runoff volumes. Rather, the Manual requires that there be no increase in peak runoff rates. Potential ground water recharge is lost to runoff causing depletion of aquifers. Many cities in Ground Water Management Areas (GWMA's) have adopted or use the King County Manual for reference in their stormwater management programs and are, therefore, likely following the same policy towards infiltration.

ST - 1A Runoff Versus Recharge. King County and cities will amend/adopt surface water design manuals to require that runoff be infiltrated when site conditions permit except where potential ground water contamination cannot be prevented by pollution source controls and stormwater pretreatment.

SOUTH KING COUNTY (needs to adopt action)

Discussion. Impacts from development on ground water can be partially mitigated by infiltrating stormwater rather than discharging it to surface water bodies. This practice partially compensates for the loss of natural recharge caused by impermeable surfaces. Some areas of King County with glacial outwash soils are particularly suited to infiltration. In these areas, infiltration should be used to mimic the natural recharge patterns present prior to development as closely as possible. While infiltration is encouraged in King County and, presumably, in some cities, taking a stronger position in favor of it should result in greater use of this technique.

Infiltration of stormwater presents a threat to ground water quality. Stormwater should not be infiltrated where the risk of ground water pollution cannot be mitigated by pollution source controls and stormwater pretreatment. Ecology provides guidance in regard to adequate source control and pretreatment in regard to specific development types in the Stormwater Management Manual for the Puget Sound Basin. Some local jurisdictions are developing similar manuals that are at least as stringent as the Ecology manual. Ground water quality concerns associated with the infiltration of stormwater are addressed further in Issue #2.

Infiltration of roof runoff, while allowed in King County and presumably cities, could be used more extensively or required in appropriate settings including single-family residential development. Consideration should be given to water quality before adopting requirements to infiltrate roof runoff. Certain roofing materials and associated treatments to retard moss growth could result in the introduction of hazardous substances to ground water. In addition, roof runoff may be too contaminated to infiltrate without treatment in highly urbanized areas subject to relatively heavy air pollution. These issues should be more thoroughly explored by King County and the cities as they develop specific requirements for infiltration. The King County manual does not presently contain any restrictions on infiltration of untreated roof runoff other than limiting the soils in which infiltration is allowed.

If the Ground Water Advisory Committee (GWAC) decides to take no action it is probable that King County and cities will gradually increase the use of infiltration technology because of the emphasis placed on it by the Stormwater Management Manual for the Puget Sound Basin (the Ecology Manual).

Development is, however, proceeding rapidly and many opportunities to use infiltration technology may be lost. It may result in more rapid implementation of the Ecology Manual's provisions if the GWACs request early action in favor of the use of infiltration whenever possible in all jurisdictions in the GWMA's.

Implementation:

Who: King County and cities

Task(s): amend/adopt surface water design manuals

When: Year __, or when agencies would normally amend/adopt surface water design manuals

Cost: to be determined during concurrence.

Fund Source: cities and King County general funds.

Issue 2. Ground Water Quality Concerns. It has been demonstrated by numerous studies that nonpoint source pollution is a major contributor to ground water degradation. Water quality controls and infiltration of stormwater will increasingly be used to reduce nonpoint source pollution effects upon both surface and ground water resources. Technology associated with these practices is in early stages and long term effects on ground water quality are unknown. While water quality controls will improve the quality of the water discharged to the ground, the increasing emphasis on infiltration poses risks. Infiltration will be employed most often in areas with glacial and alluvial soils associated with high potential aquifer recharge areas. Regardless of the comprehensiveness of new requirements, treatment systems will sometimes fail for a variety of reasons and they cannot be expected to function optimally at all times. Additionally, nonpoint source pollution that is not borne by stormwater will infiltrate and reach ground water regardless of stormwater management techniques.

NOTE: THIS IS SIMILAR TO OLD ISSUE 4 AS NOTED BELOW.

Alternative 2. Ground Water Quality Concerns. Adopt actions to ensure that high potential aquifer recharge areas are protected from nonpoint source pollution to the greatest extent feasible, that stormwater infiltration best management practices are used, and that further information is sought on the long-term effects of this practice upon ground water quality.

ST - 2A Ground Water Quality Concerns - Zoning. King County and cities within GWMA's will maintain rural and low density urban residential zoning (one acre lots) and open space in high potential aquifer recharge areas where more intensive land uses have not already been zoned. King County and cities will change zoning for more intensive land uses in these areas to the above zoning whenever possible during land use plan updates.

[NOTE: Similar to old Issue 4.2.1: "Action 1. Petition King County and cities within Ground Water Management Areas (cities) to encourage low density development (one or fewer residences per 5 acres) in high potential aquifer recharge areas and to avoid commercial, industrial, and multifamily zoning in these areas."]

ST - 2B Ground Water Quality Concerns - Facility Requirements. King County and cities within GWMA's will require the following stormwater facility in high potential aquifer recharge areas for new construction and water quality retrofit to existing facilities (where possible): wet pond, bioswale, infiltration basin in series (treatment components and conveyance lined to preclude infiltration).

[Note: Similar to APO requirement in old Issue 4.2.2.a: "a. Require tightlined conveyance and an impermeable pretreatment system consisting of a wet pond and biofiltration prior to infiltration in high potential aquifer recharge areas. Require that the wet pond be fitted with a mechanism to shut off flow to the infiltration facility in order to contain hazardous material spills. This would be required for new construction and water quality retrofit to existing facilities, including roads."]

ST - 2C Ground Water Quality Concerns - Study. King County and cities will jointly sponsor study of the effectiveness of the facility described in ST - 2B (above).

NOTE: Similar to old Issue 4.3.b: "b. King County and cities to jointly sponsor study of effectiveness of storm water management programs in preventing adverse effects on ground water quality and quantity via the Center for Urban Water Resources Management at the University of Washington. Centennial Clean Water Funds should be sought for a major study on this topic. A study should be designed which will benefit all Puget Sound jurisdictions who are both responsible for ground water protection under the Growth Management Act and the Ground Water Quality Standards (WAC 173-200) and for requiring infiltration of storm water under Ecology rules. The study should address and make recommendations regarding appropriate land use in high potential aquifer recharge areas, both from the standpoint of density and type of development."

ST - 2D Ground Water Quality Concerns - Facility Monitoring. King County will monitor a sample of the facilities described in ST - 2C in actual use and prepare a report of findings.

NOTE: Similar to old Issue 4.3.a: "a. King County Surface Water Management Division to monitor the effectiveness of the system described in Issue 4. Action 2. a. in protecting ground water quality."

NOTE: Staff recommendation to delete Issue 4 Alternative 2 Action 2 below because we don't need a separate ordinance to implement the program since other actions require amending existing and creating new regulations as needed. The Special Areas paper now provides for development of SEPA review guidance documents.

Alternative 2. Action 2. Petition King County and cities to jointly develop an Aquifer Protection Ordinance (APO) for submittal to and approval by the King County Board of Health. The ordinance should contain measures related to all issues addressed by the Ground Water Management Program (GWMP), as appropriate. (Note: This is the initial introduction to the alternative of developing an aquifer protection ordinance that encompasses many regulatory aspects of the GWMP. Subsequently, as actions are presented, those which should be included in the ordinance will be noted as such. All other issue papers will be reviewed for inclusion of action items in the APO and this will be noted in the final GWMP.) The ordinance should contain the following measures:

a. Require tightlined conveyance and an impermeable pretreatment system consisting of a wet pond and biofiltration prior to infiltration in CARAs. Require that the wet pond be fitted with a mechanism to shut off flow to the infiltration facility in order to contain hazardous material spills. This would be required for new construction and water quality retrofit to existing facilities, including roads.

b. Require a hydrogeological assessment for proposed development in CARAs which is subject to SEPA review and which is found to potentially affect ground water quality or quantity. The assessment will be reviewed by SEPA personnel and Seattle-King County Department of Public Health Environmental Health Division (within King County) to determine effects on ground water quality and quantity can be adequately mitigated. Advisory review by Seattle-King County Department of Public Health Environmental Health Division will be provided to city SEPA reviewers as requested. The assessment will include but is not limited to:

- 1) Geologic setting including well logs, borings, and other information used to make this determination;
- 2) Background water quality;
- 3) Ground water elevations including location and depth to perched water tables;
- 4) Ground water flow direction, velocity, and gradient;
- 5) Attenuation potential of soils and aquifer materials as well as the ability of affected aquifers to dilute contamination;
- 6) Surface water bodies and their degree of continuity with local ground water;
- 7) Potential use of ground or surface water by the proposed development;
- 8) Discussion of the potential effects of the proposed development on ground water quality and quantity;
- 9) Other such information as is deemed pertinent to a determination of the effects of the proposed development on ground water resources.

NOTE: Staff recommends deleting Issue 4 Alternative 2 Action 4 because all WHPP policies have been moved to the Special Areas paper. This task will be included in the list that the Management Committee will address.

Issue 4 Alternative 2. Action 4. Encourage efforts by utilities undertaking Wellhead Protection Area delineation and study to determine whether vulnerability of the zone of influence warrants prohibition of infiltration of storm water in a defined area.

SOUTH KING COUNTY Issue 4 (Potential Groundwater Contamination),
Alternative 2, Action 1:

Action 1. Petition King County and cities within Groundwater Management Areas to encourage low density development and open space in CARA's and to avoid commercial, industrial, and multifamily zoning in these areas.

Action 2: (Aquifer Protection Ordinance) Petition King County and cities to jointly develop an Aquifer Protection Ordinance (APO) for submittal to and approval by the King County Board of Health. The ordinance should contain measures related to all issues addressed by the Ground Water Management Program (GWMP), as appropriate. (Note: This is the initial introduction to the alternative of developing an aquifer protection ordinance that encompasses many regulatory aspects of the GWMP. Subsequently, as actions are presented, those which should be included in the ordinance will be noted as such. All other issue papers will be reviewed for inclusion of action items in the APO and this will be noted in the final GWMP.)

The ordinance should conform to the current Stormwater Management Manual for the Puget Sound Basin. The ordinance should contain the following measures:-

~~a. Require tightlined conveyance and an impermeable pretreatment system consisting of a wet pond and biofiltration prior to infiltration in CARAs. Require that the wet pond be fitted with a mechanism to shut off flow to the infiltration facility in order to contain hazardous material spills. This would be required for new construction and water quality retrofit to existing facilities, including roads.~~

SOUTH KING COUNTY [NOTE: GWAC VOTED TO MOVE THIS (B.) TO FED STATE PAPER]

b. Require a hydrogeological assessment for proposed development in CARAs which is subject to SEPA review and which is found to potentially affect ground water quality or quantity. The assessment will be reviewed by SEPA personnel and Seattle-King County Department of Public Health Environmental Health Division (within King County) to determine effects on ground water quality and quantity can be adequately mitigated. Advisory review by Seattle-King County Department of Public Health Environmental Health Division will be provided to city SEPA reviewers as requested. The assessment will include but is not limited to:

- 1) Geologic setting including well logs, borings, and other information used to make this determination;
- 2) Background water quality;
- 3) Ground water elevations including location and depth to perched water tables;
- 4) Ground water flow direction, velocity, and gradient;
- 5) Attenuation potential of soils and aquifer materials as well as the ability of affected aquifers to dilute contamination;
- 6) Surface water bodies and their degree of continuity with local ground water;
- 7) Potential use of ground or surface water by the proposed development;
- 8) Discussion of the potential effects of the proposed development on ground water quality and quantity;
- 9) Other such information as is deemed pertinent to a determination of the effects of the proposed development on ground water resources.

SOUTH KING COUNTY Action 3. Petition King County and cities to jointly study the effectiveness of water quality and quantity controls and infiltration in protecting groundwater quality and quantity.

The following is requested:

~~a. King County Surface Water Management Division to monitor the effectiveness of the system described in Issue 4, Action 2, a. in protecting ground water quality.~~

~~b. King County and cities to jointly sponsor study of effectiveness of storm water management programs in preventing adverse effects on ground water quality and quantity via the Center for Urban Water Resources Management at the University of Washington. Centennial Clean Water Funds should be sought for a major study on this topic. A study should be designed which will benefit all Puget Sound jurisdictions who are both responsible for ground water protection under the Growth Management Act and the Ground Water Quality Standards (WAC 173 200) and for requiring infiltration of storm water under Ecology rules. The study should address and make recommendations regarding appropriate land use in CARAs, both from the standpoint of density and type of development.~~

~~Action 4. Encourage efforts by utilities undertaking Wellhead Protection Area delineation and study to determine whether vulnerability of the zone of influence warrants prohibition of infiltration of storm water in a defined area.~~

Discussion. ST - 2A is proposed because of the sensitivity of high potential aquifer recharge areas to contamination, the increasing importance of protecting drinking water aquifers, and the difficulty, if not impossibility, of cleaning up contaminated aquifers. The wording of ST - 2A is identical with proposed actions in both the Water Quantity and Hazardous Materials issue papers. The reason for the action in the case of the Water Quantity issue is to promote recharge. The reason for the action in relation to the Hazardous Materials issue is because of the threat of chemical spills and improper materials management. Please refer to those papers for further discussion. For a variety of reasons then, land use controls should be considered in high potential aquifer recharge areas.

Management of stormwater, even if done according to best management practices, will not be perfect. Indeed, considerable difficulty has been experienced with stormwater infiltration facilities. It should be expected that systems will sometimes fail for structural, maintenance, or weather-related reasons.

King County already requires lined treatment facilities in excessively permeable soils but does not require conveyance systems that preclude infiltration. It is expected that cities in King County, some of whom have adopted all or part of the King County Manual, have similar requirements. Adoption of ST - 2B will generate discussion during the concurrence process and enable the GWAC to understand the cities' existing requirements. It will also provide an opportunity to seek concurrence with GWAC proposals to improve existing programs where appropriate.

Even as new requirements are instituted, stormwater managers do not have adequate information to determine long term effects of new requirements on ground water quality.

Monitoring the new facilities and additional study will enable us to determine whether long term effects are acceptable using best management practices.

The Center for Urban Water Resources Management (the Center) at the University of Washington or Metro may be possible coordinators of a multi-jurisdictional study. The Center was formed, in part, to address questions regarding appropriate management of stormwater. Numerous local jurisdictions are financial contributors to the Center's operations, including King County.

The Center has expressed interest in doing the type of study described in ST - 2C and feels it is warranted. The Center serves as a facilitator for local governments interested in solutions to common problems. If, for example, King County were to propose a study, the Center would then contact its members to determine if they would support it.

A study should be designed which will benefit all Puget Sound jurisdictions who are both responsible for ground water protection under the Growth Management Act and the Ground Water Quality Standards (WAC 173-200) and for requiring infiltration of stormwater per the Ecology Manual. The study should determine whether certain land uses make stormwater infiltration particularly threatening to ground water quality. For example, the study should compare rural and urban uses of land in regards to the potential to recharge stormwater safely. Residential and commercial uses of land should also be compared.

Funding. There is no cost associated with King County and cities maintaining specific zoning designations in high potential aquifer recharge areas. (ST - 2A).

The cost of using the best management practice described in ST - 2B will be borne by developers and, ultimately, consumers.

Funding for ST - 2C should come from the aquifer protection fund. Alternatively, ST - 2C could be funded by a Centennial Clean Water Fund grant if the aquifer protection fund is not approved. If that is the case, King County, cities, and the Center for Urban Water Resource Management or Metro should make a strong bid for Centennial Clean Water Fund money to carry out a study. Local governments should emphasize in a grant application that local ground water resources may be at risk from the new emphasis by Ecology on infiltration of stormwater. Local governments should be supported in their effort to study the effects of state requirements. King County and cities would need to pool financial resources to provide for local match for a grant. Other grant sources besides CCWF could also be considered. If no grant monies are available, the County and cities would have to pool resources to fund the full cost of the study.

Seattle-King County Department of Public Health Environmental Health Division will seek support from SWM to monitor stormwater infiltration facilities (ST - 2D). It is anticipated that the monitoring can be done under existing budgets because SWM's recently adopted Strategic Plan indicates that a certain amount of utility fees are dedicated to monitoring the effectiveness of stormwater management facilities. Seattle-King County Department of Public Health Environmental Health Division will seek an agreement with SWM to monitor a minimum number of facilities and provide reports on facility effectiveness.

Implementation Plan:

- Tasks: 1. Maintain zoning in high potential aquifer recharge areas (ST - 2A)
2. Change zoning in high potential aquifer recharge areas during land use plan update (ST - 2A)
3. Require stormwater facilities (ST - 2B)
4. Sponsor study (ST - 2C)
5. Monitor some facilities and report (ST -2D)

Who: King County, tasks 1 - 5, Cities, tasks 1 - 4.

When: Year __

Cost: Task 1: none. (ST - 2A)

Task 2: minimal, but may need money to compensate land owners (ST - 2A)

Task 3: costs for regulation change to be provided by cities during concurrence. (ST - 2B)

Task 4: Unknown, the program needs to be developed to determine costs. (ST - 2C)

Task 5: SWM to provide information during concurrence, but is expected to be done under existing budget. (ST -2D)

Funding Source: costs for regulation change to be provided by cities during concurrence. (ST - 2B); SWM to provide information during concurrence, but is expected to be done under existing budget. (ST -2D)

NOTE: All Education actions will be combined under Education, Chapter 3. In the draft Plan, this issue will be stated, and the reader will be directed to that Chapter for actions and discussion.

Issue 3. Education. Considerable effort is underway to educate the public regarding the prevention of nonpoint pollution and improper disposal of hazardous materials. Agencies or jurisdictions involved include King County (SWM, Seattle-King County Department of Public Health Environmental Health Division, Cooperative Extension, Environmental Division, BALD), cities, PSWQA, Ecology, Metro, King County Conservation District, Soil Conservation Service, public and private schools and others. ~~The scope of this paper does not allow detailed discussion of all ongoing efforts.~~ We do not know if existing educational materials stress the connection between surface and ground water pollution. Nor do we know if educational materials address ways in which the public can encourage recharge of precipitation rather than contribute to problems associated with excess runoff.

Alternative 2. King County and cities will jointly carry out a ground water education program. In regards to stormwater management, this effort will ensure that educational activities are adequate to communicate to the public: 1. how ground water may become contaminated via surface water pollution, and 2. ways in ground water recharge may be encouraged.

~~Alternative 2. Petition King County to take steps to ensure that educational activities are adequate to communicate to the public the connection between surface and ground water pollution.~~

ST - 3A ~~Action 1.~~ Education. Seattle-King County Department of Public Health Environmental Health Division) will review major applicable educational efforts underway to determine whether the protection of ground water is emphasized. Seattle-King County Department of Public Health Environmental Health Division will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs.

ST - 3B Action 2. Education. Seattle-King County Department of Public Health Environmental Health Division will report to the GWMP Management Committee on the adequacy of existing educational programs to address ground water concerns. This report will include proposed changes as a result of review and discussions carried out in ST - # (1) above. ~~Seattle-King County Department of Public Health Environmental Health Division will report on the adequacy of existing educational programs to address ground water concerns subsequent to carrying out Action 1 above.~~

ST - 3C ~~Action 3.~~ Education. Seattle-King County Department of Public Health Environmental Health Division will develop a supplemental educational program to address deficiencies identified above, if necessary and present it to the Management Committee for review and adoption.

ST - 3D Education. Seattle-King County Department of Public Health Environmental Health Division will coordinate implementation of the program which may involve actions by Seattle-King County Department of Public Health Environmental Health Division and other agencies and jurisdictions.

SOUTH KING COUNTY Issue 1 Alternative 2. Petition King County, the cities and the above agencies to take steps to ensure that educational activities are adequate to communicate to the public the connection between surface and groundwater and the migration of pollution between the two.

Action 1. Seattle-King County Department of Public Health (SKCHD) will review major educational efforts underway to determine whether the protection of groundwater is emphasized, report on the adequacy of existing educational programs to address groundwater concerns, and will develop a supplemental educational program to address deficiencies identified if necessary. SKCHD will seek the cooperation of the parties involved to include groundwater information and concerns in the educational programs. Funding should be done on a pro rata basis from revenues generated from surface and groundwater programs.

Discussion. Prevention of pollution is the best approach from the standpoints of cost and environmental impact. Education is the best prevention because it creates an awareness and concern in individuals which accompanies them throughout their lives. This awareness and concern prevents pollution in countless small and large ways as individuals make everyday decisions.

Seattle-King County Department of Public Health Environmental Health Division will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs.

Developing an independent educational program to address this issue would probably be largely redundant. It would not likely be supported financially by elected officials in a time of lean budgets. We can use scarce resources more efficiently by reviewing and updating existing programs. Funding for staff at Seattle-King County Department of Public Health Environmental Health Division is necessary to carry out the review, coordination, report, and development of a supplemental program, if needed. It is possible that enhancing existing programs will require that funds be provided to the relevant agency or jurisdiction.

Funding. The funding source for this effort will be aquifer protection funds. If the aquifer protection fund is not approved, grants will be sought in two phases. Phase 1 will involve initial review of educational programs and coordination with other agencies and jurisdictions to address ground water concerns. Phase 1 will also include a report outlining remaining deficiencies. Phase 2 will seek funds to provide enhanced programs at both other agencies and jurisdictions and to develop a supplemental program, if needed. Centennial Clean Water Funds will be initially sought but if that is not successful, all other reasonable sources of grants will be explored.

Implementation Plan:

Who: Seattle-King County Department of Public Health Environmental Health Division

Task(s): 1. Review educational programs

2. Report to Management Committee

3. Develop program

4. Coordinate/implement

When: Year 1 and on going.

Cost: to be determined during concurrence.

Funding Source: Aquifer protection fund.

Issue 4. Coordination Between Surface and Ground Water Planning Efforts. Surface and ground water planning efforts should be effectively coordinated in order to make the best use of limited resources.

NOTE: This is the same as old Issues 2 and 3, except for changes as noted below.

~~Issue 2. Coordination. Ecology and the Puget Sound Water Quality Authority treat watershed and ground water planning as separate activities. Further, there is a lack of coordination at the state level between sections at Ecology responsible for watershed and ground water planning. Centennial Clean Water Fund grant categories and match requirements encourage separate efforts. Valuable grant funds are being used inefficiently and, in some cases, being used to fund efforts that are unintentionally at odds with each other.~~

Alternative 2. Adopt a series of actions that promote optimal coordination between surface and ground water resource planning efforts.

ST - 4A Coordination Between Surface and Ground Water Planning Efforts: Ecology Programs. ~~Action 1. Petition Ecology~~ will to assess surface and ground water quality planning programs to determine how they could be combined or coordinated in a way which is both scientifically justified and which provides for greater efficiency.

~~b. revise Centennial Clean Water Fund categories so as not to discourage joint ground and surface water quality planning efforts.~~

NOTE: Staff recommends deleting b. because we don't know enough about revising the Fund categories to recommend this. There has been conflicting information about this; it is probably not necessary to recommend.

ST - 4B Coordination Between Surface and Ground Water Planning Efforts: Puget Sound Water Quality Authority. ~~Action 2. Petition~~ The Puget Sound Water Quality Authority to recognize that surface and ground water form a continuous and dynamic system which must be comprehensively protected ~~in order to protect Puget Sound. Request that~~ The Puget Sound Water Quality Management Plan will be revised to address all water quality issues in the Puget Sound drainage basin, including ground water.

ST - 4C Coordination Between Surface and Ground Water Planning Efforts: King County. King County will assess its water resource planning efforts to determine how to effectively coordinate them to provide the best possible protection of water resources.

~~Issue 3. Coordination. Coordination between local agencies responsible for watershed and ground water planning is inadequate.~~

~~Alternative 2. Petition King County to assess its water quality planning efforts to determine how to effectively coordinate them to avoid duplication and conflicting goals and strategies.~~

~~Discussion. Lack of coordination results in inefficient use of scarce resources for~~

~~environmental protection. Conflicting planning documents could serve to interfere with the implementation of one or both. County staff, developers, and the public have difficulty determining County policy. While a coordinating process will initially be time consuming it will save resources in the long run. Coordination will also serve to meet more closely the intent of state regulations.~~

NOTE: Staff recommends deleting Issue 3 as it is now included in Issue 4 ST - 4C. This reflects what the Issaquah and Redmond GWAC adopted.

SOUTH KING COUNTY Issue 2 Action 1. Petition Ecology to:

a. assess surface and ground water quality planning programs to determine how they could be combined in a way which is both scientifically justified and which provides for greater efficiency;

b. revise Centennial Clean Water Fund categories so as not to discourage joint ground and surface water quality planning efforts.

Action 2. Petition the Puget Sound Water Quality Authority to recognize that surface and ground water form a continuous and dynamic system which must be comprehensively protected in order to protect the Puget Sound. Request that the Puget Sound Water Quality Management Plan address all water quality issues in the Puget Sound drainage basin.

~~SOUTH KING COUNTY Issue 3. Coordination. Coordination between local agencies responsible for watershed and ground water planning is inadequate.~~

Discussion. State law encourages coordination of nonpoint and ground water protection plans. In reality, this has been difficult for local governments to achieve. There are many underlying reasons why this integration at the local level often doesn't occur. Reasons include:

1. Administration of surface and ground water protection grants by different sections at Ecology;
2. Separate state regulations guiding planning processes;
3. More favorable funding rules with the Centennial Clean Water Fund for planning processes that do not address water quantity issues, a crucial element of a ground water plan;
4. Lack of recognition of the need to protect surface and ground water concurrently as part of a continuous dynamic system;
5. Planning processes carried out by different lead agencies at the local level;
6. Lack of a proactive program to coordinate at the local level.

Alternative 2 offers the GWAC an opportunity to bring their concerns regarding this issue to the three major entities involved in multi-jurisdictional surface and ground water planning: Ecology, the Puget Sound Water Quality Authority, and King County. The cities in the GWMA are effectively reached by this alternative because cities are members of the multi-jurisdictional planning efforts. The GWAC will seek a commitment by these entities to take steps to evaluate the effectiveness of existing water resource protection planning processes and to make improvements to them where needed.

Legislation is not needed to make administrative changes at Ecology. Relevant regulations addressing ground and surface water planning already encourage coordinated or joint efforts. How the regulations are implemented will be one determining factor in whether water resource protection planning processes continue to diverge on somewhat separate tracks.

The Puget Sound Water Quality Authority's priorities should continue to be those issues which have the greatest impact upon the quality of Puget Sound waters. The Authority should explore, however, the importance of the ground water contribution to Puget Sound. It is encouraging that ground water protection is listed in the Plan's Unfinished Agenda. GWAC input may be enough to cause a shift in perspective at the Authority and thereby move ground water protection up the scale of priorities.

Changes at the state level would necessitate close cooperation with local governments currently involved in planning activities. Innovation should be encouraged in implementing water resource plans in order to alleviate redundancies which may exist between surface and ground water planning efforts.

On the local level, coordination will result in more efficient use of scarce resources for environmental protection. Conflicting planning documents that could serve to interfere with the implementation of one or both can be avoided. More importantly, integrated approaches that could result in better protection and more efficient use of resources can be developed.

County staff, developers, and the public have difficulty determining County policy when there are several incomplete planning processes addressing the same issues in the same geographic area. Coordination, if successful, will help everyone to understand both existing policy and policy in the developmental stages.

While a coordinating process will initially be time consuming it will save resources in the long run. It will also help local lead agencies to meet more closely the coordination provisions of state regulations.

King County agencies responsible for planning could jointly evaluate existing water resource planning efforts to determine how they might be streamlined and made more effective. Agencies involved should include at least SWM, Seattle-King County Department of Public Health Environmental Health Division, the Environmental Division, the Community Planning Section of the Planning and Community Development Division.

Implementation Plan:

Task(s): 1. Assess programs
2. Revise Plan
3. Assess Planning efforts.

Who: 1. Ecology
2. PSWQA
3. King County

When: Year

Cost: Ecology, PSWQA to be determined during concurrence. King County: 3 months.
(0.25 FTE)

Funding Plan. There is no local funding needed to petition Ecology and the Puget Sound Water Quality Authority to assess their programs. King County would have to undertake and fund the effort to streamline its water quality planning activities. Seattle-King County Department of Public Health Environmental Health Division will open dialogue with SWM regarding this issue and will seek the input of other County divisions. General funds should be used to cover staff time spent in this effort.

Issue 5. Assessment of Existing Stormwater Facilities. Existing stormwater management facilities (or the lack of facilities) in high potential aquifer recharge areas and Wellhead Protection Areas (WHPAs) may pose a risk to ground water quality and the population served by public water systems. Some facilities were constructed when there was little concern about ground water quality. Of particular concern are drywells used in commercial and industrial areas. Alternatively, there are areas in which no stormwater facilities were constructed to accompany development other than ditches. This situation may be found in areas with highly permeable soils that were developed prior to current regulations. Stormwater enters ditches in these areas and rapidly infiltrates without benefit of treatment.

ST - 5A Assessment of Existing Stormwater Facilities. King County and cities will assess the adequacy of stormwater facilities in high potential aquifer recharge areas and WHPAs to protect ground water quality and to give these areas high priority for water quality facility retrofit as warranted.

Discussion. Many jurisdictions are preparing for the new stormwater management requirements by inventorying their existing stormwater facilities. This is an advantageous time to bring to the attention of local authorities the GWAC's concerns regarding ongoing threats to ground water quality from antiquated stormwater management facilities. Dry wells are of particular concern because they are used in very permeable soils, they bypass any treatment afforded by near-surface soils, they are most often used in urban areas subject to significant contamination, and they are often not fitted with water quality controls.

Many jurisdictions will be required to address existing water quality problems. Unless the GWAC brings the matter to the attention of stormwater managers that ground water quality is as great a concern as surface water, our concerns may be overlooked in setting priorities for water quality retrofit.

Emphasis on high potential aquifer recharge areas is recommended because of aquifer sensitivity. WHPAs are emphasized because of the immediacy of the use of the aquifer for public drinking water supplies.

Implementation Plan:

Who: King County (SWM) and Cities

Task(s): 1. Inventory facilities in areas

2. Assign ranking depending on facility type

3. Identify which facilities should be retrofitted and develop schedule.

When: Year ___

Cost: to be determined during concurrence.

Funding Source: general agency funds; this activity is can be included in the current inventory of facilities.

Issue 6. Roadway Runoff. The State Highway Runoff Program provides for improved water quality and quantity controls for stormwater runoff from new and existing state highways. The King County Surface Water Design Manual requires water quality and quantity controls for new roadways in King County. It is expected that many cities have similar requirements. However, state and local programs may not address quality and quantity problems associated with existing roadways. Existing contamination problems may be identified via Basin Plans developed by SWM in cooperation with cities and via other processes to identify needed capital improvements. King County and cities then address the problems identified as funding allows.

NOTE: This is similar to old issue 5. Language changed to make a succinct statement.

Issue 5 Road Runoff. The State Highway Runoff Program applies only to state highways. Runoff from existing and new roadways in King County and cities contribute contamination to storm water and thus to ground water. The Ecology Draft Manual and Ecology and Authority rule, when adopted, will affect new development resulting in more than 5000 square feet of impervious surface. This will include roadways. Issue 4. Action 2.a. provides for an impermeable wet pond and biofiltration prior to infiltration in CARAs. New roadways are subject to this requirement, if adopted. However, water quality problems associated with existing roadways are not covered by new regulations with the exception of the largest jurisdictions such as King County, Seattle, and Bellevue. Assessment of existing roadway contribution to water quality problems is often included in basin planning conducted by SWM. Problems may also be identified by SWM's capital improvements program which responds to existing conditions. Basin Plans cross jurisdictional boundaries and thus theoretically assess problems within cities in the Ground Water Management Areas. It is unknown how extensive and complete assessment of water quality problems has been in areas which would likely be defined as CARAs and in areas which are particularly vulnerable to ground water contamination due to existing land use (Aquifer Vulnerable Areas or AVAs). (SKCHD intends to identify CARAs and AVAs as intended by the Growth Management Act. See related issue paper in this series titled "Identification of Geologically Susceptible Aquifer Recharge Areas".) Efforts to address existing water quality problems would be more effective if focused on CARAs and AVAs in addition to other sensitive areas such as wetlands. (Note: Storm water management techniques to address spills of hazardous materials will be addressed in the issue paper in this series that addresses that topic.)

ST - 6A Roadway Runoff. ~~Alternative 2. Petition~~ King County and cities will to:

a. direct their public works departments to give highest priority to high potential aquifer recharge areas and WHPAs when identifying and correcting water quality problems associated with existing roadways;

~~a. direct their public works departments to prioritize AVAs and CARAs, in that order, when identifying and correcting water quality problems associated with existing roadways; and~~

b. require stormwater quality and quantity controls comparable to new regulations when doing major renovation or widening of roads, ~~include in Aquifer Protection Ordinance.~~

SOUTH KING COUNTY Issue 5. Road Runoff. The State Highway Runoff Program applies only to state highways. Runoff from existing and new roadways in King County and cities contribute contamination to storm water and thus to ground water. The Ecology Draft Stormwater Manual and Ecology and Authority rule, when adopted, will affect new development resulting in more than 5000 square feet of impervious surface. This will include roadways. ~~Issue 4. Action 2.a. provides for an impermeable wet pond and biofiltration prior to infiltration in CARAs.~~ New roadways are subject to this requirement, if adopted. However, water quality problems associated with existing roadways are not covered by new regulations with the exception of the largest jurisdictions such as King County, Seattle, and Bellevue. Assessment of existing roadway contribution to water quality problems is often included in basin planning conducted by SWM. Problems may also be identified by SWM's capital improvements program which responds to existing conditions. Basin Plans cross jurisdictional boundaries and thus theoretically assess problems within cities in the Ground Water Management Areas. It is unknown how extensive and complete assessment of water quality problems has been in areas which would likely be defined as CARAs and in areas which are particularly vulnerable to ground water contamination due to existing land use (Aquifer Vulnerable Areas or AVAs). (SKCHD intends to identify CARAs and AVAs as intended by the Growth Management Act. See related issue paper in this series titled "Identification of Geologically Susceptible Aquifer Recharge Areas".) Efforts to address existing water quality problems would be more effective if focused on CARAs and AVAs in addition to other sensitive areas such as wetlands. (Note: Storm water management techniques to address spills of hazardous materials will be addressed in the issue paper in this series that addresses that topic.)

Alternative 2. Petition King County and cities to:

- a. direct their public works departments to prioritize AVAs and CARAs, in that order, when identifying and correcting water quality problems associated with existing roadways; and
- b. require storm water quality and quantity controls comparable to new regulations when doing major renovation or widening of roads (include in Aquifer Protection Ordinance).

Discussion. This action could influence local stormwater management jurisdictions within the GWMA's to give a higher priority to high potential aquifer recharge areas and WHPAs when addressing stormwater quality and quantity problems. The benefit of corrective actions would be increased by focusing them in the areas that are most susceptible to ground water contamination or are important because they are located within the zone of contribution to a public water supply well or wellfield.

County and city public works departments have a tremendous task ahead to meet all of the requirements posed by new and upcoming stormwater management regulations. Many will be addressing existing water quality problems as a result of new requirements depending on the degree of comprehensiveness of the stormwater management program required or opted

for. Cities will be establishing stormwater utilities and setting priorities for expenditures of fees collected from residents and businesses. It is important at this time to bring to the attention of local jurisdictions concerns for ground water protection and to request that these concerns receive high priority.

Implementation Plan:

Who: King County and Cities

Tasks: 1. Public Works Departments assign high priority to WHPA and high potential aquifer recharge areas
2. Require new regulatory controls.

When: Year

Cost: 1. Minor costs: is a policy.

2. Regulation development and increased costs for implementing the regulation to be determined during concurrence.

Funding. No additional funds are needed to request prioritization of high potential aquifer recharge areas for water quality and quantity improvements. Stormwater utility fees or development impact fees allowed under the Growth Management Act may be used to fund improvements made during road renovation or widening.

NOTE: New Issue 7 is the same as old issue 10 with changes as shown below, to make a problem statement.

Issue 7. Soil Amendment. Glacial till soils impede the infiltration of precipitation and are associated with relatively high runoff volumes subsequent to clearing of natural vegetation. ~~Landscaping in areas with these soils could be enhanced by soil amendment to retain water and nutrients. Less nutrient, pesticide, and other pollutants from generalized sources would run off of the site to be carried to surface water or to aquifer recharge areas. Pollutants would be attenuated by natural processes as they travel through vegetation and soil. Examples of soil amendments which could be used are yard waste compost, commercial topsoil, and sand. The City of Redmond has done a study which tested various soil amendments for their ability to increase soil moisture and nutrient holding capacity. The City was not awarded a Centennial Clean Water Fund grant which it applied for in order to field test the findings of the study. It is possible that soil amendment would be a way to reduce infiltration of pollution in areas of glacial outwash soils such as CARAs. Pesticides and nutrients used in landscaping may be carried off site with runoff instead of being retained in the soil where they can be utilized or broken down by natural processes. Contaminated runoff is carried to aquifer recharge areas where it may contribute to ground water contamination. Glacial outwash soils also present problems in relation to pesticide and nutrient retention. These chemicals may penetrate well beyond the root zone due to poor attenuation capability of the soil. Contamination of shallow aquifers can result.~~

ST - 7A Soil Amendment. Alternative 2. ~~Petition~~ King County and cities will to jointly evaluate the ground water quality and quantity benefits of soil amendment. ~~Petition that the City of Redmond's work be evaluated and built upon by field testing. This study should be carried out by the Center for Urban Water Resources Management with the cooperation of King County and cities and should be done in conjunction with other study recommended by the GWACs in regard to storm water management issues.~~ Soil amendment requirements shall be implemented if the proposed research proves to be a practical method of improving

water quality, increasing infiltration, and reducing stormwater runoff.

SOUTH KING COUNTY Issue 10 Alternative 2: Petition King County and cities to jointly evaluate the groundwater quality and quantity benefits of soil amendment. The City of Redmond's work should be evaluated and built upon by field testing.

Discussion. Soil amendment in this context refers to the process of adding materials to the soil to increase moisture and nutrient retention. Amendments which could be used include composted yard waste, commercial topsoil, and sand. The benefit of soil amendment is that nutrients, pesticides, and other pollutants from generalized sources would be less likely to run off of the site or rapidly move through excessively permeable soils to reach shallow, unprotected aquifers typical of high potential aquifer recharge areas.

The City of Redmond has done a study which tested various soil amendments for their ability to increase soil moisture and nutrient holding capacity. The City was not awarded a Centennial Clean Water Fund grant which it applied for in order to field test the findings of the study.

Soil amendment may be a valuable means to protect both ground and surface water. Additional information is needed about this topic in order to determine whether the benefits warrant further action.

A study of this sort might logically be coordinated by the Center for Urban Water Resources Management with the cooperation of King County and cities. Any additional study should build upon work done by the City of Redmond.

Implementation Plan:

Who: King County, cities, Center for Urban Water Resources, University of Washington.

Task(s): New program, unknown costs.

When: as per GWAC ranking, Implementation Table, Year _____

Cost: to be determined during concurrence with input from CUWRM.

Funding: Aquifer protection funds should be used to support this action. Centennial Clean Water Funds should be sought if the aquifer protection fund is not approved. Local governments would have to pool resources for matching funds. Other grant sources may also need to be explored. Alternatively, local governments could pool resources to fund the study.

NOTE: Staff recommend deleting old issue 6 because all of the referenced rules have been adopted and Issaquah, Redmond, South King voted to delete.

(Old Issue 6) Support. Features of the draft storm water rules by Ecology and Puget Sound Water Quality Authority, Draft Storm Water Management Manual for the Puget Sound Basin, and the SWM Strategic Plan are crucial to ground water protection.

Alternative 1. No action.

Alternative 2. Support all of these efforts by immediately sending a letter of support to legislative bodies or administrators whose decisions determine adoption of these rules or plans.

Discussion. Letters of support from the GWAC are important to elected officials because of the status of the GWAC as the only official committee designated to develop and recommend protection strategies for the protection of ground water in King County.

Funding. Costs associated with this alternative are negligible.

~~SOUTH KING Issue 6. Support. Features of the draft storm water rules by Ecology and Puget Sound Water Quality Authority, Draft Storm Water Management Manual for the Puget Sound Basin, and the SWM Strategic Plan are crucial to ground water protection.~~

~~Alternative 1. No action. Alternative 2. Support all of these efforts by immediately sending a letter of support to legislative bodies or administrators whose decisions determine adoption of these rules or plans.~~

NOTE: Staff recommends deleting old Issue 7 because this is covered in Issue 1 Action 1 and is included in Water Quantity. Also, subsequent research has found that the proposed limits are not significant to improved recharge over existing policy and SWM has already included this in the Manual. Also, most of the GWACs deleted this as written and substituted "Petition King County and cities to adopt a policy of no net reduction of recharge in any new development or redevelopment within high potential aquifer recharge areas's." This is covered in New Issue 1 by requiring infiltration where possible. Also, it is not realistic to require "no net reduction" of recharge: development always reduces recharge by some amount. What we need to do is to keep that amount as small as possible.

OLD Issue 7. Potential ground water depletion. Zoning in King County is determined by the King County Comprehensive Plan and Community Plans and Area Zoning. These planning processes have not had the benefit of use of maps which show where aquifer recharge areas are. Many city planning departments have also lacked such information. Therefore, land use decisions have often been made without adequate awareness or consideration of the potential for ground water depletion. Areas which are known to be important recharge areas are already heavily developed or slated for such. Although proposed storm water management regulations will require infiltration of storm water, we do not know at present how well artificial recharge of precipitation will mimic natural recharge nor has this technology been tested adequately to be assured that precipitation can be effectively recharged to ground water over the long term, water quality considerations aside. It may be environmentally and financially beneficial to allow natural recharge to occur in areas where it was meant to occur by zoning for low-density development and by placing additional limits on impermeable surfaces on development in CARAs. Additional research is needed to determine development density appropriate for CARAs. SWM Basin Planning provides the best existing forum in which to analyze individual CARAs in the context of area hydrology and make recommendations regarding land uses and storm water management controls appropriate to maintain ground water quantities.

Impervious surface limitations are being considered by the King County Council in a proposed revision to the zoning code. These limits were not established based on scientific analysis of environmental concerns such as ground water depletion.

