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Report On

WELL FIELD PROTECTION STUDY

City of Renton
Washington

CH2M HILL

August 1984

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CH2M HILL PROJECT NO.
S17891.A0

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RECOMMENDATIONS

This Well Field Protection Study has defined the City of Renton's well field recharge area, evaluated potential contamination pathways, identified contaminant sources, and identified controls and actions by which the City and others can minimize contamination of the well field.

Specific methods of contamination prevention recommended herein are listed below. (R) indicates action by City of Renton; (O) indicates action by others with monitoring or participation by Renton; and ($_1$) indicates high priority.

1. Limit land use within the aquifer area. (R_1)

2. Resolve regional issues such as highway planning, traffic restrictions, solid waste disposal, and development and sewerage of the area upriver of Renton. (O)

3. Monitor groundwater table elevations in the aquifer area. (R_1)

4. Continue monitoring well and river quality trends. (R)

5. Develop an emergency response plan to deal with contamination incidents. (R)

6. Provide sewer service for the Maplewood Addition. (R_1 or O_1)

7. Continue monitoring Cedar Hills and Queen City Farms landfills to ascertain leachate movement. (O)

8. Modify Cottonwood and Falcon Ridge sewage pump stations as required to minimize chance of overflows. (R)

9. Require improved storage for hazardous substances (primarily petroleum products) at existing facilities in the aquifer area. Ban new service stations in the area. (R_1)

10. Monitor aquifer water quality to detect sanitary sewer leaks. (R)

11. Collect all surface runoff from I-405 and SR 169 and extend storm sewers to discharge downriver of Wells 1 and 2. (R_1 or O_1)

12. Continue monitoring operation of fill sites near Mt. Olivet Cemetery. (R)

13. Restrict use of herbicides, pesticides, and fertilizers in aquifer area. (R_1 and O_1)

14. Construct jersey barriers along paved shoulders and on/off ramps of I-405. (O_1)

15. Control construction activities during expansion of I-405. (O)

16. Address well field protection in EIS for I-405. (O)

17. Construct jersey barriers along paved shoulders of SR 169. (O)

18. Restrict hazardous materials transportation on I-405, SR 169 and city streets in aquifer area. (R and O))

19. Survey aquifer recharge area to determine extent and risk associated with private heating oil and motor fuel storage tanks. (R)

20. Sponsor a program to inform public of potential consequences of residential disposal of hazardous materials. (R)

21. Provide collection center(s) for hazardous materials unacceptable to normal garbage collection services. (R, O)

22. Monitor operations of dry cleaning facilities to ensure proper disposal of cleaning solvents. (R)

It is also recommended that the City study the feasibility of relocating the well field upriver near the Maplewood Golf Course. The study should determine the suitability of the aquifer through a test drilling program, evaluate groundwater quality, determine transferability of water rights and impact on Cedar River flows, evaluate well field protection requirements, and compare the costs and impacts of relocation with costs and impacts recommended for protection of the existing well field.

A study should also be done to consider the merits and complications associated with having the Cedar River aquifer declared a sole-source supply by the EPA.

SUMMARY

The City of Renton depends upon the Cedar River aquifer for up to 85 percent of its water supply. The results of an engineering study for the protection of that aquifer (well field) from contamination by encroaching urban development are reported herein. The scope of the study was as follows:

- Define the well field recharge area and evaluate potential contamination pathways based on existing topographic maps, well logs, geologic and hydrologic publications and reports, water quality test reports, and other available information as provided by the City of Renton
- Identify potential industrial, commercial, traffic, and other contaminant sources that could adversely affect the well field. Evaluate relative significance of contaminant sources identified and their potential impact on the well field
- Identify controls and actions that the City of Renton and others could exercise to minimize or prevent potential contamination of the well field

Existing State of Washington Department of Social and Health Services (DSHS) regulations place the responsibility for protection of the City's sources of water on the City. Recent state legislation directs the Department of Ecology (DOE), DSHS, and local government agencies to explore and implement all possible measures for the protection of groundwater supplies.

The upper two-thirds of the Cedar River drainage basin is within the protected City of Seattle watershed. The lower one-third of the river basin, from Landsburg to Lake Washington, is not protected as a watershed and is therefore of greater significance to this study. Water from the entire drainage basin may contribute to recharge of Renton's Cedar River aquifer.

For purposes of this report, the boundaries of Renton's Cedar River aquifer have been identified (Figure 2-3) as the valley walls northeast and southwest of the river, the bedrock narrows 4,000 feet southeast of I-405, and a line drawn approximately 1,000 feet northwest of I-405. This aquifer is generally 70 to 90 feet deep, as are the five wells in the well field.

The aquifer receives natural recharge from direct precipitation infiltration, subsurface lateral and vertical discharge from the adjacent plateaus on either side of the valley, surface water runoff and seepage from the valley walls, underflow through the bedrock narrows, and inflow from the Cedar River during flood flows.

Contaminants can enter the aquifer through the same flow paths as natural recharge. Contaminants are attenuated in the earth to various degrees, depending on the chemical nature of the contaminant and nearness of the contaminant source to the wells.

Water quality in the aquifer, as sampled at the wells, currently exceeds drinking water requirements for all parameters. No detailed comparison of past and present well water quality data was made to identify trends, if any, in contaminant levels. However, water quality in the river adjacent to the aquifer is not as high and does not always meet drinking water standards. Also, river water quality is expected to decrease in the future as increased population growth occurs east of Renton. River water quality can affect aquifer water quality.

Current land use activities and potential contamination incidents adjacent to the aquifer are likely to have a more significant effect on water quality in the aquifer. Potential contaminant sources have been classified as river, subsurface, surface, transportation, and general.

Significant river sources of potential contamination upstream of the aquifer include:

- Septic tanks in the Maplewood Addition and in other developing areas upstream
- The Cedar Hills and Queen City Farms landfills
- The Gull service station approximately one mile east of I-405 along the Maple Valley Highway
- Overflows from Cottonwood and Falcon Ridge Sewage Pump Stations

Significant subsurface sources of potential contamination near the aquifer include:

- Underground petroleum storage tanks and piping at two and possibly four service stations
- Fuel and concrete additive storage tanks at the Stoneway concrete plant
- Sanitary and storm sewers near the aquifer
- Three private fill sites near the Mt. Olivet Cemetery

Significant surface sources of potential contamination near the aquifer include sprays and fertilizers used in the immediate vicinity of the aquifer.

Significant transportation sources of potential contamination near the aquifer include:

- Surface (stormwater) runoff from I-405, SR 169, and city streets
- Accidental spill of petroleum products, chemicals, or other hazardous materials on I-405, SR 169, city streets, and Burlington Northern railroad tracks

Significant general sources of potential contamination near the aquifer include:

- Residential heating oil tanks
- Residential disposal of paints, solvents, herbicides, pesticides, petroleum products, and other common but hazardous materials
- Chemical solvents from dry cleaning operations

Severe contamination of the aquifer could be extremely expensive. Necessary actions following contamination might include one or more of the following:

- Cleanup of the contaminated aquifer soils
- Isolation or diversion of contaminated aquifer water from the City's wells
- Construction of water treatment facilities
- Abandonment of the aquifer and existing supply facilities
- Location and development of a new source of water supply
- Purchase of water, if available, from Seattle Water Department

Preventive measures can be implemented to protect Renton's Cedar River aquifer from contamination. The costs of implementing these measures must be weighed against the risks of taking no action. Among the general methods of prevention recommended herein are:

- Development of policies that limit land use within the aquifer recharge area. Such policies include appropriate zoning to limit or eliminate commercial activities that are potential contaminant sources, and the acquisition of such properties for conversion to park, greenbelt or other non-contaminating use.

- Increased participation by the City of Renton in resolution of regional issues that may impact aquifer protection. These issues include I-405/ I-90 and other highway planning, construction, and traffic restrictions; continued use of and hauling of waste to the Cedar Hills landfill; land use in the river basin east of the city limits; sewerage of outlying areas; and maintenance of minimum stream flows in the Cedar River.

- The Cedar River aquifer could be declared a sole-source supply by the EPA at the request of the City. The ramifications of the declaration should be carefully considered by the City prior to making such a request, however.

- Water table monitoring in the aquifer area to confirm groundwater and contaminant flow paths.

- Water quality monitoring of both well (aquifer) water and river water to observe trends in contaminant levels.

- Development of an emergency response plan to deal with possible aquifer contamination incidents.

Among the specific methods of contamination prevention for river sources recommended herein are:

- Provision of sewer service for the Maplewood Addition as soon as possible

- Continued monitoring of the Cedar Hills and Queen City Farms landfills to ascertain leachate movement patterns and the need for additional protective measures in the future

- Modify Cottonwood and Falcon Ridge Sewage Pump Stations as required to minimize chance of overflows.

Among the specific methods of contamination prevention for subsurface sources recommended herein are:

- Adoption of an ordinance that requires construction of improved storage facilities for hazardous substances, primarily the petroleum products at the identified service stations (including the Gull station) and the petroleum products and concrete additives at the Stoneway plant. Ban new service stations in the aquifer area.

- Continued monitoring of aquifer water quality to detect leakage from adjacent sanitary sewers, with immediate repair of any known leaks in such sewers. The abandoned sewers in Cedar River Park should be completely plugged

- Repair of any known leaks in storm sewers and extension of storm sewers to discharge to the river downstream of Wells 1 and 2 wherever possible. Prevent contaminants from entering storm sewers whenever possible

- Continued monitoring of the operation of the three private fill sites near Mt. Olivet Cemetery to assure that no hazardous leachable materials are included in the fill

Among the specific methods of contamination prevention for surface sources recommended herein is continued restraint by the City, WSDOT, and BNRR in the use of herbicide and pesticide sprays and fertilizers in the vicinity of the aquifer.

Among the specific methods of contamination prevention for transportation sources recommended herein are:

- Collection of surface runoff from all paved areas of I-405 that drain toward the aquifer and discharge of this storm sewage to the river at a point downriver of Wells 1 and 2

- Construction of jersey barriers along the paved shoulders and on/off-ramps of I-405 to prevent vehicles from spilling contaminants outside the paved areas and to protect the well facilities from physical impact

- Control of construction activities (such as refueling of equipment) during expansion of I-405 to minimize chances of groundwater contamination

- Protection of the well field should be addressed during preparation of the environmental impact statement by WSDOT for the I-405 expansion

- Collection of surface runoff from all paved areas of SR 169 in the vicinity of the aquifer and discharge of this storm sewage to the river downstream of Wells 1 and 2 if possible

- Construction of jersey barriers along the north and south paved shoulders of SR 169 to prevent vehicles from spilling contaminants outside the paved areas

- Implementation of restrictions on the types of hazardous materials that can be transported on I-405, SR 169, and city streets in the vicinity of the aquifer

Among the specific methods of contamination prevention for general sources recommended herein are:

- Survey of the aquifer recharge area to determine the number of existing heating oil and motor fuel storage tanks; evaluation of the risk they represent to the aquifer, and development of a program for minimizing leakage from these tanks if necessary

- Sponsoring an education program (through inserts in monthly utility billings or other means) that informs the public of the potential consequences of residential disposal of hazardous materials such as solvents, pesticides, and petroleum products

- Provision of convenient collection centers for the public to dispose of such materials that are unacceptable to normal garbage collection services

- Monitoring operations of any dry cleaning facilities to ensure proper disposal of cleaning solvents

No guarantee is made that all potential contaminant sources have been identified. Additional or improved methods of contamination prevention may be available or will be developed in the future. The main intent of this report is to stimulate an awareness of the potential for aquifer contamination and that it serve as a tool toward maintaining the high quality of the City of Renton's existing water source.

One option to protection of the existing well field which the City should consider is that of relocating the City's wells upriver, near the Maplewood Golf Course. It appears that protection of a well field at this site from long-term contamination might be more easily accomplished. If the aquifer there is suitable for development of major wells, groundwater quality is acceptable, and the cost of relocating to that area can be justified when compared to the cost of well field protection at the present site, then the Maplewood site might provide the City of Renton with a better source of water in the future.

Chapter 1
INTRODUCTION

PROJECT DESCRIPTION

Background

The City of Renton has five potable water wells that are located in an urban setting. The wells have historically produced high-quality water that consistently exceeded State of Washington Department of Social and Health Services (DSHS) and Environmental Protection Agency (EPA) quality standards for public water supplies. However, the wells are vulnerable to contamination because they are located near existing commercial business activities and major transportation corridors. Encroaching urban developments and proposed highway expansions in the area encompassing the wells increase the potential for future contamination.

Protection of these wells is crucial to the health and safety of the public because they are the source of approximately 85 percent of the City's total water supply. Other sources of water are not readily available to meet the demands for potable water.

Well Field Description

The locations of the five wells, all of which draw from the Cedar River aquifer, are shown in Figures 2-3 and 3-1. The wells are described in detail in the 1983 City of Renton Comprehensive Water System Plan. Their construction dates, depths, and capacities are as follows:

Well No.	Date Constructed	Depth to Bottom of Well Screen (feet)	Well Capacity (gpm)
1	1942	82	2,000
2	1942	82	3,000
3	1959	56	1,600
8	1967	92	3,500
9	1984	105	1,250

The wells are located within two separate City of Renton parks. Wells 1 and 2 are located at the southeast corner of Liberty Park, with the Cedar River approximately 100 feet to the south and Houser Way bordering on the east. Houser Way is a one-way arterial street bounded on the east by a single set of Burlington Northern Railroad tracks and Interstate 405 (I-405).

Well 3 is located at the northeast corner of Liberty Park, at the intersection of Bronson Way and Houser Way. Bronson Way is a multilane arterial street with a service station and other commercial businesses to the north.

Wells 8 and 9 are located directly east of I-405 within Cedar River Park. Cedar River Park is encompassed by I-405 to the west, State Route 169 (Maple Valley Highway, SR 169) to the north, the Stoneway concrete plant to the east, and the Cedar River to the south.

The City of Renton plans to construct additional wells in the Cedar River aquifer as future water demands increase. These wells may be located near the five existing wells or they may be located farther upriver, near the Maplewood Golf Course.

Purpose

The purpose of this study was to identify potential sources of contamination that could adversely affect the quality of water produced from the wells, and to provide information on which future decisions and actions to protect this vital resource can be based. Recent laboratory tests on water samples taken from the City's distribution system indicate that the water currently extracted from the wells is of excellent quality. This report identifies potential future sources of contamination so that preventive measures can be implemented to maintain this quality. Therefore, the recommendations outlined in this report are preventive rather than corrective.

It is unlikely that all preventive measures, even though desirable, can be implemented. Some accidental contamination of the aquifer might occur even though all preventive measures were implemented. Further, it is possible that contamination of the aquifer has already occurred but has not yet been detected. The objective, then, of developing an aquifer protection plan is to reduce the risk of occurrence and the magnitude of possible contamination to acceptable and affordable levels.

SCOPE OF REPORT

This report documents an investigation of the well field area surrounding Wells 1, 2, 3, 8, and 9. The scope of the investigation, as outlined in an engineering services contract between the City of Renton and CH2M HILL, is as follows:

- Define the well field recharge area and evaluate potential contamination pathways based on existing topographic maps, well logs, and geologic and

hydrologic publications and reports, water quality test reports, and other available information as provided by the City of Renton

- Identify potential industrial, commercial, traffic, and other contaminant sources that could adversely affect the well field. Evaluate relative significance of contaminant sources identified and their potential impact on the well field

- Identify controls and actions that the City of Renton and others could exercise to minimize or prevent potential contamination of the well field

REPORT ORGANIZATION

This report is organized in a manner similar to the scope outlined above. The well field recharge area is defined in Chapter 2 using available geologic and hydrologic information. Included is a discussion of probable groundwater movement and surface drainage patterns.

Chapter 3 addresses the sources of potential contamination and their possible impact on the well field. The impact of each potential contaminant source is evaluated and ranked according to parameters such as chemical content, potential quantity, location, probability of occurrence, attenuation, and detectability. A table is provided at the end of the chapter listing each of the sources of potential contamination and the ranking of these parameters for each.

Possible methods of eliminating or controlling the potential contaminant sources or minimizing their effect on the well field are considered in Chapter 4.

EXISTING REGULATIONS

The City of Renton's Cedar River aquifer is unique among sources of public water supply because of its urban location, relatively shallow depth to water surface, and the large number of customers served. Most water purveyors of Renton's size use surface or subsurface supplies from more remote and protected watersheds. Other smaller local communities with water sources similar to Renton's include Federal Way, Issaquah, and Redmond. Because Renton's water source is somewhat unique, there are few other existing guidelines or examples of aquifer protection which Renton might follow.

Current EPA and DSHS regulations governing public water systems are oriented primarily toward defining potable water quality and the design and operation of water systems.

Neither EPA nor State of Washington Department of Ecology (DOE) currently has regulations specifically governing protection of aquifers. However, the following excerpt from DSHS' Rules and Regulations of the State Board of Health Regarding Public Water Systems, August 1983, best identifies protection requirements for water sources:

248-54-125 Source protection.

Public drinking water shall be obtained from the highest quality source feasible. Existing and proposed sources of supply shall conform to the water quality standards established in WAC 248-54-175.

(1) For wells and springs, the water purveyor shall provide an area of sanitary control for a radius of one hundred feet (thirty meters) and two hundred feet (sixty meters) respectively; except the water purveyor shall control land of a greater or lesser size or of a different shape than is defined by a one hundred or two hundred foot radius where an engineering justification has been reviewed and accepted by the department. The engineering justification must address geological and hydrological data, well construction details, and other relevant factors indicating a control area of different size or shape is necessary to assure adequate sanitary control in the vicinity of the source.

Within the control area, no source of contamination may be constructed, stored, disposed of, or applied without the permission of the department and the purveyor. The control area must be owned by the water purveyor in fee simple, or he or she must have the right to exercise complete sanitary control of the land through other legal provisions.

A purveyor owning all or part of the control area in fee simple, or who has possession and control of the sanitary control area, even though the legal title is held by another, shall convey to the department a restriction on the use of the land in accordance with these rules, by appropriate legal document, such as a declaration of covenant. This document shall state no source of contamination may be constructed, stored, disposed of, or applied without the permission of the department and the purveyor, and if any change in ownership of the system or sanitary control area is considered, all affected parties shall be informed of these requirements.

Where portions of the control area are in the possession and control of another, the purveyor must obtain a duly recorded restrictive covenant which shall run with the land, restricting the use of said land in accordance with these rules, which shall be recorded in the county wherein the land is located.

(2) Adequate watershed control, consistent with treatment provided, shall be demonstrated and documented for all surface water sources pursuant to WAC 248-54-225. A department guideline regarding watershed control is available to assist utilities in this regard.

(3) In situations where regional ground water resources are being utilized, collaborative actions may be taken by appropriate local, state, or federal agencies when necessary to protect underground sources of drinking water. These may include, but not be limited to: Sole source aquifer designation; special design criteria; or ground water resource management.

[Statutory Authority: RCW 43.20.050. 83-19-002 (Order 266), § 248-54-125, filed 9/8/83.]

The following excerpt, also from DSHS' Rules and Regulations, identifies watershed control:

248-54-225 Watershed control.

(1) All public water systems utilizing surface water shall adequately exercise surveillance over conditions affecting source water quality.

(2) Those public water systems using unfiltered surface waters shall, in addition to subsection (1) of this section, document a watershed control program. All facilities and activities in the watershed affecting public health shall be under the surveillance of the water purveyor and shall be satisfactorily limited and controlled so as to preclude degradation of the physical, chemical, microbiological, viral, and radiological quality of the source of supply.

(3) Those public water systems using unfiltered surface water shall submit to the department for approval a report identifying all conditions, activities, and facilities within the watershed, together with an acceptable program for necessary surveillance, limitation, and control. This report shall be part of the water system plan required in WAC 248-54-065, included in an operations program as required in WAC 248-54-195, or prepared independently for those systems not required to have such a plan. The report shall be reviewed, updated as necessary, and submitted to the department annually.

[Statutory Authority: RCW 43.20.050. 83-19-002 (Order 266), § 248-54-225, filed 9/8/83.]

As these excerpts indicate, the responsibility for protection of the Cedar River aquifer lies primarily with the City of Renton. However, the City currently has no specific ordinances that focus on protection of the Cedar River aquifer. Such an ordinance, or aquifer protection plan, is needed to supplement existing regulations to ensure long-term protection of this most important drinking water source.

House Bill No. 1138, recently enacted by the state legislature and effective June 7, 1984, is an act which amends existing State laws to provide additional protection of the quality and quantity of ground water used for public water supplies. It states in part that the City's

Comprehensive Plan shall provide for such protection. It further states:

> NEW SECTION. Sec. 4. There is added to chapter 90.54 RCW a new section to read as follows:
>
> The department of ecology may recommend land use management policy modifications it finds appropriate for the further protection of ground and surface water resources in this state. Such advisory recommendations may be made to other state regulatory agencies, local governments, water systems, and other appropriate bodies.
>
> NEW SECTION. Sec. 5. There is added to chapter 90.54 RCW a new section to read as follows:
>
> The legislature hereby declares that the protection of groundwater aquifers which are the sole drinking water source for a given jurisdiction shall be of the uppermost priority of the state department of ecology, department of social and health services, and all local government agencies with jurisdiction over such areas. In administration of programs related to the disposal of wastes and other practices which may impact such water quality, the department of ecology, department of social and health services, and such affected local agencies shall explore all possible measures for the protection of the aquifer, including any appropriate incentives, penalties, or other measures designed to bring about practices which provide for the least impact on the quality of the groundwater.

INFORMATION SOURCES

To investigate the well field area surrounding Wells 1, 2, 3, 8, and 9, the following documents, reports, plans, and miscellaneous sources of information were reviewed:

- City of Renton Comprehensive Water Plan, 1983
- City of Renton Water Report, 1965
- City of Renton Comprehensive Land Use Plan, 1983
- City of Renton Zoning Map and Zoning Ordinance
- City of Renton Parks and Recreation Department Map
- City of Renton Sanitary Sewer Maps
  City of Renton Storm Sewer Maps
  City of Renton Water Distribution System Maps
  City of Renton Street Improvement Maps
  City of Renton Topography Maps

- DSHS Rules and Regulations of the State Board of Health Regarding Public Water Systems, 1983
- American Water Works Association Manual No. M19, Emergency Planning for Water Utility Management
- American Water Works Association Manual No. M21, Groundwater
- Various reports and appendixes prepared for the Municipality of Metropolitan Seattle (Metro) through its River Basin Coordinating Committee (RIBCO). These reports and appendixes summarize the investigations of the Water Quality Management Study (WQMS) and Water Resource Management Study (WRMS) for the Green and Cedar Rivers and were completed in 1975.
- Washington State Department of Transportation Maps of Existing I-405 and SR 169 Facilities
- U.S. Geological Survey Geology and Groundwater Resources Maps
- King County Soos Creek Plateau Community Plan
- King County Newcastle Community Plan
- U.S. Department of Housing and Urban Development King County, Washington, Flood Insurance Rate Maps

For brevity, information found in the above sources has generally not been repeated herein. Numerous discussions were held with City of Renton Utilities, Parks, Fire, Traffic, Building and Planning Department staffs. Representatives of Seattle Water Department, Metro, EPA, DSHS, DOE, DOT, and potential contaminant sources were contacted. Field investigations of the well field area were also made. Four project meetings, involving some of the above staff and representatives, were also held as the investigation progressed.

Chapter 2
HYDROGEOLOGY

INTRODUCTION

The City's wells extract water from the aquifer beneath the Cedar River valley. The aquifer is a saturated stratum of unconsolidated deposits. Water entering the aquifer from the ground surface, or from subsurface sources, is termed recharge. The area around the aquifer that collects and transmits significant quantities of recharge to the aquifer is called the recharge area. Contaminants discharged or spilled within that area can potentially cause contamination of Renton's aquifer. Therefore, protection of this area from contaminants is of great importance to the protection of the aquifer. This chapter describes Renton's aquifer recharge area and identifies potential contamination pathways, based on existing geologic and topographic data.

CEDAR RIVER DRAINAGE BASIN

Flow from the entire Cedar River drainage basin may contribute to recharge of the aquifer. The Cedar River heads in the Cascades at the eastern edge of King County. The upper two-thirds of the river's 50-mile length and 188-square-mile drainage basin is located within the City of Seattle watershed. The westerly limit of the Seattle watershed is at Landsburg, where Seattle Water Department withdraws its major water supply. The limits of the Cedar River drainage basin below Landsburg are shown in Figures 2-1 and 2-2. The portion of the drainage basin below Landsburg is of primary importance to this study.

From the topography illustrated by contour lines in Figures 2-1 and 2-2, major surface drainage patterns are evident. These are limited primarily to natural flows overland and in contributory streams. However, below (west of) Maplewood Golf Course, the natural surface and subsurface drainage patterns are supplemented by paved streets with gutters and storm sewers in densely developed areas.

Several major storm sewers discharge into the Cedar River in the vicinity of the well field at locations indicated in Figure 2-2. The largest of these is a 30-inch line from the South Highlands area, which discharges to the river at the I-405 crossing. Others include five 18- and 24-inch lines along SR 169 southeast of the well field. These five sewers collect highway drainage and surface and subsurface water from the Lower Maplewood area.

Throughout the drainage basin, underlying soils formations affect movement of subsurface water toward the river. This is evident along the edges of the Cedar River valley between the well field and Maplewood Golf Course. Here, springs emerge from the valley walls at intervals. These springs are fed from the plateau areas northeast and southwest of the valley where surface water generally percolates into the ground. These plateau areas include South Highlands, Lower Maplewood, Heather Downs, and Tiffany Park Cascade.

GEOLOGY

The limits and character of the Cedar River aquifer in the vicinity of Renton's well field were determined by review of topographic maps, well logs, and geologic and hydrologic publications. Sources most helpful include the following:

- Water Supply Bulletin No. 28, Geology and Groundwater Resources of Southwestern King County, Washington, 1969, by the State of Washington Department of Water Resources, prepared in cooperation with the U.S. Geological Survey. The accompanying Plates 1 and 3 of the Bulletin show soil formations and known well locations in the area.

- Boring logs for Wells 1, 2, 3, 8, and 9 and observation wells for Wells 8 and 9, plus the drilling and testing reports for each of these wells.

- Hydrologic Analysis, Renton Well 9, 1983.

Information from the above sources was supplemented by field observations. The geology of the well field area is summarized in Figure 2-3. The following brief description of geologic units in the area will illustrate the significance of Renton's Cedar River aquifer.

The geologic units that form the Cedar River valley in the vicinity of Renton's well field are, from oldest to youngest:

- Bedrock of the Puget Group

  The Puget Group underlies the valley wall southwest of the Cedar River. It consists of highly folded and faulted sandstone and interbedded shale and coal. In the Renton Tiger Mountain area, the unit includes volcanic conglomerate, siltstone, breccia, and lava flows.

- Undifferentiated Pre-Vashon Drift

This unit, underlying the valley wall northeast of the Cedar River, is over 400 feet thick beneath Renton's well field. It consists of at least four layers of till separated by river-deposited sand and gravel and lake-deposited sand, silt, clay, and peat.

- Vashon Till

  The Vashon till varies in thickness from zero to 80 feet. It is a compact mixture of gravel and boulders in a silty/sand matrix.

- Vashon Outwash

  The outwash unit caps the hills northeast of the Cedar River near the well field and is from zero to 300 feet thick. It consists of clean sand and gravel.

- Vashon Drift

  This unit caps the hills southwest of the Cedar River. It consists of undifferentiated till and outwash sand and gravels.

- Alluvium (Cedar River aquifer)

  This unit comprises the Cedar River aquifer, the aquifer pumped by Renton's Wells 1, 2, 3, 8, and 9. It consists of terrace and flood-plain deposits of clean gravel and sand in the Cedar River valley. The alluvium is about 70 to 90 feet thick in the well field area. The water table within the aquifer is generally at or near the elevation of the water surface in the Cedar River. In the area of the well field, the water table is approximately 20 feet below the ground surface.

The areal and stratigraphic relationships of these geologic units are shown in Figures 2-3 and 2-4.

CEDAR RIVER AQUIFER

The alluvium is the only major water-bearing unit in the area. The Vashon drift and outwash may support a perched water table above the river valley near the well field, but this unit has not been developed. The underlying pre-Vashon drift has been reported to be not capable of yielding large quantities of water in the vicinity of the well field based on a 400-foot-deep test hole (observation Well 9). The

bedrock Puget Group usually yields only a few tens of gallons per minute to wells.

For purposes of this report, the boundaries of Renton's Cedar River aquifer, as distinct from the drainage basin, have been defined as the valley walls northeast and southwest of the river, the bedrock narrows located about 4,000 feet southeast of the well field, and a line drawn about 1,000 feet northwest of Wells 1, 2, and 3 (see Figure 2-3). The bedrock narrows was chosen as the southeast boundary because it is believed that the alluvium is thin there and most of the groundwater flowing down the valley (roughly parallel to the river) is forced to the surface. The northwest boundary was chosen to represent an assumed probable maximum radius of influence (area affected by a pumping well) of Wells 1, 2, and 3 based on reported testing of Well 9, although the aquifer itself extends beyond these limits.

As Figure 2-5 illustrates, the aquifer receives natural recharge from direct precipitation infiltration; subsurface lateral and vertical discharge from the pre-Vashon drift; surface water runoff and seepage from the valley walls bounding the aquifer; underflow through the bedrock narrows; and inflow from the Cedar River during flood flows. Water in the alluvium generally moves down valley parallel to the river, with a component of flow toward the river under non-pumping conditions. Natural discharge is to the river and/or ultimately to Lake Washington and Puget Sound. Pumping distorts the natural flow, causing water to flow roughly radially toward each well. If the aquifer becomes contaminated, the contaminants must migrate to within the well's radius of influence before a quality problem could develop with the well water.

CONTAMINANT FLOW PATHS

Contaminants can enter the aquifer system by many different routes. The principal flow paths are listed below and illustrated in Figures 2-2 and 2-5. Figure 2-5 represents a generalized cross-section of the Cedar River aquifer at the well field. The existing wells extend to near the bottom of the aquifer.

- Contaminants from direct surface sources above the aquifer could migrate through the soil to the water table.

- Contaminated Cedar River water could enter the aquifer during flood flows (when the river level is higher than the groundwater level). Entry could also be induced by pumping, as may be the case for Wells 1 and 2. Any spill or activity

within the surface watershed of the Cedar River above the narrows could conceivably contribute to river contamination.

- Surface runoff/spills from South Highlands, Lower Maplewood, Heather Downs, Tiffany Park Cascade, and the eastern portion of North Renton could carry contaminants to the aquifer.

- Contaminants from surface sources in the upland areas described above could migrate through the soil and seep out along the valley walls or enter the aquifer below ground.

- Leaking sewers or other pipelines passing through (above) the aquifer area could carry contaminants to the aquifer.

Contaminants that enter the aquifer will be attenuated to various degrees, depending on the chemical nature of the contaminant, the nature of the aquifer materials, and nearness of the contaminant source to the wells. The major attenuation processes include sorption to aquifer materials, chemical precipitation and related reactions, biodegradation, mechanical filtration, and dilution due to dispersion and mixing. The inverse of attenuation is mobility, a term used later in this report to rank contaminants.

Sorption (adsorption or absorption) generally is a reversible process and therefore serves only to slow the rate of contaminant movement relative to the water. Chemical precipitation is generally more permanent. However, all reactions are reversible to some degree. The extent of biodegradation will depend on the value of the contaminant as a food source to organisms existing in the soil.

WATER QUALITY

Renton Well Water

Water from Renton's four existing wells (and from Well 9 when completed) is disinfected by chlorination prior to discharge into the City's distribution system. In accordance with DSHS regulations, the City routinely collects untreated (raw) water samples from each well for analysis of bacteriological (total coliform) and inorganic chemical and physical parameters. Water is also sampled for turbidity, trihalomethanes, corrosivity, pesticides and radionuclides. Copies of recent laboratory analysis reports are included in Appendix A. As these reports indicate, the well water quality (and thus the aquifer water quality) exceeds current drinking water requirements for all parameters. No detailed

comparison of past and present water quality data was made to identify trends, if any, in contaminant levels.

Maplewood Well Water

The Maplewood Addition Water Co-op provides water service to the entire Maplewood Addition, including that portion inside the city limits (see Figure 3-1). Their source of supply is two wells 15 to 20 feet apart, located within the residential area near the easterly edge of the Maplewood Addition. Each well is equipped with a 10-horsepower, 200-gpm vertical turbine pump.

According to a representative of the Co-op, two raw water samples are tested for coliform each month by the King County Health Department. The representative stated that the coliform counts are always below the DSHS-allowed maximum. A comprehensive water quality analysis is also conducted every 3 years. The latest test results from November 1982, also included in Appendix A, indicate water quality meeting DSHS requirements. The water quality closely parallels that from Renton's Cedar River aquifer.

Little else is known about these wells. No conclusions have been drawn as to the relationship of this well water quality with the quality of water from the adjacent Cedar River.

River Water

Limited data is available on quality of water in the Cedar River, both adjacent to Renton's Cedar River aquifer and further upstream. Potential data sources which were checked include the following:

- U.S. Geological Survey
- Metro
- EPA (STORET system)
- DOE
- DSHS
- Seattle Water Department
- City of Renton

Data from the Seattle Water Department relative to Cedar River water is limited to water quality at the Landsburg Dam. A recent water analysis report for this source is included in Appendix A. As this report indicates, water quality at Landsburg is considerably higher than that from Renton's wells. This is as expected, due to Landsburg's upstream location away from most contaminant sources, and to the fact that ground (well) water typically contains more dissolved inorganics than does surface (stream) water.

River water quality data have been collected by USGS, Metro, DOE, EPA, and the University of Washington at six locations between the mouth of the Cedar River and the town of Maple Valley at various times from 1959 (RIBCO Water Quality Management Study, Part III, Appendix B, Water Quality Analyses, December 1974). EPA STORET data from the sampling point at the Logan Street bridge are included in Appendix A. The data have not been studied in detail in preparation of this report; however, they would be useful baseline data for future river water quality analyses and determination of contaminant trends.

In general, the available historical data indicate that, in the lower Cedar River below Maple Valley, water quality conditions frequently violate Washington State Water Quality Standards for Class A waters or similar standards suggested in the RIBCO Water Quality Management Study. (The DOE classifies the Cedar River from Lake Washington to Landsburg Dam as Class A excellent, suitable for domestic, industrial, and agricultural water supply, among other uses.)

High temperatures and low dissolved oxygen concentrations have been noted during low flow conditions (summer). Excessive total coliform counts (due to nonpoint sources) have been observed at various times year round. High nitrate-nitrogen concentrations have been noted in the winter months, apparently from nonpoint sources, and excessive concentrations of phosphate-phosphorus are also believed to occur.

Computer-modeled projections of future water quality conditions (to the year 2000) were made during the RIBCO WQMS work, assuming no significant change in the land uses of the watershed upstream of Landsburg and that no point sources would discharge to the Cedar River in the future. The modeling simulated changes in land use (increased population densities) below Landsburg. It indicated that, even with greater population, river water quality conditions will not be significantly degraded in the future. Only coliform bacteria showed significant increases to year 2000; inorganic chemical and physical parameters and BOD were not predicted to change significantly.

In conjunction with this well field protection study, the City of Renton sampled Cedar River water at Cedar River Park in March 1984. The laboratory analysis report, included in Appendix A, indicates levels of coliform and inorganic chemical and physical contaminants similar to the levels found in the well water. One sample, however, is not a reliable indicator of river water quality which fluctuates frequently.

It may be concluded that, at present, water in Renton's Cedar River aquifer is of good quality and is considerably better than that in the Cedar River. Sufficient data do not exist to document any current trends in river water quality, nor does the scope of this report permit development of additional data.

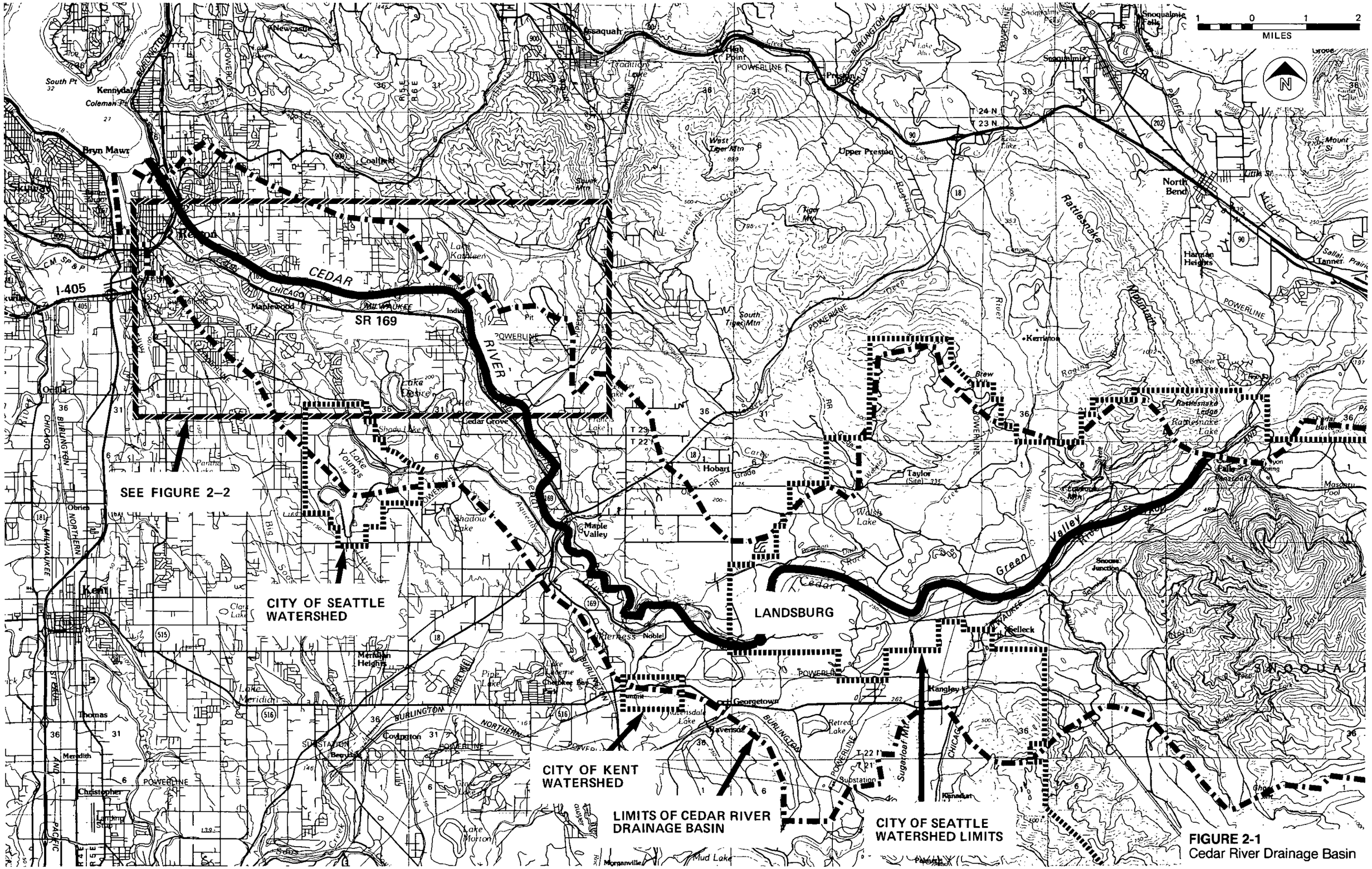
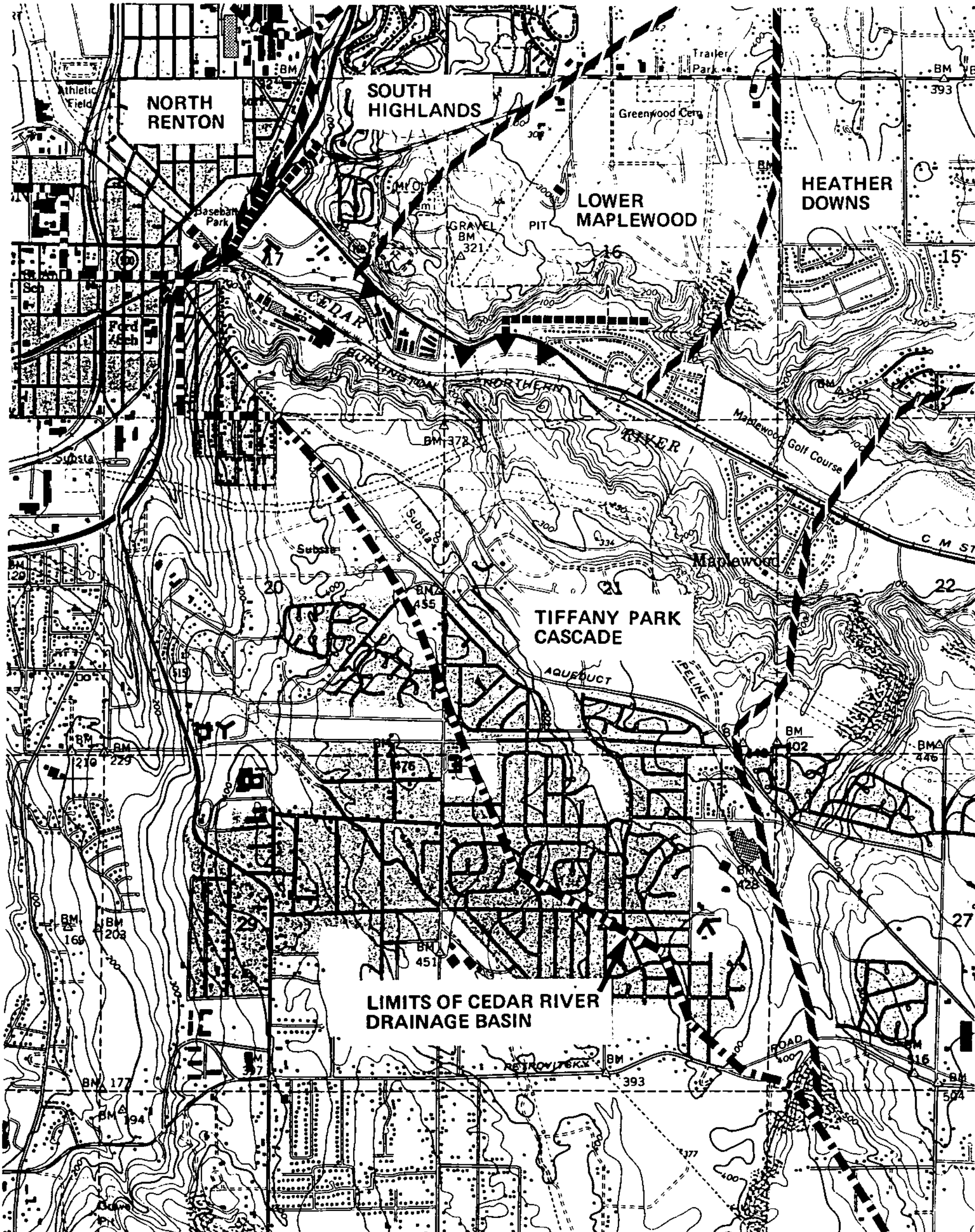


FIGURE 2-1
Cedar River Drainage Basin


NORTH
RENTON
SOUTH
HIGHLANDS
LOWER
MAPLEWOOD
HEATHER
DOWNS
TIFFANY PARK
CASCADE
LIMITS OF CEDAR RIVER
DRAINAGE BASIN
CEDAR
RIVER
BURLINGTON NORTHERN
Maplewood Golf Course
Maplewood
AQUEDUCT
Greenwood Cem
Trailer Park
Athletic Field
Baseball Park
GRAVEL PIT
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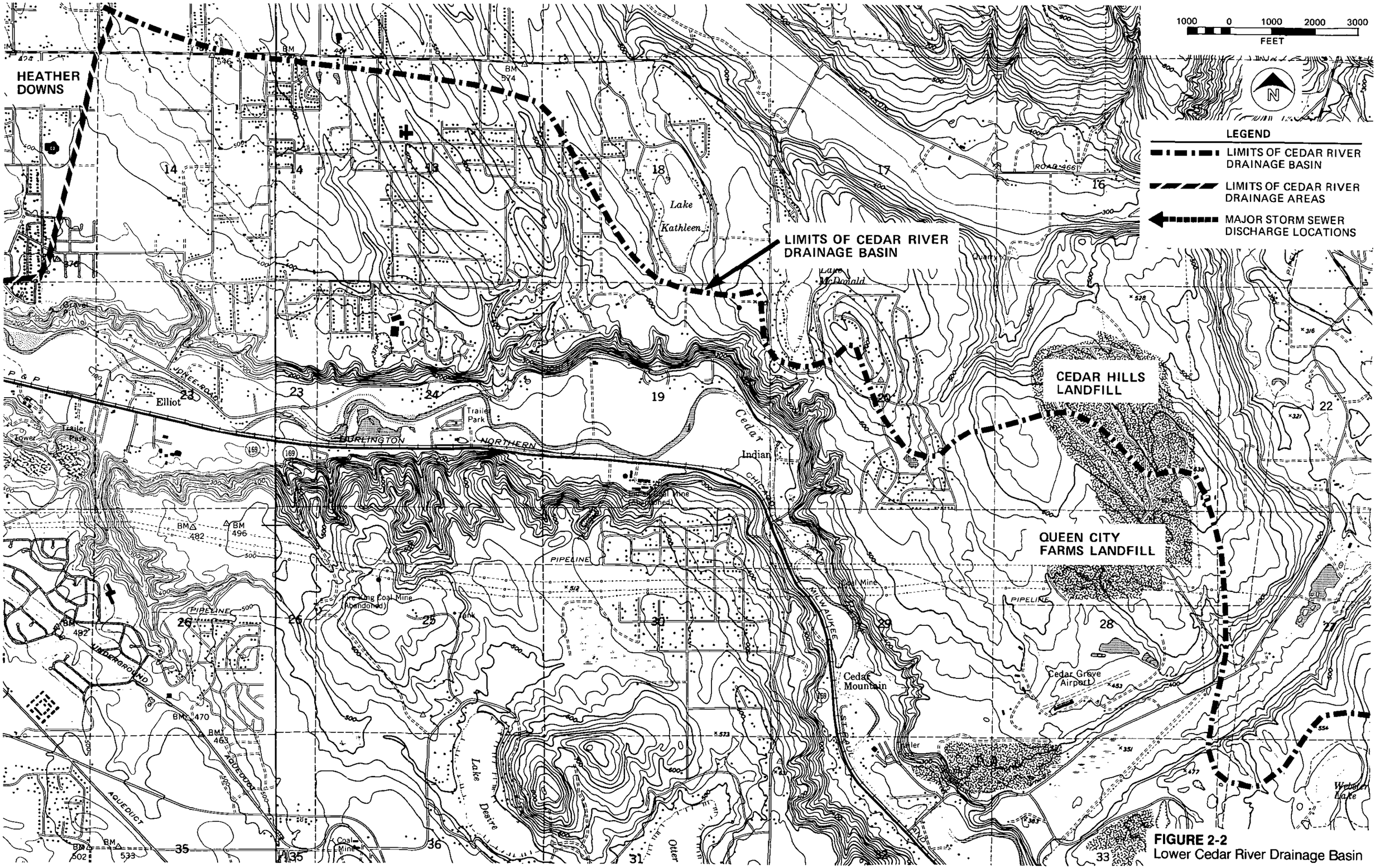

