APPENDIX E: REGIONAL BASIN PLANNING GOALS AND OBJECTIVES

On September 11, 1990, the Technical Advisory Committee comprised of the stormwater managers from Olympia, Lacey, Tumwater and Thurston County established goals and objectives for all basin plans undertaken in Thurston County. The complete text follows:

BASIN PLAN GOALS

- Preserve and/or enhance water quality, stream morphology, wetlands, groundwater, fisheries/wildlife habitat, and aesthetic amenities.

- Promote sustainable development within each basin (i.e. minimum impact on water resources and habitat).

- Promote public interest and involvement in water resource management.

- Establish short-term and long-term solutions to existing and future stormwater quality and quantity problems.

- Promote a regional approach for financing, ownership, and operation/maintenance of regional facilities and programs.

BASIN PLAN OBJECTIVES

As a result of completing a drainage basin plan the following will have been accomplished:

1. There will be a rational basis for making decisions about capital expenditures, financing options, land use regulation, source reductions, and stormwater facility location, design, and maintenance. Decision-making information and tools generated by the basin plan will include:

    - Data base on water quality, hydrology, and habitat.
    - Data base on existing and potential pollution sources.
    - Predictive model for testing effects of alternate decisions.
    - Prioritized list of structural and non-structural projects.
    - Recommended development controls (regulations/incentives).
    - Recommended program for continued monitoring of facility performance and resource conditions.

2. There will be active ongoing public involvement in stream restoration, enhancement, and education activities addressing problems identified in the plan.

3. The public will understand and support plan recommendations.

4. Responsible jurisdictions will have agreed on a common implementation and financing strategy for the drainage basin including:

- Schedule for implementing recommended projects.
- Revenue sources and methods of financing.
- Cost allocations.
- Responsibility for owning and operating capital facilities.
- Enforcement of development controls and other regulations.
- Ongoing coordination of plan implementation.
- Ongoing coordination of public involvement and education activities.

APPENDIX F: ANIMALS OF MCALLISTER BASIN AND THE NISQUALLY DELTA[1]

BIRDS

Common Name	Scientific Name
Common Loon	*Gavia immer*
Red-throated Loon	*Gavia stellata*
Arctic Loon	*Gavia arctica*
Western Grebe	*Aechmorphus occidentalis*
Red-necked Grebe	*Podiceps grisegena*
Horned Grebe	*Podiceps auritus*
Eared Grebe	*Podiceps nigricollis*
Pied-billed Grebe	*Podilymbus podiceps*
Double-crested Cormorant	*Phalacrocorax auritus*
Pelagic Cormorant	*Phalacrocorax pelagicus*
Brandt's Cormorant[2]	*Phalacrocorax penicillatus*
Great-blue Heron	*Ardea herodias*
Green Heron	*Butorides virescens*
American Bittern	*Botaurus lentiginosus*
Great Egret[3]	*Casmerodius albus*
Whistling Swan[2]	*Olor columbianus*
Canada Goose	*Branta canadensis*
Black Brant	*Branta nigicans*
White-fronted Goose	*Anser albifrons*
Snow goose	*Chen caerulescens*
Mallard	*Anas platyrhynchos*
Gadwall	*Anas strepera*
Pintail	*Anas acta*
Green-winged Teal	*Anas crecca*
Cinnamon Teal	*Anas cyanopters*
Blue-winged Teal	*Anas discors*
Garganey Teal[2]	*Anas querquedula*
European Widgeon	*Anas penelope*
American Widgeon	*Anas americana*
Northern Shoveler	*Anas clypeata*
Wood Duck	*Aix sponsa*
Redhead	*Aythya americana*
Ring-necked Duck	*Aythya collaris*
Canvasback	*Aythya valisineria*
Greater Scaup	*Aythya marila*
Lesser Scaup	*Aythya affinis*
Bufflehead	*Bucephala albeola*
Common Goldeneye	*Bucephala clangula*
Barrow's Goldeneye	*Bucephala islandica*

Common Name	Scientific Name
Oldsquaw	*Clangula hyemalis*
White-winged Scoter	*Melanitta deglandi*
Black Scoter[2]	*Melanitta nigra*
Surf Scoter	*Melanitta perspicillata*
Ruddy Duck	*Oxyura jamaicensis*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-breasted Merganser	*Mergus serrator*
Turkey Vulture	*Cathartes aura*
White-tailed Kite	*Elanus leucurus*
Cooper's Hawk	*Accipiter cooperi*
Goshawk	*Accipiter gentilis*
Sharp-shinned Hawk	*Accipiter striatus*
Red-tailed Hawk	*Buteo jamaicensis*
Rough-legged Hawk	*Buteo lagopus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Osprey	*Pandion haliaetus*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
American Kestrel	*Falco sparverius*
California Quail	*Lophortyx californicus*
Ring-necked Pheasant	*Phasianus colchicus*
Blue grouse[2]	*Dendragapus obscurus*
Ruffed Grouse	*Bonasa umbellus*
Sandhill Crane	*Grus canadensis*
Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
American Coot	*Fulica americana*
Mongolian Plover[2]	*Charadrius mongolus*
Semipalmated Plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferus*
American Golden Plover	*Pluvialis dominica*
Black-bellied Plover	*Pluvialis squatarola*
Common Snipe	*Capella gallinago*
Whimbrel	*Numenius phaeopus*
Spotted Sandpiper	*Actitus macularia*
Solitary Sandpiper[2]	*Tringa solitaria*
Wandering Tattler	*Heteroscelus incanus*
Greater Yellowlegs	*Tringa melanotos*
Lesser Yellowlegs	*Tringa flavipes*
Sharp-tailed Sandpiper	*Calidris acuminata*
Pectoral Sandpiper	*Calidris melanotos*