Native vegetation requirements are proposed in a draft clearing ordinance developed by the King County Environmental Division. These amendments to the King County Code would require a percentage of a lot to remain in natural vegetation with some exceptions such as removal of hazard trees, removal of understory for grazing purposes, and forestry subject to an approved forest management plan.

Alternative 2. Adopt a series of actions that preserve the natural function of CARAs as much as possible and that reduce the quantity of storm water runoff.

Zoning:

Action 1. Petition King County and cities to encourage low density development (one or fewer residences per 5 acres) in CARAs and to avoid commercial, industrial, and multifamily zoning in these areas.

Impervious surfaces and preservation of natural vegetation:

Action 1. Support the zoning code revision now before the King County Council while expressing concern that additional impervious surface limitations or preservation of natural vegetation may be warranted for CARAs.

Action 2. Petition King County and cities to evaluate the recharge implications of natural vegetation, landscaped areas, and impermeable surfaces typical of aquifer recharge areas in the Puget Sound Basin. This evaluation should be a component of a study the goal of which is to make recommendations regarding retention of natural vegetation and limitations on impermeable surfaces associated with development in the Puget Sound Basin. This study should be carried out by the Center for Urban Water Resources Management at the University of Washington with the support of the County and cities.

Action 3. Petition King County and cities to adopt jurisdiction-wide limitations upon impervious cover and requirements for preservation of natural vegetation on large lots. Petition that special provisions be created for CARAs if this is found to be warranted and as recommended by the study referred to above. (Additional limits in CARAs should be contained in the Aquifer Protection Ordinance.)

Action 4. Same as Issue 4. Alternative 2.

SOUTH KING COUNTY Under Issue 7 (Potential Groundwater Depletion), the Chair had concerns of being involved in the County process. Alternative 2 in the issue was replaced with the following alternative:

Alternative 2. Petition King County and cities to adopt a policy of no net reduction of recharge in any new development or redevelopment within CARA's.

~~Alternative 2. Adopt a series of actions that preserve the natural function of CARAs as much as possible and that reduce the quantity of storm water runoff.~~

Zoning:

~~Action 1. Petition King County and cities to encourage low density development (one or fewer residences per 5 acres) in CARAs and to avoid commercial, industrial, and multifamily zoning in these areas.~~

Impervious surfaces and preservation of natural vegetation:

~~Action 1. Support the zoning code revision now before the King County Council while expressing concern that additional impervious surface limitations or preservation of natural vegetation may be warranted for CARAs.~~

~~Action 2. Petition King County and cities to evaluate the recharge implications of natural vegetation, landscaped areas, and impermeable surfaces typical of aquifer recharge areas in the Puget Sound Basin. This evaluation should be a component of a study the goal of which is to make recommendations regarding retention of natural vegetation and limitations on impermeable surfaces associated with development in the Puget Sound Basin. This study should be carried out by the Center for Urban Water Resources Management at the University of Washington with the support of the County and cities.~~

~~Action 3. Petition King County and cities to adopt jurisdiction wide limitations upon impervious cover and requirements for preservation of natural vegetation on large lots. Petition that special provisions be created for CARAs if this is found to be warranted and as recommended by the study referred to above. (Additional limits in CARAs should be contained in the Aquifer Protection Ordinance.)~~

~~Action 4. Same as Issue 4. Alternative 2.~~

NOTE: Staff recommends deleting Issue 9 as Issaquah and Redmond voted.

Issue 9 Air pollution. Airborne contamination contributes heavily to pollutant loads in surface and, hence, ground water. Efforts are underway to improve mass transit for the Puget Sound Basin. The King County Board of Health has already adopted woodstove regulations aimed at reducing the presently large contribution of woodsmoke to air pollution. These regulations are effective in all cities in King County except Seattle.

Alternative 2. Support measures to reduce air pollution.

Action 1. Petition King County and cities to actively support mass transit alternatives which provide maximum reduction in air pollution.

Action 2. Petition the City of Seattle to adopt woodstove regulations comparable to those adopted by the King County Board of Health as soon as possible.

Discussion. While it is beyond the scope of this paper and the efforts of the GWMP to explore air pollution in any detail, the above actions provide the GWACs with an opportunity to support two ongoing efforts to reduce air pollution from major sources.

Funding. There is no cost associated with this alternative.

SOUTH KING COUNTY Issue 9: Alternative 2. Support measures to reduce air pollution such as mass transit alternatives and woodstove regulations.

OLD ISSUES SECTION FOR COMPARISON:

OLD Issue 1. Education. Considerable effort is underway to educate the public regarding the prevention of nonpoint pollution and improper disposal of hazardous materials. Agencies or jurisdictions involved include King County (SWM, SKCHD, Cooperative Extension, Environmental Division, BALD), cities, PSWQA, Ecology, METRO, Soil Conservation Service, public and private schools and others. The scope of this paper does not allow detailed discussion of all ongoing efforts. We do not know if existing educational materials stress the connection between surface and ground water.

Alternative 2. Petition King County to take steps to ensure that educational activities are adequate to communicate to the public the connection between surface and ground water pollution.

Action 1. Seattle-King County Department of Public Health (SKCHD) will review major educational efforts underway to determine whether the protection of ground water is emphasized. SKCHD will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs.

Action 2. SKCHD will report on the adequacy of existing educational programs to address ground water concerns subsequent to carrying out Action 1 above.

Action 3. SKCHD will develop a supplemental educational program to address deficiencies identified above, if necessary.

Discussion. Prevention of pollution is the best approach from the standpoints of cost and environmental impacts. Education is the best prevention because it creates an awareness and concern in individuals which accompanies them throughout their lives. This awareness and concern prevents pollution in countless small and large ways as individuals make everyday decisions.

Developing an independent educational program to address this issue would probably be largely redundant. It would not likely be supported financially by elected officials in a time of lean budgets. Scarce resources may be used more efficiently by reviewing and updating existing programs. (This is similar to the approach taken towards the issue of education regarding pesticide and fertilizer use.)

OLD Issue 2. State Program Coordination. Ecology and the Puget Sound Water Quality Authority treat watershed and ground water planning as separate activities. Further, there is a lack of coordination at the state level between sections at Ecology responsible for watershed and ground water planning. Centennial Clean Water Fund grant categories and match requirements encourage separate efforts. Valuable grant funds are being used inefficiently and, in some cases, being used to fund efforts that are unintentionally at odds with each other.

Alternative 2. Action 1. Petition Ecology to:

a. assess surface and ground water quality planning programs to determine how they could be combined in a way which is both scientifically justified and which provides for greater efficiency;

b. revise Centennial Clean Water Fund categories so as not to discourage joint ground and surface water quality planning efforts.

Action 2. Petition the Puget Sound Water Quality Authority to recognize that surface and ground water form a continuous and dynamic system which must be comprehensively protected in order to protect the Puget Sound. Request that the Puget Sound Water Quality Management Plan address all water quality issues in the Puget Sound drainage basin.

Discussion. Many Ecology administrative personnel and staff are aware of the confusion and inefficiency created by the division of water quality planning into ground and surface components. However, there are, as yet, no actions underway to remedy the situation. This solution will formally bring the matter to the attention of Ecology administration. Legislation is not needed to correct administrative problems. Relevant regulations addressing ground and surface water planning already encourage coordinated or joint efforts.

The Authority's priorities should continue to be those issues which have the greatest impact upon the quality of Puget Sound waters. The Authority should not, however, exclude issues just because they are seen to primarily affect ground water. It is encouraging that ground water protection is listed in the Plan's Unfinished Agenda. GWAC input may be enough to cause a shift in perspective at the Authority and thereby move ground water protection up the scale of priorities.

These actions will be consistent with both state laws governing water quality planning and the King County Comprehensive Plan. Changes will be challenging and will require cooperation with local governments currently involved in planning activities. Innovation should be encouraged in implementing water quality plans in order to alleviate redundancies which may exist between surface and ground water quality plans.

OLD Issue 3. Local Program Coordination. Coordination between local agencies responsible for watershed and ground water planning is inadequate.

Alternative 2. Petition King County to assess its water quality planning efforts to determine how to effectively coordinate them to avoid duplication and conflicting goals and strategies.

Discussion. Lack of coordination results in inefficient use of scarce resources for environmental protection. Conflicting planning documents could serve to interfere with the implementation of one or both. County staff, developers, and the public have difficulty determining County policy. While a coordinating process will initially be time consuming it will save resources in the long run. Coordination will also serve to meet more closely the intent of state regulations.

OLD Issue 4. Potential ground water contamination. It has been demonstrated by numerous studies that ground water quality declines with urbanization. Contaminated storm water is a major contributor to this contamination. Water quality controls and mandatory infiltration of storm water are components of regulations that will soon affect all storm water management jurisdictions within King County. Technology associated with these requirements is in early stages and long term effects on ground water quality are unknown. While water quality controls will improve the quality of the water recharged to the ground,

the increasing emphasis on infiltration poses risks. Infiltration will be employed most often in areas with glacial and alluvial soils associated with Critical Aquifer Recharge Areas (CARAs).

Alternative 2. Adopt a series of actions which together constitute a cautious approach to land use in CARAs pending further information developed by research and practical experience on the effectiveness of storm water management techniques in preventing ground water contamination.

Action 1. Petition King County and cities within Ground Water Management Areas (cities) to encourage low density development (one or fewer residences per 5 acres) in CARAs and to avoid commercial, industrial, and multifamily zoning in these areas.

Action 2. Petition King County and cities to jointly develop an Aquifer Protection Ordinance (APO) for submittal to and approval by the King County Board of Health. The ordinance should contain measures related to all issues addressed by the Ground Water Management Program (GWMP), as appropriate. (Note: This is the initial introduction to the alternative of developing an aquifer protection ordinance that encompasses many regulatory aspects of the GWMP. Subsequently, as actions are presented, those which should be included in the ordinance will be noted as such. All other issue papers will be reviewed for inclusion of action items in the APO and this will be noted in the final GWMP.) The ordinance should contain the following measures:

a. Require tightlined conveyance and an impermeable pretreatment system consisting of a wet pond and biofiltration prior to infiltration in CARAs. Require that the wet pond be fitted with a mechanism to shut off flow to the infiltration facility in order to contain hazardous material spills. This would be required for new construction and water quality retrofit to existing facilities, including roads.

b. Require a hydrogeological assessment for proposed development in CARAs which is subject to SEPA review and which is found to potentially affect ground water quality or quantity. The assessment will be reviewed by SEPA personnel and SKCHD (within King County) to determine effects on ground water quality and quantity can be adequately mitigated. Advisory review by SKCHD will be provided to city SEPA reviewers as requested. The assessment will include but is not limited to:

- 1) Geologic setting including well logs, borings, and other information used to make this determination;
- 2) Background water quality;
- 3) Ground water elevations including location and depth to perched water tables;
- 4) Ground water flow direction, velocity, and gradient;
- 5) Attenuation potential of soils and aquifer materials as well as the ability of affected aquifers to dilute contamination;
- 6) Surface water bodies and their degree of continuity with local ground water;
- 7) Potential use of ground or surface water by the proposed development;
- 8) Discussion of the potential effects of the proposed development on ground water quality and quantity;
- 9) Other such information as is deemed pertinent to a determination of the effects of the proposed development on ground water resources.

Action 3. Petition King County and cities to jointly study the effectiveness of water quality controls and infiltration in protecting ground water quality. The following is requested:

a. King County Surface Water Management Division to monitor the effectiveness of the system described in Issue 4. Action 2. a. in protecting ground water quality.

b. King County and cities to jointly sponsor study of effectiveness of storm water management programs in preventing adverse effects on ground water quality and quantity via the Center for Urban Water Resources Management at the University of Washington. Centennial Clean Water Funds should be sought for a major study on this topic. A study should be designed which will benefit all Puget Sound jurisdictions who are both responsible for ground water protection under the Growth Management Act and the Ground Water Quality Standards (WAC 173-200) and for requiring infiltration of storm water under Ecology rules. The study should address and make recommendations regarding appropriate land use in CARAs, both from the standpoint of density and type of development.

Action 4. Encourage efforts by utilities undertaking Wellhead Protection Area delineation and study to determine whether vulnerability of the zone of influence warrants prohibition of infiltration of storm water in a defined area.

Discussion. The best protection for water resources is avoidance of any development. However, this is not possible and a way must be found to balance interests of water resource protection and development. Action 1 encourages conservation of CARAs as the best protection available short of outright land purchase of recharge areas, an alternative which utilities undertaking Wellhead Protection Areas should consider. In the interests of feasibility, and with a recognition of means available to manage risks, an action requiring downzoning is not proposed. Such an action would be very unlikely to garner support from elected officials given uncertainties regarding ability to mitigate impacts. Action 1 would, however, be effective in giving guidance to community planners and elected officials in determining the most appropriate zoning for CARAs. The question of downzoning is best left to the Wellhead Protection Area process which studies in much greater detail the vulnerability of important public water supplies to pollution.

Preparation of an Aquifer Protection Ordinance is important for several reasons:

1. Legislative actions of the GWMP can be consolidated into one effort instead of many smaller efforts. This will result in cost and time savings for both agencies and legislative bodies and will garner visibility for the issue of ground water protection. Sections of the ordinance can subsequently be codified into existing laws as appropriate.

2. There is a possibility that all or parts of an Aquifer Protection Ordinance could be a Board of Health rule which would be effective in all jurisdictions except Seattle. If appropriate, this alternative would take full advantage of an authority whose influence crosses jurisdictional lines. Thus ground water protection would be realized even if some of the legislative bodies are reluctant to act. Time and money would also be used efficiently. There is also the possibility of dividing the effort into a Board of Health rule for those aspects which the Board can legally address and an additional King County rule. Cities would then need to pass their own legislation.

Joint effort by jurisdictions within King County is important because of the cross-jurisdictional nature of the resource to be protected. This type of collaboration is strongly encouraged by Growth Management Act. The Act requires counties and cities within those counties to collaborate on designating and protecting critical areas including aquifer recharge areas. Regulations to protect such areas are required. The very fact that very little regulation already exists within King County and cities regarding protection of ground water may work in favor of joint effort. Many cities have already requested assistance from SKCHD in both designating and protecting recharge areas and would welcome collaboration.

The GWACs have reviewed many issues and adopted actions to address those issues. Some of the actions should be included in the APO. A summary of action items which should be able to be included in the ordinance will be provided with the draft GWMP.

Action 2 a. provides additional protection not now required by any regulations and not included in any upcoming regulations. It is proposed because of the experience of researchers and storm water managers with the phenomenon of storm water being infiltrated before it can be effectively treated. This is not at all unusual in highly permeable soils. An impermeable wet pond and biofiltration in series was found to be feasible and is recommended by the Draft Covington Master Drainage Plan for glacial outwash soils (SWM, Draft Covington Master Drainage Plan, May 1991).

Action 2 b. counterbalances the fact that a broad spectrum of development will probably continue to go on in CARAs. The hydrogeological assessment provides the ability for regulatory personnel to obtain the necessary information to determine whether the proposed development will have adverse effects upon ground water quality and/or quantity. Appropriate mitigation can then be evaluated. Hydrogeological assessments are a component of an aquifer recharge area adopted in 1991 in Pierce County (Pierce County, 1991). A similar approach is being considered in Snohomish County.

Action 3 points out the need for additional information and provides concrete and feasible ways to obtain this information in an efficient manner. The Center for Urban Water Resource Management was formed to address the questions regarding appropriate management of storm water and numerous local jurisdictions are financial contributors to its operations, including King County. [The Center for Urban Water Resources Management, located in the Department of Civil Engineering at the University of Washington, was established to develop knowledge in the areas of natural water resource protection, storm water runoff (quality and quantity controls), and protection of wetlands, lakes, streams, rivers, marine waters, and ground water. The Center also seeks to develop solutions to water resource problems and then distribute this information to participants that include governmental agencies. King County is a participant and provides partial funding to the Center. The Center should prove to be a valuable source of information regarding the unique needs of the Puget Sound region.] It is incumbent upon Ecology to support local research through Centennial Clean Water Funds because of its requirement that local jurisdictions infiltrate storm water at a time when many questions remain unanswered. This requirement occurs as local governments are grappling with the requirement to designate and protect CARAs and to meet requirements of the Ground Water Quality Standards (WAC 173-200). A key question which must be answered as fully as possible is what is appropriate land use in CARAs given our ability to mitigate the

impacts of development. Ecology has no plans at present to conduct research of its own into the effectiveness of its required storm water management programs and standards in protecting ground water (Pressley, Personal communication, 1990).

Action 4 appropriately defers the question of diversion of storm water via watertight conveyance from the zone of influence of a public water supply well to the Wellhead Protection Program. This program, which is discussed in detail in the issue paper in this series entitled "Federal and State Programs Relating to Ground Water Management". All public water supplies using ground water sources will be required to delineate and protect a Wellhead Protection Area. Detailed study of the zone of influence will be a component of the process. Diversion of all storm water, a significant undertaking, can best be considered during that process.

Funding. SKCHD will seek current expense funds to support its development of an aquifer protection ordinance. Hydrogeological assessments will be the responsibility of developers. SEPA and SKCHD staff will be needed to review the assessments and, as their time is covered by fees paid for by the developer, additional local government funding is not anticipated. SKCHD should hire staff with expertise in hydrogeology to assist with these reviews.

King County, cities, and the Center for Urban Water Resource Management should, as explained above, make a strong bid for Centennial Clean Water Fund money to carry out studies. If a grant is not available from this source, there are many other possibilities. Even without a grant, the County and cities could pool resources for a significant study.

OLD Issue 5. Road Runoff. The State Highway Runoff Program applies only to state highways. Runoff from existing and new roadways in King County and cities contribute contamination to storm water and thus to ground water. The Ecology Draft Manual and Ecology and Authority rule, when adopted, will affect new development resulting in more than 5000 square feet of impervious surface. This will include roadways. Issue 4. Action 2.a. provides for an impermeable wet pond and biofiltration prior to infiltration in CARAs. New roadways are subject to this requirement, if adopted. However, water quality problems associated with existing roadways are not covered by new regulations with the exception of the largest jurisdictions such as King County, Seattle, and Bellevue. Assessment of existing roadway contribution to water quality problems is often included in basin planning conducted by SWM. Problems may also be identified by SWM's capital improvements program which responds to existing conditions. Basin Plans cross jurisdictional boundaries and thus theoretically assess problems within cities in the Ground Water Management Areas. It is unknown how extensive and complete assessment of water quality problems has been in areas which would likely be defined as CARAs and in areas which are particularly vulnerable to ground water contamination due to existing land use (Aquifer Vulnerable Areas or AVAs). (SKCHD intends to identify CARAs and AVAs as intended by the Growth Management Act. See related issue paper in this series titled "Identification of Geologically Susceptible Aquifer Recharge Areas".) Efforts to address existing water quality problems would be more effective if focused on CARAs and AVAs in addition to other sensitive areas such as wetlands. (Note: Storm water management techniques to address spills of hazardous materials will be addressed in the issue paper in this series that addresses that topic.)

Alternative 2. Petition King County and cities to:

- a. direct their public works departments to prioritize AVAs and CARAs, in that order, when identifying and correcting water quality problems associated with existing roadways; and
- b. require storm water quality and quantity controls comparable to new regulations when doing major renovation or widening of roads (include in Aquifer Protection Ordinance).

Discussion. County and city public works departments have a tremendous task ahead to meet all of the requirements posed by new and upcoming storm water management regulations. Many will be addressing existing water quality problems as a result of those new requirements depending on the degree of comprehensiveness of the storm water management program required or opted for. Cities will be establishing storm water utilities and setting priorities for expenditures of fees collected from residents and businesses. It is important at this time to bring to the attention of local jurisdictions our concerns for ground water protection and to request that these concerns receive high priority. The above actions either result in early attention to CARAs and AVAs or require additional controls not included in soon-to-be adopted regulations. AVAs are given emphasis because these are areas that are both susceptible to pollution (usually CARAs) and subject to high risk associated with current land use. Efforts to address existing problems should be made in areas most at risk. New construction will be subject to new requirements. The above actions should be feasible within programs developed by local jurisdictions. Prioritization requires a change in the order of actions but does not require additional expense. Funding options for b. are described below.

Funding. No additional funds are needed to request prioritization of AVAs and CARAs for water quality and quantity improvements. Storm water utility fees or development impact fees allowed under the Growth Management Act may be used to fund improvements made during road renovation.

OLD Issue 6. Support. Features of the draft storm water rules by Ecology and Puget Sound Water Quality Authority, Draft Storm Water Management Manual for the Puget Sound Basin, and the SWM Strategic Plan are crucial to ground water protection.

Alternative 2. Support all of these efforts by immediately sending a letter of support to legislative bodies or administrators whose decisions determine adoption of these rules or plans.

Discussion. Letters of support from the GWAC are important to elected officials because of the status of the GWAC as the only official committee designated to develop and recommend protection strategies for the protection of ground water in King County.

Funding. Costs associated with this alternative are negligible.

OLD Issue 7. Potential ground water depletion. Zoning in King County is determined by the King County Comprehensive Plan and Community Plans and Area Zoning. These planning processes have not had the benefit of use of maps which show where aquifer recharge areas are. Many city planning departments have also lacked such information. Therefore, land use decisions have often been made without adequate awareness or

consideration of the potential for ground water depletion. Areas which are known to be important recharge areas are already heavily developed or slated for such. Although proposed storm water management regulations will require infiltration of storm water, we do not know at present how well artificial recharge of precipitation will mimic natural recharge nor has this technology been tested adequately to be assured that precipitation can be effectively recharged to ground water over the long term, water quality considerations aside. It may be environmentally and financially beneficial to allow natural recharge to occur in areas where it was meant to occur by zoning for low-density development and by placing additional limits on impermeable surfaces on development in CARAs. Additional research is needed to determine development density appropriate for CARAs. SWM Basin Planning provides the best existing forum in which to analyze individual CARAs in the context of area hydrology and make recommendations regarding land uses and storm water management controls appropriate to maintain ground water quantities.

Impervious surface limitations are being considered by the King County Council in a proposed revision to the zoning code. These limits were not established based on scientific analysis of environmental concerns such as ground water depletion.

Native vegetation requirements are proposed in a draft clearing ordinance developed by the King County Environmental Division. These amendments to the King County Code would require a percentage of a lot to remain in natural vegetation with some exceptions such as removal of hazard trees, removal of understory for grazing purposes, and forestry subject to an approved forest management plan.

Alternative 2. Adopt a series of actions that preserve the natural function of CARAs as much as possible and that reduce the quantity of storm water runoff.

Zoning:

Action 1. Petition King County and cities to encourage low density development (one or fewer residences per 5 acres) in CARAs and to avoid commercial, industrial, and multifamily zoning in these areas.

Impervious surfaces and preservation of natural vegetation:

Action 1. Support the zoning code revision now before the King County Council while expressing concern that additional impervious surface limitations or preservation of natural vegetation may be warranted for CARAs.

Action 2. Petition King County and cities to evaluate the recharge implications of natural vegetation, landscaped areas, and impermeable surfaces typical of aquifer recharge areas in the Puget Sound Basin. This evaluation should be a component of a study the goal of which is to make recommendations regarding retention of natural vegetation and limitations on impermeable surfaces associated with development in the Puget Sound Basin. This study should be carried out by the Center for Urban Water Resources Management at the University of Washington with the support of the County and cities.

Action 3. Petition King County and cities to adopt jurisdiction-wide limitations upon impervious cover and requirements for preservation of natural vegetation on large lots.

Petition that special provisions be created for CARAs if this is found to be warranted and as recommended by the study referred to above. (Additional limits in CARAs should be contained in the Aquifer Protection Ordinance.)

Action 4. Same as Issue 4. Alternative 2.

Discussion. Actions 1-3 above support proposed improvements to the zoning code while providing a message to decision makers that we have additional concerns which should be studied and acted upon if appropriate. It is beyond the scope of this paper to describe the existing regulations in regard to this issue for all of the cities. However, by raising the issue during the concurrence process we will be able to assess the situation and request support for improvement where warranted. Study should be done concurrently with the study referred to in Issue 4. Additional discussion is the same as for Issue 4. (Note: It is realized that Issue 4 actually addresses quality and quantity concerns and that Issue 4 and Issue 7 need to be combined. That will be done with a subsequent rewrite.)

Funding. Funds are needed to study this issue and to draft subsequent ordinances. As stated in Issue 4, Centennial Clean Water Funds and contributions from cities in the Puget Sound Basin should be sought to carry out these studies. Also as stated in Issue 4, SKCHD will prepare an Aquifer Protection Ordinance in cooperation with other agencies in King County such as SWM and the Environmental Division. SKCHD will request current expense funds to support this effort.

OLD Issue 9. Air pollution. Airborne contamination contributes heavily to pollutant loads in surface and, hence, ground water. Efforts are underway to improve mass transit for the Puget Sound Basin. The King County Board of Health has already adopted woodstove regulations aimed at reducing the presently large contribution of woodsmoke to air pollution. These regulations are effective in all cities in King County except Seattle.

Alternative 2. Support measures to reduce air pollution.

Action 1. Petition King County and cities to actively support mass transit alternatives which provide maximum reduction in air pollution.

Action 2. Petition the City of Seattle to adopt woodstove regulations comparable to those adopted by the King County Board of Health as soon as possible.

Discussion. While it is beyond the scope of this paper and the efforts of the GWMP to explore air pollution in any detail, the above actions provide the GWACs with an opportunity to support two ongoing efforts to reduce air pollution from major sources.

Funding. There is no cost associated with this alternative.

OLD Issue 10. Soil amendment. Glacial till soils impede the infiltration of water and are associated with relatively high runoff subsequent to clearing of natural vegetation. Landscaping in areas with these soils could be enhanced by soil amendment to retain water and nutrients. Less nutrient, pesticide, and other pollutants from generalized sources would run off of the site to be carried to surface water or to aquifer recharge areas. Pollutants

would be attenuated by natural processes as they travel through vegetation and soil. Examples of soil amendments which could be used are yard waste compost, commercial topsoil, and sand. The City of Redmond has done a study which tested various soil amendments for their ability to increase soil moisture and nutrient holding capacity. The City was not awarded a Centennial Clean Water Fund grant which it applied for in order to field test the findings of the study. It is possible that soil amendment would be a way to reduce infiltration of pollution in areas of glacial outwash soils such as CARAs.

Alternative 2. Petition King County and cities to jointly evaluate the ground water quality and quantity benefits of soil amendment. Petition that the City of Redmond's work be evaluated and built upon by field testing. This study should be carried out by the Center for Urban Water Resources Management with the cooperation of King County and cities and should be done in conjunction with other study recommended by the GWACs in regard to storm water management issues.

CHAPTER 3

3.2.4 GROUND WATER EDUCATION PROGRAM

Providing citizens with information on ground water resource and protection may be a particularly effective protection method. Understanding, caring, and commitment are needed to protect a resource that is found almost everywhere and is impacted by a wide variety of activities. Although regulations may help, groups of informed citizens actively caring for their own backyard may be more effective. Providing technical assistance will not address all concerns but will empower some community members to take individual action.

Currently there are a number of education programs focused on individual sources of contamination. However, there is no comprehensive ground water education program. A comprehensive approach is needed to:

- Help engender understanding and concern in order to protect the resource.
- Aid in developing resource protection messages that are consistent regardless of the specific education program.
- Coordinate with other resource protection programs that focus on a specific issue, such as solid waste, hazardous waste or stormwater management
- Develop specific education activities and materials for point and nonpoint sources of contamination that do not have their own individual programs.

A comprehensive program would coordinate existing environmental education programs to develop consistent messages about the ground water resource and ground water protection. This component would be done by briefing environmental educators about King County's ground water system, and supporting joint programs. The program would respond to local ground water quality and quantity concerns that are not already covered by other programs. This program would provide assistance for individual drinking water supplies, local planning efforts, or other ground water protection projects.

Providing information to citizens involved in community planning projects would be another aspect of this program. Increasingly, citizens are taking an active part in neighborhood planning and are concerned about resource protection. As they develop these plans, whether they are addressing school siting, transportation routes, or zoning, they may need information about the ground water system. This knowledge will assist citizens in addressing ground water protection measures within the context of their planning process.

Educational programs have been shown to be an effective method to protect natural resources. The development of the groundwater management program included an public education component. During the GWAC's consideration of the potential threats to groundwater, several specific educational program elements were adopted. These elements need to be consolidated into one comprehensive program.

Goal

To increase individual participation in protecting the groundwater resource by educating citizens in the GWMA about groundwater, the threats to quantity and quality, and ways they can reduce those threats.

Issue 1. Existing Education. Considerable effort is underway to educate the public regarding the prevention of nonpoint pollution, conservation, well construction and improper disposal of hazardous materials. Agencies or jurisdictions involved include King County (Surface Water Management, Seattle-King County Department of Public Health Environmental Health Division, Cooperative Extension, Department of Development and Environmental Services), cities, Puget Sound Water Quality Authority, Ecology, Metro, King County Conservation District, Soil Conservation Service, public and private schools and others. We do not know if these existing educational materials contain groundwater resource protection information.

ED - 1 Existing Education. King County and cities will jointly carry out a ground water education program which will review existing education activities and make use of these programs when applicable. Seattle-King County Department of Public Health Environmental Health Division will review applicable educational efforts underway to determine whether the protection of ground water is emphasized. Seattle-King County Department of Public Health Environmental Health Division will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs. (ST - 3A)

The specific elements of the program are:

1. (From PF - 3B: Education and Proposed Programs.) Existing educational program content will be reviewed for agreement with GWMP policies and goals. Seattle-King County Department of Public Health Environmental Health Division will review the current educational programs of Soil Conservation Service (SCS), Cooperative Extension and others to ensure that the GWMP goals and policies are reflected.
2. (From OS - 3A Household hazardous wastes) King County will emphasize the risks to ground water associated with the disposal of household hazardous wastes to on-site sewage systems when conducting household hazardous waste educational activities as part of the Local Hazardous Waste Management Plan.
3. (From WQ - 4B1 Education.) ~~Petition~~ King County, Cities and Water Utilities will ~~to~~ work with local nurseries, WSU Cooperative Extension Service and the Conservation Districts to promote the availability of appropriate seed stocks, plants and materials to achieve xeriscaping (use of low-water use plants). ~~and low water use landscaping.~~
4. (From WQ - 4B2 Education.) The Education Program will support conservation education efforts in the schools, and for the general public as described in the Interim Guidelines (Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs). These would include, but not be limited to, the items listed under Public Education

in Section IV of the Implementation of the Guidelines.

5. (From WQ - 4B3 Education.) ~~Petition~~ King County will ~~to~~ educate residents about landscaping practices that promote aquifer recharge through an informational brochure prepared by Cooperative Extension and Seattle-King County Department of Public Health Environmental Health Division.
6. (From WC - 4 Education.) There is a lack of general public knowledge about the public health significance of the requirements for well construction, operation, maintenance and abandonment. The GWMP Education Program will coordinate with and support Ecology's well identification, well construction, proper well maintenance, contamination sources and well abandonment projects.

SOUTH KING COUNTY Stormwater. Issue 1 Alternative 2. Petition King County, the cities and the above agencies to take steps to ensure that educational activities are adequate to communicate to the public the connection between surface and groundwater and the migration of pollution between the two.

Action 1. Seattle-King County Department of Public Health (SKCHD) will review major educational efforts underway to determine whether the protection of groundwater is emphasized, report on the adequacy of existing educational programs to address groundwater concerns, and will develop a supplemental educational program to address deficiencies identified if necessary. SKCHD will seek the cooperation of the parties involved to include groundwater information and concerns in the educational programs. Funding should be done on a pro rata basis from revenues generated from surface and groundwater programs.

SOUTH KING COUNTY PF - 3B: Education and Proposed Programs. Action #2: SKCHD will review the current educational program of SCS, Cooperative Extension and others to ensure that the GWMP goals and policies are reflected.

SOUTH KING COUNTY OS - 3A Household hazardous wastes adopted Action 1 as written.

SOUTH KING COUNTY WQ - 4B1 Education. (Previously Action # 2: Education: 1.) 1. Petition King County, Cities and Water Utilities to work with local nurseries, WSU Cooperative Extension Service and the Conservation Districts to promote the availability of appropriate seed stocks, plants and materials to achieve xeriscaping and low water use landscaping.

WQ - 4B2 Education. (Previous Action # 1: Support existing programs: 2.) 2. Support conservation education efforts in the schools, and for the general public as described in the Interim Guidelines. These would include, but not be limited to, the items listed under Public Education in Section IV of the Implementation Plan.

WQ - 4B3 Education. (Previously Action # 2: Education: 2.) 2. Petition King County to educate residents about landscaping practices that promote aquifer recharge through an informational brochure prepared by Cooperative Extension and SKCHD.

SOUTH KING COUNTY WC - 4 Education. Action 1. Support Ecology's well identification and well abandonment projects on a community basis, coordinating community efforts with Ecology's statewide efforts.

Discussion. Prevention of pollution is the best approach from the standpoints of cost and environmental impact. Education is the best prevention because it creates an awareness and concern in individuals which influences their decisions and actions. Developing a comprehensive independent educational program to address groundwater protection would probably be redundant. Scarce resources can be used efficiently by building upon existing programs.

Seattle-King County Department of Public Health Environmental Health Division will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs. This review will ensure that the GWMP goals and policies are reflected. Cooperative Extension and others have several educational efforts underway. They integrate ground water protection information where possible, and are agreeable to including more. Cooperative Extension, SCS and others could include GWMP concerns in their educational material.

Specific elements will address specific GWAC concerns:

Seattle-King County Department of Public Health Environmental Health Division will undertake measures to increase public awareness concerning the potential impacts of discharging household chemical products to an on-site sewage system. Such measures will be an extension of activities scheduled as part of the Local Hazardous Waste Management Plan. (OS - 3A)

Educational efforts would complement and combine with current efforts of Seattle-King County Department of Public Health Environmental Health Division, Cooperative Extension and the Conservation District. This information could be disseminated through the Master Gardener and other programs of Cooperative Extension. Awareness of the problem of reduced aquifer recharge may increase responsibility and concern for aquifer recharge areas in the community. Education programs on how landscaping practices can affect aquifer recharge could be coupled with education on the effects of pesticide and herbicide use on ground-water quality. A discussion of proper disposal of household hazardous wastes could be included. Landscaping tips should include a discussion of native vegetation and its role in facilitating infiltration of moisture. (WQ - 4)

Informed and involved well owners and other community members are probably more likely to comply with the well construction and abandonment regulations than they would be otherwise. Ways to inform and involve well owners might include distributing a questionnaire about wells to homes in the community; developing and distributing an educational brochure for homeowners; and supplementing the brochure with community educational programs. The questionnaire should be designed to elicit the number of wells on each property, the construction methods used, and the number of wells that require abandonment. The brochure should include recommended practices and legal requirements for well construction and abandonment. It should also include the reasons why practices such as sealing the well are both advisable and required by law so that homeowners are

knowledgeable before they make plans to construct or abandon a well. The education program should cover the same information, and provide the public with an opportunity to ask individual questions. (WC - 4)

Implementation: will be described under Issue 2.

Issue 2. New Educational Elements. There are several issues that do not have any existing education program upon which to build. These have been identified through the GWAC consideration of groundwater protection issues. These specific elements need to be adopted as part of the education program.

ED - 2 New Educational Elements. King County and cities will jointly carry out a ground water education program which will develop specific education activities and materials for sources of contamination. Seattle-King County Department of Public Health Environmental Health Division will report to the GWMP Management Committee on the adequacy of existing educational programs to address ground water concerns. This report will include proposed changes as a result of review and discussions carried out in ED - 1. (ST - 3B) Seattle-King County Department of Public Health Environmental Health Division will then develop a supplemental educational program to address deficiencies identified above, if necessary and present it to the Management Committee for review and adoption. (ST - 3C)

New educational programs will be developed and implemented per the adopted GWAC actions below:

1. (From OS - 3B Household hazardous wastes) ~~Action 2: Petition~~ King County will to create an ongoing source of funding to develop and carry out a public education program intended to increase the awareness of proper on-site sewage system operation and maintenance, including the risks associated with disposal of hazardous wastes in such systems.

NOTE: Change to wording to emphasize the educational program. We do not need to develop a funding mechanism if the aquifer protection fee is approved.

2. (From UST - 3E Heating Oil Tanks: Education.) King County and cities will jointly educate homeowners and exempt tank owners regarding tank abandonment requirements of the UFC through the GWMP Education Program.
3. (From SW - 8: Education.) The public may not be aware of the relationship between landfilling solid waste and the threat to ground water quality. Recycling (removal of usable components from the waste stream) reduces the amount of solid waste that must be landfilled. ~~Support the county and cities efforts in their recycling programs.~~ Include information about the relationship between solid waste disposal and groundwater in the education program.

SOUTH KING COUNTY OS - 3B Household hazardous wastes adopted the Action as written.

SOUTH KING COUNTY UST - 3E Heating Oil Tanks: Education. Alternative 2. Develop and distribute educational materials intended to increase the level of public and the home heating oil industry awareness concerning potential ground water contamination problems associated with the operation and abandonment of home heating oil tanks. {UST - 3E}

SOUTH KING COUNTY SW - 8: Education. Alternative #2: Support and encourage more comprehensive county efforts in this recycling program.

Discussion. During the development and consideration of the issues that affect groundwater quantity and quality, the GWAC found that several issues could be addressed through educational efforts. However, this education was not being conducted by any other agency. Therefore, the adopted actions contained new educational elements. These are:

1. The existing public information pamphlet concerning on-site sewage system maintenance and operation will be amended to provide instructions concerning proper household hazardous waste disposal practices prior to any scheduled reprinting. (OS - 3B)
2. Including home heating oil tanks in the overall GWMP Education Program will help address the low level of compliance with the requirements for home heating oil tank abandonment. Homeowners are unaware of their responsibilities under the UFC, probably because there are no programs on proper maintenance and abandonment. By providing educational material to tank owners, an increase in the community knowledge about the problem, and, hopefully, an increase in the numbers of tank owners that comply with the regulations would result. Also, by increasing community awareness, it is expected that home purchasers would require information on tank status be disclosed. (UST - 3E)
3. Providing information about recycling and educating residents about reducing the waste stream may reduce the amount of waste going into the landfills and the amount of hazardous products that people buy. (SW - 8.)

Other new program aspects may be developed under direction from the Management Committee. Some possible tasks are:

- o Support schools or individual teachers with an interest in ground water protection. Such support could include providing education materials, or developing school skits.
- o Working with neighborhood groups on neighborhood ground water protection efforts.
- o Developing and installing interpretive signs, for example, signs explaining well Wellhead Protection Areas.
- o Development of a video on water resources for cable television and distribution to local video outlets.
- o Sponsoring informational booths at local fairs; booth displays at local libraries or bank lobbies.

Implementation:

Task 1: Review applicable educational efforts.

Task 2: Foster cooperation of other environmental education efforts.

Task 3: Report to GWMP Management Committee on the adequacy of existing educational programs to address ground water concerns. This report will include proposed changes as a result of the above review and discussions.

Task 4: Develop a supplemental educational program to address deficiencies identified above and present it to the Management Committee for review and adoption.

Task 5: Coordinate implementation of the program.

Who: Seattle-King County Department of Public Health Environmental Health Division under direction of the Management Committee.

When: Year 1 and ongoing

Cost: 3.0 FTE per year. Funding for staff at Seattle-King County Department of Public Health Environmental Health Division is necessary to carry out the review, coordination, report, and development of a supplemental program, if needed. It is possible that enhancing existing programs will require that funds be provided to the relevant agency or jurisdiction.

Fund Source: Aquifer protection fund.

3.3 PROGRAMS TO PROTECT GROUND WATER QUALITY

3.3.1 GROUND WATER PROTECTION ISSUES ASSOCIATED WITH HAZARDOUS MATERIALS MANAGEMENT IN KING COUNTY, WASHINGTON

Substances that are hazardous to public health and the environment are a by-product of industrialization. As society becomes more industrialized, materials become more prevalent and hazardous. There are myriad industrial and commercial processes that produce and use these substances. The use of hazardous materials is not, however, limited to industries and businesses. These materials are widely available and used by almost everyone to some degree. The impact of these substances on our environment, and, in particular, ground water, is determined by the management practices of the businesses and individuals who use them.

Ground water contamination can occur when hazardous materials, either liquids or those dissolved in water, migrate through the soil. Ground water contamination can also occur when hazardous materials are spilled into surface water features that are in hydraulic continuity with ground water. Human health threats occur when contaminated ground water reaches aquifers used for drinking water supplies. The clean up of contaminated aquifers is difficult, costly, time-consuming, and may not be successful.

The threat of ground water contamination by hazardous materials is currently being addressed by a number of federal, state and local statutes. These laws address particular activities associated with hazardous materials. The remainder of the discussion will be divided into three sections commensurate with the way hazardous materials are regulated. The three sections are:

1. Hazardous waste management
2. Hazardous waste contamination sites
3. Hazardous material spill prevention and emergency response.

1. HAZARDOUS WASTE MANAGEMENT

Hazardous waste is discarded hazardous materials. The Uniform Fire Code (UFC) of 1988 defines hazardous materials as those chemicals or substances which are physical hazards or health hazards as defined in Article 80 whether the materials are in usable or waste condition.

The statutes addressing the protection of ground water from hazardous waste are:

- The Resource Conservation and Recovery Act (RCRA) which requires the Environmental Protection Agency to regulate generators that produce more than 220 pounds of hazardous waste per month. Small quantities of hazardous waste are subject to state law.
- The Hazardous Waste Management Act (RCW Chapter 70.105) designates the Department of Ecology (Ecology) as the state agency to implement the RCRA. The Act describes many key features of Ecology's RCRA - based hazardous waste management program including:
 - a. Establishing a permit system for land based treatment, storage, and disposal facilities (TSDF).
 - b. Developing standards for the safe transportation, treatment, storage and disposal of hazardous wastes.
 - c. Establishing a manifest system to track hazardous waste.
 - d. Establishing reporting, monitoring, records keeping labeling and sampling requirements; and
 - e. Inspecting, monitoring and sampling.
- The Dangerous Waste Regulations Chapter 173-303 were adopted by Ecology as authorized by the Hazardous Waste Management Act for the purpose of implementing its provisions. The purpose of the regulations are:
 - a. Designation of dangerous and extremely hazardous wastes
 - b. Surveillance and monitoring of these wastes.
 - c. Provision of forms and rules to establish a system for manifesting, tracking, reporting, monitoring, record keeping, sampling and labelling hazardous wastes.
 - d. Establishment of siting, design, operation, closure, post-closure, financial, and monitoring requirements for hazardous waste transfer and TSDFs and a permit system.
 - e. To encourage recycling, reuse, reclamation and recovery to the maximum extent possible.

