

# West Olympia Access Study



Background Report #3

## *Land Use and Environment Characteristics*

City of Olympia

Washington State Department of Transportation

Prepared by

Thurston Regional Planning Council

The West Olympia Access Study is a partnership project  
between the City of Olympia and the  
Washington State Department of Transportation.  
It is funded by City of Olympia funds and a  
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*Cover Photo: "Olympia, Showing the State Capitol Group"  
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**WEST OLYMPIA ACCESS STUDY BACKGROUND REPORTS**

**Introduction**..... iii

**BACKGROUND REPORT #3 –**

**LAND USE & ENVIRONMENT CHARACTERISTICS**

**Land Use** ..... **1**

    Urban Growth Areas ..... 1

    Land Use and Zoning ..... 1

        Land Use ..... 3

        Zoning ..... 3

**Environment** ..... **5**

**Critical Areas** ..... **5**

    Hydraulic Resources ..... 5

        Shorelines ..... 5

        Drainage Basins ..... 7

        Streams ..... 8

        Wetlands ..... 10

        Lakes ..... 10

    Important Riparian Areas ..... 11

    Important Habitats and Species ..... 11

    Fish Passage Barriers ..... 11

        Capitol Lake Fish Passage Barriers ..... 12

    Wellhead Protection Areas ..... 13

    Areas of Known Soil or Groundwater Concern ..... 16

    Floodplains ..... 16

    Areas of High Groundwater ..... 16

    Terrestrial Resources ..... 17

        Landslide Hazard Areas ..... 17

Liquifaction Areas .....	17
<b><u>Air Quality</u></b> .....	20

List of Figures:

Figure 1 – Study Area Boundary – West Olympia Access Study .....	iv
Figure 2 – Map of WOAS Generalized Land Use Activities .....	2
Figure 3 – Map of WOAS Shoreline Management Areas .....	6
Figure 4 – Map of WOAS Stream Types.....	9
Figure 5 – Capitol Lake Dam and Fish Ladder.....	12
Figure 6 – Capitol Lake Dam and Fish Ladder at High Tide .....	13
Figure 7 – Map of Allison Springs Wellhead Protection Area, Floodplains and High Groundwater.....	15
Figure 8 – Map of WOAS Landslide or High Liquefaction Areas.....	18
Figure 9 – Effects of 2001 Nisqually Earthquake on Deschutes Parkway .....	19
Figure 10 – Map of Thurston Region PM10 Maintenance Area .....	20

List of Tables:

Table 1 – Generalized Land Use Activities within the WOAS Study Area .....	3
Table 2 – Shoreline Designation within the WOAS Study Area.....	7
Table 3 – Drainage Basins within the WOAS Study Area .....	8
Table 4 – Stream Types Found in the WOAS Study Area .....	8
Table 5 – Fish Passage Barriers in the WOAS Study Area by Drainage Basin .....	12
Table 6 – Generalized Risks to Olympia’s Groundwater Sources .....	14

# West Olympia Access Study Background Reports

## Introduction

The West Olympia Access Study (WOAS) is a joint project between the Washington State Department of Transportation Olympic Region (WSDOT) and the City of Olympia. The State and the City contracted with Thurston Regional Planning Council (TRPC) to facilitate the public involvement process and provide other project support.

The purpose of the West Olympia Access Study is to evaluate current and future mobility concerns on Olympia's west side and to identify a strategy to maintain safe and acceptable access and circulation. The study will consist of outreach activities, conducting and documenting transportation needs and options analyses, and recommending improvements and strategies.

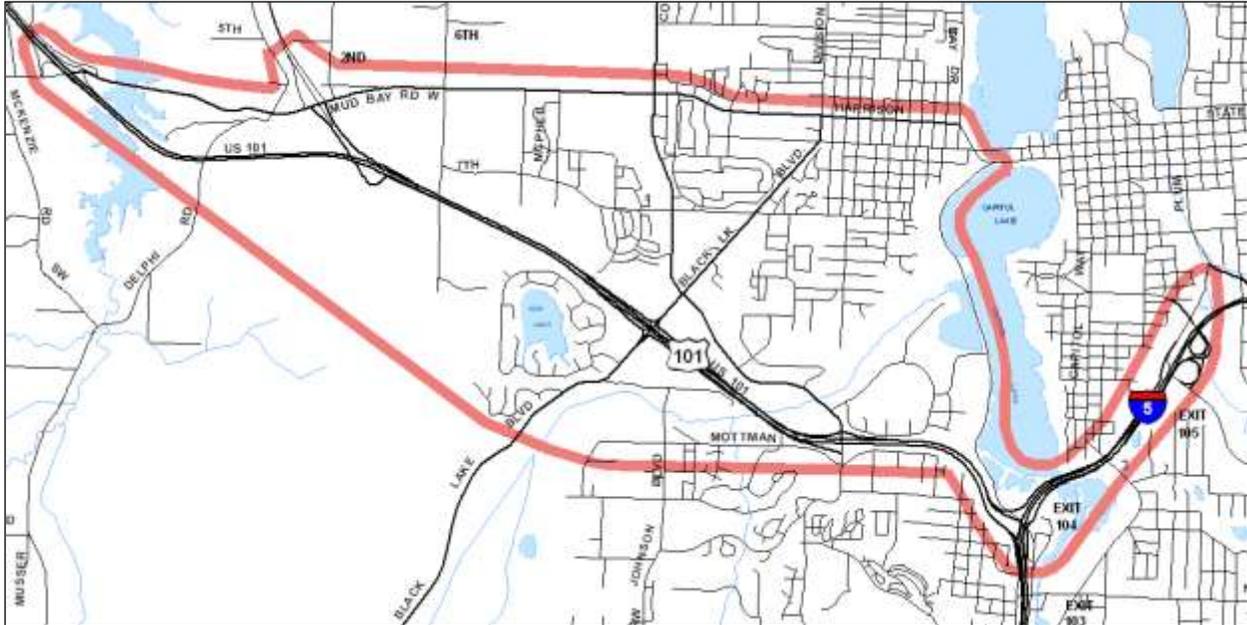
The West Olympia Access Study is needed because:

- There is growing concern about congestion on both local and state roads. Mounting congestion raises questions about the best ways to accommodate growth while maintaining safe and acceptable levels of mobility.
- The 2025 Regional Transportation Plan indicates that even with efficiency measures, the Cooper Point Road/Black Lake Boulevard intersection will fail within the next 20 years. This would cause undesirable delays and would also adversely impact nearby roads and intersections, including US 101 interchange operations.
- The current street and highway network hampers the ability to meet West Olympia's needs for emergency services, efficient transit service, better pedestrian and bicycle access, and more even distribution of local traffic.

The WOAS study area boundaries are shown on Figure 1. The study area includes 5.6 square miles within the cities of Olympia, Tumwater, and Thurston County, Washington. Within this area are 4.6 miles of the US Highway 101 corridor and approximately one mile of Interstate 5.

The study area boundaries of the West Olympia Access Study generally extend east from Eld Inlet to Budd Inlet and Capitol Lake. The northern boundary of the WOAS study area is about 0.1 mile north of Harrison Avenue and Mud Bay Road. The southern boundary generally parallels US Highway 101, but varies in distance from 0.1 mile south of the highway corridor near Eld Inlet and Capitol Lake to about 0.7 mile south along Black Lake Boulevard, encompassing the Ken Lake neighborhood.

**Figure 1 – Study Area Boundary - West Olympia Access Study**



The WOAS study area also extends both east and west to include the interchanges of US Highway 101 at Mud Bay Road (2<sup>nd</sup> Avenue) and Interstate 5 at Henderson Boulevard. In these areas the boundary parallels the corridor being about 0.1 mile north and south of the roadways.

West Olympia can generally be described as that portion of Olympia west of Capitol Lake and Budd Inlet. This area is currently home to almost 24,000 people and 17,000 jobs. Comprehensive Plans adopted by the cities of Olympia, Tumwater, and Thurston County call for increases in commercial and residential development in this area in accordance with the Washington State Growth Management Act.

A series of background reports have been developed regarding general characteristics of the study area. These reports are:

- Report #1 – Significant Transportation and Land Use Events
- Report #2 – Transportation Characteristics
- Report #3 – Land Use and Environment Characteristics
- Report #4 – Social and Economic Characteristics

Taken together, these four background reports provide an overview of baseline conditions within the West Olympia Access Study area.

# Background Report #3: **Land Use and Environmental Characteristics**

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## **Land Use**

### **Urban Growth Areas**

Thurston County and its municipal jurisdictions first adopted urban growth area (UGA) boundaries in 1982, further refining them in 1988. Those urban growth areas and the land uses they defined were reduced in size with passage of the Washington State Growth Management Act (GMA) in 1990. GMA requires cities and counties to accommodate projected 20-year population and employment growth and to concentrate that growth in a manner consistent with urban and rural land use designations. The general goal is for most future growth to locate within existing cities and designated urban growth areas, where urban-level services and infrastructure can be provided most cost effectively. Olympia adopted its Comprehensive Plan to comply with the requirements of the state GMA in 1994. Tumwater adopted its Comprehensive Plan in 1994 with Thurston County adopting its Comprehensive Plan in 1995.