Common Name	Scientific Name
Baird's Sandpiper	*Calidris bairdii*
Marbled Godwit	*Limosa fedoa*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Red Knot	*Calidris canutus rufa*
Least Sandpiper	*Calidris minutilla*
Sanderling	*Calidrid alba*
Dunlin	*Calidris alpina*
Western Sandpiper	*Calidris mauri*
Wilson's Phalarope	*Steganopus tricolor*
Parasitic Jaeger	*Stercorarius parasiticus*
Glaucous-winged Gull	*Larus glaucescens*
Glaucous Gull	*Larus hyperboreus*
Herring Gull	*Larus argentatus*
California Gull	*Larus californicus*
Ring-billed Gull	*Larus delawarensis*
Mew Gull	*Larus canus*
Heerman's Gull	*Larus heermanni*
Franklin's Gull	*Larus pipixcan*
Bonaparte's Gull	*Larus philadelphia*
Thayer's Gull	*Larus thayeri*
Common Tern	*Sterna hirundo*
Caspian Tern	*Hydroprogne caspia*
Common Murre	*Uria aalge*
Pigeon Guillemot	*Cepphus columba*
Rhinoceros Auklet	*Cerorhinca monocerata*
Marbled Murrelet	*Brachyramphus marmoratum*
Ancient Murrelet[2]	*Synthliboramphus antiquus*
Band-tailed Pigeon	*Columba fasciata*
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Saw-whet Owl	*Aegolius acadicus*
Great Horned Owl	*Bubo virginianus*
Snowy Owl[2]	*Nyctea scandiaca*
Screech Owl	*Otus asio*
Short-eared Owl	*Asio flammeus*
Barn Owl	*Tyto alba*
Common Nighthawk	*Chordeiles minor*
Vaux's Swift	*Chaetura vauxi*
Anna's Hummingbird	*Calypte anna*
Rufous Hummingbird	*Selasphorus rufus*
Belted Kingfisher	*Megaceryle alcyon*
Common Flicker	*Colaptes auratus*
Pileated Woodpecker	*Dryocopus pileatus*

Common Name	Scientific Name
Yellow-bellied Sapsucker	*Sphyrapicus varius*
Hairy Woodpecker	*Dendrocopos villosus*
Downy Woodpecker	*Dendrocopos pubescens*
Willow Flycatcher	*Empidonax traillii*
Western Flycatcher	*Empidonax difficilis*
Western Wood Pewee	*Contopus sordidulus*
Olive-sided Flycatcher	*Nuttallornis borealis*
Violet-green Swallow	*Tachycineta thalassina*
Tree Swallow	*Iriodoprocne bicolor*
Rough-winged Swallow	*Stelgidopteryx ruficollis*
Barn Swallow	*Hirundo rustica*
Cliff Swallow	*Petrpchelidon pyrrhonota*
Steller's Jay	*Cyanocitta stelleri*
Scrub Jay[2]	*Aphelocoma coerulescens*
Western Kingbird	*Tyrannus verticalis*
Purple Martin	*Progne subis*
Common Raven	*Corvus corax*
Common Crow	*Corvus brachyrhyncos*
Black-capped Chickadee	*Parus atricapillus*
Chestnut-backed Chickadee	*Parus rufescens*
Bushtit	*Psaltriparus minimus*
Brown Creeper	*Certhia familiaris*
Red-breasted Nuthatch	*Sitta canadensis*
Winter Wren	*Troglodytes troglodytes*
Bewick's Wren	*Thryomanes bewickii*
Long-billed Marsh Wren	*Telmatodytes palustris*
American Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
Hermit Thrush	*Catharus guttata*
Swainson's Thrush	*Catharus ustulata*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Water Pipit	*Anthus spinoletta*
Cedar Waxwing	*Bombycilla cedrorum*
Bohemian Waxwing	*Bombycilla garrulus*
Northern Shrike	*Lanius excubitor*
Starling	*Sturnus vulgaris*
Red-eyed Vireo	*Vireo olivaceous*
Warbling Vireo	*Vireo gilvus*
Hutton's Vireo	*Vireo huttoni*
Orange-crowned Warbler	*Vermivora celata*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped Warbler	*Dendroica coronata*

