

APPENDIX A: SUMMARY OF PUBLIC INVOLVEMENT IN WOODLAND/WOODARD BASIN PLANNING

A.1 COMMENTS FROM BASIN PLANNING WORKSHOPS, SPRING 1991:

Workshop participants expressed their opinions verbally and in writing throughout the workshops. Some of the comments represented questions or misunderstandings which the workshops addressed. Others represented statements of position on a specific issue. Most of the comments and questions received concerned the effects of new developments on runoff. Many people also had questions about the design and construction of stormwater facilities, and the role of the Storm and Surface Water program.

NEW DEVELOPMENT

The County received more comments on development practices than on any other topic. Many residents felt that developers should bear more of the financial burden for new facilities. Comments like "commercial landowners and developers should pay for drainage", and "shift the burden for new detention to new development" were typical. Citizens also had frequent complaints about the way specific developments were built, and felt that the County had permitted too many poorly designed developments. Many people felt powerless to control or improve development. Statements in favor of tightening zoning laws, increasing buffers, limiting vegetation clearing, and generally managing development to reduce environmental impacts were also common.

REGULATION ENFORCEMENT

The subject of regulation enforcement came up frequently. Residents often said they had observed illegal or destructive land clearing and grading, but did not know what to do about it or who to call. Some citizens felt that polluters should be fined to pay for water quality improvements. Comments such as "polluters should pay" and "residents don't want to pay for violations by others" were typical. Many people were frustrated by inconsistently applied and unenforced regulations.

PUBLIC EDUCATION

Residents made specific suggestions to provide better public education programs to reduce water use, promote recycling, and supply information to developers and landowners on reducing natural resource impacts.

STORMWATER UTILITY FEE

Many residents did not understand stormwater utility charges. Some people thought they were "taxes". Others erroneously believed that developable land was assessed at the same rate as undevelopable "sensitive areas". Some citizens complained about the reduced rate charged to county, city and state agencies. Some residents did not understand the services provided by the stormwater utility.

Appendix A: Public Involvement Summary

CAPITAL IMPROVEMENTS

Meeting participants asked numerous questions about capital improvements like new stormwater treatment facilities. Residents wanted to know how much new facilities would cost, what benefits they would provide, and when they would be constructed. Some people wanted to know about the potential for using existing lakes, ponds, and topographic features to control runoff.

IMPROVE LOCAL GOVERNMENT PRACTICES

Residents felt that road crews should improve their road and ditch maintenance practices. Some people suggested that road crews receive water quality training. Improved coordination between County, local, and state agencies was also suggested.

MISCELLANEOUS

Some residents wanted to improve the fisheries in the creeks and made specific suggestions for removing fish passage barriers and planting salmon fry. One citizen also urged that the plan include a mechanism for evaluating the effectiveness of the recommendations that are implemented.

A.2 COMMENTS FROM PUBLIC FORUMS, FALL 1991

EXISTING DEVELOPMENT

Many people expressed the need to repair damage to their property caused by runoff from adjacent developments. Others stated that existing stormwater facilities should be upgraded to meet newer, more stringent design standards. Some discussion focussed on providing incentives for existing owners to upgrade facilities.

NEW DEVELOPMENT

Numerous residents expressed the sentiment that developers should pay all the costs of repairing impacts and damages from new development. Some people pointed out the need for developers to account for the down-stream and off-site impacts of their developments. One person said that impact fees hit homeowners too much, and developers not enough. Many people were upset that local jurisdictions permit large, damaging developments, and felt powerless to do anything about it.

ZONING

Some discussion centered on the effects of recent downzoning. One person pointed out that people who did not race to subdivide their land before the downzoning went into effect have been penalized with higher taxes, due to the increase in assessed value of nearby subdivided parcels. Another wanted to know why the cities had not joined the county in the recent downzoning. One comment that current zoning discriminates against single family homes led to a discussion on whether zoning is the answer to controlling growth.

REGULATIONS/LAWS

Many people claimed that existing laws are not effective at controlling pollution. One person said that state laws will force the county to accommodate new growth, regardless of what the county wants. A few people suggested a building moratorium until new growth plans and basin plans are adopted.

FUNDING/TAXES/IMPLEMENTATION

The lengthiest discussions and comments concerned the issue of who pays for the basin plan recommendations, and how much will come out of the pockets of individual landowners. Many diverse opinions about this issue were expressed. These comments included:

- Where will the \$8-18 million for capital construction in the plan come from? What will be the effect on property taxes per \$1000 of assessed value?
- What is the total cost estimate to implement all the upcoming basin plans in the Thurston region?
- How will the plan affect future property taxes?
- How can we broaden the base for bearing the cost of implementing the plan beyond the basin landowners?
- We should limit funding the plan to basin residents, because we can make decision about the plan at the basin level and move ahead with implementing solutions; we don't need to wait so long to start solving the problems.
- Can we start a basin-sized program to start solving the basin problems - something like a "basin improvement district" similar to the lake districts?
- If we expect residents of other basins to help fund the Woodland/Woodard plan, then Woodland/Woodard residents will be expected to help fund other basin plans in the region
- Everyone in the state benefits from the plan, so the state should share in the cost of implementing the plan
- One participant likes alternatives 2 and 3 but is concerned that large private property holders will carry too much of the financial burden
- All county residents should contribute some of the funds to implement the plan, because everyone enjoys the quality of life here
- Fuel taxes could help fund the plan, because automobiles and roads contribute a lot to the problems
- Maybe the public should help pay for retrofitting existing facilities on commercial properties
- Spend plan funds on acquiring and preserving as much land, development rights, conservation easements, etc, as possible, but do not build new facilities on the land

Appendix A: Public Involvement Summary

STORMWATER UTILITY RATES

A few people said that stormwater utility rates are not fair to landowners who keep large parcels in undeveloped open space, and recommended new rates that offer better incentives to maintain open space.

WATER QUALITY

Many people expressed concern about pollution from agricultural fertilizers and pesticides running into lakes in the basin. Others stressed that land owners can meet the requirements of water quality laws and regulations, and still cause degradation. One person raised the issue of whether large developments should be responsible for long-term water quality monitoring.

PUBLIC EDUCATION/INFORMATION

One person commented that we must do better at educating large landowners on the impacts of development. Another person requested better public information and notification about proposals for new planned projects and developments, especially for residents of the affected areas.

STORMWATER FACILITIES

Some discussion focussed on how artificial wetlands work, or if they work at all. One person claimed that artificial wetlands are a fallacy; that they encourage non-native plants and disturb functioning natural areas. He said that natural areas such as forested lands should not be disturbed to create stormwater treatment facilities, and he suggested removing structures like parking lots, that contain impervious surfaces, and revegetating those areas. Another person commented that the stormwater ponds in new developments look much better than the facilities in old developments. Some people expressed interest in determining the effects of using natural wetlands to treat stormwater. One person recommended designing stormwater structures to look as natural as possible.

MISCELLANEOUS

One person commented that existing regulations do not control the cumulative effects of many small impacts over time. She explained that many small impacts can add up to large problems over time, and pointed to the McAllister area as an example of this process. Another person commented that we should improve our practices at home to prevent problems, rather than building large projects to solve our problems. One person expressed concern that stormwater ponds will create public health hazards. Someone commented that we need a two-pronged approach to stormwater problems: deal with long-term growth planning; and address current problems soon. Finally, one person said that we need tax incentives for individuals to preserve open space and native vegetation.

A.3 SUMMARY OF PUBLIC INVOLVEMENT AND EDUCATION ACTIVITIES

EXHIBITS AND FAIRS

Exhibits on Woodland/Woodard basin planning were displayed at the following events:

<u>Event</u>	<u>Date</u>
Olympia Stream Team Monthly Workshops	2-9/91
WSU Cooperative Extension Water Quality Educator Workshops	4-5/91
The Evergreen State College Water Day	4/20/91
Capitol High School Water Resources Open House	4/25/91
Washington Environmental Education Association Conference	4/26-28/91
Lacey Fun Fair	5/4/91
Olympia Wooden Boat Fair	5/11-12/91
Trout Unlimited Sport Fishing Expo '91	6/8-9/91

VOLUNTEER PROJECTS

Woodland/Woodard Stream Team Activities

Summary of volunteer projects:

<u>Project</u>	<u># Plants</u>	<u># Eggs/fry</u>	<u># Vols.</u>	<u>Person-hrs.</u>
Woodland Cr. clean-up			9	17
Woodard Cr. clean-up			16	36
Woodard Cr. revegetation	395		53	130
Woodland Cr. revegetation	342		24	70
Woodland Cr. egg tube planting		200,000	100	226
Woodard Cr. egg tube planting		100,000	50	112
Dobbs Cr. egg tube planting		100,000	50	112
<u>Woodard Cr. fish hatchery</u>		<u>70,000</u>	<u>25</u>	<u>250</u>
TOTALS:	737	470,000	327	953

Stream clean-ups. The Woodland/Woodard Stream Team celebrated Earth Day 1991 by cleaning up the headwaters of Woodard Creek at the Fones Road wetland - an area being considered by Olympia, Lacey, and Thurston County for a regional stormwater treatment facility. Olympia supplied a dumpster for this project, and Thurston County provided a dump truck and covered the landfill tipping fee. Sixteen volunteers contributed 36 person-hours to the day-long project, and completely filled the dumpster with assorted trash.

Volunteers cleaned up the shores of Lois Pond, behind Lake Lois on Woodland Creek, for another Stream Team project. Lacey provided a truck, trash disposal, and supervision for this project. Nine volunteers, including a local Girl Scout troop, donated 17 person-hours to make this project a success.