The Hazardous Waste Management Act requires the development of a statewide Hazardous Waste Plan that is to be updated every 5 years. The plan must include but not be limited to:

- a. State inventory and assessment of capacity of existing facilities to treat, store, disposal or otherwise manage hazardous waste.
- b. Forecast of future hazardous waste generation

- c. A description of Ecology studies to determine appropriate waste management methods.
- d. A public information and education plan coordinated with local government efforts.
- e. Public involvement.

The plan contains seventy separate issues and recommendations. Some of the most important or relevant are:

- a. Ecology is understaffed to carry out inspection and enforcement activities.
- b. Staff turnover rates within the permit section was near sixty percent over the last several years, severely limiting Ecology's ability to process applications.
- b. Penalties for violations are based on environmental or human health risk. Economic gain by the violator may be sufficient to offset the penalty.
- d. The issuing of TSDF permits is extremely resource intensive.
- e. The existing permit application guidance is very general and non-technical. There is no standardized permit application format.

•Under the Hazardous Waste Reduction Act, Ecology adopted the Pollution Prevention Planning Regulations where generators and users of more than threshold quantities of hazardous waste must prepare Pollution Prevention Plans for reducing use of hazardous waste. Annual implementation progress reports must be submitted to Ecology.

The Hazardous Waste Management Act declares that local government is the appropriate level for planning and carrying out programs to manage moderate risk waste with Ecology's assistance.

In 1991 jurisdictions in King County developed and adopted the Local Hazardous Waste Management Plan (Plan) for Seattle-King County with support of a state grant.

The goal of the plan is to protect public health and the environment from the adverse effects of improper handling and disposal of hazardous wastes by Small Quantity Generators (SQGs) and households. SQGs are those businesses that produce moderate risk waste i.e. less than 220 pounds of hazardous waste and/or less than 2.2 pounds of extremely hazardous waste per month.

Ground Water protection is discussed as a component of educational and enforcement activities during implementation of the plan. Of particular concern is the risk of ground water contamination associated with the disposal of hazardous wastes in on-site sewage disposal systems. The Plan intends to emphasize this concern in its education activities.

GOAL

Hazardous Waste Management: To ensure that ground water is not contaminated due to improper management of hazardous wastes.

SOUTH KING - Same as original

Issues - Hazardous Waste Management

Issue 1. State Hazardous Waste Plan. The Draft Washington State Hazardous Waste Plan has identified many deficiencies in the existing state program to regulate hazardous waste. These problems were identified by an Ecology-sponsored advisory committee made up of business leaders, government agency staff and elected officials, environmentalists, consulting firms, and educators over a period of two years. Ecology has stated in the Draft Plan that it is committed to carrying out the recommendations developed by the committee. Implementation of the recommended strategies is necessary in order for the state to manage hazardous wastes in a manner that will protect ground water.

HM-1. State Hazardous Waste Plan-Implementation. The GWAC adopts the following resolution: "The GWAC supports the findings and recommendations of the Washington State Hazardous Waste Plan. The GWAC requests that ~~Ecology adopt the Plan and that Ecology and the Washington Legislature fund and carry out the provisions of the Plan~~ with a sense of urgency in recognition of the threat posed to ground water from hazardous wastes." The GWAC will communicate this resolution to the Director of Ecology, the Assistant Director for Waste Management, and to the Washington Legislature.

SOUTH KING The GWAC adopts the following resolution. "The GWAC supports the findings and recommendations of the ~~DRAFT~~ Washington State Hazardous Waste Management Plan. The GWAC requests ~~Ecology adopt the Plan and that Ecology and the Washington Legislature fund~~ carry-out the provisions of the Plan with a sense of urgency in recognition of the threat posed to ground water from hazardous wastes." The GWAC will communicate this resolution to the Director of Ecology, the Assistant Director for Waste Management, and to the Washington Legislature.

Staff recommendation: Preferable to use the wording developed by Issaquah and Redmond shown above so that: 1. We can send a unified message to the Legislature and Ecology. 2. We indicate that we recognize that funding by the legislature is a fundamental means of implementing the Plan.

Discussion. The Hazardous Waste Plan identifies problems and recommends solutions for Hazardous Waste Management. The GWAC can effectively communicate its concerns for ground water protection from hazardous waste to Ecology and the Legislature by supporting the Plan. The GWAC's resolution will be communicated to Ecology via the Ground Water Management Program (GWMP) review and certification process. Letters could also be sent to Ecology and the appropriate committee chairs at the Legislature.

Implementation of HM-1.

The request to carry out the solutions recommended by the Hazardous Waste Plan is communicated to Ecology during the review and certification process for the GWMP. Additional letters will need to be written.

Task: Write letters to the Director of Ecology, the Assistant Director for Waste Management, and to the Washington Legislature.

Who: SKCHD

When: Implementation year 1

Hours/Costs: 1 day/1 FTE at \$50/per hour = \$400

Issue 2. Dangerous Waste Management Unit. Washington Dangerous Waste Regulations require a setback from the dangerous waste management unit to the aquifer of beneficial use. However, no setback is required from the unit to ground water, in general. In effect, the regulations indicate that the dangerous waste management unit may be located in ground water.

HM-2. Dangerous Waste Management Unit Setback. Siting of the dangerous waste management unit. Petition Ecology to will amend the Dangerous Waste Regulations (Chapter 173-303) to require setbacks from the seasonal high ground water level.

SOUTH KING "Petition Ecology to amend the Dangerous Waste Regulations to require setbacks from ~~ground water~~ the seasonal high water level."

NOTE TO GWAC: Staff recommendation: South King's wording is more explicit with the word "ground" inserted for those GWACs that wish to include this issue.)

Discussion. Lack of separation by a layer of unsaturated soil increases the chances that hazardous waste leaks could get into ground water before detection and remedial action. Although discussions with Ecology staff indicate that location in ground water would probably not be allowed, nowhere is such a prohibition stated in the Dangerous Waste Regulations. At best, this inconsistency creates a lack of confidence in the siting criteria among concerned citizens and confusion upon the part of proponents and reviewers. At worst, a facility could be inappropriately sited increasing the possibility of ground water contamination.

The GWACs, by requesting an amendment, will bring this matter to the attention of Ecology administrators and will precipitate a change in the regulations if Ecology agrees to it. The GWAC should be aware, however, that Ecology went through an arduous process to adopt these rules over a period of several years. At least 53 public hearings and workshops were held. Ecology may be reluctant to open the regulations to change at this time. If that is the case, the GWACs concerns will at least be registered and may be entered in a list of future changes. In addition, staff will be alerted to the inconsistency.

Implementation of HM-2.

The request to modify the setback from ground water is communicated to Ecology during the review and certification process for the GWMP. No additional action is needed.

ISSUE 3. Hazardous Waste Facilities Zones. King County has not designated zones in which hazardous substances may be used thereby notifying Ecology of the zones in which waste storage and treatment facilities may be considered. Failure to designate zones by April 1992 will result in preemption by Ecology of the right to interpret local zoning codes for the purposes of siting such facilities. This preemption is not permanent and local jurisdiction is returned upon designation of zones.

SOUTH KING - Need to adopt Issue 3.

(Note to GWACs: The language shown is similar to that adopted by Redmond. Staff recommends that the other GWACs adopt the proposed language because it is more explicit.)

HM-3. Hazardous Waste Facilities Zones-Local designation. Designation of zones for hazardous waste treatment and storage facilities in King County and cities. ~~Petition~~ King County and cities ~~to~~ will designate zones for hazardous waste storage and treatment in recognition of 1. the benefits associated with on-site waste management; 2. the opportunity for local government to interpret its own zoning codes; and 3. collective responsibility for some of the risk associated with the existence of vital commercial establishments that produce hazardous wastes.

SOUTH KING "Alternative 2. Petition King County and cities to designate zones for hazardous waste storage and treatment in recognition of 1) ~~the benefits associated with on-site waste management;~~ 2) the opportunity for local government to interpret its own zoning codes; and 3) ~~collective responsibility for some of the risk associated with the existence of vital commercial establishments that produce hazardous waste."~~

Staff recommendation: "Short term" should probably be deleted because local governments do not have authority to affect how long waste is stored. The conditions of the dangerous waste permit will determine what wastes may be stored and for how long. The original wording, especially reason 1., is recommended because it offers reasons for the position other than just local control, i.e. a reason that is related to ground water protection.)

Discussion. The designation of zones will result in better waste management practices. It will recognize and facilitate the state "Close to Home Policy" aimed at encouraging on-site waste management including waste reduction and recycling. This policy also encourages communities who benefit most directly from businesses who generate hazardous wastes to accept some of the associated risk. On-site waste management also reduces the risks involved in transporting wastes. Cost savings may be realized for the waste generator thereby providing incentive to pursue more favorable waste reduction and waste management alternatives.

Given that the state legislature determined that local government land use authority would be preempted to a large degree, it is probably better for King County to designate

the zones in which, by its own interpretation, hazardous substances may be used rather than have the state do it. It is not known whether all of the cities in the GWMA's have designated zones yet. The GWAC can raise this issue with the cities during the concurrence process for the Ground Water Management Program.

Implementation of HM-3.

The request that King County and cities designate zones is communicated during the process of concurrence with the GWMP. King County and cities will respond to the request by concurring/not concurring with it. The county and cities should designate zones within 2 years of concurrence. No further action is needed subsequent to any negotiations that are necessary for concurrence.

Task: Designate zones by local ordinance and communicate this to Ecology.

Who: King County and cities in GWMA

When: Implementation year 3

Cost:

Source of funds: Agency general funds

2. HAZARDOUS WASTE CONTAMINATION SITES

Hazardous waste contamination sites are sites where hazardous waste has been spilled, leaked or disposed of into the ground.

The statutes which regulate hazardous waste contamination sites include:

- The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) established a trust fund commonly referred to as "Superfund" for the clean up of abandoned or uncontrolled waste sites. The Environmental Protection Agency (EPA) has primary responsibility for clean up and enforcement under CERCLA.

- CERCLA established a new agency within the U.S. Public Health Service called the Agency for Toxic Substances and Disease Registry (ATSDR) to carry out health related authorities of CERCLA. ATSDR functions as a branch of the U.S. Public Health Service concerned with health effects of toxic substances in the environment. ATSDR conducts "human health assessments" at hazardous waste sites listed on the national priority list, the most serious hazardous waste sites in the nation.

- The Washington Model Toxics Control Act (MTCA) RCW 70.105D, passed by Washington voters supplements CERCLA. The stated purpose of MTCA is to raise sufficient funds to clean up all hazardous waste sites and to prevent future hazards due to improper hazardous waste disposal (RCW 70.105.010.) Toxic Control Accounts, both state and local, are created that may be used to carry out MTCA. MTCA establishes a program for Ecology to identify, investigate and clean up sites where hazardous substances have been released into the environment. Under the Act, Ecology adopted The Model Toxic Control Act Cleanup Regulations Chapter 173-340 WAC to develop a program to carry out the Act.

The Washington Department of Health (DOH) Office of Toxic Substances (OTS) has a role in hazardous waste site management that corresponds to ATSDR on the federal level. OTS has a contract with EPA to conduct health assessments for National Priority List (NPL) sites in Washington for which the responsible parties do not include the federal government.

OTS is also involved in locating and informing EPA and Ecology of sites not on the NPL list or the Hazardous Site List. OTS has sought the assistance of local health departments in this task both by letter and newsletter but, to date, has not had much response state-wide. The importance of local participation is emphasized by OTS because there are often sites of possible concern that only local health officials are aware of. Both federal and state officials indicate that more involvement by local health departments in site discovery and public outreach is needed.

Local governments are not subject to any legal requirement to regulate hazardous waste sites. They are involved in hazardous waste site cleanup primarily either as a responsible or affected party. SKCHD is involved in any aspect of cleanup actions that is subject to its regulatory programs. Landfill closure is the main facet of clean up actions that SKCHD regulates.

GOAL

Hazardous Waste Contamination Sites: To assist federal and state cleanup programs in discovering hazardous waste disposal sites in King County and in communicating public health risks associated with ground water pollution at those sites to the public.

SOUTH KING To assist federal and state clean up programs in communicating public health risks associated with ground water pollution at those sites to the public.

(Note to GWACs: "Staff recommendation: None except that South King should be more specific, e.g. "...communicating public health risks associated with ground water pollution at ~~these~~ hazardous waste contamination sites...".)

Issues - Hazardous Waste Contamination Sites

Issue 4. Hazardous waste contamination sites - site referral and public education. The Washington Department of Health (DOH) seeks a cooperative relationship with local health departments in the following areas: 1. referral of possible hazardous waste disposal sites, illness clusters, incidences of contaminated drinking water supplies, and related concerns to the DOH Office of Toxic Substances; 2. assistance in gathering data in regard to these referrals; 3. public education oriented towards health concerns in relation to hazardous waste sites, including those which may involve contaminated ground water.

HM-4. Hazardous waste contamination sites - site referral and public education. ~~Petition the King County Board of Health to support an expanded role for to will include the following in the duties of the Seattle King County Department of Public Health Environmental Health Division (SKCHD) in regard to hazardous waste disposal contamination sites in at least the following areas:~~

- a. assistance to DOH in site discovery including collection of information regarding site history;
- b. assistance to DOH in public health information and referral regarding hazardous waste sites.

SOUTH KING "Alternative 2. Petition the King County Board of Health to support an expanded role for the Seattle-King County Department of Public Health ~~in regard to hazardous waste disposal sites in at least the following areas:~~

- a. ~~assistance to DOH in site discovery including collection of information regarding site history;~~
- b. assistance to DOH in public health information and referral regarding hazardous waste sites.

(Note to GWACs: Staff recommendation: Given some of the perhaps more significant actions that GWMP contains and the lack of consensus on the significance of this issue, we might want to delete this. We could see how site discovery and cleanup progress over the first few years of plan implementation and reconsider more local involvement if needed. If the issue is to be included, the above amended language is recommended for clarity. No staff position on deleting a. Either way seems reasonable).

Discussion. Although hazardous waste site cleanup programs have a long way to go to remedy existing sites, it does not appear that regulatory involvement is needed on the local level. However, existing programs may not adequately address public health concerns in King County in regard to known or as yet undiscovered hazardous waste sites that may involve ground water pollution. Action HM-4 will bring the matter to the attention of King County. If the King County Council agrees with the concern, it may instruct the SKCHD to enter into discussions with Department of Health (DOH) regarding the appropriate role for the local health department. This would be a role that would complement the federal and state roles, rather than duplicate them. Local knowledge, not available in any written record, would be taken advantage of in locating possible sites of concern. Local health departments could be of assistance to DOH in obtaining a site history, given better knowledge and access to local land use records and residents who may have information. SKCHD could assist DOH in determining needs for public health information and in disseminating such information to the public at risk.

Implementation of HM-4. Hazardous waste contamination sites - site referral and public education.

Who: SKCHD

When: Ongoing. Starts in the first year of plan implementation.

Costs:

Personnel: .5 FTE @ \$50/hour = \$ 52,200/yr.

Source of funds: Aquifer Protection Fee.

3. HAZARDOUS MATERIAL SPILL PREVENTION AND EMERGENCY RESPONSE

A. Spill prevention at facilities.

Fire services in King County play a major role in prevention of hazardous material spills from fixed facilities. This role derives from the fire services responsibility to implement the Uniform Fire Code (UFC).

Each city in King County has its own fire department and operates according to its own ordinances. Fire protection in King County is accomplished both by the King County Fire Marshall and fire districts. The County Fire Marshall's Office is the regulatory agency that implements the UFC including hazardous materials provisions. Fire districts, on the other hand, have responsibility for fire fighting and other emergency response including hazardous material spills. Fire districts do not have authority to adopt or enforce fire codes.

The UFC is developed by the International Conference of Building Officials. The intent of the UFC is to prescribe requirements consistent with nationally recognized good practices for safeguarding life and property from the hazards of fire and explosion associated with various practices, one of which is storage, handling, and use of hazardous materials.

There is no federally adopted version of the UFC. States are free to adopt a version of the UFC, amend it, or adopt none of it, although, in practice, all states adopt some version of the UFC.

Chapter 19.27 RCW, The State Building Code, creates the Washington Building Code Council. This statute gives the Council the authority to adopt and revise the State Building Code including the UFC.

Article 80 of the UFC provides requirements for the prevention, control, and mitigation of dangerous conditions related to hazardous materials and provides for information needed by emergency response personnel.

The UFC prohibits persons and businesses from using, storing, dispensing, or handling hazardous materials in quantities over a specified amount without a permit. Inspections are performed by fire services to ensure compliance. Storage areas must be constructed according to requirements including approved secondary containment facilities for some chemicals. Modifications to and closures of storage facilities must be done under permit.

With a few exceptions, such as the appropriate use of pesticides, the UFC prohibits release of any hazardous material to sewers, storm drains, surface waters, the ground, or to the air except under permit from appropriate agencies.

At the discretion of fire chiefs, Hazardous Materials Management Plans (HMMP) and Hazardous Materials Inventory Statements (HMIS) may be required in order to obtain an operating permit. These documents are important tools that assist the fire services in implementing Article 80.

The Washington Building Code Council has adopted an amended version of the UFC. Two amendments that weaken the UFC in Washington may be of concern to the Ground Water Advisory Committees (GWAC): 1. HMMP and HMIS are not required from businesses regulated under the federal Emergency Planning and Community Right To Know Act (EPCRA)(WAC 51-24-80103); 2. An entire category of hazardous materials has been exempted from storage regulations under the UFC. This category is denoted in the 1991 UFC as "Carcinogens, irritants, sensitizers, and other health hazard solids, liquids and gases" (WAC 51-24-80315).

It was concluded by the Building Code Council that the HMMP and HMIS duplicate planning requirements under EPCRA. Some hazardous materials experts disagree with the Council and contend that fire services were left with less than adequate information for the facilities that they must respond to in an emergency.

The exemption of a category of hazardous materials from storage regulations is of concern for several reasons. The category exempted contains some of the substances that are of the greatest concern to those who are working to protect ground water quality. The section from which an exemption is granted includes a requirement for secondary containment for both indoor and outdoor storage of the materials included in the hazard class. No agency has the broad authority that the UFC grants to fire services nor are other agencies on site for inspections as frequently. The lack of regulation of storage practices for this hazard class at local businesses by the fire services could substantially weaken the effort to prevent the release of these materials to the environment and, ultimately, the ground water.

Local governments may adopt the UFC as adopted by the state or may adopt a more stringent version. The version of the UFC adopted by local governments is important to ground water protection in that weaknesses inherent in the state version can be compensated for.

While the UFC prescribes the issuance of permits and periodic inspections, local governments establish the level at which the UFC is implemented. Staffing and level of involvement in hazardous materials regulation varies. Some fire departments haven't developed expertise in hazardous materials regulation nor have staff been dedicated to the task. This is, in part, because Article 80 is a new regulation.

While there is some overlap in regulatory authority, each of the agencies involved in spill prevention has a different emphasis. In many cases, the agencies can help each other to gain compliance or to maintain contact with businesses. Regulatory requirements added together provide better protection of both the environment and public safety than any regulation standing alone. While fire services have made great strides in implementing Article 80 of the UFC, the programs of local governments are not yet fully developed.

B. Hazardous material spills in transportation during transport.

The risk of ground water contamination posed by truck or rail transport of hazardous materials is determined by many factors including the nature and quantity of the materials transported, precautions taken in packaging and transport, safety factors including speed limits, congestion, highway or railway design, and maintenance, and

sensitivity of the area in which a spill occurs.

Many highways and roads in King County that are frequented by trucks carrying hazardous materials bisect areas which are geologically susceptible to ground water contamination or near municipal wells.

Risk assessments for transportation spills have not been done for King County, in general, although individuals may have done such studies to address particular concerns such as SEPA review. Public water system purveyors will, however, in the near future, be developing their wellhead protection programs as required by federal and state law. Assessment of risk associated with transportation spills will likely be included in contaminant source inventories required under the new law.

Numerous federal and state agencies are responsible for the enforcement of the laws that are designed to prevent spills of hazardous materials from commercial carriers.

The U.S. Department of Transportation (DOT) Federal Highway Administration, Office of Motor Carriers enforces regulations for interstate motor carriers contained in 49 Code of Federal Regulations Parts 100 - 199. Parts 171-180 are commonly referred to as the Hazardous Materials Regulations.

The Federal Railroad Administration (FRA) under DOT regulates rail construction and safety as well as shipment of hazardous materials by rail.

The Washington Utilities and Transportation Commission (WUTC), the Washington State Patrol (WSP), the Washington Department of Transportation (WDOT), and Ecology are all involved in preventing spills of hazardous materials from commercial motor carriers on the state level.

Ecology has a role in regulation of transport of hazardous waste under WAC 173-303 Dangerous Waste Regulations which are more stringent than DOT hazardous materials rules.

The consensus of the persons interviewed for the section on transportation spill prevention is that the system is working well and getting better. Regulations and programs governing packaging and transportation of hazardous materials are generally felt to be good and will become more effective with recent updates.

C. Emergency response to hazardous material spills.

Emergency response to hazardous material spills that threaten the environment is the responsibility of many agencies. This section will discuss spill reporting, spill response, and emergency planning.

Spill reporting is required under the Washington Dangerous Waste Regulations, the federal Emergency Planning and Community Right to Know Act (EPCRA) the Department of Transportation's Hazardous Materials Regulations, Washington's Underground Storage Tank Regulations and the Uniform Fire Code.

Spill response is unique to each spill. First responders to hazardous materials spills

threatening life and property are usually the Hazardous Materials Units (HAZMAT) of local fire services.

The Emergency Planning and Community Right to Know Act - EPCRA (42 U.S. Code Section 11045) was enacted by Congress in 1986. It was contained within the Superfund Amendments and Reauthorization Act, Title 3 and its provisions are often referred to informally as "SARA Title 3 requirements" although it is codified separately (not a part of CERCLA). EPCRA requires emergency response planning for federal, state and local government with the participation of industry. It includes "right-to-know" provisions that provide communities with access to information on facilities in their locales. EPCRA also requires emergency and toxic release reporting.

Emergency planning provisions of EPCRA require states to establish a State Emergency Response Commission (SERC), Emergency Planning Districts and Local Emergency Planning Committees (LEPC). LEPCs must develop and facilitate the implementation of Local Emergency Management Plans (LEMP) in cooperation with the facilities who use, produce, or store "extremely hazardous substances".

King County has a basic LEMP in place. Those industries that are subject to EPCRA regulations are required to participate in the preparation of the LEMP. One of the ways in which they have participated is to provide emergency response plans for their own facilities. These have been incorporated into the LEMP. Protection of people and property has been the primary emphasis of the LEMP to date.

Some problem areas observed with the LEMP are:

1. Most industries subject to EPCRA reporting requirements have not provided their emergency response plans to King County for incorporation into the LEMP and
2. King County should be collecting information from all fire services within the planning area regarding hazardous materials facilities and entering it into a database compatible with databases used by other jurisdictions within the county. King County has a database program but lacks the information needed to enter it into the database system.

It is generally recognized by all persons interviewed for this paper that the King County LEMP needs significant improvement. There is also guarded optimism that the situation is about to improve.

A map of areas susceptible to ground water contamination from transportation spills of hazardous materials and the vulnerability assessment could be the basis for the LEPC to consider such issues as the routing and timing of extremely hazardous material shipments through the community, particularly Aquifer Protection Areas (APAs). Highway design factors and speed limits could also be considered.

Another matter that may be of concern to the GWAC can be addressed by the LEMP. In other areas of the nation, it has been found that fire fighting techniques in sensitive areas should be considered in advance of an emergency.

GOAL

Hazardous material spills: 1. To ensure that spills of hazardous materials are prevented as much as possible. 2. To be adequately prepared to respond to spills of hazardous materials so that ground water contamination is minimized.

SOUTH KING "~~To ensure that prevent~~ spills of hazardous materials ~~are prevented as much as possible.~~ and to be adequately prepared to respond to spills of hazardous materials so that ground water is not contaminated ~~is minimized.~~"

This section addresses the prevention of and the emergency response to hazardous material spills both at facilities and during transport.

NOTE: Staff recommends adopting South King goal.

Issues

Spill Prevention and Emergency Response.

Issue 5. Implementation of the Uniform Fire Code (UFC).

Article 80 of the UFC is a valuable tool to prevent hazardous material spills in business, industrial, and institutional settings. There are obstacles to comprehensive implementation of Article 80:

1. Many jurisdictions within the GWMA's have not fully developed their hazardous materials programs. They lack adequate staff, training, and enforcement tools to implement Article 80.
2. The State Building Code Council has adopted a less stringent version of Article 80 that exempts important hazardous materials from full regulation by the fire services. In addition, some businesses and industries have been exempted from the requirement for Hazardous Materials Management Plans and Hazardous Materials Inventory Statements. Some local jurisdictions within Ground Water Management Areas (GWMA) have not passed ordinances to retain the original scope of Article 80.

HM-5. Implementation of the Uniform Fire Code (UFC). ~~Petition~~ King County and cities within the GWMA's to will:

- a. Commit staff and funding to comprehensive implementation of Article 80 in both new and existing facilities using both educational and regulatory approaches;
- b. Propose Adopt ordinances for adoption, if they have not already done so, that provide adequate enforcement tools to ensure compliance with Article 80 and that restore the requirements for: require compliance with the following provisions of Article 80 of the UFC:
 - i. Hazardous Materials Management Plans;

- ii. Hazardous Materials Inventory Statements; and
- iii. Storage requirements for "Carcinogens, irritants, sensitizers, and other health hazard solids, liquids and gases" found in UFC 80.315;

c. Emphasize regulatory attention and educational activity in Aquifer Protection Areas (APA).

SOUTH KING - Alternative 2. Petition King County and cities within the GWMA's to:

- a. Commit staff and funding to comprehensive implementation of Article 80 in both new and existing facilities or contracting or entering into an interlocal agreement with a regional agency for such services not available locally.
- b. Adopt ordinances, if they have not already done so, that require compliance with the following provisions of Article 80 of the UFC:
 - i. Hazardous Materials Management Plan
 - ii. Hazardous Materials Inventory Statements; and
 - iii. Storage requirements for "Carcinogens, irritants, sensitizers, and other health hazard solid, liquids and gases found in UFC 80.315.

(Note to GWACs: All GWACs adopted the original wording except that "or contracting or entering into an interlocal agreement with a regional agency for such services not available locally;" was added at the end of 1. Staff recommendation is to drop the added wording for several reasons:

1. King County and cities have authority to implement Article 80. It can be assumed that these authorities may contract for services at their discretion.
2. Contracting for services still requires a commitment of funds. It is the commitment of funds and/or staff that this action is directed towards, not how the authority goes about carrying out the task.
3. Reference to a regional agency may raise unnecessary questions that would complicate the concurrence process.

Discussion. The UFC does not prescribe penalties. It, rather, contains an ordinance format that may be used for the purpose of setting penalties. Local jurisdictions may or may not adopt a schedule of penalties. The County has a cumbersome civil penalty procedure that can be used to gain compliance. Only by commitment to an active program to implement Article 80 will its benefits be realized. Some jurisdictions contacted in preparation of this paper have not yet staffed their programs with trained individuals. The Ground Water Advisory Committees (GWAC), by requesting a commitment to program development, will accomplish two things for ground water protection: 1. They will bring to attention of local jurisdictions the importance of good hazardous materials management programs on the local level and 2. If successful in

obtaining concurrence, will improve existing programs.

Because aquifers cross jurisdictional boundaries, less vigorous spill prevention in one jurisdiction can have a deleterious effect on the aquifer used by an adjacent jurisdiction. It is important, therefore, to seek consensus between all of the jurisdictions in the Ground Water Management Areas (GWMAs) regarding the importance of prevention of spills of hazardous materials.

Article 80 as originally written does not incorporate an enforcement program. Each jurisdiction adopting the UFC must develop and adopt its own enforcement program. Many jurisdictions do not have authority to issue citations for violations of the UFC. The GWAC can express both its support for educational approaches and request better enforcement tools in the interest of better hazardous materials management.

Several key sections of Article 80 were altered or deleted by the State Building Code Council. Certain chemicals were exempted from storage requirements and some businesses were exempted from the requirements for Hazardous Materials Management Plans and Hazardous Materials Inventory Statements. Restoration of the original wording is important for ground water protection.

It would be beneficial if fire services could focus attention on APAs since contamination introduced in these areas presents the greatest risk to drinking water wells.

Implementation of HM-5.

Initially, this action is implemented via the concurrence process. By concurring with the request, local governments will be committed to implementation of Article 80 of the UFC.

As lead agency for implementation of the GWMP, SKCHD will develop criteria for evaluating the hazardous materials management programs of fire services and include an annual evaluation in its regular reports to the GWAC and Ground Water Management Committees. (Please see Chapter 4 for a discussion of committees involved in GWMP implementation.) SKCHD will continue to encourage program development and implementation on an ongoing basis.

During the concurrence process, SKCHD will discuss funding to implement this action with the King County Fire Marshall and city fire departments. The goal of this discussion is to determine whether implementation can be funded by hazardous materials permit fees alone or whether aquifer protection fees should be considered to supplement fire service activities.

Some local governments in King County have already instituted a hazardous materials permit fee as a way to fund their program. This is probably the best long-term solution to hazardous materials regulation. Each jurisdiction will need to assess its existing program and determine the best means to fund improvements, if needed.

Tasks:

1. Hazardous materials program development including ordinances.

2. Hazardous materials program implementation.

3. Evaluation of hazardous materials programs.

Tasks 1 and 2. Hazardous materials program development and implementation.

Who: King County Fire Marshall and fire departments of cities within the GWMA's.

When: Starting in implementation year 1 and ongoing.

Costs: To be determined by each participant.

Source of funds: To be determined by each participant during concurrence process. Certified GWMP will contain designated source of funds.

Task 3. Evaluation of hazardous materials programs.

Who: Environmental Health Division (EHD)

When: Annual evaluation for implementation years 1, 2, and 3.

Costs:

Personnel: 1 FTE for 480 hours second year; 160 hours year 3; Total 640 hours.

Source of funds: Aquifer Protection Fund.

Issue 6. Implementation of the Emergency Planning and Community Right-to-Know Act (EPCRA).

Most experts conclude that the King County Local Emergency Management Plan (LEMP) does not adequately address coordination issues essential for responding to regional disasters including large chemical spills. Most of the facilities that have extremely hazardous substances on the premises in large quantities that are regulated by EPCRA have not yet submitted emergency response plans for inclusion in the LEMP. A centralized database has not been developed that would facilitate data sharing between jurisdictions who may need to jointly respond to large scale incidents. The LEMP has not, to date, considered the locations of sensitive areas such as aquifer protection recharge areas in developing emergency response measures in part because of the lack of information. EPA has enforcement authority and will use it to assist the County in obtaining compliance with EPCRA but because of the lack of a centralized database and referral system, EPA is not receiving referrals for enforcement.

HM-6. Implementation of the Emergency Planning and Community Right-to-Know Act (EPCRA). Petition King County, as lead agency for the LEMP, and cities to will seek a permanent source of funding to provide staff and resources necessary to complete a comprehensive LEMP that includes the following:

- a. Emergency response plans for all industries that have more than threshold quantities of extremely hazardous substances on premises;
- b. A centralized, current, database with 24-hour access containing information regarding the locations and amounts of hazardous materials in King County including both EPCRA-regulated facilities and those that are regulated only under the UFC;
- c. Provisions for adequate coordination between agencies and jurisdictions that might be involved in responding to a major chemical spill;
- d. Provisions for community outreach so that new businesses are brought into the system;
- e. A hazard analysis that takes into consideration the locations of Aquifer Protection Recharge Areas (APA), Wellhead Protection Areas, Sole Source Aquifers and public water systems utilizing ground water sources;
- f. Fire-fighting techniques and emergency response techniques that favor ground water protection in APAs;
- g. Referral of facilities that fail to meet EPCRA requirements to the EPA for enforcement;
- h. Provisions for regular testing of the emergency response plan.

SOUTH KING "Alternative 2. Petition the King County Fire Marshall, and the cities local fire protection jurisdictions and other HAZMAT response teams ~~to seek a permanent source of funding to provide staff and resources necessary~~ to complete a comprehensive LEMP to protect ground water from contamination that includes the following:

- a. Emergency response plans for all industries that have more than threshold quantities of extremely hazardous substances on premises;
- b. A centralized, current, database with 24 hour access containing information regarding locations and amounts of hazardous materials in King County including both EPCRA - regulated facilities and those that are regulated only under the UFC;
- c. Provisions for adequate coordination between agencies and jurisdictions that might be involved in responding to a major chemical spill;
- d. A hazard analysis that takes into consideration the locations of Critical Aquifer Recharge Areas, Wellhead Protection Areas, Sole Source Aquifers and Public Water Systems utilizing ground water sources;
- e. Referral of facilities that fail to meet EPCRA requirements to the EPA for enforcement;
- f. Provisions for regular testing of the emergency response plan.

Note to GWACs: All GWACs had different wording in introduction; were missing parts d. and f.; and part e. has not been amended, by GWAC as above.

Staff recommendation: The wording shown above is suggested for the following reasons:

1. We have generally tried to petition local governments rather than agencies within those governments because it is ultimately the legislative bodies that concur with the GWMP. The Fire Marshall is an agency of King County.
2. In addition to King County, only cities need be petitioned because other "fire protection jurisdictions" have limited authority in relation to this issue. For example, fire districts do not issue hazardous materials permits; they fight fires and respond to emergencies. HAZMAT units are a cooperative effort of cities and fire districts. They are operational, i.e. they are not involved in emergency planning.
3. The LEMP is directed towards the protection of human life, property, and the environment. Protection of ground water is included in its goals. It might unnecessarily complicate concurrence if we ask that the LEMP protect, in particular, ground water. Action HM-6 was proposed for the purpose of encouraging King County and cities to develop and implement a comprehensive

LEMP. By accomplishing that and including the concerns we listed above, ground water protection will be improved. Actions HM-7 and HM-8 below will address particular concerns related to ground water and emergency planning.

4. Changes were made in d. to reflect revisions in what constitutes an APA. See discussion in Special Areas paper.

Discussion. All persons consulted for this issue paper agreed that the LEMP needs significant improvement. The requested improvements above reflect the concerns that many of them articulated as well as elements of an LEMP as described by federal guidelines.

Maps of Aquifer Protection Areas prepared by the GWMP will provide emergency planners with the necessary information to plan for appropriate response to spills in these areas. Fire fighting and emergency response techniques that are as protective of ground water as possible should be considered.

Referral of facilities that fail to meet EPCRA requirements to the EPA for enforcement will provide the last resort measure to obtain compliance from facilities that have been uncooperative with educational approaches. This is needed because local emergency response officials do not have enforcement authority under EPCRA.

The LEMP must be constantly updated and tested to be effective. Community outreach is needed so that new businesses are brought into the system. The database should be dynamic and rapidly incorporate information taken from routine inspections done by local fire services. In this way, emergency planners, elected officials, and resource protection planners can assess the threat to the environment and public health from hazardous materials in the community on an ongoing basis.

Implementation of HM-6.

The Seattle King County Health Department, Environmental Health Division (SKCHD), as lead agency for implementation of the GWMP, will:

1. Provide APA and well location maps to the Emergency Management Division.
2. Provide information regarding emergency response techniques necessary to protect aquifers and wells.
3. Review existing literature and determine the need to contract for a consultant with expertise in this area.
4. Report the impacts upon aquifer protection and the Minimum Wellhead Protection Program referred to in Chapter 4 and;
5. Develop recommendations for the Emergency Management Division. A determination will be made as to whether to share recommendations directly with emergency responders or to work through the LEMP.

During the concurrence process, SKCHD will discuss funding to implement this action with the King County Emergency Manager and city fire departments. The goal of this discussion is to determine whether implementation can be funded by an industry supported program. Perhaps a portion of hazardous materials permit fees referred to in Action HM-5 could be dedicated to supporting the LEMP. The possibility of supplementing hazardous materials permit fees with aquifer protection fees will be considered.

Tasks:

1. Develop and implement an improved LEMP.
2. Communicate the locations of APAs and wells to emergency responders.
3. Prepare a report on fire fighting and emergency response techniques that are protective of ground water for the Emergency Management Division.
4. Develop recommendations regarding fire fighting and emergency response techniques for the King County Emergency Management Division for inclusion in the Local Emergency Management Plan; Ensure that this information is shared with emergency responders throughout King County.
5. Report on the progress of development and implementation of the LEMP in relation to GWAC concerns.

Task 1. Develop and implement an improved LEMP.

Who: King County (Emergency Management Division) in cooperation with city and other members of the LEPC.

When: Start in year 1 of implementation and ongoing.

Costs: To be determined by King County Emergency Manager.

Source of funds: To be determined during concurrence process. A source of funds will be designated in the final GWMP.

Task 2. Communicate the locations of APAs and wells to emergency responders.

Who: SKCHD

When: Beginning in year 1 of implementation and ongoing as maps are continuously refined and wellhead protection areas are defined by public water system purveyors.

Costs: Negligible. The work involved in preparing/obtaining maps is accounted for in the Data Collection and Management section.

Task 3. Prepare a report on fire fighting and emergency response techniques that are protective of ground water for the Emergency Management Division.

Who: SKCHD

When: Year 2 of plan implementation.

Costs:

Personnel: 480 hours @ \$50/hr = \$ 24,000/yr.

Other: For consultant contract allow ?

Source of funds: Aquifer Protection Funds.

Task 4. Develop recommendations regarding fire fighting and emergency response techniques for the King County Emergency Management Division for inclusion in the Local Emergency Management Plan; Ensure that this information is shared with emergency responders throughout King County.

Who: Ground Water Management Committee

When: Year 3 of plan implementation.

Costs: Costs are accounted for in the implementation plan for Chapter 4.

Task 5. Report on the progress of development and implementation of the LEMP in relation to GWAC concerns.

Who: SKCHD

When: Year 3 of plan implementation.

Costs:

Personnel: 160 hours @ \$50/hr = \$ 8000/yr.

Source of funds: Aquifer Protection Fund

Issue 7. Assessment of the risk of aquifer contamination associated with transportation-related hazardous material spills.

There has not been an assessment done in GWMA's to determine the risk of aquifer contamination associated with spills of hazardous materials from transportation sources.

SOUTH KING COUNTY "In GWMA's There has not been an assessment done in GWMA's to determine the risk of aquifer contamination associated with spills of hazardous materials from transportation sources should be assessed...and their effects upon aquifers within GWMA's should be included in all transportation planning."

Note: SKC intention is to combine former issues 3 and 4.

Staff recommendation: Because of several developments and new information staff recommends that this issue and the following issue be substantially changed (See 1. to 4. below). In the proposed text that follows, transportation issues that are unique to a particular wellhead protection area would be deferred to public water system purveyors to be addressed as they implement their wellhead protection programs. The development of county wide initiatives, if needed, relative to this issue would be deferred to the Ground Water Management Committee (see chapter 4 for description of make up and duties of the Management Committee). Improvements that could be initiated on a statewide basis would be deferred to an existing committee convened by the Washington Department of Health.

1. The state Wellhead Protection Program will require public water system purveyors to assess contamination risks in wellhead protection areas. It is likely that assessing risks of transportation-related hazardous material spills will be a component of that effort. This is a positive development because these risks are more effectively identified in a smaller area. By comparison, a risk assessment of transportation spills for an entire GWMA would be an unnecessarily unwieldy project. Better to prioritize by assessing risks in wellhead protection areas, say within the 5-year time-of-travel of water to the well.
2. Public water system purveyors should address problems unique to their wellhead protection area in their wellhead protection program. For example, the City of Renton has negotiated physical barriers along a portion of Interstate 405 that passes through its well field. As the prime stakeholder, the public water system purveyor is in the best position to negotiate improvements. This can be done with lead agency and committee support. Limited financial assistance could be provided from Aquifer Protection Funds. (see Chapter 4).
3. The Washington Department of Health (DOH) has already convened a process to identify ways in which transportation hazardous material spills could be more effectively prevented and responded to. They intend to pursue changes on a state level if appropriate. Staff from DOH, Ecology, Transportation, Federal Highway, Federal Railroad, chemical and transportation industries, and others are participants.
4. New information indicates that hazardous material spills associated with facilities are far more common than those from transportation (about 70% compared to 30%).

The general consensus in discussing transportation spills with experts in government and industry is that transportation spill prevention and emergency response is improving. The identification and mitigation of serious risks in the context of a wellhead protection area is important. However, a large scale, multiagency brainstorming process is probably not necessary and might suffer from trying to come up with general recommendations to what are probably very specific problems. It is better to see what the state committee determines. The Ground Water Management Committee can reconsider this issue at its discretion as is developed the county wide minimum wellhead protection program described in Chapter 4.

In light of the above reasoning the following new text is suggested. Existing text and committee positions follow the new text.)

Issue 7. Prevention of aquifer contamination associated with transportation-related hazardous material spills. An assessment of the risk of aquifer contamination from transportation-related hazardous material spills in King County could provide information regarding the significance and characteristics of this problem. The information obtained could be used to identify risk reduction strategies.

HM-7. Prevention of aquifer contamination associated with transportation-related hazardous material spills.

HM-7a. Transportation-Related Hazardous Materials Spills-Purveyor Assessment. ~~Petition~~ Purveyors of large public water systems (1000 connections or more) to will:

5. assess the risk of transportation-related hazardous material spills in their wellhead protection areas;
6. develop and implement risk reduction strategies as needed.

HM-7b Transportation-Related Hazardous Material Spills-Management Committee Evaluation. The GWAC resolves that it will be the responsibility of the Ground Water Management Committee to evaluate recommendations developed and actions taken by the DOH's Transportation Engineering Subcommittee in order to determine whether further actions should be taken on a county-wide basis to protect aquifers from transportation-related hazardous material spills.

SOUTH KING needs to adopt action.