FIGURE 2-2
Lower Cedar River Drainage Basin

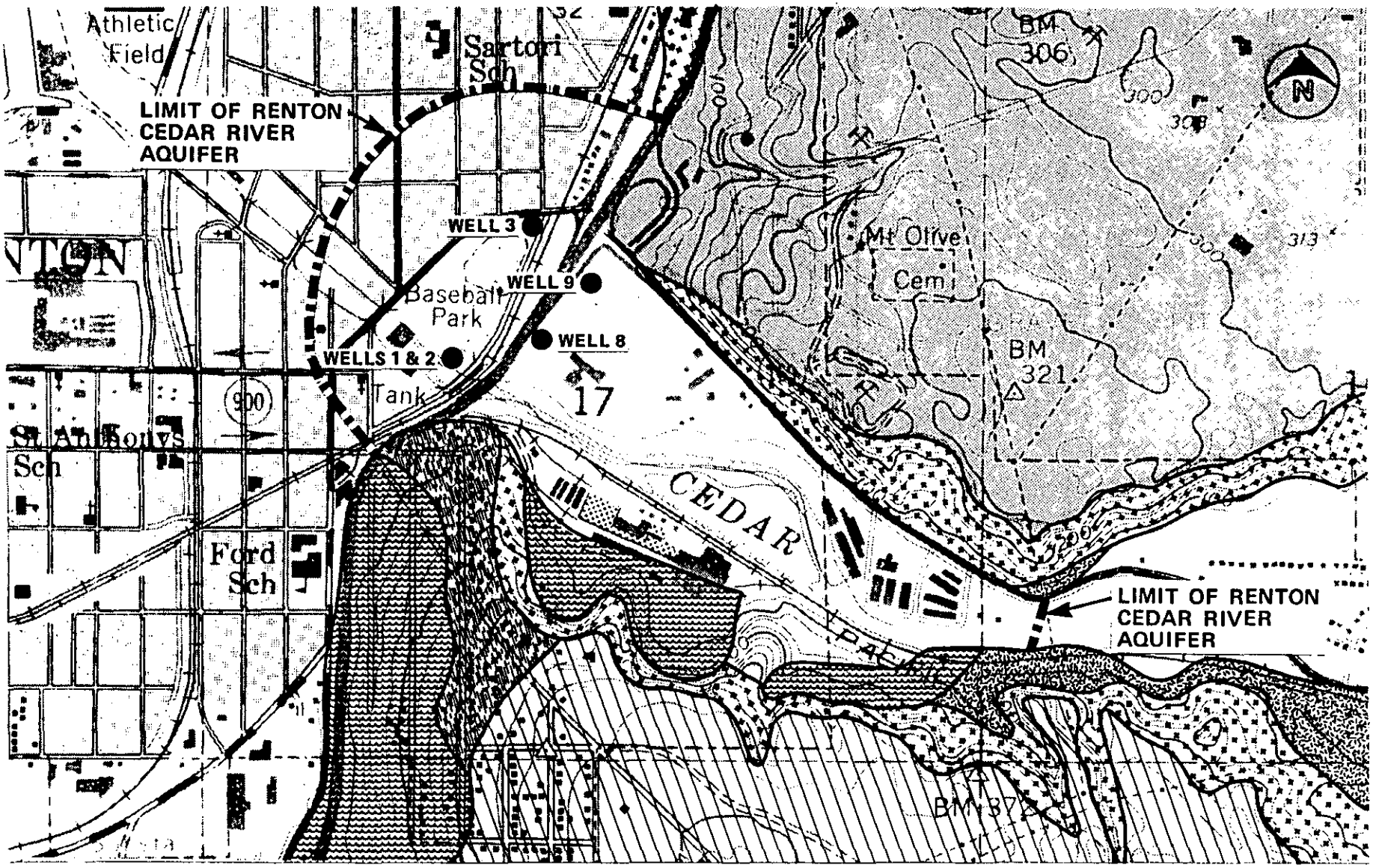

FIGURE 2-3
Geologic Map

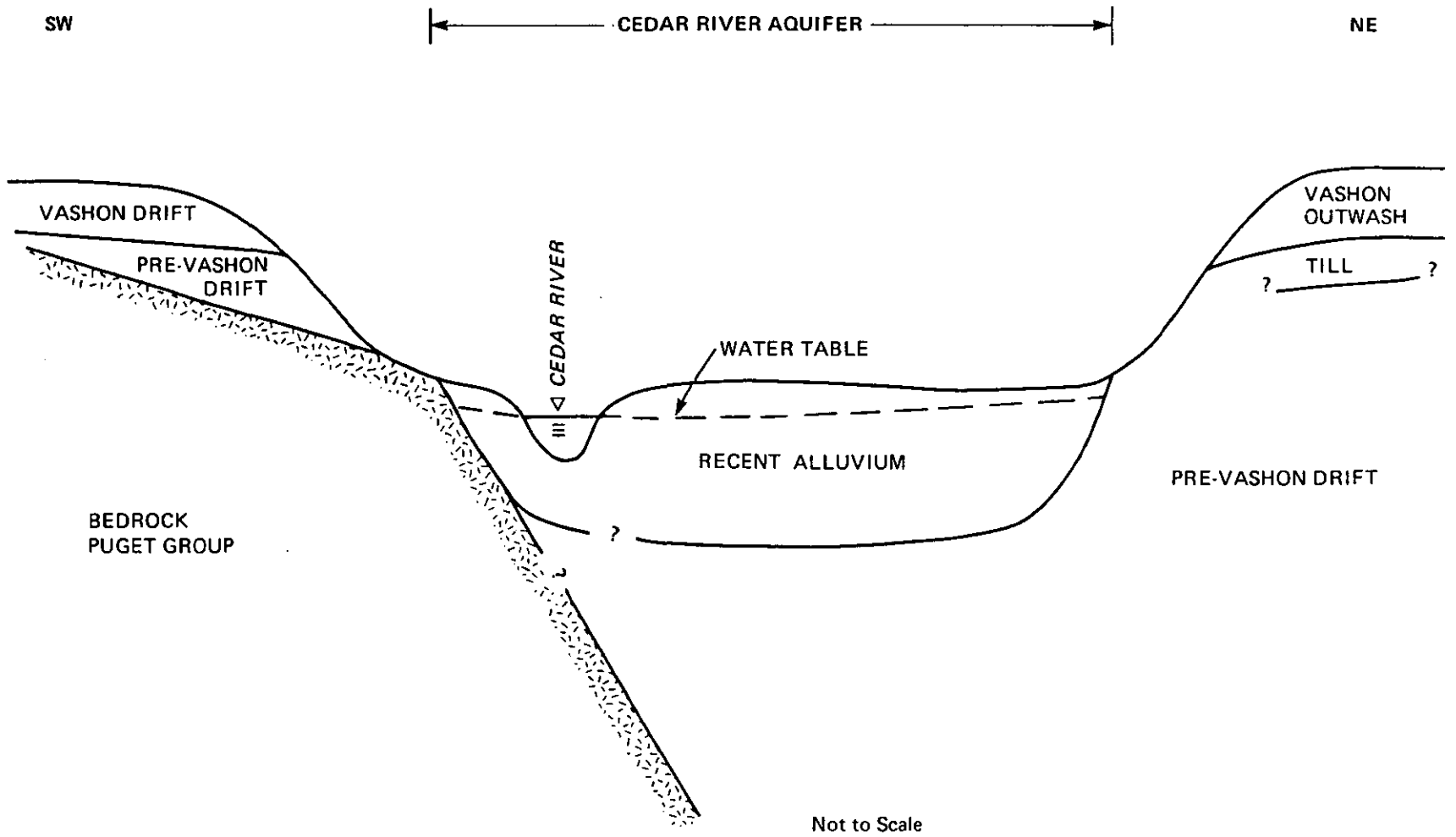

FIGURE 2-4
Schematic Cross-Section,
Cedar River Aquifer

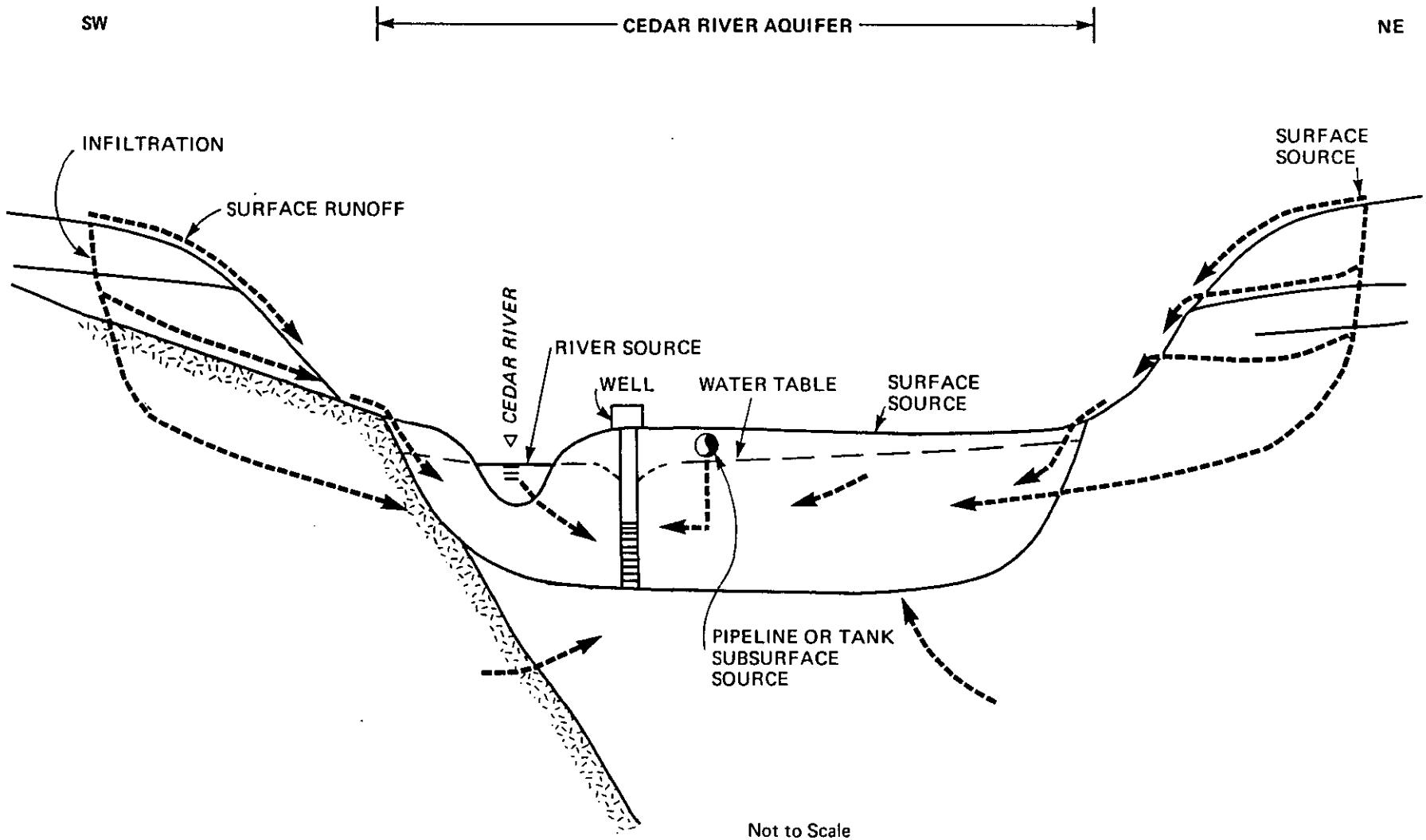

FIGURE 2-5
Recharge Flow Paths

Chapter 3
POTENTIAL CONTAMINANT SOURCES

INTRODUCTION

This chapter discusses in detail the potential contaminant sources identified by the study. For discussion purposes, the sources are organized into the following general categories:

Subsurface

These are sources of contamination that originate below the ground surface, such as leakage from a buried tank or pipeline. Contaminants from subsurface sources may remain entirely belowground or they may eventually seep to the surface along the valley walls.

Surface

Contaminants from surface sources originate on or above the ground surface and migrate to the aquifer via infiltration.

River

River contaminants flow with the surface waters in the Cedar River. They originate as either subsurface or surface sources east of the bedrock narrows, as noted in Chapter 2, or as direct discharges to the river.

Transportation

Contaminants from runoff and accidental spills related directly to transportation are organized into this category.

General

These sources of contamination can be either subsurface, surface, or river sources but have not been pinpointed to a specific site.

The potential contaminant sources that are identified with specific locations are listed and shown in Figures 2-2 and 3-1. The locations of the City's wells and city limits are also shown in these figures.

EVALUATION PARAMETERS

The degree of impact each contaminant source may have on the quality of water produced from the wells is dependent upon many factors. The principal factors are as follows:

- Chemical content of material

- Potential quantity involved
- Location of contaminant source with respect to the aquifer and the probable direction of groundwater movement
- Probability of occurrence
- Attenuation, including sorption, chemical precipitation, filtration, dilution, and biodegradation as discussed in Chapter 2
- Ability to detect occurrence of and direct movement of a spill or leak before contaminant reaches the wells

The potential impact that each contaminant source may have on the well field can be estimated by evaluating each of these factors. Table 3-2, found in the summary of this chapter, lists each of the potential contaminant sources identified in this study and ranks the impact of each.

RIVER SOURCES

Contaminants from these sources generally originate up the Cedar River valley a minimum of one mile to the east of the wells. Although contaminants in this category may originate on the ground surface or subsurface, they would reach the Cedar River and eventually flow with the surface waters of the river as they enter the shallow upstream end of Renton's Cedar River aquifer at the bedrock narrows. Also included in this category are direct discharges of raw sewage to the river caused by overflows from two pump stations located west of the narrows.

Under normal conditions, it is thought that such contaminants in the river will not have an adverse impact on the aquifer unless the quality of water in the river is degraded for a long period of time, or unless flooding conditions or excessive well pumping cause the contaminants to move from the river into the aquifer.

Septic Tanks

According to City of Renton sewer maps, most of the developed areas within the city limits are served with sanitary sewer connections. Generally, areas to the east of Renton's city limits, are on septic tanks. One area of particular concern that is not sewered is the residential development known as the Maplewood Addition, which is directly south of the Maplewood Golf Course between the Maple Valley Highway and the Cedar River. The entire area is not sewered, although approximately one-third of the area is within the city limits.

Each residence is on a separate septic tank. There are approximately 200 residences in the area with 145 of these in the portion that is outside the city limits. The Seattle Metro Cedar River Trunk interceptor sewer bounds this parcel of land to the north but the development is not connected to it.

The development is in a 100-year flood zone according to U.S. Department of Housing and Urban Development flood insurance rate maps. Flooding of this area could result in raw sewage being carried down the Cedar River from submerged septic tanks and drain fields. As mentioned in Chapter 2, the normal groundwater flow patterns are generally parallel to the river or from the aquifer toward the river. However, under flooding conditions, this natural flow pattern may be interrupted. Thus, contaminants carried downriver during a period of flooding could reach Renton's wells.

As noted in Chapter 2, water service to the Maplewood Addition is provided by two wells located within the residential area. Although test reports indicate water quality meets DSHS requirements, these test results may not represent the water quality when a flood condition exists.

In addition, there are numerous other residential developments upstream of Maplewood, even beyond the town of Maple Valley, which are served by septic tank systems. These developments are located both in the Cedar River valley and on the plateaus to the north and south, in varying densities and sizes. Some indication of the extent of such developments appears on the base map (USGS map) used for Figure 2-2, although the map was last updated in 1973.

Because of the nature of the soils near the surface in these areas, it has been found that most septic tank systems do not perform satisfactorily after 10 to 12 years of service. King County sanitarians have indicated that the rate of septic tank failures in the entire Cedar River drainage basin probably exceeds 30 percent. According to the RIBCO Water Quality Management Study, Part III, Appendix A, Sewerage Analysis and Plan, population in the basin between Renton and Landsburg is expected to double to approximately 50,000 in the years between 1980 and 2000.

The existing Metro Cedar River Trunk interceptor sewer ends just east of Maplewood at the intersection of the Maple Valley Highway and 149th Avenue SE. Extension of this interceptor sewer upriver for a distance of approximately 2.5 miles is anticipated by 1990. Further extension to the town of Maple Valley is not anticipated until after 1990.

Construction is scheduled to begin under a ULID in June 1984 which will connect the developments in the vicinity of the

Aqua Barn Ranch to the Metro sewer. The King County Building and Land Development Department has no knowledge of a proposed commercial development in the vicinity of 140th Place SE at Maple Valley Highway. However, should such development occur, it should also be connected to the Metro sewer.

Until Maplewood and other residential developments upstream are connected to sanitary sewers, an increase in coliform count and nutrients (such as those found in commercial fertilizers) from failing septic tank systems can be expected to occur in the Cedar River. Contaminants from septic tanks are among the most serious of the potential contaminants categorized as river sources.

Landfills

There are two existing solid-waste landfills approximately 7 miles east of Renton within the Cedar River drainage basin. The locations of these sites are shown in Figure 2-2. The Cedar Hills landfill is operated by the King County Solid Waste Division. Queen City Farms is a private landfill, located directly to the south of the Cedar Hills landfill, that no longer accepts waste for disposal.

Because of natural drainage patterns, the majority of surface runoff and leachate from those landfills flows into Issaquah Creek rather than into the Cedar River. Typical leachate characteristics include low pH, low dissolved oxygen, high coliform, BOD and COD levels, increased hardness, and increased levels of metals, salts, nitrogen and phosphate. All of these characteristics are highly undesirable in a potable water supply, as well as harmful, if not deadly, to aquatic life in the river. A table of typical leachate characteristics is included in Appendix B.

The Queen City Farms site is on the U.S. Environmental Protection Agency hazardous waste site priority list. Sites included on this list are subject to future study and possible cleanup by the EPA. The EPA has found high levels of contaminants in the groundwater beneath ponds located on the Queen City Farms site. Tests using an organic vapor analyzer have been performed at approximately 40 private well sites in the area encompassing the landfill. The tests indicate that groundwater contaminants at these sites are below the maximum contaminant levels (MCL) set by the EPA. Tests to determine the direction and rate of movement of the contamination plume are continuing at this time.

The EPA believes that contaminants that leach from either of these landfill sites would not be at measurable levels once they reached the Cedar River.

Gull Service Station

A Gull service station is located approximately one mile to the east of I-405 along the Maple Valley Highway. This site is located beyond the eastern boundary of the City's aquifer (the bedrock narrows) as described in Chapter 2. Therefore, product leakage from this site would probably migrate to the surface of the Cedar River and have little, if any, effect on Renton's aquifer under normal river flow conditions. The contaminants associated with service stations and their potential impact on water quality are discussed in detail in the following section on subsurface sources.

Sewage Pump Station Overflows

There are two sewage pump stations located within the aquifer recharge area that include emergency overflows to the Cedar River. They are the Cottonwood pump station, located north of the river to the east of the Stoneway Concrete plant, and the Falcon Ridge pump station situated south of the bedrock narrows.

Emergency overflows typically discharge raw sewage to adjacent waterways when power failures occur at pump stations or when the influent flows exceed pumping capacities, causing overflow of the wetwell.

Details of design and construction of these pump stations were not obtained. It is believed that discharge from these overflows is infrequent and that the resulting contaminants in the Cedar River would continue to flow downstream without adversely affecting the aquifer.

Olympic Petroleum Pipelines

Olympic Pipeline Company operates two petroleum pipelines that cross the Cedar River just west of the Maplewood Golf Course. These pipelines are 16-inch- and 20-inch-diameter cathodically protected steel. They are buried and carry refined petroleum products. Because the pipelines are located east of the bedrock narrows, it is probable that petroleum product leakage would flow on the surface of the Cedar River without degrading the quality of water in the aquifer.

Miscellaneous

No point discharges (contaminant sources concentrated at a single point) of any consequence are known to exist upstream in the Cedar River valley. Besides failing septic tank systems, other nonpoint sources not mentioned above which contribute to water quality degradation include urban runoff, horse and cattle pasturage, and logging.

Urban runoff (storm sewage) is discussed in the Transportation Sources section of this chapter. As urban development increases in the river basin, an increase in storm sewage contaminants in the river can be expected. Horse and cattle pasturage is expected to decrease as urban development increases. The Aqua Barn, located one mile east of Maplewood, presently has the largest concentration of horse pasturage in the basin. Contaminants from logging, primarily sediments, are not thought to threaten Renton's aquifer and are more readily controllable than other contaminant sources.

SUBSURFACE SOURCES

Contaminants that originate below the ground surface, such as leakage from a buried tank or pipeline, are categorized as subsurface source contaminants. Because these sources are out of sight, immediate detection of leakage or impending danger is often difficult and may require special equipment. Contaminants from subsurface sources may remain entirely belowground or, if the source is in the upland area, they may eventually seep to the surface along the valley walls.

Service Stations

Service stations within the aquifer recharge area pose a continuous threat to the quality of Renton's water supply. Leaks from buried fuel storage tanks or piping can release quantities of petroleum product without immediate detection. Even small quantities of petroleum product can contaminate large volumes of water. Harmful components generally found in petroleum products include hydrocarbons, tetraethylead, ethylene-dichloride or ethylene-dibromide, benzene, EDB, and various gasoline detergents. The range of effects that these components may have on water quality covers a broad spectrum. Some components may only produce adverse taste and odors in the water while others may be carcinogenic when ingested.

Because most fuel storage tanks and pipes are constructed of steel, they are subject to corrosion. Failure of these vessels at service stations within the Puget Sound area is not uncommon. There have been incidents in the cities of Auburn and Seattle within the past year. Crowley Environmental Services, a local firm that specializes in the cleanup of hazardous material spills, reports that they have been directly involved in cleanup activities at 35 to 40 service station sites in the Puget Sound area. They indicate that most of the leaks they have encountered at service stations have been associated with failures of buried piping to the fuel dispensing units rather than failures of the storage tanks. Failure of steel pipes due to corrosion is a common occurrence.

Leakage of petroleum near the wells could cause serious contamination of the aquifer. Petroleum product would rapidly migrate vertically through the permeable soil to the water table. The product would then float on the surface of the water table, spread laterally, and could possibly be drawn into the well.

Cleanup of petroleum spills is extremely difficult. Total excavation of the contaminated soil is sometimes required to restore groundwater quality. Continuous pumping of a contaminated well to a waste site may also be required to protect other wells in the vicinity from contamination. Often, additional wells must be drilled to continuously monitor groundwater quality around a contaminated well. Efforts to clean up petroleum contamination can be very expensive and their results are not always successful. Therefore, in addition to the potentially serious health effects, a petroleum product spill within the aquifer recharge area could have enormous economic consequences.

The potential for a major petroleum tanker truck spill during transportation and unloading also exists. This is discussed further in the "Transportation Sources" section of this chapter.

Generally, small surface spills of fuel and motor oil drippings at service stations in the area are collected by the storm drainage system. Special catch basin traps are normally used to contain these minor spills. Therefore, they are not considered to be a major threat to groundwater quality.

Service stations near Well 3 are the most obvious cause for concern. A Texaco station is located approximately 150 feet directly to the north of Well 3 on Bronson Way. This station has four 6,000-gallon gasoline storage tanks, a 550-gallon waste oil tank, and a 1,000-gallon heating oil tank. All of the tanks are buried, are of steel construction, and have been in service for nearly 17 years. Buried steel piping on the site connects the storage tanks to a total of six fuel dispensers.

The average quantity of gasoline dispensed from this station each month is 150,000 gallons. Inventory control at this site includes stick gauging the storage tanks on a daily basis and reading the meter on each dispenser. Records are kept on the premises indicating the daily inventory on hand, the quantity of fuel dispensed, and the net gain or loss from inventory. Cumulative records from April 1983 through February 1984 indicate the following:

- A loss of 307 gallons from the premium unleaded gasoline inventory, representing an average monthly loss of 27.9 gallons

- A loss of 1,281 gallons from the regular unleaded gasoline inventory, representing an average monthly loss of 116.5 gallons

- A gain of 1,191 gallons in the regular gasoline inventory, representing an average monthly gain of 108.3 gallons

According to these statistics, the average monthly loss from the total inventory at this site is 36.1 gallons per month. Losses are not necessarily attributed to leakage. Evaporation, temperature variations, pilferage, and limited accuracy of storage tank gauging practices are all factors to be considered when analyzing petroleum product inventories.

A Union Oil station is located approximately 500 feet to the west of Well 3. This facility has two gasoline storage tanks including a 5,000-gallon tank that is 25 to 30 years old and a 6,000-gallon tank that is 10 to 15 years old. There are also three 350-gallon diesel fuel tanks and a waste oil tank of undetermined capacity on the site.

The average quantity of gasoline dispensed from this station each month is 12,000 gallons. Inventory control includes stick gauging the storage tanks approximately 3 times per week and reading the meters on the dispensers each day. The operator of this facility states that the total quantity of fuel indicated on the dispensers for the last 12 months equals the total quantity of fuel delivered to the site in the same period.

An abandoned service station and an Exxon service station are located approximately 1,200 feet to the northeast of Well 3 at the intersection of Sunset Boulevard and North 3rd Street. These stations may not be as critical to the safe operation of the well field system as the previously mentioned sites. It is probable that they are located beyond the radius of influence of the wells.

Texaco, Inc., recently filed an application for a new conditional use permit from the City that, if approved, would have allowed Texaco to remove its existing facility and install new facilities on the same site. The proposed new facilities included a service station, a car wash, and a convenience store. These plans also included removing the existing buried tanks and installing one 12,000-gallon and two 10,000-gallon gasoline storage tanks. In addition, a 10,000-gallon diesel fuel storage tank was to be installed.

Each of these tanks would have been constructed of fiberglass. New buried fiberglass piping would have connected the tanks to a total of 12 fuel dispensers under the proposed plan.

This proposal represented a major expansion of fuel storage and dispensing facilities on the site. Marketable product storage would have been increased by 75 percent over present capacities. Fuel dispensers and related buried piping would have been doubled. Texaco has stated that the amount of fuel dispensed from the upgraded facility would remain at the present 150,000 gallons per month. Texaco's application was denied by the City's land use hearing examiner, as was their appeal to the city council. According to City records, the denial was primarily due to limited space on the site, which necessitated the use of a public alley in order to conduct normal business.

A public hearing was held on January 17, 1984, prior to the decision of the City's land use hearing examiner. A staff report was prepared prior to the hearing with input from various City departments. The staff report addresses the City's concern regarding the relationship of the service station to the water supply system. The report notes that Well 3 is approximately 100 feet from the southern border of the service station property and also states that "any spill or contamination of the ground by a leak in the gasoline tanks could result in a major public health hazard." The close relationship between the well and the existing service station facility is a valid concern.

To reduce the risk associated with a petroleum spill, the staff report recommended that Texaco be required to install an electronic leakage monitoring system around the storage tanks. Such a system would provide a means for early detection of a tank leak. Early detection may help in reducing the quantity of petroleum product lost into the ground. Prompt notification of a leak would also allow the City to discontinue pumping operations, thus possibly preventing the product from reaching the water distribution system. An early detection system will not prevent a leak from occurring, nor will it guarantee that the product will not reach a well. Such a system will also not reduce the long-term threat of aquifer contamination associated with a service station or eliminate the need to clean up contamination should leakage occur.

Concrete Plant

The Stoneway concrete plant that is located approximately 1,100 feet to the east of the City's wells is a potential source of serious contamination. Petroleum products and

chemical additives for concrete are stored in bulk quantities on the site. A pond for disposal of concrete slurry is also located on the site. As stated in Chapter 2, the groundwater in this area probably flows parallel to the Cedar River. Contaminants from this site that infiltrate through the alluvium to the water table would flow in the general direction of the wells. Thus, the entire well field is vulnerable to contamination from this site.

Materials stored onsite to be used as concrete additives include the following:

- Zeecon, which is a water reducing agent made from wood pulp byproducts and is stored in a 5,000-gallon tank
- A polymer-base water reducing agent manufactured by Master Builders (MB Pozz 322N)
- Approximately 1,000 gallons of Master Builders MB AE-10 air entraining agent
- Calcium chloride stored in a 2,000- to 3,000-gallon aboveground tank
- Master Builders 122 HE, which is an accelerator containing calcium chloride in combination with a water reducing agent
- A retardant, which is basically a sugar or organic material

According to the Master Builders factory in Cleveland, Ohio, the chemical compositions of these admixtures are proprietary. However, some information about these products was obtained. The MB Pozz 322N water-reducing agent is primarily a carbohydrate with an organic amine that is also used in soaps. The MB AE-10 air entraining agent is a wood pulp byproduct resin that is neutralized with sodium hydroxide. This particular agent is believed to be water soluble. The MB 122 HE accelerator is a combination of calcium chloride and a carbohydrate water-reducing agent with a trace of an organic amine.

From this information, a determination of the impact that leakage of these materials would have on the water system is not possible. It does appear, however, that these materials are water soluble and biodegradable and may therefore be readily dissolved and diluted to harmless levels.

The slurry pond that is located on the site would also contain these chemicals; however, they would be significantly diluted.

Steel tanks containing petroleum products on the concrete plant site include:

- A buried 4,000-gallon regular gasoline tank
- Three buried unleaded gasoline tanks totaling 6,000 gallons
- Two buried 10,000-gallon diesel fuel tanks
- A 500-gallon aboveground waste oil tank

This facility dispenses approximately 1,500 gallons of diesel fuel per day. Stoneway indicated that in comparison the quantity of gasoline dispensed is relatively low. Inventory control consists of stick gauging the storage tanks twice each week. Gauging is done primarily to confirm that there is available space in the tanks to accept fuel deliveries. Records for the previous 12 months indicating the quantity of fuel delivered to the site versus the quantity dispensed have been requested from Stoneway by letter. Stoneway indicated verbally that this information would be made available; however it was not received. This information could be used to calculate the annual and monthly gain or loss from inventory.

As discussed previously, storage of petroleum products within the aquifer recharge area poses a major threat to Renton's water supply. The concerns outlined for the service stations near Well 3 in the previous section also apply to the Stoneway concrete plant. However, leakage from the fuel facilities at the concrete plant could cause serious contamination at all of the well locations, not just one well in particular. Contamination of this magnitude would have disastrous effects on the City of Renton.

Contrary to the belief of some, Stoneway's manager indicates that they do not have plans to relocate their facilities or change their current operations within the next 5 years. He says that a rumor relating to a potential relocation has been circulating for several years. The products listed above are essential to the operation of the concrete plant; therefore, use and storage of these products on the site will continue as long as the plant remains active.

Brick Plant

The North American Refractories Company brick plant is located south of the Cedar River, approximately 1,000 feet to the southeast of Well 8. According to the plant manager, they have two petroleum product storage tanks on the site. These include a 1,000-gallon gasoline storage tank and a vertical 100,000-gallon aboveground diesel fuel storage tank.

The gasoline storage tank is buried and of steel construction. It was internally inspected for signs of corrision last year; no specific problems were noted.

The diesel storage tank is relatively new, according to the manager. The perimeter of the tank is diked to contain leakage as required by the Uniform Fire Code. The ground surface below the tank is covered with gravel. The maximum quantity of fuel stored in the tank averages around 5,000 gallons.

These particular petroleum facilities are not considered to be a major threat to the City's wells. Because the large storage tank is located aboveground, leakage would be detectable in a timely manner. Also, it is probable that leakage from either of these tanks would surface along the south bank of the Cedar River and flow downstream without affecting the groundwater quality north of the river.

In addition to the petroleum products, chemicals used to manufacture fire brick are also stored on the site. These chemicals include sodium silicate solution, trisodium phosphate, and aluminum sulfate.

The sodium silicate solution is stored in a 4,000-gallon buried steel tank. It is completely soluble and is sometimes used as a coagulant aid in potable water treatment plants. The trisodium phosphate is a dry chemical stored in bags on the site. This chemical is sometimes used in industrial and potable water treatment plants to reduce corrosion and to control scaling.

Aluminum sulfate is also a dry chemical that is stored in bags on the site. This chemical, commonly known as alum, is often used as a coagulant aid in water treatment processes. None of these chemicals is harmful in potable water systems in dilute solutions. They are not considered a threat to the Cedar River aquifer.

Sanitary Sewers

Sanitary sewers within the vicinity of the wells are potential sources of contamination. Raw sewage from a ruptured sewer pipe is a serious threat to public health. Outbreaks of typhoid fever, gastrointestinal infection, infectious hepatitis, and other waterborne diseases are frequently associated with sewage spills.

There are relatively few sanitary sewers in the vicinity of the wells. Fortunately, the sewers that do exist are not force mains. Force mains under pressure from a pump or hydraulic head would pose a greater threat to the safety of the aquifer than do the existing gravity sewers.

Most of the sewers in the area range from 6 to 15 inches in diameter. These City of Renton sewers are located along Houser Way and Bronson Way to the north end of Cedar River Park. Abandoned sewer lines also exist within Cedar River Park. These abandoned lines may serve as open conduits, allowing surface contaminants to migrate toward the wells.

The largest sewer in the area, however, is the Seattle Metro Cedar River Trunk Section No. 1. It is a 42-inch-diameter line that traverses Liberty Park north of Wells 1 and 2, continues along the southern and eastern boundaries of Cedar River Park, and extends up the Cedar River valley toward Maple Valley as shown in Figure 3-1. It is made of concrete pipe and was constructed in 1962 and 1963. The average depth of the pipeline is approximately 10 feet below the ground surface.

The pipe was oversized to provide for discharge from future developments up the valley. Because the flows in the pipe are low at present, the current contamination risk is also reduced. As areas east of Renton are developed, flows through this pipeline will increase. Therefore, the impact that failure of this pipe will have on the water supply is also increasing. Concrete sewer pipe is inherently not leak tight. Some infiltration and exfiltration are expected even with a new installation. The existing pipe is 20 years old. As the pipe gets older, the probability of leaks through either the pipe wall or pipe joints will increase; however, no specific leaks are known at this time.

Storm Sewers

As discussed in Chapter 2, ground surface slopes and enclosed storm sewers provide pathways for storm water contaminants to flow toward the aquifer. Surface drainage in the area flows naturally toward the Cedar River valley from the adjacent hillsides. The drainage basins are shown in Figure 2-2.

Typical stormwater has many of the same characteristics as effluent from a secondary sewage treatment plant, except that it often contains higher concentrations of lead, iron, settleable and suspended solids, petroleum products, and coliform organisms. A table of typical stormwater characteristics and a comparison with secondary sewage treatment plant effluent is included in Appendix B.

Leaks from storm sewers or open drains in the aquifer area pose the same threat of contamination to the aquifer as leaks from sanitary sewers. Although the danger of contamination by infectious disease is much reduced, contamination potential by metals and petroleum products is greater than from sanitary sewage.

Cemetery Sites

There are two existing cemeteries on the hill to the northeast of the well field. These are Mt. Olivet and Greenwood Cemeteries. It is probable that groundwater from this area migrates to the well field area. Contaminants in the leachate from these sites could include dissolved organics and inorganics and bacterial and viral organisms.

Water quality tests on samples taken from the City's wells indicate that the levels of these contaminants are below DSHS maximum contaminant levels. It is probable that any contaminants leaching from the site are attenuated through filtration and biodegradation. The risk factor associated with aquifer contamination from these sites is therefore believed to be low.

Private Fill Sites

There are three private fill sites located approximately 3,000 feet to the northeast of the well field. These sites are in the general area between the Mt. Olivet and Greenwood Cemeteries. The individual sites are operated by Mt. Olivet Cemetery, Emma Cugini, and M. A. Segale, Inc.

The Mt. Olivet Cemetery fill site is directly to the north of their existing burial grounds. The existing fill materials at this site may include excess or waste soils from construction projects, gypsum board, household appliance frames, and miscellaneous building demolition debris, as well as other materials. It is understood that the fill operations at this site have been temporarily suspended, but they may continue in the future upon renewal of the fill and grading permit.

Permits were issued by the City of Renton in 1982 allowing the fill operations at the Cugini and Segale sites. Cugini is permitted to import 150,000 cubic yards of fill material and excavate 30,000 cubic yards of gravels. The permit expires in 1987. The fill materials allowed at this site are not defined in the city hearing examiner's report. The report notes that this fill and excavation operation will involve approximately 4,000 truckloads of materials.

The permit issued to Segale allows a gravel pit area to be filled with 1,100,000 cubic yards of materials. The city hearing examiner's report notes that this fill operation will involve approximately 44,000 truckloads of materials. The examiner's approval of the fill permit for the Segale site stipulates that:

> "No material may be incorporated in the site which contains soluble poisons or other leachable compounds which have the potential for contaminating the groundwater."

This permit also expires in 1987.

The examiner's estimations of the number of truckloads to complete the work at each of these sites may be low. Even so, close monitoring of all the materials transported to the sites in the 48,000 truckloads cited by the examiner is not possible. The origin and content of all fill material may be unknown. Although one of the above permits specifically precludes the depositing of "leachable compounds," it is possible that some contaminants such as waste oils and waste household products such as paints, cleaners, and pesticides may be delivered to these sites. Other disposed materials such as the gypsum board, building demolition debris, and household appliance frames may develop leachable compounds.

Because of the permeable soil conditions, contaminants from any of these sites could find their way into the aquifer as leachate in the groundwater or surface runoff.

SURFACE SOURCES

Contaminants that originate on or above the ground surface include herbicides, pesticides, and fertilizers. Urban runoff and accidental spills are also specific types of surface source contamination; however, these are discussed in the "Transportation Sources" section of this chapter.

Sprays and Fertilizers

Pesticides, herbicides, and fertilizers are used in the immediate vicinity of the wells. Entities using these products include the City of Renton Parks and Recreation Department, Washington State Department of Transportation, and Burlington Northern Railroad, as well as private parties for residential maintenance. Table 3-1 notes the products that are known to have been used in the immediate area of the wells and those who have reportedly used them.

Also noted on Table 3-1 are the generic chemical names of some of these products, along with toxic designations or comments. The LD_{50} or lethal dose 50 noted in the table is defined as the calculated dose of a substance which is expected to cause death of 50 percent of an entire defined experimental animal population. The experimental animal is noted and the lethal dose is given in milligrams of constituent per kilograms of animal body weight. This indicates the relative toxicity of the various products listed.

Table 3-1
SPRAY AND FERTILIZER USAGE

Product	Purpose	City	WSDOT	BN	Generic Chemical[1]	Comments
2,4-D	Weed Killer	X		X	Not Researched	
Assault	Sterilizer	X			Not Researched	
Bavel	Brush Control		X		Not Researched	
Casoron	Weed Killer	X			2,6-Dichlorobenzonitrile	Almost insoluble in water, moderate toxic, LD_{50} (rat) = 2710 mg/kg[2]
Diazinon	Insecticide	X			Dimpylate	LD_{50} (rat) 76 mg/kg, possible carcinogen[3]
Dowpon	Sterilizer	X			*,*-Dichloropropionic Acid	Moderate toxic, LD_{50} (rat) = 970 mg/kg[2]
Garlon	Brush Control		X	X	Not Researched	
Gleen	Brush Control			X	Not Researched	
Karmex	Sterilizer	X	X	X	Diuron or Monuron	Permitted in animal feed, moderate toxic LD_{50} (mouse) = 640 mg/kg[2] Experimental carcinogen, moderate toxic LD_{50} (rat) = 1480 mg/kg[2]
Krenite	Brush Control		X		Not Researched	
Oust	Sterilizer		X	X	Not Researched	
Polysol	Dormant Spray	X			Not Researched	
Princep	Sterilizer	X	X		Simazine	Moderate toxic, LD_{50} (rat) = 850 mg/kg[2]
Roundup	Weed Killer	X			Glyphosine	LD_{50} (rat) = 3925 mg/kg[3]
Spike	Brush Control			X	Not Researched	
Tordon	Brush Control			X	4-Amino-3,5,6-trichloropicolinic acid	Carcinogenic, LD_{50} (rat) = 3750 mg/kg[3]
Turf Two	Weed Killer	X			Not Researched	
	Lawn Fertilizer	X			Not Researched	

[1] The Merch Index, 9th Edition.

[2] SAX Handbook of Hazardous Substances.

[3] NIOSH Registry of Toxic Effects of Chemical Substances, U.S. Department of Health, Education and Welfare, 1978.

These products are approved by the U.S. Environmental Protection Agency for use by the general public. Generally, this means that, if they are used at the dilution rates and dosages recommended by the manufacturer, they are not presently known to be a serious threat to public health. Limited use of any of these products may not have a measurable effect on local groundwater quality. However, prolonged use of these products or dosages greater than those recommended by the manufacturer may have a detrimental effect on local groundwater quality and hence on water quality in the Cedar River aquifer.

The synergistic or combined effect of these chemicals on the environment is uncertain. The chemical industry is constantly developing additional organic chemical products for use as herbicides and pesticides. Research to determine the health effects of these products in drinking water in various combinations and concentrations has not kept pace with their development. Many products commonly used in the past have recently been found to have serious effects on public health, and their use has since been restricted. Future research may show that products commonly used today may also be unsafe.

Fertilizers are used by the Parks and Recreation Department on the lawn areas of the parks. Nitrates in fertilizers are poorly attenuated and can therefore be transmitted to the aquifer. The DSHS maximum contaminant level for nitrates is 10 mg/l. Excessive nitrates can affect the ability of blood in the body to carry oxygen.

EDB is a chemical that has been used in some areas of the state to control worm festations around berry and potato fields. The use of EDB has recently been restricted by the U.S. Environmental Protection Agency because of its harmful effects on the environment. The Washington State Department of Agriculture is currently developing a list of sites within western Washington that may be contaminated due to the use of EDB. According to the Department of Agriculture, there are no sites currently identified within the Cedar River drainage basin where EDB has been used.

Water quality analyses on samples taken from the City's water distribution system indicate that the pesticide levels in city water are well below specified DSHS maximum contaminant levels (see appendix for sample report). Nitrates and other fertilizer components are also reported to be well below specified DSHS maximum contaminant levels.

TRANSPORTATION SOURCES

The City's wells are located near major transportation routes and are therefore subject to contamination from accidental chemical and petroleum product spills. These

transportation routes include Interstate 405 (I-405), State Route 169 (SR 169), numerous city streets, and the Burlington Northern railroad tracks.

There are currently no regulations specifically intended to protect the wells that restrict the types of materials transported in the well field area. The only regulations that are known to exist are Federal Interstate Commerce Commission regulations that restrict the movement of certain substances such as radioactive materials. Chemical and petroleum products are currently transported through the well field area.

Normal precipitation runoff may carry contaminants from the roadways that could infiltrate to the aquifer, causing degradation of the City's water supply. The runoff coefficient for paved areas ranges from 0.90 to 1.00. This means that approximately 95 percent of the moisture that falls on paved roadways will drain off either to the surrounding unpaved ground or to a storm sewer system. The runoff coefficient for unpaved areas with light vegetation, such as the lawn areas of the parks, unpaved roadway shoulders, and embankment slopes, ranges from 0.10 to 0.50. Therefore, as much as 90 percent of the runoff moving to unpaved areas could be absorbed by the underlying soils and potentially infiltrate to the aquifer below.

Potential runoff contaminants could include motor oil drippings, fuel leakage, tire wear products, and exhaust precipitates such as lead. Leakage from transport vehicles, such as solid waste transfer station container trucks, could also be a source of potential contaminants. Containment of roadway runoff is therefore critical to the protection of the aquifer.