Appendix A: Public Involvement Summary

Revegetation projects. A revegetation project on Woodard Creek brought together local 5th grade students, Cub Scouts, and other volunteers in a concerted effort to halt erosion and restore native plants to a failing streambank adjacent to prime salmon spawning habitat. The 5th grade class from Pleasant Glade Elementary School received a pre-trip briefing and hands-on demonstration in their classroom. The Cub Scouts earned credit toward nature badges. Fifty three volunteers worked for 130 person-hours over a two-day period. A Volunteer Fisheries grant from the Department of Fisheries covered the cost of the native plant stock.

Native vegetation planted on Woodard Creek:

<u>Plant species</u>	<u># planted</u>
Willow (<i>Salix sp.</i>) whips	200
Willow (<i>Salix sp.</i>) rooted cuttings	100
Willow (<i>Salix sp.</i>) potted plants	50
Red elderberry (<i>Sambucus racemosa</i>) potted plants	40
Red flowering currant (<i>Ribes sanguinum</i>) potted plants	<u>5</u>
TOTAL:	395

On Woodland Creek in Lacey, erosion from steep banks threatened spawning gravels near the overflow outlet of a new stormwater treatment facility. Volunteers from previous Stream Team projects, Trout Unlimited members, and other interested local residents devoted the morning of Saturday, June 1, to replanting the stream banks with native plants and cleaning litter out of the stream. Lacey provided shovels and trash disposal. Twenty four volunteers worked for 70 person-hours to restore this section of creek. Again, a Volunteer Fisheries grant covered the cost of the plant materials.

Native vegetation planted on Woodland Creek:

<u>Plant species</u>	<u># planted</u>
Willow (<i>Salix sp.</i>) whips	200
Willow (<i>Salix sp.</i>) rooted cuttings	50
Willow (<i>Salix sp.</i>) potted plants	60
Red elderberry (<i>Sambucus racemosa</i>) potted plants	5
Snowberry (<i>Symphoricarpos albus</i>) potted plants	25
Red flowering currant (<i>Ribes sanguinum</i>) potted plants	<u>2</u>
TOTAL:	342

Storm drain stencilling. Olympia, Lacey, and Thurston County administer storm drain stencilling programs, utilizing stencils supplied by the Washington Department of Ecology. The government agencies supply volunteers with stencilling kits comprised of brooms for street cleaning, safety vests, traffic control paint, and stencils with the message "Dump no waste - drains to stream". The Woodland and Woodard creek basins were surveyed to identify neighborhoods and subdivisions in need of stencilling. The PIE Coordinator recruited volunteers to spend an afternoon stencilling drains in their neighborhoods, and supplied a list of storm drain locations. The volunteers then recruited their own work groups. Numerous locations in the Woodland/Woodard basin have been stencilled, but many unstencilled storm drains remain. This activity proved especially popular with children.

Salmon egg tube planting. A North Thurston High School class planted salmon egg tubes in Woodland and Woodard Creeks, and Dobbs Creek (part of the Henderson Inlet watershed) in the winter of 1991. This project involved filling flexible plastic tubes with layers of gravel and salmon eggs and staking them into the creeks at sites with good stream flow and fish habitat. The Squaxin Tribe Hatchery donated the chum salmon eggs. The project involved 200 volunteers over 4 weekends, and resulted in placing almost a half million salmon eggs in the creeks.

Volunteer salmon egg planting:

<u>Creek</u>	<u># eggs</u>	<u># volunteers</u>	<u>person-hours</u>
Woodland Cr.	200,000	100	226
Woodard Cr.	100,000	50	112
<u>Dobbs Cr.</u>	<u>100,000</u>	<u>50</u>	<u>112</u>
TOTAL:	400,000	200	450

Salmon fry planting. The Olympia Salmon Club assisted a local volunteer with building a salmon hatchery on the banks of Woodard Creek. The remote site hatchery designed by Jerry Manuel attained a 99% success rate for propagating Chum and Coho Salmon. A Volunteer Fisheries grant assisted with funding this project.

Appendix A: Public Involvement Summary

Salmon fry hatched into Woodard Creek:

<u>Species</u>	<u>#</u>
Chum salmon	40,000
<u>Coho salmon</u>	<u>30,000</u>
TOTAL:	70,000

In early spring, the Department of Fisheries installed a weir trap on Woodard Creek to help determine smolt escapement. This trap was tended, and smolt recorded, by a local volunteer. By the season's end, 2608 coho smolts had passed through the weir.

PRESENTATIONS TO COMMUNITY AND SPECIAL INTEREST GROUPS

Staff met with numerous local groups to present an overview of the basin plan and generate public support. These meetings gave staff the opportunity to discuss the basin plan in some detail in a small, local setting. They also gave local residents an important opportunity to raise specific concerns, which indicated the issues most likely to generate public interest. These groups included:

- Henderson Inlet Watershed Action Committee
- Lacey Chamber of Commerce
- Lakes Improvement Association
- Long Lake Steering Committee
- Olympia Salmon Club
- South Lake Pattison Committee
- Storm and Surface Water Basin Planning Subcommittee
- Trout Unlimited, Olympia Chapter

A.4 BASIN RESIDENT SURVEY RESULTS

Summary of Woodland/Woodard basin survey results (percentages listed do not add up to 100 because not all respondents answered every question):

Question 1. Have you experienced any of these problems in Woodland or Woodard basin?