Discussion. The state Wellhead Protection Program will require public water system purveyors to assess contamination risks in wellhead protection areas. It is likely that assessing risks of transportation-related hazardous material spills will be one of the components. The GWAC can ensure that this matter is considered by bringing it up during concurrence, with the GWMP.

Public water system purveyors should address problems unique to their wellhead protection area in their wellhead protection program.

DOH has convened a process to identify ways in which transportation hazardous material spills could be more effectively prevented and responded to. DOH plans to pursue changes on a state level if appropriate. Participants will include the DOH, Ecology, Transportation, federal highway, federal railroad and chemical and transportation industries. The GWAC could take advantage of this existing process and defer the matter to the Ground Water Management Committee for further resolution.

Previous text and committee positions:

Issue 3. Alternative 2. Assessment of the risk of aquifer contamination associated with transportation-related hazardous material spills. Petition King County and the cities in the GWMA to assess the risk of aquifer contamination associated with spills of hazardous materials from transportation sources.

SOUTH KING "Alternative 2. Petition King County and the cities in the GWMA to assess the risk of aquifer contamination associated with spills of hazardous material from transportation sources. At a minimum, the issues of routing, timing, and roadway design features should be considered. Upon completion of the evaluation, the affected jurisdictions shall incorporate risk reduction methods in the transportation of hazardous materials within CARAs."

Discussion. The GWACs have previously decided to assess the vulnerability of aquifers in the GWMA to contamination. (See issue paper in this series entitled "Identification of Geologically Susceptible Aquifer Recharge Areas".) The precise method of analyzing vulnerability and all of the sources to be considered has not yet been determined. The GWACs may want to decide at this point whether the risk of transportation spills should be included in the vulnerability assessment. The information generated would be of value to emergency planners in considering such issues as routing and timing of hazardous materials shipments through the county and roadway design features that might reduce the incidence of accidents or reduce their damage to the environment. By making this decision now, the GWACs are positioned to petition jurisdictions and agencies to create a process for the consideration of these issues.

Issue 4. There has not been an evaluation of possible methods to reduce to a minimum the risk of transportation spills of hazardous materials and their effects upon aquifers within GWMA.

SOUTH KING This issue was incorporated into Issue 3.

Alternative 2. Petition King County, cities, and affected agencies to jointly evaluate methods of reducing to a minimum the risk of transportation-related hazardous material spills and their effects upon aquifers within GWMA.

SOUTH KING COUNTY Issue and Alternative deleted (incorporated into Issue 3.)

Discussion. The purpose of an LEMP is to enable emergency response personnel to appropriately respond to emergencies in the community. It is generally not a tool for policy makers to create methods for the reduction of risk. A separate process is needed to evaluate mitigation methods.

SKCHD with the close cooperation of the King County Office of Emergency Management (OEM) should convene a process to evaluate measures to reduce the risk of transportation-related hazardous material spills in GWMA's. This process should be convened after the vulnerability assessment referred to in Issue 3. has been completed since it will rely on data produced by that effort.

The OEM should be consulted regarding the participation of emergency response personnel and other expertise that OEM is more familiar with. The Washington Department of Transportation, the Washington Utilities and Transportation Commission, the Department of Ecology, the King County Surface Water Management Division, and the King County Environmental Division should be requested to participate in this planning process.

The issues of routing, timing, and roadway/railway design and maintenance features should be considered. Structural modifications might include wider rights-of-way, straightening of curves, removal of visual obstructions, and signing and lighting improvements in the most sensitive areas. Barriers and other physical methods that may be employed to keep spilled materials away from sensitive areas or well fields should also be considered.

Implementation of HM-7. Prevention of aquifer contamination associated with transportation-related hazardous material spills.

This is initially implemented during the concurrence process. Purveyors will indicate whether they intend to address this concern via wellhead protection programs. SKCHD as lead agency, will report to the GWAC and Ground Water Management Committee on progress in implementation briefs. It is intended that a progress report will be provided in year 3 of plan implementation because wellhead protection programs are just beginning to be developed.

The Ground Water Management Committee will review this issue according to its priorities and will address it prior to the plan update.

Tasks:

Task 1. Assess the risk of transportation-related hazardous material spills in wellhead protection areas.

Task 2. Develop and implement risk reduction strategies.

Task 3. Evaluate recommendations/actions of the Department of Health's Transportation Engineering Subcommittee and determine whether further action should be taken on a county-wide basis to protect aquifers from transportation-related hazardous material spills.

Task 4. Prepare a brief evaluation of progress made by purveyors in addressing this issue for the GWAC and Management Committee.

Task 1. Assess the risk of transportation-related hazardous material spills in wellhead protection areas.

Who: Public water system purveyors (1000 connections or more).

When: When developing the wellhead protection program. Note: These programs will be phased in according to rules developed by the Department of Health.

Costs: To be determined by purveyors.

Source of funds: Purveyors operating budgets with some APA fee support.

Task 2. Develop and implement risk reduction strategies as needed.

Who: Public water system purveyors (1000 connections or more).

When: According to schedules prepared by purveyors in their wellhead protection program.

Costs: To be determined by purveyors.

Source of funds: To be determined by purveyors. Limited use of Aquifer Protection Funds might be available.

Task 3. Evaluate recommendations/actions of the Department of Health's Transportation Engineering Subcommittee and determine whether further action should be taken on a county-wide basis to protect aquifers from transportation-related hazardous material spills.

Who: Ground Water Management Committee

When: Prior to update of the GWMP.

Costs: Costs associated with the functions of the Management Committee are accounted for in Chapter 4. There are no further costs anticipated.

Task 4. Prepare a brief evaluation of progress made by purveyors in addressing this issue for the GWAC and Management Committee.

Who: SKCHD

When: Year 3 of plan implementation.

Costs:

Personnel: 160 hours @ \$50/hour = \$8000/yr.

Source of funds: Aquifer Protection Fund

3.3.2. UNDERGROUND STORAGE TANK MANAGEMENT

I. COMMERCIAL UNDERGROUND STORAGE TANKS

Commercial underground petroleum and chemical storage tanks represent perhaps the most significant potential threat to ground water quality in King County. Leakage from underground storage tanks and associated piping often occurs without detection and even relatively small amounts of certain compounds can have serious adverse impacts on ground water quality. Once released from an underground storage tank, some volatile organic compounds and petroleum products can rapidly migrate through the soil profile to ground water.

The precise number of underground storage tanks that are located in King County is not known. However, Ecology estimates that at least 6,550 such tanks are currently in operation, not including home heating oil tanks.

Underground storage tanks are regulated by federal, state, and local governments. Private sector pressures from insurance and lending institutions also bring increasing pressure to bear upon owners and operators of underground storage tanks to install and maintain systems in a manner which reduces liability risks by avoiding spills. A summary of each level of governmental regulation is provided below.

Federal Program

Federal regulations (Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks, 40 CFR 290 Part 280) have been developed by the Environmental Protection Agency (EPA) under Subtitle i of the Resource Conservation and Recovery Act (RCRA). The EPA regulations contain provisions for delegation of the federal Underground Storage Tank (UST) Program to the states.

State Program

RCW 90.76 (1989) directs Ecology to develop an UST program designed, operated, and enforced in a manner that meets the requirements for delegation of the federal UST Program. RCW 90.76 provided Ecology with authority to adopt rules for management of all underground storage tanks that are governed under the EPA regulations. Accordingly, Ecology adopted the state Underground Storage Tank Regulations (WAC 173-360) in November 1990. These comprehensive regulations incorporate the minimum requirements of the federal UST Program. Certain classes of underground storage tanks are exempt from regulation under both the Ecology and EPA underground storage tank programs. These classes include tanks of less than 1100 gallons that store heating oil and farm and residential motor fuel tanks of up to 1100 gallons.

Local Programs Under RCW 90.76

Under RCW 90.76, Ecology is encouraged to delegate portions or all of the state UST Program responsibilities to cities, towns, or counties. The annual fees collected by Ecology will be apportioned between Ecology and the city, town, or county assuming responsibility for the program or a portion of the program. However, local governments seeking delegation of the entire program would be undertaking a heavy commitment with funding options available.

Local jurisdictions may establish UST programs more strict than the state program if they do so to protect an "Environmentally Sensitive Area" (ESA). Under RCW 90.76, local underground storage tank regulations that are more stringent than those contained in WAC 173-360 can be implemented, subject to approval by Ecology, in an ESA. ESAs are geographic areas that possess physical characteristics that make them especially vulnerable to releases from underground storage tanks. A city, town, or county can request Ecology to designate an area within its jurisdiction as an ESA. If a single ESA is located within more than one political jurisdiction, such as two different cities or one city and a county, the jurisdictions can jointly request that Ecology designate the area as sensitive.

An area can qualify as an ESA in one of two ways: 1) if the area has already been granted special environmental status under another state or federal statute or regulation for the purpose of protecting ground water or surface water from pollution, or 2) the local jurisdiction must demonstrate that ground water is vulnerable to pollution because of site specific hydrogeological characteristics (WAC 173-360-520).

An Environmentally Sensitive Area designation under authority of RCW 90.76 is not synonymous with an Environmentally Sensitive Area designation under WAC 197-11-908 of the State Environmental Policy Act (SEPA); although, a single area could be designated as an Environmentally Sensitive Area under both RCW 90.76 and SEPA. Designation under RCW 90.76 affects only the construction and operation of underground storage tanks while designation under SEPA can affect a much broader range of land-use activities.

Local Programs Under Uniform Fire Code

Local fire protection agencies must regulate underground storage tanks under the provisions of the Uniform Fire Code (Article 79 UFC). Chapter 51-16 WAC, State Building Code adopts the UFC by reference. Local governments must enforce the provisions of the UFC as adopted and modified by the state. Local jurisdictions may adopt more stringent requirements.

It should be noted that some cities in King County do not believe that the UFC authorizes them to regulate heating oil tanks. King County Fire Marshals Office, however, does regulate heating oil tanks under Article 79 of the UFC.

King County is legally responsible for permitting and inspecting the installation and removal of underground tanks within unincorporated areas regardless of whether the area is in a Fire District. Fire Districts are responsible for the fire fighting function while

the King County Fire Marshall's office is responsible for technical tasks such as construction plan review for compliance with fire safety codes and hazardous materials storage including plan review for new underground storage tanks. The Fire Marshall's office is a section of the Department of Development and Environmental Services (DDES). City fire departments carry out both the fire fighting and permitting tasks.

USTs of 10,000 gallons or larger in size must undergo environmental review under the State Environmental Policy Act (SEPA). The SEPA section of the King County Environmental Division, DDES routinely requires secondary containment for underground storage tanks of this size in GWMA's upon review of permit applications referred by the Fire Marshall's office. It is not known whether city SEPA reviewers are requiring secondary containment.

Leaking Underground Storage Tank Management

Section 205 of the Superfund Amendments and Reauthorization Act of 1986 created an Underground Storage Tank Trust Fund intended to pay for the cleanup of releases of hazardous substances, including petroleum products, from underground storage tanks. The fund is administered by the EPA Office of Underground Storage Tanks (OUST). The fund is intended to support cleanup of leaking underground storage tanks in cases where no financially solvent owner/operator can be identified, where the owner/operator refuses or is unable to promptly respond to the problem, or where an imminent hazard to public health or the environment exists. The fund also provides financial assistance to state governments for development of state leaking underground storage tank response programs. Ecology developed this state's Leaking Underground Storage Tank (LUST) Program through this fund. Releases of hazardous substances from underground storage tanks in this state are currently addressed by Ecology through oversight of voluntary cleanup actions by tank owners or through enforcement actions.

II. UNDERGROUND HOME HEATING OIL TANKS

Leaking underground home heating oil tanks may present a threat to ground water quality. Both federal and state regulations adopt a less aggressive approach to regulation of heating oil tanks, however, because of differences in the constituency and migration in the soil of fuel oils.

Potential problems associated with home heating oil tanks include leakage from operating tanks and releases from improperly abandoned tanks containing residual product. Many of the existing home heating oil tanks within King County are likely to be bare steel tanks without cathodic protection and, as such, a large percentage may be leaking or will leak in the future.

The number of underground home heating oil tanks in operation within King County is unknown, primarily because the number and locations of such tanks is considered proprietary information by the heating oil industry. The King County Department of Assessments has information regarding the heat source for residences excluding mobile homes. The information is not necessarily accurate, however, because it is often not updated when oil to gas conversions occur. The frequency of underground home heating

oil tank abandonment is estimated at 20%.

The UFC requires that tanks which have remained unused for a period of one year must be abandoned in a manner prescribed by Article 79, which generally involves removal and proper disposal of the tank. The tank may be abandoned in place at the discretion of the fire chief (or in the case of King County) by the Fire Marshall. Whether removed or abandoned in place, remaining product must be removed and disposed of properly. The tank must be filled with concrete or other approved substance if abandoned in place.

Compliance with UFC requirements has been historically very low according to the King County Fire Marshall's Office. There are many home heating oil tank owners that are apparently unaware of their responsibilities under the UFC. Tank owners that are aware of their responsibilities are often reluctant to undertake proper tank abandonment because of the relatively high cost, about \$2,000 per tank. This cost could be double this amount or more, if soil sampling and removal of contaminated soil are required. Part of the expense in unincorporated King County includes the cost of a permit. The fee, presently at \$232.90, is the same as that paid by those who are removing a commercial tank. (These costs were current for 1991.)

GOAL

To ensure that underground chemical and fuel storage tanks are managed adequately to prevent contamination of ground water in King County.

SOUTH KING COUNTY To ensure that underground storage tanks are managed adequately to prevent contamination of groundwater.

ISSUES

Issue 1. Augment State UST Program. The underground storage tank (UST) management program administered by Ecology does not have resources to field check and monitor for compliance with regulations.

UST - 1A Augment State UST Program. ~~Petition~~ King County and cities ~~to~~ will jointly petition Ecology to designate GWMA's as Environmentally Sensitive Areas (ESAs) under Chapter 90.76 RCW Underground Storage Tanks.

SOUTH KING COUNTY Action 1. Petition King County and cities to jointly petition Ecology to designate GWMA's as Environmentally Sensitive Areas (ESAs) under Chapter 90.76 RCW Underground Storage Tanks.

UST - 1B Augment State UST Program. ~~Petition~~ King County and cities ~~to~~ will enhance current inspection of underground storage tank installation and removal in ESAs to include the relevant requirements of Chapter 173-360 WAC - Underground Storage Tank Regulations.

UST - 1C Augment State UST Program. ~~Petition Ecology to provide training to local governments regarding additional physical requirements~~ King County and cities will jointly develop a training program for inspectors regarding additional requirements of the Underground Storage Tank Regulations in order to carry out the inspections referred to in UST - 1B Action 2.

UST - 1D Augment State UST Program. ~~Petition~~ King County and cities ~~to~~ will jointly evaluate local program by: 1. monitor Ecology annual reports to the Legislature to evaluate the effectiveness of the state UST program; 2. monitor effectiveness of local programs; 3. determine whether additional local program elements are needed upon completion of annual reviews in order to meet Ground Water Management Program (GWMP) goals for ESAs; and 4. develop additional local program elements as needed.

NOTE: Training and evaluation, along with other program aspects, is discussed under implementation. These don't need to be specific actions.

SOUTH KING COUNTY Action 2. Petition King County and cities to enhance current inspection of underground storage tank installation and removal in ESAs to include the relevant requirements of Chapter 173-360 WAC - Underground Storage Tank Regulations.

SOUTH KING COUNTY King County Fire Marshal's office and local fire service jurisdictions should assume responsibility for underground storage tank management, provided that they have the capacity or interest.

NOTE: this will be covered in the implementation section discussion.

Discussion. Designation of ESAs in King County by Ecology will give local jurisdictions an opportunity to build upon the Ecology program. Ecology has already indicated that their program will not involve field inspections of each individual underground storage tank. Many of the compliance activities associated with the Ecology rules will be conducted through the mail. Ecology anticipates that their underground storage tank program will stress a self policing approach. Preventing contamination of some of the more highly vulnerable aquifers in King County from the operation of underground storage tanks may require a more comprehensive management program than that currently envisioned by Ecology. An enhanced program may be developed and implemented commensurate with the importance of the ESAs as areas contributing recharge to important public water supplies.

Designation of the entire GWMA would create workable boundaries for administrative purposes and is supportable from a protection standpoint since GWMA boundaries are based on ground water divides. WAC 173-360-510 provides that GWMA's may be readily designated as ESAs.

Funding sources for state and local activities are connected. Ecology charges an annual tank fee to all UST owners. If an ESA is established, Ecology may charge a supplemental fee for tanks in the area. Ecology may pass through some of this supplemental fee to local programs, however, Ecology must retain a sufficient portion of the fees necessary for operation of the state program. This may be the entire fee, since the fee set by the legislature is very low. Local jurisdictions are prohibited by RCW 90.76 from assessing additional annual tank fees. Local programs may assess a permit fee in ESAs to support local program activities.

So, State and local governments are limited in their ability to assess industry for program costs. Local governments that are interested in developing enhanced UST programs should determine which aspects of the state program most need enhancement and offer possibilities for adequate funding, given the prohibitions against increased annual tank fees contained in RCW 90.76 and the small possibility of a portion of the supplemental ESA fees.

Tank installation and removal are critical steps in the management of underground storage tanks. Removal is particularly important because of the opportunity to detect and clean up previous spills. These are activities that are already inspected for compliance with the Uniform Fire Code (UFC). This action offers the possibility of expanding the existing inspection program to include relevant requirements of the Underground Storage Tank Regulations. Increased permit fees to offset inspection costs would not violate the prohibition against raising the annual tank fee. Staff training is an aspect of the program that could be funded by pass-through monies collected by Ecology based upon status of the GWMA's as ESAs.

Feasibility of an enhanced inspection program will rest upon resolution of a number of issues by state and local government:

a. Each of the existing GWMA's except Vashon Island includes one or more incorporated communities. Decisions regarding the nature of an enhanced local program must be jointly made by all of the affected jurisdictions.

b. Local governments will need to develop a proposal and submit it to Ecology. Ecology will determine whether the proposal meets the requirements of laws and regulations governing designation of ESAs and provisions for stricter local programs. The amount of money collected by Ecology and available for passing through to the local program will have to be negotiated.

c. A key local decision involves delegation of the new responsibility. Both fire protection agencies and the Seattle-King County Department of Public Health, Environmental Health Division (EHD) could logically carry out the program. Fire protection agencies offer the advantage of current involvement in an existing inspection program. On the other hand, the EHD may be the most appropriate agency to implement the program because it has legal standing in all incorporated and unincorporated communities in King County and has been identified as the lead agency for ground water protection and management activities. It may be much simpler and offer consistency if a King County Board of Health (BOH) rule were to establish a County-wide program such as that in existence for on-site sewage disposal. It is not known whether a BOH rule could be implemented by the fire protection agencies but that possibility should be explored. At least one neighboring county has a dual program for tank removal inspection. The Tacoma-Pierce County Health Department inspects for environmental concerns while the fire protection agencies continue to inspect for fire code requirements. This arrangement is reported to be working well with good cooperation between the two entities involved. The dual program offers the benefit that fewer personnel must be trained to do inspections.

d. Staff must be trained in the installation and removal requirements of the Underground Storage Tank Requirements. Funds are needed to pay for this activity. A possible source is the supplementary annual tank fee Ecology collects in ESAs. It is planned that this money will be turned over to local governments for the purpose of carrying out enhanced local programs in ESAs.

e. A fee for the installation of new underground storage tanks will be needed to offset the costs incurred by the agency responsible for plan review and on-site inspections associated with the design and installation of new underground storage tanks. Plan review and on-site inspection costs can be quite high. Experiences in a neighboring county suggest that, on a time and material basis, an average of about \$300 to \$350 is expended by an agency responsible for plan review and on-site inspection of each new underground storage tank. King County Fire Marshall's Office currently charges \$125 for the first tank and \$39 for each additional tank for plan review and inspection under the UFC. For aggregate storage at one site of over 10,000 gallons the proposal is referred to the SEPA Section which requires an additional \$600 fee. (These fees were current as of 1991.)

f. Expansion of the enhanced program to other cities or unincorporated areas of the County should be considered. However, supplemental annual tank fees would not be available to train staff. It is possible that training could be provided to all jurisdictions in

the County for the same cost as to those in GWMA's. This possibility should be considered.

Implementation:

Task 1: Prepare and submit petition to designate GWMA's as Environmentally Sensitive Areas (ESAs). After ESA is designated, there may be additional work, such as publicity, mapping, and notifying affected agencies.

Task 2: To enhance current inspection program of underground storage tank installation and removal in ESAs to include the relevant requirements of Chapter 173-360 WAC - Underground Storage Tank Regulations, the following steps are needed:

1. determine local regulatory authority.
2. develop elements of an enhanced program, including training and evaluation.
3. determine role of local agencies in implementation. For example, King County Fire Marshal's office and local fire service jurisdictions could assume responsibility for underground storage tank management, provided that they have the capacity or interest.
4. amend ordinances as necessary to implement program.

Task 3: Develop and implement a training program for inspectors regarding additional requirements of the Underground Storage Tank Regulations in order to carry out the inspections referred to in Task 2. Management Committee must decide who is to provide this training. This program includes determining the additional training needed, identifying inspectors in need of this training, and train all inspectors within a given time frame.

Task 4. Determine how to modify local program based upon:

1. Ecology's annual reports evaluating the state UST program;
2. annually reviewing effectiveness of local programs. Need to develop evaluation methods.

Who:

Tasks 1, 2, 4: EHD, under Management Committee direction.

Task 3: Management Committee to determine.

When: as per implementation schedule.

Cost/Source of Funds: Minimum EHD staff: 0.5 FTE for three years. Other costs will be determined during development of program by the Management Committee. The enhanced local program is funded by industry in the form of increases in current inspection fees and supplementary annual tank fees. The latter may be used to pay for training of inspection staff. Other tasks could be funded through the aquifer protection fee.

Issue 2. Exempt Tanks. Chapter 173-360 WAC Underground Storage Tank Regulations are reactive in some respects. The regulations focus on monitoring and post-leak detection, rather than prevention of leaks. Construction and monitoring requirements,

~~while offering vast improvement over past practices, still allow leaks and consequently contamination of the environment. Additionally, certain classes of underground storage tanks are partially or completely exempt from federal and state regulation. Examples are tanks of 1100 gallons or less that store heating oil or home and farm tanks of the same size that store motor fuel for consumptive use on the premises. Other tanks are exempt from some of the requirements of federal and state regulations. Examples are heating oil tanks over 1100 gallons in size. NOTE: moved deleted text to discussion.~~

SOUTH KING COUNTY has not adopted an issue

~~UST - 2 Exempt Tanks. Petition the King County Board of Health to will adopt EHD will prepare an ordinance for King County Board of Health consideration requiring secondary containment for underground chemical storage tanks as defined by WAC 173-360-120 and for the following exempt or deferred tanks: heating oil tanks of all sizes and motor fuel tanks of 1100 gallons or less. The possibility of allowing or requiring above-ground storage in lieu of secondary containment should be considered.~~

SOUTH KING COUNTY Request that King County and the cities adopt an ordinance on underground storage tanks which is at least as stringent as the EPA and Ecology regulations.

NOTE: this would be covered under Issue 4 below.

~~12-18-91 Petition the King County Board of Health to adopt an ordinance requiring secondary containment for underground storage tanks as defined by WAC 173-360-120 and for the following exempt or deferred tanks: heating oil tanks of all sizes and motor fuel tanks of 1100 gallons or less. The possibility of allowing or requiring above-ground storage in lieu of secondary containment should be considered.~~

Discussion. Current state regulations focus on monitoring and post-leak detection, rather than prevention of leaks. They provide for leak detection methods which may not alert tank operators until ground water is already contaminated.

Requiring secondary containment would enhance current regulations by providing a method to prevent leaks. Secondary containment offers the best protection from contamination of the environment from leaks from USTs. It is both economically and technically feasible.

Secondary containment refers to the practice of enclosing the primary tank with a second impermeable barrier. The secondary vessel may be a separate container or it may be an integral component of the primary tank. Leak detection monitoring is provided in the space between the tanks.

The primary reason to consider secondary containment is because it offers the best prevention of leaks that contaminate soil and ground water. It is the only method that detects the potential for spill before the spill is introduced into the environment.

The BOH could impact the possibility of future contamination of ground water in a major way by requiring that this precaution be taken. The industry widely recognizes the advisability of secondary containment and most commercial installations now incorporate it.

The smaller, exempt tanks could also benefit from secondary containment. Most existing exempt tanks lack corrosion protection and many are probably leaking. Exempt tanks are home and farm tanks of 1100 gallons or less that store motor fuel for consumptive use on the premises and heating oil tanks of 1100 gallons or less; Also, heating oil tanks over 1100 gallons in size are exempt from some of the requirements of federal and state regulations. Secondary containment equipment is available for small tanks as well as large and is economically feasible.

Fire protection agencies already have programs to review plans for above and underground tanks that are fee-supported. A requirement for secondary containment or above-ground storage would have major impact on the existing inspection programs.

Implementation:

Task 1: The Management Committee needs to determine who would enforce this ordinance. It may not be feasible to have the BOH pass an ordinance that the Fire Marshall enforces.

Task 2: Prepare an ordinance for King County Board of Health (BOH) (or other appropriate body) consideration requiring secondary containment for underground storage tanks (as in WAC 173-360-120) and for exempt tanks.

Who: EHD, under Management Committee advisement.

When: as per implementation schedule

Cost/Source of Funds: EHD staff 160 hours minimum. Aquifer protection fees will be needed for staffing the effort to draft the ordinance and carry it through public hearings and BOH review. Plan review by fire protection agencies would be fee supported.

~~Issue 3. Heating Oil Tanks: Location. We do not know~~—The extent of a possible threat to ground water associated with underground heating oil tanks, including those serving single family residences is unknown. ~~We have not thoroughly evaluated literature addressing research that has been done on this topic. We also do not know~~ It is also unknown how many of these tanks are in the GWMA's or where they are located.

~~Issue 4. Heating Oil Tanks. Homeowners and some small businesses may be often~~ are unaware of requirements for the proper operation and abandonment of underground heating oil tanks. There are currently no programs in place to educate citizens or provide incentives for proper operation and abandonment. Additionally, they are reluctant to remove tanks properly and under permit due to the expense ~~and fear of~~ associated with finding contaminated soil. ~~The GWACs may wish to recommend the nature of a program to address this potential problem if the study referred to in Issue 4. indicates that further action should be taken.~~

NOTE: these two issues are now combined. Need to determine the authority for local governments to enforce Article 79, evaluate potential threat first, and locate tanks, and educate tank owners. Staff recommends adopting replacement Issue below:

Issue 3. Heating Oil Tanks. There is some disagreement whether Article 79 of the UFC contains clear authority for the local Fire Marshall to regulate heating oil tanks. This should be determined at the State level.

Home heating oil tanks may not be maintained and abandoned properly. Homeowners often are unaware of requirements for the proper operation and abandonment of underground heating oil tanks. There are currently no programs in place to educate citizens or provide incentives for proper operation and abandonment. Also, homeowners are reluctant to abandon tanks properly and under permit due to the expense associated with remediating a site with contaminated soil.

Also, the extent of the threat to ground water associated with underground heating oil tanks, including those serving single family residences, is unknown. Locating these tanks would help in determining the potential threat. It is unknown how many of these tanks are in the GWMA's or where they are located.

SOUTH KING COUNTY has not adopted an issue

NOTE: staff recommends the original alternative and actions for Issues 3 and 4 be deleted and replaced with new actions below:

Alternative 2. Petition King County and cities to jointly develop a pilot program that:

- a. educates citizens and businesses regarding potential threats to ground water quality associated with improper operation and abandonment of heating oil tanks;
- b. explores options for better tank management by owners including waiver of permit fee to remove unused tanks, cooperative programs with industry to help defray costs of proper abandonment, disclosure at point of sale of real estate, mandatory tank integrity testing combined with a tagging program (prohibit delivery of product to untagged tanks), requirement for certification of proper abandonment prior to conversion to other methods of heating;
- c. explores the possibility of allowing modified abandonment rules for small tanks, i.e. pump and dispose properly of contents and fill with concrete (Note: There is not uniform agreement among fire protection agencies as to requirements for abandonment. Some jurisdictions, such as Seattle, are allowing pump and abandon in place while others, King County, are not. This may be a suitable compromise to address small heating oil tanks.);
- d. explores options for assisting owners with cleanup of contaminated soils;
- e. provides evaluation and recommendations to elected officials including the advisability of expansion of all or parts of the pilot program to other areas in King County.

NOTE: Proposed new:

UST - 3A Heating Oil Tanks: Local Legal Authority. The Washington State Department of Ecology (Ecology) will seek an Attorney General's opinion regarding the authority of the King County Fire Marshall and city fire chiefs to regulate the installation and removal of underground heating oil tanks through UFC provisions.

UST - 3B Heating Oil Tanks: State Code Amendment. Ecology will seek an amendment to the State Building Code (Chapter 51-16 WAC) to make underground heating oil tanks subject to the provisions of Article 79 of the Uniform Fire Code (UFC) if the Attorney General's opinion indicates that such tanks are not now regulated.

UST - 3C Heating Oil Tanks: Abandonment and Maintenance. EHD will prepare an ordinance for the King County Board of Health's consideration regarding underground tanks containing the following provisions:

1. For all USTs:
 - a. Disclosure at the time of sale of any property in King County of the number, location, and legal status of existing underground chemical storage tanks;
 - b. Require secondary containment for new tanks.
2. For home heating oil tanks:
 - a. Proof from the Fire Marshall or fire chief that the underground heating oil tank was abandoned in accordance with regulations prior to release of any permits associated with energy conversions (gas piping, electrical, etc.);
 - b. Require underground heating oil tanks that are abandoned in place are filled with a material that precludes further storage of any chemical in the tank;
3. For exempt tanks:
 - a. Require all underground chemical storage tanks without secondary containment that are in use and exempt from the state Underground Storage Tank Regulations must be tested at regular intervals for integrity by qualified personnel and tagged to either allow or prohibit future product delivery.

UST - 3D Heating Oil Tanks: Location. King County and cities will jointly explore ways to quantify the problem within King County including the development of a database locating these tanks.

UST - 3E Heating Oil Tanks: Education. King County and cities will jointly educate homeowners and exempt tank owners regarding tank abandonment requirements of the UFC through the GWMP Education Program.

NOTE: New actions that relate to previous adopted GWAC actions are shown in {}:

SOUTH KING COUNTY (12-18-91 Alternative 2, sections a to e is now Action 1. Action 2 is added as follows:)

At point of property sale:

1. Disclosure of existence of underground fuel oil tank. {UST - 3C}
2. Testing integrity of the tank. {UST - 3C}
3. Certification (notify buyer that only certified tanks may be filled.) {UST - 3C}

Prohibit new underground fuel tanks, but still allow above ground fuel tanks with secondary containment.

NOTE: Staff recommends adopting new wording and deleting this sentence because above ground tanks are not covered in this issue and total prohibition of UST not practical. The existing and these proposed regulations and programs should cover groundwater concerns.

Strengthen enforcement of the existing abandonment program. {UST - 3A, 3B, 3C}

A certification program be adopted and implemented with testing at a prescribed periodicity with enforcement and penalties. {UST - 3C}

A pilot program be used to refine the certification program and incentives for compliance.

(2-13-91) It will be requested that BALD waive the permit fee for tank removal during pilot program.

SOUTH KING COUNTY (January 30, 1991) Alternative 2. Develop and distribute educational materials intended to increase the level of public and the home heating oil industry awareness concerning potential ground water contamination problems associated with the operation and abandonment of home heating oil tanks. {UST - 3E}

(12-18-91 Under Issue 3, Alternative 2, adopted Alternative 2 as written.)

Alternative 2. Petition King County and cities to jointly: 1. study the available literature regarding possible threats to ground water associated with underground storage of heating oil;

2. if warranted based on the findings of 1. above, explore ways to quantify the problem within King County including the development of a database locating these tanks. {UST - 3D}

NOTE: SKCO GWAC took action twice. Last time adopted as written.

Discussion for UST - 3A Heating Oil Tanks: Local Legal Authority. It is clear to King County that there is regulatory authority under Article 79 of the UFC for the regulation of underground heating oil tanks. However, with the discrepancy in interpretation among the cities, this should be clarified at the State level. This needs to be resolved so that the activities under 3C and 3D can be assigned.

Implementation:

Task 1: Review problem and ordinances

Task 2: Prepare question(s) for State Attorney Generals Office

Task 3. Submit to State Attorney Generals Office.

Who: EHD, under the Management Committee, through Ecology.

When: Year 1

Cost: EHD: 320 hours. Funding provided by aquifer protection fee.

Discussion for UST - 3B Heating Oil Tanks: State Code Amendment. If the State Attorney General's Office finds that the Article 79 does not give local governments the authority, then the State Building Code will need to be revised.

Implementation:

Task 1: Write revision with appropriate staff at State Building Code Council, propose revision; implement revision process, public hearings, etc.

Who: Ecology.

When: Year 1.

Cost: to be determined during concurrence.

Discussion for UST - 3C Heating Oil Tanks: Abandonment and Maintenance. Requiring disclosure of any tanks on a piece of property would provide a source of information for the database on tank location. This would enable King County to provide information on a specific property to anyone in need of the information. This would also provide the Fire Marshal's Office information on heating oil tanks. The education program could include these properties for direct mail or other educational activities.

Requiring secondary containment for new tanks would close a gap in the current federal and state regulations. Federal and state regulations do not require secondary containment of USTs. This measure would help prevent groundwater from becoming contaminated. Current regulations only require leak detection, which may not alert tank operators until after ground water is contaminated. Secondary containment is where the primary tank is enclosed within a second impermeable barrier, with some provision for all or partial containment of the tank volume. Combining secondary containment with interstitial monitoring can detect leaks before they escape into the environment.

Requiring proof that the underground heating oil tank was properly abandoned before any permits associated with energy conversions (gas piping, electrical, etc.) are issued will provide a method to ensure that fewer tanks are improperly abandoned upon energy conversion. This would require an additional check to be reviewed by the permit issuing agency, but a standard form could be developed to provide this information.

There is a potential problem with the current requirement for material used to fill tanks. If for some reason the tank cannot be removed, the tank must be filled with inert material, generally interpreted to mean concrete or other approved substance. However, sand and other porous material is allowed. This type of material would allow storage of some liquid product, which could be another contamination source for groundwater. The local regulation of abandoning tanks in place could require that the material used to fill tanks be concrete or other material that would not allow storage of any other material in the tank.

Requiring that exempt tanks are tested and tagged would ensure that leaking tanks don't receive more product. This would also help address the question whether groundwater is being contaminated from these tanks. These tanks location could be added to the database for analysis. This is a stringent requirement that would provide a lot of

information. A future problem that would need to be addressed is what would be done with the information, and if there would be any follow-up.

Implementation:

Task 1: Draft ordinance wording, present for King County Board of Health's consideration.

Who: EHD.

When:

Cost: Time: 160 hours. Aquifer protection fees will be needed for staffing the effort to draft the ordinance and carry it through public hearings and BOH review.

Discussion for UST - 3D Heating Oil Tanks: Location. A database of underground storage tank locations could be used to help analyze the threat to groundwater from tanks, and to provide a client list for educational activities. The database could include information gathered from all of the above activities, and other sources. This information could be compared to sensitive areas and leaking tank reports from Ecology and analyzed by EHD/Management Committee to determine if current program meets the groundwater protection goal. This information could also be used to help deliver information from the Education Program to tank owners.

Implementation:

Task 1: Develop a database on tank location by collecting and entering information (existing and new);

Task 2: maintain database;

Task 3: analyze periodically;

Task 4: provide location information to Education Program, other users such as Ecology.

Who: EHD, under Management Committee direction.

When: as per implementation schedule

Cost/Source of Funds: 0.25 FTE, aquifer protection fee.

Discussion for UST - 3E Heating Oil Tanks: Education. Including home heating oil tanks in the overall GWMP Education Program will help address the low level of compliance with the requirements for home heating oil tank abandonment. Homeowners are unaware of their responsibilities under the UFC, probably because there are no programs on proper maintenance and abandonment. By providing educational material to tank owners, an increase in the community knowledge about the problem, and, hopefully, an increase in the numbers of tank owners that comply with the regulations would result. Also, by increasing community awareness, it is expected that home purchasers would require information on tank status be disclosed.

Implementation: this will be included in the Education Program.

3.3.3 GROUND WATER QUALITY ISSUES RELATING TO ON-SITE SEWAGE DISPOSAL SYSTEM USE IN KING COUNTY

Ground water contamination associated with domestic on-site sewage system 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 since it is highly resistant to removal from treatment mechanisms present in the soil profile. Bacteria and viruses can be attenuated during migration through a few feet of fine to medium textured soils provided unsaturated flow conditions can be maintained. However, coarse textured, excessively permeable soils are ineffective in removing bacteria and viruses. Also, domestic effluent often contains volatile and semi-volatile organic compounds at very low levels. These organic chemicals are generally residues from household cleaning and paint products, and are known as household hazardous wastes. If on-site sewage systems are improperly designed or constructed, installed in inadequate soils, used at too high of a development density, or used to dispose of non-domestic wastewater, they can adversely impact surface and ground water quality as well as public health.

There is an extensive regulatory system currently in place at the state and local level to prevent adverse environmental impacts from the use of on-site sewage disposal systems. That regulatory system is undergoing modifications at the state level that will further strengthen the ground water protection provisions of applicable on-site sewage system regulations and standards.

Controls on system density and improved design characteristics appear to have minimized the threat to ground water quality posed by new individual residential on-site systems. However, within the various Ground Water Management Areas, there may be existing high density developments served by conventional on-site sewage systems. To date, water quality problems associated with such developments have been not been documented. Also, extensive ground water monitoring efforts to identify problems associated with on-site sewage systems have not been undertaken.

GOAL

To promote on-site sewage disposal practices that are effective in protecting ground water resources from possible adverse impacts.

NOTE: All GWACS adopted goal as written

ISSUES

Issue 1: Nitrate Concerns. ~~The designs of most of the individual, single-ownership commercial, single-ownership multifamily, and smaller community on-site sewage disposal systems installed in Type 1 soils prior to April 1987, the implementation date of King County Board of Health Title 13, did not incorporate enhanced treatment technology. These systems often support development densities that exceed one residential unit, or equivalent, per acre. The poor treatment efficiency of conventional on-site sewage systems installed in coarse textured soils suggests a potential for nitrate contamination of underlying ground water, especially in areas where the density of on-site sewage systems is relatively high. Nitrate concentrations may build up in the zone of contribution to public water systems to unacceptable levels resulting in irreversible loss of drinking water supplies.~~

~~In addition, larger on-site sewage systems (receiving flows of between 3,500 and 14,999 gallons per day) installed in type 1 soils prior to 1979, the implementation date of the Washington Department of Health's larger system guidelines, may also lack enhanced treatment technology and may be supporting development densities greater than one unit per acre. Such systems may be treating potentially adverse impacts on underlying ground water.~~

NOTE: All areas adopted original issue wording. Staff recommends revised issue for brevity.

OS - 1A Nitrate Concerns. The GWAC requests that the following be considered by the Management Committee: 1. Require that Wellhead Protection Programs for systems serving over 1000 connections incorporate nitrate loading analysis in determining the level of risk to public water supplies associated with on-site sewage disposal systems and other sources of nitrate; and 2. Work with land use authorities to require alternative methods of sewage disposal where nitrogen levels are found to be unacceptable (more than 5 mg/l).

NOTE: Staff recommends replacing the original adopted action with this wording. The original wording was too broad. Evaluating every potential site in King County does not focus on WHPP, the most critical part of the GWMA and where controls will most likely be effective. Please see note below discussion.

SOUTH KING COUNTY Alternative 2: Petition King County to identify areas where the use of conventional on-site sewage systems may be adversely affecting ground water quality, conduct investigations in those areas, and where necessary, seek replacement of existing on-site sewage systems with suitable alternative wastewater disposal facilities.

Discussion: Taking no action would continue to expose the public to potential loss of its drinking water supplies. The extent of the risk, however, would remain unknown if nitrate loads are not measured, modeled, and predicted. It is possible because of a lag time in the travel of nitrate to wells that by the time the problem is detected it would be too late to remedy the situation.

Public water system purveyors are required to delineate Wellhead Protection Areas (WHPA) and develop Wellhead Protection Programs (WHPP). WHPAs include the surface and subsurface area surrounding a well or wellfield that supplies a public water system through which contaminants are likely to pass and eventually reach the well(s). Wellhead protection areas must be managed by a community in order to protect ground water based drinking water supplies. Research has shown that, when median nitrogen levels are 6 mg/l or greater, 10 percent of nitrate samples will be greater than the 10 mg/l maximum contaminant level. Other communities in the nation have set a limit of 5 mg/l to provide a margin of error and safety.

An analysis of current and future loading will enable planners and public officials to make informed decisions regarding land use and water use. Where current nitrate levels threaten public water supplies, decisions regarding future water supply will need to be made. Such alternatives as a new drinking water source or the extension of public sewers to the community can be considered. The nitrate loading analysis will also enable planners and public officials to make decisions regarding future land use in the WHPA.

NOTE: The previous action would have identified all areas in each GWMA with Type 1 soils with systems installed prior to April 1987. Susceptible areas would have been identified, then, in the apparent high risk areas, the Seattle-King County Health Department would conduct ground water quality investigations to determine the extent of adverse impacts on ground water from on-site sewage systems. If the investigations indicated that significant ground water quality deterioration has occurred or is likely to occur, the King County Planning and Community Development Division, the Department of Ecology, and, where applicable, the nearest responsible sewer utility will be requested to expedite measures to mitigate impacts from the existing on-site sewage systems. Such mitigation could have included replacement of the on-site sewage systems with public sewers or modification of existing systems by adding enhanced treatment.

It was expected that considerable difficulties would occur in implementing a program geared towards seeking replacement of existing on-site sewage systems with sewers or alternative on-site technology. Strong opposition to sewer expansion may be encountered in some communities because sewer availability may promote or facilitate additional growth and development. In addition, public opposition may result from costs to individual property owners associated with substituting existing systems with either alternative on-site technology or public sewers.

However, if this activity is associated with WHPP, a focused and defined area where a drinking water system is located, this type of resistance can be minimized.