Interstate 405

Interstate 405 is a four-lane limited access freeway which bisects the well field from north to south. Wells 1, 2, and 3 are 250 to 300 feet west of the freeway. Wells 8 and 9 are along the eastern border of the freeway. They are 70 to 80 feet from the pavement edge. I-405 is a major corridor between southern suburban Seattle and the communities east of Lake Washington. Because I-405 is a link between Interstates 5 and 90, as well as a bypass of Seattle and the I-90 tunnels, it is a popular commercial truck route.

A potential contamination incident involving a commercial truck occurred in September of 1983. A 1,500-gallon petroleum tanker truck overturned on I-405 between the north end of the Renton S-curves and SR 169. The tanker was carrying diesel fuel and gasoline. Approximately 500 gallons of

petroleum product were reported to have leaked from the vehicle. According to the City of Renton Fire Department Incident Report, the spill was contained with temporary dikes near the accident scene away from the unpaved shoulders. However, some of the product flowed to the paved median strip between the opposing lanes of the freeway where it entered a storm drainage system and was discharged to the Cedar River.

Absorbent pads were used on the surface of the river to collect the product at the outlet of the drainage system. Additional product was collected at the mouth of the river by a Boeing Company oil boom. It is not known what fraction of the total quantity of spilled fuel infiltrated into the underlying soil through cracks and openings in the pavement. The spill has not caused measurable effects on the quality of water produced from the wells. Product that did infiltrate underlying soil could possibly result in contamination of the aquifer in the future.

The potential for a similar, yet more serious, accidental spill incident exists. The freeway is at a higher elevation than the surrounding topography. The same tanker truck could have overturned on the outside traffic lane and rolled over the embankment. The side slopes of the freeway are not covered with an impervious material. Accidental spills from the freeway could infiltrate these exposed slopes, or the level areas at the bottom of the slopes, and cause serious contamination of the aquifer.

Drainage from the existing elevated concrete structures over the Cedar River and SR 169 is not plumbed directly to the storm sewer system. Runoff from these structures is channeled to downspouts which drain freely to the exposed ground below. This condition represents a potential source of contamination. During a previous resurfacing project on I-405, an asphalt emulsion tack coat was allowed to run into these downspouts and caused pollution of the Cedar River. The ground surfaces under these downspouts are not paved and the shoulder areas of SR 169 under I-405 collect much of the runoff from this overpass structure. Standing water and extremely muddy conditions exist in the shoulder areas during rainstorms.

Many of the storm drainage catch basins located along the I-405 corridor in the well field area are connected to a 30-inch storm sewer that originates on the hillside to the northeast of the well field. The storm sewer discharges into the Cedar River directly beneath the I-405 S-curve structure. Contaminants from accidental spills and freeway runoff are discharged directly into the river. Wells 1 and 2 may be vulnerable to contaminants discharged in this area.

The existing I-405 storm sewer system also includes open ditches in the area of the exit from northbound I-405 to westbound Bronson Way. Runoff collected by catch basins on the freeway above is discharged to these shallow ditches and is allowed to run across the ground for approximately 50 feet before entering a collection basin. The ditches are shallow and overgrown with vegetation and do not adequately contain runoff. During rainstorms this area becomes saturated with contaminated runoff. In a recent storm, the water being discharged from a pipe directly north of SR 169 on the east embankment of I-405 was observed to be gray in color, indicating high concentrations of oil emulsions and other contaminants.

Aside from the risk of contamination, the pump station structures over Wells 8 and 9 are also vulnerable to direct impact of vehicles careening from the freeway. The existing chain link fence would not withstand the force of a large vehicle which could severely damage the well structure and the equipment inside. The buildings house chlorination facilities in addition to the pumping equipment. Thus, the potential for chlorine leakage also exists during such an accident.

The Washington State Department of Transportation (WSDOT) is currently planning a project which would add a high-occupancy vehicle (HOV) lane in each direction of I-405. A meeting was held with the City of Renton, WSDOT, Washington State Department of Ecology (DOE), the Department of Social and Health Services (DSHS), and CH2M HILL to discuss the current and future effects of I-405 on the well field and water quality. The minutes for that meeting are included in Appendix C.

An environmental impact statement (EIS) is being prepared by WSDOT to specifically address the effects of the I-405 expansion project on the area between the South Renton interchange and the Sunset Boulevard interchange. The draft EIS is scheduled to be completed by October or November of 1984. According to WSDOT staff, advertisement for the construction bids is scheduled for 1987. This proposed work may provide the opportunity to incorporate certain well protection safeguards into the freeway design.

According to WSDOT, there are 12 design concepts that are currently being considered. Basically, in the vicinity of the well field these concepts include widening of the existing S-curve structure, relocating the alignment to the east of the existing roadway, and relocating the alignment to the west of the existing roadway. Various vertical alignment alternatives are being considered with each of these concepts. Alignments relocated to the west or east might conflict with the existing well locations.

State Route 169

SR 169, also known as the Maple Valley Highway, is a four-lane roadway north of Wells 8 and 9 and perpendicular to I-405. This highway connects the rural communities east of Renton to the urban portions of King County. Traffic volumes along this route are high, especially during morning and evening peak periods. The shoulders along this roadway are wide and unpaved near the wells. As previously discussed, surface runoff from these shoulder areas and accidental spills can infiltrate into the ground and cause contamination of the aquifer.

City Streets

Wells 1, 2, and 3 are bounded by Bronson Way to the north and Houser Way to the east. Each of these streets is a major arterial. Concrete curbs and gutters, catch basins, and storm sewers collect precipitation runoff on both edges of the paved surface. The major contaminant concern is that of potential accidental spills. As mentioned earlier, there are service stations near the wells in this area. Trucks carrying bulk quantities of petroleum products are certain to travel in this vicinity. Because of the proximity of the I-405 entrances and exits, other types of commercial trucks transporting potential contaminants most probably also use these streets. There are no alternative traffic routes for these vehicles.

Burlington Northern Railroad

There are two existing railroad lines within the well field area. A north-south line lies between Houser Way and I-405. This line joins with an east-west line south of the Cedar River. The maximum allowable speed of trains on these lines within the city limits is 10 miles per hour.

According to a Burlington Northern representative, both of these tracks are used on a limited basis. The track that lies between I-405 and Wells 1, 2, and 3 is used primarily to transport goods to and from the Safeway Company in Bellevue. This line may also be used for spur traffic to Boeing, Pacific Car and Foundry Company, and smaller businesses west of I-405. Approximately two trains per day use this track six days per week.

The tracks that parallel the Cedar River on its south bank are used primarily for transporting timber products to and from the Weyerhaeuser Company mill near Snoqualmie Falls. Approximately four trains per week pass this area south of the wells. This line is also used for spur traffic to the North American Refractories Company brick plant.

An exact account of all materials transported on either of these tracks is not available without extensive research, according to Burlington Northern. It is conceivable that goods transported to the Safeway distribution center in Bellevue could include household detergents, sprays, and other toxic substances. Paints, acids, and solvents could be transported to the Boeing and Pacific Car and Foundry facilities.

Burlington Northern has indicated that the City may obtain information regarding the substances transported by submitting a formal request. The company will then assign a person from their staff to review the weigh bills associated with the trains using these routes and compile a list of materials transported.

Because of the relatively slow speed limit and the reported limited use of these tracks, the risk of a major rail accident is minimal. Further research of the materials transported through the area may reveal, however, that additional restrictions should be imposed.

The railroad tracks cross the Cedar River in several places east of Renton. These crossings are all to the east of the City's aquifer as defined by this report. Accidental spills at these crossings could cause contamination of the Cedar River. Similar to "River Sources" discussed previously in this chapter, contaminants in the river would likely, under normal river flow conditions, continue to flow downriver past the well field without affecting the quality of the groundwater near the wells. However, flood conditions or influence from an operating well may cause this natural flow pattern to be interrupted. Should such a spill occur, it is recommended that the City closely monitor the groundwater quality and direction of movement for potential signs of contamination.

GENERAL SOURCES

General (nonpoint) sources of contamination are those that are not identified with a specific site at this time. They could originate as either subsurface or surface sources and could also be associated with river sources.

Coal Mines

There are numerous existing and abandoned coal mines within the Cedar River drainage basin. Abandoned coal mines have been implicated in numerous groundwater/surface water contamination cases in the Midwest and eastern United States. Coal mines pose a contamination hazard because coal was deposited under anaerobic, or oxygen deficient, conditions. Mining exposes these deposits to atmospheric oxygen and

oxygenated water, which will oxidize certain minerals and other substances present in coal. The most serious problem is usually caused by pyrite (FeS_2) a mineral which upon oxidation will release ferric iron, sulfate, and hydrogen ions, resulting in acidic drainage from the coal mine. Acidic water could lower the pH of surface waters, endangering aquatic life, or could mobilize certain ions, such as arsenic, which had previously precipitated onto sediments as relatively insoluble hydroxides.

Moreover, abandoned mines sometimes serve as convenient disposal sites for unwanted materials. These materials could include hazardous substances. Because of the illegal nature of this kind of activity, it is difficult to assess the location and number of sites that may be involved. Coal mines are generally located in the southeastern portion of King County east of the limits of the City's aquifer. These contaminant sources would be classified as river sources, and the risk associated with the sites would therefore be reduced.

Residential Heating Oil Tanks

Buried heating oil storage tanks within the recharge area may also have adverse effects on the aquifer water quality. The harmful components of heating oil and the effects on water quality are similar to those stated for fuel storage tanks at service stations. Similarly, the same concerns relative to storage tank construction and corrosion apply.

A comprehensive inventory of all home heating oil storage tanks within the recharge area is not possible within the scope of this study. A list of residences that have oil burners within the area could possibly be obtained from fuel oil distributors in Renton; however, the completeness of such a list would be questionable. It is likely that abandoned heating oil tanks exist in the area in addition to those currently being used.

The City may wish to conduct a survey of the residences in the area to determine the location, capacity, and age of buried heating oil tanks. Such a survey should also consider private storage tanks for gasoline or other motor fuels. The risk associated with tanks found within the area could then be evaluated based on the criteria used herein to evaluate other potential sources of contamination.

Residential Use and Disposal

Improper use and/or disposal of household, garage, and garden materials such as paints, solvents, herbicides, pesticides, motor oils, and other substances by residential consumers may have an adverse effect on the quality of water in

the City's aquifer. Disposal of many of these substances in the typical residential customer's garbage can or at a public solid waste landfill or transfer station is prohibited. Many individuals are unaware of the location of proper disposal sites and the ramifications of improper use and/or disposal of these substances. Although illegal, disposal of unwanted hazardous liquids into an adjacent storm sewer catch basin or directly onto the ground is common practice.

The risks associated with these practices are dependent upon the substances involved, the distance and direction from the aquifer, and soil conditions. Prevention of aquifer contamination from these sources is difficult, and total elimination of the risks associated with these sources would be economically infeasible.

Dry Cleaners

Chemical solvents used in dry cleaning processes are extremely harmful to potable water supply systems. Improper disposal of residual solids removed from dry cleaning equipment can cause serious contamination of the aquifer. For example, the City of Tacoma has recently been involved in the cleanup of an aquifer because of contamination caused by dry cleaning solvents. This cleanup operation has been extremely expensive.

An investigation of the immediate area surrounding the well field has not identified any dry cleaning establishments. It is probable, however, that there are such businesses within the boundaries of the aquifer recharge area.

SUMMARY

The potential contaminant sources identified and discussed in this chapter are listed in Table 3-2. The evaluation parameters discussed at the beginning of this chapter are used to rank each contaminant source according to its potential impact on water quality in the wells. The rankings are defined as follows:

- High. This designation indicates that, based on the single parameter, the contaminant source listed may have a severe impact.
- Medium. This designation indicates that, based on the single parameter, the contaminant source listed may have a moderate impact.
- Low. This designation indicates that, based on the single parameter, the contaminant source listed may have a minimal impact.

- Unknown. Insufficient information is known about the contaminant to assign a relative significance to this parameter.

The last column in Table 3-2 indicates the overall relative significance of each contaminant source as a threat to the water quality in Renton's Cedar River aquifer. Protective measures should be implemented to reduce the contamination potential from all sources with a ranking of high and from most sources with a ranking of medium. Those sources ranked low in overall relative significance probably do not require additional protective measures at this time.

Table 3-2
CONTAMINANT SOURCE EVALUATION

	Hazardous Nature	Location of Source (nearness to wells)	Potential Quantity	Probability of Occurrence	Mobility (lack of attenuation)	Difficulty of Detection	Overall Relative Significance
River							
Septic Tanks	High	Low	Medium	Medium	Low	Medium	Medium
Landfills	Unknown	Low	Unknown	Medium	Low	Low	Low
Gull Service Station	High	Low	High	Medium	Low	High	Medium
Cottonwood Sewage Overflow	High	Medium	Unknown	Medium	Low	Low	Medium
Falcon Ridge Sewage Overflow	High	Medium	Unknown	Medium	Low	Low	Medium
Olympic Petroleum Pipelines	High	Low	High	Low	High	Low	Medium
Subsurface							
Texaco Service Station	High	High	High	Medium	High	High	High
Union Oil Service Station	High	Medium	High	Medium	High	High	High
Exxon Service Station	High	Low	High	Medium	Medium	High	Medium
Abandoned Service Station	Unknown	Low	Low	Low	Medium	High	Medium
Stoneway Concrete Plant	High	High	High	Medium	High	High	High
North American Refractories Co.	High	Low	High	Medium	Low	High	Low
Sanitary Sewers	High	High	High	Medium	Medium	High	High
Storm Sewers	Medium	High	Medium	Low	Medium	Medium	Medium
Cemetery Sites	Low	Medium	Low	High	Low	High	Low
Private Fill Sites	Unknown	Medium	Unknown	Medium	Unknown	Medium	Medium
Surface							
Sprays and Fertilizers	High	High	Low	High	Low	Medium	Medium
Transportation							
I-405 Spill	High	High	High	High	High	Low	High
SR 169 Spill	High	High	High	High	High	Low	High
City Street Spill	High	High	High	Medium	High	Low	High
Railroad Spill	High	High	Medium	Low	High	Low	Medium
I-405 Runoff	Medium	High	High	High	Medium	Low	High
SR 169 Runoff	Medium	High	Medium	High	Medium	Low	High
City Street Runoff	Medium	High	Medium	High	Medium	Low	Medium
General							
Coal Mines	Unknown	Low	Unknown	Low	Low	Medium	Low
Residential Heating Oil Tanks	High	Low	High	Medium	Low	High	Medium
Residential Use and Disposal	High	Low	Medium	High	Low	High	Medium
Dry Cleaners	High	Low	Low	Low	High	High	Medium

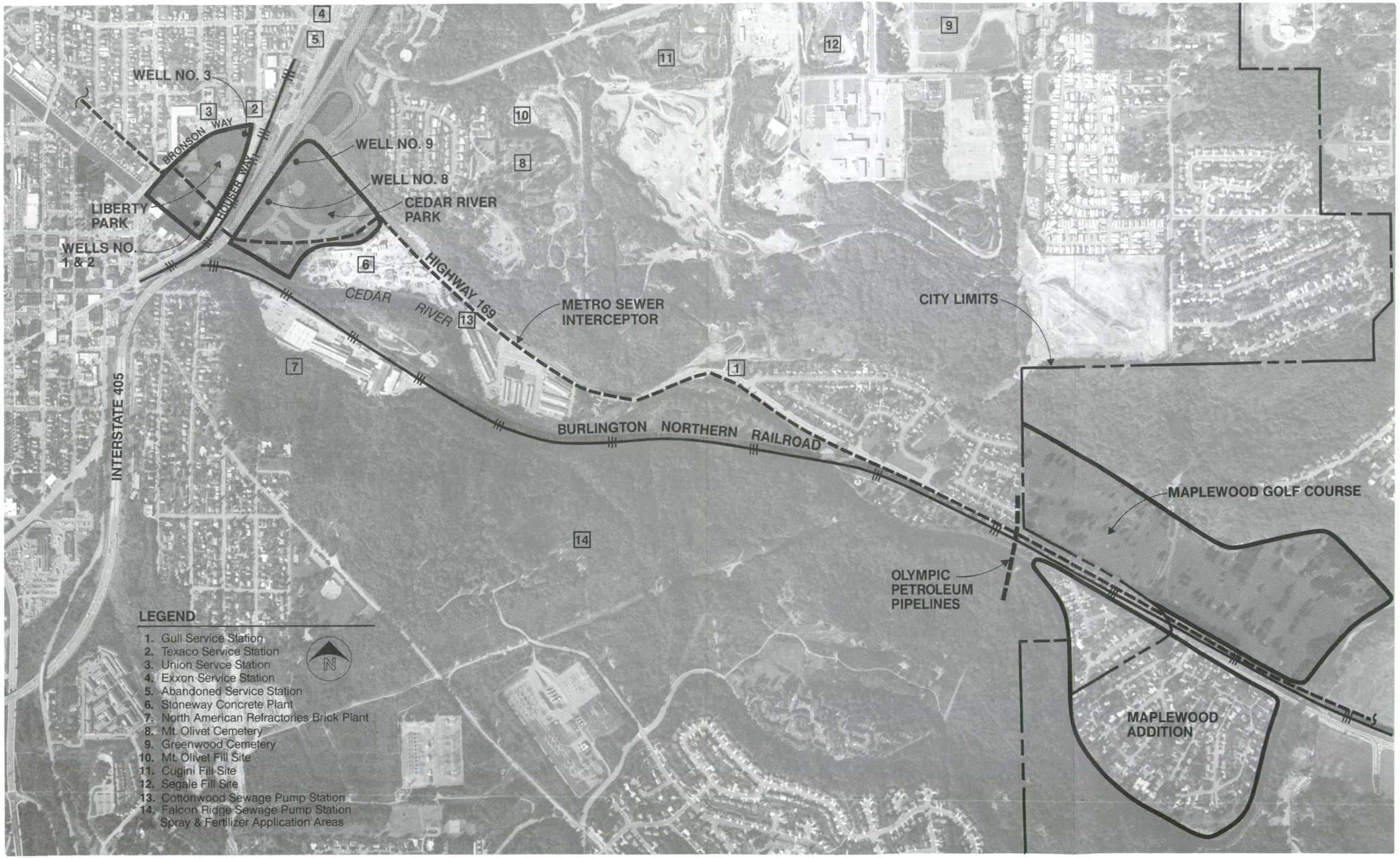

FIGURE 3-1
Potential Contaminant Sources

Chapter 4
CONTAMINATION PREVENTION

INTRODUCTION

The consequences of severe contamination of the aquifer could be extremely expensive and complicated. Severe contamination in this case means an increase beyond specified maximum contaminant levels of any one or more physical, chemical, biological, or radiological substances in the aquifer water. Existing water treatment, limited to chlorination, would not be effective in treating most, if any, of the identified potential contaminants.

Depending on the nature of aquifer contamination, necessary actions might include one or more of the following:

- Cleanup of contaminated aquifer soils by excavation and replacement
- Isolation of contaminated portion of the aquifer by construction of underground slurry walls or barriers
- Diversion of contaminated aquifer water through well field injection of higher quality water or pumping to waste that water removed from existing or new wells in the area
- Construction of water treatment facilities to operate in conjunction with existing supply facilities
- Abandonment of Cedar River aquifer and existing supply facilities
- Location and construction of alternative well facilities in the Maplewood aquifer or other area aquifers (assuming such sources were available and were not already contaminated to the same degree)
- Short- or long-term purchase of additional water supplies from Seattle Water Department or adjacent water districts, if such supplies were available

Preventive measures can be implemented to protect Renton's Cedar River aquifer from future contamination. Potential contamination sources and their relative significance have been identified in the previous chapter. This chapter will discuss and recommend possible methods of eliminating these sources of potential contamination or ways to minimize their effect on the quality of water in the aquifer. General

methods of contamination prevention are first discussed, followed by methods applicable to specific contaminant sources. Controls and actions that the City of Renton and others can exercise are discussed. Contaminant sources are discussed in the same sequence as in Chapter 3.

It should be reiterated that the City's existing well water quality is excellent according to recent laboratory analysis. Therefore, the recommendations outlined in this chapter are preventive rather than corrective measures.

GENERAL METHODS

Section 248-54-125, Source Protection, in DSHS' Rules and Regulations (see Chapter 1) could be interpreted to require that the City of Renton "control land of a greater... size...than is defined by a one hundred...foot radius" from the existing wells. The City now controls the two parks which generally surround the wells for a distance considerably more than 100 feet. However, the City currently has limited control of the I-405 corridor, SR 169 right-of-way, and private properties within the geographic area covering the aquifer. The City has even less control over the remainder of the aquifer recharge area.

Preventive Programs by Others

To the extent possible, the City should control land use and activities within the aquifer area. Examples of such control, or lack of it by others, include the City of Issaquah, which has a land use ordinance protecting two wells adjacent to I-90. The City of Spokane is considering protective ordinances and sewerage of a low-density rural area outside the city to protect its aquifer. Centralia, Kent, and Federal Way all have well supplies (aquifers) within their suburban areas but to date have not developed protective programs.

Land Use

Policies that limit land use within the aquifer recharge area offer Renton one of the most effective means of preventing aquifer contamination. Such policies include appropriate zoning to eliminate commercial activities that may degrade the groundwater quality. The pollutant controls for the area near the wells should be similar to those outlined in WAC 248-54-225 (see Chapter 1) for a watershed providing unfiltered surface water supply, wherein all facilities and activities are limited to preclude degradation of the water supply.

The City of Renton has expressed a desire to establish such a regulated area around the existing well field. The Comprehensive Land Use Plan adopted by the City indicates that

much of the land east of the wells and bordering the Cedar River is designated for recreational or greenbelt use. Figure 4-1 illustrates the extent of these recreational and greenbelt areas. Powerline rights-of-way and other properties having similar use are also indicated on the figure as greenbelt use.

The recreational or greenbelt designations are compatible with the aquifer protection concept. However, there are adjacent commercial land use areas designated by the plan which may require additional control. These include the areas directly to the north and east of the wells. To maximize protection of the aquifer, it is recommended that commercial businesses in these areas be limited to nonpolluting activities.

Existing businesses which currently engage in activities that threaten the aquifer include the service station sites near Well 3 and the Stoneway concrete plant east of Cedar River Park. As discussed in the previous chapter, the petroleum products stored below ground at these sites are a continual threat to the groundwater quality. The Stoneway plant is especially important because of its location upstream from the wells.

One means of eliminating these sources of potential contamination would be for the City to purchase the property where these businesses are located. Although initial acquisition of these parcels would be expensive, commercial or residential developments that are more environmentally compatible with the City's aquifer protection program could be established on these sites to partially or totally offset the acquisition expenses, or the properties could be converted to additional park use or greenbelts.

The political ramifications and the effect of such acquisition on the City's tax base must be considered by the City. These factors, although important, must be weighed against the potential loss of water supply due to accidental contamination of the aquifer. Should contamination of the aquifer occur, other sources of potable water are not readily available to meet the current demand. The assurance of future reliability of this water source will be determined by a city government that is dedicated toward protecting the well field system.

Regional Issues

Several regional issues are of particular concern to Renton insofar as protection of the aquifer. These include:

- I-405 planning and construction

- o I-405/I-90 traffic restrictions
- o Continued use of the Cedar Hills landfill for solid waste disposal and the hauling of waste to this site
- o Land use in the county east of the city limits, including residential, commercial, industrial, or other development and the resulting suburban stormwater runoff
- o Sewerage of the outlying rural/suburban areas
- o Maintenance of minimum stream flows in the Cedar River

Some aspects of these issues are discussed in more detail later in this chapter. In general, it is recommended that the City of Renton be actively involved in the public debate and resolution of all such regional issues impacting the Cedar River aquifer.

For example, in the planning process for widening and possible realignment of I-405, the City should take the necessary steps to ensure that all feasible improvements associated with protecting the aquifer from I-405 contaminant sources are included in the final design. The City should have a voice in any decision regarding restriction of hazardous materials transportation through the I-90 tunnels west of Lake Washington. Such a restriction would force the increased use of I-405 for transport of these materials. The April 30, 1984, letter from City of Renton to Washington State DOT included in Appendix C is a first step in such active involvement.

The City should participate in any decisions regarding the continued use of the Cedar Hills landfill and should closely monitor ongoing studies relative to leachate from this site. The City should also participate in decisions regarding the route that solid waste transport trucks follow through Renton to Cedar Hills. At present these trucks make approximately 150 trips per day along SR 169 from the I-405 interchange. Alternative routes for these trucks should be considered in view of the potential contaminant spills from these vehicles.

The City should participate in decisions relative to land use in the developing areas east of the city limits within the Cedar River basin. Such land use will have a significant impact on stormwater runoff to the Cedar River and on the future need for sanitary sewerage in the area. The City should work with Metro and other agencies to encourage the extension of sanitary sewers as early as possible. Other

county regulations such as those governing septic tanks, mines, and private disposal sites should receive input from Renton.

The maintenance of minimum stream flows in the Cedar River is a concern not only of Renton but also of the State Department of Fisheries, the Seattle Water Department, the Corps of Engineers, and others. Renton's interests are best served by maintenance of higher minimum stream flows that tend to dilute the concentration of contaminants in the river and in the aquifer replenishment. Recreational use of the river upstream of the City, as it affects water quality, is also a concern of Renton.

The City of Renton could declare the Cedar River aquifer a sole-source supply. Such a declaration, according to the EPA, would prevent the use of federal funds on any project within the aquifer recharge area unless it could be shown that the project would have no negative impact on the aquifer. Before declaring the Cedar River aquifer a sole-source supply, the City should carefully consider the merits of such declaration against the possible complications to other city projects or interests.

Water Table Monitoring

At present there is insufficient information to clearly establish the relative elevation of the water table in the well field area and other parts of Renton's Cedar River aquifer with the water level in the river. Such information would be very useful in confirming groundwater and contaminant flow paths in the aquifer area. Presently it is not known whether the aquifer is contaminated; all that is known is that no contaminants have yet reached the wells.

It is recommended that the City develop a comprehensive water table monitoring program. Such monitoring should measure water table elevations at all five producing wells, at the adjacent observation wells, and at additional 2-inch observation wells located at key points throughout the aquifer area and around the perimeter. Initial observation wells should include several near the service stations and the Stoneway concrete plant; these should be installed as soon as possible. The 2-inch observation wells could also be used to sample groundwater quality routinely or in event of a suspected contamination leak or spill.

The water table at each observation point should be monitored monthly or at such other time intervals as experience indicates. River level should always be noted for comparison, as should the duration and rate of pumping at each well preceding the time of water table monitoring. The procedure should note fluctuations in river level due to storm runoff.

The monitoring program should also permit evaluation of seasonal fluctuations in the water table and, in particular, should address the impact of low river flows in the summer and occasional flood flows in winter. Special emphasis should be given to the relative water levels in Wells 1 and 2 and the river because of the proximity of these wells to the river.

Initially, one year of water table monitoring should be sufficient to confirm groundwater flow paths and direction of major recharge. Subsequent monitoring every few years would be useful to determine long-term trends or to monitor impacts of changes in pumping rates or river flow rates. Until groundwater flow paths are confirmed, it is futile to monitor groundwater quality at points other than the wells.

Water Quality Monitoring

It is recommended that the City compare all well water quality data collected within the past 10 years to observe any possible trends in aquifer water quality. Such comparison should continue to be made in the future and may give advance warning of a coming water quality violation.

A relatively continuous record of river water quality has been obtained at the sampling point near the Logan Street Bridge (see Appendix A for copy of data from EPA's STORET system). However, many of the water quality parameters of interest for potable supplies have not been monitored at this point. In addition, this sampling point is downstream of the aquifer. River water quality here may not represent the quality of river water adjacent to the aquifer. The ideal location to monitor river water quality as it may impact aquifer water quality is believed to be at the bedrock narrows at the upstream end of Renton's aquifer. Although it is understood that some water quality sampling has been done near this point by the University of Washington, the extent of the data is unknown.

The RIBCO Water Quality Management Study recommended a permanent water quality monitoring station at river mile 9.5, near Cedar Mountain. The status of this station is unknown. Since Renton's Cedar River aquifer lies generally between river mile 1.5 and 2.5, river water quality from considerably farther upstream is of less value.

It is recommended that the City periodically sample river water at the bedrock narrows. Sampling should be as frequent as once per month and correlated with river flows. Parameters to be tested monthly should include those normally tested for raw water samples taken at the wells--bacteriological and inorganic chemical and physical. In addition, samples should be tested quarterly for trihalomethanes and

pesticides. It is not believed practical to monitor water quality in tributary streams of the Cedar River.

Random river water samples are of little value because they may show one or more abnormally high contaminants at any time because of one-time occurrences. The quality of river water samples should be compared over time to establish any trends. These samples should also be compared with other historical river water quality data and with well water quality to establish any correlations. Since movement of water in the aquifer is much slower than movement in the river, trends in river water quality may give advance warning of coming aquifer water quality violation.

Discharge Permits

The Cedar River below Landsburg is classified under WAC 173-201-045 as a Class A freshwater river. Under the provisions of this classification the following water quality criteria must be met when waste is discharged into the waterway by a municipal, commercial, or industrial party:

- Fecal coliform organisms shall not exceed a median value of 14 organisms/100 ml, with not more than 10 percent of samples exceeding 43 organisms/ml
- Dissolved oxygen shall exceed 8.0 mg/l
- The concentration of total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection
- Water temperatures shall not exceed 18.0° Celsius due to human activities. When natural conditions exceed 18.0° Celsius, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3° Celsius
- The pH shall be within the range of 6.5 to 8.5 with a man-caused variation within a range of less than 0.5 units
- Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU
- Toxic, radioactive, or deleterious material concentrations shall be below those of public health significance

- Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste

In addition to these provisions, a waste discharge permit must be obtained by the discharging organization pursuant to the National Pollutant Discharge Elimination System (NPDES). These permits are issued by the Department of Ecology.

According to WAC 173-201-080, no waste discharge to the Cedar River is allowed within the City of Seattle watershed east of Landsburg. The Cedar River is a Class AA freshwater river east of Landsburg. According to a DOE spokesman, a permit has been issued to the Seattle Water Department that allows periodic discharges of chlorinated water downstream from their Landsburg facility. The DOE indicates that this is the only NPDES permit that has been issued for the Cedar River.

According to the DOE, Washington State regulations prohibit the issuance of additional discharge permits within the entire Lake Washington basin. This includes all of the tributaries that feed into Lake Washington. Therefore, the Cedar River and Renton's aquifer are legally protected from future point source contamination discharges by municipal, commercial, and industrial entities.

Emergency Response Plan

Regardless of the precautions the City or others may take to prevent spills of contaminants in the recharge area, such accidents may still occur. The City can minimize the impact that future contaminant spills will have on the aquifer by rapidly responding to contain or clean up these accidental spills. It is possible that immediate action by the City or others could totally avert contamination of the aquifer.

Although certain state or federal agencies, such as the DOE and EPA, may have the overall responsibility of protecting the environment, the City must take the lead in such situations and not rely on others to protect the water supply. The City is familiar with the supply system and the precautions necessary to protect it from potential contamination.

To ensure that response to such accidents is immediate and effective, it is recommended that the City develop an emergency response plan specifically directed toward protecting Renton's aquifer. The plan should clearly delineate the tasks necessary to protect the aquifer from various sources of contamination. The plan should then identify the agencies that have the resources to perform those tasks. These agencies could include various city departments as well as

county, state, and federal agencies. It is possible that certain private organizations offering specialized services should also be incorporated into the plan.

The key to such a plan is not necessarily to define who does what, but rather, what needs to be done and what resources are available to do it. Obviously, certain tasks may require resources that only one agency can provide. A properly drafted plan will identify those tasks in advance and provide for immediate notification of those specific agencies.

The American Water Works Association Manual No. M19, Emergency Planning for Water Utility Management, is an excellent guide for developing an emergency response plan. The document not only provides suggestions for protecting against contamination but also offers guidelines to water utilities for dealing with other natural and man-caused disasters.

In addition to containment and cleanup of accidental spills, the emergency response plan should include measures to protect nonpolluted wells, should only portions of the aquifer become contaminated. It may be necessary to continuously run the pump in a contaminated well to prevent migration of the contaminant to other wells. The discharge from the contaminated well must not only be isolated from the distribution system in this case, but also be prevented from returning to the aquifer.

The quantity of water stored in the City's reservoirs may be crucial in the event of aquifer contamination. Reservoir capacities in a water system are generally determined by the number of service connections, sources of supply in the system, historical water demands, and water reserved for firefighting. The City of Renton currently has six reservoirs with a total capacity of 12.5 million gallons. As mentioned in Chapter 1 of this report, Renton's Cedar River aquifer currently provides 85 percent of the City's total water supply. Loss of this source of supply because of contamination of the aquifer could cause rapid depletion of stored water.

The emergency response plan should include procedures to maintain high water levels in the reservoirs when aquifer contamination is suspected. Procedures to limit water demand on an emergency basis should also be included. Use of the broadcast media to notify the public promptly, or the curtailment of supplies to large industrial users, might be necessary and should be addressed in such a plan.

The steps outlined above are only a few examples of items to be considered when developing an emergency response plan. The main consideration is to make those agencies that have the available resources aware of the importance of the aquifer to the City and the need to respond in a rapid manner.

RIVER SOURCE PREVENTION

Septic Tanks

As stated in Chapter 3, contaminants from septic tanks are among the most serious of the potential contaminants categorized as river sources. Septic tanks located within flood zones, potential failure of septic tank systems because of adverse soil conditions, and projected increases in population densities east of Renton's city limits are all causes for concern. Connecting residences upstream of Renton's aquifer to sanitary sewer systems would increase protection of the City's water supply system.

Before an area outside the city limits can be sewered, it must be incorporated into the King County General Sewerage Plan and be declared a "local service area" by the King County Building and Land Development Division. After these steps have been taken, the area is eligible to connect to the Seattle Metro interceptor sewer system.

The City of Renton currently has an ordinance that prohibits the connection of developments outside the city limits to the City's sewer system. Although this ordinance may limit the City's operation and maintenance costs by minimizing the flows and size of the system, it also limits the City's ability to provide sewer service to the residences east of the well field.

The Maplewood Addition residential development has been declared a "local service area" and is eligible to connect to the existing Metro interceptor sewer north of the development. It is recommended that the Maplewood area be sewered as soon as possible to protect the aquifer from potential contamination. The proximity of this development to Renton's aquifer and the possibility of flooding cause these septic tanks to be a threat to the aquifer water quality.

Although the Maplewood development is eligible to be sewered, a project has not yet been organized. Funding for such a project is a major consideration. The residents of the development recently decided not to connect to Renton's water system because they were not willing to impose the financial burden upon themselves. It is likely that the sewerage project would be more expensive than the previously proposed water project.

It may be necessary for the City to sponsor a sewerage project for the Maplewood area. This may necessitate either annexation of the area into the City or modification of the ordinance prohibiting city sewers outside the city limits.

Landfills and Solid Waste Disposal

As outlined in the previous chapter, groundwater quality monitoring is ongoing at the Cedar Hills and Queen City Farms landfill sites. It is recommended that the City go on record with the EPA and DOE that these monitoring programs must be continued. The results should indicate groundwater quality trends and leachate movement patterns from these sites. The trend data should indicate if the groundwater quality is deteriorating and the rate of deterioration. The City should analyze these data as they are made available to determine if additional protective measures must be taken in the future.

The DOE has indicated that there is already sufficient legislation for protecting groundwater quality in waste disposal regulations. The coal mines and private dump sites are subject to these existing regulations. Enforcement of these regulations is therefore the key to preserving the groundwater quality that the City already enjoys. Additional legislation should be drafted that would make individuals who engage in contaminating activities financially responsible for their actions. This legislation should include making them liable for losses suffered by others as a result of their contaminating activities.

Sewage Pump Station Overflows

It is recommended that the City evaluate the operation and design of the Cottonwood and Falcon Ridge sewage pump stations to determine the frequency of overflow discharges and the quantities of raw sewage that may be involved. Safeguards that are often incorporated into the design of sewage pump stations to eliminate or minimize overflow of raw sewage include:

- Duplicate pumps
- Backup power supply
- Increased wetwell storage capacity
- Various alarms including power failure, pump failure and wetwell high level alarms.

If it is determined that the pump stations discharge significant quantities of raw sewage to the Cedar River, additional safeguards that may not already be included in the designs should be added.

Olympic Petroleum Pipelines

Buried petroleum pipelines are generally designed and constructed according to stringent federal guidelines to protect the environment. Aside from completely relocating,

the pipelines out of the recharge area, which is not economically justified nor recommended, there is little the City or others can do to lessen the already minimal risk associated with these installations. Internal pressures should be monitored to detect losses and suspected leakage should be investigated immediately.

SUBSURFACE SOURCE PREVENTION

Service Stations

It is recommended that the City impose regulations on the existing service stations in the aquifer area to improve the protection of the aquifer. Recent legislation in California requires that buried storage tanks for hazardous substances be equipped with certain safeguards to protect the environment. California Assembly Bill No. 1362 requires that all underground storage tanks for hazardous substances installed after January 1, 1984, comply with certain requirements concerning design, construction, monitoring systems, and drainage.

Petroleum products are included in the category of hazardous substances. The specific designs for new installations include primary containment tanks with corrosion protection and secondary containment capable of intercepting leakage from any portion of the tank to protect groundwater. Monitoring devices capable of detecting leakage from the primary containment tank are also required for new installations.

The legislation also requires that all underground storage tanks installed on or before January 1, 1984, have a leakage monitoring system and a means for inspection installed prior to January 1, 1985.

Pending California Assembly Bill No. 3565 would amend this existing legislation to require existing tanks to also have monitored pressurized piping systems, but it would extend the deadline for outfitting to June 1, 1985. Copies of both Assembly bills are included in Appendix D.

Monitoring devices around single-shelled storage tanks will provide for early detection of leakage but will not protect the aquifer from contamination. Because of the gravelly soils in the area of Renton's wells and the close location of the service stations, the petroleum product could migrate to a well in a short time. Therefore, monitoring devices with single-shelled storage tanks would provide the aquifer with little, if any, protection, and are not recommended.

Secondary containment structures or double-walled storage tanks would provide the most protection for the aquifer. The California legislation substantiates the fact that the failure of buried storage tanks is a recognized concern. It should be noted that secondary containment around storage tanks does not provide protection against piping failures.

Although fiberglass storage tanks and piping are considered to be safer than their steel counterparts because they are resistant to corrosion, they are not free from problems. For instance, in Auburn, a new service station was recently built that used buried fiberglass piping. The piping was successfully pressure tested after installation. Subsequent site work included constructing the concrete islands on which the dispensers were to be placed.

While placing the forms for the concrete, a worker unknowingly drove a steel stake through the top of one of the pipes. The work was completed, and the station was opened for business. Approximately 8,000 gallons of gasoline were lost before the leak was reported. Product recovery efforts by Crowley Environmental Services proved to be unsuccessful. The fiberglass piping at the Auburn station was subsequently replaced by steel piping. This case also illustrates that even leaks in relatively small-diameter piping can involve large quantities of product and may have an enormous impact on groundwater quality.

The City of Auburn Fire Department now requires a final pressure test of fuel piping after all construction activity is completed. The City of Renton should also adopt such a policy.

The accuracy of service station inventory control practices also allows small fuel leaks to go undetected. A small variation on the gauging stick can represent a significant quantity of product. According to Texaco, the accuracy of inventory control varies from station to station. Improved inventory control may be a cost-effective means of detecting leaks at an early stage. It is understood that currently available automated gauging systems are more accurate than conventional stick gauging methods.

It is recommended that the City of Renton adopt an ordinance similar to the California Assembly Bills for the specific purpose of protecting the aquifer from petroleum contamination. The ordinance should require the following protective measures for all service stations in the area within the limits of the aquifer as shown of Figure 2-3:

- Double-walled tanks constructed on non-corrosive material or cathodically protected steel
- Secondary containment around all piping, including fuel dispensing and vent lines. The secondary containment should slope toward the storage tanks
- Piping constructed of approved non-metallic materials or cathodically protected Schedule 40 steel pipe
- Pressure testing of all piping after all construction has been completed
- A device to detect product or pressure losses in pressurized product lines
- Automated storage tank gauging systems
- Observation wells with a minimum diameter of 2-inches, located at two corners of storage tank excavations
- Inventory records be maintained and reconciled daily. Records should be made available to the City for inspection
- Notification to the City by service station operators if fuel leakage is identified
- Penalties for failure to maintain inventory procedures and records

It is recommended that all existing service stations be required to comply with this ordinance within the next 2 years. The Gull service station upstream of the aquifer limits should also be required to comply. The two service stations near the northerly limit of the aquifer (Exxon and abandoned station) should be required to comply with this ordinance if groundwater table monitoring indicates that water in the aquifer could move from the area of these stations toward the City's wells.

Concrete Plant

The location of the Stoneway concrete plant with respect to the well field makes containment of potential contaminants stored on that site critical to the safe operation of the City's water supply system. Contaminants entering the aquifer from this site could possibly migrate to any or all of the City's wells.

As recommended above, the City should adopt an ordinance that would require secondary containment and monitoring devices around storage tanks for hazardous substances. The definition of hazardous substances in the ordinance should be broad enough to include any liquid or solid substance that could adversely affect the aquifer water quality. The California bills refer to other California legislative documents to define hazardous substances. It is clear that petroleum products are considered as such; however, further research of applicable California documents may be necessary for a complete definition.

In addition to requiring secondary containment and monitoring for the buried fuel storage tanks, consideration must be given to the aboveground storage of other substances. The chemical additives stored on the Stoneway site should be considered as hazardous to the aquifer unless proven otherwise. Double-walled tanks or containment dikes with an impervious ground cover should be incorporated. The impervious ground cover method would require that additional consideration be given to drainage and/or treatment of precipitation runoff.

Brick Plant

The fuel storage facilities at the North American Refractories brick plant are not considered to be a major threat to Renton's aquifer because of the brick plant's location on the south side of the Cedar River. However, the ordinance requirements outlined above for the service stations and the concrete plant should also apply to this facility if sufficient evidence developed to indicate that contaminants from the brick plant could migrate to the aquifer.

The chemicals stored on this site are commonly used in potable water treatment processes, and therefore specific storage requirements to protect the aquifer are not necessary.

Sanitary Sewers

Relocation of the 42-inch Metro sewer line away from the well field would reduce the contamination hazard. Reconstruction of the pipeline with newer materials that would be less likely to fail or leak would also reduce the risk of potential contamination. However, the present contamination risk that the sewer line poses does not justify the large expense of either of these options.

Awareness of the pipeline location and its potential impact on the aquifer will allow the City to be alert for early signs of sewer line failure. Needless to say, if such a failure occurs, immediate response will be critical in protecting the aquifer from contamination.

Continued bacteriological testing of raw water from the wells represents the most cost-effective monitoring of this potential contaminant source. Pressure testing of the pipeline to isolate leaks would be nearly impossible while maintaining sewage flows.

Monitoring groundwater quality along the pipeline in the aquifer area would not be beneficial unless specific leak locations had been identified. The water table is approximately 20 feet below ground while the pipeline is only 10 feet below ground. Although small 2-inch-diameter sampling probes could be placed at intervals along the pipeline, the 6,000-foot length of pipeline through the aquifer area makes this impractical.

If leaks are found within a limited length of pipeline, the sewer should be repaired, or it could be lined with a PVC insert. Lining of the Metro sewer with an insert for the full 6,000 feet within the aquifer area should be considered in the future as the pipeline ages and becomes more prone to leakage.

Most of what has been discussed above for the 42-inch Metro sewer is also applicable to the 6-inch to 15-inch City of Renton sanitary sewers in the aquifer area. The age, condition, depth above or below water table, and other details of these sewers are unknown. Known leaks should be repaired.

Other options for checking existing sanitary sewers for leakage include TV inspection and smoke testing. Generally, TV inspection will not disclose leaks in the pipe or joints unless the sewer is below the water table and infiltration into the pipe can be observed. However, major structural damage (cracked or broken pipe) could be observed by TV inspection. Smoke testing will disclose leaks in sewers only if the sewers are above the water table and the soil is porous (gravelly or sandy) and relatively dry (no precipitation for some time).

The abandoned sanitary sewers from the government housing complex in Cedar River Park should be completely plugged. Unplugged, these sewers will serve as conduits toward the aquifer of any contaminants or surface water entering the sewers at other points. These abandoned sewers should be plugged at all possible locations, if this has not already been done.

Storm Sewers

Major leaks in storm sewers in the aquifer area should be located and repaired. Methods of leak detection are similar to those discussed for sanitary sewers, except that pressure testing could also be done easily when flows are nonexistent

or can be interrupted. Monitoring for storm sewer leaks in the aquifer area by water quality sampling adjacent to the storm sewers is not practical.

Storm sewage, once collected into storm sewers, should be piped to a river discharge point downstream of Renton's aquifer (as defined in Chapter 2) whenever possible. In particular, any dry wells (sumps into which storm sewers empty) in the aquifer area, whether serving public storm sewers or private parking lots, should be eliminated by piping to other storm sewers.

Contaminants should be prevented from entering storm sewers whenever possible. Oil traps at service stations, for example, should be inspected periodically by the City to ensure good working order. Even frequent sweeping of streets is effective in reducing contamination of stormwater flow. In specific cases, connection of a storm sewer source to the sanitary sewer to provide treatment of the flow might be more desirable than continuing to pipe the source to the storm sewer and ultimately the river. Separate treatment of storm sewage by oil skimming and sedimentation in a detention pond is not considered feasible, except possibly in the case of runoff from I-405, discussed later in this chapter.