	#(%)		
	<u>Yes</u>	<u>No</u>	<u>Don't Know</u>
Flooded basement, water ponding on property	90(16)	420(73)	14(2)
Water over road and/or road damage	225(38)	290(51)	18(3)
Creeks, wetlands or ponds overflowing	129(23)	325(57)	40(7)
Mudslides and/or landslides	36(6)	438(77)	42(7)
Creek pollution (oil sheen, suds, bad odors, etc.)	129(23)	329(57)	67(12)
Littered or foul smelling ponds or creeks	126(22)	336(57)	58(10)
Ditches or culverts flooding	212(37)	284(50)	30(5)
Sedimentation (silting up of lawns, ditches, creeks, etc.)	100(17)	371(65)	48(10)
Streambanks or ditches eroding	121(21)	335(58)	62(10)

Question 2. Stormwater problems may be reduced in many different ways. Considering that costs increase as you add items, circle the priority you would give each suggested action:

		#(%)			
		Priority:			<u>Don't Know</u>
		<u>High</u>	<u>Med.</u>	<u>Low</u>	
<u>COST:</u>	No action/ maintain existing public facilities only	99(17)	63(11)	248(43)	37(6)
	Change zoning laws to protect stream zones, wetlands, and other sensitive and hazardous area	339(59)	90(16)	75(13)	19(3)
	Prohibit structures within the flood plain	295(51)	116(20)	81(14)	33(6)
<u>LOW</u>	Restore natural streamside vegetation to damaged creeks	294(51)	131(23)	91(16)	16(3)
	Use existing ponds, lakes, and wetlands to store runoff	226(39)	138(24)	101(18)	59(10)
	Establish a Citizen Hotline phone number for reporting flooding and stormwater-related problems	154(27)	163(28)	173(30)	32(6)
	Offer public education workshops and pamphlets on how residents can reduce or prevent stormwater problems	199(35)	198(35)	118(21)	17(3)
<u>MED</u>	Repair and maintain private ponds and swales	148(26)	168(29)	165(29)	32(6)
<u>IUM</u>	Require new developments to build bigger stormwater facilities	377(66)	87(15)	57(10)	16(3)
	Purchase and protect critical wetlands, floodplains, etc.	237(41)	112(20)	136(24)	26(5)
<u>HIGH</u>	Build new regional ponds and treatment facilities	124(22)	151(26)	196(34)	47(8)

Appendix A: Public Involvement Summary

Question 3. How important to you are the following stormwater management goals?

	#(%)			No
	<u>High</u>	<u>Medium</u>	<u>Low</u>	<u>Opinion</u>
Restore natural, pristine conditions to creeks	282(49)	158(28)	86(15)	14(2)
Prevent increase in runoff and flooding	330(58)	149(26)	53(9)	14(2)
Protect and improve fish habitat	303(53)	160(28)	75(13)	11(2)
Protect water quality and shellfish habitat	360(63)	141(25)	46(8)	8(1)
Provide public education and assistance	256(45)	180(31)	96(17)	14(2)

Question 4. Do you reside in Woodland/Woodard Basin? Yes 438(76) No 74(13)

Question 5. Summary of comments received:

No new taxes or fees	8
Halt or limit development	48
Improve regulation enforcement	7
Improve/increase regulations on development	13
Make developers pay for new stormwater facilities	9
Improve planning	13
Save/improve fish runs and habitat	16
Limit land clearing and grading	8
Eliminate stormwater utility	3
Expand stormwater utility	4
Improve/expand public involvement and education	11
Build new regional stormwater facilities	4
Remove milfoil from lakes	6
Protect wetlands from development	15
Decrease bureaucracy and regulations	12
Improve waste disposal practices	13
Have not actually observed any problems in basin	3
Site-specific basement/road flooding problems*	23
Site-specific ditch maintenance problem*	12
Site-specific pollution problem*	18
Other comments	32

*Site-specific problems were entered into the data base for field inspection or remedial action.