Implementation:

Task 1: Require that Wellhead Protection Programs for systems serving over 1000 connections incorporate nitrate loading analysis in determining the level of risk to public water supplies associated with on-site sewage disposal systems and other sources of nitrate; Who: Management Committee

When: as per implementation schedule during development of the WHPP.

Cost:

Fund Source: aquifer protection fund.

Task 2: Work with land use authorities to require alternative methods of sewage disposal where nitrogen levels are found to be unacceptable (more than 5 mg/l).

Who: Management Committee

When: after analysis

Cost:

Fund Source: aquifer protection fund.

Issue 2: Hazardous Materials. Because some types of commercial, industrial, and institutional facilities use or store hazardous materials in their day to day operations or dispose of unregulated, small quantities of hazardous wastes, there may be an opportunity for hazardous materials or wastes to be inadvertently or intentionally discharged to on-site sewage disposal systems serving those types of facilities.

OS - 2A Hazardous Materials. ~~Petition~~ King County will to: 1. inventory commercial, industrial, and institutional facilities served by on-site sewage disposal systems which potentially use, store, or dispose of hazardous materials; 2. educate operators regarding hazardous materials management, and; 3. selectively monitor those facilities that appear to represent a significant risk to ground water quality.

SOUTH KING COUNTY Action 1: Petition King County to support the inclusion of the following in Local Hazardous Waste Management Plan: 1. inventory commercial, industrial, and institutional facilities served by on-site sewage disposal systems which potentially use, store, or dispose of hazardous materials; 2. educate operators regarding hazardous materials management; 3. selectively monitor those facilities that appear to represent a significant risk to ground water quality.

NOTE: Staff recommendation to remove additional wording. LHWMP is in place, there is not a way to amend it at this time. It doesn't include provision to inventory facilities based on sewage system. #2 Is already part of the LHWMP. LHWMP can not do #3 (outside of its authorized responsibilities), King County has to.

Discussion: A number of important programs are being implemented as a result of the Local Hazardous Waste Management Plan for King County. However, those activities are not currently designed to emphasize the unique risks associated with hazardous materials introduced into on-site sewage systems.

Once released to the soil column, hazardous materials or hazardous wastes can potentially migrate to underlying ground water. Since low levels of some hazardous materials in drinking water can pose a high level of risk to human health, even releases of small quantities of hazardous materials to an on-site sewage system can have a profound impact on underlying ground water quality.

The inventory proposed here will enable Seattle-King County Health Department Environmental Health Division to identify facilities that are likely have the types and quantities of hazardous substances on the premises which would suggest a relatively high risk of a release of those substances to the on-site sewage system. Those high risk

facilities will be targeted for earliest possible field audits and educational activities under the Local Hazardous Waste Management Plan. The educational activities will provide facility owners and operators with information concerning alternative products, proper hazardous substance storage, handling, recycling, disposal, and spill containment. Should the field audit reveal any facilities where wastewater other than that of residential/domestic quality is being generated, the owner/operator will be referred to the Department of Ecology for possible regulation under the State Waste Discharge Program.

Changes in occupancy of commercial, industrial, and institutional facilities will be carefully monitored by Seattle-King County Department of Public Health Environmental Health Division and the inventory periodically updated. Seattle-King County Department of Public Health Environmental Health Division will develop and implement this program within the context of the Local Hazardous Waste Management Plan.

This action should prove moderately effective in limiting the release of hazardous substances to on-site sewage systems serving commercial, industrial, and institutional facilities.

Implementation:

Task 1: Prepare inventory

Task 2: educate operators

Task 3: carry out monitoring program

Who: Seattle-King County Department of Public Health Environmental Health Division. Some education of operators is being done through the LHWMP.

When: As per implementation schedule

Cost: The costs incurred by the Seattle-King County Health Department will be offset by fees collected under the Local Hazardous Waste Management Plan and the aquifer protection fund.

~~OS - 2B Hazardous Materials. Action 2: Petition Seattle-King County Department of Public Health Environmental Health Division King County Board of Health~~ will to: 1. explore legal mechanisms for prohibiting the use and/or sale of products marketed as on-site sewage system additives which are intended to dissolve grease accumulations or to reduce the frequency of sludge removal from the septic tank and 2. prepare an ordinance for King County Board of Health's consideration which would prohibit the sale and/or use of such products within the cities and unincorporated areas of King County.

SOUTH KING COUNTY Action 2: Petition King County Board of Health to: 1. explore legal mechanisms for prohibiting the use and/or sale of products marketed as on-site sewage system additives which are intended to dissolve grease accumulations or to reduce the frequency of sludge removal from the septic tank and 2. prohibit the sale and/or use of such products within the cities and unincorporated areas of King County.

Note: This action is to be relocated under Issue #3.

NOTE: Staff recommendation to keep this issue here. This is an "intentional discharge" of hazardous material and so is not an "inadvertent waste" which issue 3 covers.

Discussion: Seattle-King County Department of Public Health Environmental Health Division will conduct an assessment of the feasibility of prohibiting the use or sale of septic tank additives that contain chemicals or substances capable of contaminating ground water. Such additives may not only be harmful to underlying ground water but may adversely affect on-site sewage system operation. The feasibility assessment will explore legal mechanisms for such a prohibition, evaluate the potential for adequate enforcement, and identify all associated costs. The potential effectiveness of prohibiting septic tank additives cannot be determined until the feasibility assessment is completed. If it is found to be feasible, Seattle-King County Department of Public Health Environmental Health Division will prepare amendments to Title 13 of the Code of the King County Board of Health.

Implementation:

Task 1. Assess feasibility

Task 2. Prepare amendments to Title 13 of the Code of the King County Board of Health

Task 3. Adopt amendments

Who:

Task 1, 2: Seattle-King County Department of Public Health Environmental Health Division

Task 3: King County Board of Health

When: as per implementation schedule

Cost: 80 hours (EHD)

Fund Source: aquifer protection fund.

OS - 2C Hazardous Materials. ~~Action 3: Petition King County to~~ Seattle-King County Department of Public Health Environmental Health Division will prepare amendments to Title 13 of the Code of the King County Board of Health to expressly prohibit the use of on-site sewage systems for disposal of any materials or substances other than domestic sewage as defined WAC 246-272-010 for King County Board of Health consideration.

SOUTH KING COUNTY Action 3: Petition King County to amend Title 13 of the code of the King County Board of Health to expressly prohibit the use of new on-site sewage systems for disposal of any materials or substances other than domestic sewage as

defined WAC 246-272-010.

NOTE: Staff recommendation to delete "new" as action is supposed to apply to old and new systems, otherwise this will not be as effective.

Discussion: Under this action, Seattle-King County Department of Public Health Environmental Health Division would be requested to prepare amendments to Title 13 to prohibit the discharge of non-domestic wastewater to on-site sewage systems and submit the amendments to KCBOH for approval. The primary intent of the alternative is to strengthen Seattle-King County Department of Public Health Environmental Health Division's existing authority to prevent the discharge of non-domestic wastes to on-site sewage systems, particularly wastes containing hazardous materials.

Enforcement of this provision will require careful review of site applications for on-site sewage disposal by Seattle-King County Department of Public Health Environmental Health Division staff. Seattle-King County Department of Public Health Environmental Health Division should consider requiring discharge monitoring reports from operators of commercial or institutional establishments. Strengthening the regulatory authority to prevent discharges of non-domestic wastewater may assist in enforcement actions.

Implementation:

Task 1. Prepare amendments to Title 13

Task 2. Adopt amendments

Who:

Task 1: Seattle-King County Department of Public Health Environmental Health Division

Task 2: King County Board of Health

When: as per implementation schedule

Cost: 80 hours (EHD)

Fund Source: aquifer protection fund.

Issue 3: Household hazardous wastes. Household hazardous wastes can enter the wastewater stream when residues from cleaning and paint products or quantities of unwanted chemical substances are disposed of in a sink or toilet. When discharged to an on-site sewage system, household hazardous wastes may pass through the system and migrate to underlying ground water. While wastes from any single residence are not likely to have detectable impacts on underlying ground water, the cumulative effects of many residences may be significant. Many people are unaware that common household products often contain chemical compounds that can represent an environmental or even public health hazard if improperly handled.

OS - 3A Household hazardous wastes ~~Alternative 2: Alternative 2 is comprised of 4 related actions which are considered separately for ease of discussion. Action 1: Petition King County will~~ to emphasize the risks to ground water associated with the disposal of

household hazardous wastes to on-site sewage systems when conducting household hazardous waste educational activities as part of the Local Hazardous Waste Management Plan.

SOUTH KING COUNTY adopted Action 1 as written.

Discussion: Seattle-King County Department of Public Health Environmental Health Division will undertake measures to increase public awareness concerning the potential impacts of discharging household chemical products to an on-site sewage system. Such measures will be an extension of activities scheduled as part of the Local Hazardous Waste Management Plan.

Implementation:

Task 1: Conduct educational activities

Who: Seattle-King County Department of Public Health Environmental Health Division

When: as part of ongoing LHWMP.

Cost:

Fund Source: LHWMP fees.

OS - 3B Household hazardous wastes ~~Action 2: Petition~~ King County will ~~to create an ongoing source of funding to develop~~ and carry out a public education program intended to increase the awareness of proper on-site sewage system operation and maintenance, including the risks associated with disposal of hazardous wastes in such systems.

NOTE: Change to wording to emphasize the educational program. We do not need to develop a funding mechanism if the aquifer protection fee is approved.

SOUTH KING COUNTY adopted the Action as written.

Discussion: This will be included in the overall GWMP education program, which includes:

1. Seattle-King County Department of Public Health (Seattle-King County Department of Public Health Environmental Health Division) will review applicable educational efforts underway to determine whether the protection of ground water is emphasized. Seattle-King County Department of Public Health Environmental Health Division will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs.

2. Seattle-King County Department of Public Health Environmental Health Division will report to GWMP Management Committee on the adequacy of existing educational programs to address ground water concerns. This report will include proposed changes as a result of review and discussions carried out in 1. above.

3. Seattle-King County Department of Public Health Environmental Health Division will develop a supplemental educational program to address deficiencies

identified above, if necessary and present to the Management Committee for review and adoption.

4. Seattle-King County Department of Public Health Environmental Health Division will coordinate implementation of the program which may involve actions by Seattle-King County Department of Public Health Environmental Health Division and other agencies and jurisdictions.

One item that has been identified to be done for this action is that prior to any scheduled reprinting, the existing public information pamphlet concerning on-site sewage system maintenance and operation will be amended to provide instructions concerning proper household hazardous waste disposal practices.

Implementation: as per Education Section.

Issue 4. Operation and Maintenance. Homeowners may not be aware of the location and proper operation and maintenance of on-site sewage disposal systems.

NOTE: This issue added because the following two issues did not fit under household hazardous wastes.

OS - 4A Operation and Maintenance. Action 3: ~~Petition King County to~~ Seattle-King County Department of Public Health Environmental Health Division will prepare amendments to Title 13 of the Code of the KCBOH for King County Board of Health's consideration to require that the as-built on-site sewage disposal system plan be recorded with the property deed in order that it be transferred with the title at the time of property purchase. In addition, information concerning the relationship between on-site system maintenance and operation practices and ground water protection should be added to the standard as-built plan form.

SOUTH KING COUNTY adopted the Action as written.

Discussion. Under this action, Seattle-King County Department of Public Health Environmental Health Division will prepare amendments Title 13 concerning recording of as-built plans and submit the amendments to the KCBOH for approval. An as-built plan is a scale drawing of an on-site sewage disposal system as it is actually installed at a construction site. It is submitted to Seattle-King County Department of Public Health Environmental Health Division by the designer after construction is completed.

The as-built plan serves the important function of demonstrating the location and configuration of the on-site sewage system at a site. The standard as-built form of Seattle-King County Department of Public Health Environmental Health Division also provides information concerning general maintenance and operation of the system such as recommended frequency of septic tank pumping. That information could be expanded to include information concerning household hazardous waste disposal practices.

Currently, there is no requirement for the home builder or first owner to provide the as-built plan to subsequent owners of a home. By requiring the as-built to be recorded with the deed, the as-built will be provided automatically to subsequent owners with the title report.

This action should be highly effective in ensuring that critical information concerning the location and configuration of the on-site sewage system is transferred to a home purchaser. It also affords an opportunity to transmit information concerning proper on-site sewage system maintenance and operation. Recording of the as-built will result in nominal cost to the initial homeowner. No significant obstacles to implementation are anticipated.

Implementation:

Task 1. Prepare amendments to King County Board of Health Title 13

Task 2. Adopt amendments

Who:

Task 1: Seattle-King County Department of Public Health Environmental Health Division

Task 2: King County Board of Health

When: as per implementation schedule

Cost: 80 hours (EHD)

Fund Source: aquifer protection fund.

OS - 4B Operation and Maintenance. ~~Action 4: Petition~~ King County will ~~to~~ explore the feasibility of ~~developing and enacting~~ a county-wide on-site sewage system management program effectiveness for ground water protection.

SOUTH KING COUNTY Action 4: Petition King County and water and sewer districts to develop and carry out a comprehensive educational program regarding proper maintenance of on-site sewage systems with emphasis on the promotion of water quality.

The Federal Way Water and Sewer District Water Quality Protection Program will be considered a pilot study for the South King County Ground Water Management Program. If the program is found to be successful, the GWAC will consider petitioning other jurisdictions in the GWMA to adopt similar programs. If the program is not successful, the GWAC will consider a mandatory on-site sewage system management program.

Discussion. Seattle-King County Department of Public Health Environmental Health Division will conduct a feasibility assessment concerning the effectiveness of a county-wide on-site sewage system management program on ground water quality. The purpose of an on-site sewage system management program is to help ensure proper operation and maintenance of on-site sewage systems. Historically, a failing system was one where the sewage backed up into the house, or sewage surfaced on the ground. These types of failures usually affected human health (by direct contact) and surface water quality. Systems that affect ground water quality do so by subsurface discharge to groundwater. This type of impact should be minimized by the on-site sewage regulations that require enhanced treatment in those soils that do not provide adequate contaminant attenuation (Type 1 soils). It is unclear how an on-site system management program could help prevent or remedy subsurface failures, and this is what needs to be addressed.

Implementation:

Task 1: Conduct a feasibility assessment concerning the effectiveness of a county-wide on-site sewage system management program on ground water quality.

Who: Seattle-King County Department of Public Health Environmental Health Division

When: as per implementation schedule

Cost: to be determined

Fund Source: aquifer protection fund.

Issue 5: The adoption of the Water Quality Standards for Ground Waters of the State of Washington, WAC 173-200, by the Department of Ecology in October of 1990 has created concerns over whether the existing Regulations of the State Board of Health for On-Site Sewage Disposal (WAC 248-96) and Title 13 are consistent with the provisions of those new standards.

To date, Ecology and the Department of Health have not released guidance as to how the Ground Water Quality Standards should be interpreted by local health departments in review of new development projects involving use of on-site sewage disposal systems. Ecology has formed an interagency committee to address this issue, however, it appears that the earliest the guidance may be forthcoming is February of 1992.

OS - 9 Alternative 2. Encourage efforts by Ecology and the Department of Health to:

- o Evaluate the effects of on-site sewage disposal systems on ground water, and
- o Determine best available technology for on-site sewage disposal which meets the intent of the Water Quality Standards for Ground Waters of the State of Washington, WAC 173-200.

NOTE: State DOH has prepared draft on-site regulations which were reviewed by Ecology. Compliance with State ground water standards was looked at by a subcommittee. This subcommittee recommended minimum lot size to prevent ground water degradation. The draft is currently going through public review. Staff recommends deleting this issue and actions from the DGWMP.

SOUTH KING COUNTY adopted the Action as written.

Discussion. In regulating on-site sewage system use, state and local health agencies have attempted to ensure that contamination associated with the use of those systems will not result in contamination levels that will adversely affect either the beneficial use of underlying ground water or public health. With the passage of the Ground Water Quality Standards, the traditional approach of the health agencies must now be reconciled with the Ecology focus of preventing any significant deviation of ground water quality from natural quality.

The specific effects of on-site sewage systems on underlying ground water should be carefully studied and explicit guidelines developed concerning the best reasonable available technology.

Guidance concerning the interpretation of the Ground Water Quality Standards will help ensure that application of on-site sewage disposal system technology is consistent with the State's Anti-degradation Policy.

Costs associated with this alternative are primarily limited to Ecology and DOH staff time. However, special field studies of on-site sewage system performance may need to be conducted to provide reliable data on which to base the guidance.

Potential difficulties in implementation may be encountered if Ecology and DOH are unable to achieve consensus on major issues.

Implementation Plan

Cost Estimate. A funding plan to support preparation of the guidelines and conducting field studies of on-site sewage system performance may need to be developed in conjunction with Ecology and DOH.

3.3.4 GROUND WATER QUALITY ISSUES RELATED TO THE USE OF PESTICIDE AND FERTILIZER

Pesticides and fertilizers are used for the control of plant and animal pests and promotion of plant growth. Pesticides are a large and varied group of substances that are specifically designed to kill biological organisms including weeds, insects and rodents. Fertilizer is used to promote plant growth. Pesticides and fertilizers are in everyday use all around us. The major categories of use are agriculture, home, forestry and right of way maintenance. Pesticides and fertilizer have the potential to contaminate ground water when they are used improperly.

Home use accounts for approximately 20 percent of pesticide use in the Puget Sound region. Unlike licensed pesticide users, homeowners are not trained in proper application procedures or in diagnosing whether a particular pesticide is needed, and may use them improperly. The use of fertilizer and pesticides by non-agricultural users will likely increase as King County population continues to grow.

In rural areas, agricultural activities are likely to have presented the greatest threat to ground water quality. Past activities, before current federal and state regulations were in place, may have contaminated ground water. In addition, current agricultural practices, especially by small farms, may not adequately protect ground water.

A variety of entities use herbicides for right of way (ROW) maintenance. These include county public works, electric companies, state Department of Natural Resources, railroads, natural gas companies and oil pipeline companies. Right of way maintenance consists of a combination of herbicide use and physical methods, such as mowing. For example, Puget Power maintains low-growing plant communities under their power lines by using a combination of physical and chemical plant maintenance techniques. Also, the King County Department of Public Works uses chemical weed control on road shoulders.

The current regulations, programs and practices may be enough to protect ground water. There has not been a reported incident of ground water contamination related to these practices in King County. However, close examination of ground water quality in King County has not yet been accomplished. Ground water contamination related to pesticide and fertilizer use may not have been reported because, in the past, no one looked in the right places for it, the expense for this analysis has been prohibitive, and laboratories did not have the capability to analyze for these components. Monitoring and research programs are difficult to design because there is little accurate information about the types of compounds used in the region and the patterns of use. The Ground Water Management Program included pesticide and fertilizer components in the ground water quality sampling program to characterize the aquifer(s). Additional work through an ongoing program is needed to evaluate the effect of pesticides and fertilizer on ground water.

Small farms may need help to ensure that their practices do not contaminate ground water. National and local programs which have looked at this problem have found that a cooperative effort between agriculture, educators and regulators is the best approach. The main local effort for this is through the King County Conservation District. The District's goal is technical assistance, education and cooperation for the agriculturalist. The District: 1) works with landowners to train and instruct them on best management practices (BMP's)

to improve water quality and to increase productivity, 2) provides technical assistance to landowners who are developing farm management plans on their own initiative or who have been referred by Department of Ecology prior to taking enforcement action, and 3) develops local education and information programs on soil and water conservation. The District boundaries include all unincorporated King County and any incorporated areas that have been annexed into the District. The Conservation District depends on funding from outside sources, such as King County, Ecology, Washington Conservation Commission and private groups.

The Conservation District helps part-time farmers manage small acreage. Management practices can be implemented as individual practices or as components of integrated farming systems, known as Farm Conservation Plans. A Farm Conservation Plan is a comprehensive plan for managing farm resources to protect the quality of the environment and maintain economic viability of the farm. Farm Plans integrate BMP's to protect ground water quality into a comprehensive resource protection plan designed for the individual farm. Each Plan is made to fit a particular farm, by the person who runs the farm, with the help of a soil conservationist from the Conservation District. Different ways to overcome problems and take advantage of opportunities to make better use of the soil, water and plant resources is covered in the farm plan. The landowner makes all of the implementation decisions. This is primarily a voluntary educational approach, since Farm Plans are developed with the farmers input, and are currently not mandatory.

In the Puget Sound Water Quality Management Plan, Non-Point Source Pollution Program (see below), the Authority states that the use of farm conservation plans is the preferred approach to controlling pollution from both commercial and noncommercial farms (the Conservation District's farm conservation planning and practices documents for farm conservation plans are the recommended standard).

Washington State Department of Agriculture (WSDA) is the state agency with primary authority over pesticide and fertilizer sale and use through the following regulations:

Chapter 15.54 RCW Fertilizers, Agricultural Minerals and Limes requires that commercial fertilizer distributors must report twice a year to WSDA on the net tons of fertilizer they distribute in Washington.

Chapter 15.58 RCW Washington Pesticide Control Act requires that pesticide dealers and private and public pest control consultants must be licensed. Licensees must demonstrate knowledge of pesticide laws, hazards, and the safe distribution, use and application and disposal of pesticides, and they may be required to keep records, including quantity of pesticide, date of shipment and receipt, name of consignor and consignee, and any other information requested by WSDA.

Chapter 16-228 WAC Rules Relating to General Pesticide Use require record keeping by pesticide dealers on the sale of restricted use pesticides, on the distribution of pesticides, except those labeled for home and garden use only, and on distribution of state restricted use pesticides. Certified applicators must keep records on application sites. These records must be given to the Director of the Department of Agriculture upon request.

WSDA conducted the Record Database Pilot Project to explore the feasibility of using

pesticide application records in a state geographic system (GIS). This approximated requesting and cataloguing the information that commercial fertilizer dealers, pesticide dealers and certified applicators are required to keep. Because the data request was voluntary, the data received was not a complete summary of all pesticides applied in the areas for the year. Several major applicators, such as railroad, right-of-way, and a few commercial farms did not submit records. Most homeowner use in urban areas also was not part of the database as record-keeping is not required of these individuals. In general, WSDA found that a general application data request was very expensive and time consuming. Those individuals and businesses that have had record keeping requirements for some time were able to complete the information required fairly accurately. Small hobby farms and individuals who have not been required to keep records in the past had difficulty. Most records submitted needed staff time to analyze before the data could be entered. Approximately six or seven records per hour could be entered into the computer GIS system. Since major record requests can involve thousands of applications, present staffing could not effectively handle the data. The GIS system and database was shown to be feasible if the initial data request is limited to specific sites or specific pesticides.

WSU Cooperative Extension Service. Cooperative Extension is part of the state educational system. They develop and implement a broad range of educational programs and resource materials. Specific programs are developed relating to pest and nutrient management for homeowners, recreational areas, and crop and livestock production. They provide technical assistance in selecting and implementing "Best Management Practices" and integrated pest management systems for specific sites and circumstances. They also provide training to private and commercial pesticide applicators to prepare for licensing and recertification exams.

The Pesticide Reduction Program is a grant project by the WSU Cooperative Extension Service. This prevention education program will emphasize proper diagnosis of plant problems and advocate alternatives and reduced pesticide use. The Program will target residents and businesses in the Green-Duwamish and Cedar River watersheds during January 1992 to December 1994. This project could be applied to GWMA's, if it is found to be effective in reducing pesticide and fertilizer impacts on groundwater.

Washington State Department of Ecology (Ecology) has coordinated a multi-jurisdictional effort to address the impact upon ground water of pesticide and fertilizer use. This effort has produced the Protecting Ground Water: A Strategy for Managing Agricultural Pesticides and Nutrients. Draft, July 1991, which is referred to as the "State Strategy." The Strategy is intended to provide support and direction to agencies and the agricultural community in their efforts to protect and preserve ground water quality in rural areas. The focus of the Strategy is on protection of ground water, rather than remediation. It identifies and supports activities and programs to prevent contamination, and will allow both the agricultural community and involved agencies to make best use of resources.

Puget Sound Water Quality Authority (PSWQA) has adopted the comprehensive Puget Sound Water Quality Management Plan. The 1991 Plan update includes: the addition of monitoring for pesticides in Puget Sound; additions to the household hazardous waste program to incorporate educational opportunities for urban and suburban residents about pest management alternatives and the proper application of pesticides; and two new elements in the non-point source pollution section addressing water quality impacts from

pesticides. These additions are reflected in the following policies:

- *Non-point Source Pollution Program: NP-16 Pesticide Usage Surveys in Selected Watersheds.* Cooperative Extension will be the lead to design pilot pesticide usage surveys for selected watersheds in the Puget Sound Basin. Cooperative Extension shall include appropriate agencies, scientists and local governments in designing and conducting the surveys. The surveys should define spatial and temporal use patterns; focus specifically on pesticides of concern in the watershed; include information from all major users, including homeowners; and identify storage and disposal practices.

- *Non-point Source Pollution Program: NP-17 Puget Sound Pest Management Information Program.* Cooperative Extension will be the lead to establish this Program by designing and implementing program activities with an advisory group. The program will work through existing programs and groups, to conduct research and education on integrated and targeted pest management, promoting conservative use of pesticides particularly by local governments and homeowners.

Educational activities although currently extensive, may not correctly reflect the threat to ground water from the use of pesticide and fertilizer and the ways to reduce that threat. A variety of education programs are currently underway, which could be evaluated and augmented with information on the relationship with pesticide and fertilizer use and groundwater. This include the extensive activities of the WSU Cooperative Extension Service. The PSWQA Plan contains two policies for Cooperative Extension:

- *Household Hazardous Waste Program: HHW-2 Information and Education on Less-Toxic Alternatives for Household Products.* Cooperative Extension will work with others to make information and training available to promote targeted and proper use and disposal of pesticides as part of the implementation of the local hazardous waste plans. Cooperative Extension will consult with other groups on the type of information and program needed.

- *Non-point Source Pollution Program: NP-17 Puget Sound Pest Management Information Program.* Cooperative Extension shall act as the lead to establish a Puget Sound Pest Management Information Program. Cooperative Extension will design and implement program activities with an advisory group. The program will work through existing programs and groups, including the King County Roads Division program on integrated pest management, to conduct research and education on integrated and targeted pest management, promoting conservative use of pesticides particularly by local governments and homeowners.

Summary. More control of pesticide and fertilizer impacts on ground water is possible. This would involve utilizing current technology to target the areas that could benefit most from increased education or regulation. Current technology is available in King County to determine ground water susceptibility and vulnerability to pollution. Susceptibility depends upon the overlying soil characteristics. Vulnerability depends on the presence of contaminants at the surface. It is also possible to match the chemical characteristics of pesticide and fertilizer to the soils capability to absorb and break them down, thereby identifying possible ground water contamination sources. Ground water monitoring,

parameters could then be designed to include the predicted pesticide and fertilizer components. The various educational efforts could be augmented with information on the impact on groundwater from the use of pesticide and fertilizer.

GOAL

To prevent ground water contamination from the use of pesticide and fertilizer.

SOUTH KING COUNTY need to adopt goal

ISSUES

Issue #1: Pesticide and Fertilizer - Past Use. Past use of pesticide and fertilizer may pose a threat to ground water quality.

NOTE: This issue is now two: past and future use.

SOUTH KING COUNTY need to adopt issue

NOTE: Recommend deleting this action 1A because the Well Head Protection Program will include land uses that have the potential for pesticide and fertilizer use in the contamination source inventory. The strategy for determination of vulnerable aquifer areas has already been determined by GWACs.

PF - 1A Pesticide and Fertilizer - Past Use. Include land uses that have the potential for pesticide and fertilizer use in the determination of vulnerable aquifer areas in the strategy described in "Identification of Geologically Susceptible Recharge Areas" paper.

SOUTH KING COUNTY Action # 1. Identify areas where pesticide/fertilizer contamination of groundwater may be a concern.

Discussion: This will identify areas where pesticide/fertilizer contamination of ground water may be a concern. There is no additional cost associated with this action. Also, other aspects of the GWMP may use this information, such as the ground water monitoring program.

Funding: There is no additional cost associated with this action that has not been included in the "Identification of Geologically Susceptible Recharge Areas" paper.

NOTE: Recommend moving this action 1B, discussion to the Long Term Monitoring Program (LTM). This does not match with the goal; however, it does fit in with LTM. The committees adopted action will fit into LTM.

PF - 1B: Pesticide and Fertilizer - Past Use. Seattle-King County Department of Public Health Environmental Health Division and cities will monitor for include pesticide and fertilizer component monitoring in the critical-aquifer protection recharge-areas (APA), where they are expected to occur based upon past land use.

SOUTH KING COUNTY Action 2: SKCHD will include pesticide and fertilizer component monitoring in the critical recharge areas where they are expected to occur.

Discussion: The ground water monitoring program will be designed to include the expected components when monitoring in APA and have or had land uses associated with pesticide and fertilizer use. This action would be included in the Long Term Monitoring Plan (LTM) (a separate issue).

Implementation:

Task 1: Include pesticide/fertilizer components in the ground water monitoring program

Who: Seattle-King County Department of Public Health Environmental Health Division

When: during the design of the ground water monitoring program

Cost: no additional cost to include as part of the LTM design. These costs will be included in that issue.

NOTE: if action 1 is deleted and action 2 is moved to LTM, then Issue 1 should be deleted.

NOTE: New Issue for current and future use:

Issue # 2: Pesticide and Fertilizer Use. Use of pesticide and fertilizer may pose a threat to ground water quality.

PF - 2A: Pesticide and Fertilizer Use. Require King County and cities will fund the King County Conservation District to develop Farm Plans for from any agricultural user (small, hobby or homeowner farms) of pesticide and fertilizer in critical aquifer recharge protection areas (APAs).

SOUTH KING COUNTY Action 3: Request King County Conservation District to encourage Farm Plans from any agricultural user of pesticide and fertilizer in critical aquifer recharge areas (CARA's).

Discussion: The cumulative impact from large numbers of small farms can be substantial. As more land is developed on the border between urban and rural zones, more small or hobby farms are created. Various agencies provide training on best management practices, (BMP) and integrated pest management (IPM), but hobby farms are not required to attend, and often do not have the time, or do not know about opportunities to learn about BMP and IPM. Farm plans include BMP and IPM for a variety of farm practices, including pesticide and fertilizer. This would provide a mechanism for direct education of the hard-to-reach pesticide and fertilizer users.

After the APA's are identified, King County Conservation District would follow up by identifying and contacting all of the small farms that would be affected, and working with them to develop their Plans. King County Conservation District has the administrative

framework in place for Farm Plans. However, they do not have unassigned funding for this type of task. This work would need additional funding from their outside sources, such as King County and cities.

Implementation:

- Task 1: Estimate how many farm plans are needed and how much funding is needed.
- Task 2: Include funding for this program in the King County Conservation District budget.
- Task 3: Contact farms and prepare farm plans.

Task 1, 3: King County Conservation District

When: as per implementation plan

Cost: to be determined during concurrence

Fund Source: aquifer protection fund.

Task 2: King County and cities that support the King County Conservation District.

When: as per implementation plan

Cost: to be determined during concurrence

Fund Source: aquifer protection fund.

NOTE: Recommend deletion of action 2B because of WSDA response - they said it wouldn't be feasible, that is, the required legislation change and funding would not pass. Also, re adopted actions of Issaquah, Redmond: this legislation is already in place and was discussed in the issue paper.

PF - 2B: Pesticide and Fertilizer Use. Petition WSDA to require that records of pesticide sale and use be routinely provided and reviewed to ensure proper use.

SOUTH KING COUNTY Action 4: Petition WSDA to evaluate the results of the record maintenance pilot program and apply it county-wide if successful.

Discussion: If WSDA implements this program, this would allow WSDA to evaluate pesticide use. The program would be based on the record database pilot project. Requiring record submittal and analyzing pesticide use would show if use or over-use of leaching pesticides was occurring in King County, or, more specifically, in a critical aquifer recharge area. WSDA would require extended regulatory authority to develop and implement a complete program (based on the pilot program), staff to administer the program, review the reports and enforce regulations would be required. Funding would need to be increased. Currently, this approach does not appear to be feasible, per WSDA.

PF - 2C: Pesticide and Fertilizer Use. King County and cities will evaluate the Cooperative Extension Pesticide Reduction Program ~~should be evaluated for effectiveness for protecting groundwater~~ and applicability to Ground Water Management Areas.

SOUTH KING COUNTY Action #5: The Cooperative Extension Pesticide Reduction Program should be evaluated for effectiveness and applicability to Ground Water Management Areas.

Discussion: The Cooperative Extension Pesticide Reduction Program emphasizes proper diagnosis of plant problems and advocate alternatives and reduced pesticide use. It targets homeowners, commercial pesticide applicators and nursery operators in the Green-Duwamish and Cedar River watersheds, during January 1992 to December 1994. King County and cities (the Management Committee) would evaluate its effectiveness and possible applicability for implementation in other areas in the county to determine if this program would be useful for ground water protection. This evaluation would be done with Cooperative Extension at the end of the Program. The Management Committee must also determine funding needs and sources. A potential funding source could be from development fees as a mitigation for non-point source pollution.

Implementation:

Task 1: Evaluate Program

Task 2: Determine if program is applicable to GWMA's

Task 3: Determine funding sources

Task 4: Design and implement program in GWMA's

Who: Task 1: Cooperative Extension

When: at end of program

Cost: No additional cost, the evaluation is included in the program.

Who: Task 1 - 4: Management Committee

When: at end of program

Cost: to be determined during concurrence

Fund Source: aquifer protection fund.

PF - 2D: Pesticide and Fertilizer Use. King County and cities will use non-chemical vegetation maintenance practices or only non-leaching chemicals for roads and utility right-of-ways in GWMA's. King County and cities will determine if maintenance practices by others for roads and utility right-of-ways in GWMA's need to be restricted to non-chemical methods or non-leaching chemicals.

~~Explore and encourage non-chemical vegetation maintenance practices or only non-leaching chemicals for roads and utility right-of-ways in critical aquifer recharge areas.~~

NOTE: new language is proposed because we don't know if others can use or would be willing to use non-chemical, non-leaching methods, or even what they are using now. However, King County and cities can agree to do this now. If we keep "Require" this means that an ordinance must be passed by King County and cities. However, we don't know if there is a need for this at this time.

SOUTH KING COUNTY Action #6: Explore and encourage non-chemical vegetation

maintenance practices or only non-leaching chemicals for roads and utility right of ways and require such in critical recharge areas.

Discussion. The use of leaching vegetation management chemicals could have a detrimental effect on ground water. Some public and private agencies are decreasing or eliminating use of leaching chemicals, and are actively researching alternative methods. However, some agencies have not followed this trend. These agencies are not easily reached through existing educational programs. This would be a preventative, not remedial, action, as there has been no documented case of ground water pollution from these practices.

Research into use would involve a variety of agencies and utilities, including State Department of Transportation, State Parks and Recreation Commission, Burlington Northern, Weyerhaeuser and other forest owners, and public and private utilities.

Implementation:

Task 1: Adopt ordinance/policy that only non-chemical vegetation maintenance or non-leaching chemicals be used for ROW maintenance.

Task 2: Research practices by other organizations

Task 3: Determine if prohibition is needed based upon research.

Who:

Task 1: King County and Cities

When: as per implementation plan

Cost: 320 hours (EHD), Standard personnel costs for adoption of an ordinance or policy for cities. There may be increased costs associated with these methods.

Task 2, 3: King County and Cities (Management Committee)

When: as per implementation plan

Cost: to be determined during concurrence

Fund Source: aquifer protection fund.

Issue # 3: Education and Proposed Programs. Many issues concerning the use of fertilizers and pesticides are best addressed by the State Strategy and the Puget Sound Water Quality Authority Plan and various educational efforts. Implementation of many of the programs outlined in the Strategy and the Plan depend upon public support and funding from the Legislature and other sources. Existing educational efforts may not address ground water protection policies and goals of the GWMP.

PF - 3A: Education and Proposed Programs. GWAC will ~~adopt and~~ supports the strategies in "Protecting Ground Water: A Strategy for Managing Agricultural Pesticides and Nutrients. Draft, July 1991" and the 1991 PSWQA Plan (Household Hazardous Waste Program: HHW-2 Information and Education on Less-Toxic Alternatives for Household Products and Non-point Source Pollution Program: NP-17 Puget Sound Pest Management Information Program) to help insure that small farmers and homeowners receive more information about pesticide and fertilizer use.

NOTE: additional language is more specific.

SOUTH KING COUNTY Action #1: Support the strategies in "Protecting Groundwater: A Strategy for Managing Agricultural Pesticides and Nutrients. Draft, July, 1991 and the 1991 PSWQA Plan to help insure that small farmers and homeowners receive more information about pesticide and fertilizer use.

Discussion. The State Strategy and the Puget Sound Water Quality Authority Plan address statewide use of pesticide and fertilizer. Since they are statewide strategies, they are not specific to King County, but attempt to attain similar ground water protection goals. They provide an overall backdrop to development of local programs. They contain state-wide proposals, yet provide guidance to developers of local non-point plans, well head protection strategies, and ground water management plans. These strategies would benefit from recognition and support in the GWMP.

Implementation:

Task 1: GWMP states that the State Strategy and the 1991 PSWQA Plan will be supported.

Who: GWAC

When: During preparation of the Draft GWMP

Cost: there is no additional cost associated with this action.

PF - 3B: Education and Proposed Programs. Existing educational program content will be reviewed for agreement with GWMP policies and goals. Seattle-King County Department of Public Health Environmental Health Division will review the current educational programs of Soil Conservation Service (SCS), Cooperative Extension and others to ensure that the GWMP goals and policies are reflected. This will be done as part of the GWMP Education Section.

SOUTH KING COUNTY Action #2: SKCHD will review the current educational program of SCS, Cooperative Extension and others to ensure that the GWMP goals and policies are reflected.

Discussion. Prevention of pollution is the best approach from the standpoints of cost and environmental impact. Education is the best prevention because it creates an awareness and concern in individuals which influences their decisions.

Seattle-King County Department of Public Health Environmental Health Division will seek the cooperation of the parties involved to include ground water information and concerns in the educational programs. This review will ensure that the GWMP goals and policies are reflected. Cooperative Extension and others have several educational efforts underway. They integrate ground water protection information where possible, and are agreeable to including more. Cooperative Extension, SCS and others could include GWMP concerns in their educational material.

Developing an independent educational program to address this issue would probably be largely redundant. It would not likely be supported financially by elected officials in a time of lean budgets. We can use scarce resources more efficiently by reviewing and updating existing programs. Funding for staff at Seattle-King County Department of Public Health Environmental Health Division is necessary to carry out the review, coordination, report, and development of a supplemental program, if needed. It is possible that enhancing existing programs will require that funds be provided to the relevant agency or jurisdiction.

Implementation: as per the Education Section.

3.3.5 GROUND WATER QUALITY ISSUES RELATED TO WELL CONSTRUCTION AND ABANDONMENT

Wells provide a link between an aquifer and the earth's surface. Modern wells consist of a well casing that extends downward from the ground surface to the aquifer within a cylindrical bore hole. Chapter 173-160 Washington Administrative Code (WAC), Minimum Standards for Construction and Maintenance of Wells, requires that the space between the casing and the wall of the bore hole be sealed to prevent vertical movement of water along the outside of the casing. If this space is not adequately sealed, it may serve as a conduit by which contaminated surface or subsurface water may travel into an aquifer.

Under WAC 173-160, any well that is unusable, whose use has been permanently discontinued, which is in such disrepair that its continued use is impractical, or is an environmental, safety, or public health hazard, must be abandoned. The principal objective of proper abandonment procedures is to restore, as far as possible, the original hydrogeologic conditions at the well site. Proper abandonment procedures entail sealing the well in such a way that water is excluded from the well and no vertical movement of water is possible. An improperly abandoned well may serve as a conduit for contaminated ground or surface water, permit continued flow of water to the surface from an artesian aquifer, alter the pressure conditions within a confined aquifer, or present a physical hazard at the surface.

Resolving the issue of potential aquifer contamination by improper well construction and abandonment involves ensuring that existing regulations pertaining to construction and abandonment are followed. Ecology is the agency responsible for regulating well construction and abandonment by administering the State standards. However, Ecology has sufficient work force and budget to inspect only a fraction of the wells constructed and abandoned each year. Because of Ecology's budgetary limitations, well construction and abandonment is largely self-policed by well owners and contractors. Also, prior to 1973, Ecology did not require well contractors or owners to submit well logs. As a result, an unknown number of wells exist in the state without any record and therefore cannot be evaluated for compliance with regulations.

In response to these and other concerns, the State Legislature passed SHB 2792 in 1992, which authorized Ecology to delegate to local health districts or counties the authority to administer and enforce the well sealing and decommissioning portions of the water well construction program. Utilizing the expertise and work force of the local health jurisdictions may help in ensuring that wells are constructed and abandoned properly.

GOAL

To protect the quality ~~and quantity~~ of ground water in the county by ensuring that proper well construction and abandonment procedures are followed.

NOTE: quantity is recommended to be deleted from the goal because it is not being addressed in this issue.

SOUTH KING COUNTY adopted goal as written: To protect the quality and quantity of ground water in the county by ensuring that proper well construction and abandonment

procedures are followed.

ISSUES

Issue # 1: State Program. Existing regulations for well construction and abandonment are not adequately enforced. Ecology does not receive enough funding to inspect more than a small percentage of wells during construction or abandonment.

Issue 2: Well Identification. There is no method to systematically identify wells; wells that were drilled before 1973 were not required to submit well logs to Ecology; and there is no program to identify wells that should be abandoned.

NOTE: Split Issue 1 into two issues to better relate to the actions. Issue 2 will be located further down in text, as shown below.

SOUTH KING COUNTY adopted issue as written: Existing regulations for well construction and abandonment are not adequately enforced. Ecology does not receive enough funding to inspect more than a small percentage of wells during construction or abandonment. There is no method to systematically identify wells; wells that were drilled before 1973 were not required to submit well logs to Ecology; and there is no program to identify wells that should be abandoned.

WC - 1A State Program. ~~Petition~~ Ecology, King County and cities ~~to~~ will continue to pursue sufficient funding for the well construction and abandonment program.

NOTE: did not include GWACS and State Legislature, as per GWAC action, because they can not be concurring agencies.