Common Name	Scientific Name
Black-throated Grey Warbler	*Dendroica nigrescens*
Townsend's Warbler	*Dendroica townsendi*
MacGillivray's Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Wilson's Warbler	*Wilsonia pusilla*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Red-winged Blackbird	*Agelaius phoeniceus*
Northern Oriole	*Icterus galbula bullockii*
Brewer's Blackbird	*Euphagus cyanocephalus*
Brown-headed Cowbird	*Molothrus ater*
Western Tanager	*Piranga ludoviciana*
Evening Grosbeak	*Hesperiphona vespertina*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Purple Finch	*Carpodacus purpureus*
House Finch	*Carpodacus mexicanus*
Pine Siskin	*Spinus pinus*
American Goldfinch	*Spinus trisis*
Rufous-sided Towhee	*Pipilo erythrophthalmus*
Vesper Sparrow	*Pooecetes gramineus*
Savannah Sparrow	*Passerculus sandwichensis*
Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*Spizella passerina*
Dark-eyed Junco	*Junco hyemalis*
White-throated Sparrow	*Zonotrichia albicollis*
Harris' Sparrow	*Zonotrichia querula*
White-crowned Sparrow	*Zonotrichia leucophyrs*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Fox Sparrow	*Passerella iliaca*
Lincoln's Sparrow	*Melospiza lincolnii*
Song Sparrow	*Melospiza melodia*
Snow Bunting[2]	*Plectrophenax nivalis*

MAMMALS

Common Name	Scientific Name
Masked shrew	*Sorex cinerus*
Vagrant shrew	*Sorex vagrans*
Shrew species	*Sorex* sp.
Shrew-mole	*Neurotrichus gibbsi*
Townsend mole	*Scapanus townsedii*

Common Name	Scientific Name
Mole species	*Scapanus* sp.
Bat species	*Myotis* sp.
Eastern cottontail	*Sylvilagus floridanus*
Mountain beaver	*Aplodontia rufa*
Townsend chipmunk	*Eutamias townsendii*
Western gray squirrel	*Sciurus griseus*
Eastern gray squirrel	
Northern flying squirrel	*Glaucomys sabrinus*
Beaver	*Castor canadensis*
Porcupine	*Erethizon dorsatum*
Deer mouse	*Peromyscus maniculatus*
Townsend vole	*Microtus townsendi*
Oregon vole	*Microtus oregoni*
Vole (mouse) species	*Microtus* sp.
Muskrat	*Ondatra zibethica*
House mouse	*Mus musculus*
Pacific jumping mouse	*Zapus trinotatus*
Coyote	*Canis latrans*
Racoon	*Procyon lotor*
Longtail weasel	*Mustela frenata*
Mink	*Mustela vison*
River otter	*Lutra canadensis*
Western Spotted Skunk	*Spilogale gracilis* (or *putorius*)
Striped Skunk	*Mephitis mephitis*
Opossum	*Didelphis marsupialis*
Mule (Black-tailed) deer	*Odocoileus hemionus*
Harbor seal	*Phoca vitulina*

REPTILES AND AMPHIBIANS

Common Name	Scientific Name
Rough-skinned newt	*Taricha granulosa*
Western long-toed salamander	*Ambystoma macrodactylum*
Western toad	*Bufo boreas*
Pacific tree frog	*Hyla regilla*
Bullfrog	*Rana catesbeiana*
Red-legged frog	*Rana aurora*
Western pond turtle	*Clemmys marmorata*
Northern alligator lizard	*Gerrhonotus coeruleus*
Garter snake	*Thamnophis* sp.

MARINE INVERTEBRATES

Common Name	Scientific Name
Burrowing ghost shrimp	*Callianassa californiensis*
False mya, clam	*Cryptomya californica*
Corrugated worm	*Glycera rugosa*
Oregon mud-crab	*Hemigrapsus oregonensis*
Threadworm species	*Lumbreneris* sp.
Tiny pink clam	*Macoma inconspicua*
Bent-nosed clam	*Macoma nasuta*
Mud clam, soft-shelled clam	*Mya arenaria*
Blue mussel	*Mytilus edulis*
	Nephtys sp.
Clamworm, sandworm	*Nereis virens*
	Phyllodocidae family
	Polynoidae family
Little-neck clam, hard-shell clam	*Protothaca staminea*
Kelp crab	*Pugettia productus*
	Stylodurus abdominalis
Mud-shrimp	*Upogebia pugettensis*

[1] This list is compiled from a variety of sources, including A. Wiedemann; M.E. Burg et al; S.A. Klotz et al; Washington Department of Wildlife; Washington Department of Fisheries; and the Nisqually National Wildlife Refuge.

[2] Uncommon or rare occurrence

[3] Accidental occurrence

APPENDIX G: HYDROLOGIC MODEL ASSUMPTIONS

The hydrologic modeling performed by Brown and Caldwell was based on the following assumed characteristics:

Lake St. Clair basin area

Eaton Creek sub-basin:	8,000 acres
Lake St. Clair sub-basin:	2,400 acres
TOTAL:	10,400 acres

Soil hydrologic classes

Eaton Creek sub-basin:

Class A	5,000 acres
Class D	3,000 acres

Lake St. Clair sub-basin:

Class A	2,400 acres

100-year, 7-day storm event

Synthesized from storm of January 3 - January 9, 1990.
Actual storm: 8.6" in 7 days.
Synthesized storm: 12" in 7 days.