APPENDIX B: STORMWATER QUALITY SURVEY RESULTS

B.1 SYNOPSIS OF FINDINGS: *WATER QUALITY SURVEY OF WOODLAND AND WOODARD CREEK BASIN (1989)*

- Twenty-nine organic contaminants and 7 toxic metals were detected in Thurston County storm drain sediments.
- The number of sediment contaminants which exceeded criteria or highest apparent effects threshold values ranged from 3 to 23 at the 7 storm drain sites sampled.
- Phthalate esters and polynuclear aromatic hydrocarbons were the 2 chemical groups appearing most often and in the highest concentrations in sediments.
- Polychlorinated biphenyls (PCBs) were detected in 4 of the 7 storm drain sediment sites at levels above established criteria.
- Lead and zinc were the 2 toxic metals that exceeded sediment criteria at all 7 storm drain sites. The zinc criterion was exceeded at one receiving water site, Woodard Creek at Ensign Road.
- The South Sound Drainage site, with 23 contaminants exceeding established sediment criteria or HAET, is the storm drain in this survey with the greatest number of problem chemicals.
- Priority pollutant pesticides were not detected in any storm drain or receiving water sediment samples collected.
- Only 2 organic contaminants, 4-methylphenol and benzoic acid, were detected in receiving water sediment samples. The HAET value for benzoic acid was exceeded at the Woodland Creek at Pleasant Glade site.
- Twenty-nine organic contaminants were detected in stormwater at concentrations near the detection limits or at very low levels.
- Total phthalates exceeded chronic toxicity criteria for freshwater aquatic life in 15 of 24 stormwater samples.
- Polynuclear aromatic hydrocarbons and phthalate esters were the most commonly appearing contaminants in stormwater, with 4 phenolic compounds, 4 benzene compounds, and 3 volatile organic compounds also appearing.

Appendix B: Stormwater Quality Survey Results

- Three of the five phenolic contaminants detected in the survey were found only in stormwater samples.
- The median concentrations of conventional parameters for Thurston County stormwater are similar to median Bellevue data.
- A relationship between the percentage of the sub-basin in commercial land use and Total PAH concentrations was seen.

The long open ditch system separating the South Sound sampling site from the Fones Road sampling site appears to play a role in stormwater contaminant removal.

- Total phosphorus concentrations in Thurston County stormwater are above the concentration EPA suggests to prevent nuisance aquatic plant growth and cultural eutrophication in lakes. And more than fifty percent of the stormwater samples exceeded the concentration EPA suggests to prevent nuisance growth of plants in streams and rivers.
- Stormwater contaminant concentrations were orders of magnitude lower than sediment contaminant concentrations, confirming that sediments are a sink for pollutants.

B.2 DISCUSSION OF INDIVIDUAL SAMPLING SITES

All seven of the sampling sites received run-off from mixed land uses, but were dominated by 1 or 2 particular land uses (Refer to Figure B-1). Evaluation of data revealed a relationship between percentage of commercial land use in the sub-basins and total PAH concentrations. Galvin and Moore found no clear differences in contaminant concentrations between residential, commercial, and industrial land uses in their street dust work.

1. RUDDELL ROAD OUTFALL

In the stormwater from the Ruddell Road outfall, total phthalates (26 ug/L) exceeded chronic freshwater quality criteria (assuming a 24 hour average) of 3 ug/l for the December sample event. In the sediment, butyl benzyl phthalate (1500 ug/Kg) was found at a concentration that exceeded HAET, while lead (160 ug/Kg) and zinc (280 ug/Kg) exceeded freshwater sediment criteria. All of these contaminants were identified as problem chemicals based on exceedance of HAET or freshwater sediment criteria but were below mean urban street dust concentrations.

2. COLLEGE STREET AT MARTIN WAY

In stormwater from this collection system total phthalates (3.8 and 5.0 ug/L) exceeded chronic freshwater quality criteria (assuming a 24 hour average) for the November and December sample events. In the sediment total phthalates (6300 ug/Kg), bis(2-ethylhexyl) phthalate (4300 ug/Kg), and benzoic acid (680 ug/Kg) exceeded HAET concentrations. With exception to di-n-octyl phthalate all values were below typical urban street dust concentrations. Levels of di-n-octyl phthalate were roughly three times the expected urban street dust concentration which implies there may be another source of this contaminant. Lead (72 mg/Kg) and zinc (140 mg/Kg) exceeded freshwater sediment criteria but were below typical urban street dust values.

3. TANGLEWILDE

Analysis of stormwater from this site showed total phthalates (14 ug/L) exceeded freshwater quality criteria for the December sample event.

4. LACEY OUTFALL

In stormwater total phthalates levels (3.8, 15 and 3.2 ug/L) exceeded chronic freshwater quality criteria (assuming 24 hour average) for the November, December and February sampling events, respectively. These criteria are based on acute and chronic effects to aquatic life, and are not enforceable standards but can be viewed as general guidelines. In sediments, butyl benzyl phthalate (580 ug/Kg) and bis(2-ethylhexyl)phthalate (2100 ug/Kg) exceeded HAET concentration but were an order of magnitude below urban street dust concentrations. Lead (160 mg/Kg) and zinc (130 mg/Kg) exceeded freshwater sediment criteria but were also below typical street dust values.