SOUTH KING COUNTY Action 1. Petition King County, cities, other GWACs and the State Legislature to continue to pursue sufficient funding for the well construction and abandonment program.

Discussion. Ecology is not focusing on well construction and has been operating the program at a minimal level due to lack of funding. Ecology tried to obtain the needed funding by proposing legislation to provide funding from increased fees for licensing, start cards, water right applications and enforcement penalties. This proposed legislation was not approved.

Ecology would continue its efforts to increase funding for these programs, including presenting legislation. Ecology will call upon the GWAC, including King County and cities, for support for the legislation. This could include phone calls, letters and/or testimony to the state legislators. If legislation is passed, Ecology could then hire staff to adequately implement the well program.

Implementation:

Task 1: Develop and submit legislation, with input from affected parties.

Who: Ecology

When: Year ____
Cost: to be determined during concurrence.
Funding Source: agency general funds.

Task 2: Support proposed legislation
Who: King County and cities
When: after legislation is presented
Cost: probably minimal, to be determined during concurrence.
Funding Source: agency general funds.

~~WC - 1B State Program. Petition Ecology to develop a model local health department (LHD) program for implementation of part of the well construction and abandonment program.~~ King County and Ecology will develop a local health department program for implementation of the delegated portion of the well construction and abandonment program in King County.

NOTE: The original action has been fulfilled by passage of SHB 2762, which authorized Ecology to delegate to local health districts or counties the authority to administer and enforce the well sealing and decommissioning portions of the water well construction program. After Ecology determines that a local health department has resources, capability and expertise, it may enter into a memorandum of agreement which sets forth the specific authorities delegated to the local health department. Tacoma-Pierce County Health Department has started such a program. According to the bill, Ecology may not delegate the authority to license water well contractors, renew licenses, receive notices of intent to commence drilling a well (start cards), receive well reports, or collect state fees.

SOUTH KING COUNTY Action 2. Petition King County, conjunction with Ecology, to develop a model local health department (LHD) program for implementation of part of the well construction and abandonment program.

Discussion. Delegation of part of a program to the local health department has been demonstrated to be dynamic method of ensuring that public health concerns are safeguarded, as shown by the local health department/Washington State Department of Health (DOH) programs for on-site sewage disposal and small public water systems. A partnership between local and state government could provide a greater degree of protection for the public health than what is currently in effect, because local health department's are closer to the public and see more problems on a day-to-day basis than does Ecology.

Seattle-King County Department of Public Health Environmental Health Division would work with Ecology to develop a program. This will include showing how King County meets the requirements and adding the program to the Seattle-King County Department of Public Health Environmental Health Division budget. The local program would include identification tagging as part of the program. Ecology would continue to perform the administrative aspects of the program, such as well driller licensing and instruction; well log review and record-keeping; providing technical information and training to the local health department; and completing enforcement procedures, when necessary.

Implementation:

Task 1: Develop and implement program

Who: Ecology and Seattle-King County Department of Public Health Environmental Health Division

When: Year ____

Cost: to be developed.

Funding Source: aquifer protection fund.

Issue 2: Well Identification. Wells need to be identified so that Ecology may implement their programs to protect the ground water resource. There is no method to systematically identify wells; wells that were drilled before 1973 were not required to submit well logs to Ecology; and there is no program to identify wells that should be abandoned.

WC - 2A Well Identification. ~~Petition Ecology, King County and cities, to will seek state legislation which requires sellers to disclose to buyers the existence of used or unused wells on the property.~~ Ecology will prepare draft legislation to require sellers to disclose to buyers the existence of used or unused wells on the property.

SOUTH KING COUNTY Action 3. Petition Ecology, King County, cities, GWMA's and the State Legislature to seek legislation which requires sellers to disclose to buyers the existence of wells on the property, used or unused.

Discussion. King County Planning estimates that, on the average, a residence is sold every five years. This disclosure could identify a significant number of unknown wells. Buyers will be notified using a coordinated disclosure form which could encompass other environmental, health and safety concerns in addition to well abandonment and identification. The form will notify buyers that unused or unusable wells, or wells presenting an environmental, safety or public health hazard are required to be abandoned according to procedures outlined in WAC 173-160. It will also state that wells are legally required to be tagged with a well identification number. The disclosure form will indicate whether abandonment has been performed according to requirements. Identification numbers for wells on the property, if available, will be provided on the form. The cost for this evaluation would be borne by the parties to the transaction.

This would result in Ecology, DOH and Seattle-King County Department of Public Health Environmental Health Division responding to the reported wells. This response could be slow, given the current funding of their programs. Ecology would oversee the abandonment of wells or delegate this to Seattle-King County Department of Public Health Environmental Health Division. DOH and Seattle-King County Department of Public Health Environmental Health Division would enforce existing regulations on any unapproved public water supplies that were found.

Ecology would develop similar legislation. If this legislation is passed, Ecology will draft rules providing a state wide form. In drafting these rules, Ecology will use broad-based participation of appropriate agencies and affected parties. It is also requested that Ecology and Department of Health, in carrying out this task, consider the possibility of enforcement techniques, such as withholding conveyance of title, until requirements are complied with.

Implementation:

Task 1: Prepare and pass ordinance or policies which will require sellers to disclose to buyers the existence of used or unused wells on the property.

Who: King County and cities

When: Year ___

Cost: 160 hours (King County)

Funding Source: aquifer protection fund.

Task 2: Prepare legislation

Who: Ecology

When: Year ___

Cost: to be determined.

Funding Source: general agency funds.

~~WC - 2B Well Identification. Petition King County and cities to revise rezone and land use permitting procedures so that applicants must establish the number and condition of wells present on the property in question.~~

King County and cities will require that applicants establish the location and status of wells present on the property in question during SEPA review, rezone and land use permit applications. King County and cities will provide this information to Ecology.

NOTE: reworded action to clarify language, and to tell county and cities what to do with the info collected so that Seattle-King County Department of Public Health Environmental Health Division, in conjunction with Ecology, can follow up on problems.

SOUTH KING COUNTY Action 4. Petition King County and cities to revise rezone and land use permitting procedures so that applicants must establish the number and condition of wells present on the property in question.

Discussion. One reason that well identification is needed is to determine if a well should be abandoned. Proper abandonment procedures entail sealing the well in such a way that water is excluded from the well and no vertical movement of water is possible. By having applicants provide information as to status, more wells could be evaluated. Status means whether the well is currently in use, what it is used for, and apparent construction method.

King County involvement in identifying wells in need of proper abandonment is already in effect on an informal basis. This alternative would formalize the involvement while also encouraging community involvement and education. The discovery of unused wells during land development is fairly common. Granting of the rezone or permit would be contingent upon unused wells being properly abandoned and active wells being tagged with an identification number and entered into Ecology's well inventory. By requiring that applicants for rezones and land use permits demonstrate that the property has been examined for wells and that existing wells are in compliance with the standards specified in WAC 173-160, King County and cities could help narrow a regulatory gap. The cost of these requirements would be passed on to the applicants for rezones and permits. Follow up on the status report would be through the Seattle-King County Department of Public Health Environmental

Health Division delegation program.

Implementation:

Task 1: Develop ordinance or policy/procedure change as needed for each application type.

Task 2: Implement policy/procedure and new regulations.

Task 3: Provide this information to Ecology

Who: King County and cities.

When: Year __

Cost: 160 hours (King County)

Funding Source: aquifer protection fund.

Task 4: Enter new information into records

Who: Ecology

When: Year __ (to be determined during concurrence)

Cost: agency general funds.

Issue 3: Abandonment cost. Improperly abandoned wells may become a channel for contamination to the aquifer. Abandonment cost may prevent property owners from disclosing improperly abandoned wells.

WC - 3A Abandonment cost. King County will explore the possibility of having a funding source for abandonment of wells for those property owners which disclose that they have an existing unabandoned well.

NOTE: new action and issue per GWACs action.

SOUTH KING COUNTY Action 5. Petition King County to explore the possibility of having a funding source for abandonment of wells for those well owners which disclose that they had an existing unabandoned well.

Discussion: The Management Committee will decide if aquifer protection fund could support this and if to include in work program. Seattle-King County Department of Public Health Environmental Health Division will provide report to Management Committee on feasibility and cost. The Seattle-King County Department of Public Health Environmental Health Division report will be based on the disclosure information collected through other actions.

Implementation:

Task 1: Report to Management Committee on feasibility of providing money for well abandonment.

Task 2: Determine if aquifer protection fund could support this, and to what level.

Task 3: Revise GWMP if necessary.

Who: Task 1: Seattle-King County Department of Public Health Environmental Health Division

When: Year _____

Cost: this will be included in Seattle-King County Department of Public Health Environmental Health Division work program.

Funding Source: aquifer protection fund.

Task 2, 3: Management Committee

When: Year _____

Cost: this will be part of Management Committee tasks.

Funding Source: aquifer protection fund.

WC - 3B Abandonment cost. Ecology, during WAC revision, will consider alternatives to present requirements for well abandonment procedures, that are cost effective and would protect public health.

NOTE: new action per GWACs action.

Discussion: There is interest in Ecology to consider alternatives to the current regulations for well abandonment, which may be costly for some well owners. Ecology may consider alternatives during revision of WAC 173-160, which details the required abandonment methods.

Implementation:

Task 1: Consider alternatives to current abandonment procedure

Who: Ecology

When: during next WAC revision

Cost: to be determined during concurrence

Funding Source: agency general funds.

Issue # 4: Education. There is a lack of general public knowledge about the public health

significance of the requirements for well construction, operation, maintenance and abandonment.

WC - 4 Education. The GWMP Education Program will coordinate with and support Ecology's well identification, well construction, proper well maintenance, contamination sources and well abandonment projects. ~~on a community basis, coordinating community efforts with Ecology's statewide efforts. This support would include distributing a questionnaire about wells to homes in the community; developing and distributing an educational brochure for homeowners; and supplementing the brochure with community educational programs.~~

NOTE: last sentence is included in Discussion.

SOUTH KING COUNTY Action 1. Support Ecology's well identification and well abandonment projects on a community basis, coordinating community efforts with Ecology's statewide efforts.

Discussion. Informed and involved well owners and other community members are probably more likely to comply with the well construction and abandonment regulations than they would be otherwise. Ways to inform and involve well owners might include distributing a questionnaire about wells to homes in the community; developing and distributing an educational brochure for homeowners; and supplementing the brochure with community educational programs. The questionnaire should be designed to elicit the number of wells on each property, the construction methods used, and the number of wells that require abandonment. The brochure should include recommended practices and legal requirements for well construction and abandonment. It should also include the reasons why practices such as sealing the well are both advisable and required by law so that homeowners are knowledgeable before they make plans to construct or abandon a well. The education program should cover the same information, and provide the public with an opportunity to ask individual questions.

Implementation: This will be included in the Education Section.

3.3.6 GROUND WATER CONCERNS ASSOCIATED WITH SEWER PIPES IN KING COUNTY

Sewage collection and treatment in King County is provided by the Municipality of Metropolitan Seattle (Metro), cities, and water and sewer districts. Wastewater is carried from homes and businesses through a system of side sewers, which are connected to a system of tributary sewers (or "trunk sewers") within the drainage area. Trunk sewers are connected to interceptors which transport the wastewater to treatment plants. In King County, there are approximately 3,000 miles of sewer pipe with approximately 150 million gallons of wastewater received at wastewater plants throughout the county each day.

Currently, all sewer pipes in King County are fabricated from polyvinyl chloride (PVC), a strong, durable material that is virtually leak-free. However, prior to the use of PVC, sewer pipes were made from materials such as concrete, brick, clay and ductile iron. Joints were more susceptible to leaking with the use of these materials. Many of these older pipes are still in use today.

Infiltration is defined as ground water entering sewer pipes, both as runoff during storm events or as base flow from other sources. Inflow refers to direct flows of stormwater into sewer pipes through hookups such as roof and footing drains. Because sources of infiltration and inflow (I and I) are not easily distinguished by sewer authorities, they are commonly considered under the single heading, "I and I." Infiltration generally occurs in the joints of older pipes made of concrete, brick, etc.

In the area characterization report for the Issaquah Groundwater Management area, infiltration into sewer systems servicing the City of Issaquah and the Sammamish Plateau also represent potential export losses of groundwater. Export loss means that groundwater is transported out of the basin by sanitary sewer reducing the total amount of available groundwater.

If groundwater infiltrates into sewer pipes during periods when the water table is high, then it is conceivable that waste water is discharged into the ground when the water table is lowered. Exfiltration (waste water leaking from sewer pipes) is not considered a problem by the utilities contacted in King County.

Numerous utility officials consider side sewers on private property more of a threat to ground water quality than the sewer mains themselves. For example, in Kent, side sewers were determined to contribute 75 percent of the infiltration to Kent sewers. This was detected by Metro using a smoke test. Metro bore the cost of replacing these leaking side sewers.

In 1987, Metro completed an infiltration study for the Renton Treatment Plant. The conclusion of the study was that it was cheaper to treat the waste water at the plant than repair the leaking pipes. However, with new technologies for pipe repair, it now appears less costly to correct infiltration and inflow problems than to enlarge the plant. Metro's Renton plant treats approximately 60 million gallons per day in summer. From a study conducted at this plant in 1989/90, it was determined that approximately 20 million gallons per day of infiltration was occurring. Thirty-three percent of the total treatment volume is infiltration.

To date, data on the extent and magnitude of this potential problem is unavailable. There have been no studies conducted on exfiltration of wastes from sewer lines in King County and their impacts on groundwater quality.

GOAL

1. To prevent the degradation of ground water which may be caused by waste water leaking from gravity sewer pipes and side sewers, and
2. To prevent the loss of water through infiltration to gravity sewer pipes and side sewers.

SOUTH KING To protect ground water from degradation due to leaking sewer pipes (exfiltration) and depletion due to loss of ground water into sewer pipes (infiltration).

ISSUES

Issue: Infiltration of ground water into gravity sewer pipes may be ~~depleting the county's groundwater resource~~ causing significant export losses of ground water from GWMA's. Exfiltration of sewage from leaking sewer pipes may be causing contamination of groundwater.

SP - 1 Sewer - Studies Action #1:

- Petition King County to:
1. Review and analyze existing studies and on going pilot programs by Metro and local sewer districts to determine if infiltration and exfiltration are problems in GWMA's and,
 2. Analyze conclusions and determine appropriate follow up action, if any.

NOTE: This is similar wording to the Issaquah GWAC adopted action.

SOUTH KING COUNTY: Action 1. Deleted.

Discussion: Existing programs by Metro and the sewer utilities are replacing leaking sewer pipes where necessary to prevent overloading of waste treatment plant facilities. This is reducing exfiltration from sewer pipes and infiltration of ground water into sewer pipes. This is a long term project and is only in effect in some parts of the ground water management areas.

Side sewers in some of the older established residential areas of high density are leaking. In GWMA's, these areas and those areas where piping has been replaced need to be mapped. Older residential areas of high density need to be given priority for maintenance of sewers and side sewers.

Implementation:

Task 1: Review existing studies and on going pilot programs. Map maintenance areas and potential problem areas in GWMA's. Other action as necessary.

Who: Seattle-King County Department of Public Health Environmental Health Division

When: Within 2 years of adoption of GWMP by Ecology.

Cost: Explore funding sources such as general funds.

SP - 2 Sewer - Programs

Encourage Metro, cities and sewer utilities to continue or to adopt regularly scheduled leak detection and repair programs and public education programs to protect ground water aquifers in the GWMA.

SOUTH KING COUNTY. Action #2. Encourage Metro, cities and sewer utilities to continue or to adopt regular annual leak detection and repair programs and public education programs to protect ground water aquifers in the GWMA.

Discussion: Metro and the utilities are conducting maintenance and pilot programs in King County to replace leaking sewer pipes for reduction of I and I at waste treatment plants. This is reducing exfiltration from sewer pipes and infiltration of ground water into sewer pipes. For ground water protection from contamination and depletion, Metro and the utilities should be encouraged to replace leaking sewer pipes in GWMA's and to educate homeowners in properly maintaining their side sewers. Projects such as Metro's replacement of side sewers in Kent should be encouraged.

Implementation:

Task 1: Draft letter to Metro, cities, and sewer utilities concerning need for public education programs and leak proof sewer pipes in GWMA's.

Who: Seattle-King County Department of Public Health Environmental Health Division

When: Upon approval by GWACs.

Cost: None required. Cost by Seattle-King County Department of Public Health Environmental Health Division as part of GWMA administration tasks.

SP - 3: Leakproof Piping

King County will amend the Comprehensive Land Use Plans and KCC 13.24 to require the following:

1. New sewer piping installed in Aquifer Protection Areas be leakproof; and
2. Existing leaking sewer pipes including side sewers will be replaced as soon as possible with leakproof piping in Aquifer Protection Areas according to a schedule contained in the Sewer Utility Comprehensive Plans.

NOTE TO GWAC: The King County Sewerage General Plan has been superseded by the Growth Management Act.

SOUTH KING Alternative 3. Petition King County to amend the King County Comprehensive Plan and the King County Sewerage Plan to include a policy that new sewer piping including side sewers in critical aquifer recharge areas, where shown to be geologically susceptible to this type of contamination, must be leakproof. Existing leaking pipes, including side sewers, in critical aquifer recharge areas where shown to be geologically susceptible to this type of contamination, as identified in a regular leak detection and repair program will be repaired or replaced as soon as possible.

Discussion: The King County Comprehensive Plan is currently being updated. By amending the Comprehensive Plan, King County can require leak-proof piping for new installations or replacement of leaking sewer pipes in ~~Groundwater Management Areas CARAs~~ high infiltration potential areas when reviewing sewer utility plans. King County Code 13.24 states that utility plans must be consistent with King County Comprehensive Plans. ~~The King County Sewerage General Plan also is currently being revised. The 1979 Plan is obsolete and does not address ground water concerns.~~ By requiring leak-proof sewer piping in ~~Groundwater Management Areas CARAs~~ high infiltration potential areas, groundwater in those areas will be protected from depletion and contamination.

Implementation:

Task 1: Draft letter to King County Comprehensive Planning and Policy Division ~~Section~~ requesting inclusion of provision of new and existing leakproof sewer piping in GWMAAs.

Who: Seattle-King County Department of Public Health Environmental Health Division

When: Upon approval by GWACs

Cost: No additional funding is required as King County staff are currently carrying out this task.

NOTE: This is a new issue raised by GWACs.

ISSUE: Groundwater Depletion: Sewer pipes installed on sloping ground could provide a conduit for ground water, depleting valuable ground water reserves from an specific area.

SP - 4: Groundwater depletion - backfill

Ecology should consider amendments to sewer construction specifications which stops the transmission of ground water along pipe alignments in high infiltration potential areas. Such transmissions take place in the required granular backfill used as pipe support. These provisions shall include BMPs for backfill materials and/or the use of impermeable seals at appropriate intervals.

SP - 4 South King Alternative 4 (New)

Petition Ecology and the sewer agencies to adopt special provisions in sewer construction specifications which stops the transmission of ground water along pipe alignments in CARAs. Such transmission takes place in the required granular backfill used as pipe support. These provisions shall detail the use of impermeable seals at appropriate intervals.

Discussion: The use of granular sand as backfill for pipe support in new sewer construction or repair allows for the transmission of ground water along the pipe alignments. This may cause a depletion in ground water levels or a depletion in the quantity of ground water available for drinking water purposes in a specific area. Back-fill materials used in pipe construction and repair need to be constructed of materials that do not permit this ground water transmission. Ecology needs to develop BMPs for sewer trenches on sloping ground for gravel based bedding or similar materials, or the use of impermeable seals at appropriate intervals to stop ground water transmission and loss.

Implementation:

Task 1: Draft letter to Ecology requesting development of BMPs for bedding materials and/or impermeable seals at appropriate intervals for sewer trenches on sloping ground in high infiltration potential areas.

Who: Seattle-King County Department of Public Health Environmental Health Division

When: Upon approval by GWACs

Cost: None required. Cost borne by Seattle-King County Department of Public Health Environmental Health Division as part of GWMA administration tasks.

3.3.7 GROUND WATER QUALITY ISSUES RELATED TO SOLID WASTE LANDFILLS

A landfill is a disposal facility at which solid waste is permanently placed in or on land. A landfill can accept all waste except hazardous wastes. There are environmental impacts associated with landfills, including leachate and gas production. Leachate is water or other liquid that has been contaminated by dissolved or suspended materials due to contact with solid waste or gases from the solid waste. Landfills may pose a threat to ground water quality due to leachate production. Ground water that has been contaminated by leachate may affect the people's health. Ground water that is not currently being used for drinking water also needs to be protected from leachate contamination, as it may become a drinking water source in the future.

Regulations: There are many regulations that affect landfill operations. The significant state and local regulations are:

Water Quality Standards for Ground Water of the State of Washington (Chapter 173-200 WAC) establishes ground water quality standards which provide for the protection of the environment and human health and protection of existing and future beneficial uses of ground water. These regulations are administered by the Washington State Department of Ecology (Ecology).

The Minimum Functional Standards for Solid Waste Handling (Chapter 173-304 WAC) (MFS) contain solid waste disposal facility standards for leachate management, ground and surface water monitoring, facility siting, and other factors important to groundwater management. All active landfills in Washington State are required to comply with MFS regulations or obtain a variance from Ecology. It is not clear whether MFS meets these ground water standards. There is a provision that the bottom of a landfill must be 10 feet above groundwater. However, this specification may not provide adequate protection for groundwater in all situations. The MFS is being revised, and will meet the anti-degradation goal of the ground water standards. Ecology reviews all state regulation changes for compliance with the groundwater standards.

The Code of the King County Board of Health, Title 10, "King County Solid Waste Regulations." The Seattle-King County Board of Health (BOH) has adopted the Minimum Functional Standards as the local regulation for governing design, construction, operation, and closure of solid waste facilities in King County. The Seattle-King County Department of Public Health Environmental Health Division enforces Title 10. Seattle-King County Department of Public Health Environmental Health Division revised Title 10 during 1992. Among other changes, demolition disposal sites now must meet siting criteria for mixed waste landfills.

These regulations on design, operation, maintenance and closure have many standards that help ensure that ground water will not be contaminated by leachate. There are some gaps in the current regulations, which can be closed by ensuring consistency with the state ground water standards and revising state and local regulations. These changes will help ensure that existing landfills are operated to the best ground water protection methods.

Abandoned landfills may pose a threat to ground water quality. An abandoned landfill is any

site completed prior to the requirement of obtaining a closure permit. A permit allows solid waste activities to be performed at a specific location. A permit also includes specific conditions for facility operations, including closure requirements. Not enough is known about abandoned landfills to determine their possible impact on ground water quality. King County has identified a number of abandoned landfills and has proposed a program to investigate and propose remedial action for these abandoned landfills.

Recycling reduces the amount of waste that must be landfilled, by reusing waste materials and extracting valuable materials from the waste stream. Encouraging King County's recycling efforts may also help protect ground water quality.

GOAL

To prevent the occurrence of ground water contamination problems associated with the operation of solid waste disposal facilities in King County.

SOUTH KING COUNTY: Adopted goal as written: To prevent the occurrence of ground water contamination problems associated with the operation of solid waste disposal facilities in King County.

ISSUES

Issue #1: Standards. Standards can be improved ~~need to be changed~~ to provide better ground water protection. The areas where changes are needed may be made include: 1. compliance with MFS and Title 10 ~~may not meet the new State Ground Water Standards (WAC 173-200)~~; 2. ~~SKCHD Title 10 and MFS may not adequately protect critical aquifer recharge~~ protection areas; 3. cell expansion in existing facilities; and 4. ~~liner quality s can tear during use or placement~~.

NOTE: Issue changed to make a clear statement of need. Liner quality section proposed to be deleted. please see below for discussion. This would now read: Issue #1: Standards. Standards can be improved to provide better ground water protection. The areas where changes may be made include: 1. compliance with State Ground Water Standards (WAC 173-200); 2. aquifer protection areas; 3. cell expansion in existing facilities.

SOUTH KING COUNTY: Adopted issue as written: Issue #1: Standards need to be changed to provide better ground water protection. The areas where changes are needed include: cell expansion in existing facilities; MFS and Title 10 may not meet the new State Ground Water Standards; SKCHD Title 10 and MFS may not adequately protect critical aquifer recharge areas; liners can tear during use or placement.

SW - 1A: Standards. ~~Petition Ecology and Seattle-King County Department of Public Health Environmental Health Division to~~ will determine whether existing regulations (MFS) meet State Ground Water Quality standards and revise as necessary.

SW - 1B: Standards. ~~Petition Seattle-King County Department of Public Health Environmental Health Division to~~ will prepare amendments to Title 10 to prohibit siting or expansion of landfills in critical-high potential recharge areas for King County Board of Health's consideration ~~except by variance if it can be demonstrated that ground water will be protected.~~

SW - 1C: Standards. ~~Petition Ecology (MFS) and Seattle-King County Department of Public Health Environmental Health Division (Title 10) will~~ to prepare amendments to revise regulations to so that clearly state that cell expansion is subject to current standards, including location for King County Board of Health's consideration.

SW - 1D: Standards. ~~Petition Ecology and Seattle-King County Department of Public Health Environmental Health Division to~~ will prepare amendments to regulations (MFS and Title 10, respectively) which require ~~more stringent liner standards, such as quality control, including~~ improved the quality control of liners, such as inspection and leak testing during liner placement.

NOTE: Staff recommends deleting SW - 1D because according to technical staff, liners are now required to be currently constructed to high standards. At the time this was originally proposed, it was not clear if this was the case. It is not necessary to include these standards in the regulations.

SOUTH KING COUNTY Action #1: ~~Petition Ecology and SKCHD to prepare amendments to revise regulations so that cell expansion is subject to current standards~~ MFS and Title 10.

Action #2: ~~Petition Ecology and SKCHD to determine whether existing regulations meet State Ground Water~~ Quality Standards and revise as necessary.

Action #3: ~~Petition SKCHD to prepare amendments to Title 10 to prohibit siting or expansion of landfills in critical recharge areas~~ except by variance if it can be demonstrated that ground water will be protected.

Action #4: ~~Petition Ecology and SKCHD to evaluate liner standards and other procedures to decrease the potential for ground water contamination.~~

Discussion for Issue 1. Standards. The MFS is currently being revised. The revision will

probably consider State Ground Water Standards (WAC 173-200), however, written support for this would help ensure this change. These alternatives do meet the intent of the Goal. Including a statement that cell expansion must meet current standards would codify the current construction practices. That is, cell construction does comply in practice with the standards.

The proposed regulatory changes may have some economic ramifications. For example, expenses associated with compliance with the regulatory changes may result in an increase in landfill development costs and higher tipping fees. If a landfill is planned in the future, the aquifer protection area exclusion would reduce the possible sites and perhaps make it more costly. The agencies would have related administrative costs for these revisions.

Implementation:

Tasks:

1. Amend regulation for cell expansion.
2. Determine if MFS meets ground water standards and revise.
3. Amend Title 10 to prohibit siting/expansion in high potential recharge areas.
4. Amend regulations for liner standards.

Who:

Task 1,2,4: Ecology

When: During MFS revision

Cost: (to be determined during concurrence)

Fund Source: general agency funds.

Who:

Task 1, 3, 4: Seattle-King County Department of Public Health Environmental Health Division. Seattle-King County Department of Public Health Environmental Health Division would propose that the BOH amend Title 10. This includes writing the revision, advertising the hearing, briefing the BOH and having a majority vote in favor. Also, revision of the MFS will be reviewed by Seattle-King County Department of Public Health Environmental Health Division. Consistency of WAC 173-200 and other recommendations would be checked during regulation revision.

When: During regulation revision, as per implementation schedule, Chapter 4.

Cost: (to be determined during concurrence)

Fund Source: general fund source.

Issue #2: Waste Screening. Inert waste landfills do not have the same siting requirements as mixed waste landfills.

Unauthorized hazardous waste may be entering landfills, which increases the potential

contamination to groundwater.

~~SW - 5: Waste Screening. Petition SKCHD to revise Title 10 to require that inert waste landfills have the same siting requirements as for mixed waste landfills.~~

Seattle-King County Department of Public Health Environmental Health Division and Solid Waste will evaluate the effectiveness of the Waste Clearance and Screening Program and provide a report to the Management Committee within two years.

NOTE: This action is changed because Title 10 now has eliminated "inert waste" and includes this type of waste under "mixed municipal." A problem continues that unauthorized waste (hazardous) may be entering the landfills undetected. Solid Waste has started a new program to prevent this, described in the Discussion section.

SOUTH KING COUNTY Alternative #2: Petition SKCHD to revise Title 10 to require that inert waste landfills have the same siting requirements as for mixed waste landfills.

Discussion. King County Public Works, Solid Waste Division's (SWD) new program, the Waste Clearance and Screening Program, is designed to reduce the amount of unauthorized waste that is accepted at county landfills. This type of program is required under federal law. The first phase of the program is to review and evaluate current procedures. Also, three major elements of the program have been started: 1. perform random loads checks, 2. respond to landfill/transfer station incidents with suspect waste, and 3. train employees on how to spot suspect waste..So far, all of the transfer station employee have been trained. By October, they expect to have all other staff (landfill, drivers) trained. The funding is part of the status quo budget.

The results of the program, as determined by evaluation, should be considered by the Management Committee for possible future action.

Implementation:

Tasks:

1: Evaluate Waste Clearance and Screening Program

Who:

1. Seattle-King County Department of Public Health Environmental Health Division and Solid Waste Division

When: At end of pilot project, and after two years of full program.

Cost: Seattle-King County Department of Public Health Environmental Health Division (to be determined during concurrence)

Solid Waste Division costs: these are already included in the Program.

Fund Source: aquifer protection fund.

Issue #3: Ground Water Protection. It is not known if Storage and Treatment Piles, Recycling Sites with less than 10,000 cubic yards and Surface Impoundment sites are impacting groundwater. These sites do not have ground water monitoring requirements. ~~Also, the standard is either monitoring or leachate control, but not both.~~

SW - 6: Ground Water Protection. ~~Petition~~ Seattle-King County Department of Public Health Environmental Health Division and Ecology will ~~to~~ revise regulations (MFS and Title 10) so that monitoring and/or leachate control on case-by-case basis be required ~~in MFS and Title 10~~ for Storage and Treatment Piles, Recycling Sites and Surface Impoundments, when a determination is made that there may be an adverse impact on groundwater quality.

NOTE: recommend deleting issue # 3. Latest revision to Title 10 has covered most of these concerns. Storage and treatment piles that may leach are request to be on an impervious surface so that leachate may be collected. If the pile is over 10,000 cubic yards, they must either provide ground water monitoring or provide a leachate management system. The Recycling sites have to meet storage/disposal standards if the health officer determines that they have the potential to contaminate ground water.

SOUTH KING COUNTY Alternative #2: Petition SKCHD and Ecology to revise MFS and Title 10 regulations so that monitoring and/or leachate control on a case-by-case basis will be required for commercial storage and treatment piles and surface impoundments. (When a determination is made that there would be an adverse impact on ground water quality).

Discussion: Storage and Treatment Piles, small Recycling Sites and Small Surface Impoundment sites may impact ground water. This depends upon the type of material they will handle and where the ground water is in relation to the site. These sites should be required to included ground water protection as part of obtaining a permit.

Implementation:

Tasks:

1. Revise Title 10 to include this requirement.

Who: Seattle-King County Department of Public Health Environmental Health Division

When: as per implementation plan.

Cost: could be included as part of next revision.

2. Revise MFS to include this requirement.

Who: Ecology

When: as per implementation plan.

Cost: could be included as part of next revision.

Issue #4: Abandoned sites. Abandoned solid waste disposal sites may still pose a threat to ground water.

SW - 7: Abandoned sites. ~~Petition SKCHD to complete the proposed abandoned landfill investigation program. Petition SWD and King County Council to fund SWD's proposed abandoned landfill program.~~ will proceed with investigation and remediation of the abandoned sites in a timely manner.

NOTE: This change is recommended because Seattle-King County Department of Public Health Environmental Health Division has completed their investigation and ranking of the abandoned sites. Solid Waste Division is proceeding with investigation and remediation of those sites. This statement will notify SWD and other reviewers of the GWMP that this issue is important to the GWAC, but that the existing program has been found sufficient to address the problem.

SOUTH KING COUNTY Alternative #2: Petition SKCHD to complete the proposed abandoned landfill investigation program. Petition SWD and King County Council to fund SWD's proposed abandoned landfill program.

Discussion. Seattle-King County Department of Public Health Environmental Health Division prioritized the abandoned sites based on the potential for ground water contamination as indicated in the Abandoned Landfill Survey. The investigation program by Solid Waste Division assesses the existence of contamination in ground water. If potential for contamination is found, the site may be referred to Ecology for their follow-up per the Model Toxics Control Act.

This alternative is feasible because SWD is proceeding with this program. Funding for the SWD's program has been identified. Implementation would not require additional resources. However, a timely investigation of these sites is requested to show SWD that this issue is of important to the GWAC and to ground water quality.

Implementation:

Tasks:

1. continue investigation of the abandoned sites.

Who: Solid Waste Division

When: as per the implementation schedule.

Cost: costs for this have been identified and a funding source secured. No additional costs are anticipated.

Issue #5: Education. The public may not be aware of the relationship between landfilling solid waste and the threat to ground water quality. Recycling (removal of usable components from the waste stream) reduces the amount of solid waste that must be landfilled.

SW - 8: Education. ~~Support the county and cities efforts in their recycling programs.~~ Include information about the relationship between solid waste disposal and groundwater in the education program. (This will be included in the Education Program. Please see Chapter 3).

NOTE: This change is suggested because the original action, to support existing activities, was superfluous. Including this in the Education program will increase awareness of this relationship and provide community support for the recycling programs.

SOUTH KING COUNTY Alternative #2: Support and encourage more comprehensive county efforts in this recycling program.

Discussion. Providing information about recycling and educating residents about reducing the waste stream may reduce the amount of waste going into the landfills and the amount of hazardous products that people buy.

Implementation: See Education Program Chapter 3.

3.3.8 GROUND WATER CONCERNS ASSOCIATED WITH BURIAL OF HUMAN REMAINS IN KING COUNTY

Cemeteries are found throughout King County and it is possible that, under certain hydrogeologic conditions, burial practices have affected or are affecting local ground water quality. About 40 percent of King County residents rely on ground water for their potable water source. Currently, there are 70 cemeteries in King County ranging in size from 20 burial sites to 140,000 burial sites. Nothing is known about the existing or potential effect of decomposing corpses and caskets on ground water.

The threat to ground water from decomposing corpses and caskets includes chemicals, bacteria, viruses and metals. The embalming process uses formalin, (formaldehyde, methanol, glycerin, borax, and water). Approximately 1/2 gallon of formalin is used to embalm each body. Bacteria and viruses are not a concern since nutrients and oxygen are not present for the bacteria to survive and multiply. Viruses in both embalmed and non-embalmed bodies will eventually die out because they require a host to reproduce.

Similar to body decomposition, the rate of a casket's decomposition depends on materials used and soil conditions. Materials used include hardwood, softwood, metals and a magnesium bar placed along the middle of the casket to prevent hydrolysis of the metals. It is unknown if these metals have leached into and are contaminating ground water.

Ground water may be in contact with corpses and caskets. Concrete burial liners and vaults are not waterproof. Embalming fluids and other materials may infiltrate ground water depending on such factors as soil type, topography, the geology encountered as water travels to an aquifer and the depth to the water table. Soils and geologic materials vary in their ability to attenuate or remove contamination by chemical, biological and physical processes. Generally, the deeper the water table, the more opportunity exists for contaminant removal by soil and geologic deposits.

In King County, there is ample opportunity for cemetery graves to come in contact with water. Many cemeteries are located in areas where the water table is believed to be very shallow, within 10 feet of land surface. Rainfall ranges for 20 to 50 inches per year throughout the Puget Sound lowlands, with an average value of approximately 35 inches per year. Additionally, the grounds of most operational cemeteries are heavily irrigated in the summer months. In instances where vaults are not used, or do not keep water out, either ground water or recharge water could come into contact with the grave, hastening decomposition and transporting decomposition and embalming products to the ground water system.

Attempts to gather information pertaining to ground water contamination have produced no useful citations. Considerable information does exist on the transitional and end products of decomposing human bodies, residual body wastes and chemicals that are used in the process of embalming bodies. Data are also available on the composition of residues of disintegrating caskets and associated materials. However, little is known about the effects of these products on ground water.

GOAL

To prevent the degradation of ground water from embalming fluids, disintegrating metal caskets, decaying human remains and other materials associated with processing bodies for funeral burial or cremation.

NOTE: SOUTH KING need to adopt goal.

ISSUES

Issue 1: Information is insufficient to determine ground water impairments from embalming fluids, decaying human remains and other materials associated with the burial of human remains in King County.

C - 1 Information - Studies: King County will continue to search for and evaluate existing information on cemeteries (including the results of the Woodlawn, New York, Cemetery investigation when made available) and conduct a study within the county to determine if cemeteries are contaminating ground water. Findings of this study can be critically reviewed and compared with findings of other studies nationwide. Information gathered can be used to establish siting criteria for new and existing cemeteries or to take other appropriate follow-up actions, if required.

NOTE: USGS and Seattle-King County Department of Public Health Environmental Health Division will commence a two year cemetery study in April 1993.

SOUTH KING

1. EXISTING CEMETERIES

Alternative B. Petition King County to conduct a study locally to determine whether cemeteries are causing ground water contamination. After analysis of study conclusions, along with evaluation of other on-going studies of cemeteries (Woodlawn Cemetery, New York), determine appropriate follow-up actions if any.

2. PROPOSED CEMETERIES

Alternative B. If studies indicate contamination of ground water is occurring at existing cemetery sites, petition King County to establish siting criteria and other regulations necessary, for proposed cemeteries to protect ground water appropriate to the results of past, on-going and proposed studies in existing cemeteries. Petition Ecology to propose State Legislation which would establish siting criteria and other regulations for proposed cemeteries appropriate to the results of past, on-going and proposed studies on existing cemeteries.

Discussion. A thorough search, to date, of national and international databases concluded that there was no information available on cemetery waste impacts on ground water. The results of the Woodlawn Cemetery study should provide some information on impacts to ground water. However, this study may not meet our needs, given the unique geology of this region. The goals and objectives of the Woodlawn study and various factors (such as depth of ground water sources) may be quite different. Correspondence dated August 18, 1992 from the President of the Woodlawn Cemetery, New York indicated that the original company contracted to do the study had cancelled and as yet a suitable replacement has not been found.

A study of the potential for cemeteries to contaminate ground water aquifers would make an important contribution to the assessment of ground water quality. This study could provide King County with regionally specific answers to this issue and allow the county to determine if further action is warranted.

Costs associated with such a study could be high. For example, USGS has estimated the cost of its proposed two-year study on cemeteries and ground water at \$228,000. Half of this cost would be augmented with funds from USGS. Local funding could be obtained from sources such as the state's Centennial Clean Water Fund. Costs using private consultants would vary, depending on the number of sites selected, wells drilled, etc.

~~**EXISTING CEMETERIES:** A local study will have significant costs, but directly meet all information needs. For example, The USGS has proposed a two year study of the impacts of cemeteries on ground water. The estimated cost is \$228,000. Such a study would provide specific information on local ground water impacts. The USGS proposes to fund one half of the cost. Local funding might be obtained from the Centennial Clean Water Fund.~~

Through the Centennial Clean Water Fund (CCWF), King County and the USGS are conducting a two year study of cemetery waste impacts on ground water quality commencing in April 1993. Although the GWAC may consider this study low priority, the USGS considered it to be of local and national scientific significance and Ecology rated it high on their CCWF list.

The USGS proposes to start such a study in 1992. Costs using a private consultant could vary based on the number of sites selected and the number of wells drilled. Appropriate actions may include the required use of vaults, development of siting ordinances for proposed cemeteries, cleanup of contamination that has occurred. if any, etc.

PROPOSED CEMETERIES

Establish Siting Criteria for Cemeteries. Siting criteria should prevent ground water from coming into contact with burial sites thereby lessening chances of leaching and ground contamination (if this is shown by proposed and existing studies to be a problem). It is not known how receptive local and state governments would be to such regulation. Costs to cemetery owners might be increased if suitable sites were less available. Other regulations such as the required placement of embalmed bodies in leak proof vaults to protect ground water can be explored. This would be based on may need demonstrated in studies of existing cemeteries.

IMPLEMENTATION PLAN

Existing Cemeteries

Request the SKCHD apply for Centennial Clean Water Funds in 1992 application period for monies to conduct a local monitoring program that three cemetery sites in King County. Review and adopt appropriate regulations or other appropriate follow-up based on these studies conducted, and results from the Woodlawn Cemetery, New York.

PROPOSED CEMETERIES

If demonstrated as needed by existing or proposed studies of cemeteries request SKCHD to write a letter to the State legislature after approval of the Ground Water management Plan by the Department of Ecology. Request the Washington State Legislature to amend legislation concerning siting criteria for burial sites, in relation to ground water impacts. Also included in the letter the requirement of impermeable vaults for the burial of embalmed bodies and/or other regulations as necessary to protect ground water.

Task 1: Prepare grant application for cemetery study Grant Application granted by Ecology in 1992.

Task 2: Follow up the study recommendations if studies concluded that cemeteries are contaminating ground water with pertinent state and local legislation regarding siting criteria. etc.

Who: Seattle-King County Department of Public Health Environmental Health Division

When: 1991. This two year study to commence in April 1993.

Cost: Estimated at \$228,000.

Funding Source: This two year study is being funded under the Centennial Clean Water Fund by Ecology, by USGS and the Seattle-King County Department of Public Health Environmental Health Division.

NOTE: This section has been deferred to the On-site Issue paper. Recommend delete from this paper. ISSUE 1: It is unknown how much embalming fluid and body wastes are disposed of into the on-site disposal systems. The potential impact on ground water quality from mortuaries using on-site disposal systems to dispose of embalming fluids and body wastes is unknown. We wish to prevent the degradation of ground water quality from chemicals and other materials disposed of into the on-site disposal system.

SOUTH KING

Alternative B: Petition King County to study the issue of existing mortuaries at on-site sewage disposal systems and determine if there is any problem. Determine appropriate actions for ground water based on the results of the study for those mortuaries located in critical recharge areas.