There are few if any storm sewers on the plateau area (primarily lower Maplewood) north of the Cedar River. Permeable soils in this area allow percolation into the ground of runoff from streets. Future land use in this area is expected to be primarily residential. Served with sanitary sewers, such residential use is not expected to be a major source of potential contaminants. Therefore, it is believed that the stormwater runoff disposal by percolation into the ground will continue to be acceptable as the area develops, and that construction of an extensive storm sewer system is not essential to protection of the City's aquifer.

Besides saving the cost of storm sewer construction, whatever natural recharge of the aquifer occurs from this source will be beneficial. At this time there is no evidence that the contaminants originating from residential sources in the area would not be attenuated satisfactorily in the subsoils. If future water quality monitoring near the river narrows indicates that storm water percolation here is endangering the river water quality, and if water table elevation monitoring at the aquifer indicates movement of water from the river to the wells, then the need for storm sewers in this area should be reconsidered.

Cemetery Sites

The contamination risk associated with the existing cemetery sites is believed to be minimal because of the small quantity and probable attenuation of contaminants that may leach from those sites. Relocation of the cemeteries to eliminate these sources of potential contamination is not feasible.

It is understood that current burial practices at both these sites include the use of concrete vaults to prevent the ground from collapsing around excavations. These vaults also provide a means for containing potential contaminants.

Water quality analysis data from the City's wells indicate that the levels of contaminants thought to be associated with the cemetery sites are below the DSHS maximum contaminant levels. Monitoring trends of both primary and secondary chemical and physical contaminants at the wells would indicate if the levels of these contaminants are increasing. The City may wish to perform additional water quality tests on water samples obtained closer to the cemeteries to determine if the level of groundwater contaminants increases nearer the sites. This information may be useful in determining if additional remedial actions, such as more stringent burial practices, are necessary.

Private Fill Sites

The possibility of harmful wastes being improperly disposed at the three fill sites cited in Chapter 3 is a serious concern. It is recommended that of these fill operations be controlled so that the City is assured that no materials containing soluble poisons, paints, cleaners, waste oils, or other leachable compounds, are incorporated into these fills. The fill operators should be bonded and be made responsible for monthly reporting to the City of materials incorporated into the fill, results of leachate monitoring, and for costs of subsequent cleanup if required. It is also recommended that the City perform periodic spot checks of these sites to enforce ordinance and permit requirements.

SURFACE SOURCE PREVENTION

As discussed in Chapter 3, contaminant sources that are organized into the surface source category in this report are limited to sprays and fertilizers. Urban runoff and accidental spills are also specific types of surface sources. However, prevention techniques related to these types of surface sources are detailed in the Transportation Source Prevention section of this chapter.

Sprays and Fertilizers

The use of pesticides, herbicides, and fertilizers by private parties is not believed to be a major threat to the aquifer because of the limited quantities that may be involved. The EPA and the Department of Agriculture generally regulate the use of these products. Many of the existing regulations are intended to protect the environment including groundwaters. Imposing and enforcing additional restrictions on the general public would probably not be cost effective or feasible.

Because the wells are located within City parks, the City has direct control over the use of sprays and fertilizers in the immediate area surrounding the wells. Limiting the use of sprays and fertilizers within the City parks and other public areas near the wells is the most effective means of protecting against these sources of contamination. Mechanical methods of weed and brush control are recommended instead of chemicals near the well buildings.

It is not recommended that the use of fertilizers in the Parks be discontinued altogether; however, some products may have less impact on water quality than others. Products that are nearly insoluble in water should not be used. These products are not readily decomposed or broken down and therefore will tend to accumulate in the underlying soils with repeated dosages.

It is recommended that a park maintenance procedure management plan be developed. This plan should identify chemicals that should or should not be used within the parks. The plan should also include records of when chemicals are used and the quantities involved. The types of shrubs and trees used for future landscaping within the parks and along the freeway should also be considered in the plan. Some varieties of plants require less maintenance with chemicals than others.

WSDOT indicates that they have a list of sensitive areas where they avoid using sprays. The area adjacent to the well field is not currently on this list. The City should request that spraying along the right-of-way near the wells be discontinued or limited. WSDOT may in turn require an agreement with the City which would delegate any necessary mechanical maintenance work to the City. It is recommended that the City contact WSDOT regarding this matter.

Burlington Northern does not have a listing of areas that may be sensitive to sprays. According to a Burlington Northern representative, they contract out their right-of-way brush maintenance with spraying contractors. The contractors are licensed by the U.S. Department of Agriculture. It is the responsibility of the contractor to research sensitive areas and take the necessary precautions.

The City should go on record by sending a letter to Burlington Northern explaining the importance and sensitivity of the well field area, and the consequences of contamination. The City should request that Burlington Northern avoid the use of chemical sprays near the well field.

TRANSPORTATION SOURCE PREVENTION

Interstate 405

It is recommended that surface runoff from all paved areas of I-405 which drain toward the aquifer be collected in storm sewers and piped to the river downstream of the aquifer. The existing catch basins at the I-405/SR 169 interchange are presently connected to the 30-inch storm sewer. Where surface drainage now flows across unpaved shoulders, as is the case under the elevated structure at the interchange, these shoulders should be paved to limit infiltration into the ground. Drainage from the elevated structure and roadway to the north of the interchange should be piped to the storm sewer. The 30-inch storm sewer should be extended downriver beyond Wells 1 and 2. The distance downriver should be determined by monitoring water table elevations as discussed previously in this chapter. All drainage from the elevated structure downspouts above the river and south of the river should be collected in a storm sewer and piped downstream as well.

Additional consideration should be given to separation of I-405 storm sewage from other storm sewage in the 30-inch sewer. This would facilitate separation of oils and possibly other contaminants from I-405 storm sewage in a detention basin prior to discharge to the river. The costs and difficulties of successfully operating such separation facilities are recognized. The facilities would, however, be useful in containing an accidental spill from I-405 and preventing contamination of the river and Lake Washington. Any separation facility should be sized appropriately to contain a large tanker truck spill.

Another alternative that should be considered further is discharge of I-405 storm sewage to a sanitary sewer for treatment. The risk of receiving explosive materials is recognized, however.

Construction of jersey barriers or similar walls with gutters along the edges of all traffic lanes or paved shoulders, including the on- and off-ramps, is recommended to prevent vehicles from spilling contaminants down the pervious side slopes toward the aquifer. These barriers would also protect the Well 8 and 9 buildings from impact by out-of-control vehicles from I-405.

Other means of containing spills could include covering the slopes beyond the paved shoulders with an impervious material to prevent infiltration of potential contaminants into the ground. A polyethylene or plastic sheet material covered with topsoil was considered, but suitable anchorage of the topsoil mass may be difficult. Asphalt paving on the slopes would also provide an effective protection against contaminant infiltration but would not present an attractive appearance. Construction of the barriers described above, while continuing the present grassed and planted surfacing on the side slopes, appears to be the best alternative.

A paved trough or invert should be constructed at the toe of the slopes to divert surface runoff and any spilled materials to the storm sewer system and away from the well field. Toward this end, the City is including certain site work in the construction package for the Well 9 pump building. This site work will provide an access road to the pump building around the north corner of the park. The road will be slightly elevated above the surrounding grade of the park to act as a barrier to surface runoff from the I-405 embankment and SR 169. All runoff on the I-405/SR 169 side of the access road will be directed to catch basins and storm sewers away from the well field.

The proposed freeway improvements for I-405 should include all of the above features to protect the well field from traffic-related contamination.

Special consideration should be given to the protection of the well field during construction of I-405 improvements. Construction activities will disturb the vegetation and other existing protection features such as gutters and storm sewer connections. Contaminated runoff material may be more frequently discharged into the soils above the aquifer. Construction equipment refueling, oil changing, and lubrication should be done within containment areas away from the well field.

The City of Renton should be actively involved in alternative evaluations and design decisions for I-405 improvements that relate to well field protection. Protection of the well field should be specifically addressed in the environmental impact statement being prepared by WSDOT for these improvements.

SR 169 (Maple Valley Highway)

The use of jersey barriers with gutters along the north and south paved shoulders of SR 169 from the I-405 interchange east to the bedrock narrows is recommended wherever possible. This will control runoff from the paved roadway and limit the spread of contaminants from an accidental spill. All roadway runoff should be collected into storm sewers and discharged to the river downstream of Wells 1 and 2.

although not as effective, discharge of this storm sewage to the river upstream of Wells 1 and 2 is preferable to not containing and collecting the runoff at all, as is presently done. Another alternative, also not as effective, would be to contour the ground along the south side of SR 169 with a paved shoulder and ditch invert near the south right-of-way line. All runoff from the roadway, including that piped from the north side of the road, could be collected in the paved ditch and piped to the river. Accidental spills beyond the paved ditch might still occur.

Limitations on materials hauled by truck traffic on SR 169 may be impractical since SR 169 is the major traffic arterial east of Renton. Additional safeguards in the manner in which these materials are hauled (the solid waste transfer trucks, for example) might be implemented to prevent or reduce the chances of spillage.

City Streets

One method of preventing potentially hazardous spills from occurring on City streets around the well field would be to limit commercial truck traffic. This would limit the number of vehicles hauling large quantities of potential contaminants through the area. Service stations adjacent to the wells require periodic bulk shipments of petroleum products. Use of these streets would still be necessary for these local deliveries, as long as these businesses remain in the area. However, through truck traffic should be rerouted where feasible. The City should restrict the types of materials hauled by commercial truck traffic in the area around the wells. We understand that the City's Public Works Director has the authority to establish such traffic restrictions although there is no City legislation of record regarding this matter.

WSDOT has indicated that no additional on- and off-ramps are included in the planned improvements for I-405. Traffic patterns on City streets adjacent to the aquifer are related to existing I-405 access. These patterns cannot be changed because alternative traffic routes do not exist. Total restriction of truck traffic on these streets may severely disrupt commercial activity in the adjacent area.

The best alternative for prevention of contamination from the City streets appears to be that of collecting all surface runoff (storm sewage) and contaminant spills to the extent possible. Street surfaces should be kept in good repair and shoulder areas where necessary should be paved to prevent or limit infiltration of materials from the surface. All runoff should be piped to the river, downstream of Wells 1 and 2 whenever possible.

Railroad

Due to the relatively slow speed of trains traveling within the city limits and the limited use of the tracks near the wells, the probability of a major rail accident affecting water quality is low.

The City should express a concern directly to Burlington Northern regarding spillage of materials. The company may be able to take special precautions to protect the well field, such as making sure that tracks are properly maintained. As discussed previously in the Emergency Response Plan section of this chapter, awareness of the sensitivity of the area may also improve the response of Burlington Northern and others should an accidental spill occur.

It is possible that the tracks paralleling the Cedar River on the south bank may be abandoned by Burlington Northern in the future. According to a Burlington Northern representative, this matter is being studied but a final decision regarding abandonment is not expected in the near future. The City should stay abreast of any information regarding this potential abandonment. Future acquisition of this right-of-way by the City would provide direct control over its use. With direct ownership, the City could establish a recreation greenbelt along the south bank of the river to minimize the exposure of the wells from potential contaminating activities.

GENERAL SOURCE PREVENTION

Coal Mines

As stated in Chapter 3, there are many unknowns associated with the possible use of abandoned coal mines as waste disposal sites. Some of these unknowns include the location and number of sites that may be involved, and the types and quantities of substances being disposed. The risk associated with these sites is believed to be low. Therefore, aside from being aware that these potential contaminant sources may exist, no specific actions by the City are recommended.

Residential Heating Oil Tanks

The contamination risk associated with residential heating oil tanks is believed to be low, however, the City may wish to conduct a survey of the residences in the aquifer recharge area to determine the location, capacity, and age of buried heating oil and private motor fuel storage tanks.

The risks associated with the leakage from tanks found within the area could then be evaluated, and a program for preventing contamination from this source could be developed if necessary.

Residential Use and Disposal

It is recommended that the City sponsor or actively participate in an education program to inform the public of the potential consequences of continued disposal of materials such as paints, waste oils, insecticides, pesticides, and poisons at the landfill sites, residential sites, or other unapproved locations. The public should be informed of the locations where these materials can be disposed of in a proper manner. Continued dumping of potential contaminants into the landfills may cause future water quality problems for the City. The program could include special educational inserts to be sent with monthly garbage collection, sewer, or water billings.

The City could also establish convenient collection centers for the public to drop off materials that are undesirable at transfer stations or landfills. This would help eliminate the illegal dumping of these materials onto the ground or into the storm sewer catch basins.

Dry Cleaners

The disposal practices of any dry cleaning businesses located within the aquifer recharge area should be monitored to determine if additional safeguards are necessary. These safeguards may include more stringent enforcement of existing regulations or the enactment of additional controls to set greater penalties for improper disposal of chemical solvents.

CONCLUSIONS

Potential contaminant sources have been identified from information furnished by the City and from supplementary sources where possible. Methods of contamination prevention have been discussed and recommendations made in specific cases, particularly for those sources of potential contamination believed to be of greatest threat to aquifer water quality.

No guarantee is made that all existing contaminant sources have been identified. Additional contaminant sources may be identified in the future, as well as additional or improved methods of contamination prevention.

The City of Renton, with the help of DSHS, DOE, WSDOT, Metro, and other agencies, should implement the recommended contamination prevention measures as soon as feasible to protect the existing high quality of Renton's Cedar River aquifer.

Progress toward implementation of these measures should be reviewed after one year to determine whether the City is in fact staying ahead of the potential contamination problem.

One option to protection of the existing well field which the City should consider is that of relocating the City's wells upriver. The Renton Parks Department has considered purchase of the Maplewood Golf Course. The Golf course, together with the King County Park Department land and other sparsely populated lands for several miles upstream of the Golf Course could provide Renton with an aquifer which is better protected than the existing well field area. However, several major questions must be resolved prior to such a move. These include:

- Is the aquifer in the Cedar River Valley near the Maplewood Golf Course suitable for development of major wells which could supply Renton's water needs?
- Are the water rights presently held at the existing well field transferrable to the new location?
- Is the groundwater quality in this area suitable for municipal supply without treatment, except chlorination?
- Could all of the property in the valley necessary for protection of the new aquifer be obtained, or the land use thereon controlled? Land use up the valley might be controlled, for example, by purchase of development rights through the King County Farmlands Preservation Act.
- Would the cost of drilling new wells, constructing new pump buildings and chlorination facilities, and constructing a major transmission line into Renton be justified?
- Could such a relocation (aside from constructing the transmission line) be done one well at a time to minimize near-term expenditure?
- Could the ownership of lands, or rights to locate wells in the area, and protection of the area from contamination, be secured now to allow relocation of City wells in the future?

As first steps toward the goal of eventual relocation of wells, the City should initiate a separate study to consider the following:

- Explore the aquifer area to determine its geologic and hydrologic value as a municipal water source. Such exploration might include the drilling of several test wells, which could be capped for future use. Such exploration should also determine water quality.

- Purchase the Maplewood Golf Course, or establish an option to purchase it, or obtain permission to drill exploratory or permanent wells on it.

- Investigate the other questions posed above to determine whether relocation of the wells is economically and politically feasible.

500 0 500 1000
FEET

N

BM 406

△325

COAST

UNDERGROUND

Substation

300

334

BM 455

LEGEND

- RESIDENTIAL
- COMMERCIAL/OFFICE
- INDUSTRIAL
- PUBLIC AND PRIVATE GREENBELT
- UNDEVELOPED

FIGURE 4-1
Aquifer Area Land Use

APPENDIX A

WATER QUALITY TEST REPORTS

am test inc.
4900 9TH AVENUE N.W., • SEATTLE, WASHINGTON 98107 • 206/783-4700

ANALYSIS REPORT

CLIENT: City of Renton

DATE SAMPLES RECEIVED: 9-6-83

REPORT TO: Water Department
800 Edmonds Avenue N.E.
Renton, WA 98056

DATE SAMPLES REPORTED: 9-16-83

Laboratory Sample No.	70844	70845
Client Identification	Drinking fountain Fire Station	Outside Fire Station
Total Dissolved Solids (mg/l)	86. 91.]	121.
Calcium (mg/l)	14.0	13.7
Alkalinity (mg/l as $CaCO_3$)	55.	56.
pH	6.7	6.6

The parameters above are used to determine the Langlier Index of corrosivity. Theoretically, a slightly positive index should be non-corrosive, while an increasing negative index indicates increasing corrosivity. Locally, waters with an Index reading of less than -1.0 are considered to be non-corrosive. Sample 70844 has an Index of -1.9 and 70845 has -2.0, both indicating high corrosivity.

REPORTED BY

John M. Blunt

nr

am test inc.
4900 9TH AVENUE N.W., • SEATTLE, WASHINGTON 98107 • 206/783-4700

ANALYSIS REPORT

CLIENT: City of Renton - Water Department

DATE SAMPLES RECEIVED: 9-14-83

REPORT TO: 800 Edmonds Avenue N.E.
Renton, WA 98056

DATE SAMPLES REPORTED: 9-30-83

Laboratory Sample No.	71024	71025	71026	71027	71028	MCL*
Client Identification	#1 Fire Station	#2 Fire Station	#3 City Hall	#4 City Hall	#5 City Hall	
pH	6.3	6.4	6.3	6.4	6.4	-
Arsenic (mg/l)	<0.001	0.001	0.001 0.001]	0.001	<0.001	0.05
Barium (mg/l)	<0.25	<0.25	<0.25	<0.25	<0.25	1.0
Cadmium (mg/l)	0.0001	0.0001	0.0001	0.0006	0.0007 0.0006]	0.01
Chromium (mg/l)	<0.0005	<0.0005 <0.0005]	<0.0005	<0.0005	<0.0005	0.05
Iron (mg/l)	<0.05	<0.05	5.9	<0.05	<0.05	0.3
Lead (mg/l)	0.003	0.002	0.016 0.019]	0.002	0.002	0.05
Manganese (mg/l)	<0.03	<0.03	0.03	<0.03	<0.03	0.05
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.002
Selenium (mg/l)	<0.002	<0.002	<0.002 <0.002]	<0.002	<0.002	0.01
Silver (mg/l)	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.05
Sodium (mg/l)	4.9	4.9	4.9	5.1 5.0]	5.0	-

cont....

AT inc.

CLIENT: City of Renton - Water Department

DATE SAMPLES RECEIVED: 9-14-83

REPORT TO: 800 Edmonds Avenue N.E.
Renton, WA 98056

DATE SAMPLES REPORTED: 9-30-83

Laboratory Sample No.	71024	71025	71026	71027	71028	MCL*
Client Identification	#1 Fire Station	@2 Fire Station	#3 City Hall	#4 City Hall	#5 City Hall	
Hardness (mg/l as $CaCO_3$)	18.	52.	68.	56.	54.	-
Conductivity (μmhos/cm)	127.	134.	170.	150.	140.	700.
Turbidity (NTU)	0.2	0.2	1.8	0.3	0.3	1.0
Color (color units)	<5.	<5.	5.	<5.	<5.	15.
Fluoride (mg/l)	0.10	0.11 0.10]	0.11	0.10	<0.10	2.0
Nitrate + Nitrite (mg/l as N)	0.41	0.52	0.50	0.55	0.49	10.0
Calcium (mg/l)	14.0	13.9	22.	14.3	14.3	-
Total Dissolved Solids (mg/l)	119.	85.	110.	95.	90.	500.
Alkalinity (mg/l as $CaCO_3$)	55. 55.]	57.	72.	59.	59.	-
Langlier Index (at20°C)	-2.3	-2.2	-2.0	-2.1	-2.1	-

Theoretically, a slightly positive index should be non-corrosive, while an increasing negative index indicates increasing corrosivity. Locally, waters with an Index of less than -1.0 are considered to be non-corrosive. A reading of greater than -2.0 should be considered highly corrosive.

*Washington State drinking water Maximum Contaminant Level allowed.

REPORTED BY 

John M. Blunt

nr

am test inc.
4900 9TH AVENUE N.W., • SEATTLE, WASHINGTON 98107-3697 • 206/783-4700

ANALYSIS REPORT

CLIENT: City of Renton

DATE RECEIVED: 10/4/83

REPORT TO: 800 Edmonds Avenue N.
Renton, WA 98052

DATE REPORTED: 10/18/83

Laboratory Sample No.	71442	MCL *
Client Identification	9:00 Well 9 Renton	
pH	6.0	---
Arsenic (mg/l)	<0.001	0.05
Barium (mg/l)	<0.25	1.0
Cadmium (mg/l)	0.0001	0.01
Chromium (mg/l)	<0.001	0.05
Iron (mg/l)	<0.05	0.3
Lead (mg/l)	0.003	0.05
Manganese (mg/l)	<0.03	0.05
Mercury (mg/l)	<0.0002, <0.0002]	0.002
Selenium(mg/l)	<0.002	0.01
Silver (mg/l)	<0.0003	0.05
Sodium (mg/l)	5.7, 5.6]	---
Hardness (mg/l as $CaCO_3$)	56.7, 56.7]	---
Conductivity (μhmos/cm)	170.	700.
Turbidity (NTU)	0.36	1.0
Color (color units)	<5.	15.
Fluoride (mg/l)	<0.10	2.0
Nitrate + Nitrite (mg/l as N)	0.38	10.0

*Washington State drinking water Maximum Contaminant Level allowed.

REPORTED BY _____
John M. Blunt

JMB:bc

Please Print Plainly
USE HEAVY PENCIL
DO NOT WRITE IN SHADED AREAS

State of Washington
Department of Social and Health Services
Health Services Division
PUBLIC HEALTH LABORATORIES
1409 Smith Tower, B17-9, Seattle, Washington 98104

WATER SAMPLE INFORMATION FOR INORGANIC CHEMICAL ANALYSES

LAB. NUMBER	CO.	CITY	DATE RECEIVED	DATE COLLECTED	COLLECTED BY:
106185			11/03/83	11/01/83	Telephone:

Is this a follow up of a previous out of compliance sample? Yes ☐ No ☒

If yes, what was the laboratory number of the previous sample? _____

SYSTEM I.D. NO.	SYSTEM NAME	SYSTEM CLASS (circle one) 1 2 3 4	COUNTY
11401	MAPLEWOOD AREA WATER CO-OP		KING

SAMPLE LOCATION	THIS SAMPLE TAKEN BEFORE ☐ AFTER ☐ TREATMENT (CHECK ONE OF THE ABOVE BOXES) U T	IF TAKEN *AFTER* TREATMENT WAS IT ___FILTERED ___FLUORIDATED ___CHLORINATED ___WATER SOFTENER: TYPE USED
1		

SOURCE TYPE:	SOURCE NO.	IF SOURCE IS LAKE OR STREAM, ENTER NAME	IF SAMPLE WAS DRAWN FROM DISTRIBUTION SYSTEM IT WAS COLLECTED FROM SYSTEM AT: (ADDRESS)
___ 1. SURFACE X 3. WELL ___ 2. SPRING ___ 4. PURCHASE			

DATE OF FINAL REPORT: 03/16/83

SEND REPORT TO: (PRINT FULL NAME & ADDRESS)

MAPLEWOOD AREA WATER CO-OP
Name
15302 132ND AVE SE
Street
RENTON WA 9805
City Zip Code
Telephone: (206) 255-7805
Area Code

REMARKS:

LABORATORY REPORT
(DO NOT WRITE BELOW THIS LINE)

TESTS	*MCL	LESS THAN <	RESULTS	UNITS	Compliance YES	Compliance NO	Chemist Initials
Arsenic As	0.05P	<	0.001	mg/l	✓		KGN
Barium Ba	1.0P	<	0.2	mg/l	✓		RLB
Cadmium Cd	0.01P	<	0.004	mg/l	✓		KGN
Chromium Cr	0.05P	<	0.01	mg/l	✓		KGN
Iron Fe	0.3		0.03	mg/l	✓		RLB
Lead Pb	0.05P	<	0.001	mg/l	✓		KGN
Manganese Mn	0.05	<	[illegible]	mg/l	✓		KGN
Mercury Hg	0.002P	<	0.0003	mg/l	✓		RLB
Selenium Se	0.01P	<	0.001	mg/l	✓		KGN
Silver Ag	0.05P	<	0.01	mg/l	✓		RLB
Sodium Na		<	5	mg/l			RLB
Hardness			46	mg/l AS CaCo3			CAB
Conductivity	700		110	Micromhos/cm 25° C	✓		KGN
Turbidity	1.0P		0.2	NTU	✓		KGN
Color	15.0	<	5	Color Units	✓		KGN
Fluoride F	2.0P	<	0.1	mg/l	✓		CAB
Nitrate as N	10.0P		0.2	mg/l	✓		RLB
Chloride Cl	250	<	5	mg/l	✓		RLB
Sulfate SO_4	250			mg/l			

LABORATORY SUPERVISOR (Name or Initials)
CHARGE: $17.00

REMARKS:

*MCL is the Maximum Contaminant Level Allowed
P Primary Standard

KGN RLB

Water Supplier Copy

DOHS 4-92F (7-83)

LABORATORY NAME
AH TEST, INC.
4900 - 9th Avenue N.W.
Seattle, WA 98107

SEE BACK FOR INSTRUCTIONS

WATER SAMPLE INFORMATION FOR INORGANIC CHEMICAL ANALYSES

LAB NO.	DATE RECEIVED	DATE COLLECTED	COLLECTED BY:
36 [illegible]	03/16/84	3/16/84	Doug Stark

Telephone: 235-2646

Is this a previous out of compliance sample? Yes ☐ No ☒

What is the laboratory number of the previous sample? — — — — — —

SYSTEM NAME	SYSTEM CLASS (circle one)	COUNTY
[illegible]	(1) 2 3 4	King

WAS THIS SAMPLE TAKEN BEFORE ☒ U TREATMENT OR AFTER ☐ T

IF TAKEN *AFTER* TREATMENT WAS IT ___FILTERED ___FLUORIDATED ___CHLORINATED ___WATER SOFTENER: TYPE USED ___

SOURCE: WELL ☐ SPRING ☐ PURCHASE ☐ SOURCE NO. — IF SOURCE IS LAKE OR STREAM, ENTER NAME: Cedar River

IF SAMPLE WAS DRAWN FROM DISTRIBUTION SYSTEM IT WAS COLLECTED FROM SYSTEM AT: (ADDRESS)

DATE OF FINAL TREATMENT: 03/15/84

[illegible] Taker

Cedar River

Ha/ll pH=6.9

SEND REPORT TO: (PRINT FULL NAME & ADDRESS)

Renton Water Dept
Name

800 Edmonds Ave NE
Street

Renton WA 98056
CITY ZIP CODE

Telephone: (206) 235-2646
Area Code

LABORATORY REPORT
(DO NOT WRITE BELOW THIS LINE)

	MCL	TYPE	RESULTS		Compliance YES	Compliance NO	Chemist Initials	Laboratory Number (If different than above)
[illegible]		P	.010	mg/l	X			
[illegible]		P	.250	mg/l	X			
[illegible]		P	.020	mg/l	X			
[illegible]		P	.010	mg/l	X			
[illegible]	0.3		.120	mg/l	X			
[illegible]	0.05	P	.010	mg/l	X			
[illegible]	0.05		.003	mg/l	X			
[illegible]	0.002	P	.001	mg/l	X			
[illegible]	0.01	P	.005	mg/l	X			
[illegible]	0.05	P	.010	mg/l	X			
[illegible]			16	mg/l	X			
[illegible]			28	mg/l As CaCO3	X			
[illegible]			96	Micromhos/cm 25° C	X			
[illegible]			.9	NTU	X			
[illegible]	15		10	Color Units	X			
[illegible]	2.0	P	.2	mg/l	X			
[illegible]	10.0	P	.2	mg/l	X			
[illegible]				mg/l				
[illegible]				mg/l				

MCL = Maximum Contaminant Level Allowed

P = Primary Standard

DSHS 4-820 (10-79)

WATER SUPPLIER COPY

Laboratory Supervisor

STATE OF WASHINGTON

John Spellman
Governor

DEPARTMENT OF SOCIAL AND HEALTH SERVICES
P. O. Box 190 - L-47, Wenatchee, Washington 98801

TO: City of Renton
200 Mill Ave. S.
Renton, WA 98055

Report of Analytical Results

Date of Report: April 4, 1984

Date Sample Received: March 20, 1984

Sample Identification: Water sample (84W0022)

Analytical Results:

See attached tabulation

Confirming report - results telephoned 4/3/84

Albert L. Robbins
Regional Laboratory Director

Harold E. Ruark, Chemist

RESULTS OF ANALYSIS

Date: 4/3/84

Sample Identification	Lab Number	Test or Residue	Results	Units	MRL
CITY OF RENTON					
WATER - CEDAR RIVER IN MARCH 3 - CONTAINERS	84W0022	PHENOXY SCAN	N.D.	PPB	.050
		ORG. PHOS. SCAN	N.D.	PPB	.050
		AR 1254	16.9	PPB	1.0

Harold E Clark

STATE OF WASHINGTON

DEPARTMENT OF SOCIAL AND HEALTH SERVICES

WATER BACTERIOLOGICAL ANALYSIS

SAMPLE COLLECTION: READ INSTRUCTIONS ON BACK OF GOLDENROD COPY
If instructions are not followed, sample will be rejected.

DATE COLLECTED (MONTH / DAY / YEAR)	TIME COLLECTED	COUNTY NAME
3/12/84	☒ AM ☐ PM	King

TYPE OF SYSTEM: ☒ PUBLIC ☐ INDIVIDUAL (service only) (residence only)

IF PUBLIC SYSTEM, COMPLETE: I.D. No. 7 1 85 9 L — CIRCLE CLASS 1 2 3 4

NAME OF SYSTEM: Renton Water Dept

SPECIFIC LOCATION WHERE SAMPLE COLLECTED (ie. kitchen tap @ school, fire station, fountain): Cedar River

SYSTEM OWNER/MGR. NAME AND TELEPHONE NO.: City of Renton (206) 235-2626

SAMPLE COLLECTED BY: (Name): Lloyd Seto

SOURCE TYPE: ☒ SURFACE ☐ WELL ☐ SPRING ☐ PURCHASED ☐ COMBINATION or OTHER

SEND REPORT TO: (Print Full Name, Address and Zip Code)
Renton Water Dept
800 Edmonds Ave NE
Renton WASHINGTON 98128

TYPE OF SAMPLE (Check only one in this section)

1. ☐ DRINKING WATER — check treatment → ☐ Chlorinated (Residual: ____ Total ____ Free) ☐ Filtered ☐ Untreated or Other: ____
2. ☒ RAW SOURCE WATER
3. ☐ NEW CONSTRUCTION or REPAIRS
4. ☐ OTHER (Specify) ____

COMPLETE IF THIS SAMPLE IS A CHECK SAMPLE

PREVIOUS LAB NO. ____ PREVIOUS SAMPLE COLLECTION DATE ____

REMARKS: Not for Drinking Water

LABORATORY RESULTS (FOR LAB USE ONLY)

MPN - COLIFORM	STD PLATE COUNT	SAMPLE NOT TESTED BECAUSE:
1/5 ml	/1 ml	☐ Sample Too Old
MPN DILUTION: 70	TEST UNSUITABLE: 1. ☐ Confluent Growth	☐ Not in Proper Container
MF COLIFORM: /100 ml	2. ☐ TNTC	☐ Insufficient Information Provided—Please Read Instructions on Form
FECAL COLIFORM: ☒ MPN ☐ MF 45/100 ml	3. ☐ Excess Debris 4. ☐ ____	☐ ____

FOR DRINKING WATER SAMPLES ONLY, THESE RESULTS ARE: ☐ SATISFACTORY ☐ UNSATISFACTORY

SEE REVERSE SIDE OF GOLDENROD COPY FOR EXPLANATION OF RESULTS

LAB NO.	DATE, TIME RECEIVED—	RECEIVED BY
66812	3/16/84 3:30	[illegible]

DATE REPORTED: 3-22-84 — LABORATORY: AM TEST INC.
4900 9th Ave. N.W.
SEATTLE, WA 98107-3697

REMARKS: ____

WATER — GOLDENROD COPY

SEATTLE WATER DEPARTMENT
1983 ANNUAL WATER ANALYSIS OF CEDAR & TOLT WATER SUPPLIES

Samples Collected:
October 11, 1983

Cedar Distribution Area: South of Lake Washington Ship Canal.
Tolt Distribution Area: North of Lake Washington Ship Canal.

Prepared by
Water Quality Laboratory
Seattle Water Department
1509 South Spokane Street
Seattle, Washington 98144
(206) 625-4305

Results given in milligrams per liter, i.e., parts per million (ppm), except as noted.

WATER QUALITY PARAMETERS	WASHINGTON STATE BOARD OF HEALTH MAXIMUM CONTAMINANT LEVEL	CEDAR DISTRIBUTION	TOLT DISTRIBUTION
*Primary Standards			
Arsenic, Total, µg/l.	50.0	<3	<3
Barium.	1.0	<0.04	<0.04
Cadmium, µg/l	10.0	<0.05	<0.05
Chromium.	0.05	<0.01	<0.01
Fluoride.	2.0	0.95	0.99
Lead, µg/l.	50.0	<½	<½
†Mercury, Total, µg/l.	2.0	<1	<1
Nitrate-Nitrogen.	10.0	.08	0.11
†Selenium, µg/l.	10.0	<5	<5
Silver, µg/l.	50.0	<2	<2
Turbidity, NTU.	1.0‡	0.65	0.55
**Secondary Standards			
Chloride.	250.0	3.8	3.5
Color, standard units	15.	8	11
Copper.	1.0	<0.01	<0.01
Iron.	0.3	.02	0.07
Manganese, µg/l	50.0	2½	4
Residue, Total Dissolved.	500.0	46	30½
Sulfate	250.0	2.1	2.5
Zinc, µg/l.	5000.0	<4	<4
Non-Regulated Standards			
Alkalinity, Total (as $CaCO_3$).	N/A	19.0	11.5
Alkalinity, Bicarbonate (as $CaCO_3$).	N/A	19.0	11.5
Aluminum.	N/A	<0.03	<0.03
Calcium (as $CaCO_3$).	N/A	22.3	11.3
Carbon Dioxide, free (calculated).	N/A	1.2	0.8
Hardness (as $CaCO_3$) (calculated).	N/A	27.4	13.1
Hardness, grains per gallon (calc.)	N/A	1.60	0.77
Magnesium	N/A	1.23	0.41
pH.	N/A	7.55	7.50
Phosphorus, Tot. Ortho.-PO_4, µg/l	N/A	4	2½
Silica, Reactive.	N/A	9.7	5.6
Sodium.	N/A	1.84	4.62
Specific Conductance, µmhos	N/A	66.7	44.3
Tannin-Lignin (as Tannic Acid).	N/A	<.03	0.08
Temperature, °C	N/A	14½	16

*Primary standards: Water supplier subject to public notification if standard exceeded.
**Secondary standards: Water supplier not subject to public notification if standard exceeded.
†Analysis performed by Laucks Testing Laboratories, Inc., Seattle, Washington.
‡As measured at point of intake to distribution system.
µg/l = Micrograms per liter.
< = Less than.

SEATTLE WATER DEPARTMENT
WATER ANALYSIS

CEDAR AND TOLT RIVERS

(1) Landsburg, Cedar River
(2) Lake Youngs near Intake
(3) Cedar Distribution at S. Forest Street & Airport Way S.
(4) Tolt Regulating Basin near Intake
(5) Tolt Distribution at N.W. 122nd Street & 1st Avenue N.W.

SAMPLES COLLECTED: October 11, 1983

Results given in milligrams per liter, i.e., parts per million, except as noted.

Cedar				Tolt	
(1)	(2)	(3)		(4)	(5)
23.1	19.2	19.0	Alkalinity, Total (as $CaCO_3$)	6.4	11.5
23.1	19.2	19.0	Alkalinity, Bicarbonate (as $CaCO_3$)	6.4	11.5
<0.03	<0.03	<0.03	Aluminum	<0.03	<0.03
--	--	<3	Arsenic, Total, µg/l	--	<3
<.04	<.04	<.04	Barium	<.04	<.04
<.05	<.05	<0.05	Cadmium, µg/l	<0.05	<0.05
19.5	19.4	22.3	Calcium (as $CaCO_3$)	7.9	11.3
0.95	0.7	1.2	Carbon Dioxide, free (calculated)	1.2	0.8
0.65	2.5	3.8	Chloride	0.55	3.5
<0.01	<0.01	<0.01	Chromium	<0.01	<0.01
--	--	8	Color, standard units	--	11
<.01	<.01	<.01	Copper	<.01	<.01
<0.1	1.01	0.95	Fluoride	<0.10	0.99
24.6	24.5	27.4	Hardness (as $CaCO_3$)(calculated)	9.9	13.1
1.47	1.43	1.60	Hardness, grains per gallon (calc.)	0.58	.77
<.01	<.01	.02	Iron	.06	.07
<½	<½	<½	Lead, µg/l	<½	<½
1.23	1.23	1.23	Magnesium	.46	.41
<1	<1	2½	Manganese, µg/l	5	4
--	--	<1	*Mercury, Total, µg/l	--	<1
<0.01	<0.01	<0.01	Nickel	<0.01	<0.01
0.12	0.08	0.08	Nitrate-Nitrogen	0.15	0.11
7.80	7.80	7.55	pH	7.10	7.50
2½	<2½	4	Phosphorus, Tot. Ortho.-PO_4, µg/l	2½	2½
0.26	0.26	0.27	Potassium	0.18	0.19
39	41	46	Residue, Total Dissolved	17	30½
--	--	<5	*Selenium, µg/l	--	<5
10.3	9.7	9.7	Silica, Reactive	5.4	5.6
<1	<1	<1	Silver, µg/l	<1	<1
1.89	1.81	1.84	Sodium	0.95	4.62
57.1	59.9	66.7	Specific Conductance, µmhos	23.9	49.3
25½	24	26	Strontium, µg/l	8½	10
1.9	2.15	2.1	Sulfate	2.4	2.5
0.09	0.04	<.03	Tannin-Lignin (as Tannic Acid)	.29	.08
9	13½	14½	Temperature, °C	13½	16
0.2	0.45	0.65	Turbidity, NTU	0.6	0.55
<4	<4	<4	Zinc, µg/l	<4	<4

*Analysis performed by Laucks Testing Laboratories, Inc., Seattle, Washington.
µg/l = Micrograms per liter.
< = Less than.

'STORET RETRIEVAL DATE 84/03/20
08C077) 33080076 12119007 541947
47 29 09.0 122 12 28.0 2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON KING
PACIFIC NORTHWEST 131108
PUGET SOUND (CEDAR-08)
21540011 17110012000
DEPTH 0
/TYPA/AMBNT/STREAM
INDEX 1111141 000040 00100
MILES 0009.35 0011.50 001.00

	INITIAL DATE			01/01/01	59/07/08	59/08/12	59/09/25	59/10/16	59/11/30	59/12/31	60/01/27
	INITIAL TIME-DEPTH-BOTTOM										
00010	WATER	TEMP	CENT		14.5	14.5	12.6	10.0	7.0	5.2	6.5
00011	WATER	TEMP	FAHN		58.1	58.1	54.7	50.0	44.6	41.4	43.7
00042	ALTITUDE	FEET	AB MSL	18							
00060	STREAM	FLOW	CFS		325	80	740	972	1920	966	794
00081	COLOR	PT-CO	UNITS		0	5	5	5	10	10	10
00095	CNDUCTVY	AT 25C	MICROMHO		69	93	53	50	46	55	59
00300	DO		MG/L		10.3	7.6	10.0	11.1	11.4	11.8	11.4
00301	DO	SATUR	PERCENT		101.0	74.6	94.4	98.3	93.5	92.2	93.5
00400	PH		SU		7.00	7.00	7.30	7.10	6.90	7.20	7.20
00440	HCO3 ION	HCO3	MG/L		36	48	27	25	22	26	28
00625	NO3-N	TOTAL	MG/L		0.090	0.020	0.000	0.070	0.230	0.110	0.160
00665	ORTHOPO4	PO4	MG/L		0.05	0.00	0.02	0.00	0.05	0.02	0.02
00900	TOT HARD	CACO3	MG/L		28	36	20	20	16	21	22
00902	NC HARD	CACO3	MG/L		0	0	0	0	0	0	0
00915	CALCIUM	CA,DISS	MG/L		10.0	10.0	5.5	6.0	5.0	6.0	6.5
00925	MGNSIUM	MG,DISS	MG/L		0.9	2.7	1.7	1.1	1.0	1.4	1.4
00930	SODIUM	NA,DISS	MG/L		2.50	3.70	2.10	1.80	1.80	2.10	2.20
00935	PTSSIUM	K,DISS	MG/L		0.50	0.70	0.30	0.50	0.20	0.40	0.30
00940	CHLORIDE	TOTAL	MG/L		2	2	1	1	1	2	1
00945	SULFATE	SO4-TOT	MG/L		3	4	3	2	3	3	4
00950	FLUORIDE	F,DISS	MG/L		0.00	0.10	0.10	0.10	0.10	0.10	0.00
00955	SILICA	DISOLVED	MG/L		12.0	15.0	11.0	11.0	10.0	12.0	12.0
01045	IRON	FE,TOT	UG/L		40	0	110	70	1300	210	100
31505	TOT COLI	MPN CONF	/100ML		230	430	91	750	230	230	36
70300	RESIDUE	DISS-180	C MG/L		49	66	39	36	35	40	39
	INITIAL DATE			60/02/19	60/03/22	60/04/11	60/05/13	60/06/10	60/07/21	60/08/02	60/09/07
	INITIAL TIME-DEPTH-BOTTOM										
00010	WATER	TEMP	CENT	6.3	7.5	8.4	12.5		20.0	15.5	15.0
00011	WATER	TEMP	FAHN	43.3	45.5	47.1	54.5		68.0	59.9	59.0
00060	STREAM	FLOW	CFS	1030	820	1140	1130	664	310	258	310
00081	COLOR	PT-CO	UNITS	5	5	5	5	5	0	5	5
00095	CNDUCTVY	AT 25C	MICROMHO	56	57	47	51	54	67	80	68
00300	DO		MG/L	11.9	11.0	12.0	9.6	9.7	8.5	9.9	10.9
00301	DO	SATUR	PERCENT	95.3	92.5	100.9	91.6		92.5	99.1	106.9
00400	PH		SU	7.10	7.50	7.30	7.50	7.60	7.40	7.40	7.40
00440	HCO3 ION	HCO3	MG/L	27	29	24	26	29	36	34	36
00625	NO3-N	TOTAL	MG/L	0.110	0.090	0.020	0.070	0.000	0.020	0.020	0.070
00665	ORTHOPO4	PO4	MG/L	0.02	0.01	0.00	0.02	0.01	0.01	0.03	0.01
00900	TOT HARD	CACO3	MG/L	21	21	18	19	22	27	26	27
00902	NC HARD	CACO3	MG/L	0	0	0	0	0	0	0	0
00915	CALCIUM	CA,DISS	MG/L	6.5	7.0	6.0	6.0	7.0	8.0	7.5	8.0
00925	MGNSIUM	MG,DISS	MG/L	1.0	0.9	0.6	1.0	1.0	1.8	1.8	1.7
00930	SODIUM	NA,DISS	MG/L	2.10	3.00	1.90	2.00	2.20	2.80	2.50	2.90
00935	PTSSIUM	K,DISS	MG/L	0.20	0.30	0.20	0.30	0.30	0.30	0.60	0.30
00940	CHLORIDE	TOTAL	MG/L	1	1	1	1	1	1	1	2

(SAMPLE CONTINUED ON NEXT PAGE)

09C077 3308C070 12119037 541047
47 29 39.0 122 12 26.0 2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON KING
PACIFIC NORTHWEST 171108
PUGET SOUND (CEDAP-08)
21540011 17110012000
DEPTH 0
/TYPA/AMBNT/STREAM
INDEX 1111141 000040 00100
MILES 3109.35 0011.50 001.00

(SAMPLE CONTINUED FROM PREVIOUS PAGE)