5. SOUTH SOUND DRAINAGE

Results from stormwater samples showed total phthalates (6.3, 10 and 20 ug/L) exceeded freshwater quality criteria (assuming 24 hour average) for November, December and February, respectively. Sediments analyzed from this site showed phenanthrene (17000 ug/Kg), fluoranthene (37000 ug/Kg), pyrene (27000 ug/Kg), benzo(a)anthracene (11000 ug/Kg), chrysene (16000 ug/Kg), indeno(1,2,3-cd)pyrene (5600 ug/Kg), benzo fluoranthenes (40000 ug/Kg), benzo(a)pyrene (14000 ug/Kg), benzo(g,h,i)perylene (5800 ug/Kg), and bis(2-ethylhexyl)phthalate (55000 ug/Kg), exceeded HAET and EAR 1000 concentrations while LPAH (23000 ug/Kg), HPAH (160000 ug/Kg), acenaphthene (1200 ug/Kg), anthracene (2900 ug/Kg), dibenzo(a,h)anthracene (1700 ug/Kg), total phthalates (76000 ug/Kg), di-n-butyl phthalate (9500 ug/Kg), butyl benzyl phthalate (4700 ug/Kg), and dibenzofuran (670 ug/Kg) exceeded HAET concentrations. PCBs (9100 ug/Kg), cadmium (2.7 mg/Kg), lead (420 mg/Kg), and zinc (600 mg/Kg) exceeded Freshwater Sediment Criteria.

Appendix B: Stormwater Quality Survey Results

6. FONES ROAD DITCH

Stormwater analysis from this site showed total phthalates (4.6 ug/L) exceeded freshwater quality criteria (assuming 24 hour average) for the December sample event. Sediments indicated benzo fluoranthenes (13000 ug/Kg) exceeded HAET concentrations while indeno(1,2,3-cd)pyrene (2200 ug/Kg) and bis(2-ethylhexyl)phthalate (2400 ug/Kg) exceeded HAET. PCBs (4600 ug/Kg), lead (66 mg/Kg) and zinc (180 mg/Kg) exceeded freshwater sediment criteria.

7. MARTIN WAY

Results of stormwater analysis showed total phthalates (5.3 and 9 ug/L) exceeded freshwater quality criteria (assuming 24 hour average) for the November and December sample events. Sediments from this site showed total phthalates (4300 ug/Kg), bis(2-ethylhexyl)phthalate (3200 ug/Kg), and dimethyl phthalate (370 ug/Kg), exceeded HAET concentrations, while PCBs (27000 ug/Kg), cadmium (2.0 mg/Kg), lead (170 mg/Kg), and zinc (180 mg/Kg) exceeded freshwater sediment criteria.

B.3 SUMMARY

In reviewing the organic contaminant results 6 of the 7 sites had the greatest number of organic contaminants appear in the February samples. This supports the generally accepted theory that contaminants accumulate in the watershed during the dry periods and contribute to higher stormwater contaminant concentrations in the subsequent rainfall event.

Unlike most of the contaminants, bis(2-ethylhexyl)phthalate concentrations were higher in December than in February by an order of magnitude at 4 of the 7 stations. This may not be a significant observation due to the presence of this phthalate in both the lab and field blanks for the February sampling event. The bis(2-ethylhexyl)phthalate results reported by the laboratory have been adjusted to reflect its presence in the blanks. This particular phthalate ester is the most widely produced of the phthalates and is very commonly found in the environment.

In the December sampling event, no phenolic or benzene compounds were detected. While this observation is noteworthy, there is no obvious reason for the absence of these compounds during that event.

It was also generally true for the conventional parameters that the higher concentrations were seen in the February samples. The notable exception to this is the fecal coliform bacteria with a mean value one order of magnitude lower in February than in the November and December means. Numerous factors have could contributed to this, including dilution and reduced numbers of organisms contributed from the sediments due to previous flushing. Slightly increased settleable and suspended solids may be partly attributed to the wash-off of de-icing and

traction materials spread on the streets during the snowfall 2 weeks prior to the February storm event.

B.4 SAMPLING RECOMMENDATIONS

The results of this survey demonstrated the value of sediment samples as opposed to stormwater samples. Since most contaminants are associated with particulate material, the sediments provide a record of the contaminants present in stormwater during those times when samples cannot be collected. Sediments in the storm sewer can also be used to track sources. A secondary advantage of sediment sampling is that it does not require coordination with storm events, and is therefore easier and less costly to accomplish. Two drawbacks to sediment sampling are that pollutant loading rates cannot be calculated and development of sediment quality criteria is not completed. Since Thurston County area jurisdictions are in the start-up phase of stormwater programs, use of sediment sampling as a screening tool would be a cost-effective method of identifying and prioritizing problems.

The specific parameters chosen for any sampling program will always depend on the objectives of the project. Preliminary assessment of the storm sewer system and the sub-basin is necessary to design an appropriate sampling program. The base/neutral/acid test for semi-volatile organic compounds and priority pollutant metals (or a subset of those metals) are good analyses to include, especially if it is the first sampling conducted in a particular storm sewer system.

The experience from this survey and that of Metro sampling indicate that volatile organic compound are not usually detected in stormwater. Unless there is reason to expect volatile contaminants they need not routinely be included in a stormwater sampling program.