Discussion: The on-site sewage issue paper will be addressing management of hazardous materials to prevent their entrance into the on-site sewage disposal system for a variety of commercial establishments. The proposed threat of embalming fluids degrading ground water through entrance by an on-site sewage system can best be studied in the context of all commercial systems in that paper.

Implementation: See on-site sewage system policy for specific implementation steps.

Funding: Same as implementation.

3.3.9 GROUND WATER QUALITY ISSUES RELATED TO SAND AND GRAVEL MINING IN KING COUNTY

It is not unusual for productive sand and gravel mines to be located over vulnerable aquifers. Mining activities in these areas can increase ground water vulnerability to contamination both from the extraction process and from site reclamation.

The primary "effluent" discharged at a gravel site is turbid rinse water. Generally, operators are required to collect the wastewater on-site in retention and settling ponds where the fine sediment settles out. The collected water is then allowed to infiltrate back to the water table.

Often the excavation pit is also a component of the treatment system. Any chemical contaminants that are allowed to enter the excavation pit via the wash water or spills in the area would have increased access to the aquifer. Possible contaminants found at a mining site include lubricants and fuels which may be from the site or from road and work area runoff.

Beyond the risks associated with active mining, one of the largest threats to ground water appears to be the excavation pit itself. Excavation pits have been used both legally and illegally as dump sites for a variety of wastes. In many cases the material used to fill the pits would today be classified as a dangerous waste.

Sand and gravel mining operations are subject to permitting at both the local and state level. One of two land use permits must be obtained in King County to mine sand and gravel: 1) A conditional use permit is required to mine in a mining zone. As implied by the title, conditions are attached to the permit. The conditions are established during environmental review under Chapter RCW 43.21 State Environmental Policy Act (SEPA); 2) An unclassified use permit is required to mine in areas not zoned for mining. This is a temporary permit lasting for five years and is also subject to conditions established during environmental review.

Applications for the above permits incorporate the reclamation plan for the site and provide information showing how provisions of Chapter 21.42 Q-M, Quarrying and Mining classifications, will be met.

King County also requires a grading permit for excavations of sand and gravel with a volume exceeding 500 cubic yards. The applicant must demonstrate that the conditions regarding operation and reclamation of the site are met. Grading permits are renewed annually allowing The Department of Development and Environmental Services (DDES) to institute new conditions as regulations change. Ground water protection is one of the conditions of the permit. The King County Council is currently revising the zoning code including a chapter on reclaimed lands. This section is very general and does not address ground water concerns. The source of fill being used in reclamation is specified in the

initial permit and upon annual updates. Applicants must provide fill approved by Ecology if the fill comes from a previously developed site. Soil must be tested for contamination in order to obtain Ecology approval. Certification is not required if fill comes from an undeveloped site.

The King County Comprehensive Plan includes a section on mineral resources which identifies three major issues. 1) Designation of mineral extraction sites; 2) Need for review of operating procedures at existing sites, and 3) The need to reduce environmental effects of extractive operations.

Currently Regional Planning and Policy Division of Parks Planning and Resources Department is reviewing the 1985 King County Comprehensive Plan and preparing amendments for the King County Council in order to meet the requirements of the Growth Management Act regarding resource lands.

State permits for sand and gravel mining are required both from Department of Natural Resources (DNR) and the Department of Ecology (Ecology).

Applicants generally apply for the DNR permit concurrently with the King County grading permit. DNR permits sand and gravel mines over 3 acres in size. King County works closely with DNR to ensure that each is approving the same operating plans.

SB 5502 "Surface Mining" is presently passing through the House. In this bill, ground water protection is a high priority. Specific contents of the bill include that DNR will regulate mine reclamation with the county reviewing applications with DNR considering the county comments. DNR cannot approve fill for reclamation of site without county health department approval of fill first. This does not correlate with Ecology's general permit requirements where Ecology approves of fill material. The minimum reclamation standards (still under review until SB5502 is passed) discuss how DNR will protect ground water and surface water during reclamation. DNR will regulate to protect ground water and surface water resources after reclamation is complete.

DNR has more concern with possible contamination of water sources from adjacent operation pollutants. DDES will need to regulate all pollutant sources near mines. DNR suggested Seattle-King County Health Department Environmental Health Division follow up status in 1-3 months. It is unknown how this will impact the King County Zoning Code, Chapter 21.A.22 at this time.

In 1991, Ecology, DNR and several local authorities identified some Best Management Practices (BMP's) for sand and gravel operations. Originally, Ecology planned to adopt BMPs as either guidelines or formal rules for industry to follow in order to comply with the requirements of Chapter 173-200 WAC, Water Quality Standards for Ground Waters of Washington State. After further evaluation, Ecology determined to protect both surface and ground water quality through a general permit titled: "General Permit for Processed Water

and Stormwater Associated with Sand and Gravel Operations, Rock Quarries, and similar mining operations, including Stockpiles of Mined Materials, Concrete Batch Operations and Asphalt Batch Operations." This draft is out for public review and written comments until March 15, 1993. This general permit issued by Ecology supersedes surface and ground water permits that Ecology requires.

This draft general permit issued by Ecology includes:

The goal which is to enforce state and federal standards that apply to the quality of water discharged to either surface water or groundwater from certain types of mines. All discharges from sand and gravel mines must meet the Groundwater Quality Standards (Chapter 173-200) and the Surface Water Standards (173-201A). For this permit, the discharge of water includes both surface water discharge (National Pollutant Discharge Elimination System) and discharge to ground (State Waste discharge) such as through infiltration ponds.

The method of compliance with the general permit may include the implementation of recently developed BMPs and wastewater treatment facilities.

Permittees will be required to monitor discharges to both surface water and ground water. All facilities covered under the general permit will collect and report their monitoring data annually to Ecology. Ecology will use the monitoring data obtained in the first three years to determine permit effluent limits for potential contaminants and the scope of monitoring required in the re-issued general permit (after 5 years).

GOAL

To ensure that regulatory programs are adequate to prevent adverse effects upon ground water quality attributed to sand and gravel mining operations.

Note: SOUTH KING GWAC needs to adopt a goal.

ISSUES

Issue #1: Sand and gravel mining can cause changes in the site or include activities which increase the potential for contamination of important aquifers. Major changes ~~are underway~~ are in the process of occurring ~~have occurred~~ at the state and local level regarding ~~regulation and siting of~~ draft general permitting of sand and gravel mining operations. These changes have not yet been ~~fully developed by regulatory agencies or finalized, approved by legislative bodies, where appropriate.~~

Note to GWAC: Both actions under this issue recommended for deletion. Recommend delete action as too vague and these changes are occurring.

SOUTH KING. Alternative 2: Actively support efforts presently underway to modify regulations to provide better protection of ground water and encourage local legislative bodies to adopt similar regulations.

Discussion: Regulatory changes of some kind are inevitable. Between revisions to site statues and the availability of BMPs, improvements in regulatory activity will probably be made which will relate to ground water protection. There is a risk, probably a small one, that changes beneficial to ground water protection will be deleted or will not be supported by legislative bodies. By taking no action, the GWAC loses an opportunity to help influence the development of the coming changes in the direction of better protection of ground water.

Implementation: The GWAC chair to prepare letters of support to Ecology, DNR and King County as needed. SKCHD to keep informed regarding legislative act and to alert GWAC chairs and members when support is needed. GWAC chairs and members to prepare letters of support and/or phone contact when legislation is considered.

Funding: No funding is necessary for this task.

NOTE TO GWAC: Recommend GWAC delete this action as Ecology is now requiring BMPs as part of general permit for all mines in King County.

SOUTH KING COUNTY needs to take action.

Discussion: Same as above. In addition, the GWACs gain attention for the ground water management program (GWMP) and help to remind regulators and legislative bodies of importance of ground water protection to constituents. Letters of support and emphasis could be to agencies preparing regulatory changes. Support could also be provided by GWACs as key issues come before legislative bodies. This support could be in the form of a letter from the GWAC or could consist of many letters and phone calls from individual GWAC members or both. This support would need to be given as circumstances dictated as opposed to waiting for the GWMP to go through the concurrence process. This alternative meets valuative criteria of cost-effectiveness, feasibility, timeliness, and consistency with the goal.

For the general permit drafted by Ecology, sand and gravel facilities are required to manage, treat and discharge their water in a manner consistent with the Ground Water Quality Standards. This general permit includes the implementation of BMPs and the monitoring of discharges to ground water by permit with annual reporting of this data to Ecology. The proposed general permit provides good controls to protect both surface water and ground water from contamination.

Implementation: GWAC chair to prepare letter of support to Ecology and King County. The SKCHD to keep informed regarding legislative actions and to alert GWAC chairs and members when support is needed. The GWAC chairs and members to prepare letters of support and/or phone contact when legislation is considered.

Funding: No funding is necessary for this task.

Note to GWAC: Recommend delete Issue 2 as both actions recommended for deletion.

Issue #2: The SEPA process may not provide adequate technical review of siting issues during review of applications for rezones and unclassified use permits.

Note to GWAC: Recommend GWAC delete Action #1 as Ecology and King County review SEPA and will have general permit to provide adequate technical review.

SOUTH KING COUNTY: Action #1. Take no action.

Discussion: Recent reviews of applications for sand and gravel mines have been subject to a great deal of scrutiny. All have received Declarations of Significance upon review of the environmental checklist. There is active participation by Ecology during SEPA review as evidenced by a brief review of Ecology comments on recent applications. Ecology required a state waste discharge permit for disposal of wastewater response to one application which it reviewed. King County does not have a hydrogeologist on staff but Ecology does and is providing input. It may not be inconsistent with the goal to take no action.

Implementation: SKCHD will prepare a job description and a budget request within 60 days of concurrence of the plan by King County. The King County Council will approve the budget request at the earliest opportunity depending on budget cycles. SKCHD will fill the position within 90 days of budget approval.

Funding: Funding for this position could come from a variety of sources including SEPA review, general funds, permit fees, and database access fees. These and other sources of funding will be explored by SKCHD.

Note to GWAC: Recommend GWAC delete action as covered in Special Areas Issue paper.

SOUTH KING COUNTY: Seattle King County Health Department to develop an issue statement modification of the SEPA checklist for ground water impacts requiring any SEPA review and for providing any educational support.

Discussion: The SEPA checklist, an environmental checklist, is reviewed by government agencies to determine if the environmental impacts proposed by the applicant are significant, requiring the preparation of an Environmental Impact Statement. Section 3 of the SEPA checklist covers water-surface water, ground water and water runoff (stormwater). The questions to be completed by the applicant in this section are general, many requiring just a yes or no, and they do not assure that ground water impacts are adequately addressed.

Implementation: King County to amend the SEPA checklist within 90 days of plan adoption by Ecology.

Funding: None required.

Issue #3: Subsequent land use of reclaimed sand and gravel mining sites should reflect the increased susceptibility of aquifers to contamination. There is currently no formal requirement that this be given special consideration.

SG - 5. ~~Petition~~ King County and cities to will amend their Comprehensive Plans to include a policy which provides that land use of reclaimed sand and gravel mines be carefully evaluated in light of the increased susceptibility of aquifers to contamination due to mining activities.

SOUTH KING: Adopted above wording

Discussion: Land use is generally a matter of local control. The Comprehensive Plans (Plans) provide overall guidance for land use decisions. It would be appropriate for the Plans to address subsequent land use of reclaimed sand and gravel sites, this issue thereby influencing subsequent policy decision, regulation revisions, and day-to-day decision. The Comprehensive Regional Planning and Policy Division Section for King County is ~~will be~~ currently reviewing the Plan for the King County Council and the requirements of the Growth Management Act and is actively seeking input from GWACs regarding amendments to the King County Plan. ~~If the King County Council agrees with the proposed work program (for the Mineral Resources Section). If the King County Council does not agree to open the Plan for revision, it is not likely to agree to this alternative. The matter is likely to be decided in early fall 1991 assuming that revisions will be made.~~ The King County Council would probably be receptive to this recommendation because it does not preclude particular land uses but requires special consideration for gravel mining sites. This alternative is consistent with the goal in that it would help to ensure that regulatory agencies adequately protect ground water quality. The alternative is also timely and requires no funding. Concurrence with the GWMP by the King County Council and effected cities would constitute agreement to implement this alternative. For the King County Plans a separate petition could be prepared by Seattle-King County Health Department Environmental Health Division on behalf of the GWAC if the need for input precedes the concurrence process. Seattle-King County Health Department Environmental Health Division will ~~have to~~ keep aware abreast of the progress of the Plan revisions in order to ensure timely input by the GWAC.

Implementation: King County has commenced and the cities will commence amending their Comprehensive Plans once they concur with the GWMP. For King County Comprehensive Planning and Policy Division and SKCHD will prepare Comprehensive Plan amendments ~~within 60 days of King County action.~~ King County Council will adopt Comprehensive Plan amendments depending upon their schedule ~~established by the King County Council upon~~ and approval of the work plan which provides for all plan amendments including this one.

Funding: There is no funding necessary for this action.

Note to GWAC: Recommend GWAC delete this action as in original text and at bottom of page 1 of this paper. Ecology must approve fill which comes from a previously developed site.

SOUTH KING needs to take action.

Discussion: The type of material used as fill in reclaimed sand and gravel sites is unknown. Material considered hazardous waste could have been disposed of as fill at these sites. Where the soil consists of coarse sand or gravel/rocks, hazardous materials could migrate to and contaminate ground water used as a drinking water source. Sand and gravel fill in reclaimed sites particularly in critical recharge areas, needs to be tested to determine if it is contaminating ground water.

Implementation: King County and affected cities commence testing of sand and gravel fill in reclaimed sites within 90 days of concurrence with the GWM Plan.

Funding: Funding for this activity could come from general funds, permit fees, etc.

SG - 7 Zoning Code-Reclamation Plans. King County and cities will amend their zoning code to require that reclamation plans for mineral extraction sites include measures to protect ground water quality and quantity.

Note to GWAC: This is a new action based on latest revision.

SOUTH KING needs to take action.

Discussion: The King County Zoning Code is currently being revised. Chapter 21.A.22, Developed Standards. Mineral Extraction, Selection 446 Reclamation requires that a reclamation plan shall be submitted for each rezone application that addresses the subsequent land uses of the reclaimed lands anticipating reclassification of zones; and a time schedule indicating how and when reclamation will occur during and after extractive operations. This section is general and does not address groundwater quality and quantity impacts from land uses proposed in the reclamation plan. These sites consist of gravel type soil and there's ready access to ground water from the excavation pit prior to site reclamation.

The cities should adopt a similar ordinance/wording to protect ground water at these sites. SB5502 is presently going through the House. The outcome of this bill will not be known until mid May 1993. DNR has stated that this bill will protect surface water and ground water in reclaimed sand and gravel mining sites.

Implementation:

Task 1: Revise zoning code to protect ground water in reclaimed sand and gravel mining operations.

Who: King County and cities

When: During concurrence - agreement to amend section accordingly when code revised.

Costs: None.

Task 2: Review SB5502 and DNR's role in protecting ground water during and after mine reclamation. Depending on findings draft letter to DNR concerning ground water protection (if needed).

Who: Seattle-King County Health Department Environmental Health Division

When: In first year.

3.3.10 LAND APPLICATION OF MUNICIPAL WASTE TREATMENT PLANT PRODUCTS: BIOSOLIDS AND SEWAGE EFFLUENT

Biosolids are settled sewage solids generated from wastewater treatment plants (formerly referred to as "sludge"). Biosolids can be solid or semi-solid, usually combined with varying amounts of water and dissolved materials. The primary means of biosolids disposal in Washington State are landfilling and incineration. However, biosolids may be utilized for various beneficial uses, including composting, land application, (including agriculture and silvicultural application), land reclamation, land covers, construction material, and soil amendment (composted mixtures). Land application is gaining in popularity and potential for direct benefit to crops (including forest areas) or top soil development prior to planting.

Utilization of biosolids for beneficial purposes is the environmentally preferred method of handling a difficult problem. Currently, nearly all the biosolids generated and disposed of in King County are utilized for silviculture, composting, soil improvement, or agricultural purposes through land application. Potential contaminants in raw biosolids include nitrogen, phosphorous, heavy metals, hydrocarbons, microorganisms, and radionuclides. Based on present technology, properly managed land application of biosolids poses little threat to health or the environment. Also, it is not known to have caused any degradation of the underlying groundwater resources. However, with the increased interest in land application, the potential impacts on the groundwater resources from land application may need to be considered.

Biosolids are considered to be solid waste. They are regulated under the Minimum Functional Standards for Solid Waste Handling (MFS) Chapter 173-304 WAC. These standards require land utilization facilities for sewage sludge and woodwaste sludge (at agricultural and silvicultural sites only) to meet utilization guidelines, or to meet the landspreading disposal standards. The utilization guidelines are "Municipal and Domestic Sludge Utilization Guidelines, Ecology Report 82-11, October, 1982." The "Best Management Practices for the Use of Municipal Sewage Sludge, Ecology 82-12, September, 1982" are also referred to in the MFS.

The Seattle-King County Department of Public Health Environmental Health Division has approximately 1/4 full-time equivalent (FTE) assigned to the issuance of permits and monitoring of land application of biosolids projects. Seattle-King County Department of Public Health Environmental Health Division has found that this level of staffing is not sufficient to carefully review new applications to assure the permits have proper conditions; to monitor permitted projects; to field check "permit-by-rule" projects; and to maintain technical and scientific knowledge relating to biosolids management.

GOAL

To provide assurance that the groundwater resources in King County will not be contaminated by the land application of biosolids sludge.

NOTE: Staff recommends use of new term in Goal statement.

SOUTH KING COUNTY Adopted goal as written: To provide assurance that groundwater resources in King County will not be contaminated by the land application of sludge.

ISSUES

Issue #1: Regulatory Program Staffing. Seattle-King County Health Department, Environmental Health Division (EHD) does not have adequate staff: 1) to carefully review new applications to assure the permits have proper conditions; 2) to monitor permitted projects; 3) to field check "permit-by-rule" projects; and, 4) to ~~increase~~ keep their technical and scientific knowledge relating to biosolids ~~sludge management current~~.

~~BSE - 1: Regulatory Program Staffing. Support additional staff at EHD: 1) to carefully review new applications to assure the permits have proper conditions; 2) to monitor permitted projects; 3) to field check "permit by rule" projects; and, 4) to increase their technical and scientific knowledge relating to biosolids sludge management.~~

Seattle-King County Department of Public Health Environmental Health Division will adequately staff the biosolids program.

NOTE: action changed so that Seattle-King County Department of Public Health Environmental Health Division can staff it at the level necessary, and to not repeat what is in the issue.

SOUTH KING COUNTY Support adequate staffing at SKCHD: 1) to carefully review new applications to assure the permits have proper conditions; 2) to monitor permitted projects; 3) to field check "permit-by-rule" projects; and, 4) to increase their technical and scientific knowledge relating to sludge management.

Discussion: According to the supervisor for the solid waste program, the addition of 3/4 FTE to the program at a cost of about \$30,000 per year would enhance present management and partially accommodate the projected increase in land application of biosolids projects. Increased staff would be consistent with the intent of current programs and guidelines for which current staff cannot cover. There would be cost increases for biosolids generators and ultimately, the public. Short and long term benefits would be provided by this alternative. There would be an immediate improvement in oversight and long term benefit to the environment. The alternative is feasible provided it met with King County Board of Health approval.

Implementation:

Task 1: Determine appropriate level of staffing for the biosolids program

Task 2: Revise Title 10 to increase fees to support position, prepare a budget request for adoption.

Task 3: Present Title 10 revision to King County Board of Health (KCBOH) for adoption.

Task 4: Present Seattle-King County Department of Public Health Environmental Health Division budget revision to King County Council.

Task 5: Position description written, advertised, position filled

Who: Seattle-King County Department of Public Health Environmental Health Division

When: as per implementation schedule, after KCBOH approves regulation and King County Council approves budget.

Cost: It is estimated that this position would be 3/4 FTE, cost about \$30,000 annually.

Fund Source: an increased permit fee or some type of annual operation fee based on tonnage to provide funding for the position.

Issue 2: Ecology does not have adequate staff to provide technical support and oversight to the Seattle-King County Department of Public Health Environmental Health Division program.

BSE - 2: Petition Ecology to fill the vacant position at the NW Regional Office to provide technical support and overview to the Seattle-King County Department of Public Health Environmental Health Division program.

NOTE: This vacant position in Issue 2 was moved to the Olympia office and filled. This action is no longer necessary. Staff recommends deleting issue and action.

SOUTH KING COUNTY Action #2. Encourage Ecology to provide adequate staffing to provide technical support and overview to the Seattle-King County Department of Public Health Environmental Health Division program.

Discussion: Effective regulation of biosolids requires close cooperation and technical assistance from Ecology to local governments. Many application sites are co-reviewed by Ecology and Seattle-King County Department of Public Health Environmental Health Division. It is important the Ecology commit resources to assure an environmentally sound biosolids program given existing and projected increases in biosolid volumes. There should be little financial impact on Ecology since the position already exists in the budget. Immediate improvement in support and oversight would result. Long term benefit to the environment and the public could be expected. This should be a feasible alternative since financial impacts are minimal.

SEWAGE EFFLUENT

Sewage effluent is the liquid part left after sewage has settled. This liquid may be untreated, or it may be further settled, filtered, and disinfected, depending on final use.

Reuse of effluent is regulated by the State Water Pollution Control Act (Chapter 90.48 RCW) administered by the Department of Ecology (Ecology) and by the "Guidelines for Land Disposal of Treated Domestic Sewage Effluent in Washington State, dated February, 1976" that were prepared jointly by Ecology and the Department of Social and Health Services (now Department of Health). These guidelines are considered to be outdated.

Currently, reuse of sewage effluent by land application is not widely practiced in King County because of precipitation which limits the application period. However, interest in effluent reuse increased during the 1992 drought period. During that time, METRO, Seattle Water Department, Ecology, DOH and Seattle-King County Department of Public Health Environmental Health Division discussed possible uses for treated sewage effluent. The City of Seattle, with concurrence from DOH, used treated effluent for a variety of non-public contact uses, such as street washing and sewer line flushing. Also, other utilities and industries are proposing projects such as irrigation and energy recovery.

In response to the concern about outdated guidelines, and to the increased interest in effluent reuse, the Legislature passed SHB 2833 on April 2, 1992. This requires Ecology to adopt standards, procedures and guidelines by August 1, 1993 for industrial and commercial use of reclaimed water. Ecology, State Department of Health (DOH) and State Department of Agriculture are to provide technical assistance in the development of the standards, procedures, and guidelines. The standards must include provisions for permits, fees, monitoring, and inspections. As with any regulation revision, the standards must comply with the Ground Water Standards, Chapter 173-200 WAC. However, it is not known if the revisers will consider the needs for additional groundwater protection in high potential aquifer recharge areas.

GOAL

To provide assurance that the groundwater in King County will not be contaminated by the reuse of wastewater effluent.

SOUTH KING COUNTY adopted goal as written.

ISSUES

Issue #1: Guideline Revision. Recently, an increased need for conservation of water resources has focused interest in reuse of treated effluent. The effluent guidelines are being revised and will need to comply with the State ground water standards. However, it is not known if special protection for high potential aquifer recharge areas will be considered.

~~BSE - 3: Guideline Revision. Prepare and send a letter of support for the local effort to reuse effluent to participating agencies, DOH and Ecology. GWAC encourages Ecology to include groundwater protection in the revised guidelines for reuse of effluent. The guidelines may need to include constraints for reuse of effluent in high potential aquifer recharge areas.~~

SOUTH KING COUNTY Alternative 2. Prepare and send a letter of support for the local effort to reuse effluent to participating agencies, DOH and Ecology.

Discussion: The potential for effluent reuse by a variety of organizations appears to be increasing. Some effluent reuse applications sites may be in high potential aquifer recharge areas. The revision to the guidelines should anticipate this, and address this potential problem.

Implementation:

Task 1: Revise effluent reuse guidelines, include aquifer recharge protection concerns

Who: DOH and Ecology

When: as per legislative mandate

Cost: no additional cost is anticipated

NOTE: Issue # 2 is now included in Issue # 1: legislature has mandated updating of guidelines. Recommend deleting issue and action.

Issue #2: The existing guidelines are not useful to those who want to reuse effluent and those who must regulate the practice.

BSE - 4: Petition DOH and DOE to update guidelines as soon as possible in support of effluent reuse as a water conservation measure. Urge that revised guidelines give necessary protection to ground water.

SOUTH KING COUNTY Petition DOH and DOE to update Guidelines for Land Application of Treated Domestic Sewage Effluent in Washington State, dated Feb. 1976 as soon as possible in advance of requests for effluent reuse as a water conservation measure. Urge that revised guidelines give necessary protection to ground water.

3.4 GROUND WATER QUANTITY ISSUES

The ground water resource is the result of geology and climate. The geology of King County allows for water to be contained in a variety of soils. The climate provides fairly dependable rainfall and recharge to the ground water. Natural recharge occurs only through relatively undisturbed permeable soils. Aquifer and surface water levels are maintained by preserving recharge. Impetus for ground water resource management comes from a variety of sources. Population growth creates an increasing demand on limited natural resources, including ground water. State law dictates how water may be appropriated. The State of Washington has attempted to balance the needs of the citizens with maintaining the water resource. The Department of Ecology (Ecology) administers laws dealing with water appropriations and allocations. Allocation to new users must not conflict with existing use, however, the information needed to make allocation decisions is faulty. Some areas have experienced the effects of unwise use of aquifers, such as water level decline and sea water intrusion. Parties involved in water use are developing and using innovative techniques to decrease water use and increase water availability, such as conservation and artificial recharge. Recent interest in maintaining surface water resources has spotlighted the interaction of ground water and surface water. Future ground water resource management must include consideration of this interaction.

STATE

The Washington State Department of Ecology (Ecology) must make decisions on water rights, water level declines, ground water reservations, sea water intrusion and artificial recharge. These decision are difficult, because of the lack of adequate data upon which to make decisions.

To evaluate water right applications, Ecology must determine how much water an aquifer system is capable of yielding on a sustained basis. This is difficult to do because of the lack of accurate pumpage figures. Ecology has issued water rights in the past using standard, but informal, water usage rates for various land uses when precise information was not available. Technically and legally, water use should approximate water right totals. This is seldom the case due, in part, to the lack of a State-wide systematic water usage data management program and outdated water rights records. Staffing limitations and inefficient reporting frequently restrict staff efforts to priority areas experiencing significant problems. Consequently, estimates based on field inventory, random sampling, or personal contacts are frequently the best available figures. Ecology does have the statutory authority to require an actual use accounting from the various appropriators of ground water.

It has been the general position of Ecology that aquifer systems could be fully utilized to the capacity of the aquifer to yield water on a sustained basis as long as the water table did not decline below a reasonable or feasible pumping lift, known as a decline limit. In order for Ecology to determine if a water table is declining, a long record of water level data is required. Most of King County does not have sufficient water level data to make confident

statements about the regional response to withdrawal of ground water.

Ecology also evaluates ground water reservation petitions. As part of an acceptable petition, Ecology must make a finding of general availability of unappropriated water to reserve. This finding depends upon known appropriation, which may not reflect actual use.

The threat to ground water from seawater intrusion (migration of salt water into fresh water aquifers due to pumping of ground water) is an emerging concern along the coast. When ground water is pumped from aquifers that are in hydraulic connection with Puget Sound, the gradients that are set up may induce a flow of salt water from Puget Sound toward the well. The lack of information on the extent of ground water resources and ground water use compounds the problem of determining where seawater intrusion could exist. In response to these concerns, Ecology and the State Department of Health (DOH) produced the Draft Seawater Intrusion Policy. The goal of the policy is to prevent seawater intrusion in areas where it has not occurred and to control seawater intrusion where the problem already exists.

Artificial recharge is an innovative method to augment the ground water resource. The main function of artificial recharge is to replenish aquifers during winter months when stream flows exceed minimum instream flow requirements. Replenished aquifers could be pumped during summer periods to meet local peak demands. This would reduce seasonal demands placed on the system during the summer and late fall months.

Currently, Ecology does not have the comprehensive ground water information needed to evaluate water right applications, water level decline, and sea water intrusion. DOH and Ecology are responsible for water usage and water rights data.

The problem of lack of accurate data is being addressed by the Water Resource Data Management Task Force, in the Five Year Water Resource Water Management Plan. The Plan is to provide the information necessary for effective statewide and regional planning and management of the State's water resources. The Plan will utilize data developed through the GWMP and other sources.

The State Department of Health (DOH) requires conservation plans from larger water purveyors and has guidelines for these plans (Water Use Efficiency Act of 1989 RCW 43.20.230 and Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs). In addition to these requirements, the adopted coordinated water supply plans include specific conservation program elements. Source and service meters, common conservation methods, are routinely installed for the larger public water systems. However, the smaller water systems with 2 - 9 connections do not currently have these requirements. These systems are regulated by the King County Board of Health Title 12 and administered by Seattle-King County Department of Public Health Environmental Health Division.

Drought, aquifer depletion and population growth is renewing attention on water reuse. Sewage effluent may be "re-used" for a variety of purposes, including water for toilet flushing, industrial use, irrigation, and aquifer recharge. The 1992 legislative session passed SHB 2833, which provided for the use of "reclaimed water." This bill set out the procedure for Ecology, the Washington State Department of Agriculture, and the Department of Health (DOH) to follow to update the guidelines for sewage effluent reuse. By August 1, 1993, DOH is to adopt a single set of standards, procedures, and guidelines for the industrial and commercial use of reclaimed water.

KING COUNTY

In King County, high potential aquifer recharge areas are primarily protected through policies in the King County Comprehensive Plan, individual community plans and ordinances in the Zoning Code. Basin plans may also direct how development occurs to protect recharge. King County relies on community plans to implement and augment through zoning the aquifer protection policies outlined in the King County Comprehensive Plan (Comprehensive Plan). The Comprehensive Plan is currently being revised, and Seattle-King County Department of Public Health Environmental Health Division is recommending that high potential aquifer recharge considerations be included. Currently, the Comprehensive Plan contains several policies that relate to ground water protection, either directly or indirectly:

Policy E-337: "Groundwater recharge areas should be identified and protected to ensure that ground water resources are protected from potential pollution." (emphasizes ground-water quality rather than quantity. This is proposed to be changed during the comprehensive plan update required by the Growth Management Act.)

Policy E-328: "Wetlands important for flood control, drainage, water quality, aquifer recharge, visual or cultural values or habitat functions should be preserved or enhanced."

Policy E-302: "When environmentally sensitive features are discovered through technical review of a development proposal, the need to protect the sensitive feature should be factored into site planning. Development plans should ensure that structures located on unconstrained portions of the site, and that clustering, if approved, is compatible with surrounding land uses. *These considerations may result in a reduction in density from that otherwise allowed by the zoning.*" (Emphasis added. This means that if a development may impact recharge, density could be reduced from that allowed by the area zoning.)

The Comprehensive Plan policies are implemented specifically in community plans. For example, the Tahoma-Raven Heights Community Plan states that "the demand from surrounding land uses and densities should not exceed the capacity of the area's ground water resources nor otherwise cause deterioration of its quality" and "critical ground water recharge areas and watersheds should be identified and maintained in low density residential

or similar non-intensive uses."

Recently, several policies were proposed that would enhance recharge in the county for community plans, basin plans and changes to the zoning code. The Northshore Community Plan included policies for land clearing which may benefit aquifer recharge:

- "King County should adopt a county wide clearing ordinance with guidelines for clearing on lands outside of sensitive areas and specific performance standards including phasing and seasonality of clearing activities, retention requirements, seasonality, and coverage. The ordinance should include the clarification of a clearing permit process."

- "Until such time that a county wide clearing ordinance is adopted, interim development standards should be implemented whereby clearing is limited on subdivision, short subdivision, and new residential and commercial building projects to protect water quality, limit surface water runoff and erosion, and maintain wildlife habitat and visual buffers."

Another proposed policy which may benefit ground water recharge is in the Executive Proposed Basin Plan for Hylebos Creek and Lower Puget Sound. This policy on vegetation retention states that significant trees should be identified during the platting process and retained, that significant natural vegetation should be retained, and the retained vegetation areas should be clearly and permanently marked on the site and identified on all maps, and have legally binding restrictions. It also states that long term monitoring for water quality trends should be performed to assess trends associated with increased urbanization.

King County Code Title 21 Zoning regulates the degree of impervious cover allowed for developments and therefore effects the amount of recharge. The existing code contains maximum lot coverage by building. Proposed changes establish, for the first time, limitations on impervious cover for development. These limitations were established to provide for accurate sizing of stormwater facilities to manage future runoff. They also would prevent extreme cases of lot coverage by impermeable surfaces. They are considered a clarification of the existing code and are representative of existing coverage with impermeable surface in King County. Therefore, it should not be interpreted that these revisions to the zoning code provide a significant reduction in the amount of impermeable surfaces allowed.

Another method to protect ground water recharge is through State Environmental Policy Act (SEPA) evaluation. A number of proposed land uses require completion of a SEPA checklist prior to permitting by King County. If the proposed activities are judged to represent a significant environmental impact, an environmental impact statement (EIS) is completed. The SEPA review process is implemented by King County Environmental Division, SEPA Section. The SEPA checklist includes sections on surface, ground, and runoff water, but does not ask specifically whether the proposed activities will be conducted in an aquifer recharge area, whether they are likely to affect the quantity of recharge on-site, or to what degree the quantity of recharge is likely to be affected. In recharge related questions, however, the applicant is asked how much dredging or filling of wetlands is

planned, whether water will be discharged to ground water, and how runoff will be generated and handled. Additional information may be requested by the SEPA Section if the reviewers decide that the information provided in the checklist is not sufficient or if another agency or group has indicated that the proposed site of the land use is an area that requires extra attention. The SEPA law allows exemption of certain activities from SEPA review. The SEPA ordinance at the county level may be amended to include these activities if it is found that they could contribute environmental effects.

NOTE: Chapter 173-100 WAC Ground Water Areas Management and Program contains guidelines on program content which were to be adapted to the particular needs of an GWMA. Included in the program content was a section on alternatives, which was to outline various land and water use management strategies that address each of the ground water problems discussed in the problem definition section. It states that the alternative management strategies would address water conservation, conflicts with existing water rights and minimum instream flow requirements, programs to resolve such conflicts, and long-term policies and construction practices necessary to protect existing water rights and subsequent facilities installed in accordance with the GWMA program and/or other water right procedures. This issue section does not address these topics directly, except for conservation. Several new state programs have begun since the WAC was written which provide programs to resolve conflicts with existing water rights and minimum instream flow requirements, and long-term policies and construction practices necessary to protect existing water rights and subsequent facilities. (Generally, under the Water Resources Forum from the Chelan Agreement). The best way to address these issues and to support the new programs is to develop and implement a long-term monitoring and data collection program to provide the decision makers the necessary information so that they can make better decisions. This is addressed in this issue and in the data collection and management issue.

GOAL

To manage the ground water resources of King County to optimize the current and long term benefits.

SOUTH KING COUNTY To assure that the ground water resources of King County are managed in a manner that will optimize the current and long term benefits.

ISSUES

Issue # 1: Policies and Ordinances. Several policies and ordinances are proposed which may provide broad protection for aquifer recharge areas. The revision to the Comprehensive Plan, the clearing ordinance and the interim clearing standards may not be adopted by King County. ~~CARA protection needs to be included in county wide policies.~~

WQ - 1A Policies and Ordinances. ~~Support proposed Clearing policies, Basin Plan and King County Comprehensive Plan policies.~~

1. King County will amend Comprehensive Plan Policy E-337 to include aquifer recharge.

2. King County and cities will consider adopting a clearing ordinance with guidelines for clearing on lands outside of sensitive areas and specific performance standards including phasing and seasonality of clearing activities, retention requirements, seasonality, and coverage. The ordinance should include the clarification of a clearing permit process.

3. King County and cities will implement interim development standards whereby clearing is limited on subdivision, short subdivision, and new residential and commercial building projects to protect water quality, limit surface water runoff and erosion, and maintain wildlife habitat and visual buffers, until such time that a clearing ordinance is adopted.

3. King County will adopt the Executive Proposed Basin Plan for Hylebos Creek and Lower Puget Sound policy on vegetation retention which states that significant trees should be identified during the platting process and retained, that significant natural vegetation should be retained, and the retained vegetation areas should be clearly and permanently marked on the site and identified on all maps, and have legally binding restrictions. Long term monitoring for water quality trends should be performed to assess trends associated with increased urbanization.

NOTE: Action changed to be a strong statement of what King County and cities will do, instead of just supporting proposed policies. If the GWAC wants King County and cities to adopt these policies, this is the way to present the action.

SOUTH KING COUNTY Action # 1: Support proposed Clearing policies and Basin Plan and Comprehensive Plan policies.

Discussion: The community plan and zoning are primary tools for protection of aquifer recharge areas. Largely as a result of the 1990 Growth Management Act, changes are underway in the treatment of aquifer recharge areas in King County. For example, recommendations have been made to the King County Comprehensive Plan review committee that the sections of the Comprehensive Plan pertaining to aquifer recharge be revised. These proposed policies and ordinances are requested to be adopted to help preserve aquifer recharge.

Implementation:

Tasks:

1. Amend Comprehensive Plan Policy E-337.
2. Consider adopting a clearing ordinance.
3. Adopt interim development standards.
4. Adopt Hylebos Basin Plan as written.

Who:

Tasks 1, 2, 3, 4: King County

When: Task 1: during comprehensive plan update

Task 2 & 3: as per implementation schedule

Task 4: when County review is accomplished.

Costs: No additional costs are anticipated for these tasks.

Tasks 2, 3: Cities

When: Task 2, 3: as per implementation schedule

Costs: No additional costs are anticipated.

WQ - 1B: Support changes in the King County Zoning Code:

- ~~1. Petition King County and cities to establish or maintain average densities of one or less residential units/5 acres in CARA's.~~
- ~~2. Petition King County and cities to set maximum percentages of impervious cover for critical recharge areas.~~
- ~~3. Petition King County and cities to encourage cluster development and other land uses in CARA's which maximize land left in natural state.~~
- ~~4. Petition King County and cities to prevent further encroachment of multi-family, commercial, and industrial zones into CARA's. Where these zones are already located in CARA's the percentage of impervious surface for new development will be restricted. Development practices which promote recharge will be required.~~

NOTE: Recommend deleting WQ - 1B from this issue because #1, 3 and 4 will be covered in the Special Areas issue under land use; #2 is not supported by studies and will be in the zoning code revision.

WQ - 6: Petition cities to adopt ordinances or policies to protect CARA.

NOTE: WQ 6 moved here because is similar to WQ 2. Staff recommends deleting from this issue because this will be included in the special areas paper.

SOUTH KING COUNTY King County and city zoning codes development practices which while protecting CARAs from water quality degradation, will require enhanced aquifer recharge. These practices may include maximum percentages of impervious cover and densities development.

SOUTH KING COUNTY Action # 6: Petition cities to adopt ordinances or policies to protect CARA.

Discussion: Cities planning under the Growth Management Act (GMA) are required to protect CARA. A variety of methods are available to cities, which include ordinances and policies. Some cities may not be planning under GMA. These should include CARA protection, as the King County policies would not apply in these areas. It is generally agreed that protection resources up to a political boundary does not "protect" at all, unless the protection is equal on both sides of the boundary. Cities could use the ordinances of Bothell, Redmond and policies of Federal Way and Kent as models.

The Vashon Community Plan and Area Zoning (1986) established maximum development densities of one house per ten acres in portions of Vashon Island that were identified as high recharge areas in a study of the hydrogeology of the Island. Maximum development densities could be established for critical recharge areas elsewhere in the county in a similar manner. Implementation of this alternative would require that critical recharge areas be identified, that community plans and area zoning be developed or updated to include upper limits on development density for critical recharge areas, and that development be kept within the prescribed limits by the permitting agencies (primarily BALD). Costs of this alternative would include the costs of revising community plans and area zoning to include limits on development densities and possibly the cost of additional review time by permitting agency personnel. The costs associated with community plan and area zoning revisions would probably be minimal if revisions were introduced in the course of the standard periodic review process. Costs associated with permit review would be offset by related review fees.

WQ - 1D: Policies and Ordinances. ~~Petition Ecology King County to amend their SEPA checklist to include an evaluation of the effects of the proposed project on the quantity of aquifer recharge. Petition elected state representatives to amend the SEPA checklist to include quantification of the effects of the proposed project on ground water recharge. Petition Ecology to support this change and draft the legislation.~~ impacts on the quantity of aquifer recharge. Until the change by Ecology can be made, cities, King County and other reviewing agencies will consider impacts on the quantity of aquifer recharge during SEPA checklist review.

NOTE: Revised per Issaquah and Redmond GWAC'S language. The development of SEPA guidance policy will be included in the Special Areas issue actions.

SOUTH KING COUNTY Action #3: Petition Ecology to amend their SEPA checklist to include impacts on the quantity of aquifer recharge. Until the change by Ecology can be made, request the cities, King County and other reviewing agencies to consider impacts on the quantity of aquifer recharge in their SEPA checklist and develop appropriate policy on recharge impacts.

Discussion: Revising the SEPA questionnaire would reflect a growing concern for protection of ground-water resources in general and critical recharge areas in particular. The cost of addressing the expanded SEPA questionnaire would be carried primarily by the developers. Additional costs could arise from the increased work load for the SEPA questionnaire reviewers at King County and cities, possibly necessitating addition of staff associated with SEPA review, which would be offset by related review fees.

Implementation:

Task 1: Revise SEPA checklist.

Who: Ecology, through rule revision.

When: as per implementation plan.

Cost: to be determined during concurrence.

Fund Source: general agency funds.

Task 2: Impacts on the quantity of aquifer recharge during SEPA checklist review will be considered.

Who: Cities, King County and other reviewing agencies

When: as per implementation plan.

Cost: to be determined during concurrence. Probably small, would be a policy change by the reviewing agencies (if they are not doing this already). Cost of the increased review would be borne by developers.

Fund Source: general agency funds.

NOTE: The following is proposed for deletion per Issaquah and Redmond actions. Also, this is considered in the Special Areas issue.