	INITIAL DATE			60/02/19	60/03/22	60/04/11	60/05/13	60/06/10	60/07/21	60/08/02	60/09/07
	INITIAL TIME-DEPTH-BOTTOM										
00945	SULFATE	SO4-TOT	MG/L	3	3	2	3	3	2	3	2
00950	FLUORIDE	F,DISS	MG/L	0.10	0.10	0.00	0.00	0.00	0.10	0.10	0.00
00955	SILICA	DISOLVED	MG/L	11.0	11.0	10.0	11.0	11.0	12.0	11.0	12.0
01022	BORON	B,DISS	UG/L			0					0
01045	IRON	FE,TOT	UG/L	90	60	60	50	10	10	80	80
31505	TOT COLI	MPN CONF	/100ML	91	0	91	150	430	91	2400	73
70300	RESIDUE	DISS-180 C	MG/L	37	42	34	40	40	46	48	47
	INITIAL DATE			60/10/04	60/11/04	60/11/30	61/01/03	61/02/02	61/03/06	61/04/19	61/05/03
	INITIAL TIME-DEPTH-BOTTOM										
00010	WATER	TEMP	CENT	13.0	8.0	6.5	4.1	8.1	6.0	8.8	9.0
00011	WATER	TEMP	FAHN	55.4	46.4	43.7	39.4	46.6	42.8	47.8	48.2
00060	STREAM	FLOW	CFS	259	852	1210	441	1130	1450	1150	1130
00080	COLOR	PT-CO	UNITS	5	5	5	5	5	5	5	5
00095	CNDUCTVY	AT 25C	MICROMHO	65	47	59	63	47	50	47	51
00300	DO		MG/L	10.3	11.5	11.6	12.3	11.9	11.8	11.9	11.0
00301	DO	SATUR	PERCENT	97.2	96.7	95.1	94.0	100.1	94.5	102.7	94.9
00400	PH		SU	7.20	7.10	7.40	7.40	7.40	7.30	7.40	7.20
00440	HCO3 ION	HCO3	MG/L	34	24	24	31	22	24	24	25
00625	NO3-N	TOTAL	MG/L	0.070	0.110	0.160	0.200	0.180	0.160	0.090	0.070
00660	ORTHOPO4	PO4	MG/L	0.04	0.02	0.03	0.02	0.03	0.02	0.01	0.00
00900	TOT HARD	CACO3	MG/L	26	18	18	24	18	19	18	19
00902	NC HARD	CACO3	MG/L	0	0	0	0	0	0	0	0
00915	CALCIUM	CA,DISS	MG/L	8.0	5.5	6.0	7.0	5.0	6.0	5.0	6.0
00925	MGNSIUM	MG,DISS	MG/L	1.4	1.1	0.8	1.6	1.2	1.0	1.4	1.0
00930	SODIUM	NA,DISS	MG/L	2.50	2.10	1.90	2.50	1.80	1.90	2.00	2.20
00935	PTSSIUM	K,DISS	MG/L	0.00	0.10	0.20	0.00	0.20	0.00	0.10	0.30
00940	CHLORIDE	TOTAL	MG/L	1	1	1	1	1	1	1	1
00945	SULFATE	SO4-TOT	MG/L	2	3	3	3	2	2	2	2
00950	FLUORIDE	F,DISS	MG/L	0.00	0.00	0.10	0.00	0.10	0.00	0.10	0.10
00955	SILICA	DISOLVED	MG/L	11.0	9.6	10.0	12.0	10.0	11.0	10.0	11.0
01020	BORON	B,DISS	UG/L				0				
01045	IRON	FE,TOT	UG/L	60	50	10	60	60	50	40	60
31505	TOT COLI	MPN CONF	/100ML	430	430	91	36	0	0	150	36
70300	RESIDUE	DISS-180 C	MG/L	45	38	43	44	34	35	35	42

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 08C071          3308C070     12119007     541047
47 29 39.0 122 12 29.0  2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON        KING
PACIFIC NORTHWEST        171108
PUGET SOUND (CEDAR-08)
21543011          17110012000
                  DEPTH    0
/TYPA/AMBNT/STREAM
INDEX 1311141  000040  00100
MILES 1169.35 C011.50 031.00
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	INITIAL DATE			61/06/06	61/07/05	61/08/03	61/09/06	61/11/01	62/02/07	62/05/07	62/08/14
	INITIAL TIME-DEPTH-BOTTOM										
00011	WATER	TEMP	CENT	13.0	15.0	22.8	13.0	8.5	6.0	12.0	16.5
00011	WATER	TEMP	FAHN	55.4	59.0	73.0	55.4	47.3	42.8	53.6	61.7
00060	STREAM	FLOW	CFS	726	207	200	186	428	816	780	160
00070	TURB	JKSN	JTU						0.0	0.0	0.0
00080	COLOR	PT-CO	UNITS	5	5	5	5	5	5	5	5
00095	CNDUCTVY	AT 25C	MICROMHO	56	81	71	78	57	52	50	81
00300	DO		MG/L	9.2	9.8	8.8	10.3	11.5	11.7	10.3	9.8
00301	DO	SATUR	PERCENT	86.8	96.1	101.2	97.2	99.2	93.7	95.4	101.1
00400	PH		SU	7.20	7.30	7.40	7.30	7.30	7.20	7.00	7.30
00440	HCO3 ION	HCO3	MG/L	28	42	38	42	29	25	24	44
00445	CO3 ION	CO3	MG/L					0	0	0	0
00620	NO3-N	TOTAL	MG/L	0.070	0.050	0.070	0.090	0.090	0.090	0.050	0.050
00660	ORTHOPO4	PO4	MG/L	0.02	0.06	0.02	0.03	0.00	0.02	0.01	0.02
00900	TOT HARD	CACO3	MG/L	22	32	28	31	22	20	18	32
00902	NC HARD	CACO3	MG/L	0	0	0	0	0	0	0	0
00915	CALCIUM	CA,DISS	MG/L	7.0	10.0	8.5	9.5	7.0	6.0	6.0	10.0
00925	MGNSIUM	MG,DISS	MG/L	1.0	1.7	1.7	1.8	1.1	1.1	0.9	1.8
00930	SODIUM	NA,DISS	MG/L	2.20	3.50	3.10	3.50	2.50	2.20	1.60	3.20
00935	PTSSIUM	K,DISS	MG/L	0.30	0.70	0.50	0.50	0.40	0.30	0.50	0.60
00940	CHLORIDE	TOTAL	MG/L	1	1	1	1	2	1	1	1
00945	SULFATE	SO4-TOT	MG/L	3	5	2	3	2	3	3	5
00950	FLUORIDE	F,DISS	MG/L	0.00	0.10	0.00	0.00	0.10	0.10	0.00	0.10
00955	SILICA	DISOLVED	MG/L	11.0	13.0	12.0	13.0	11.0	11.0	11.0	13.0
01020	BORON	B,DISS	UG/L					0		0	
01045	IRON	FE,TOT	UG/L	30	120	80	20	60	30	50	180
31505	TOT COLI	MPN CONF	/100ML	91	930	91	430	0	91	0	230
70300	RESIDUE	DISS-180 C	MG/L	45	60	48	53	45	40	34	57
	INITIAL DATE			62/11/08	63/02/06	63/05/02	63/08/13	63/11/15	64/02/25	64/05/20	64/08/27
	INITIAL TIME-DEPTH-BOTTOM										
00010	WATER	TEMP	CENT						8.4	10.9	14.0
00011	WATER	TEMP	FAHN						47.1	51.6	57.2
00060	STREAM	FLOW	CFS	250	1250	792	67	1070	527	863	645
00070	TURB	JKSN	JTU						0.0	5.0	25.0
00080	COLOR	PT-CO	UNITS	5	10	5	5	5	0	5	5
00095	CNDUCTVY	AT 25C	MICROMHO	83	52	54	112	53	70	55	56
00300	DO		MG/L						11.5	11.4	10.3
00301	DO	SATUR	PERCENT						96.7	102.8	99.1
00400	PH		SU	7.90	7.00	7.20	7.50	7.00	7.10	7.10	7.30
00440	HCO3 ION	HCO3	MG/L	42	25	26	58	26	35	28	30
00445	CO3 ION	CO3	MG/L	0	0	0	0	0	0	0	0
00620	NO3-N	TOTAL	MG/L	0.110	0.340	0.110	0.160	0.250	0.230	0.110	0.070
00660	ORTHOPO4	PO4	MG/L	0.26	0.02	0.02	0.05	0.03	0.03	0.02	0.03
00900	TOT HARD	CACO3	MG/L	34	21	21	46	20	29	22	22
00902	NC HARD	CACO3	MG/L	0	0	0	0	0	0	0	0
00915	CALCIUM	CA,DISS	MG/L	11.0	7.0	6.0	12.0	6.5	8.5	7.0	7.0

(SAMPLE CONTINUED ON NEXT PAGE)

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 08C070          3308C070     12119007     541047
47 29 39.6 122 12 28.0  2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON        KING
PACIFIC NORTHWEST        131108
PUGET SOUND (CEDAR-08)
21540000            17110012000
                    DEPTH    0
/TYPE/AMBNT/STREAM
INDEX 1311141  C00040  00100
MILES 1009.35 C011.50 001.00    .     .     .     .     .     .     .     .     .
(SAMPLE CONTINUED FROM PREVIOUS PAGE)
     INITIAL DATE                          62/11/08  63/02/06  63/05/02  63/08/13  63/11/15  64/02/25  64/05/20  64/08/27
     INITIAL TIME-DEPTH-BOTTOM
00925 MGNSIUM   MG,DISS      MG/L            1.5       0.8       1.4       3.7       1.1       1.9       1.3       1.1
00930  SODIUM   NA,DISS      MG/L            3.20      2.30      2.10      5.00      2.70      3.10      2.40      2.40
00935 PTSSIUM    K,DISS      MG/L            0.60      0.20      0.40      0.90      0.30      0.50      0.30      0.30
00940 CHLORIDE    TOTAL      MG/L              2         1         1         2         1         2         1         1
00945 SULFATE   SO4-TOT      MG/L              5         4         2         6         3         4         3         3
00950 FLUORIDE   F,DISS      MG/L            0.10      0.00      0.10      0.10      0.00      0.00      0.00      0.10
00955  SILICA  DISOLVED      MG/L            14.0      11.0       9.5      15.0       9.8      12.0       9.2       9.2
01020  BORON    B,DISS      UG/L               0                 0                 0                   0
01045   IRON   FE,TOT       UG/L             450       270       100       300       190       110       120       850
31505 TOT COLI  MPN CONF    /100ML                                                              36       230        91
70300 RESIDUE   DISS-180  C   MG/L            57        43        39        77        44        55        39        36
     INITIAL DATE                          64/11/28  65/02/25  65/05/12  65/08/04  65/12/14  66/03/16  66/06/13  66/09/17
     INITIAL TIME-DEPTH-BOTTOM
00010  WATER      TEMP       CENT            6.0       6.3      13.5      14.9       5.6       7.8
00011  WATER      TEMP       FAHN           42.8      43.3      56.3      58.8      42.1      46.0
00070   TURB      JKSN        JTU            5.0       5.0       5.0       0.0
00080  COLOR     PT-CO      UNITS             5         5         5         0         5         5
00095 CNDUCTVY   AT 25C    MICROMHO          62        47        53       104        61        58
00300    DO                  MG/L           11.8      12.5      10.1       9.4      11.8      11.6
00301    DO      SATUR     PERCENT          94.5     100.1      97.2      92.2      94.5      97.5
00400    PH                   SU             7.10      7.40      7.10      7.30      7.00      7.00
00440 HCO3 ION    HCO3       MG/L              28        23        27        53        30        26
00445 CO3 ION     CO3        MG/L               0         0         0         0         0         0
00620  NO3-N     TOTAL       MG/L           0.430     0.290     0.050     0.090     0.160     0.160
00660 ORTHOPO4    PO4        MG/L            0.03      0.02      0.04      0.05
00900 TOT HARD   CACO3       MG/L              24        19        21        42        24        21
00902 NC HARD    CACO3       MG/L               0         0         0         0         0         0
00915 CALCIUM    CA,DISS     MG/L             7.0       5.6       6.0      11.0       7.2       6.4
00925 MGNSIUM    MG,DISS     MG/L             1.5       1.2       1.5       3.4       1.4       1.3
00930  SODIUM    NA,DISS     MG/L             2.90      2.40      2.50      4.70      2.60      2.70
00935 PTSSIUM     K,DISS     MG/L             0.40      0.20      0.40      0.80      0.60      0.40
00940 CHLORIDE    TOTAL      MG/L                1         1         1         2         1         2
00945 SULFATE   SO4-TOT      MG/L                4         2         3         5         4         4
00950 FLUORIDE   F,DISS      MG/L            0.10      0.00      0.00      0.10      0.10      0.10
00955  SILICA  DISOLVED      MG/L            11.0       8.3       9.9      15.0      11.0       9.8      11.0      11.0
01020  BORON    B,DISS      UG/L               0                 0                             0
01045   IRON   FE,TOT       UG/L             270       130       320        50
31505 TOT COLI  MPN CONF    /100ML           230        91       430       930       230        36
70300 RESIDUE   DISS-180  C   MG/L            45        37        36        72        40        42
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 38C07J          3308C07J     12119007      541047
47 29 39.0 122 17 29.0  2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON          KING
PACIFIC NORTHWEST          131108
PUGET SOUND (CEDAR-08)
21540000              17110012000
                      DEPTH     0
/TYPA/AMBNT/STREAM
INDEX 1311141  000040  00100
MILES 0009.35 0011.50 001.00
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	INITIAL DATE			66/11/01	66/11/15	66/12/27	67/02/21	67/03/27	67/04/24	67/05/18	67/06/12
	INITIAL TIME-DEPTH-BOTTOM										
00955	SILICA	DISOLVED	MG/L	13.0	11.0	10.0	9.7	11.0	13.0	11.0	12.0
	INITIAL DATE			67/07/19	67/08/14	67/09/18	70/11/30	70/12/14	71/01/04	71/01/18	71/02/01
	INITIAL TIME-DEPTH-BOTTOM						1125	1130	1005	1100	1020
00010	WATER	TEMP	CENT				5.7	5.2	2.7	6.5	6.3
00011	WATER	TEMP	FAHN				42.3	41.4	36.9	43.7	43.3
00025	BAROMTRC	PRESSURE	MM OF HG				747	757	779		762
00070	TURB	JKSN	JTU				1.0	3.0	1.0	4.0	4.0
00080	COLOR	PT-CO	UNITS				16	16	4	26	25
00095	CNDUCTVY	AT 25C	MICROMHO				64	53	67	51	47
00300	DO		MG/L				12.2	12.3	13.5	12.2	12.1
00301	DO	SATUR	PERCENT				97.7	96.2	100.1	100.1	96.9
00400	PH		SU				7.10	7.20	7.20	7.10	7.00
00610	NH3+NH4-	N TOTAL	MG/L				0.000	0.020	0.020	0.000	0.050
00615	NO2-N	TOTAL	MG/L				0.000	0.000	0.000	0.000	0.000
00619	NH-IONZD	NH3-NH3	MG/L				0.000	0.00	0.00	0.000	0.00
00620	NO3-N	TOTAL	MG/L				0.320	0.340	0.380	0.250	0.200
00625	TOT KJEL	N	MG/L						0.040	0.000	0.070
00665	PHOS-TOT		MG/L P				0.010	0.010	0.030	0.040	0.060
00671	PHOS-DIS	ORTHO	MG/L P				0.000	0.010	0.010	0.030	0.010
00955	SILICA	DISOLVED	MG/L	13.0	14.0	12.0					
31504	TOT COLI	MFIM LES	/100ML				440	250	200	230	100
31616	FEC COLI	MFM-FCBR	/100ML				40	20 K	20 K	20 L	
	INITIAL DATE			71/02/15	71/03/01	71/03/15	71/04/12	71/04/26	71/05/10	71/05/24	71/06/07
	INITIAL TIME-DEPTH-BOTTOM			1045	0945	1010	1010	0840	1000	0930	1010
00010	WATER	TEMP	CENT	6.0	3.1	6.5	7.2	9.5	9.5	10.3	11.4
00011	WATER	TEMP	FAHN	42.8	37.6	43.7	45.0	49.1	49.1	50.5	52.5
00025	BAROMTRC	PRESSURE	MM OF HG	760	779	775	775	763	774	759	760
00070	TURB	JKSN	JTU	15.0	2.0	4.0	1.0	1.0	1.0	2.0	6.0
00080	COLOR	PT-CO	UNITS	31	14	18	15	14	9	13	11
00095	CNDUCTVY	AT 25C	MICROMHO	44	59	58	54	63	57	55	57
00300	DO		MG/L	11.9	13.1	12.1	12.4	11.8	12.7	11.1	11.3
00301	DO	SATUR	PERCENT	95.3	97.1	99.2	101.7	104.5	112.5	98.3	101.9
00400	PH		SU	7.10	7.00	6.90	6.90	7.40	7.30	7.00	7.00
00610	NH3+NH4-	N TOTAL	MG/L	0.150	0.120	0.070	0.070	0.000	0.000	0.020	0.050
00615	NO2-N	TOTAL	MG/L	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000
00619	NH-IONZD	NH3-NH3	MG/L	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000
00620	NO3-N	TOTAL	MG/L	0.280	0.270	0.290	0.520	0.140	0.110	0.110	0.090
00625	TOT KJEL	N	MG/L	0.180	0.090	0.200	0.140	0.120	0.080		
00665	PHOS-TOT		MG/L P	0.040	0.010	0.130	0.070	0.050	0.060	0.050	0.070
00671	PHOS-DIS	ORTHO	MG/L P	0.040	0.010	0.000		0.030	0.050	0.050	0.030
31504	TOT COLI	MFIM LES	/100ML	400	100 K	100	330	130	220	400	350

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 08C077          33080070     12119007     541047
47 29 33.0 122 12 28.0  2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON        KING
PACIFIC NORTHWEST        131108
PUGET SOUND (CEDAR-DR)
21543077            17110012000
                    DEPTH    0
/TYPA/AMBNT/STREAM
INDEX 1111141  000040  00100
FILES 0069.35 0011.50 001.00
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	INITIAL DATE			71/06/21	71/07/12	71/07/26	71/08/09	71/08/23	71/09/13	71/09/27	72/10/10
	INITIAL TIME-DEPTH-BOTTOM			0950	1005	1020	1005	1000	0950	0945	1530
00010	WATER	TEMP	CENT	13.2	12.8	17.2	17.3	15.3	13.0	11.2	12.2
00011	WATER	TEMP	FAHN	55.8	55.0	63.0	63.1	59.5	55.4	52.2	54.0
00025	BAROMTRC	PRESSURE	MM OF HG	760	769	763	767	769	774	763	
00061	STREAM	FLOW	CFS				268	190	274	324	460
00070	TURB	JKSN	JTU	1.0	1.0	2.0	1.0	3.0	3.0	3.0	1.0
00080	COLOR	PT-CO	UNITS	7	11	16	8	12	9	14	13
00095	CNDUCTVY	AT 25C	MICROMHO	50	59	82	75	89	78	85	65
00300	DO		MG/L	10.9	11.0	11.4	9.5	10.4	10.7	10.6	11.2
00301	DO	SATUR	PERCENT	102.9	103.8	117.6	98.0	102.0	101.0	95.6	103.8
00400	PH		SU	6.90	7.10	7.20	7.40	7.40	7.70	7.20	7.50
00610	NH3+NH4-	N TOTAL	MG/L	0.300	0.040	0.190	0.010	0.090	0.010	0.120	0.080
00615	NO2-N	TOTAL	MG/L	0.000	0.010	0.010	0.010	0.010	0.000	0.001	0.005
00619	UN-IONZD	NH3-NH3	MG/L	0.000	0.000	0.001	0.00	0.001	0.000	0.000	0.001
00620	NO3-N	TOTAL	MG/L	0.090	0.260	0.050	0.240	0.280	0.370	0.670	0.170
00625	TOT KJEL	N	MG/L	0.010	0.040	0.200	0.070	0.150	0.160	0.160	0.200
00630	NO2&NO3	N-TOTAL	MG/L						0.37	0.67	
00665	PHOS-TOT		MG/L P	0.010	0.010	0.010	0.020	0.030	0.010	0.020	0.016
00666	PHOS-DIS		MG/L P	0.010	0.010						
00671	PHOS-DIS	ORTHO	MG/L P	0.010	0.010	0.000	0.010	0.020	0.000	0.040	0.008
01030	CHROMIUM	CR,DISS	UG/L								0
01040	COPPER	CU,DISS	UG/L								7
01049	LEAD	PB,DISS	UG/L								6
01090	ZINC	ZN,DISS	UG/L								10
31504	TOT COLI	MFIM LES	/100ML	80	250	400	900	500	800	1600	1000
71900	MERCURY	HG,TOTAL	UG/L								0.2
	INITIAL DATE			72/10/24	72/11/06	72/11/20	72/12/05	72/12/18	73/01/02	73/01/29	73/02/14
	INITIAL TIME-DEPTH-BOTTOM			1430	1545	1610	1530	1540	1450	1545	1555
00010	WATER	TEMP	CENT	9.9	9.1	7.7	2.5	6.8	5.4	5.1	7.0
00011	WATER	TEMP	FAHN	49.8	48.4	45.9	36.5	44.2	41.7	41.2	44.6
00061	STREAM	FLOW	CFS	385	355	320	365	671	1370	1080	550
00070	TURB	JKSN	JTU	2.0	2.0	1.0	3.0	37.0	3.0	3.0	2.0
00080	COLOR	PT-CO	UNITS	10	16	0	0	60	43	15	10
00095	CNDUCTVY	AT 25C	MICROMHO	60	64	19	60	57	44	56	68
00300	DO		MG/L	11.8	11.1	12.6	13.0	12.3	12.5	12.6	12.5
00301	DO	SATUR	PERCENT	104.5	95.8	106.0	96.4	100.9	97.7	98.5	102.5
00400	PH		SU	7.60	7.20	7.60	7.50	7.40	7.30	7.20	7.60
00610	NH3+NH4-	N TOTAL	MG/L	0.100	0.090	0.070	0.060	0.180	0.040	0.030	0.020
00615	NO2-N	TOTAL	MG/L	0.007	0.015	0.010	0.006	0.007	0.001	0.009	0.003
00619	UN-IONZD	NH3-NH3	MG/L	0.001	0.000	0.001	0.000	0.001	0.000	0.00	0.000
00620	NO3-N	TOTAL	MG/L	0.010	0.300	0.270	0.370	0.540	0.400	1.600	0.290
00625	TOT KJEL	N	MG/L	0.140	0.290	0.230	0.180	0.260	0.090		0.130
00665	PHOS-TOT		MG/L P	0.020	0.019	0.024	0.031	0.140	0.021	0.024	0.018
00671	PHOS-DIS	ORTHO	MG/L P	0.021	0.016	0.011	0.013	0.019	0.003	0.003	0.004
01030	CHROMIUM	CR,DISS	UG/L	0	0	0	0	0	0	0	0
01040	COPPER	CU,DISS	UG/L	3	8	2	4	3	6	1	2

(SAMPLE CONTINUED ON NEXT PAGE)

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 080070          33080070     12119007     541047
47 29 37.0 122 12 28.0  2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON          KING
PACIFIC NORTHWEST          131100
PUGET SOUND (CEDAR-08)
21543000             17110012000
                     DEPTH     0
/TYPA/AMBNT/STREAM
INDEX 1311141  000040  00100
MILES 0009.35 0011.50 001.00    .     .     .     .     .     .     .     .     .
(SAMPLE CONTINUED FROM PREVIOUS PAGE)
     INITIAL DATE                        72/10/24  72/11/06  72/11/20  72/12/05  72/12/18  73/01/02  73/01/29  73/02/14
     INITIAL TIME-DEPTH-BOTTOM           1430      1545      1610      1530      1540      1450      1545      1555
01049   LEAD     PB,DISS      UG/L          2         6         0         2         3         8         3         6
01090   ZINC     ZN,DISS      UG/L          0        10         0         0        20        10         0        10
31504 FOT COLI   MFIM LES    /100ML       200       220       500       150      1600 L    400 K     300       250
71900 MERCURY    HG,TOTAL     UG/L          0.2       0.1       0.0       0.2       0.3       0.0       0.0       0.1
     INITIAL DATE                        73/02/26  73/03/12  73/03/26  73/04/09  73/04/23  73/05/21  73/05/30  73/06/11
     INITIAL TIME-DEPTH-BOTTOM           1550      1630      1615      1500      1515      1710      1835      1730
00010  WATER      TEMP        CENT          9.0       7.5       9.9      14.0      10.6      16.5      15.1      17.4
00011  WATER      TEMP        FAHN         48.2      45.5      49.8      57.2      51.1      61.7      59.2      63.3
00060  STREAM     FLOW        CFS           570       484       375       360       365       268       276       256
00070  TURB       JKSN        JTU           8.0       2.0       2.0       2.0       2.0       1.0       1.0       1.0
00080  COLOR      PT-CO       UNITS          21        15        41        14        17         7        22         0
00095 CNDUCTVY    AT 25C    MICROMHO         69        82        84        92        86        76        83        88
00300     DO                  MG/L         12.0      12.0      11.9      11.4      11.5      10.7      10.1      10.1
00301     DO       SATUR      PERCENT     103.5     100.9     105.4     109.7     103.7     110.4      99.1     104.2
00400     PH                  SU            7.50      7.60      7.50      8.30      7.50      7.60      7.50      7.80
00610 NH3+NH4-   N TOTAL      MG/L          0.050     0.030     0.030     0.070     0.050     0.050     0.030     0.010
00615  NO2-N     TOTAL        MG/L          0.006     0.003     0.006     0.009     0.007     0.006     0.004     0.002
00619 NH4-IONZD  NH3-NH3      MG/L          0.000     0.000     0.000     0.004     0.000     0.001     0.000     0.000
00620  NO3-N     TOTAL        MG/L          0.240     0.320     0.270     0.130     0.230     0.130     0.170     0.130
00625 TOT KJEL     N          MG/L          0.140     0.180     0.110     0.150     0.120     0.080     0.130     0.080
00665 PHOS-TOT               MG/L P        0.019     0.013     0.012     0.014     0.017     0.012     0.010     0.009
00671 PHOS-DIS   ORTHO        MG/L P        0.004     0.008     0.007     0.005     0.010     0.010     0.010     0.009
01030 CHROMIUM   CR,DISS      UG/L             1         0         0         0         0         0         0         0
01040 COPPER     CU,DISS      UG/L             4         8        10        10         9         3         3         5
01049   LEAD     PB,DISS      UG/L             5         9         0         4         5         3         2         1
01090   ZINC     ZN,DISS      UG/L            20        10        10        10        10        10        10        10
31504 FOT COLI   MFIM LES    /100ML        1200       220       100       100 K     150       380        44       225
71900 MERCURY    HG,TOTAL     UG/L          0.0       0.5       0.0       0.1       0.2       0.3       0.4       0.1
     INITIAL DATE                        73/06/25  73/07/16  73/07/23  73/08/07  73/08/21  73/09/05  73/09/18  75/10/16
     INITIAL TIME-DEPTH-BOTTOM           1645      1705      1955      1345      1300      1335      1400      1150
00010  WATER      TEMP        CENT         15.3      22.6      17.0      15.9      14.8      16.6      13.7      10.7
00011  WATER      TEMP        FAHN         59.5      72.7      62.6      60.6      58.6      61.9      56.7      51.3
00060  STREAM     FLOW        CFS           335       112       118       125       228       150       190       304
00070  TURB       JKSN        JTU           2.0       1.0       1.0       1.0       2.0       1.0       1.0       2.0
00080  COLOR      PT-CO       UNITS          24        14        63        11        10         6         6        17
00095 CNDUCTVY    AT 25C    MICROMHO         89       109       117       112       112       112        90        79
00300     DO                  MG/L         11.0       9.3      14.0      10.5      12.0      11.2      11.3      11.7
00301     DO       SATUR      PERCENT     107.9     107.3     144.4     105.1     117.7     115.5     108.7     105.5
00400     PH                  SU            7.80      8.30      8.00      8.50      8.10      8.00      8.00      7.60
00610 NH3+NH4-   N TOTAL      MG/L          0.020     0.040     0.020     0.070     0.030     0.090     0.020     0.120
00615  NO2-N     TOTAL        MG/L          0.006     0.011     0.004     0.004     0.009     0.002     0.006
00619 NH4-IONZD  NH3-NH3      MG/L          0.000     0.004     0.001     0.007     0.001     0.003     0.001     0.001
00620  NO3-N     TOTAL        MG/L          0.160     0.140     0.130     0.110     0.100     0.130     0.140
00625 TOT KJEL     N          MG/L          0.140     0.160     0.110     0.090     0.080     0.120     0.060
(SAMPLE CONTINUED ON NEXT PAGE)
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 08C077          3308C070     12119007     541047
47 29 39.0 122 12 28.0  2
CEDAR R AT LOGAN ST PR AT RENTON
53033 WASHINGTON        KING
PACIFIC NORTHWEST        131108
PUGET SOUND (CEDAR-08)
21540003           17110012000
                   DEPTH    0
/TYPA/SAMBNT/STREAM
INDEX 1311141  000040  00100
FILES 0009.35 0011.50 001.00    .     .     .     .     .     .     .     .     .
(SAMPLE CONTINUED FROM PREVIOUS PAGE)
     INITIAL DATE                      73/06/25  73/07/16  73/07/23  73/08/07  73/08/21  73/09/05  73/09/18  75/10/16
     INITIAL TIME-DEPTH-BOTTOM          1645      1735      1955      1345      1300      1335      1400      1150
00630 N02&N03   N-TOTAL      MG/L                                                                             0.29
00665 PHOS-TOT               MG/L P    0.015     0.021     0.016     0.012     0.014     0.030     0.013     0.030
00671 PHOS-DIS   ORTHO       MG/L P    0.005     0.012     0.001     0.001     0.005     0.006     0.011     0.020
01034 CHROMIUM   CR,DISS     UG/L         0         0         0         0         0         0         0
01042 COPPER     CU,DISS     UG/L         2         8         8         2         3         2         4
01049   LEAD     PB,DISS     UG/L         2         2         2         2         2         2         8
01090   ZINC     ZN,DISS     UG/L        10        10        10        20        40         0        20
31504 TOT COLI   MFIM LES    /100ML     800       700       520       780      2300       580      3500       400 B
31616 FEC COLI   MFM-FCBR    /100ML                                                                           100
71900 MERCURY    HG,TOTAL    UG/L         0.1       0.5       0.0       0.2       0.0       0.0       0.0
     INITIAL DATE                      75/10/22  75/11/05  75/11/19  75/12/03  75/12/17  76/01/14  76/01/28  76/02/04
     INITIAL TIME-DEPTH-BOTTOM          1325      1120      1215      1110      1045      1230      1210      1140
00010  WATER      TEMP        CENT        9.4       9.6       5.9       7.5       5.3       6.6       7.5       4.3
00011  WATER      TEMP        FAHN       48.9      49.3      42.6      45.5      41.5      43.9      45.5      39.7
00060  STREAM     FLOW        CFS         445       584       773      8200      1470      1880      1540      1210
00070    TURB     JKSN        JTU         9.0       4.0       4.0      300.0      17.0      33.0      16.0       8.0
00080  COLOR      PT-CO       UNITS        38        25        17       121        29        79        42        25
00095 CNDUCTVY   AT 25C      MICROMHO      79        69        74        41        60        53        49        58
00300    DO                  MG/L        11.9      11.6      11.9      13.8      12.4      12.4      12.2      12.8
00301    DO       SATUR      PERCENT    102.7      97.4      95.3      99.8      96.9     101.7     102.6      97.8
00400    PH                  SU          7.30      7.40      7.10      7.00      6.80      7.60      7.20      7.60
00610 NH3+NH4-   N TOTAL     MG/L       0.090     0.060     0.050     0.280     0.120     0.280     0.090     0.100
00619 UN-IONZD   NH3-NH3     MG/L       0.000     0.000     0.000     0.001     0.000     0.002     0.000     0.001
00630 N02&N03    N-TOTAL     MG/L        0.44      0.40      0.43      0.33      0.29      0.36      0.28      0.24
00665 PHOS-TOT               MG/L P     0.050     0.020     0.010     0.800     0.040     0.110     0.040     0.020
00671 PHOS-DIS   ORTHO       MG/L P     0.010     0.000     0.000     0.010     0.000     0.010     0.000     0.010
31504 TOT COLI   MFIM LES    /100ML      2200 B    1000 B     350 B     4000       400 B     3400 B     350 B      15 B
31616 FEC COLI   MFM-FCBR    /100ML        95 B      49        28 B      100 K       4 B      400 B      15 B       2 K
     INITIAL DATE                      76/02/19  76/03/03  76/03/18  76/04/07  76/04/21  76/05/05  76/05/19  76/06/03
     INITIAL TIME-DEPTH-BOTTOM          1145      1205      1230      1330      1225      1220      1310      1310
00010  WATER      TEMP        CENT        5.6       4.3       7.7       9.7       9.7      10.6      12.2      11.7
00011  WATER      TEMP        FAHN       42.1      39.7      45.9      49.5      49.5      51.1      54.0      53.1
00060  STREAM     FLOW        CFS         1090       786       652       508       670       544       628       480
00070    TURB     JKSN        JTU          5.0       6.0       5.0       2.0       4.0       8.0       6.0       2.0
00080  COLOR      PT-CO       UNITS        17        17        13         8        13        17         8         5
00095 CNDUCTVY   AT 25C      MICROMHO      59        60        63        70        65        70        60        75
00300    DO                  MG/L        12.6      13.0      12.1      12.6      13.2      12.9      12.0      11.8
00301    DO       SATUR      PERCENT    104.9      99.3     101.7     111.6     116.9     116.3     111.2     109.3
00400    PH                  SU          7.20      7.20      7.60      7.00      8.00      8.00      7.00      7.60
00610 NH3+NH4-   N TOTAL     MG/L       0.070     0.020     0.050     0.040     0.110     0.100     0.070     0.060
00619 UN-IONZD   NH3-NH3     MG/L       0.000     0.000     0.000     0.000     0.002     0.002     0.000     0.001
00630 N02&N03    N-TOTAL     MG/L        0.40      0.29      0.25      0.18      0.11      0.12      0.12      0.13
00665 PHOS-TOT               MG/L P     0.020     0.030     0.020     0.010     0.020     0.020     0.010     0.010
00671 PHOS-DIS   ORTHO       MG/L P     0.010     0.000     0.000     0.000     0.000     0.000     0.000     0.010
(SAMPLE CONTINUED ON NEXT PAGE)
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 08C077          3308C070     12119007     541947
47 29 39.0 122 12 28.0  2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON          KING
PACIFIC NORTHWEST          131108
PUGET SOUND (CEDAR-08)
21540033              17110012060
                      DEPTH    0
/TYPA/AMBNT/STREAM
INDEX 1311141  CC0040  00100
FILES 3309.35 0011.50 C01.00  .     .     .     .     .     .     .     .     .
(SAMPLE CONTINUED FROM PREVIOUS PAGE)
     INITIAL DATE                    76/02/19  76/03/03  76/03/18  76/04/07  76/04/21  76/05/05  76/05/19  76/06/03
     INITIAL TIME-DEPTH-BOTTOM       1145      1205      1230      1330      1225      1220      1310      1310
31501 TOT COLI  MFIMENDO  /100ML                                    130 B      20 B      70 B      60 B
31504 TOT COLI  MFIM LES  /100ML      260        30 B      220 B     130 B      20 B      70 B      60 B      190
31616 FEC COLI  MFM-FCBR  /100ML        5 B       2 B       48         4 B       2 B      10 B       4 B       2 B
     INITIAL DATE                    76/06/16  76/07/08  76/07/21  76/08/04  76/08/18  76/09/09  76/09/29  77/10/05
     INITIAL TIME-DEPTH-BOTTOM       1300      1210      1225      1140      1140      1115      1125      1025
00010  WATER      TEMP      CENT      12.2      14.6      15.1      15.5      14.5      13.6      13.5      9.5
00011  WATER      TEMP      FAHN      54.0      58.3      59.2      59.9      58.1      56.5      56.3      49.1
00060  STREAM     FLOW      CFS        877       712       400       135       141       420       332
00061  STREAM     FLOW,     INST-CFS                                                                    300
00070  TURB       JKSN      JTU       10.0       5.0       2.0       2.0       2.0       1.0       5.0       3.0
00080  COLOR      PT-CO     UNITS       21        25         8         8         8         8                   13
00095  CNDUCTVY   AT 25C    MICROMHO    58        60        61        87        96        68        75        84
00300     DO                 MG/L      11.1      10.7      10.5      10.7      10.5      10.3      10.8      12.3
00301     DO       SATUR     PERCENT   102.8     105.0     103.0     107.1     103.0      99.1     103.9     107.9
00400     PH                 SU         7.50      7.60      7.60      7.70      7.50      7.50      7.70      7.40
00610  NH3+NH4-   N TOTAL    MG/L      0.070     0.070     0.060     0.050     0.040     0.060     0.060     0.110
00619  NH4-IONZD   NH3-NH3   MG/L      0.001     0.001     0.001     0.001     0.000     0.001     0.001     0.001
00630  NO2&NO3    N-TOTAL    MG/L      0.16      0.12      0.06      0.05      0.23      0.13      0.13      0.29
00665  PHOS-TOT              MG/L P    0.040     0.020     0.010     0.013     0.030     0.020     0.020     0.030
00671  PHOS-DIS   ORTHO      MG/L P    0.000     0.000     0.000     0.004     0.000     0.000     0.010     0.010
31504  TOT COLI  MFIM LES   /100ML      560       580      4000 L     280 B     140 L     480 B     2800
31616  FEC COLI  MFM-FCBR   /100ML      220       200        17 B      10 B       40        44        36 B      100
     INITIAL DATE                    77/11/30  77/12/21  78/01/18  78/02/23  78/03/08  78/04/05  78/05/03  78/06/21
     INITIAL TIME-DEPTH-BOTTOM       0955      1105      1105      1040      1120      1115      1110      1050
00010  WATER      TEMP      CENT       6.3       5.8       5.8       7.3       7.8       9.1      10.2      13.6
00011  WATER      TEMP      FAHN      43.3      42.4      42.4      45.1      46.0      48.4      50.4      56.5
00025  BAROMTRC   PRESSURE  MM OF HG                                                              774       769
00061  STREAM     FLOW,     INST-CFS  1610      1660       580       520       448       442       484       390
00070  TURB       JKSN      JTU       13.0      13.0       2.0       3.0       3.0       2.0       2.0       1.0
00080  COLOR      PT-CO     UNITS       33        42         8        17        17        25        38         4
00095  CNDUCTVY   AT 25C    MICROMHO    54        56        66        55        76        79        74        74
00300     DO                 MG/L      12.5      12.4                12.1      12.2      12.3      12.0      10.5
00301     DO       SATUR     PERCENT   101.4      99.3                99.6     102.7     106.8     105.0      99.9
00400     PH                 SU         6.90      7.10      7.30      7.40      7.60      7.90      7.50      7.30
00530  RESIDUE    TOT NFLT   MG/L                           2         8         2        18         5         8
00610  NH3+NH4-   N TOTAL    MG/L      0.150     0.130     0.060     0.080     0.040     0.060     0.050     0.060
00619  NH4-IONZD   NH3-NH3   MG/L      0.000     0.000     0.000     0.000     0.000     0.001     0.000     0.000
00630  NO2&NO3    N-TOTAL    MG/L      0.41      0.41      0.43      0.30      0.43      0.35      0.33      0.18
00665  PHOS-TOT              MG/L P    0.040     0.040     0.020     0.020     0.030     0.020     0.010     0.010
00671  PHOS-DIS   ORTHO      MG/L P    0.000     0.010     0.010     0.000     0.000     0.000     0.000     0.000
31616  FEC COLI  MFM-FCBR   /100ML      260 L      16 B       36        29        44        40        60        96
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 08C079          3308C079     12119007     541047
47 29 39.0 122 12 28.0  2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON          KING
PACIFIC NORTHWEST          131108
PUGET SOUND (CEDAR-08)
21543011             17110012000
                     DEPTH    0
/TYPA/AMBNT/STREAM
INDEX 1111141  000040  00100
MILES 0209.35 0011.50 001.00
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	INITIAL DATE			78/07/19	78/08/09	78/09/20	78/10/25	78/11/15	78/12/20	79/01/11	79/02/08	
	INITIAL TIME-DEPTH-BOTTOM			1115	1100	1155	1135	1230	1145	1100	1120	
00008	LAB	IDENT.	NUMBER				4481	4790	5249	34	377	
00010	WATER	TEMP	CENT	15.8	19.3	11.6	9.2	6.7	4.9	5.4	5.7	
00011	WATER	TEMP	FAHN	60.4	66.7	52.9	48.6	44.1	40.8	41.7	42.3	
00025	BAROMTRC	PRESSURE	MM OF HG			768	770		776	758		
00060	STREAM	FLOW	CFS				435	425	645	445	799	
00061	STREAM	FLOW,	INST-CFS	164	78	306						
00070	TURB	JKSN	JTU	1.0	1.0	3.0	2.0	2.0	3.0	3.0	10.0	
00080	COLOR	PT-CO	UNITS	17	22	0	9	13	17	13	17	
00095	CNDUCTVY	AT 25C	MICROMHO	79	90	77	76	77	61	74	60	
00300	DO		MG/L	11.8	10.8	12.5	11.6	12.5	12.8	12.5	12.5	
00301	DO	SATUR	PERCENT	119.3	117.4	113.9	99.6	102.4	98.0	99.3	99.8	
00400	PH		SU	8.00	7.70	7.80	7.50	7.50	7.40	7.40	7.20	
00530	RESIDUE	TOT NFLT	MG/L	8	2	8	9	5	4	8	28	
00610	NH3+NH4-	N TOTAL	MG/L	0.070	0.060	0.030	0.090	0.040	0.010	0.010	0.030	
00619	UN-IONZD	NH3-NH3	MG/L	0.002	0.001	0.000	0.001	0.000	0.00	0.00	0.00	
00630	N02&N03	N-TOTAL	MG/L	0.14	0.25	0.29	0.27	0.33	0.43	0.46	0.81	
00665	PHOS-TOT		MG/L P	0.010	0.020	0.020	0.010	0.020	0.020	0.030	0.020	
00671	PHOS-DIS	ORTHO	MG/L P	0.000	0.000	0.000	0.010	0.000	0.010	0.000	0.000	
31616	FEC COLI	MFM-FCBR	/100ML	56	100	92	110	42	15	38	610 J	
	INITIAL DATE			79/03/07	79/04/11	79/05/16	79/06/27	79/07/18	79/08/29	79/09/26	79/10/24	
	INITIAL TIME-DEPTH-BOTTOM			1050	1120	1130	1105	1210	1145	1040	1200	
00008	LAB	IDENT.	NUMBER	635	1158	1730	2250	2518	2967	3420	3861	
00010	WATER	TEMP	CENT	6.9	8.0	11.4	14.1	19.8	14.8	14.2	10.9	
00011	WATER	TEMP	FAHN	44.4	46.4	52.5	57.4	67.6	58.6	57.6	51.6	
00025	BAROMTRC	PRESSURE	MM OF HG	779	764	770	773	770			747	
00060	STREAM	FLOW	CFS	1720	530	566	328	129	117	168	196	
00070	TURB	JKSN	JTU	14.0	8.0	4.0	2.0	2.0	1.0	2.0	5.0	
00080	COLOR	PT-CO	UNITS	63	8	17	8	21	8	8	21	
00095	CNDUCTVY	AT 25C	MICROMHO	53	70	66	76	95	95	90	90	
00300	DO		MG/L	12.5	12.0	11.2	10.9	10.1	11.0	11.7	11.0	
00301	DO	SATUR	PERCENT	100.0	100.5	100.7	103.5	108.2	108.0	113.4	100.8	
00400	PH		SU	7.00	7.60	7.40	7.80	7.90	8.10	7.90	7.50	
00530	RESIDUE	TOT NFLT	MG/L	76	2	8	1 K	2	5	11	14	
00610	NH3+NH4-	N TOTAL	MG/L	0.010	0.430	0.010	0.040	0.030	0.000	0.040	0.040	
00619	UN-IONZD	NH3-NH3	MG/L	0.00	0.003	0.00	0.001	0.001	0.000	0.001	0.000	
00630	N02&N03	N-TOTAL	MG/L	0.47	0.34	0.21	0.16	0.22	0.15	0.19	0.40	
00665	PHOS-TOT		MG/L P	0.040	0.010	0.010	0.010	0.010	0.010	0.000		
00671	PHOS-DIS	ORTHO	MG/L P	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.010	
31616	FEC COLI	MFM-FCBR	/100ML	20 J	26 J	55	20	100	95	91 J	750 J	

STORET RETRIEVAL DATE 84/03/29 PAGE: 11

08C070 3308C070 12119007 541947
47 29 09.0 122 12 28.0 2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON KING
PACIFIC NORTHWEST 131108
PUGET SOUND (CEDAR-08)
21540011 17110012000
DEPTH 0
/TYPA/AMBNT/STREAM
INDEX 1111141 C00040 00100
FILES 0009.35 C011.50 001.00