Storm was synthesized by increasing hourly rainfall totals of real storm by 40%.

Hydrologic characteristics

Shown in Table G-1 on next page, based on EPA Storm Water Management Model (SWMM) calibrations for an area south of Tacoma.

These calculations probably err toward underestimating the total runoff.

Table G-1: Assumed Hydrologic Characteristics in Lake St. Clair Runoff Analysis

Parameter	Undeveloped	Low Density 1-2du/5ac	Medium Density 1du/acre	Suburban Density 4-5 du/acre	High Density/multi family
Effective impervious area - %	0	4	10	23	48
Disturbed land area - %	0	40	75	100	100
Pervious area depression storage - inches	0.25	0.19	0.14	0.10	0.10
Impervious area depression storage - inches	_	0.03	0.03	0.03	0.03
Mannings friction factor-impervious	_	0.014	0.014	0.014	0.014
Mannings friction factor-pervious	0.20	0.20	0.20	0.20	0.20
Infiltration rate decay and regeneration - 1/sec	0.001 0.0001	0.001 0.0001	0.001 0.0001	0.001 0.0001	0.001 0.0001
Horton infiltration parameters[1]					
SCS Class A soils Fo - in/hr Fc - in/hr	 3.0 0.4	 2.2 0.34	 1.5 0.2	 1.0 0.1	1.0 0.1
SCS Class D soils Fo - in/hr Fc - in/hr	 0.6 0.06	 0.5 0.04	 0.4 0.04	 0.3 0.03	0.3 0.03
Alderwood complex soils Fo - in/hr Fc - in/hr	 2.0 0.40	 1.6 0.28	 1.25 0.08	 1.0 0.10	 1.0 0.10

[1] Fo and Fc are respectively the maximum and minimum Horton infiltration rates

APPENDIX H: GROUND WATER RISK MODEL DESCRIPTION

Adolfson Associates, Inc. and Sweet-Edwards/EMCON performed the risk analysis under sub-contract with Brown and Caldwell. The study divided the McAllister Springs GSA, as it was designated in 1988, into 20 separate source areas depending on land use, surface drainage, and ground water table gradient (see Map 10 in Appendix A), and considered potential contamination sources and targets in each area.

All existing Class 1 and 2 wells (10-99 connections and 100 or more connections) were mapped in each source area. Thirty-two of these systems are within or adjacent to the study area. The consultant conducted traffic surveys of each source area to provide accurate information on the hazardous materials and containers currently being transported through the area.

The hydrogeology of the area was developed from a variety of sources, including the Washington State Division of Water Resources water supply bulletin (Noble, 1966), well logs, existing cross-sectional information, and preliminary potentiometric surface mapping conducted by Golder and Associates.

The Thurston Regional Planning Council provided population projections for developing future land use and traffic estimates. These provided a "future scenario" for the basin in the year 2010. "Virtual wells", or theoretical wells representing future development, were mapped for each source area at the midpoint of the down-gradient side of the area. The virtual wells show a slightly higher susceptibility to contamination because they are located at the focus of ground water flow paths for each source area. The virtual wells give a reliable method for comparing the relative risks of different source areas.

Potential contaminants were grouped into three broad categories, based on their physical properties when dissolved into water. HM-1 included highly water-soluble material that moves directly into the water column or aquifer with the first rain. Nitrates, soluble solvents, and antifreeze are typical of this group. HM-2 included light, slightly water-soluble petroleum products that float on top of the water column. Gasoline, kerosene, and petroleum-based solvents are typical of this group. HM-3 included heavy, slightly water-soluble solvent materials that sink to the bottom of the water column. Chlorinated solvents and the pesticide 2,4-D are typical of this group.

To estimate the potential health hazards posed by each contaminant type, the consultant chose a representative contaminant or group of contaminants from each category, with an associated water quality standard. These categories of contaminants have distinctly different behaviors in combination with ground water. The study considered an exceedance to have occurred whenever the model showed contamination levels above the water quality standards. The representative constituents are shown in Table H-1.

The consultant set chronic loading levels for stormwater, septic tanks and agricultural runoff according to an extensive review of the current literature. Records of reported spills for the

period from 1986 through 1989 yielded probabilities of on-site spills related to transfer of hazardous materials on commercial or industrial sites.

All these factors were entered into a computer model designed to calculate the risk of ground water contamination in each source area from all three contaminant types for existing conditions as of 1988, and future conditions in the year 2010. The computer model projected spills and chronic loading over a series of one-year periods, and calculates the likelihood of resulting water quality exceedances. The model also considered lateral movement of contaminant "plumes" in the ground water over time. A "hit", or exceedance, was an occasion when the model predicts that the concentration of a hazardous material at any target well exceeds the established criterion for that material. Table 3-3 shows the number of drinking water standard exceedances for each source area under existing and future conditions. The final column shows the source areas at risk from chronic stormwater and septic system loading under existing and future conditions.