Due to the physical proximity of storm sewer pipes to sanitary sewer systems and the likelihood of illegal connections, fecal coliform bacteria analyses should always be included in any screening level sampling being done. Inclusion of other conventional parameters, such as nutrients or settleable solids, will depend on the particular concerns associated with that storm sewer system, such as discharge to a lake or sedimentation over salmon spawning gravel beds.

B.5 FUTURE STUDY NEEDS

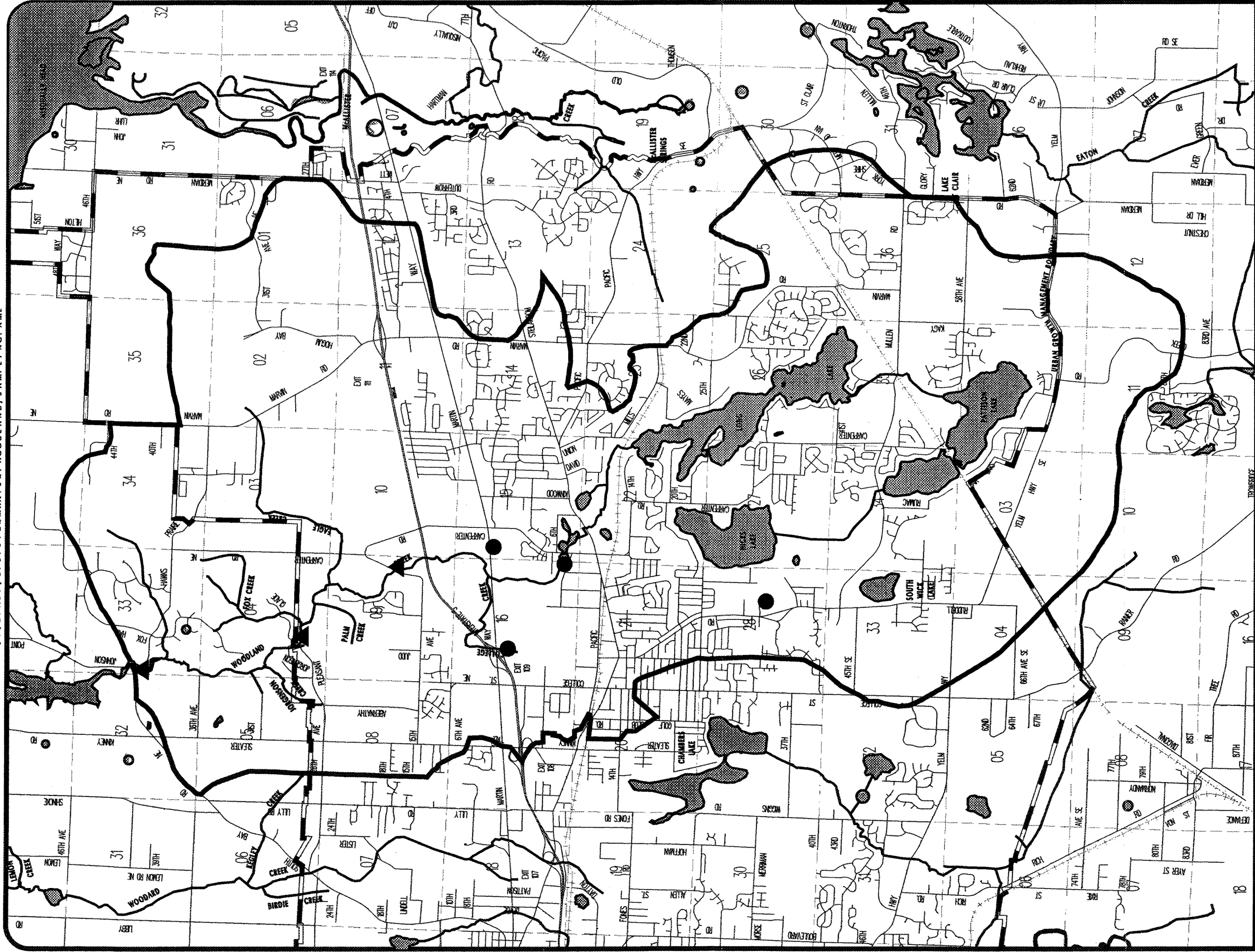
This study did not examine the contribution stormwater may have to groundwater contamination or potential impacts to natural wetland systems. A study on impacts to wetlands is currently underway by the University of Washington. However, local studies may be desired in specific areas where groundwater or wetlands are a particular concern.

Appendix B: Stormwater Quality Survey Results

The effort in this survey to determine contaminant movement down the creeks to Puget Sound was very limited. More extensive sediment sampling is needed to statistically validate the results of this survey which showed few detected contaminants in the receiving waters.

This survey did not evaluate the risks or impacts to aquatic organisms or human health for the contaminants detected. Risk assessments, bioassays, and aquatic organisms surveys would be necessary to determine the impacts and potential impacts.