	INITIAL DATE			79/11/07	79/12/12	80/01/30	80/02/14	80/03/12	80/04/09	80/05/07	80/06/11
	INITIAL TIME-DEPTH-BOTTOM			1210	1150	1130	1205	1420	1400	1245	1500
00038	LAB	IDENT.	NUMBER	4030	4324	182	262	565	936	1506	1941
00010	WATER	TEMP	CENT	8.9	6.5	1.3	3.5	6.0	10.0	12.4	13.7
00011	WATER	TEMP	FAHN	48.0	43.7	34.3	38.3	42.8	50.0	54.3	56.7
00025	BAROMTRC	PRESSURE	MM OF HG	765	771	777	757	765	769	775	771
00060	STREAM	FLOW	CFS	254	218	383	525	560	602	430	353
00070	TURB	JKSN	JTU	2.0	1.0	3.0	4.0	2.0		1.0	1.0
00080	COLOR	PT-CO	UNITS	4	17	3	13	22	21	13	17
00095	CNDUCTVY	AT 25C	MICROMHO	85	88	70	61	69	78	62	77
00300	DO		MG/L	12.0	12.2	13.1	13.2	12.5	12.0	11.6	12.4
00301	DO	SATUR	PERCENT	102.5	97.6	90.8	99.6	99.6	104.7	106.0	117.1
00400	PH		SU	7.70	7.50	7.30	7.30	7.40	7.50	8.10	8.10
00530	RESIDUE	TOT NFLT	MG/L	4	7	12	19	3	10	4	5
00610	NH3+NH4-	N TOTAL	MG/L	0.040	0.070	0.010	0.040	0.010	0.000	0.060	0.030
00619	UN-IONZD	NH3-NH3	MG/L	0.000	0.000	0.00	0.000	0.00	0.000	0.002	0.001
00630	NO2&NO3	N-TOTAL	MG/L	0.39	0.86	0.53	0.45	0.45	0.30	0.17	0.13
00665	PHOS-TOT		MG/L P	0.020	0.030	0.030	0.010	0.010	0.030	0.010	0.010
00671	PHOS-DIS	ORTHO	MG/L P	0.000	0.030	0.020	0.010	0.010	0.000	0.020	0.010
31616	FEC COLI	MFM-FCBR	/100ML	40	72 J	37	8 J	8	42	3 J	30
	INITIAL DATE			80/07/30	80/08/13	80/09/10	80/10/08	80/11/05	80/12/03	81/01/07	81/02/19
	INITIAL TIME-DEPTH-BOTTOM			1035	1055	1110	1205	1050	1150	1105	1005
00038	LAB	IDENT.	NUMBER	2968	3164	3872	4538	5038	5423	64	633
00010	WATER	TEMP	CENT	15.2	15.2	13.3	12.2	10.5	6.7	6.4	7.9
00011	WATER	TEMP	FAHN	59.4	59.4	55.9	54.0	50.9	44.1	43.5	46.2
00025	BAROMTRC	PRESSURE	MM OF HG	773	771	771	777	769	747	769	761
00060	STREAM	FLOW	CFS	131	124	199	285	274	1560	1140	1850
00070	TURB	JKSN	JTU	1.0	1.0	1.0	3.0	2.0	4.0	5.0	22.0
00080	COLOR	PT-CO	UNITS	8	8	8	13	33	42	21	29
00095	CNDUCTVY	AT 25C	MICROMHO	94	94	84	77	77	57	53	52
00300	DO		MG/L	10.2	10.4	11.9	11.0	11.1	12.5	12.1	11.8
00301	DO	SATUR	PERCENT	99.2	101.4	111.5	99.8	97.9	103.8	96.8	99.0
00400	PH		SU	7.70	8.10	7.70	7.70	7.00	7.00	7.20	7.50
00530	RESIDUE	TOT NFLT	MG/L	4	2	1 K	10	5	30	2	32
00610	NH3+NH4-	N TOTAL	MG/L	0.010	0.010	0.010 K	0.050	0.100	0.060	0.010	0.010
00615	NO2-N	TOTAL	MG/L	0.010 K	0.010 K	0.010 K	0.010 K	0.010	0.010 K	0.010 K	0.010
00619	UN-IONZD	NH3-NH3	MG/L	0.000	0.000	0.000	0.001	0.000	0.000	0.00	0.00
00620	NO3-N	TOTAL	MG/L	0.160	0.210	0.210	0.270	0.440	0.670	0.340	0.480
00630	NO2&NO3	N-TOTAL	MG/L	0.16	0.21	0.21					
00665	PHOS-TOT		MG/L P	0.030	0.030	0.070	0.030	0.030	0.040	0.020	0.050
00671	PHOS-DIS	ORTHO	MG/L P	0.010 K	0.010 K	0.010 K	0.010 K	0.010	0.010 K	0.010 K	0.010 K
31616	FEC COLI	MFM-FCBR	/100ML	25	65 J	78 J	340 J	96	60	31	180

08C077 3308C070 12119007 541047
47 29 33.0 122 12 28.0 2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON KING
PACIFIC NORTHWEST 131108
PUGET SOUND (CEDAR-08)
21540011 17110012000
DEPTH 0
/TYPA/AMBNT/STREAM
INDEX 1311141 000040 00100
FILES 2109.35 C011.50 001.00

	INITIAL DATE			81/03/04	81/04/22	81/05/13	81/06/10	81/07/15	81/08/12	81/09/23	81/10/21
	INITIAL TIME-DEPTH-BOTTOM			1110	1040	1100	1140	1000	1000	1215	1140
00008	LAB	IDENT.	NUMBER	800	1684	1965	2352	2800	3279	4134	4500
00010	WATER	TEMP	CENT	7.0	9.2	11.4	14.4	12.8	17.9	11.8	8.3
00011	WATER	TEMP	FAHN	44.6	48.6	52.5	57.9	55.0	64.2	53.2	46.9
00025	BAROMTRC	PRESSURE	MM OF HG	763	768	766	766	770	30	770	777
00061	STREAM	FLOW	CFS	1280	835	532	1400	425	124	247	322
00070	TURB	JKSN	JTU	5.0	3.0	2.0	18.0	6.0	1.0	1.0	2.0
00080	COLOR	PT-CO	UNITS	17	13	29	25	13	8	4	13
00095	CNDUCTVY	AT 25C	MICROMHO	52	57	63	52	75	96	85	72
00300	DO		MG/L	12.3	11.7	11.7	11.2	12.1	6.3	11.8	11.8
00301	DO	SATUR	PERCENT	100.6	100.2	105.8	108.1	112.3	65.5	107.0	97.8
00400	PH		SU	7.40	7.40	7.50	7.50	7.30	8.00	7.50	7.30
00530	RESIDUE	TOT NFLT	MG/L	4	7	1	33	2	16	1	4
00610	NH3+NH4-	N TOTAL	MG/L	0.010 K	0.010	0.090	0.030	0.110	0.090	0.130	0.190
00615	NO2-N	TOTAL	MG/L	0.010 K	0.010	0.010 K	0.010 K	0.010	0.010 K	0.010	0.010
00619	ON-IONZD	NH3-NH3	MG/L	0.00	0.00	0.001	0.000	0.001	0.004	0.001	0.001
00620	NO3-N	TOTAL	MG/L	0.360	0.280	0.290	0.240	0.100	0.220	0.210	0.280
00665	PHOS-TOT		MG/L P	0.010	0.010 K	0.010	0.050	0.010	0.020	0.030	0.030
00671	PHOS-DIS	ORTHO	MG/L P	0.010 K	0.010 K	0.010 K	0.010 K	0.010 K	0.010 K	0.010	0.010 K
31616	FEC COLI	MEM-FCBR	/100ML	23	79 J	17 J	320 J	80	360 B	44	87 J
	INITIAL DATE			81/11/24	81/12/23	82/01/20	82/02/18	82/03/24	82/04/28	82/05/26	82/06/23
	INITIAL TIME-DEPTH-BOTTOM			1040	1140	1200	1200	1125	1145	1215	1155
00008	LAB	IDENT.	NUMBER	4937	5210	131	651	1292	2052	2649	3159
00010	WATER	TEMP	CENT	6.6	5.2	5.0	5.2	6.8	10.6	10.2	15.8
00011	WATER	TEMP	FAHN	43.9	41.4	41.0	41.4	44.2	51.1	50.4	60.4
00025	BAROMTRC	PRESSURE	MM OF HG	766	772	756	763	765	767	764	769
00061	STREAM	FLOW	CFS	465	618	790	4210	1080	420	735	694
00070	TURB	JKSN	JTU	3.0	1.0	4.0	73.0	3.0	8.0	1.0	1.0
00080	COLOR	PT-CO	UNITS	25	17	13	42	17	4	8	4
00095	CNDUCTVY	AT 25C	MICROMHO	65	67	62	40	55	75	50	53
00300	DO		MG/L	12.0	12.5	12.3	12.7	12.4	13.2	11.9	10.5
00301	DO	SATUR	PERCENT	96.9	96.6	96.7	99.3	100.7	117.0	105.0	103.9
00400	PH		SU	7.40	7.30	7.20	7.00	7.40	7.90	7.50	7.80
00530	RESIDUE	TOT NFLT	MG/L	8	4	6	160	6	3	4	2
00610	NH3+NH4-	N TOTAL	MG/L	0.060	0.020	0.040	0.030	0.010 K	0.010 K	0.020	0.020
00615	NO2-N	TOTAL	MG/L	0.010	0.020	0.010	0.010	0.010	0.010	0.010 K	0.010 K
00619	ON-IONZD	NH3-NH3	MG/L	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.000
00620	NO3-N	TOTAL	MG/L	0.650	0.470	0.580	0.390	0.270	0.320	0.160	0.100
00665	PHOS-TOT		MG/L P	0.030	0.020	0.030	0.070	0.020	0.010	0.010	0.010
00671	PHOS-DIS	ORTHO	MG/L P	0.010	0.010 K	0.010 K	0.010	0.010 K	0.010 K	0.010 K	0.010 K
31616	FEC COLI	MEM-FCBR	/100ML		25	20	84	3 J	21	29	19 J

08C070 3308C070 12119007 541047
47 29 37.0 122 12 28.0 2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON KING
PACIFIC NORTHWEST 131108
PUGET SOUND (CEDAR-08)
21540033 17119012000
DEPTH 0
/TYPA/AMBNT/STREAM
INDEX 1311141 000040 00100
MILES 0009.35 0011.50 001.00

	INITIAL DATE		82/07/28	82/08/25	82/09/29	82/10/27	82/11/17	82/12/15	83/01/19	83/02/23
	INITIAL TIME-DEPTH-BOTTOM		1240	1740	1210	1410	1345	1210	1400	1320
00008	LAB	IDENT.	3704	4226	5066	5691	5995	6283	150	620
00010	WATER	TEMP	16.6	20.0	11.7	12.8	8.9	6.2	7.8	9.5
00011	WATER	TEMP	61.9	68.0	53.1	55.0	48.0	43.2	46.0	49.1
00025	BAROMTRC	PRESSURE	772	760	769	771	746	756	762	753
00061	STREAM	FLOW	105	133	230	375	616	882	1200 J	931
00070	TURB	JKSN	1.0	2.0	3.0	2.0	26.0	6.0	3.0	10.0
00080	COLOR	PT-CO	4	4	17	17	38	17	17	25
00095	CNDUCTVY	AT 25C	99	91	83	69	71	61	58	61
00300	DO		11.3	9.6	12.8	12.1	10.4	12.1	11.9	12.0
00301	DO	SATUR	113.3	104.6	116.0	112.0	91.1	98.0	99.4	105.6
00400	PH		8.00	7.90	8.00	7.50	7.30	7.30	7.40	7.30
00530	RESIDUE	TOT NFLT	1 K	12	34	4	56	1 K	6	8
00610	NH3+NH4-	N TOTAL	0.020	0.040	0.090	0.060	0.070	0.050	0.070	0.010
00615	NO2-N	TOTAL	0.010 K	0.010 K	0.010	0.010	0.010 K	0.010	0.010	0.010
00619	UN-IONZD	NH3-NH3	0.001	0.001	0.002	0.001	0.000	0.000	0.000	0.00
00620	NO3-N	TOTAL	0.160	0.190	0.320	0.290	0.400	0.380	0.360	0.330
00665	PHOS-TOT		0.020	0.020	0.030	0.030	0.080	0.040	0.030	0.030
00671	PHOS-DIS	ORTHO	0.010 K	0.010 K	0.010	0.010	0.040	0.010	0.010	0.020
31616	FEC COLI	MEM-FCBR	110 J	107 J	710 J	40 J	390	20 J	27	35

	INITIAL DATE		83/03/30	83/04/27	83/05/25	83/06/22	83/07/27	83/08/17	83/09/21	83/10/19
	INITIAL TIME-DEPTH-BOTTOM		1255	1330	1430	1155	1340	1250	1340	1340
00008	LAB	IDENT.	1144	1697	2396	2991	3681	4109	4944	5647
00010	WATER	TEMP	10.1	13.8	16.8	14.8	14.8	16.6	13.2	10.5
00011	WATER	TEMP	50.2	56.8	62.2	58.6	58.6	61.9	55.8	50.9
00025	BAROMTRC	PRESSURE	764	764	767	766	768	766	767	767
00061	STREAM	FLOW	658	400	380 J	290	310	234	400	358
00070	TURB	JKSN	7.0	2.0	3.0	2.0	7.0	1.0	1.0	8.0
00080	COLOR	PT-CO	29	13	13	8	21	8	13	17
00095	CNDUCTVY	AT 25C	70	81	78	81	84	81	78	71
00300	DO		12.1	12.5	11.9	12.4	11.2	11.1	12.1	12.1
00301	DO	SATUR	106.5	119.4	120.6	120.8	108.8	112.2	113.7	107.0
00400	PH		7.40	8.00	8.10	7.90	7.80	7.90	7.30	7.60
00530	RESIDUE	TOT NFLT	2	4	9	8	10	5	10	14
00610	NH3+NH4-	N TOTAL	0.030	0.020	0.020	0.010	0.010 K	0.020	0.010	0.040
00615	NO2-N	TOTAL	0.010	0.010 K	0.010 K	0.010 K	0.010 K	0.010 K	0.010 K	0.010 K
00619	UN-IONZD	NH3-NH3	0.000	0.001	0.001	0.000	0.000	0.001	0.00	0.000
00620	NO3-N	TOTAL	0.360	0.150	0.130	0.140	0.140	0.140	0.150	0.210
00665	PHOS-TOT		0.040	0.010 K	0.020	0.030	0.020	0.020	0.010	0.030
00671	PHOS-DIS	ORTHO	0.010	0.010	0.010 K	0.010 K	0.010	0.010 K	0.010 K	0.010 K
31616	FEC COLI	MEM-FCBR	34	1 K	27	19 J	440 J	23 J	41	460 J

08C379 33080970 12119007 541047
47 29 09.0 122 12 28.0 2
CEDAR R AT LOGAN ST BR AT RENTON
53033 WASHINGTON KING
PACIFIC NORTHWEST 131108
PUGET SOUND (CEDAP-08)
21540300 17110012000
DEPTH 0
/TYPA/AMBNT/STREAM
INDEX 1111141 000040 00100
FILES 0009.35 0011.50 001.00

	INITIAL DATE			83/11/16	83/12/14	
	INITIAL TIME-DEPTH-BOTTOM			1245	1335	
00008	LAB	IDENT.	NUMBER	6320	6763	
00010	WATER	TEMP	CENT	9.5	8.5	
00011	WATER	TEMP	FAHN	49.1	47.3	
00025	BAROMTRC	PRESSURE	MM OF HG	757	768	
00060	STREAM	FLOW	CFS	1160	791	
00070	TURB	JKSN	JTU	12.0	4.0	
00080	COLOR	PT-CO	UNITS	38	21	
00095	CNDUCTVY	AT 25C	MICROMHO	58	67	
00300	DO		MG/L	11.2	11.9	
00301	DO	SATUR	PERCENT	98.1	100.3	
00400	PH		SU	7.60	7.20	
00530	RESIDUE	TOT NFLT	MG/L	26	27	
00610	NH3+NH4-	N TOTAL	MG/L	0.040	0.040	
00615	NO2-N	TOTAL	MG/L	0.010 K	0.010 K	
00619	UN-IONZD	NH3-NH3	MG/L	0.000	0.000	
00620	NO3-N	TOTAL	MG/L	0.560	0.560	
00665	PHOS-TOT		MG/L P	0.030	0.040	
00671	PHOS-DIS	ORTHO	MG/L P	0.010 K	0.010 K	
31616	FEC COLI	MFM-FCBR	/100ML	57	31	

APPENDIX B

LANDFILL LEACHATE AND STORM RUNOFF CHARACTERISTICS

TYPICAL LEACHATE CHARACTERISTICS*
(Sanitary Landfills)

Parameter	Cedar Hills[1] F.C.R.	Kent Highlands[2] F.C.R.	Kent Highlands[2] Miller	California[3]	Fungaroli[4]
pH	5.8-6.2	6.0-6.9	6.3-6.5	6.0-6.5	3.7-8.5
Dissolved Oxygen	0-0.1	0-2.1	0		
Total Coliform (MPN)	23-1,600	8-2,400	7,000-17,500		
BOD	1,150-7,000	820-7,300	1,010-2,240	21,700-30,300	
COD	1,760-8,870	1,240-8,940	1,250-3,095		800-50,700
Total Solids			916-2,045		
Suspended Solids			48-311		13-26,500
Volatile Solids			341-1,103		
Alkalinity ($CaCO_3$)			548-1,571	730-9,500	
Total Hardness ($CaCO_3$)			480-750	890-7,600	200-5,500
Calcium			110-192	240-2,330	
Magnesium			214-333	64-410	
Total Nitrogen		31-447	26.4-124.0		
Organic Nitrogen			1.5-30.5	2.4-564	8-482
Ammonia - N			12.2-102.2	.22-480	2.1-177
Nitrate - N	0.9-2.4		.20-2.50		
Total Phosphate	0-0.1	0-20	.36-.72	.3-29	2-130
Ortho-Phosphate			0-.16		
Total Iron			27.7-143.8	6.5-220	.12-1,640
Sodium				85-1,700	127-3,800
Potassium				28-1,700	
Sulfate			16-35	84-730	20-450
Sulfide			2		
Chloride			0-65	96-2,350	47-2,340
Copper		0-0.026	2.4-3.6		0-7.6
Zinc		0-0.017			0.03-129
Nickel		0.1-0.6			0-0.81
Chromium		0-0.3			
Mercury		0-0.0004			
Lead	0.03-0.12	0.01-0.319	0		

[1] Food, Chemical and Research Laboratories, Inc.

[2] Miller, Joseph R., "Characteristics of a Sanitary Landfill Leachate and Its Treatability in an Aerated Lagoon," a Master's thesis, University of Washington 1971. A study conducted at the City of Seattle's Kent-Highlands landfill.

[3] California State Water Pollution Control Board. Report on the investigation of leaching of a sanitary landfill. Publication No. 10. Sacramento, 1954.

[4] "Pollution of Subsurface Water by Sanitary Landfills." United States Environmental Protection Agency, Solid Waste Management Research Grant EP-000162, Drexel University, Pennsylvania, 1971.

*Source: Report on Environmental Management for the Metropolitan Area, Part III, Water Quality, December 1974, prepared for the Municipality of Metropolitan Seattle (Metro) and the River Basin Coordinating Committee (RIBCO) by Stevens, Thompson & Runyan, Inc.

COMPARISON: CHARACTERISTICS OF STORM RUNOFF
AND SECONDARY SEWAGE EFFLUENT*

Parameter	Mean Concentrations in Urban Runoff[1]						Secondary Effluent from Municipal Sewage Treatment[2]
	View Ridge 1	View Ridge 2	South Seattle	South Center	Lake Hills	High-Lands	
Temperature (C)	13.1	12.9	14.8	13.3	14.6	10.7	--
Conductivity (umho/cm)	125	136	134	99	51	132	--
Turbidity (JTU)	30	37	47	18.7	15	22	--
DO (mg/l)	8.6	8.9	8.5	9.5	9.6	9.4	--
BOD	30	30	19	15	8.5	8.0	25
COD (mg/l)	95	97	95	70	68	57	70
Hexane Ext. (mg/l)	12	16	14	11	7.3	8.5	--
Chloride (mg/l)	7.7	12	12.2	6.6	5.3	7.5	45
Sulfate (m/l)	17	18	26.1	18	7	18	--
Organic N (mg/l)	2.6	3.5	1.7	1.4	1.4	1.4	7
Ammonia N (mg/l)	0.32	0.48	0.32	0.32	0.19	0.09	10
Nitrite N (mg/l)	0.11	0.12	0.06	0.04	0.03	0.02	--
Nitrate N (mg/l)	0.67	0.72	0.83	0.64	0.51	0.76	3 as NO_3+NO_2-N
Hydrolyzable P (mg/l)	0.45	0.40	0.24	0.17	0.24	0.35	10
Ortho P (mg/l)	0.12	0.12	0.08	0.05	0.12	0.10	--
Copper (mg/l)	0.040	0.056	0.10	0.081	0.076	0.12	0.07-0.50
Lead (mg/l)	0.44	0.32	0.25	0.40	0.27	0.08	0.10-0.30
Iron (mg/l)	2.4	2.0	2.1	0.75	0.39	0.44	0.10-0.40
Mercury (mg/l)	0.0003	0.0004	0.0004	0.0008	0.0003	0.0068	0.01
Chromium (mg/l)	0.025	0.009	0.010	0.074	0.010	0.010	0.02-0.15
Cadmium (mg/l)	0.005	0.004	0.005	0.004	0.004	0.004	0.015
Zinc (mg/l)	0.18	0.12	0.43	0.24	0.082	0.008	0.20-0.40
Settled Solids (mg/l)	51	84	60	40	40	68	--
Suspended Solids (mg/l)	85	112	80	73	54	98	25
TDS (mg/l)	134	125	170	89	72	101	--
Total Coliform (Org./100 ml)[3]	28,000	26,000	4,200	1,600	37,000	1,600	--
Fecal Coliform (Org./100 ml)[3]	3,600	1,200	30	370	1,400	370	200

[1] Metro, "Appendix C, Storm Water Monitoring Program," Part II, RIBCO Runoff and Basin Drainage Study, October 1974.

[2] Based on effluent concentrations normally expected from Secondary Treatment, modified to reflect higher concentrations measured at Renton STP for 1971.

[3] Median.

*Source: Report on Environmental Management for the Metropolitan Area, Part III, Water Quality, December 1974, prepared for the Municipality of Metropolitan Seattle (Metro) and the River Basin Coordinating Committee (RIBCO) by Stevens, Thompson & Runyan, Inc.

APPENDIX C

MEETING MINUTES AND CORRESPONDENCE WITH WSDOT

MEETING MINUTES

Date: March 20, 1984

Location: City of Renton Municipal Building

Attendance:			
	Art Storbo	CH2M HILL	453-5000
	Jim Dingfield	CH2M HILL	453-5000
	Ron Olsen	City of Renton	235-2631
	Bob Bergstrom	City of Renton	235-2631
	Dale Wirkkala	WSDOT	464-5462
	Harold Morgan	WSDOT	233-2304
	David Dye	WSDOT	
	Ralph Nichols	WSDOT	233-2386
	George Stahl	City of Renton	
	Bob McCormick	Dept. of Ecology	885-1900
	Moe Batra	DSHS	464-7672

Subject: Renton Well Field Protection Study
Effects of I-405 on Wells and Water Quality

Art Storbo started the meeting by describing the study which CH2M HILL is currently conducting. The study is to identify the well field recharge area, identify potential well field contaminant sources, and recommend ways of preventing contamination of the well field. The purpose of the meeting was to specifically address the impact Interstate 405 currently has or may have in the future on the well field. Accidental spills of chemicals and petroleum products from the freeway was labeled as the major concern. Normal surface runoff carrying oils and other contaminants was also addressed. Physical impact from out of control vehicles, although not on the subject of contamination, was also mentioned as being a concern.

The significance of the well field to the City was stressed. The five wells adjacent to the freeway produce approximately 85 percent of the City's total water supply. Art described the aquifer and sources of recharge. In addition to recharge from the river, surface water from the area surrounding the well field infiltrates through the soils to recharge the aquifer. It was also mentioned that the City does not have other comparable sources of water available to them.

CH2M HILL is currently designing the pump station for Well No. 9 and anticipates incorporating possible improvements in that construction project to prevent contamination from I-405.

Dale Wirkkala described the status of the I-405 expansion project and briefly outlined what the project will include. There are currently 12 different alternatives that WSDOT is

considering to add High Occupancy Vehicle (HOV) lanes to the I-405 corridor. Basically the alternatives are:

- o Widen the existing S-Curve structure
- o Relocate the alignment to the east of the existing roadway
- o Relocate to the west of the existing roadway

Included in each of these alternatives are various vertical alignment alternatives. Alignments relocated to the west or east might conflict with existing well locations. The option of doing nothing at all was also mentioned as a possibility. WSDOT has an open house scheduled for April 25, 1984 to discuss these alternatives with the public. It is hoped that after the open house some of the options can be eliminated. Dale pointed out that it is possible that additional alternatives may be suggested by the public. An environmental impact statement (EIS) is being prepared by WSDOT for the area of the freeway from the South Renton interchange to Sunset Blvd. The draft EIS is scheduled to be completed by October or November of 1984. Advertisement for construction is scheduled for 1987.

Bob Bergstrom brought up the subject of hauling hazardous materials on I-405 through the Renton area. The City is concerned that hauling these types of material through the I-90 tunnels may be banned in the future thus increasing the volume of this kind of traffic through Renton. The WSDOT representatives at this meeting stated that they are not directly involved with the I-90 corridor and were therefore unable to provide input on this subject. Harold Morgan stated that he would discuss the issue with others at the DOT to find out what plans were being considered for I-90 and get comments back to the City. The City verbally requested to be involved in the planning process on regional issues such as this that may directly impact the City. The City is also concerned about solid waste hauling decisions that are being made by others that may directly impact the groundwater quality in the well field area. The City of Seattle, King County, and Snohomish County are all considering hauling all of their garbage to the Cedar Hills landfill east of Renton. It is estimated that 150 transfer station container trucks could pass through the Maple Valley interchange at I-405 each day.

Control of freeway surface drainage was discussed in detail. The WSDOT representatives thought that Jersey barriers could be incorporated into the freeway design along the shoulder to divert drainage to the freeway storm drain system. They indicated that they would look at the area after the meeting to determine if interim barriers could be used to divert runoff to the existing storm drain system.

It was pointed out that due to Interstate funding requirements, the City should submit a formal request for any improvements the City may wish WSDOT to consider. The City indicated that WSDOT can expect a letter in the future from them.

WSDOT anticipates resurfacing I-405 through Renton this summer. Bob Bergstrom pointed out that last time this was done the tack coat ran into the storm drain system and polluted the Cedar River. WSDOT will address this concern to prevent a similar incident.

The location of the northbound exit to Highway 169 with respect to Well No. 9 is a concern of DSHS. Redesign of exits and on-ramps is not anticipated. The City will include this issue in their letter to WSDOT. Collection of surface runoff from the interchange is a major concern.

The possibility of declaring the well field as a sole source of water supply was discussed. Bob McCormick thought that this may cause federal funding problems for the City on other projects. The issue was discussed to consider whether such a declaration could force WSDOT to make certain freeway improvements or possibly imposing traffic restrictions on types of materials hauled through the area.

WSDOT requested a copy of the draft Well Field Protection Study Report when it is complete. It was agreed that the City would provide a copy to them.

jmn/se551511

CITY OF RENTON
INCORPORATED SEPTEMBER 6, 1901

BARBARA Y. SHINPOCH
MAYOR

PUBLIC WORKS DEPARTMENT
RICHARD C. HOUGHTON ● DIRECTOR
MUNICIPAL BUILDING 200 MILL AVE. SO. RENTON, WASH. 98055
206 235-2569

April 30, 1984

Washington State Department of Transportation
6431 Corson Ave. S.
Seattle, WA 98108

ATTENTION: Mr. R. Bockstruk

SUBJECT: Protection of Renton Cedar River Aquifer from Potential Contamination Related to Interstate-405

Gentlemen:

This letter is written as a followup to our meeting of March 20, 1984, at Renton City Hall, In that meeting, also attended by representatives of DSHS, DOE, and CH2m Hill, We discussed the following:

Background and purpose of our current Well Field Protection Study

WSDOT plans and schedule for improvements to I-405

Ways to prevent potential contamination of the well field from I-405 sources

The City of Renton depends upon the Cedar River aquifer adjacent to I-405 for almost 85 (eighty-five) percent of its potable water supply. No comparable sources of potable water are available. The City has for many years enjoyed high-quality water from this source. However, it has recently been recognized that the Cedar River aquifer is vulnerable to contamination from many sources. One of the principal sources is I-405.

The City of Renton intends to protect and preserve existing water quality in the aquifer. It is our wish to be actively involved in regional decisions regarding transportation of hazardous materials on I-405, State Route 169, and related state highways. This would include assessment of impact on I-405 traffic caused by a proposed ban on transportation of hazardous materials through the I-90 tunnels west of Lake Washington.

The City hereby requests that WSDOT carefully consider the following items in developing plans for improvements (expansion and realignment) of I-405 through Renton from South Renton to Sunset Boulevard.

Siting of I-405 and on-/off-ramps relative to existing well field facilities

Containment of all surface runoff including that from accidental spills

An oil/containment trap in the storm sewer between I-405 and the discharge to the Cedar River

Location of the discharge point downriver from the well field

Impact barriers (jersey barriers or other means) along the soutside freeway lanes and on-/off-ramps to prevent accidental spills beyond the pavement limits and to prevent physical damage to well field buildings from out-of-control vehicles

Paving of shoulder areas and collection of surface runoff beyond the paved areas within the right-of-way

The City would like to be involved in evaluation of alternatives related to the above items. We request that protection of the well field and aquifer be specifically addressed in the Environmental Impact Statement currently being prepared by WSDOT.

The City also requests that the following interim improvements be implemented by WSDOT prior to the planned expansion of I-405 in 1987:

Jersey barriers along the east shoulder of I-405 from the north end of the S-curve structure to the bottom of the northbound offramp at SR169 to protect Wells 8 and 9 from impact and to direct surface runoff to existing WSDOT storm drains

Piping of storm flows in lieu of continued use of overland (surface) ditches such as that observed in the northeast corner of the I-405/SR169 Interchange to prevent infiltration of contaminated storm water

Asphalt surfacing of runoff areas such as the gravel (dirt) shoulders under the overpass at SR169 to prevent infiltration of contaminated

Installation of a piped collection system on the existing downspouts from the elevated structure over and south of the Cedar River, to discharge to the river, preferably downstream of Wells 1 and 2 storm water

Prevention of runoff or infiltration to the ground of asphalt tack coat when resurfacing the S-curve pavement this summer

The City plans to recontour the northwest corner of Cedar River Park to prevent entry of runoff from I-405. This work will be included in our Well 9 construction scheduled for this summer. Separate correspondence on storm sewer improvement in this area has been and will be directed to you during design and construction of this work.

The City also requests that WSDOT place the well field area on your list of sensitive areas where spraying of herbicides and pesticides is prohibited or limited.

A draft of our Well field Protection Study Report will soon be completed by our consultant, CH2M Hill. We will forward a copy of the draft report to you for review and comment.

We appreciate your concern for Renton's well field and anticipate that we can work together to develop adequate well field protection measures which are mutually satisfactory.

Please call me if you have any questions.

Sincerely,

Barbara Y. Shinpoch

Barbara Y. Shinpoch
Mayor

Enclosure: Map

cc: Mr. Moe R. Batra, DSHS
Mr. Dale Wirkkala, WSDOT
Mr. Robert McCormick, DOE (Redmond)
Mr. Art Storbo, CH2M Hill

APPENDIX D

CALIFORNIA BURIED STORAGE TANK LEGISLATION

CHAPTER 1046

An act to add Section 25150.1 to, and to add Chapter 6.7 (commencing with Section 25280) to Division 20 of, the Health and Safety Code, relating to hazardous substances.

[Approved by Governor September 23, 1983. Filed with Secretary of State September 23, 1983.]

LEGISLATIVE COUNSEL'S DIGEST

AB 1362, Sher. Hazardous substances: underground storage.

(1) Existing law does not specifically regulate the storage of hazardous substances in underground tanks.

This bill would prohibit any person from owning or operating an underground storage tank used for the storage of hazardous materials without a permit to the owner from a local agency, which is defined as the department or office so designated by a county or a city, if the city assumes exclusive jurisdiction for enforcement of these provisions. The bill would define terms, including "hazardous substance," and would exclude from the definition of underground storage tank a tank used for the storage of hazardous substances used for the control of cattle parasites and subject to the supervision of the county agricultural commissioner, if certain determinations are made by the commissioner, a tank located on a farm and used to store motor vehicle fuel for a specified purpose, a tank used for aviation or motor vehicle fuel, located within one mile of a farm and used by a licensed pest control operator, and specified structures. The bill would require the State Water Resources Control Board to conduct a study concerning applying certain standards to all of these exempted tanks and structures by January 1, 1985.

The bill would require the State Department of Health Services to compile a master list of hazardous substances, and to make it available, as specified, by June 30, 1984, notwithstanding any other provision of law, including provisions concerning the Office of Administrative Law's regulatory review process. The bill would also authorize the department to revise this list in accordance with specified procedures.

The bill would require each county to implement these provisions and would authorize a county, or a city assuming local jurisdiction, to implement design and construction standards in addition to those specified in the bill. The bill would also authorize a county or city to implement a provision concerning tanks installed after January 1, 1984, until the board adopts specified regulations.

The bill would specify the conditions for transferring a permit, would specify the term of a permit to operate an underground storage tank as 5 years, and would prohibit a local agency from

issuing or renewing a permit if the local agency inspects the tank and determines that the underground storage tank does not comply with certain provisions. The bill would require that certain information be provided on the application for a permit by the owner of the tank and would also require the permittee to complete an annual report detailing any specified changes. The bill would impose certain procedures concerning the use of trade secrets. The bill would also require a permittee who stores a hazardous substance not listed on the application to apply for a new or amended permit within 30 days after commencing storage.

The bill would authorize a county, or city which assumes exclusive jurisdiction, to establish a fee, which would be paid by each person submitting an application for a permit, or a renewal or amendment thereof, to cover the costs incurred by its implementation of these provisions. The bill would require the fee to include a surcharge, to be determined annually by the Legislature, to cover the costs of the board and would require the surcharge to be deposited in the Underground Storage Tank Fund created in the General Fund. The bill would provide that the money in the fund is available, upon appropriation by the Legislature, to the board for purposes of carrying out the bill. The bill would require the fee to include a one-time $5 surcharge, to be forwarded to the State Water Resources Control Board to cover the costs of developing regulations.

The bill would require a local agency to inspect every underground storage tank, within its jurisdiction, every 3 years, or to require a permitholder to employ, periodically, special inspectors to conduct the inspection, issue a report, and make recommendations which the permitholder would be required to implement or demonstrate to the local agency why these recommendations should not be implemented. The bill would authorize a representative of the local agency or the board to enter into any place where underground storage tanks are located, for inspections, testing, obtaining samples, and copying records, and would authorize these persons to also enter into real property which is within 2,000 feet of such a place, for these purposes.

The bill would require that all underground storage tanks installed after January 1, 1984, comply with certain requirements concerning design, construction, monitoring systems, and drainage, and would require that all underground storage tanks installed on or before that date have a monitoring system installed before January 1, 1985, and have a means for inspection. The bill would exempt underground storage tanks for motor vehicle fuel storage installed after January 1, 1984, from certain design and construction standards, if the tank either has a specified primary containment construction material and a leak monitoring system or if the tank has a pressurized piping system which is monitored. A local agency would be required to review the permit whenever there has been an unauthorized release [illegible] hazards, or causes tank deterioration, or whenever the agency determines that the tank is unsafe. A local agency would also be required to consider certain factors in determining whether to modify or terminate a permit.

The bill would require that if the owner of the tank is not the operator, the owner is required to provide certain information to the operator and enter into a written contract with the operator requiring the operator to monitor the tank.

The bill would require that unauthorized releases be recorded and reported by the operator of the underground storage tank within 24 hours to the local agency, as specified. The bill would authorize a local agency to request the department or a regional water quality control board to utilize that agency's authority to take corrective action to remedy the effects of a release of a hazardous substance from an underground storage tank. The bill would authorize the permitholder of an underground storage tank containing motor vehicle fuel not under pressure to repair the tank after an unauthorized release from that tank with an interior-coating process once, if the tank meets specified requirements, but if the results of a certain test show that a serious corrosion problem exists, the local agency may require additional protection or prohibit the repair. The bill would repeal this authorization if specified regulations are adopted. The bill would also prohibit a person from abandoning, closing, or temporarily ceasing to operate an underground storage tank unless certain actions are taken by that person. The bill would make an operator or owner of a tank liable for a civil penalty of from $500 to $5,000 for failing to take certain actions concerning permitting, monitoring, maintaining records, compliance, and closure of an underground storage tank, and would impose upon a person falsifying records, or failing to file the report of an unauthorized release, a fine of from $5,000 to $10,000, or imprisonment in the county jail for up to one year, or both.

The bill would exempt cities and counties which have enacted ordinances, before January 1, 1984, from the provisions of this act if the ordinances provide, at least, for double containment and monitoring of underground storage tanks and permits are issued under the ordinance. The bill would require a local agency so exempted to submit specified reports and information to the board. The bill would specify that its provisions do not otherwise affect the authority of a city or county to adopt ordinances concerning information, investigations, inspections, or enforcement.

The bill would require the State Water Resources Control Board to issue regulations implementing specified provisions by January 1, 1985, and would authorize the board to adopt regulations implementing other provisions.

The bill would also state the intent of the Legislature that these provisions are of statewide interest and concern and are intended to preempt the local regulation of underground storage tanks, as

specified, and that the program created within the department by this bill will be funded both through the department's budget commencing with the 1984–85 fiscal year and through the use of existing financial resources.

The bill would authorize a permitholder to apply to the board for a categorical variance from specified provisions and to apply to the regional water quality control board for a site-specific variance from specified provisions, pursuant to a specified procedure.

(2) The bill would provide that, notwithstanding Section 2231.5 of the Revenue and Taxation Code, this act does not contain a repealer, as required by that section; therefore, the provisions of the act would remain in effect unless and until they are amended or repealed by a later enacted act.

(3) Article XIII B of the California Constitution and Sections 2231 and 2234 of the Revenue and Taxation Code require the state to reimburse local agencies and school districts for certain costs mandated by the state. Other provisions require the Department of Finance to review statutes disclaiming these costs and provide, in certain cases, for making claims to the State Board of Control for reimbursement.

This bill would impose a state-mandated local program by requiring counties to carry out a program of permitting and inspecting underground tanks used for the storage of hazardous substances and by imposing obligations upon cities, counties, and districts which operate underground storage tanks. Although the bill provides for a self-financing provision concerning the administration of these provisions, it would provide that no appropriation is made for the other imposed costs, by this act for the purpose of making reimbursement pursuant to the constitutional mandate or Section 2231 or 2234, but would recognize that local agencies and school districts may pursue their other. available remedies to seek reimbursement for these costs.

The people of the State of California do enact as follows:

SECTION 1. (a) The Legislature finds and declares as follows:

(1) Substances hazardous to the public health and safety, and to the environment, are stored prior to use or disposal in thousands of underground locations in the state.

(2) Underground tanks used for the storage of hazardous substances and wastes are potential sources of contamination of the ground and underlying aquifers, and may pose other dangers to public health and the environment.

(3) In several known cases, underground storage has resulted in undetected and uncontrolled releases of hazardous substances into the ground. These releases have contaminated public drinking water supplies and created a potential threat to the public health and to the waters of the state.

(4) The Legislature has previously enacted laws regulating the management of hazardous wastes, including statutes providing the means to clean up releases of hazardous substances into the environment when the public health, domestic livestock, wildlife and the environment are endangered. Current laws do not specifically govern the construction, maintenance, testing and use of underground tanks used for the storage of hazardous substances, or the short-term storage of hazardous wastes prior to disposal, for the purposes of protecting the public health and the environment.

(5) The protection of the public from releases of hazardous substances is an issue of statewide concern.

(b) The Legislature therefore declares that it is in the public interest to establish a continuing program for the purpose of preventing contamination from, and improper storage of, hazardous substances stored underground. It is the intent of the Legislature, in enacting this act, to establish orderly procedures that will ensure that newly constructed underground storage tanks meet appropriate standards and that existing tanks be properly maintained, inspected, and tested so that the health, property, and resources of the people of the state will be protected.

SEC. 2. Section 25150.1 is added to the Health and Safety Code, to read:

25150.1. The requirements in Sections 25284 and 25284.1 apply to the construction, operation, maintenance, monitoring, and testing of underground storage tanks, as defined in subdivision (m) of Section 25280, which are required to obtain hazardous waste facilities permits from the department. The department shall adopt regulations implementing the requirements of Sections 25284 and 25284.1, for regulating the construction, operation, maintenance, monitoring, and testing of underground storage tanks used for the storage of hazardous wastes which standards and regulations are necessary to protect against hazards to the public health, to domestic livestock, to wildlife, or to the environment. The regulations department shall adopt the regulations by January 1, 1985. If the regulations are not adopted by that date, the regulations adopted by the board implementing Section 25284.1 shall be deemed to be the regulations of the department pursuant to this section until new regulations are adopted by the department pursuant to this section.

SEC. 3. Chapter 6.7 (commencing with Section 25280) is added to Division 20 of the Health and Safety Code, to read:

CHAPTER 6.7. UNDERGROUND STORAGE OF HAZARDOUS SUBSTANCES

25280. For purposes of this chapter, the following definitions apply:

(a) "Department" means the State Department of Health Services.

(b) "Facility" means any one, or combination of, underground storage tanks used by a single business entity at a single location or site.

(c) "Hazardous substance" means all of the following liquid and solid substances, unless the department, in consultation with the State Water Resources Control Board, determines the substance could not adversely affect the quality of the waters of the state:

(1) Substances on the list prepared by the Director of the Department of Industrial Relations pursuant to Section 6382 of the Labor Code.

(2) Hazardous substances, as defined in Section 25316.

(3) Any substance or material which is classified by the National Fire Protection Association (NFPA) as a flammable liquid, a class II combustible liquid, or a class III-A combustible liquid.

(d) "Local agency" means the department, office, or other agency of a county or city designated pursuant to Section 25282.

(e) "Person" means an individual, trust, firm, joint stock company, corporation, including a government corporation, partnership, and association. "Person" also includes any city, county, district, the state, or any department or agency thereof.

(f) "Board" means the State Water Resources Control Board.

(g) "Primary containment" means the first level of containment, such as the portion of a tank which comes into immediate contact on its inner surface with the hazardous substance being contained.

(h) "Product-tight" means impervious to the substance which is contained, or is to be contained, so as to prevent the seepage of the substance from the primary containment. To be product-tight, the tank shall not be subject to physical or chemical deterioration by the substance which it contains over the useful life of the tank.

(i) "Secondary containment" means the level of containment external to, and separate from, the primary containment.

(j) "Single-walled" means construction with walls made of only one thickness of material. For the purpose of this chapter, laminated, coated, or clad materials shall be considered single-walled.

(k) "Storage" or "store" means the containment, handling or treatment of hazardous substances, either on a temporary basis or for a period of years. "Storage" or "store" does not mean the storage of hazardous wastes in an underground storage tank if the person operating the tank has been issued a hazardous waste facilities permit by the department pursuant to Section 25200 or granted interim status under Section 25200.5.

(*l*) "Unauthorized release" means any release or emission of any hazardous substance which does not conform to the provisions of this chapter, unless this release is authorized by the State Water Resources Control Board pursuant to Division 7 (commencing with Section 13000) of the Water Code.

(m) "Underground storage tank" means any one or combination of tanks [redacted] pes [redacted] ect [redacted] eret [redacted] hich [redacted] ed [redacted] e

storage of hazardous substances and which is substantially or totally beneath the surface of the ground. "Underground storage tank" does not include any of the following:

(1) A tank used for the storage of hazardous substances used for the control of external parasites of cattle and subject to the supervision of the county agricultural commissioner if the county agricultural commissioner determines, by inspection prior to use, that the tank provides a level of protection equivalent to that required by Section 25284, if the tank was installed after June 30, 1984, or protection equivalent to that provided by Section 25284.1, if the tank was installed on or before June 30, 1984.

(2) Tanks which are located on a farm and store motor vehicle fuel which is used only to propel vehicles used primarily for agricultural purposes.

(3) Tanks used for aviation or motor vehicle fuel located within one mile of a farm and the tank is used by a licensed pest control operator, as defined in Section 11705 of the Food and Agricultural Code, who is primarily involved in agricultural pest control activities.

(4) Structures such as sumps, separators, storm drains, catch basins, oil field gathering lines, refinery pipelines, lagoons, evaporation ponds, well cellars, separation sumps, lined and unlined pits, sumps and lagoons. Sumps which are a part of a monitoring system required under Section 25284 or Section 25284.1 are not exempted by this section. These structures may be regulated by the board pursuant to the Porter-Cologne Water Quality Control Act (Division 7 (commencing with Section 13000) of the Water Code) to ensure that they do not pose a threat to water quality. The board shall conduct a study which analyzes the necessity of applying the standards of Section 25284 and 25284.1 to the structures exempted by this section. The board shall complete the study by January 1, 1985. After completing the study the board shall review existing regulatory authority over such structures.

(n) "Special inspectors" means a professional engineer, registered pursuant to Chapter 7 (commencing with Section 6700) of Division 3 of the Business and Professions Code, who is qualified to attest, at a minimum, to structural soundness, seismic safety, the compatibility of construction materials with contents, cathodic protection, and the mechanical compatibility of the structural elements.

(o) "Owner" means the owner of an underground storage tank.

(p) "Operator" means the operator of an underground storage tank.

(q) "Pipe" means any pipeline or system of pipelines which is used in connection with the storage of hazardous substances and which are not intended to transport hazardous substances in interstate or intrastate commerce or to transfer hazardous materials in bulk to or from a marine vessel.

25281. (a) The department shall compile a comprehensive [redacted]

master list of hazardous substances. The master list shall be made available to the public and mailed to each local agency no later than June 30, 1984, notwithstanding any other provision of law, including Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code. Local agencies and owners or operators of underground storage tanks shall use the master list or, when adopted, the revised list adopted pursuant to subdivision (b), to determine which underground storage tanks require permits pursuant to this chapter. Hazardous substances included on the list may be denominated by scientific, common, trade, or brand names.

(b) The department may revise, when appropriate, the master list of all the hazardous substances specified in subdivision (a). The revised list of hazardous substances shall be prepared and adopted, and may be further revised, in accordance with Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code.