Table H-1: Representative constituents of ground water contaminant categories

Contaminant Category	Criteria	Representative Constituent	Regulatory Level
HM-1	10.0 mg/L	NO_3-N	10.0 mg/L
HM-2	0.01 mg/L	benzene toluene gasoline	0.005 mg/L 0.10 mg/L 0.05 mg/L[1]
HM-3	0.01 mg/L	1,1,1-trichloroethane trichloroethylene perchloroethylene	0.070 mg/L 0.005 mg/L 0.005 mg/L[2]

[1] Approximate taste threshold
[2] Recommended level

APPENDIX I: PROJECT RANKING WORKSHEET

STORM & SURFACE WATER REMEDIAL ACTION/CAPITAL IMPROVEMENT PROJEC

SPOT IMPROVEMENTS EVALUATION CRITERIA

Project: _____ Project No. _____

_____ Date of Evaluation ____

Problem: _____ Total Score _____

_____ APPROVED:

Proposed Solution: _____ _____

County Engineer

_____

Ranking Criteria

1. What is endangered by the Problem? Score _____
   - -Property only 5
   - -Natural systems 10
   - -Building or roads 12
   - -Human safety 15

2. How often does the problem occur? Score _____
   - -Once 0
   - -Every few years 3
   - -Every year 7
   - -Several times each year 11

3. To what extent will the project solve the problem: (including the need for maintenance)? Score _____
   - -No effect 0
   - -Some relief 5
   - -Much relief 9
   - -Complete relief 12

4. How many homes or businesses will be positively impacted by the project? Score _____
   - - 0 - 2
   - - 3 - 6
   - - 7 - 30
   - -31 +

STORM & SURFACE WATER REMEDIAL ACTION/CAPITAL IMPROVEMENT PROJECT
Page 2

	Significant Negative Impact*	Negative Impact	No Impact	Positive Impact	Significant Positive Impact
What impact will the project have on:					
5. The local drainage system	-10	-5	0	8	15
6. County liability	-10	-5	0	8	15
7. Fish habitat	-10	-5	0	6	10
8. Water quality	-10	-5	0	6	10

Total Score _____

*Projects having significant negative impacts in any of these areas should be carefully considered for elimination

What is the projects total estimated cost? _____

APPENDIX J: GSA RESOLUTIONS

RESOLUTION NO. H3-90

A RESOLUTION relating to groundwater protection, establishing a geologically sensitive area in the area east of Lacey, and adding a new Section 30 to Article IV of the Thurston County Sanitary Code.

The Thurston County Board of Health makes the following findings of fact:

1. The aquifer lying under the area described in Section 1 of this Resolution (McAllister aquifer) is one of the most important sources of drinking water in Thurston County. Approximately 5,800 persons in the unincorporated County obtain their drinking water from wells drilled into this aquifer. Approximately 47,000 persons in the cities of Olympia and Lacey obtain their drinking water from springs fed by this aquifer. This aquifer is capable of providing water to twice these numbers and will be the major source of drinking water in Thurston County well into the future.

2. This aquifer consists primarily of coarse sands and gravels, with approximately five to ten percent less permeable glacial till. These coarse sands and gravels allow relatively rapid infiltration and transmission of water and have high percolation rates. These soils are also generally poor at binding, trapping and filtering contaminants. Consequently, they have low potential to treat and retain pollutants.

3. There are likely six different soil layers in the McAllister aquifer. All of these layers or aquifer levels are connected. Consequently, a pollutant introduced into the surface aquifer can migrate through all aquifer levels.

4. The McAllister aquifer is often very shallow, as demonstrated by well depths that are often less then fifty feet. The soil above the top aquifer level is also coarse, thus affording reduced protection from pollution.

5. The physical characteristics described in findings 2 through 4, together with the fact that the McAllister aquifer receives its water from the infiltration of rainwater and runoff, demonstrate that the McAllister aquifer is quite susceptible to pollution. This conclusion has also been reached by several recent independent, technical studies of the aquifer.

6. United States census figures show that from 1980 to 1989 Thurston County was one of the fastest growing counties in the state. The part of the County experiencing the highest growth rate is the area lying south of I-5, west of the Nisqually River, east of Lacey, and north of the Yelm Highway. The vast majority of the growth in this area is in the form of residences using on-site sewage disposal systems. Much of this high growth area is situated directly over the McAllister aquifer.

7. Land use activities, principally residential and agricultural, are already causing increased levels of pollution in the McAllister aquifer. Wells drilled into the aquifer have significantly higher nitrate levels than other wells sampled in the north Thurston County area. McAllister Springs, which is fed by the McAllister aquifer, is experiencing a strong trend of increasing nitrate levels. Pesticides, often at concentrations exceeding existing or proposed maximum contaminant levels, have been detected in wells along Lake St. Clair and Pattison Lake.

8. Nitrates are a pollutant, capable of causing, at elevated levels, a blood disorder in infants known as methemoglobinemia, or blue baby syndrome. More importantly, nitrates are a product of common land use activities, such as sewage disposal and fertilization of crop lands. Consequently, an increase in nitrate levels is an accepted indicator of probable increase in other pollutants, such as disease-causing organisms and household hazardous waste.