WQ - 1E: Petition King County to remove SEPA exemptions listed in text.

SOUTH KING COUNTY did not take action

Discussion: Removal of these exemptions would probably not have a great impact on ground water recharge. Forest practices could have an impact, but not enough is currently known about the extent of activities that would impact recharge and how much of that activity goes on in CARA's. Removal of this exemption should be based on information as to the extent of these activities. Forestry practices in CARA's may influence recharge of aquifers. The Timber/Fish/Wildlife (TFW) Agreement guiding forest practices in the state may result indirectly in greater awareness of recharge area issues, but these issues will not be a priority with the TFW Committee. TFW does not consider aquifer recharge protection explicitly, but it is included in other topics, such as erosion and soil permeability considerations after burning. This action would evaluate the extent of activities that may effect recharge. This evaluation may involve King County and State forest resource specialists and hydrogeologists.

NOTE: The following is proposed for deletion per Issaquah, Redmond and South King County actions. Also, this is considered in the Special Areas issue.

WQ - 1F: Petition the County to prepare an application for Special Protection Area status for the GWMA under Chapter 173-200 WAC Water Quality Standards for Ground Water of the State of Washington.

~~SOUTH KING COUNTY Action #5: Petition the County to prepare an application for Special Protection Area status for the GWMA under Chapter 173-200 WAC Water Quality Standards for Ground water of the State of Washington.~~

Discussion: After a SPA is designated, permits could be more restrictive in response to the specific vulnerability and needs of the area. This is discussed in the Federal and State issue paper, and implementation would be as per that paper.

Issue # 2: Data Needs. There are many needs for a complete characterization of the aquifer resource. ~~capability~~ This information is needed by Ecology for water rights application analysis, surface water/ground water interaction determination, possible ground water reservation and other resource management concerns. To date, this has not been completed.

WQ - 2A: Data Needs. Design and implement a ground water data collection management monitoring and modeling program which would enable Ecology and others who make land and water use decisions (such as purveyors, land use planners and public officials) to make water resource decision based on more complete information. ~~capable of predicting the resource capability for the GWMA.~~

NOTE: This is changed to reflect a comprehensive program. As previously worded, emphasized quantity only. Details of the program will be in the ground water monitoring (Data Collection and Management) issue. Some of the GWAC'S actions will be shown there, as noted below.

SOUTH KING COUNTY Design and implement a ground water monitoring and modeling program capable of predicting the resource capability for the GWMA.

Discussion: The GWMP started the development of data necessary for ground water resource characteristics, including resource capability. However, a two - three year study is not long enough to collect all of the data necessary upon which to base good decisions. Ecology, King County and utilities need this information for a variety of ground water resource management purposes. If this information is not obtained, then decisions will be based on incomplete or inaccurate data. Specific information about the data needed will be in the Data Collection and Management Program, and will be based upon the needs identified by the state Data Management Task Force.

Implementation:

Task 1: ground water data collection management program will be designed and implemented.

Who: King County and cities through the Management Committee

When: as per implementation schedule

Cost: to be determined.

Fund Source: aquifer protection fund.

WQ - 2B: The local ground water monitoring program will maintain sufficient information to determine if ground water withdrawals are causing water level declines or decreased stream or spring flow. This includes increased monitoring of groundwater levels, surface-water levels, and stream baseflows.

NOTE: Recommend for deletion as per GWAC action.

~~SOUTH KING COUNTY Action # 2. The local ground water monitoring program will maintain sufficient information to determine if ground water withdrawals are causing water level declines or decreased stream or spring flow. This includes increased monitoring of groundwater levels, surface water levels, and stream baseflows.~~

Discussion: Not enough is known about ground water/surface water interaction for a complete resource characterization description, which needs to include hydraulic continuity. Also, Ecology needs to evaluate surface water impacts when evaluating water right applications.

The surface waters that occur within, or pass through, King County have a moderately high degree of protection under state regulations filed by Ecology. Ecology's present position on the issue of allowable continuity between a new groundwater appropriation with surface waters that are protected by rule pursuant to chapter 90.54 RCW has not been formalized. In order to determine the magnitude of impacts to water levels and baseflows from groundwater development, it is necessary to maintain an extensive monitoring network of wells, major rivers and streams (baseflow), lakes and wetlands (water levels). Collection of this data not only allows direct observation of trends within the hydrologic system, but also allows calibration of numerical models of the hydrologic system. Computer models can be used to predict future effects of present withdrawal rates, anticipated development, and to assess the relative advantages of competing development strategies.

There are a limited amount of surface water data for streams, springs, lakes and wetlands to define baseline conditions and subsequent impacts associated with development. The Water Resources Act of 1971, RCW 90.54.020 (8), reads in part: "Full recognition shall be given in the administration of water allocation and use programs to the natural interrelationships of surface and ground waters." Ecology, in conjunction with the Water Resources Forum, is preparing new guidelines. It is important for the protection of base flow streams that the hydraulic continuity and level of acceptable impact be correctly established. Absolute prevention of some groundwater development effects upon surface-water features is theoretically impossible. Prevention of undesirable effects upon surface-water features is possible with sound aquifer management, water consumption, and growth planning strategies.

NOTE: This action deleted per GWAC action.

WQ - 2C: Develop information on development projections for GWMA, including future land use zoning and localized population growth projections.

~~SOUTH KING COUNTY Action # 3. Develop information on development projections for GWMA, including future land use zoning and localized population growth projections.~~

Discussion: Urbanization causes increased runoff and decreased infiltration of precipitation. Not enough is known about land use, and related impermeable surfaces (existing and projected for each land use) to determine and/or predict the effect of currently allowed land use. This action will provide the information necessary to evaluate land area made impermeable by surface paving and estimate future water supply demands expected from population growth and the impacts of certain land uses. Development and analysis of other aspects of ground water protection, such as storm water management, conservation and resource characterization, will be able to use this information.

WQ - 2D: Policies and Ordinances. ~~Establish near shore monitoring wells in the LTM to provide early warning of encroachment of sea water on aquifers. Support Ecology's efforts to develop a Sea Water Intrusion Policy.~~

NOTE: staff recommends this change because Ecology has developed the Seawater policy and per GWAC's language. Data Collection and Management Program specifics will be included in the Data Collection and Management Program for South King County.

SOUTH KING COUNTY Action 4: Establish monitoring wells as needed to provide early warning of encroachment of seawater on aquifers. Support Ecology's Seawater Intrusion Policy.

Discussion: Sea water intrusion may be a problem, or become a problem, in the coastal areas of King County. Support for the Sea Water Intrusion Program and collecting chloride data in the Data Collection and Management Program will help in implementing the program in King County in the future.

Implementation:

Task 1: Include a statement of support in the Final GWMP. There is no additional cost for this action.

Issue # 3: Water rights. Water rights records do not necessarily accurately reflect actual pumpage rates and current use of the ground water resource.

WQ - 3A: Water rights. ~~Petition utilities to~~ will update their water right records and report to Ecology, as per the recommended program in the "Five Year Water Resource Data Management Plan". ~~The LTM will address needed information and methods.~~

NOTE: staff recommends change because the Data Management Task Force has addressed collection of this information through the Five Year Plan.

SOUTH KING COUNTY Action #1: Recommend utilities to update their water right records and report to Ecology.

Discussion: Water right records could be a much better tool in ground water management if the individual water rights more clearly reflected actual use and if unused rights were voluntarily or involuntarily relinquished to be eliminated from the records. Utility records of water rights need to be updated and reported to Ecology to influence policy decision. The Five Year Water Resource Data Management Plan's "Activity 10.2 Standardize Water Use Reporting" will provide for a standard method for organizations that report water use to use. This Activity will specify the data to be collected, acceptable methods of data collection, and frequency of collection. This Plan is designed to address the needs of Ecology, King County and utilities for a variety of ground water resource management purposes. If this information is not obtained, then decisions will be based on incomplete or inaccurate data.

Implementation:

Task 1: Water use records will be updated and reported to Ecology as per the Five Year Water Resource Data Management Plan.

Who: Water users

When: as per the Plan.

Cost: to be determined during concurrence.

Fund Source: general agency funds.

NOTE: Staff recommends deletion of WQ - 3B and 3C per GWAC's recommendation. Ecology will have to determine if they are going to do this, based on Forum and other directives, including budget considerations.

WQ - 3B: Evaluate the utility of Ecology re-appropriating Water Rights that are no longer used. Information as to who has water rights in King County and whether or not they are being used would be collected. At this point, the extent of the problem could be evaluated.

WQ - 3C: Ecology would be provided with the information. Ecology could then determine if they wanted to pursue relinquishment, that is, if there would be a great public benefit to be gained by so doing. (RCW 90. 14)

~~SOUTH KING COUNTY Action # 2: Evaluate the utility of Ecology re-appropriating Water Rights that are no longer used. Information as to who has water rights in King~~

~~County and whether or not they are being used would be collected. At this point, the extent of the problem could be evaluated.~~

~~Action # 3: Ecology would be provided with the information. Ecology could then determine if they wanted to pursue relinquishment, that is, if there would be a great public benefit to be gained by so doing. (RCW 90.14)~~

Discussion for Actions 2 and 3: Ecology does have authority to require reports from each ground water appropriator as to the amount of ground water being used which would also be a mechanism to identify those persons not using their water rights. However, short of field inventory, title search or notice to every property owner through tax statement, such as was done in the "Registration Claim Act" (RCW 90.14.040 through RCW 90.14.121), Ecology has no way to communicate with all of the water right holders and those persons or entities that have registered claims to water rights. Once a certificate of water right is issued, the right becomes an appurtenance to property and changes in the ownership of the water right as the land changes hands are not recorded with Ecology. The extent of existing unused rights is unknown and will remain unknown under Ecology's present program. The statutory authorities to document and formalize the relinquishment of water rights through non-use are in place (Under Chapter 90.14 RCW or under a general adjudication of water rights process), but the chances of initiating a comprehensive relinquishment program are very small, because of high costs and staff requirements. Therefore, this should only be pursued after the water rights analysis is completed.

~~Issue # 4: Need to determine which of a variety of established and innovative resource management methods will be pursued and supported, such as conservation, effluent reuse, artificial recharge, ground water reservation, and setting water level decline limits.~~

NOTE: This issue has been rearranged into topics:

Issue 4A: Conservation. Conservation has been shown to have a positive impact on ground water resources. There are some conservation methods that could be implemented to enhance current programs. The draft King County landscaping ordinances have been proposed, but they may not be adopted. King County Board of Health (KCBOH) regulations for small water systems do not include conservation elements.

WQ - 4A1 (Previous Action # 1: Support existing programs: 1.) Support existing medium and large size utility efforts to develop and promote conservation as described in the Coordinated Water System Plans (CWSP) approved by the Washington State Department of Health.

NOTE: Staff recommends deletion because conservation efforts for these utilities are required by DOH and King County Utilities Technical Review Committee (UTRC) per the adopted CWSP.

WQ - 4A2 Conservation. (Previous Action # 4: Regulations: 1.) ~~Support King County's will adopt the~~ proposed landscaping ordinances to encourage conservation for new development. Landscaping plans should incorporate native growth areas, use of plant species which are drought tolerant, water efficient irrigation technologies, soil amendments, and limitations on the amount of turf. ~~Petition Cities will~~ to consider adopting similar ordinances.

WQ - 4A3 Conservation. (Previous Action # 4: Regulations: 2.) ~~Petition Seattle-King County Department of Public Health Environmental Health Division will to adopt propose a revision to regulations for existing, new or expanded Group B Small Public Water Systems to covering water conservation goals and measures for King County Board of Health consideration. This would include water source meters, individual meters, and other items listed under the Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conservation Programs. Existing Group B Small Public Water Systems could be required to retrofit with meters (Source and Individual) within 5 years of regulation adoption. New and Expanding Group B systems could have to comply with requirements upon creation, or completion of expansion.~~

NOTE: Moved strike-out text to discussion, page 3 - 216.

WQ - 4A4 Conservation. (Previous Action # 4: Regulations: 3.) ~~Petition Seattle-King County Department of Public Health Environmental Health Division will to adopt propose regulations for new and existing individual wells incorporating conservation measures, including source meters for King County Board of Health consideration. Existing individual wells will be required to retrofit with a source meter at the time of property sale and title transfer. New individual wells will have a source meter installed at time of initial well completion and approval.~~

NOTE: Moved strike-out text to discussion, page 3 - 217.

Issue 4B Education. Education has also been shown to have a positive impact on ground water resources. These educational activities need to be included in the Education Section:

WQ - 4B1 Education. (Previously Action # 2: Education: 1.) ~~Petition King County, Cities and Water Utilities will~~ work with local nurseries, WSU Cooperative Extension Service and the Conservation Districts to promote the availability of appropriate seed stocks, plants and materials to achieve xeriscaping (use of low-water use plants). ~~and low water use landscaping.~~

WQ - 4B2 Education. (Previous Action # 1: Support existing programs: 2.) Support conservation education efforts in the schools, and for the general public as described in the Interim Guidelines (Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs). These would include, but not be limited to, the items listed under Public Education in Section IV of the Implementation of the Guidelines.

WQ - 4B3 Education. (Previously Action # 2: Education: 2.) Petition King County to educate residents about landscaping practices that promote aquifer recharge through an informational brochure prepared by Cooperative Extension and Seattle-King County Department of Public Health Environmental Health Division.

Issue 4C Artificial recharge. Artificial recharge is a new technique that is being tried in this area. However, not enough is known about the possibility for long-term artificial recharge.

WQ - 4C1 Artificial recharge. (Previously Action # 3: Support New Programs: 1.) ~~Encourage Purveyors should~~ that were identified in the South King County Background Report to investigate artificial recharge programs.

Issue 4D Reservation. Reservation. Ground water reservation may be used to limit the amount of ground water withdrawn from a system.

NOTE: Recommend delete this action and issue as SOUTH KING COUNTY GWAC, as shown:

WQ - 4D1 (Previously Action # 3: Support New Programs: 2.) ~~Prepare a petition for ground water supply Reservation for GWMA to be submitted to Ecology as a critical tool for proper management of ground water resource in the GWMA based on aquifer quantity evaluation in the GWMP and LTM. Also, petition county and cities to adopt policies supporting the petition.~~

NOTE: Recommend deleting Issue 4E and actions because the new state law requires that

DOH and DOE update the effluent reuse guidelines. This is discussed in the Biosolids/Effluent issue. These actions are not now necessary.

Issue 4E. EFFLUENT REUSE provides for a "second use" of water before it is discharged back to the natural system. This allows for use of non-potable water instead of using treated potable water.

WQ - 4E 1 (Previously Action # 1: Support existing programs: 3.) Prepare and send a letter of support for the local effort to reuse effluent to participating agencies, DOH and Ecology.

WQ - 4E 2 (Previously Action # 4: Regulations: 5.) Petition DOH and DOE to update guidelines as soon as possible in support of effluent reuse as a water conservation measure. Urge that revised guidelines give necessary protection to ground water.

Issue 4F. Decline Limits. Water level decline limits are set by Ecology and can be an effective tool for managing the resource. Ecology needs long-term information in order to set decline limits.

WQ - 4F1 (Previously Action # 3 Support New Programs: 3.) Petition King County to include monitoring for water level decline in the LTM. Proposed program could include these elements:

1. Lacking a bona fide artificial recharge program, total annual withdrawal from the aquifer should be reduced to a point where the system was stabilized. This determination will be based on an active monitoring network to detect any further aquifer declines.
2. If significant water table declines are observed in a specific aquifer, studies of the aquifer system shall be initiated (by King County or the water utility) to determine the reasons for the decline and recommendations made to prevent further declines or restore predecline levels. The evaluation will correlate areas with observed decline with land use map changes, rainfall, zoning, water demand, etc.
3. Petition Ecology to establish maximum aquifer water level decline limits in areas of known progressive declines that appear not to be reaching a new state of equilibrium. These areas may be closed to new appropriations of groundwater because any new withdrawals could increase the overuse of the aquifer, if other protection or correction measures do not alleviate the decline.

NOTE: Staff recommends to delete WQ - 4F1 (Previously Action # 3 Support New Programs: 3 1,2) because monitoring will be covered in Data Collection and Management Program and Ecology has to determine what they will do with the information.

Recommend that this part (from Issaquah) be included as the action: "Recommendations shall be made to prevent further declines or restore predecline levels and to maintain safe sustainable yields. Based on the results of the study, appropriate mitigation actions shall be taken by all jurisdictions."

WQ - 4F2 Decline Limits. Ecology shall review the information collected through the Data Collection and Management Program and recommendations shall be made to prevent further declines or restore predecline levels and to maintain safe sustainable yields. All jurisdictions shall then follow the appropriate mitigation actions as recommended by Ecology.

SOUTH KING COUNTY

Action # 1: Support existing programs:

1. Support existing medium and large size utility efforts to develop and promote conservation as described in the Coordinated Water System Plans approved by the Washington State Department of Health.
2. Support conservation education efforts in the schools, and for the general public as described in the Interim Guidelines. These would include, but not be limited to, the items listed under Public Education in Section IV of the Implementation Plan.
3. Prepare and send a letter of support for the local effort to reuse effluent to participating agencies, DOH and Ecology.

Action # 2: Education:

1. Petition King County, Cities and Water Utilities to work with local nurseries, WSU Cooperative Extension Service and the Conservation Districts to promote the availability of appropriate seed stocks, plants and materials to achieve xeriscaping and low water use landscaping.
2. Petition King County to educate residents about landscaping practices that promote aquifer recharge through an informational brochure prepared by Cooperative Extension and SKCHD.

Action #3: This action was amended as follows: #1 remains as is; #2 is deleted; #3 becomes #2 with subsections changed from 1,2, and 3 to A,B and C; A new #3 was added.

The new #2 is amended as under: --

C. Based on the results of the study, appropriate mitigation actions shall be taken by all jurisdictions.* (*Redmond GWAC adopted position.)

2. Petition King County to include monitoring for water level decline in the Data Collection and Management Program. Proposed program could include these elements:

A. Lacking a bona fide artificial recharge program or firm supply of additional water, total annual withdrawal from the aquifer should be reduced to a point where the system was stabilized. This determination will be based on an active monitoring network to detect any further aquifer declines (Alternative D).

B. If significant water table declines are observed in a specific aquifer, studies of the aquifer system shall be initiated (by King County or the water utility) to determine the reasons for the decline and recommendations made to prevent further declines or restore predecline levels. The evaluation will correlate areas with observed decline with land use map changes, rainfall, zoning, water demand, etc.

C. Petition Ecology to establish maximum aquifer water level decline limits in Critical Water Supply Planning areas (CWSP) of known progressive declines that appear not to be reaching a new state of equilibrium. These areas may be closed to new appropriations of ground water because any new withdrawals could increase the overuse of the aquifer, if other protection or connection measures do not alleviate the decline. Existing appropriations could be adjusted accordingly to the maximum decline limits if other protection or connection efforts do not alleviate the decline.

Action 4: #1: This action was amended as follows: #1. Support King County's proposed landscaping ordinances to encourage conservation for new development. Landscaping plans should incorporate native growth areas, use of plant species which are drought tolerant, water efficient irrigation technologies, soil amendments, and limitations on the amount of turf. (2) Petition cities to adopt similar ordinances if they don't already have them.

#2. Petition King County and the suburban cities to establish clearing and grading ordinances which encourage retention of the existing vegetation and trees for future water conservation in landscaping.

Under Issue 4, Alternative 2, Action #4, #'s 2, 3 and 4 now are #'s 3, 4 and 5.

Under Issue 4, Alternative 2, Action #4, #3 this action was amended as follows: #3. Petition Seattle-King County Health Department to adopt regulations for new or expanded Group B Small Public Water Systems covering water conservation goals and measures. This would include water source meters, individual meters, and other items listed under the Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conservation Programs. New and Expanding Group B systems could have to comply with requirements upon creation or completion of expansion.

Under Issue 4, Alternative 2, Action #4 was amended as follows: #4 Petition Seattle-King County Health Department to adopt regulations for new individual wells incorporating conservation measures, including source meters. New individual wells will have a source meter installed at time of initial well completion and approval.

5.4. Petition DOH and DOE to update guidelines as soon as possible in support of effluent reuse as a water conservation measure. Urge that revised guidelines give necessary protection to ground water.

Discussion: Support for appropriate resource management methods would increase the effectiveness of the GWMP:

Action 4A Conservation: Ground water may be conserved through implementation of effective demand reduction techniques. Conservation of water supplies is essential to the proper management of ground water resources.

Action 4A3: Including conservation measures in the landscaping ordinance will ensure that water conservation is considered during the planning of a development. Otherwise, subsequent owners may have to retrofit conservation measures.

Action 4A4: The proposed regulations would address a gap in the requirement of conservation plans. A system that is not in a Coordinated Water Supply Plan Area (CWSA), with <1000 connections; and not under UTRC review does not have to prepare a conservation element in a comprehensive plan. The proposed regulations would address this type of system.

Revising the Small Public Water System Regulations would include requiring water source meters, individual meters, and other items listed under the Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conservation Programs. Existing Group B Small Public Water Systems could be required to retrofit with meters (Source and Individual) within 5 years of regulation adoption. New and Expanding Group B systems could have to comply with requirements upon creation, or completion of expansion.

Action 4A5: New regulations for individual wells would incorporate conservation measures. These would include requiring these wells to retrofit with a source meter at the time of property sale and title transfer. New individual wells will have a source meter installed at time of initial well completion and approval. Meters provide a record and a method to monitor water use.

Action 4B Education: Educational efforts would complement and combine with current efforts of Seattle-King County Department of Public Health Environmental Health Division, Cooperative Extension and the Conservation District. This information could be disseminated through the Master Gardener and other programs of Cooperative Extension. Awareness of the problem of reduced aquifer recharge may increase responsibility and concern for aquifer recharge areas in the community. Education programs on how landscaping practices can affect aquifer recharge could be coupled with education on the effects of pesticide and herbicide use on ground-water quality. A discussion of proper disposal of household hazardous wastes could be included. Landscaping tips should include a discussion of native vegetation and its role in facilitating infiltration of moisture.

Action 4C Artificial Recharge: The main function of artificial recharge is to replenish aquifers during winter months when stream flows exceed minimum instream flow requirements. Replenished aquifers could be pumped during summer periods to meet local peak demands. This would reduce seasonal demands placed on the system during the summer and late fall months. South King County Grant No. 1 identified potential sites in Federal Way, Auburn, and the Covington Upland. Site specific investigations are required before suitability is established. The Seattle Water Department's Highline Project may serve as a model for other programs.

Action 4D Ground Water Reservation: The amount of unallocated ground water that can be safely withdrawn without depleting the resource is limited. Reservation for future needs will protect the resource and promote its best use. Prudent ground water management includes planning for the future. The Reservation process provides a mechanism to do this.

A Reservation petition may be prepared at any time. By including this action in the GWMP, the GWAC informs the readers of the Plan that it intends to petition for Reservation in the future and that it supports Reservation as a ground water management tool. However, reserving ground water without understanding the available resource may be pointless. A Reservation should reflect both future needs and an approximation of the unallocated, usable ground water resource. Future needs may be projected based on population projections.

Action 4F Water Level Decline Limits: State-wide activities, such as the Water Resources Forum, are covering this and other water resource issues. Ecology will be guided by the Forum for its future actions regarding setting decline limits. Ecology has the authority to set allowed decline limits. However, it needs good data upon which to base this decision. The Data Collection and Management Program will collect data on water levels, which Ecology can use.

Implementation:

4A Conservation

Task 1. adopt/consider landscaping ordinance (4A2)

Task 2. propose and consider changes to Title 12 (4A3)

Task 3. propose and consider individual water system regulations. (4A4)

Who: Task 1: King County, Cities.

When: as per implementation schedule.

Cost: to be determined

Fund Source: general agency funds.

Who: Task 2, 3: Seattle-King County Department of Public Health Environmental Health Division, KCBOH.

When: as per implementation schedule.

Cost: 160 hours

Fund Source: aquifer protection fund.

4B Education. To be implemented as per Education section.

4C Artificial Recharge

Task: Investigate Artificial Recharge

Who: Public water systems

When: per their needs and timeframe

Cost: to be determined

Fund Source: general agency funds.

4D Reservation [for Issaquah version only]

Task: Encourage systems to petition Ecology

Who: GWAC

When: Include statement in Final GWMP

Cost: no additional cost

4F Decline Limits

Task: Review water level information collected through the Data Collection and Management Program to determine if decline limits are necessary.

Who: Ecology

When: as per implementation schedule

Cost: to be determined during concurrence.

Fund Source: general agency funds.

SECTION IV

SECTION IV

RECOMMENDED IMPLEMENTATION PROCESS FOR THE GROUND WATER MANAGEMENT PROGRAM

1. INTRODUCTION

The groundwater management planning process has been funded by Centennial Clean Water Fund (CCWF) grants administered by the Washington Department of Ecology (Ecology) and contributions from King County, cities, and water utilities. These funds provided for the development of a plan for action. However, the implementation of the Ground Water Management Program (GWMP) is dependent upon long-term funding and appropriate assignment of responsibility. Executive and legislative branches of government and other public and private interests have important roles to play. The recommended implementation process described in this chapter assigns roles and tasks and proposes a source of funding. Topics addressed include:

- Legislative authority
- Funding
- Ecology
- Ground Water Management Committee (Management Committee)
- Ground Water Advisory Committee (GWAC)
- Lead agency
- Implementation Plan
- Process to Consolidate GWMPs in King County
- Process for evaluation and revision of the GWMP

Summary Tables IV-1 and IV-2 list actions to be taken during plan implementation. These tables also list priorities, who is responsible for implementation, cost, source of funds, and an approximate schedule for commencing and completing the work.

Two significant developments occurred during the planning process that had a profound influence upon the GWMP. Both occurred after scopes of work for the GWMP were adopted. Both necessitated major shifts in policy development.

The first is the Growth Management Act (GMA) which was passed by the Washington legislature in 1990. This act requires local governments to identify and protect areas that are critical for aquifer recharge.

The second is wellhead protection requirements mandated by the 1986 amendments to the Safe Drinking Water Act (SDWA). The amendments require

states to develop Wellhead Protection Programs (WHPP). The WHPP is being developed in Washington by the Department of Health (DOH). The draft program has not yet been released to the public. However, review of federal law, program fact sheets, and early program drafts indicate that public water system purveyors will be required to delineate wellhead protection areas for each public water system and develop programs to protect ground water in those areas.

Both the GMA and the WHPP include specific provisions that must be carried out at the local level. The GWACs have tried to accommodate and, where appropriate, incorporate the provisions of the GMA and the WHPP into the GWMP. For example, some GWMP recommendations are county wide in applicability rather than limited to Ground Water Management Areas (GWMA)s. This is in keeping with the directive of the GMA to local governments to cooperatively protect aquifer resources on a county or regional basis. The GWMP is designed to accommodate other ground water protection activities in King County that are expected to occur in response to both the GMA and the WHPP.

2. LEGISLATIVE AUTHORITY

Legislative authority is needed to both adopt the GWMP and ordinances that may be necessary to implement it.

The GWAC recommends that legislative authority for adoption and implementation of the GWMP be shared between the King County Council (KCC), the King County Board of Health (BOH), and affected city councils. Three legislative bodies are needed to implement the plan because it encompasses actions that are typically under the purview of one but not the others. BOH authority is particularly important because it allows for the adoption of ordinances that are effective in both the unincorporated areas and in the cities of King County. (The City of Seattle is an exception. It has its own Board of Health.)¹ Roles of each legislative authority are recommended as outlined below:

A. King County Council

- Review and prepare findings on the Draft GWMP;
- Recommend a final Draft GWMP to Ecology upon concurrence by the BOH, affected governments and agencies;

¹ The Ground Water Management Committee oversees the implementation of the GWMP. Please refer to discussion under Parts 5 and 6 of this Section for information regarding committee oversight of GWMP implementation.

- Adopt the GWMP after it has been certified by Ecology;
- Appoint members of the Management Committee from nominees provided by entities represented (see note i.);
- Adopt revisions to the GWMP, subject to concurrence by the Management Committee, the BOH, and affected governments and agencies;
- Allocate aquifer protection funds subject to concurrence by the Management Committee, the BOH, and affected governments and agencies; and
- Adopt ordinances necessary for the implementation of the GWMP (generally addressing such matters as land use, zoning, and regulations governing the activities of county agencies).

B. King County Board of Health

- Adopt an ordinance providing long term funding for the implementation of the GWMP; and
- Adopt ordinances necessary for the implementation of the GWMP (generally addressing activities regulated by the Seattle-King County Health Department, Environmental Health Division (EHD), e.g. on-site sewage disposal, small public and private drinking water systems, wellhead protection, solid waste disposal, etc.).

C. City Councils

- Adopt the GWMP after it has been certified by Ecology;
- Adopt ordinances as needed to implement the GWMP within city limits;
- Adopt revisions to the GWMP.

D. Others

- Adopt the GWMP after it has been certified by Ecology;
- Adopt measures as needed to implement the GWMP within their jurisdiction;
- Adopt revisions to the GWMP.

3. FUNDING

A major source of long term funding must be developed in order to implement the GWMP. This source of funding will augment grants and specific use/service fees that may be appropriately instituted. Tables IV-1 and IV-2 indicate actions for which grants and specific use/service fees are appropriate.

The GWAC recommends that the BOH adopt an ordinance providing for long term funding of the GWMP incorporating the following features:

- Funding should be adequate to implement the adopted GWMPs;
- The source of funds should be aquifer protection fees paid by persons who use groundwater withdrawn from the GWMA;
- The aquifer protection fee should be related to how much water is used;
- Aquifer protection fees should be deposited in a dedicated aquifer protection fund established by King County;
- A fixed percentage of aquifer protection funds should be set aside for public water system purveyors to implement elements of an approved Wellhead Protection Program that are not already implemented by inclusion in the GWMP;
- The fee structure should be flexible to account for fluctuations in water use that might produce budget shortfalls;
- The amount of the fee should be subject to amendment when GWMPs are revised; and
- The fee should be collected by public water system purveyors in routine customer billings whenever possible.

Determination of the aquifer protection fee involves several steps. First, costs of program elements are carefully estimated. Then, costs of the implementation of all GWMPs in King County are added together. Finally, costs that can be funded by grants or special use/service fees are deducted. The resulting amount is the total that is supported by aquifer protection funds.

The aquifer protection fee will be based on equivalent residential units (ERU). ERUs are a unit of water that water utilities often use in setting rates. A typical residence uses and is billed for one ERU. A small business might be billed for anywhere from one to several ERUs. An aquifer protection fee per ERU would automatically provide cost distribution according to the amount used.

Cost estimates for GWMP elements are shown in Tables IV-1 and IV-2. It is

estimated that the aquifer protection fee to support implementation of the GWMP per single family residence in the affected cities and in King County will be \$__. The cost for businesses is estimated to be \$__ per ERU. Cost estimates will be refined to enable the BOH to establish the aquifer protection fee.

(NOTE to GWAC: Aquifer protection fees would be easier to collect from those who obtain drinking water from public systems than from those who have individual systems. An evaluation of the feasibility of collecting the aquifer protection fee from individual water supplies will be needed. It is possible that the cost of collection will be more than the amount that could be collected. This is due, in part, to the fact that there are no complete records of owners of individual water supplies. In addition, supplies are not metered and there is no convenient pre-existing utility bill that the fee could be attached to. However, every effort should be made to explore the possibility of assessing the aquifer protection fee to individual well owners.)

4. WASHINGTON DEPARTMENT OF ECOLOGY ROLE

The certified GWMP will be codified in the Washington Administrative Code (WAC). As such, it is a regulation that Ecology is responsible for administering. Ecology will rely on local government cooperation to implement the Plan but may assist the lead agency, if needed, to gain compliance with provisions of the adopted Plan.

5. GROUND WATER MANAGEMENT COMMITTEE

The GWAC recommends the formation of a Management Committee that will coordinate groundwater protection activities in the GWMA's. The Management Committee will be advised by the GWAC, at its discretion, for a period of three years after certification of the GWMP by Ecology.

The Management Committee will carry out the following tasks:

- Allocation of Aquifer Protection Funds: Review, amend as necessary, adopt, and recommend to the BOH an annual allocation of aquifer protection funds based upon the adopted implementation plans for the GWMPs;
- Monitor the implementation of the GWMPs:
 - Review annual reports on implementation prepared by the lead agency;
 - Determine whether implementation is adequate and whether changes are needed in priorities, monitoring, reporting etc.

during the implementation period.

- Facilitate wellhead protection in King County:
 - Develop and recommend for adoption by the BOH minimum wellhead protection strategies for public water systems serving more than 1000 connections in King County;
 - Develop and recommend for adoption by the BOH minimum wellhead protection strategies for public water systems serving up to 1000 connections;
 - Incorporate minimum wellhead protection strategies into the GWMP when it is updated.
- Update the GWMP:
 - Act as a forum to consider new or ongoing ground water protection issues of significance to all GWMA's;
 - Determine whether revisions are needed to the GWMP; and
 - Review, amend as necessary, adopt, and recommend for adoption by the KCC, BOH, and city councils an updated GWMP three years after certification of the original GWMP by Ecology.
- Jointly determine categorical exemptions to the State Environmental Protection Act (SEPA) that should be eliminated in Aquifer Protection Areas (APA).
- Jointly develop guidance documents to assist environmental reviewers in King County and cities to:
 - Identify proposed development that may significantly affect groundwater;
 - Recognize and require adequate information to assess effects upon groundwater; and
 - Recognize and propose effective mitigation.

The Management Committee will include representation from:

- Each Ground Water Advisory Committee;
- Seattle-King County Health Department as lead agency for implementation of the GWMP;

- Each city within King County that withdraws groundwater for drinking purposes from a GWMA to serve its residents;
- King County;
- Each land use authority in whose jurisdictional boundaries are located a GWMA or any portion of a GWMA;
- Each tribal nation with lands contained in the boundaries of a GWMA or who is potentially affected by the GWMA;
- Metro (until merger with King County is completed);
- Each public water system purveyor using a groundwater source in King County that serves more than 1000 connections;
- Public water systems serving 15 to 1000 connections and using a groundwater source in King County (one representative);
- Public water systems serving 2 to 14 connections and using a groundwater source in King County (one representative);
- Private well owners (one representative);
- DOH;
- Ecology;
- All regional water associations in King County*;
- One environmental organization*;
- One business organization*;
- One agricultural organization*;
- One well drillers' organization*;
- King County Conservation District*;
- King County Cooperative Extension*;
- EPA*;
- S. Geological Survey*;
- Soil Conservation Service*.

**Denotes advisory (nonvoting) member.*

The KCC will appoint members of the Management Committee from nominees provided by the represented government or agency listed above. EHD will nominate citizen members.

Water purveyors relying on a ground water source are asked to participate in the Management Committee regardless of whether the system is located in a GWMA. The reason is that the committee will be deliberating upon issues that will affect all ground water purveyors, not just those in GWMA's. An example of such an issue is minimum wellhead protection for public water systems in King County.

Decisions of the Management Committee will be by consensus whenever possible. Procedures for resolving lack of consensus should be adopted by the committee for inclusion in its bylaws.

Management Committee bylaws should include a provision stating that GWAC recommendations will be carefully and promptly considered and followed by a written response.

The Management Committee may make use of subcommittees to accomplish some of its tasks due to its large size. For example, a subcommittee might address the topic of hazardous materials transport through aquifer protection areas.

Individual members of the Management Committee will have the responsibility to coordinate internally with the entity represented. For example, a representative of a city needs to communicate and coordinate with their council and public works, planning, and building departments, etc. regarding ground water management issues.

The existing GWMP will fulfill many wellhead protection needs. Minimum wellhead protection strategies developed by the Management Committee will add to what is already contained in the GWMP. It is also expected that individual purveyors will have system specific needs that they will want to include in their own wellhead protection programs. The funding proposal outlined in Section IV, Part 3 includes financial support for those programs.

Further discussion regarding wellhead protection is contained in Section III, Part 2.

6. GROUND WATER ADVISORY COMMITTEE

The GWAC will continue to meet at its discretion for up to three years from the date that the GWMP is certified by Ecology. The role of the GWAC is to

monitor implementation of the GWMP and to make recommendations to the Management Committee via its representative. The GWAC will also review and comment upon the first GWMP update.

7. LEAD AGENCY

Seattle-King County Department of Public Health will serve as lead agency for the implementation of the GWMP.

In fulfilling its role as lead agency, EHD will:

- Refine cost estimates of the GWMP in consultation with implementing governments and agencies;
- Assist the BOH in determining the amount of the aquifer protection fee;
- Prepare an annual proposed allocation of the aquifer protection fund based upon the adopted GWMP implementation plans for review and adoption by the Management Committee, BOH, affected governments and agencies, and the KCC;
- Ensure that funds are disbursed per the adopted allocation plan to implementing agencies and governments;
- Provide staff support to the Management Committee and the GWACs;
- Monitor the implementation of the GWMP;
- Prepare annual implementation reports for the review of the Management Committee and GWACs;
- Implementation of elements of the GWMPs as assigned to the lead agency by adopted implementation plans;
- Coordination of implementation of multi-jurisdictional program efforts such as data collection and APA mapping;
- Bring issues to the attention of the Management Committee;
- Coordinate implementation with the King County Surface Water Management Division Basin and Nonpoint Pollution Planning Program in order to optimize use of resources in achieving program goals; Coordinate with other King County planning processes;
- Coordinate with federal, State, and local agencies regarding groundwater protection;

- Coordinate the process for revision of the GWMP:
- Prepare draft update of the GWMP for review, amendment as necessary, and approval of the Management Committee;
- Hold public hearings;
- Submit draft updates of the GWMP to the KCC and carry out the process of obtaining concurrence from affected governments and agencies.
- Carry out other tasks that are determined to be appropriate.

8. IMPLEMENTATION PLAN

GWAC implementation priorities are listed in the Implementation Plan included in this section as Tables IV-1 and IV-2. Prioritization enables the GWAC to ensure that ground water protection is maximized in the near term. The schedule contained in the Implementation Plan provides a framework within which all governments and agencies can plan their GWMP implementation activities.

Tables IV-1 and IV-2 are designed to conveniently communicate important facts about the implementation process. Each table lists, in relation to a specific action, its priority, who will be responsible for carrying it out, how much it will cost, what the source of funding will be, and approximately when it will be accomplished. The first table is organized by GWAC-determined priority. The second is organized by the agency or government that will be responsible for implementing the action.

9. PROCESS TO CONSOLIDATE GWMPs IN KING COUNTY

It is recommended that GWMPs in King County be consolidated into one program at the time that individual GWMPs come due for evaluation and revision. This will occur three years from the date that Ecology certifies the GWMP. GWMPs will be phased into the county-wide plan since certification dates may vary. The current GWMPs have provided a strong basis for extending the program into the rest of the county. The existing plans have been developed with interagency coordination and by a broad spectrum of community interests.

Reasons for consolidation include:

- The emergence of the federal/State WHPP that requires each public water system purveyor to delineate a Wellhead Protection Area and develop an individual WHPP;
- The emergence of the GMA of 1990 that requires coordinated protection of aquifer resources on a County wide basis; and

- A preponderance of similar basic ground water protection needs in the separate GWMA's.

It is envisioned that the County-wide plan would primarily serve as a tool to coordinate ground water protection activities, the bulk of which are common to all GWMA's.

Wellhead protection programs, in conjunction with GWMP programs and regulations, will become the basin-specific groundwater protection activity. It is seen as redundant and confusing to continue basin-specific GWMPs in light of the wellhead protection requirements.

County-wide wellhead protection strategies will be developed by the Management Committee for inclusion in the County-wide GWMP. Public water system purveyors will play a strong role in developing these strategies. Inclusion of wellhead protection strategies in the GWMP will make them eligible for funding under the aquifer protection fee. It is expected that individual purveyors may still have a need for water system specific measures that are not included in the county-wide GWMP. They will be responsible for implementation of such measures although the county-wide funding mechanism would provide financial support. Refer to Section III part 2 for a detailed discussion of the WHPP.

The County-wide plan, containing wellhead protection strategies, would meet the GMA requirement for a coordinated effort among local governments to protect aquifer resources.

The lead agency will draft the county wide GWMP for the review, amendment, and adoption of the Management Committee, affected local governments, and the King County Council.

Citizens will have the opportunity to provide input to ground water protection decisions through:

- GWAC;
- Water utility (public input is required in the development of WHPPs);
- The Management Committee (has citizen members);
- Public hearings for plan adoption, revision, and implementation ordinances.

10. PROCESS FOR EVALUATION AND REVISION OF THE GWMP

A process for periodic evaluation and revision of the GWMP is established in order to ensure that the goals of the GWMP are achieved efficiently under

changing conditions.

The Management Committee, the GWACs, EHD, and governments and agencies affected by the GWMP will be involved in the evaluation and revision of the GWMP. The first revision will be considered three years from the date of GWMP certification by Ecology. Subsequent revisions will be considered on five year intervals unless the Management Committee determines that more frequent updates are needed.

The concurrence process will be initiated by EHD following adoption of revisions by the Management Committee. Public hearings will be held as required by law. The draft update will be submitted to the KCC for review, amendment, and adoption when all affected governments and agencies have concurred.

GWMP updates at time intervals smaller than three years should be avoided due to the lengthy process of review, public hearings, concurrence, and adoption. Other mechanisms may be used to implement short term changes either in substance or priority. For example, a grant could be sought to carry out a specific new task that the Management Committee feels is urgent but which is not included in the current GWMP. Alternatively, GWMP priorities could be changed in order to step up activity related to an issue that the Management Committee determines is more urgent than others.

EHD will assist the Management Committee in its evaluation of the GWMPs by preparing annual implementation reports. These reports will cover such topics as:

- Progress in implementing plan elements in comparison with established priorities and schedule;
- Problems encountered in implementation of specific program elements;
- Proposed revisions or priority adjustments to address problems encountered in implementation;
- Changes in federal, State, or local laws impacting the GWMP.

The Management Committee will use the reports as well as its own deliberations and the recommendations of the GWACs to determine whether and how GWMPs should be modified when they are updated. EHD will incorporate proposed revisions into the draft County-wide GWMP.

Table IV

Implementation Plan Organized by Priority

(To be added)

Table IV-2

Implementation Plan Organized
by Agency of Government

(To be added)