25282. Every county shall implement this chapter pursuant to the regulations adopted by the board. A city may, by ordinance, assume responsibility for the implementation of this chapter pursuant to the regulations adopted by the board and, if so, shall have exclusive jurisdiction within the boundary of the city for the purposes of carrying out this chapter. A city which assumes responsibility for implementation of this chapter shall provide notice of its program and consult with the county in which the city is located. A county shall designate a department, office, or other agency of that county as the local agency responsible for administering and enforcing the provisions of this chapter and a city which assumes responsibility for implementing this chapter shall also make a similar designation.

25283. (a) Except as provided in subdivision (b), no person shall own or operate an underground storage tank unless a permit for its operation has been issued by the local agency to the owner. Each local agency shall prepare a form which provides for the acceptance of the obligations of a transferred permit by any person who is to assume the ownership of an underground storage tank from the previous owner and is to be transferred the permit to operate the tank. That person shall complete the form accepting the obligations of the permit and submit the completed form to the local agency at least 30 days after the ownership of the underground storage tank is to be transferred. A local agency may review and modify, or terminate, the transfer of the permit to operate the underground storage tank, pursuant to the criteria specified in subdivision (c) of Section 25284.1, upon receiving the completed form.

(b) Any person assuming ownership of an underground storage tank used for the storage of hazardous substances for which a valid operating permit has been issued shall have 30 days after the date of assumption of ownership to apply for an operating permit pursuant to Section 25283.2 or, if accepting a transferred permit, shall submit to the local agency the completed form accepting the obligations of the transferred permit, as specified in subdivision (a). During the period from the date of application until the permit is issued or refused, the person shall not be held to be in violation of this section.

(c) When, in its judgment, it is appropriate to do so, the local agency may issue a single permit to a person for a facility.

25283.1. A permit to operate issued by the local agency pursuant to Section 25283 shall be effective for five years. A local agency shall not issue or renew a permit to operate an underground storage tank if the local agency inspects the tank and determines that the tank does not comply with this chapter.

25283.2. (a) An application for a permit to operate an underground storage tank, or for renewal of the permit, shall be made, by the owner, on a standardized form prepared by the board and provided by the local agency and shall be accompanied by the appropriate fee, as specified in Section 25283.3. The local agency shall provide the board with a copy of the completed application.

(b) The board shall store this information on a computer, for the purpose of managing and appropriately cross-referencing and indexing this data. The application form shall include, but not be limited to, requests for the following information:

(1) A description of the construction of the underground storage tank or tanks.

(2) A list of all the hazardous substances which are or will be stored in the underground storage tank or tanks, specifying the hazardous substances for each underground storage tank.

(3) A description of the monitoring program for the underground storage tank or tanks.

(4) The name and address of the person, firm, or corporation which owns the underground storage tank or tanks and, if different, the name and address of the person who operates the underground storage tank or tanks.

(5) The address of the facility at which the underground storage tank or tanks are located.

(6) The name of the person making the application.

(7) The name and 24-hour phone number of the contact person in the event of an emergency involving the facility.

(8) If the owner or operator of the underground storage tank is a public agency, the application shall include the name of the supervisor of the division, section, or office which operates the tank.

(c) As a condition of any permit to operate an underground storage tank, the permittee shall complete an annual report form, prepared by the board, which will detail any changes in the usage of any underground storage tanks, including the storage of new hazardous substances, changes in monitoring procedure and unauthorized release occurrences, as defined in Sections 25284.3 and 25284.4. The requirements for computer storage and management of the data generated by the application forms specified in subdivision (b) also apply to information generated by the annual reports.

(d) If a permittee stores in an underground storage tank or tanks a hazardous substance which is not listed in the application, as required by paragraph (2) of subdivision (b), the permittee shall apply for a new or amended permit within 30 days after commencing the storage of that hazardous substance.

25283.3. (a) A fee shall be paid to the local agency by each person who submits an application for a permit to operate an underground storage tank or to renew or amend a permit. The governing body of the county, or a city which assumes enforcement jurisdiction, shall establish the amount of the fees at a level sufficient to pay the necessary and reasonable costs incurred in administering this chapter, including, but not limited to, permitting and inspection responsibilities. The governing body may provide for the waiver of fees when a public agency makes an application for a permit to operate or an application to renew a permit.

(b) This fee shall include a surcharge, the amount of which shall be determined by the Legislature annually to cover the costs of the board in carrying out its responsibilities under this chapter. The surcharge shall be transmitted to the board and deposited in the Underground Storage Tank Fund hereby created in the General Fund. The money in this account is available, upon appropriation by the Legislature, to the board for the purposes of implementing this chapter.

(c) From January 1, 1984 to June 30, 1984 there shall be a one-time surcharge of five dollars ($5) on each tank permitted pursuant to this chapter, which surcharge shall be forwarded to the board, by the local agency, to cover the costs of developing the statewide regulations implementing this chapter, and shall be deposited in the Underground Storage Tank Fund.

25283.4. (a) The local agency shall inspect every underground storage tank within its jurisdiction at least once every three years. The purpose of the inspection is to determine whether the tank complies with the design and construction standards of Section 25284 or 25284.1, whichever is applicable, whether the operator has monitored and tested the tank as required by the permit, and whether the tank is in a safe operating condition. After an inspection, the local agency shall prepare a compliance report detailing the inspection and shall send a copy of this report to the permitholder.

(b) In addition to, or instead of, the inspections specified in subdivision (a), the local agency may require the permitholder to employ, periodically, special inspectors to conduct an audit or assessment of the permitholder's facility to determine whether the facility complies with the factors specified in subdivision (a) and to prepare a special inspection report with recommendations concerning the safe storage of hazardous materials at the facility. The report shall contain recommendations consistent with the provisions of this chapter, where appropriate. A copy of the report shall be filed with the local agency at the same time the inspector submits the report to the permitholder. Within 30 days after receiving this report, the permitholder shall file with the local agency a plan to implement all recommendations contained in the report or shall demonstrate, to the satisfaction of the local agency, why these recommendations should not be implemented.

25283.5. In order to carry out the purposes of this chapter, any duly authorized representative of the local agency or the board has the authority specified in Section 25185, with respect to any place where underground storage tanks are located, and in Section 25185.5, with respect to real property which is within 2,000 feet of any place where underground storage tanks are located.

25283.6. (a) "Trade secrets," as used in this chapter, may include, but is not limited to, any formula, plan, pattern, process, tool, mechanism, compound, procedure, production data, or compilation of information which is not patented, which is known only to certain individuals within a commercial concern who are using it to fabricate, produce, or compound an article of trade or a service having commercial value, and which gives its user an opportunity to obtain a business advantage over competitors who do not know or use it.

(b) The board or a local agency may disclose trade secrets received by the board or the local agency pursuant to this chapter to authorized representatives or other governmental agencies only in connection with the board's or local agency's responsibilities pursuant to this chapter. The board and the local agency shall establish procedures to ensure that these trade secrets are utilized only in connection with these responsibilities and are not otherwise disseminated without the consent of the person who provided the information to the board or the local agency.

(c) Any person providing information pursuant to Section 25283.2 shall, at the time of its submission, identify all information which the person believes is a trade secret. Any information or record not identified as a trade secret is available to the public, unless exempted from disclosure by other provisions of law.

(d) Where the local agency, by ordinance, provides an alternative to the listing of a substance which is a trade secret, the person storing that substance shall provide the identification of the material directly to the board pursuant to this section.

25284. Every underground storage tank installed after January 1, 1984, shall meet the following requirements:

(a) Be designed and constructed to provide primary and secondary levels of containment of the hazardous substances stored in them in accordance with the following performance standards:

(1) Primary containment shall be product-tight.

(2) Secondary containment shall be constructed to prevent structural weakening as a result of contact with any released hazardous substances, and also shall be capable of storing, for the maximum anticipated period of time necessary for the recovery of

any released hazardous substance.

(3) In the case of an installation with one primary container, the secondary containment shall be large enough to contain at least 100 percent of the volume of the primary tank.

(4) In the case of multiple primary tanks, the secondary container shall be large enough to contain 150 percent of the volume of the largest primary tank placed in it, or 10 percent of the aggregate internal volume of all primary tanks, whichever is greater.

(5) If the facility is open to rainfall, then the secondary containment must be able to additionally accommodate the volume of a 24-hour rainfall as determined by a 100-year storm history.

(6) Single-walled containers do not fulfill the requirement of an underground storage tank providing both a primary and a secondary containment.

(7) The design and construction of underground storage tanks for motor vehicle fuels storage need not meet the requirements of paragraphs (1) to (6), inclusive, if the primary containment construction is of glass fibre reinforced plastic, cathodically protected steel, or steel clad with glass fibre reinforced plastic, any such alternative primary containment is installed in conjunction with a system that will intercept and direct a leak from any part of the tank to a monitoring well to detect any release of motor vehicle fuels stored in the tank and which is designed to provide early leak detection, response, and to protect groundwater from releases, and if the monitoring is in accordance with the alternative method identified in paragraph (3) of subdivision (b) of Section 25284.1. Pressurized piping systems connected to underground storage tanks used for the storage of motor vehicle fuels and monitored in accordance with paragraph (3) of subdivision (b) of Section 25284.1 shall also be deemed to meet the requirements of this subdivision.

(b) Be designed and constructed with a monitoring system capable of detecting the entry of the hazardous material stored in the primary containment into the secondary containment. If water could intrude into the secondary containment, a means of monitoring for water intrusion and for safely removing the water shall also be provided.

(c) When required by the local agency, a means of overfill protection for any primary tank, including an overfill prevention device or an attention-getting higher level alarm, or both. Primary tank filling operations of underground storage tanks containing motor vehicle fuels which are visually monitored and controlled by a facility operator satisfy the requirements of this paragraph.

(d) Different substances that in combination may cause a fire or explosion, or the production of flammable, toxic, or poisonous gas, or the deterioration of a primary or secondary container, shall be separated in both the primary and secondary containment so as to avoid potential intermixing.

(e) If water could enter into the secondary containment by precipitation or infiltration, the facility shall contain a means of removing the water by the owner or operator. This removal system shall also provide for a means of analyzing the removed water for hazardous substance contamination and a means of disposing of the water, if so contaminated, at an authorized disposal facility.

25284.1. For every underground storage tank installed on or before January 1, 1984, and used for the storage of hazardous substances the following actions shall be taken:

(a) On or before January 1, 1985, the owner shall outfit the facility with a monitoring system capable of detecting unauthorized releases of any hazardous substances stored in the facility, and thereafter, the operator shall monitor each facility, based on materials stored and the type of monitoring installed.

(b) Provide a means for visual inspection of the tank, wherever practical, for the purpose of the monitoring required by subdivision (a). Alternative methods of monitoring the tank on a monthly, or more frequent basis, may be required by the local agency, consistent with the regulations of the board.

The alternative monitoring methods include, but are not limited to, the following methods:

(1) Pressure testing, vacuum testing or hydrostatic testing of the piping systems or underground storage tanks.

(2) A groundwater monitoring well or wells which are down gradient and adjacent to the underground storage tank, vapor analysis within a well where appropriate, and analysis of soil borings at the time of initial installation of the well. The board shall develop regulations specifying monitoring alternatives. The local agency, or any other public agency specified by the local agency, shall approve the location and number of wells, the depth of wells and the sampling frequency, pursuant to these regulations.

(3) For monitoring tanks containing motor vehicle fuels, daily gauging and inventory reconciliation by the operator, if inventory records are kept on file for one year and are reviewed quarterly, the tank is tested for tightness hydrostatically or, when appropriate with pressure between three and five pounds, inclusive, per square inch at time intervals specified by the board and whenever any pressurized system has a leak detection device to monitor for leaks in the piping. The tank shall also be tested for tightness hydrostatically or where appropriate, with pressure between three and five pounds, inclusive, per square inch whenever there is a shortage greater than the amount which the board shall specify by regulation.

25284.2. The operator of the underground storage facility shall monitor the facility using the method specified on the permit for the facility. Records shall be kept in sufficient detail to enable the local agency to determine that the operator has undertaken all monitoring activities required by the permit to operate.

If the operator is not the owner, the owner shall provide a copy of

the permit to the operator, enter into a written contract with the operator which requires the operator to monitor the tank as set forth in the permit, and provide the operator with a copy of Section 25287, or a summary of this section, in the form which the board specifies by regulation. The owner shall notify the local agency of any change of operator.

25284.3. Any unauthorized release from the primary containment which the operator is able to cleanup within eight hours, and which does not escape from the secondary containment, does not increase the hazard of fire or explosion and does not cause any deterioration of the secondary containment of the underground storage tank, shall be recorded on the operator's monitoring reports.

25284.4. (a) Any unauthorized release which escapes from the secondary containment, increases the hazard of fire or explosion, or causes any deterioration of the secondary containment of the underground tank shall be reported by the operator or the local agency within 24 hours after the release has been detected or should have been detected. A full written report shall be transmitted by the owner or operator of the underground storage tanks within five working days of the occurrence of the release.

The local agency shall review the permit whenever there has been an unauthorized release or when it determines that the underground storage tank is unsafe. In determining whether to modify or terminate the permit, the local agency shall consider the age of the tank, the methods of containment, the methods of monitoring, the feasibility of any required repairs, the concentration of the hazardous substances stored in the tank, the severity of potential unauthorized releases, and the suitability of any other long-term measures preventive measures which would meet the requirements of this chapter.

(b) In cooperation with the Office of Emergency Services, the board shall submit an annual statewide report by county, to the Legislature, of all unauthorized releases, indicating for each unauthorized release the operator, the hazardous substance, the quantity of the unauthorized release, and the actions taken to abate the problem.

(c) The reporting requirements imposed by this section are in addition to any requirements which may be imposed by Section 13271 of the Water Code.

25284.5. If there has been any unauthorized release, as defined in subdivision (a) of Section 25284.4, from an underground storage tank containing motor vehicle fuel not under pressure, the permitholder may repair the tank once by an interior-coating process if the tank meets all of the following requirements:

(a) An ultrasonic test, or comparable test, has been conducted to determine the thickness of the storage tank. If the result of the test indicates that a serious corrosion problem exists with regard to the tank, as determined by the person conducting the test, the local agency may require additional corrosion protection for the tank or may deny the authorization to repair.

(b) A hydrostatic test is an alternative to the ultrasonic test in subdivision (a). If the result of the test indicates that a serious problem exists with regard to the integrity of the tank, as determined by the person conducting the test or the local agency, the local agency may require additional protection for the tank or may deny authorization for the repair.

(c) A vacuum test has been conducted with a result indexed at not more than 5.3 inches of mercury. This requirement shall not be applicable if technology is not available for testing the tank on site using accepted engineering practices.

(d) Following the repair, the standard installation testing for requirements for underground storage tanks specified in Section 2-7.3 of the Flammable and Combustible Liquids Code, adopted by the National Fire Protection Association on November 20, 1981 (NFPA 30-1981), and published in the 1982 edition of the National Fire Code shall be followed.

(e) The material used to repair the tank by an interior-coating process is compatible with the motor vehicle fuel that is stored, as approved by the board by regulation.

(f) The material used to repair the tank by an interior-coating process is applied in accordance with nationally recognized engineering practices such as the American Petroleum Institute's recommended practice No. 1631 for the interior lining of existing underground storage tanks.

(g) The board may develop regulations, in consultation with the State Fire Marshal, for the repair of underground storage tanks, and the standards in this section shall remain in effect until the adoption of these regulations.

25285. The local agency may request the following agencies to utilize that agency's authority to remedy the effects of, and remove, any hazardous substance which has been released from an underground storage tank:

(a) The department which may take action pursuant to Chapter 6.8 (commencing with Section 25300) and, for this purpose, any unauthorized release shall be deemed a release as defined in Section 25320.

(b) A regional water quality control board may take action pursuant to Division 7 (commencing with Section 13000) of the Water Code and, for this purpose, the discharged hazardous substance shall be deemed a waste as defined in subdivision (d) of Section 13050.

25286. (a) No person shall abandon an underground storage tank or close or temporarily cease operating an underground storage tank, except as provided in this section.

(b) An underground storage tank which is temporarily taken out of service, but which the operator intends to return to use, shall

continue to be subject to all the permit, inspection, and monitoring requirements of this chapter, unless the operator complies with the provisions of subdivision (c) for the period of time the underground tank is not in use.

(c) No person shall close an underground storage tank unless the person undertakes all of the following actions:

(1) Demonstrates to the local agency that all residual amounts of the hazardous substance or hazardous substances which were stored in the tank prior to its closure have been removed, properly disposed of, and neutralized.

(2) Adequately seals the tank to minimize any threat to the public safety and the possibility of water intrusion into, or runoff from, the tank.

(3) Provides for, and carries out, the maintenance of the tank as the local agency determines is necessary, for the period of time the local agency requires.

(4) Demonstrates to the local agency that there has been no significant soil contamination resulting from a discharge in the area surrounding the underground storage tank or facility.

25287. (a) Any operator of an underground storage tank shall be liable for a civil penalty of not less than five hundred dollars ($500) or more than five thousand dollars ($5,000) per day for any of the following:

(1) Operates an underground storage tank which has not been issued a permit.

(2) Fails to monitor the underground storage tank, as required by the permit.

(3) Fails to maintain records, as required by Section 25283.2.

(4) Fails to report an unauthorized release, as required by Sections 25284.3 and 25284.4.

(5) Fails to properly close an underground storage tank, as required by Section 25286.

(b) Any owner of an underground storage tank shall be liable for a civil penalty of not less than five hundred dollars ($500) or more than five thousand dollars ($5,000) per day for any of the following:

(1) Failure to obtain a permit as specified by this chapter.

(2) Failure to repair an underground tank in accordance with the provisions of this chapter.

(3) Abandonment or improper closure of any underground tank subject to the provisions of this chapter.

(4) Knowing failure to take reasonable and necessary steps to assure compliance with this chapter by the operator of an underground tank.

(c) Any person who falsifies any monitoring records required by this chapter, or knowingly fails to report an unauthorized release, shall, upon conviction, be punished by a fine of not less than five thousand dollars ($5,000) or more than ten thousand dollars ($10,000), or by imprisonment in the county jail for not to exceed one year, or by both that fine and imprisonment.

(d) In determining both the civil and criminal penalties imposed pursuant to this section, the court shall consider all relevant circumstances, including, but not limited to, the extent of harm or potential harm caused by the violation, the nature of the violation and the period of time over which it occurred, the frequency of past violations, and the corrective action, if any, taken by the person who holds the permit.

(e) Penalties under this section are in addition to, and do not supersede or limit, any and all other legal remedies and penalties, civil or criminal, which may be applicable under other laws.

25288. (a) Any city, county or city and county which prior to January 1, 1984, has adopted an ordinance which, at a minimum meets the requirements set forth in Section 25284 and 25284.1, providing for double containment, monitoring of underground storage tanks and under which permits are issued therefor is exempt from the provisions of this chapter so long as the ordinance, as it may be amended, continues to meet the requirements of Sections 25284 and 25284.1.

Those local agencies which are exempted from this chapter pursuant to this subdivision shall submit to the board the application form and annual information specified by Section 25283.2 and shall submit a written report of any unauthorized release from an underground storage tank to the Office of Emergency Services within 10 working days from the time the local agency is notified of the unauthorized release.

(b) This chapter shall not be construed to limit or abridge the authority of any city, county, or city and county to adopt an ordinance requiring information, conducting investigations, inspections, or implementing and enforcing this chapter.

25288.1. The Legislature hereby finds and declares that the provisions of this chapter are of statewide interest and concern and are intended to preempt any local regulations of underground storage tanks, which regulations are for the protection of the soil from contamination or the protection of the beneficial uses of waters of the state, and which conflict with these provisions, except as provided in Section 25288.

25288.2. (a) The board shall develop regulations implementing the standards of Section 25284, 25284.1, 25284.3, 25284.4, 25284.5, 25286, and 25288.3. These regulations shall be promulgated by the board by January 1, 1985. The board may adopt regulations implementing Sections 25283.2, 25283.3 and 25283.6, as it deems necessary.

(b) Until the board adopts regulations, any city, county, or city and county may implement the provisions of Section 25284 with regard to permits. Any tank or facility so permitted shall be deemed to be in compliance with the regulations of the board implementing that section. Any underground storage tank installed within a city,

county or city and county which has not implemented the provisions of Section 25284 prior to the adoption of regulations by the board shall be subject to the same requirements of this chapter as an underground storage tank installed prior to January 1, 1984.

25288.3. (a) Any permitholder or permit applicant may apply to the board for a categorical variance from Section 25824 or 25824.1. The application shall include a description of the proposed alternative program, method, device, or process and description of the region, area, or circumstances under which the variance would apply. The board shall give notice to all affected cities, counties and city and counties. The board shall issue a categorical variance from this chapter if it finds, after investigation and at least two public hearings held in different areas of the state, as selected by the board, that the applicant has demonstrated by clear and convincing evidence that the proposed alternative will adequately protect the soil and the beneficial uses of water of the state from an unauthorized release. The board may remand the application to the appropriate regional board if it determines the application falls within subdivision (c).

(b) After January 1, 1984, any local agency may apply to the board for authority to implement design and construction standards for the containment of a hazardous substance in underground storage tanks which are in addition to those set forth in this chapter. The application shall include a description of the additional standards and a discussion of the need to implement them. The board shall approve the application if it finds, after an investigation and public hearing, that the local agency has demonstrated by clear and convincing evidence that the additional standards are necessary to adequately protect the soil and the beneficial uses of the waters of the state from unauthorized releases.

The board shall make its determination within six months of the date of application for authority to implement additional standards. If the board's determination upholds the application for authority to implement additional standards, the standards shall be effective as of the date of the determination. If the board's determination does not uphold the application, the additional standards shall not go into effect.

(c) Any permitholder or permit applicant may apply to the regional water quality control board having jurisdiction over the location of the permitholder or applicant's facility for a site-specific variance from Section 25824 or 25824.1. Before applying for a variance, the applicant shall contact the local agency. If the local agency decides that a variance would be necessary to approve a proposal, or if the local agency does not make a decision within 60 days, the permitholder or applicant may proceed with a variance application. At least 30 days before applying to the appropriate regional water quality control board the applicant shall notify and request the local agency and the city, county, or city and county

having land use jurisdiction over the city to join the applicant in the variance application. The city, county, or city and county shall provide notice of the receipt of this request to any person who has requested the notice. The local agency shall have 30 days from completion of any documents required by the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) and the receipt of the regional board's staff recommendation and analysis to act on the request. The regional board shall not hold a hearing upon the application until after the expiration of this 30-day period. Failure of the local agency or city, county, or city and county to join in the variance application shall not affect the request of the applicant to proceed with the variance application, except that the board shall consider the local agency's and the city, county, or city and county's recommendations in rendering its decision. The notification and request to join to the local agency and the city, county, or city and county and the appplication to the appropriate regional board shall include a description of the proposed alternative program method or process. The regional water quality control board shall approve the variance if it finds, after investigation and public hearing, that the applicant has demonstrated by clear and convincing evidence that because of special circumstances not generally applicable to other property or facilities, including size, shape, design, topography, location or surroundings, the strict application of the standards of this chapter would be unnecessary to adequately protect the soil and beneficial uses of the waters of the state from an unauthorized release, or that strict application would create practical difficulties not generally applicable to other facilities or property and that the proposed alternative will adequately protect the soil and beneficial uses of the waters of the state from an unauthorized release.

(d) Applicants for action under this section shall pay a fee determined by the state water quality control board to be reasonable in covering costs in considering the application.

25289. This chapter shall not be construed to limit or abridge the powers and duties granted to the State Department of Health Services by Chapter 6.5 (commencing with Section 25100) and by Chapter 6.8 (commencing with Section 25300) or to the State Water Resources Control Board and each regional water quality control board by Division 7 (commencing with Section 13000) of the Water Code.

SEC. 4. It is the intent of the Legislature that the program created by this act within the State Department of Health Services will be funded both through the department's budget commencing with the 1984–85 fiscal year and through the use of existing financial resources.

SEC. 5. Notwithstanding Section 2231.5 of the Revenue and Taxation Code, this act does not contain a repealer, as required by that section; therefore, the provisions of this act shall remain in effect

unless and until they are amended or repealed by a later enacted act.

SEC. 6. No appropriation is made and no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution or Section 2231 or 2234 of the Revenue and Taxation Code because the local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for administering the program or level of service mandated by this act or else it is recognized, that a local agency or school district may pursue any remedies to obtain reimbursement available to it under Chapter 3 (commencing with Section 2201) of Part 4 of Division 1 of that code.

o

ASSEMBLY BILL No. 3565

Introduced by Assembly Member Sher

February 17, 1984

An act to amend and renumber Sections 25280, 25281, 25282, 25283, 25283.1, 25283.2, 25283.3, 25283.4, 25283.5, 25283.6, 25284, 25284.1, 25284.2, 25284.3, 25284.4, 25284.5, 25285, 25286, 25287, 25288, 25288.1, 25288.2, 25288.3, and 25289 of, and to add Sections 25280 and 25299.6 to, the Health and Safety Code, relating to hazardous substances.

LEGISLATIVE COUNSEL'S DIGEST

AB 3565, as introduced, Sher. Hazardous substances: underground storage.

(1) Existing law regulates, generally, the storage of hazardous substances in underground tanks.

This bill would define "tank" for these purposes.

(2) Existing law requires the State Water Resources Control Board to complete a study by January 1, 1985, on the necessity of applying the requirements for underground storage tanks to certain structures exempted from these provisions and, after completing the study, to review existing regulatory authority over these structures.

This bill would instead require the board, after completing the study, to review existing regulatory authority.

(3) Existing law imposes a one-time $5 surcharge, until June 30, 1984, on each tank permitted pursuant to these provisions.

This bill would repeal that surcharge.

(4) Existing law exempts underground storage tanks for motor vehicle fuel storage installed after January 1, 1984, from certain design and construction standards, if the tank either has a specified primary containment construction material

and a leak monitoring system or if the tank has a pressurized piping system which is monitored.

This bill would require that such an exempt tank, with a monitored pressurized piping system, must also have the specified primary containment construction material and a leak monitoring system.

(5) Existing law requires owners of underground storage tanks installed on or before January 1, 1984, to outfit the facility with a monitoring system by January 1, 1985.

This bill would extend the date by which the facility must be outfitted to June 1, 1985.

(6) Existing law authorizes the permitholder of an underground storage tank which contains motor vehicle fuel not under pressure to repair the tank, after an unauthorized release from that tank, with an interior-coating process if the tank meets specified requirements, including the conducting of a vacuum test.

This bill would instead require the vacuum test to be conducted following the repair.

(7) Existing law requires a local agency which has enacted a specified ordinance prior to January 1, 1984, and is exempted from these provisions, to submit certain forms and notices to the board.

This bill would require these exempted local agencies to submit to the board a surcharge to be used, upon appropriation, for administering these provisions.

(8) Existing law authorizes a permitholder or permit applicant to apply to the board for a categorical variance from specified standards required for underground storage tanks.

This bill would allow only a permitholder to apply for a categorical variance and would specify that a categorical variance is an alternative procedure applicable to more than one local agency jurisdiction. The bill would require the variance to prescribe the conditions which the applicant is required to maintain and would authorize the board to modify or revoke the variance upon a specified finding.

(9) Existing law authorizes a permitholder or permit applicant to apply to the local regional water quality control board for a site-specific variance.

This bill would allow only a permitholder to apply for a site-specific variance and would specify that a site-specific variance is an alternative procedure applicable in one local agency jurisdiction.

(10) Under existing law, before applying for a site-specific variance, the applicant is required to contact the local agency and if the local agency decides that a variance would be necessary to approve a proposal, the applicant is allowed to proceed with the variance application.

This bill would instead provide that if the local agency determines that a site-specific variance is required, the applicant would be allowed to proceed with the application.

(11) Existing law requires the local agency to decide, within 30 days after completing specified documents, whether to join the applicant in the site-specific variance application and prohibits the regional board from holding a hearing upon the application until after this period expires.

This bill would instead require the regional board to hold a public hearing within 60 days after the specified documents are completed.

(12) Existing law requires that the notification of, and request to join, the variance application, to the local agency and the city, county, or city and county, and the application to the regional board, include a description of the proposed alternative method or process.

This bill would repeal that requirement.

(13) The bill would provide that, notwithstanding Section 2231.5 of the Revenue and Taxation Code, this act does not contain a repealer, as required by that section; therefore, the provisions of the act would remain in effect unless and until they are amended or repealed by a later enacted act.

(14) Article XIII B of the California Constitution and Sections 2231 and 2234 of the Revenue and Taxation Code require the state to reimburse local agencies and school districts for certain costs mandated by the state. Other provisions require the Department of Finance to review statutes disclaiming these costs and provide, in certain cases, for making claims to the State Board of Control for reimbursement.

This bill would impose a state-mandated local program by requiring that cities, counties, and districts operating

underground storage tanks for motor vehicle fuel storage equipped with a monitored pressurized piping system provide the tank with additional equipment.

The bill would provide that no appropriation is made by this act for the purpose of making reimbursement pursuant to the constitutional mandate or Section 2231 or 2234, but would recognize that local agencies and school districts may pursue their other available remedies to seek reimbursement for these costs.

Vote: majority. Appropriation: no. Fiscal committee: yes. State-mandated local program: yes.

The people of the State of California do enact as follows:

SECTION 1. Section 25280 is added to the Health and Safety Code, to read:

25280. (a) The Legislature finds and declares as follows:

(1) Substances hazardous to the public health and safety, and to the environment, are stored prior to use or disposal in thousands of underground locations in the state.

(2) Underground tanks used for the storage of hazardous substances and wastes are potential sources of contamination of the ground and underlying aquifers, and may pose other dangers to public health and the environment.

(3) In several known cases, underground storage has resulted in undetected and uncontrolled releases of hazardous substances into the ground. These releases have contaminated public drinking water supplies and created a potential threat to the public health and to the waters of the state.

(4) The Legislature has previously enacted laws regulating the management of hazardous wastes, including statutes providing the means to clean up releases of hazardous substances into the environment when the public health, domestic livestock, wildlife, and the environment are endangered. Current laws do not specifically govern the construction, maintenance,

testing, and use of underground tanks used for the storage of hazardous substances, or the short-term storage of hazardous wastes prior to disposal, for the purposes of protecting the public health and the environment.

(5) The protection of the public from releases of hazardous substances is an issue of statewide concern.

(b) The Legislature therefore declares that it is in the public interest to establish a continuing program for the purpose of preventing contamination from, and improper storage of, hazardous substances stored underground. It is the intent of the Legislature, in enacting this chapter, to establish orderly procedures that will ensure that newly constructed underground storage tanks meet appropriate standards and that existing tanks be properly maintained, inspected, and tested so that the health, property, and resources of the people of the state will be protected.

SEC. 2. Section 25280 of the Health and Safety Code is amended and renumbered to read:

~~25280~~

25281. For purposes of this chapter, the following definitions apply:

~~(a) "Department" means the State Department of Health Services.~~

~~(b) "Facility" means any one, or combination of, underground storage tanks used by a single business entity at a single location or site.~~

~~(c) "Hazardous substance" means all of the following liquid and solid substances, unless the department, in consultation with the State Water Resources Control Board, determines the substance could not adversely affect the quality of the waters of the state:~~

~~(1) Substances on the list prepared by the Director of the Department of Industrial Relations pursuant to Section 6382 of the Labor Code.~~

~~(2) Hazardous substances, as defined in Section 25316.~~

~~(3) Any substance or material which is classified by the National Fire Protection Association (NFPA) as a flammable liquid, a class II combustible liquid, or a class

III/A combustible liquid.

(d) "Local agency" means the department, office, or other agency of a county or city designated pursuant to Section 25282.

(e) "Person" means an individual, trust, firm, joint stock company, corporation, including a government corporation, partnership, and association. "Person" also includes any city, county, district, the state, or any department or agency thereof.

(f) "Board" means the State Water Resources Control Board.

(g) "Primary containment" means the first level of containment, such as the portion of a tank which comes into immediate contact on its inner surface with the hazardous substance being contained.

(h) "Product/tight" means impervious to the substance which is contained, or is to be contained, so as to prevent the seepage of the substance from the primary containment. To be product/tight, the tank shall not be subject to physical or chemical deterioration by the substance which it contains over the useful life of the tank.

(i) "Secondary containment" means the level of containment external to, and separate from, the primary containment.

(j) "Single/walled" means construction with walls made of only one thickness of material. For the purpose of this chapter, laminated, coated, or clad materials shall be considered single/walled.

(k) "Storage" or "store" means the containment, handling or treatment of hazardous substances, either on a temporary basis or for a period of years. "Storage" or "store" does not mean the storage of hazardous wastes in an underground storage tank if the person operating the tank has been issued a hazardous waste facilities permit by the department pursuant to Section 25200 or granted interim status under Section 25200.5.

(l) "Unauthorized release" means any release or emission of any hazardous substance which does not conform to the provisions of this chapter, unless this release is authorized by the State Water Resources Control Board pursuant to Division 7 (commencing with Section 13000) of the Water Code.

(m) "Underground storage tank" means any one or combination of tanks, including pipes connected thereto, which is used for the storage of hazardous substances and which is substantially or totally beneath the surface of the ground. "Underground storage tank" does not include any of the following:

(1) A tank used for the storage of hazardous substances used for the control of external parasites of cattle and subject to the supervision of the county agricultural commissioner if the county agricultural commissioner determines, by inspection prior to use, that the tank provides a level of protection equivalent to that required by Section 25284, if the tank was installed after June 30, 1984, or protection equivalent to that provided by Section 25284.1, if the tank was installed on or before June 30, 1984.

(2) Tanks which are located on a farm and store motor vehicle fuel which is used only to propel vehicles used primarily for agricultural purposes.

(3) Tanks used for aviation or motor vehicle fuel located within one mile of a farm and the tank is used by a licensed pest control operator, as defined in Section 11705 of the Food and Agricultural Code, who is primarily involved in agricultural pest control activities.

(4) Structures such as sumps, separators, storm drains, catch basins, oil field gathering lines, refinery pipelines, lagoons, evaporation ponds, well cellars, separation sumps, lined and unlined pits, sumps and lagoons. Sumps which are a part of a monitoring system required under Section 25284 or Section 25284.1 are not exempted by this section. These structures may be regulated by the board pursuant to the Porter/Cologne Water Quality Control Act (Division 7 (commencing with Section 13000) of the Water Code) to ensure that they do not pose a threat to water quality. The board shall conduct a study which analyzes the necessity of applying the standards of Section 25284 and 25284.1 to the structures exempted by

~~this section. The board shall complete the study by January 1, 1985. After completing the study the board shall review existing regulatory authority over such structures.~~

~~(n) "Special inspectors" means a professional engineer, registered pursuant to Chapter 7 (commencing with Section 6700) of Division 3 of the Business and Professions Code, who is qualified to attest, at a minimum, to structural soundness, seismic safety, the compatibility of construction materials with contents, cathodic protection, and the mechanical compatibility of the structural elements.~~

~~(o) "Owner" means the owner of an underground storage tank.~~

~~(p) "Operator" means the operator of an underground storage tank.~~

~~(q) "Pipe" means any pipeline or system of pipelines which is used in connection with the storage of hazardous substances and which are not intended to transport hazardous substances in interstate or intrastate commerce or to transfer hazardous materials in bulk to or from a marine vessel.~~

(a) "Board" means the State Water Resources Control Board. "Regional board" means a California Regional Water Quality Control Board.

(b) "Department" means the State Department of Health Services.

(c) "Facility" means any one, or combination of, underground storage tanks used by a single business entity at a single location or site.

(d) "Hazardous substance" means all of the following liquid and solid substances, unless the department, in consultation with the board, determines that the substance could not adversely affect the quality of the waters of the state:

(1) Substances on the list prepared by the Director of the Department of Industrial Relations pursuant to Section 6382 of the Labor Code.

(2) Hazardous substances, as defined in Section 25316.

(3) Any substance or material which is classified by the National Fire Protection Association (NFPA) as a flammable liquid, a class II combustible liquid, or a class III-A combustible liquid.

(e) "Local agency" means the department, office, or other agency of a county or city designated pursuant to Section 25283.

(f) "Operator" means the operator of an underground storage tank.

(g) "Owner" means the owner of an underground storage tank.

(h) "Person" means an individual, trust, firm, joint stock company, corporation, including a government corporation, partnership, and association. "Person" also includes any city, county, district, the state, or any department or agency thereof.

(i) "Pipe" means any pipeline or system of pipelines which is used in connection with the storage of hazardous substances and which are not intended to transport hazardous substances in interstate or intrastate commerce or to transfer hazardous materials in bulk to or from a marine vessel.

(j) "Primary containment" means the first level of containment, such as the portion of a tank which comes into immediate contact on its inner surface with the hazardous substance being contained.

(k) "Product-tight" means impervious to the substance which is contained, or is to be contained, so as to prevent the seepage of the substance from the primary containment. To be product-tight, the tank shall not be subject to physical or chemical deterioration by the substance which it contains over the useful life of the tank.

(l) "Secondary containment" means the level of containment external to, and separate from, the primary containment.

(m) "Single-walled" means construction with walls made of only one thickness of material. For the purpose of this chapter, laminated, coated, or clad materials shall be considered single-walled.

(n) "Special inspector" means a professional engineer,

registered pursuant to Chapter 7 (commencing with Section 6700) of Division 3 of the Business and Professions Code, who is qualified to attest, at a minimum, to structural soundness, seismic safety, the compatibility of construction materials with contents, cathodic protection, and the mechanical compatibility of the structural elements of underground storage tanks.

(o) "Storage" or "store" means the containment, handling, or treatment of hazardous substances, either on a temporary basis or for a period of years. "Storage" or "store" does not mean the storage of hazardous wastes in an underground storage tank if the person operating the tank has been issued a hazardous waste facilities permit by the department pursuant to Section 25200 or granted interim status under Section 25200.5.

(p) "Tank" means a stationary device designed to contain an accumulation of hazardous substances which is constructed primarily of nonearthen materials (e.g. wood, concrete, steel, plastic) which provides structural support.

(q) "Unauthorized release" means any release or emission of any hazardous substance which does not conform to the provisions of this chapter, unless this release is authorized by the board pursuant to Division 7 (commencing with Section 13000) of the Water Code.

(r) "Underground storage tank" means any one or combination of tanks, including pipes connected thereto, which is used for the storage of hazardous substances and which is substantially or totally beneath the surface of the ground. "Underground storage tank" does not include any of the following:

(1) A tank used for the storage of hazardous substances used for the control of external parasites of cattle and subject to the supervision of the county agricultural commissioner if the county agricultural commissioner determines, by inspection prior to use, that the tank provides a level of protection equivalent to that required by Section 25291, if the tank was installed after June 30, 1984, or protection equivalent to that provided by Section 25292, if the tank was installed on or before June 30, 1984.

(2) Tanks which are located on a farm and store motor vehicle fuel which is used only to propel vehicles used primarily for agricultural purposes.

(3) Tanks used for aviation or motor vehicle fuel located within one mile of a farm, and the tank is used by a licensed pest control operator, as defined in Section 11705 of the Food and Agricultural Code, who is primarily involved in agricultural pest control activities.

(4) Structures such as sumps, separators, storm drains, catch basins, oil field gathering lines, refinery pipelines, lagoons, evaporation ponds, well cellars, separation sumps, lined and unlined pits, sumps and lagoons. Sumps which are a part of a monitoring system required under Section 25291 or 25292 are not exempted by this section. Structures identified in this paragraph may be regulated by the board pursuant to the Porter-Cologne Water Quality Control Act (Division 7 (commencing with Section 13000) of the Water Code) to ensure that they do not pose a threat to water quality.

SEC. 3. Section 25281 of the Health and Safety Code is amended and renumbered to read:

~~25281.~~

25282. (a) The department shall compile a comprehensive master list of hazardous substances. The master list shall be made available to the public and mailed to each local agency no later than June 30, 1984, notwithstanding any other provision of law, including Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code. Local agencies and owners or operators of underground storage tanks shall use the master list or, when adopted, the revised list adopted pursuant to subdivision (b), to determine which underground storage tanks require permits pursuant to this chapter. Hazardous substances included on the list may be denominated by scientific, common, trade, or brand names.

(b) The department may revise, when appropriate, the master list of all the hazardous substances specified in subdivision (a). The revised list of hazardous substances shall be prepared and adopted, and may be further

revised, in accordance with Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code.

SEC. 4. Section 25282 of the Health and Safety Code is amended and renumbered to read:

~~25282.~~

25283. Every county shall implement this chapter pursuant to the regulations adopted by the board. A city may, by ordinance, assume responsibility for the implementation of this chapter pursuant to the regulations adopted by the board and, if so, shall have exclusive jurisdiction within the boundary of the city for the purposes of carrying out this chapter. A city which assumes responsibility for implementation of this chapter shall provide notice of its program and consult with the county in which the city is located. A county shall designate a department, office, or other agency of that county as the local agency responsible for administering and enforcing the provisions of this chapter and a city which assumes responsibility for implementing this chapter shall also make a similar designation.

SEC. 5. Section 25283 of the Health and Safety Code is amended and renumbered to read:

~~25283.~~

25284. (a) Except as provided in subdivision ~~(b)~~ *(c)*, no person shall own or operate an underground storage tank unless a permit for its operation has been issued by the local agency to the owner.

(b) Each local agency shall prepare a form which provides for the acceptance of the obligations of a transferred permit by any person who is to assume the ownership of an underground storage tank from the previous owner and is to be transferred the permit to operate the tank. That person shall complete the form accepting the obligations of the permit and submit the completed form to the local agency ~~at least~~ *within* 30 days after the ownership of the underground storage tank is to be transferred. A local agency may review and modify, or terminate, the transfer of the permit to operate the underground storage tank, pursuant to the criteria

specified in subdivision ~~(c)~~ *(a)* of Section ~~25281.1~~ *25295*, upon receiving the completed form.

~~(b)~~

(c) Any person assuming ownership of an underground storage tank used for the storage of hazardous substances for which a valid operating permit has been issued shall have 30 days after the date of assumption of ownership to apply for an operating permit pursuant to Section ~~25283.2~~ *25286* or, if accepting a transferred permit, shall submit to the local agency the completed form accepting the obligations of the transferred permit, as specified in subdivision (a). During the period from the date of application until the permit is issued or refused, the person shall not be held to be in violation of this section.

~~(c)~~

(d) When, in its judgment, it is appropriate to do so, the local agency may issue a single permit to a person for a facility.

SEC. 6. Section 25283.1 of the Health and Safety Code is amended and renumbered to read:

~~25283.1.~~

25285. A permit to operate issued by the local agency pursuant to Section ~~25283~~ *25284* shall be effective for five years. A local agency shall not issue or renew a permit to operate an underground storage tank if the local agency inspects the tank and determines that the tank does not comply with this chapter.

SEC. 7. Section 25283.2 of the Health and Safety Code is amended and renumbered to read:

~~25283.2.~~

25286. (a) An application for a permit to operate an underground storage tank, or for renewal of the permit, shall be made, by the owner, on a standardized form prepared by the board and provided by the local agency and shall be accompanied by the appropriate fee, as specified in Section ~~25283.3~~ *25287*. The local agency shall provide the board with a copy of the completed application.

(b) The board shall store this information on a

computer, for the purpose of managing and appropriately cross-referencing and indexing this data. The application form shall include, but not be limited to, requests for the following information:

(1) A description of the construction of the underground storage tank or tanks.

(2) A list of all the hazardous substances which are or will be stored in the underground storage tank or tanks, specifying the hazardous substances for each underground storage tank.

(3) A description of the monitoring program for the underground storage tank or tanks.

(4) The name and address of the person, firm, or corporation which owns the underground storage tank or tanks and, if different, the name and address of the person who operates the underground storage tank or tanks.

(5) The address of the facility at which the underground storage tank or tanks are located.

(6) The name of the person making the application.

(7) The name and 24-hour phone number of the contact person in the event of an emergency involving the facility.

(8) If the owner or operator of the underground storage tank is a public agency, the application shall include the name of the supervisor of the division, section, or office which operates the tank.

(c) As a condition of any permit to operate an underground storage tank, the permittee shall complete an annual report form, prepared by the board, which will detail any changes in the usage of any underground storage tanks, including the storage of new hazardous substances, changes in monitoring procedure and unauthorized release occurrences, as defined in Sections ~~25284.3~~ *25294* and ~~25284.4~~ *25295*. The requirements for computer storage and management of the data generated by the application forms specified in subdivision (b) also apply to information generated by the annual reports.

(d) If a permittee stores in an underground storage tank or tanks a hazardous substance which is not listed in the application, as required by paragraph (2) of subdivision (b), the permittee shall apply for a new or amended permit within 30 days after commencing the storage of that hazardous substance.

SEC. 8. Section 25283.3 of the Health and Safety Code is amended and renumbered to read:

~~25283.3.~~

25287. (a) A fee shall be paid to the local agency by each person who submits an application for a permit to operate an underground storage tank or to renew or amend a permit. The governing body of the county, or a city which assumes enforcement jurisdiction, shall establish the amount of the fees at a level sufficient to pay the necessary and reasonable costs incurred in administering this chapter, including, but not limited to, permitting and inspection responsibilities. The governing body may provide for the waiver of fees when a public agency makes an application for a permit to operate or an application to renew a permit.