9. The low natural level of nitrates in McAllister area groundwater indicates that the increasing nitrate trends now being detected are the result of land use activities.

10. A recent study shows that a substantial number of years must pass before water and pollutants introduced at the ground's surface will migrate through the McAllister aquifer to reach McAllister Springs. It is estimated that vertical travel time from the surface to the aquifer's main water-bearing Salmon Springs formation takes from two to ten years. Once within the Salmon Springs formation, water may take over fifty years to reach McAllister Springs. Consequently, the increasing level of pollution at McAllister Springs is the result of land use activities occurring years ago, before the recent higher level of development in the area. The current levels of pollution at the Springs do not yet reflect the intensification of land use activities occurring in the years leading up to the partial development moratorium in the McAllister area adopted in 1988.

11. Recent independent studies show that on-site sewage disposal systems (septic systems), agricultural practices, stormwater runoff and lawn fertilization are the

most significant contributors to nitrogen and other pollutants to the McAllister aquifer. A study also indicates that the risk of spills and accidents involving hazardous materials poses a potentially high threat to the area's groundwater.

12. The boundaries of the McAllister aquifer were derived first by calculating the elevation above mean sea level of the water level in numerous wells throughout the area. Water levels of the same elevation were connected to give groundwater contour lines. Groundwater flow lines were then determined by recognizing that groundwater flows perpendicular to the contour lines, from higher to lower elevations. The hydrologic boundaries of the aquifer were determined using this contour and flow information and were further refined by use of a computer model or program developed by Golder Associates for the McAllister aquifer. The area included in the McAllister GSA established by this Resolution is the area overlying the McAllister aquifer as determined by the methods summarized in this finding.

13. By Resolution No. H-5-88, adopted September 28, 1988, this Board imposed a moratorium on the issuance of most building site approvals and on the filing of most building site applications in the area then thought to lie over the McAllister aquifer. The Board took these actions because evidence of increasing pollution of the groundwater indicated that the McAllister aquifer might be irreparably damaged by the time a number of groundwater studies then commencing were completed. The data from those and other studies commissioned by the County is now available. That data, the essential features of which are summarized in these findings, shows that it is necessary in the public health, safety and welfare to enact permanent measures to protect this aquifer of great importance to the people of Thurston County. These measures must be adopted before the restrictions of Resolution H-5-88 expire on August 15, 1990.

14. In order to halt the trend of increasing pollution of the McAllister aquifer, avoid the spread of disease and unsanitary conditions and prevent the creation of a public nuisance, it is necessary for the preservation of the public health, welfare and safety to adopt the measures contained in this Resolution and to amend the zoning ordinance as proposed in this Resolution. The brief moratorium on building site applications and approvals for development at densities greater than one dwelling unit per five acres established by this Resolution is necessary to afford the Planning Commission and Board of County Commissioners adequate opportunity to consider the zoning changes recommended herein.

15. The Board recognizes the necessity of protecting and preserving all of the County's groundwater resources. County departments shall continue and intensify their

efforts to identify aquifers which may be vulnerable to pollution and shall propose appropriate measures to combat such threats.

NOW, THEREFORE, BE IT RESOLVED BY THE THURSTON COUNTY BOARD OF HEALTH as follows:

Section 1. A new section 30 is hereby added to Article IV of the Thurston County Sanitary Code to read as follows:

SECTION 30: McALLISTER GEOLOGICALLY SENSITIVE AREA.

30.1 Creation of Geologically Sensitive Area. Pursuant to Chapter 70.05 RCW and Article IV, Section 15 of the Thurston County Sanitary Code, the area described in subsection 30.2 of this Section 30 constitutes a geologically sensitive area to be known as the McAllister Geologically Sensitive Area (McAllister GSA).

30.2 Area of McAllister GSA. The McAllister GSA comprises the territory shown on the parcel specific map entitled "McAllister Geologically Sensitive Area, August 13, 1990" with a notation referring to this Resolution in the custody of the Thurston County Public Health and Social Services Department.

30.3 Sewage Disposal Regulations. In addition to any other requirements imposed by this Code, the following requirements shall apply within the McAllister GSA:

(a) Any on-site sewage disposal system for which a permit to install, connect, repair, alter, extend or relocate is issued on or after August 15, 1990

(i) shall contain a pressure distribution system in accord with state Department of Health Technical Review Committee Guidelines;

(ii) shall have SSAS trenches or beds no deeper than thirty (30) inches below the surface of the ground;

(iii) shall have at least thirty-six (36) inches of separation between the bottom of any SSAS trenches or beds and the maximum seasonal groundwater elevation or any impermeable layer. The health officer may require greater vertical separation pursuant to Section 5.2.2 of this Article IV. However, notwithstanding the provisions of Section 5.2.2 the health officer may not reduce the thirty-six (36) inch vertical separation required by this Section.