\$18 DIA 3: [C.F.E. STORMWATER, WOODLAND] SAMPLING, A.M.I.



WOODLAND CREEK BASIN

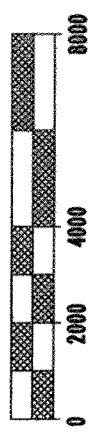
WATER QUALITY SAMPLING LOCATIONS

MAP B-1

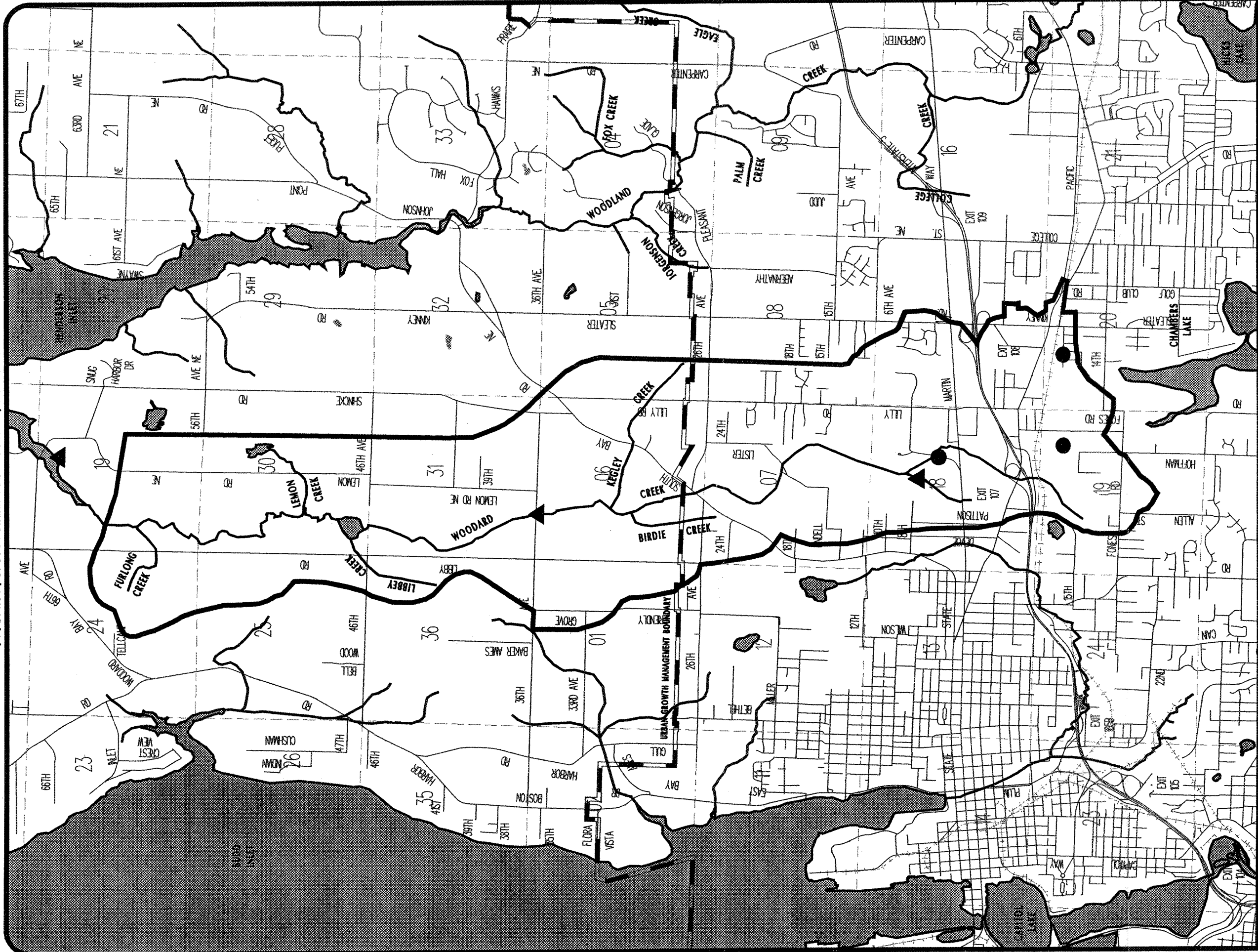
● SAMPLING SITE

▲ SEDIMENT ONLY

PREPARED BY:
THURSTON COUNTY STORMWATER
SEPTEMBER 1994



SCALE IN FEET



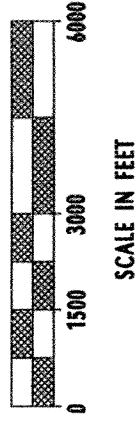
WOODWARD CREEK BASIN

WATER QUALITY SAMPLING LOCATIONS

MAP B-2

PREPARED BY:
THURSTON COUNTY STORMWATER
SEPTEMBER 1994

- SAMPLING SITE
- ▲ SEDIMENT ONLY



SCALE IN FEET