(b) This fee shall include a surcharge, the amount of which shall be determined by the Legislature annually to cover the costs of the board in carrying out its responsibilities under this chapter. The surcharge shall be transmitted to the board and deposited in the Underground Storage Tank Fund hereby created in the General Fund. The money in this account is available, upon appropriation by the Legislature, to the board for the purposes of implementing this chapter.

~~(c) From January 1, 1984 to June 30, 1984 there shall be a one/time surcharge of five dollars ($5) on each tank permitted pursuant to this chapter, which surcharge shall be forwarded to the board, by the local agency, to cover the costs of developing the statewide regulations implementing this chapter, and shall be deposited in the Underground Storage Tank Fund.~~

SEC. 9. Section 25283.4 of the Health and Safety Code is amended and renumbered to read:

~~25283.4.~~

25288. (a) The local agency shall inspect every

underground storage tank within its jurisdiction at least once every three years. The purpose of the inspection is to determine whether the tank complies with the design and construction standards of Section ~~25284~~ *25291* or ~~25284.1~~ *25292*, whichever is applicable, whether the operator has monitored and tested the tank as required by the permit, and whether the tank is in a safe operating condition. After an inspection, the local agency shall prepare a compliance report detailing the inspection and shall send a copy of this report to the permitholder.

(b) In addition to, or instead of, the inspections specified in subdivision (a), the local agency may require the permitholder to employ, periodically, special inspectors to conduct an audit or assessment of the permitholder's facility to determine whether the facility complies with the factors specified in subdivision (a) and to prepare a special inspection report with recommendations concerning the safe storage of hazardous materials at the facility. The report shall contain recommendations consistent with the provisions of this chapter, where appropriate. A copy of the report shall be filed with the local agency at the same time the inspector submits the report to the permitholder. Within 30 days after receiving this report, the permitholder shall file with the local agency a plan to implement all recommendations contained in the report or shall demonstrate, to the satisfaction of the local agency, why these recommendations should not be implemented.

SEC. 10. Section 25283.5 of the Health and Safety Code is amended and renumbered to read:

~~25283.5.~~

25289. In order to carry out the purposes of this chapter, any duly authorized representative of the local agency or the board has the authority specified in Section 25185, with respect to any place where underground storage tanks are located, and in Section 25185.5, with respect to real property which is within 2,000 feet of any place where underground storage tanks are located.

SEC. 11. Section 25283.6 of the Health and Safety Code is amended and renumbered to read:

~~25283.6.~~

25290. (a) "Trade secrets," as used in this chapter, may include, but is not limited to, any formula, plan, pattern, process, tool, mechanism, compound, procedure, production data, or compilation of information which is not patented, which is known only to certain individuals within a commercial concern who are using it to fabricate, produce, or compound an article of trade or a service having commercial value, and which gives its user an opportunity to obtain a business advantage over competitors who do not know or use it.

(b) The board or a local agency may disclose trade secrets received by the board or the local agency pursuant to this chapter to authorized representatives or other governmental agencies only in connection with the board's or local agency's responsibilities pursuant to this chapter. The board and the local agency shall establish procedures to ensure that these trade secrets are utilized only in connection with these responsibilities and are not otherwise disseminated without the consent of the person who provided the information to the board or the local agency.

(c) Any person providing information pursuant to Section ~~25283.2~~ *25286* shall, at the time of its submission, identify all information which the person believes is a trade secret. Any information or record not identified as a trade secret is available to the public, unless exempted from disclosure by other provisions of law.

(d) Where the local agency, by ordinance, provides an alternative to the listing of a substance which is a trade secret, the person storing that substance shall provide the identification of the material directly to the board pursuant to this section.

SEC. 12. Section 25284 of the Health and Safety Codee is amended and renumbered to read:

~~25284.~~

25291. Every underground storage tank installed after January 1, 1984, shall meet the following requirements:

(a) Be designed and constructed to provide primary and secondary levels of containment of the hazardous

substances stored in them in accordance with the following performance standards:

(1) Primary containment shall be product-tight.

(2) Secondary containment shall be constructed to prevent structural weakening as a result of contact with any released hazardous substances, and also shall be capable of storing, for the maximum anticipated period of time necessary for the recovery of any released hazardous substance.

(3) In the case of an installation with one primary container, the secondary containment shall be large enough to contain at least 100 percent of the volume of the primary tank.

(4) In the case of multiple primary tanks, the secondary container shall be large enough to contain 150 percent of the volume of the largest primary tank placed in it, or 10 percent of the aggregate internal volume of all primary tanks, whichever is greater.

(5) If the facility is open to rainfall, then the secondary containment must be able to additionally accommodate the volume of a 24-hour rainfall as determined by a 100-year storm history.

(6) Single-walled containers do not fulfill the requirement of an underground storage tank providing both a primary and a secondary containment.

(7) The design and construction of underground storage tanks for motor vehicle fuels storage need not meet the requirements of paragraphs (1) to (6), inclusive, if the *following conditions exist: (A)* primary containment construction is of glass fibre reinforced plastic, cathodically protected steel, or steel clad with glass fibre reinforced plastic, *(B)* any such alternative primary containment is installed in conjunction with a system that will intercept and direct a leak from any part of the tank to a monitoring well to detect any release of motor vehicle fuels stored in the tank, and *(C)* which is designed to provide early leak detection, response, and *(D)* to protect groundwater from releases, and if the monitoring is in accordance with the alternative method identified in paragraph (3) of subdivision (b) of Section

~~25284.1~~ *25292. (E)* Pressurized piping systems connected to underground storage tanks used for the storage of motor vehicle fuels and monitored in accordance with paragraph (3) of subdivision (b) of Section 25292 shall also be deemed to meet the requirements of this subdivision, *provided that such tank meets the conditions of subparagraphs (A) to (D), inclusive.*

(b) Be designed and constructed with a monitoring system capable of detecting the entry of the hazardous material stored in the primary containment into the secondary containment. If water could intrude into the secondary containment, a means of monitoring for water intrusion and for safely removing the water shall also be provided.

(c) When required by the local agency, a means of overfill protection for any primary tank, including an overfill prevention device or an attention-getting higher level alarm, or both. Primary tank filling operations of underground storage tanks containing motor vehicle fuels which are visually monitored and controlled by a facility operator satisfy the requirements of this paragraph.

(d) ~~Different~~ *If different* substances ~~that~~ *are stored in the same tank and,* in combination may cause a fire or explosion, or the production of flammable, toxic, or poisonous gas, or the deterioration of a primary or secondary container, *then they* shall be separated in both the primary and secondary containment so as to avoid potential intermixing.

(e) If water could enter into the secondary containment by precipitation or infiltration, the facility shall contain a means of removing the water by the owner or operator. This removal system shall also provide for a means of analyzing the removed water for hazardous substance contamination and a means of disposing of the water, if so contaminated, at an authorized disposal facility.

SEC. 13. Section 25284.1 of the Health and Safety Code is amended and renumbered to read:

~~25284.1.~~

25292. For every underground storage tank installed on or before January 1, 1984, and used for the storage of hazardous substances the following actions shall be taken:

(a) On or before ~~January~~ *June* 1, 1985, the owner shall outfit the facility with a monitoring system capable of detecting unauthorized releases of any hazardous substances stored in the facility, and thereafter, the operator shall monitor each facility, based on materials stored and the type of monitoring installed.

(b) Provide a means for visual inspection of the tank, wherever practical, for the purpose of the monitoring required by subdivision (a). Alternative methods of monitoring the tank on a monthly, or more frequent basis, may be required by the local agency, consistent with the regulations of the board.

The alternative monitoring methods include, but are not limited to, the following methods:

(1) Pressure testing, vacuum testing or hydrostatic testing of the piping systems or underground storage tanks.

(2) A groundwater monitoring well or wells which are down gradient and adjacent to the underground storage tank, vapor analysis within a well where appropriate, and analysis of soil borings at the time of initial installation of the well. ~~The board shall develop regulations specifying monitoring alternatives. The local agency, or any other public agency specified by the local agency, shall approve the location and number of wells, the depth of wells and the sampling frequency, pursuant to these regulations.~~

(3) For monitoring tanks containing motor vehicle fuels, daily gauging and inventory reconciliation by the operator, if inventory records are kept on file for one year and are reviewed quarterly, the tank is tested for tightness hydrostatically or, when appropriate with pressure between three and five pounds, inclusive, per square inch at time intervals specified by the board and ~~whenever~~ any pressurized system has a leak detection device to monitor for leaks in the piping. The tank shall also be tested for tightness hydrostatically or where appropriate, with pressure between three and five pounds, inclusive, per square inch whenever there is a shortage greater than the amount which the board shall specify by regulation.

(c) The board shall develop regulations specifying monitoring alternatives. The local agency, or any other public agency specified by the local agency, shall approve the location and number of wells, the depth of wells and the sampling frequency, pursuant to these regulations.

SEC. 14. Section 25284.2 of the Health and Safety Code is amended and renumbered to read:

~~25284.2.~~

25293. The operator of the underground storage facility shall monitor the facility using the method specified on the permit for the facility. Records shall be kept in sufficient detail to enable the local agency to determine that the operator has undertaken all monitoring activities required by the permit to operate.

If the operator is not the owner, the owner shall provide a copy of the permit to the operator, enter into a written contract with the operator which requires the operator to monitor the tank as set forth in the permit, and provide the operator with a copy of Section ~~25287~~ *25299*, or a summary of this section, in the form which the board specifies by regulation. The owner shall notify the local agency of any change of operator.

SEC. 15. Section 25284.3 of the Health and Safety Code is amended and renumbered to read:

~~25284.3.~~

25294. Any unauthorized release from the primary containment which the operator is able to cleanup within eight hours, and which does not escape from the secondary containment, does not increase the hazard of fire or explosion and does not cause any deterioration of the secondary containment of the underground storage tank, shall be recorded on the operator's monitoring reports.

SEC. 16. Section 25284.4 of the Health and Safety Code is amended and renumbered to read:

~~25284.4~~

25295. (a) Any unauthorized release which escapes

from the secondary containment, increases the hazard of fire or explosion, or causes any deterioration of the secondary containment of the underground tank shall be reported by the operator ~~or~~ *to* the local agency within 24 hours after the release has been detected or should have been detected. A full written report shall be transmitted by the owner or operator of the underground storage tanks within five working days of the occurrence of the release.

The local agency shall review the permit whenever there has been an unauthorized release or when it determines that the underground storage tank is unsafe. In determining whether to modify or terminate the permit, the local agency shall consider the age of the tank, the methods of containment, the methods of monitoring, the feasibility of any required repairs, the concentration of the hazardous substances stored in the tank, the severity of potential unauthorized releases, and the suitability of any other long-term measures preventive measures which would meet the requirements of this chapter.

(b) In cooperation with the Office of Emergency Services, the board shall submit an annual statewide report by county, to the Legislature, of all unauthorized releases, indicating for each unauthorized release the operator, the hazardous substance, the quantity of the unauthorized release, and the actions taken to abate the problem.

(c) The reporting requirements imposed by this section are in addition to any requirements which may be imposed by Section 13271 of the Water Code.

SEC. 17. Section 25284.5 of the Health and Safety Code is amended and renumbered to read:

~~25284.5.~~

25296. If there has been any unauthorized release, as defined in subdivision (a) of Section ~~25284.1~~ *25295*, from an underground storage tank containing motor vehicle fuel not under pressure, the permitholder may repair the tank once by an interior-coating process if the tank meets all of the following requirements:

(a) An ultrasonic test, or comparable test, has been conducted to determine the thickness of the storage tank. If the result of the test indicates that a serious corrosion problem exists with regard to the tank, as determined by the person conducting the test, the local agency may require additional corrosion protection for the tank or may deny the authorization to repair.

(b) A hydrostatic test is an alternative to the ultrasonic test in subdivision (a). If the result of the test indicates that a serious problem exists with regard to the integrity of the tank, as determined by the person conducting the test or the local agency, the local agency may require additional protection for the tank or may deny authorization for the repair.

(c) ~~A~~ *Following the repair, a* vacuum test has been conducted with a result indexed at not more than 5.3 inches of mercury. This requirement shall not be applicable if technology is not available for testing the tank on site using accepted engineering practices.

(d) Following the repair, the standard installation testing for requirements for underground storage tanks specified in Section 2-7.3 of the Flammable and Combustible Liquids Code, adopted by the National Fire Protection Association on November 20, 1981 (NFPA 30-1981), and published in the 1982 edition of the National Fire Code shall be followed.

(e) The material used to repair the tank by an interior-coating process is compatible with the motor vehicle fuel that is stored, as approved by the board by regulation.

(f) The material used to repair the tank by an interior-coating process is applied in accordance with nationally recognized engineering practices such as the American Petroleum Institute's recommended practice No. 1631 for the interior lining of existing underground storage tanks.

(g) The board may develop regulations, in consultation with the State Fire Marshal, for the repair of underground storage tanks, and the standards in this section shall remain in effect until the adoption of these

regulations.

SEC. 18. Section 25285 of the Health and Safety Code is amended and renumbered to read:

~~25285.~~

25297. The local agency may request the following agencies to utilize that agency's authority to remedy the effects of, and remove, any hazardous substance which has been released from an underground storage tank:

(a) The department which may take action pursuant to Chapter 6.8 (commencing with Section 25300) and, for this purpose, any unauthorized release shall be deemed a release as defined in Section 25320.

(b) A regional water quality control board may take action pursuant to Division 7 (commencing with Section 13000) of the Water Code and, for this purpose, the discharged hazardous substance shall be deemed a waste as defined in subdivision (d) of Section 13050.

SEC. 19. Section 25286 of the Health and Safety Code is amended and renumbered to read:

~~25286.~~

25298. (a) No person shall abandon an underground storage tank or close or temporarily cease operating an underground storage tank, except as provided in this section.

(b) An underground storage tank which is temporarily taken out of service, but which the operator intends to return to use, shall continue to be subject to all the permit, inspection, and monitoring requirements of this chapter, unless the operator complies with the provisions of subdivision (c) for the period of time the underground tank is not in use.

(c) No person shall close an underground storage tank unless the person undertakes all of the following actions:

(1) Demonstrates to the local agency that all residual amounts of the hazardous substance or hazardous substances which were stored in the tank prior to its closure have been removed, properly disposed of, and neutralized.

(2) Adequately seals the tank to minimize any threat to the public safety and the possibility of water intrusion into, or runoff from, the tank.

(3) Provides for, and carries out, the maintenance of the tank as the local agency determines is necessary, for the period of time the local agency requires.

(4) Demonstrates to the local agency that there has been no significant soil contamination resulting from a discharge in the area surrounding the underground storage tank or facility.

SEC. 20. Section 25287 of the Health and Safety Code is amended and renumbered to read:

~~25287.~~

25299. (a) Any operator of an underground storage tank shall be liable for a civil penalty of not less than five hundred dollars ($500) or more than five thousand dollars ($5,000) per day for any of the following:

(1) Operates an underground storage tank which has not been issued a permit.

(2) Fails to monitor the underground storage tank, as required by the permit.

(3) Fails to maintain records, as required by Section ~~25283.2~~ *25286.*

(4) Fails to report an unauthorized release, as required by Sections ~~25284.3~~ *25294* and ~~25284.4~~ *25295.*

(5) Fails to properly close an underground storage tank, as required by Section ~~25286~~ *25298.*

(b) Any owner of an underground storage tank shall be liable for a civil penalty of not less than five hundred dollars ($500) or more than five thousand dollars ($5,000) per day for any of the following:

(1) Failure to obtain a permit as specified by this chapter.

(2) Failure to repair an underground tank in accordance with the provisions of this chapter.

(3) Abandonment or improper closure of any underground tank subject to the provisions of this chapter.

(4) Knowing failure to take reasonable and necessary steps to assure compliance with this chapter by the operator of an underground tank.

(c) Any person who falsifies any monitoring records

required by this chapter, or knowingly fails to report an unauthorized release, shall, upon conviction, be punished by a fine of not less than five thousand dollars ($5,000) or more than ten thousand dollars ($10,000), or by imprisonment in the county jail for not to exceed one year, or by both that fine and imprisonment.

(d) In determining both the civil and criminal penalties imposed pursuant to this section, the court shall consider all relevant circumstances, including, but not limited to, the extent of harm or potential harm caused by the violation, the nature of the violation and the period of time over which it occurred, the frequency of past violations, and the corrective action, if any, taken by the person who holds the permit.

(e) Penalties under this section are in addition to, and do not supersede or limit, any and all other legal remedies and penalties, civil or criminal, which may be applicable under other laws.

SEC. 21. Section 25288 of the Health and Safety Code is amended and renumbered to read:

~~25288.~~

25299.1. (a) Any city, county, or city and county which prior to January 1, 1984, has adopted an ordinance which, at a minimum meets the requirements set forth in Section ~~25284~~ *25291* and ~~25284.1~~ *25292*, providing for double containment, monitoring of underground storage tanks, and under which permits are issued therefor is exempt from the provisions of this chapter so long as the ordinance, as it may be amended, continues to meet the requirements of Sections ~~25284~~ *25291* and ~~25284.1~~ *25292*.

Those local agencies which are exempted from this chapter pursuant to this subdivision shall submit to the board the application form, *the surcharge specified in subdivision (b) of Section 25287,* and annual information specified by Section ~~25283.2~~ *25286*, and shall submit a written report of any unauthorized release from an underground storage tank to the Office of Emergency Services within 10 working days from the time the local agency is notified of the unauthorized release.

(b) This chapter shall not be construed to limit or abridge the authority of any city, county, or city and county to adopt an ordinance requiring information, conducting investigations, inspections, or implementing and enforcing this chapter.

SEC. 22. Section 25288.1 of the Health and Safety Code is amended and renumbered to read:

~~25288.1.~~

25299.2. The Legislature hereby finds and declares that the provisions of this chapter are of statewide interest and concern and are intended to preempt any local regulations of underground storage tanks, which regulations are for the protection of the soil from contamination or the protection of the beneficial uses of waters of the state, and which conflict with these provisions, except as provided in Section ~~25288~~ *25299.1.*

SEC. 23. Section 25288.2 of the Health and Safety Code is amended and renumbered to read:

~~25288.2.~~

25299.3. (a) The board shall develop regulations implementing the standards of ~~Section 25284, 25284.1, 25284.3, 25284.4, 25284.5, 25286, and 25288.3~~ *Sections 25291, 25292, 25294, 25295, 25296, 25298, and 25299.4.* These regulations shall be promulgated by the board by January 1, 1985. The board may adopt regulations implementing Sections ~~25283.2, 25283.3 and 25283.6,~~ *25286, 25287, and 25290,* as it deems necessary.

(b) Until the board adopts regulations, any city, county, or city and county may implement the ~~provisions~~ *requirements* of Section ~~25284~~ *25291* with regard to permits. Any *underground storage* tank or facility so permitted shall be deemed to be in compliance with the regulations of the board implementing that section. Any ~~underground storage~~ *such* tank installed within a city, county, or city and county which has not implemented the provisions of Section ~~25284~~ *25291* prior to the adoption of regulations by the board shall be subject to the same requirements of this chapter as an underground storage tank installed prior to January 1, 1984.

SEC. 24. Section 25288.3 of the Health and Safety Code is amended and renumbered to read:

~~25288.3.~~

25299.4. ~~(a) Any permitholder or permit applicant may apply to the board for a categorical variance from Section 25282 or 25282.1. The application shall include a description of the proposed alternative program, method, device, or process and description of the region, area, or circumstances under which the variance would apply. The board shall give notice to all affected cities, counties and city and counties. The board shall issue a categorical variance from this chapter if it finds, after investigation and at least two public hearings held in different areas of the state, as selected by the board, that the applicant has demonstrated by clear and convincing evidence that the proposed alternative will adequately protect the soil and the beneficial uses of water of the state from an unauthorized release. The board may remand the application to the appropriate regional board if it determines the application falls within subdivision (c).~~

(a) Any permitholder may apply to the board for a categorical variance from Section 25291 or 25292. A categorical variance is an alternative procedure which would be applicable to more than one local agency jurisdiction.

(1) The application shall include a description of the proposed alternative program, method, device, or process and a description of the region, area, or circumstances under which the variance would apply.

(2) The board shall give notice to all affected cities, counties, and city and counties.

(3) The board shall issue a categorical variance from these sections if it determines, after investigation and at least two public hearings held in different areas of the state, as selected by the board, that the applicant has demonstrated by clear and convincing evidence that the proposed alternative will adequately protect the soil and the beneficial uses of water of the state from an unauthorized release. Any variance so issued shall prescribe the conditions the applicant must maintain and shall describe the alternative.

(4) The board shall modify or revoke a categorical variance upon a finding that the proposed alternative does not adequately protect the soil and the beneficial uses of water of the state from an unauthorized release.

(5) The board may remand the application to the appropriate regional board if it determines that the application falls within subdivision (c).

(6) The board may charge and collect from the applicant a fee sufficient to recover the reasonable costs of proceeding under this section.

(b) After January 1, 1984, any local agency may apply to the board for authority to implement design and construction standards for the containment of a hazardous substance in underground storage tanks which are in addition to those set forth in this chapter. The application shall include a description of the additional standards and a discussion of the need to implement them. The board shall approve the application if it finds, after an investigation and public hearing, that the local agency has demonstrated by clear and convincing evidence that the additional standards are necessary to adequately protect the soil and the beneficial uses of the waters of the state from unauthorized releases.

The board shall make its determination within six months of the date of application for authority to implement additional standards. If the board's determination upholds the application for authority to implement additional standards, the standards shall be effective as of the date of the determination. If the board's determination does not uphold the application, the additional standards shall not go into effect.

~~(c) Any permitholder or permit applicant may apply to the regional water quality control board having jurisdiction over the location of the permitholder or applicant's facility for a site/specific variance from Section 25282 or 25282.1. Before applying for a variance, the applicant shall contact the local agency. If the local agency decides that a variance would be necessary to approve a proposal, or if the local agency does not make a decision within 60 days, the permitholder or applicant~~

~~may proceed with a variance application. At least 30 days before applying to the appropriate regional water quality control board the applicant shall notify and request the local agency and the city, county, or city and county having land use jurisdiction over the city to join the applicant in the variance application. The city, county, or city and county shall provide notice of the receipt of this request to any person who has requested the notice. The local agency shall have 30 days from completion of any documents required by the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) and the receipt of the regional board's staff recommendation and analysis to act on the request. The regional board shall not hold a hearing upon the application until after the expiration of this 30/day period. Failure of the local agency or city, county, or city and county to join in the variance application shall not affect the request of the applicant to proceed with the variance application, except that the board shall consider the local agency's and the city, county, or city and county's recommendations in rendering its decision. The notification and request to join to the local agency and the city, county, or city and county and the appplication to the appropriate regional board shall include a description of the proposed alternative program method or process. The regional water quality control board shall approve the variance if it finds, after investigation and public hearing, that the applicant has demonstrated by clear and convincing evidence that because of special circumstances not generally applicable to other property or facilities, including size, shape, design, topography, location or surroundings, the strict application of the standards of this chapter would be unnecessary to adequately protect the soil and beneficial uses of the waters of the state from an unauthorized release, or that strict application would create practical difficulties not generally applicable to other facilities or property and that the proposed alternative will adequately protect the soil and beneficial uses of the waters of the state from an unauthorized release.~~

~~(d) Applicants for action under this section shall pay a fee determined by the state water quality control board to be reasonable in covering costs in considering the application.~~

(c) Any permitholder may apply to the regional board having jurisdiction over the location of the permitholder or applicant's facility for a site-specific variance from Section 25291 or 25292. A site-specific variance is an alternative procedure which is applicable in one local agency jurisdiction. Prior to applying to the regional board, the permitholder shall first contact the local agency pursuant to paragraph (4).

(1) The regional board shall hold a public hearing 60 days after the completion of any documents required by the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code).

(2) The regional board shall consider the local agency's and the city, county, or city and county's recommendations in rendering its decision. Failure of the local agency or city, county, or city and county to join in the variance application pursuant to paragraph (4) shall not affect the request of the applicant to proceed with the variance application.

(3) The regional board shall approve the variance if it finds, after investigation and public hearing, that the applicant has demonstrated by clear and convincing evidence that:

(A) Because of the facility's special circumstances, not generally applicable to other facilities' property, including size, shape, design, topography, location, or surroundings, the strict application of Sections 25291 and 25292 would be unnecessary to adequately protect the soil and beneficial uses of the waters of the state from an unauthorized release, or that,

(B) Strict application of the standards of Sections 25291 and 25292 would create practical difficulties not generally applicable to other facilities or property and that the proposed alternative will adequately protect the

soil and beneficial uses of the waters of the state from an unauthorized release.

(4) Before applying for a variance, the applicant shall contact the local agency to determine if a site-specific variance is required. If the local agency determines that a site-specific variance is required or does not act within 60 days, the applicant may proceed with the variance procedure in subdivision (a).

(5) At least 30 days before applying to the appropriate regional board, the applicant shall notify and request the city, county, or city and county to join the applicant in the variance application before the regional board.

(A) The city, county, or city and county shall provide notice of the receipt of that request to any person who has requested the notice.

(B) The local agency within the city, county, or city and county which has the jurisdiction for land use decisions shall have 30 days from completion of any documents required by the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) to act on the applicant's request to join the applicant.

(d) Applicants requesting a variance pursuant to this section shall pay a fee determined by the board to necessary to recover the reasonable cost of administering this section.

SEC. 25. Section 25289 of the Health and Safety Code is amended and renumbered to read:

~~25289.~~

25299.5. This chapter shall not be construed to limit or abridge the powers and duties granted to the State Department of Health Services by Chapter 6.5 (commencing with Section 25100) and by Chapter 6.8 (commencing with Section 25300) or to the State Water Resources Control Board and each regional water quality control board by Division 7 (commencing with Section 13000) of the Water Code.

SEC. 26. Section 25299.6 is added to the Health and Safety Code, to read:

25299.6. The board shall conduct a study which analyzes the necessity of applying the standards of Sections 25291 and 25292 to the structures exempted by paragraph 4 of subdivision (m) of Section 25280. The board shall complete the study by January 1, 1985. After completing the study, the board shall review existing regulatory authority over these structures.

SEC. 27. Notwithstanding Section 2231.5 of the Revenue and Taxation Code, this act does not contain a repealer, as required by that section; therefore, the provisions of this act shall remain in effect unless and until they are amended or repealed by a later enacted act.

SEC. 28. Notwithstanding Section 6 of Article XIII B of the California Constitution and Section 2231 or 2234 of the Revenue and Taxation Code, no appropriation is made by this act for the purpose of making reimbursement pursuant to these sections. It is recognized, however, that a local agency or school district may pursue any remedies to obtain reimbursement available to it under Chapter 3 (commencing with Section 2201) of Part 4 of Division 1 of that code.

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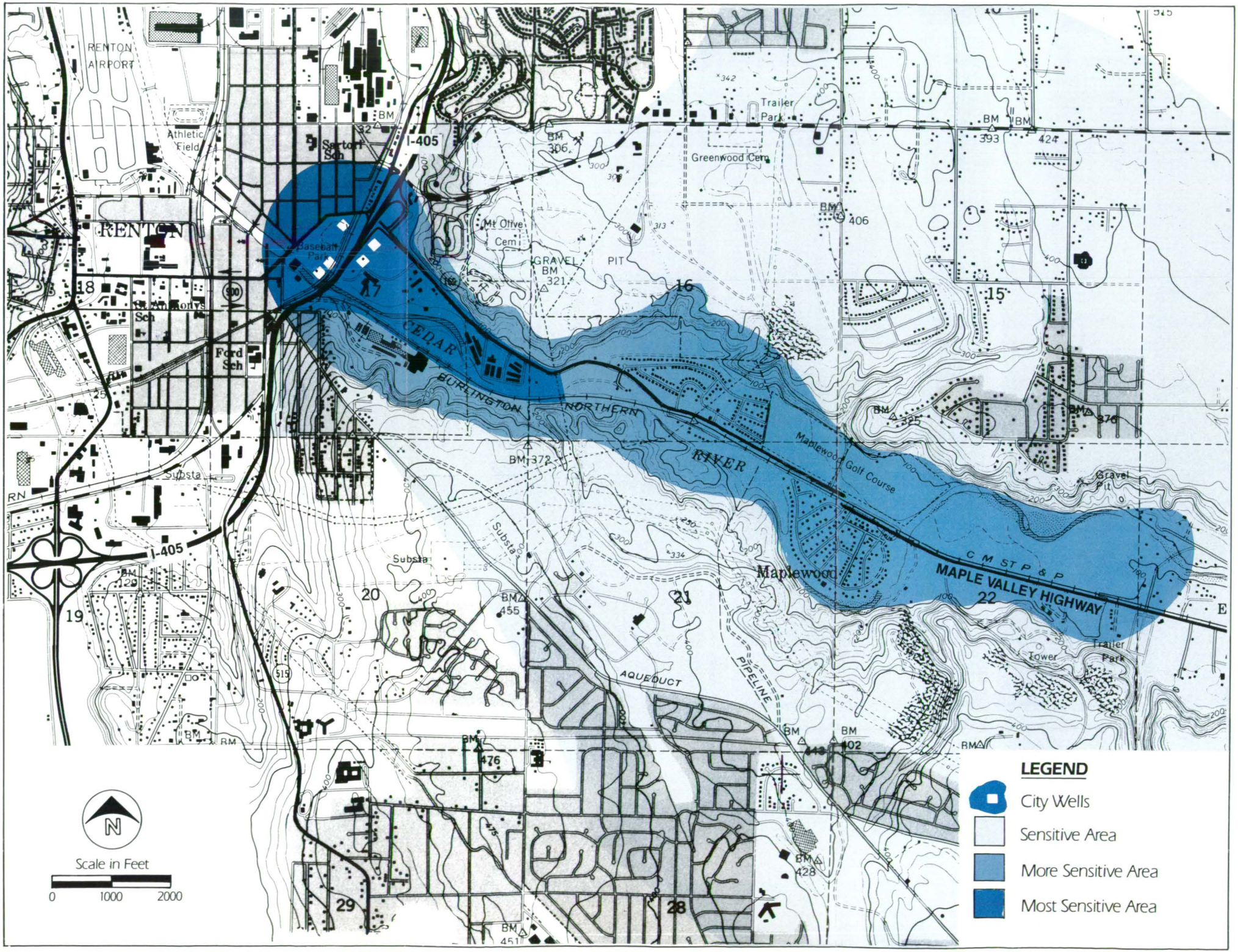
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Maplewood
C M ST P & P
MAPLE VALLEY HIGHWAY
Tower
Trailer Park
AQUEDUCT
PIPELINE
BM 455
BM 476
BM 428
BM 402
16
15
18
19
20
21
22
29
28
N
Scale in Feet
0
1000
2000
LEGEND
City Wells
Sensitive Area
More Sensitive Area
Most Sensitive Area

The City of Renton depends upon the Cedar River aquifer for up to 85% of its water supply. This aquifer lies in the Cedar River canyon near I-405 and the Maple Valley highway (shown on map as most sensitive area).

As much as 14 million gallons per day is pumped into the City's water system from five wells located near I-405. Water in the aquifer is replenished by precipitation above the aquifer, by underground flow from the Cedar River, and by overland and underground flow of precipitation from adjacent drainage areas (shown on the map as more sensitive and sensitive areas).

Contaminants can enter the aquifer by any of these replenishment routes. After contaminants have entered the soil, groundwater, or stream flows, they are extremely difficult to remove. They do not "just disappear"; most do not break down into harmless constituents, and small amounts of contaminants can render large amounts of water undrinkable.

The City currently enjoys high quality water from the Cedar River aquifer. No treatment is required, except chlorination to ensure total disinfection. Please do your part to protect Cedar River water quality.

Potential contaminants include the following:

- Poisons
- Pesticides, herbicides
- Paints, solvents
- Gasoline, fuel oils
- Lubricating oils, grease
- Antifreeze
- Household cleaners
- Detergents
- Acids, salts
- Sewage, manure
- Other hazardous wastes

Good ecological housekeeping dictates proper disposal of these and other contaminants regardless of where you live. However, if you are in the sensitive areas indicated on the map, it is particularly important to the City of Renton's water supply that you:

DO NOT

- Dump or spill these materials on the ground or into sumps.
- Dump or spill these materials into gutters, storm sewers, open drainage courses, or ponds.
- Dispose of these materials in your septic tank or garbage can.
- Allow fuel or heating oil tanks to leak onto or into the ground.

DO

- Dispose of these materials only at approved collection points.
- Call King County Health Dept. (228-2620 or 587-2722) for information about collection points.
- Call City of Renton (235-2631) to report spills of these materials or to request additional information.
- Check your home heating oil or fuel tanks and pipelines for leaks.
- Check your septic tank and drainfield for proper operation.

PROTECT YOUR WATER SUPPLY

City of Renton
Water Department

ADDENDUM
to the
WELL FIELD PROTECTION STUDY
for
City of Renton, Washington

May 22, 1985

INTRODUCTION

This addendum supplements the report on Well Field Protection Study prepared for the City of Renton by CH2M HILL in August 1984. It documents a more detailed review of chemical and petroleum products storage and other activities at the Stoneway Concrete Plant and at the North American Refractories Brick Plant. It also documents information gained about Tony's Cleaners (a dry cleaning establishment on Bronson Way just north of the Cedar River).

These three facilities were investigated in more detail because of their possible hazard to Cedar River aquifer water quality. The Stoneway and North American plants were described on pages 3-9 through 3-12 of the study report. These potential contaminant sources were also evaluated in Table 3-2. Tony's Cleaners was not described or evaluated in the study report. Specific recommendations were made concerning the Stoneway and North American plants on pages 4-14 and 4-15. From the descriptions that follow, the location of most facilities may be visualized by reference to Figure 3-1 of the study report.

STONEWAY CONCRETE PLANT

Concrete additives stored onsite were correctly listed in the study report. All of these are stored in aboveground tanks near the concrete mix plant at the center of the site. Any spillage from these tanks would follow the pattern of surface water drainage to the slurry pond (holding pond) mentioned in the study report and discussed below.

Most of the Stoneway plant site is paved and slopes toward the holding pond located near the west end of the site about 100 feet from the river. Surface drainage runs to this pond, and the truck wash area is adjacent to it. Sand and gravel are occasionally removed from this pond and salvaged. Decant water is pumped from this pond to an infiltration pond about 1,000 feet upstream, adjacent to the bend in the river. From the infiltration pond, water percolates through the gravel pond bottom to the river and surrounding alluvium. The infiltration pond has been dredged out to ensure good percolation.

All of the buried fuel tanks and the aboveground waste oil tank listed in the study report are located near the front (northeast end) of the plant site, adjacent to Highway 169 and the lube room. Two underground tanks not listed in the study report are a 500-gallon diesel tank adjacent to the shop and a 500-gallon gasoline tank adjacent to the office, both at the front of the plant site. One of the 10,000-gallon diesel fuel tanks was installed in 1973; all of the other tanks are older, but their specific ages are unknown.

According to Stoneway personnel, no part of the plant site is presently used as a disposal area or dump for waste materials. These personnel did not know whether any area had been used in the past for disposal of waste materials. Stoneway presently parks and maintains onsite a fleet of 25 or more ready-mix trucks, together with other plant equipment such as front-end loaders and miscellaneous vehicles. There have been no changes in the basic plant facilities and operations over the past 15 years, and no changes are anticipated in the next 5 years. Stoneway would like to move to a less expensive location, but has no specific plans for the foreseeable future.

The south portion of the Stoneway plant site has been occupied by Renton Concrete Products (RCP). However, since their lease will not be renewed in 1987, RCP is relocating to Tacoma. Their pipe and vault production has already been moved to Tacoma; the Renton plant will continue to manufacture vault lids and other small items.

RCP has their own fuel tanks and other storage facilities, independent of Stoneway. These include the following:

- An aboveground 1,000-gallon diesel fuel tank (about 1 year old), near the west end of the plant site.
- An underground 1,000-gallon gasoline tank (adjacent to the aboveground diesel tank), previously used for diesel fuel storage.
- Possibly, a second 1,000-gallon underground tank (no longer used) adjacent to the above tanks.
- A 500- to 1,000-gallon underground waste oil tank adjacent to the southeast corner of the maintenance shop, near the west end of the site. This tank was used as a gasoline tank until it was found to be leaking. It is no longer used for storing waste oil, since the maintenance shop is no longer used.
- Two aboveground 500-gallon diesel (stove oil) tanks near the dispatch building, located just

west of Stoneway's mix plant. These tanks were once used for fuel storage for the boilers in this building.

- A 1,000-gallon aboveground propane storage tank near the dispatch building; propane is now used for heating the building.

- The maintenance shop has two lube pits, which apparently have no floor drains. Oil changes, lubrication and other vehicle maintenance were once done here. This building, having a concrete floor, also serves as a storage area for about eight 50-gallon drums of engine oil, several 5- to 15-gallon cans of grease, tires, and parts and supplies. Two 50-gallon drums aboveground outside this building have held stove oil for fueling the shop heater.

- The fabrication shop (toward the east end of the site) houses reinforcing steel and other metal fabricating operations, and spray painting facilities, but not sand-blasting or pickling facilities for metal preparation. A paint storage locker outside the east end of the building is used to store fifteen to twenty 1-gallon cans of Galvacon, other paints, thinners, solvents and supplies. There is no paint/solvent waste storage tank. Left-over materials are reportedly dumped on the ground or placed in a dumpster with paper to absorb excess liquid. Stored inside the fabrication shop were 12 to 15 pallets of cement in sacks.

- Approximately ten 50-gallon drums of form (stripping) oil were stored on the ground near the fabrication shop. Even with the majority of concrete casting operations moved to Tacoma, it is anticipated that some form oil will continue to be used at this site.

Site surface drainage is less well defined on the RCP site than at Stoneway. Although much of the site is paved, runoff is not channeled to a single collection point. A portion of the site that is not paved drains to a low point near Stoneway's holding pond, thence to the river through a catch basin and 50 feet of 12-inch culvert. There is no oil separator at the catch basin. Oil slicks have reportedly been observed in the Cedar River adjacent to discharge point(s) from this site. Portions of the site seem to have no specific drainage pattern, suggesting percolation downward from the surface.

The aboveground 1,000-gallon diesel fuel tank is located on an abandoned concrete floor area where a shed once stood, about 100 feet from the river. There are no containment curbs or protective barriers around the tank. South of the maintenance shop two 50-gallon drums (possibly containing form oil) were observed lying on the ground, one leaking into a puddle. The paint storage locker at the fabrication shop, although located on a concrete slab, also has no containment curbs around it, nor does the painting area. The two 500-gallon diesel tanks near the dispatch building are located over a concrete slab, also without containment curbs.

RCP personnel did not know of any specific areas on their site which might have been used for disposal of waste materials. However, current housekeeping is not as good as it could be, and with the continuing move of plant operations to Tacoma, this site should be carefully observed. Stoneway's plans for future use of the RCP site are unknown.

NORTH AMERICAN REFRACTORIES BRICK PLANT

The size and use of the two fuel storage tanks discussed in the study report was confirmed. The 1,000-gallon underground gasoline tank is located near the east end of the main factory building, with the fuel dispensing equipment next to the building, adjacent to the tank. The 100,000-gallon aboveground diesel storage tank at the western end of the plant site was built in 1973, sized for long-term storage of fuel for the rotary kiln. Because the kiln has not been used for the past 4 years, and probably will never again be used, only about 5,000-gallons of diesel fuel are now stored in this tank. Although the tank is surrounded with a 4-foot-high concrete block/brick containment wall, the earth surface inside the containment wall is gravel, and has no impermeable liner beneath it. Rainwater percolates downward in the containment area, as would spilled fuel.

Other petroleum products are stored onsite in a small wood frame building with concrete floor toward the east end of the site. Approximately twenty 50-gallon drums and twenty 5- to 15-gallon cans of engine oil, hydraulic oil, kerosene, grease, and other lubricants are currently stored in this building. The floor has no floor drains or concrete curb, and is covered with "Floor Dry," an absorbent material to catch spilled petroleum product.

Waste oil is stored in an aboveground 300-gallon steel tank and two 50-gallon drums, located near the above petroleum products storage building. Although this tank is surrounded by a 1-foot-high concrete containment curb, the earth surface inside the curb is covered only with gravel. The waste oil is periodically hauled away by a contracted disposal service.

Chemicals stored onsite for brick manufacture were correctly listed on page 3-12 of the study report. The 4,000-gallon underground sodium silicate solution tank is located near the gasoline storage tank. Both trisodium phosphate and aluminum sulfate are stored in bags in the main factory building.

Maintenance of yard equipment (front end loaders, trucks, etc.) is done onsite. There are no special washdown facilities; the nature of the plant operations and equipment does not require washdown.

North American Refractories has an NPDES permit for discharge to the Cedar River. It was recently renewed; however, it is not currently needed since the rotary kiln is no longer operated. The permit, acquired 9 years ago, required that water discharged from the kiln exhaust gas scrubber be monitored for fluoride, pH and suspended solids; river water quality upstream and downstream of the discharge point was also monitored.

The western 80 percent of the plant site (to the east end of the main factory building) is paved with asphalt. Surface runoff flows primarily to two catch basins, or off the edges of the asphalt. The catch basins discharge to a 24-inch storm sewer which runs diagonally through the plant site in a northwesterly direction and discharges to the Cedar River about 1,000 feet from Well No. 8. The area behind (east of) the eastern-most buildings is not paved. No surface drainage pattern is evident, suggesting downward percolation.

The plant site receives considerable runoff (stormwater) from the hill south of the plant. The hill side is heavely wooded, yet erosion occurs occasionally. At the toe of the slope most of the runoff percolates into the ground under the plant, although storm water at the southeast corner of the plant site ponds and enters the 24-inch storm sewer.

No changes in the present operation of the plant are planned for the future. North American Refractories personnel did not know of any specific areas on their site which might have been used for disposal of hazardous waste materials.

Northeast of the main plant, between the railroad tracks and the Cedar River, is a large mound approximately 1,000 feet long, 200 feet wide, and 20 to 25 feet high, on land owned by North American Refactories. Waste materials from operation of the plant over many years have been dumped here. The mound by observation also contains crushed brick, waste wood (pallets, etc.), scrap metal, waste cement additives, and discarded paper and plastic sacks and buckets. It is possible that it may contain other waste materials.

TONY'S CLEANERS

Tony's Cleaners uses a cleaning solvent called Percoethylene. The solvent is recycled by filtering to remove dirt and lint. Losses are through solvent left in the clothing, in the filters, and evaporation. Approximately 30 to 40 gallons of solvent must be replenished every three months; this is done by bulk tank delivery with a hose connected between the tank truck and the solvent storage tank. The storage tank, located under the floor of the building, is thought to hold 50 to 100 gallons, and could not be observed when the site was visited. No separate containers of replacement solvent are stored on site.

The dryer which removes the last of the solvent from clothing discharges to the sanitary sewer. Steam condensate from other cleaning operations is also discharged to the sanitary sewer. The filters used for cleaning recycled solvent are discarded and picked up by the garbage collection service. Tony's Cleaners has been in business at this location for 13 years and has no plans to change operations in the foreseeable future.

CONCLUSIONS AND RECOMMENDATIONS

In the contaminant source evaluation on Table 3-2 of the study report the Stoneway Concrete plant was ranked as having a "high" overall relative significance as a potential contaminant source to the Cedar River aquifer. The research documented in this addendum reinforces this ranking and, given the conditions recently observed at the site, the "probability of occurrence" parameter should be revised from "medium" to "high" as well.

The North American Refractories Company was ranked as having a "low" overall relative significance as a potential contaminant source to the Cedar River aquifer. The research documented in this addendum suggests a "medium" ranking; however, no more specific conclusion can be made until the direction of groundwater movement is known from the upcoming City well field monitoring study.

Tony's Cleaners should also be listed in the subsurface category of Table 3-2. The evaluation parameters are ranked as follows:

Hazardous nature	High
Location of source (nearness to wells)	Medium
Potential quantity	Low
Probability of occurrence	Unknown
Mobility (lack of attenuation)	High
Difficulty of detection	High
Overall relative significance	Medium

In addition to the recommendations given in Chapter 4 of the study report, the following are recommended for the Stoneway plant site:

- All areas should be paved to control runoff and spills. Discharge should be directed to the Cedar River at specific points, and oil separators should be installed upstream of all discharges.

- The protective measures recommended for all service stations in the aquifer area (relative to storage tanks and monitoring) should also be applied to this site. Scattered tanks on the site should be consolidated into one area.

- All underground tanks not in use should be removed, and the soil surrounding the tanks should be verified free of petroleum products or other contaminants.

- All aboveground storage tanks and areas for storage of any hazardous material should be placed over impervious ground covers with containment curbs sufficiently high to contain the maximum volume of spilled materials.

- As Renton Concrete Products is moving out, the condition of their site should be verified and any identified contaminants removed.

- Permanent monitoring wells should be located either within the Stoneway site at critical points or between the site and the City's wells.

- New development (construction of additional fuel storage tanks or use of additional hazardous materials) should be prohibited.

For the North American Refractories Company site, the recommendations given in Chapter 4 of the study report and those above for the Stoneway plant should be applied, if the upcoming City well field monitoring study verifies groundwater movement from the site across the river toward the City's wells.

For Tony's Cleaners, the protective measures recommended for all service stations in the aquifer area (relative to storage tanks and monitoring) should be applied, if the upcoming City well field monitoring study verifies groundwater movement from the cleaners site toward the City's wells.

It is also recommended that the City well field monitoring study be started as soon as possible so that the need for specific protective measures identified above can be determined.