(b) An operational permit is required for any on-site sewage disposal system for which a permit to install, connect, repair, alter, extend or relocate is issued on or after August 15, 1990, or which is part of a sale of property on or after August 15, 1990. The operational permit may be revoked when:

(i) the on-site system fails to meet the maintenance and operational conditions or requirements of the permit, or

(ii) the on-site system fails to meet any standard or requirement imposed by law.

The operational permit shall be revoked when any dwelling unit or other premises where sewage originates is required to connect to public sewer pursuant to subsection 30.3(c), below. Unless inconsistent with this section, all other provisions of Article IV, Section 10.6 of this Code shall apply to operational permits.

(c) Whether or not an operational permit is required, any dwelling unit or other premises where sewage originates within two hundred (200) feet of a public sewer system shall be connected to the sewer system pursuant to Article IV, Sections 6.1 through 6.1.4 and 6.2 through 6.6.2 of this Code.

(d) Building site approvals may be issued for uses other than single or multi-family residential only if

(i) the designed sewage flow is no greater than 450 gallons per five acres per day, and

(ii) the waste entering the on-site system is equivalent in quality to typical residential waste.

30.4 Agriculture. (a) The Thurston County Cooperative Extension Office is requested annually to review best management practices for the use of pesticides and fertilizers within the McAllister GSA. The procedures used in this review should be submitted to the Board of Health for approval by January 1, 1991.

(b) The health officer shall work with the North Thurston School District and any public or private agency owning or operating parks within the McAllister GSA to obtain better compliance with best management practices for pesticides and fertilizers.

30.5 Stormwater and Hazardous Materials. (a) Pesticides shall not be used to maintain any County property in the McAllister GSA.

(b) The health officer shall send letters to the director of the State Department of Transportation and to the governing officials of the Fort Lewis Military Reservation, Nisqually Indian Reservation and Puget Power requesting that chemical methods not be used to maintain any rights-of-way located within the McAllister GSA or over groundwater which the health officer deems is connected to the aquifer underlying the McAllister GSA.

(c) The health officer shall write a letter to the director of the State Department of Ecology requesting that applications for the use of aquatic pesticides in Lake St. Clair be granted only upon a finding by the health officer that the proposed use will not likely threaten groundwater.

(d) The health officer shall advise Burlington Northern Railroad and Amtrak of the vulnerable nature of groundwater in the McAllister GSA and request that each:

(i) cease discharging sewage and wastewater along tracks within the McAllister GSA, and

(ii) cease using chemical methods to maintain rights-of-way within the GSA.

The health officer shall also request Burlington Northern and Amtrak to coordinate emergency management

procedures with the County for spills and accidents within the McAllister GSA.

(e) By December 31, 1990 the health officer shall review existing and proposed requirements for stormwater management governing public or private developments. If the health officer deems such requirements insufficient to protect groundwater in the McAllister GSA, he shall propose stormwater management requirements which are sufficient to that end.

30.6 Education. The Office of Water Quality and Resource Management shall conduct a public education program in the McAllister GSA. The purpose of this program shall be to protect groundwater by instructing residents in proper lawn care and gardening practices, septic system maintenance, and handling and disposal of household hazardous waste.

Section 2. The Board of Health requests the Thurston County Groundwater Advisory Committee (GWAC) to propose special area regulations to the state Department of Agriculture restricting the use of pesticides, especially leaching pesticides, in the McAllister GSA. If these proposed regulations are insufficient to protect the groundwater, the Board of Health will develop and propose additional measures to the state.

Section 3. The health officer shall request the appropriate state and local officials to adopt rules restricting truck traffic within the McAllister GSA to major arterials, such as the Yelm Highway and State Route 510, except for local deliveries. The health officer shall request the responsible agencies to give such designated truck routes high priority for road improvements and maintenance work. The health officer shall also request the proper agencies to install stormwater systems with containment capabilities at any high-risk intersections along such designated truck routes.

Section 4. The Board of Health requests the Thurston County Planning Commission and Board of County Commissioners to consider and adopt the following changes to the Thurston County Zoning Ordinance for property within the McAllister GSA:

(a) Establish a residential density of one unit per five acres applicable to development which is not connected to public sewer. Residential densities established otherwise in the Thurston County Zoning Ordinance should apply only to development connected to public sewer and served by stormwater facilities meeting all applicable state and local standards. The clustering of residential development should be encouraged in that part of the McAllister GSA lying within the long-term urban growth area boundary.

(b) Commercial activities which use, handle or store hazardous substances or dangerous wastes as defined in WAC 173-303-040 should not be allowed.

(c) No permit under the Thurston County Zoning Ordinance should be issued for any activity involving the use, handling or storage of hazardous materials as so defined.

(d) No additional area should be zoned for commercial or industrial purposes.

(e) Mining, mineral extraction, and soil removal should be prohibited.

(f) Existing land uses which become nonconforming or which would not be allowed to be sited as a result of zoning ordinance revisions regarding the use, handling or storage of hazardous materials as so defined or mining or mineral extraction should not be allowed to expand or intensify.

(g) Any land uses which include major uses of fertilizer should be subject to restrictions on the use of fertilizer adequate to protect the groundwater from deterioration in quality.

Section 5. On the basis of the above findings and the evidence of aquifer vulnerability and groundwater contamination which has been presented to it, the Board declares the need to accelerate public sewer service to areas in the McAllister GSA where groundwater is likely at risk due to the presence of on-site sewage disposal systems. These are the areas east and southeast of Long Lake, including the Seasons and Eagle Crest subdivisions. This section shall have the effect of a declaration of sewerage need under Sanitary Code Article IV, Section 6.8.

Section 6. The health officer shall request the Technical Review Committee of the state Department of Health to develop as quickly as possible septic system guidelines for systems which enhance nitrogen removal.

Section 7. (a) Subject to the exceptions in subsection (b) of this section, the health officer shall neither issue building site approvals nor accept building site applications for any residential use at a density greater than one dwelling unit per five acres in the McAllister GSA.

(b) The prohibition in subsection (a) does not apply to building site approvals or applications for

(i) lots which received final subdivision approval or otherwise were legally in existence on or before August 15, 1988; or

(ii) lots which are included in an unexpired, fully completed application for preliminary subdivision, short subdivision or large lot subdivision approval submitted to the Thurston County Planner on or before August 15, 1988. The requirements for submittal of a fully

completed application are set out in Title 18 of the Thurston County Code.

(c) For purposes of this section, the density of residential uses which are part of a subdivision for which final approval has been granted shall be the average density of the entire subdivision or subdivision phase.

(d) The provisions of this section 7 shall expire on February 1, 1991.

Section 8. Severability. If any provision of this Resolution or its application to any person or circumstance is held invalid, the remainder of the Resolution or the application of the provision to other persons or circumstances is not affected.

ADOPTED: August 13, 1990.

ATTEST:

Patricia Swanson
Clerk of the Board

APPROVED AS TO FORM:

PATRICK D. SUTHERLAND
PROSECUTING ATTORNEY

By: Thomas R. Bjorgen
Thomas R. Bjorgen
Senior Deputy
Prosecuting Attorney

BOARD OF HEALTH
Thurston County, Washington

Jes Eldridge
Chairman

George L. Barner Jr.
Member

Member

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RESOLUTION NO. 9534

A RESOLUTION relating to internal County management and temporarily directing the Planning Director not to accept certain subdivision applications.

The Board of Thurston County Commissioners makes the following findings of fact:

1. The Thurston County Board of Health has this date adopted a resolution creating a Geologically Sensitive Area known as the McAllister GSA.

2. This Board of Health resolution adopts a number of measures designed to protect the McAllister aquifer from pollution from land use activities. The resolution also recommends that the County adopt a number of changes to its zoning ordinance, among which is the establishing of a residential density of one dwelling unit per five acres throughout the McAllister GSA. The Board of Health recommends that this density apply to all residential development until connected to public sewer and served by adequate stormwater facilities.

3. In order to afford the Planning Commission and this Board adequate opportunity to consider the recommended zoning changes, the Board of Health imposed a moratorium on the filing of building site applications and issuance of building site approvals for development at a density greater than one dwelling unit per five acres. This moratorium expires on February 1, 1991.

4. Because a building site approval is necessary to install a septic system, it would be an improper use of both public and private resources to commence the subdivision approval process for property which must rely on septic systems, but which cannot obtain a building site approval.

5. Therefore, to avoid the commencement of a futile process, it is necessary to direct the Thurston County Planning Director not to accept the submission or filing of preliminary subdivision applications, short subdivision applications or large lot subdivision applications for developments which will rely on septic systems and which are subject to the Board of Health moratorium on the filing of building site applications or the issuance of building site approvals.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF THURSTON COUNTY, that

(1) The Thurston County Planning Director is directed not to accept for submission or filing preliminary subdivision applications, short subdivision applications or large lot subdivision applications for any development within the McAllister GSA as defined by the Board of Health resolution of this date subject to the moratorium on the filing of building site applications or the issuance of building site approvals established by such Board of Health resolution.

(2) However, the Planning Director may accept the subdivision applications listed in section (1), above, if

(a) the property is wholly within the short-term Urban Growth Management boundary as established in the memorandum of understanding by Thurston County and the Cities of Olympia, Lacey and Tumwater of June 20, 1988 as it may be amended;

(b) sanitary sewer is the proposed method of waste disposal; and

(c) the application is accompanied by a letter stating that sanitary sewer will be available within three years of preliminary subdivision approval. Such letter shall be signed by the director of the utility or department providing the sewer.

(3) The provisions of this Resolution shall expire on February 1, 1991.

ADOPTED: August 13, 1990.

ATTEST:

Jo Stupy
Clerk of the Board

APPROVED AS TO FORM:

PATRICK D. SUTHERLAND
PROSECUTING ATTORNEY

By: Thomas R. Bjorgen
Thomas R. Bjorgen
Senior Deputy
Prosecuting Attorney

BOARD OF COUNTY COMMISSIONERS
Thurston County, Washington

Jes Eldridge
Chairman

George L. Barner Jr.
Commissioner

Diane Oberquell
Commissioner

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