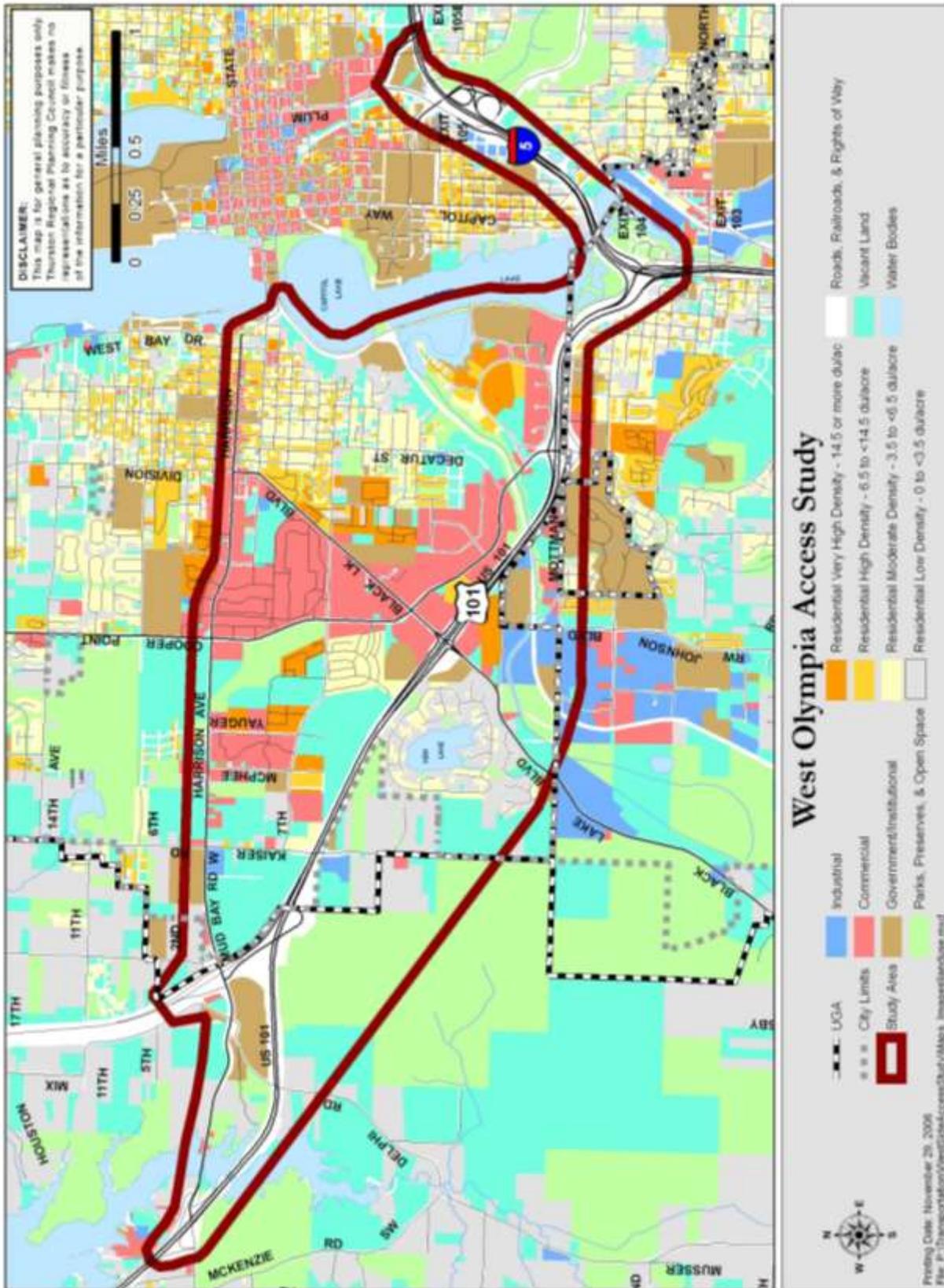
Urban Growth Areas boundaries are intended to reduce sprawl. Under the Growth Management Act UGAs are to be sized large enough to accommodate projected urban growth over the ensuing 20 year time horizon. While Thurston County is responsible for establishing UGAs in this region it is a coordinated effort with the cities and towns. Lands which are within the UGA boundary and are in unincorporated Thurston County are eventually to be annexed into cities and towns.

A little over 80 percent of the 5.6 square mile West Olympia Access Study area lies within the cities and Urban Growth Areas (UGAs) of Olympia and Tumwater. As of early 2007, 73 percent of the WOAS study area was incorporated as part of Olympia or Tumwater city limits; the remaining 354 acres of unincorporated UGA will be annexed in the future.

### **Land Use and Zoning**

For purposes of the West Olympia Access Study, land uses within the study area has been aggregated into eleven categories. These are illustrated in Figure 2, Generalized Land Use Activities. As it applies to this report, land use reflects the current activities or uses of land, regardless of zoning. Zoning pertains to the underlying development regulations that determine what land uses will be allowed during property development or redevelopment.

Figure 2 – Map of WOAS Generalized Land Use Activities



## Land Use

The largest land use activity within the WOAS study area is “Residential.” Residential land uses represent almost 25 percent of the study area and are described in four categories based on the allowed density, which is expressed in dwelling units per acre. “Roads, Railroads, & Rights of Way” uses account for nearly as much land. Public infrastructure accounts for a significant amount of land in any jurisdiction. “Vacant Land” is the third largest land use category. This includes parcels of land that have no structures or buildings with very little assessed value. This is typically land that will develop or redevelop in the future according to the underlying zoning designation and market conditions. “Parks, Open Space Areas, or Preserves” is not considered to be vacant land and is identified as its own land use activity. “Commercial or Mixed Use” land use activities can be found in many parts of the WOAS study area. This is also true of “Government or Institutional” uses such as government offices, churches and power substations. “Industrial” is the smallest land use category in the study area with most of Tumwater’s Mottman Industrial complex lying just outside the study area to the south. “Natural Resources” includes those lands which are actively enrolled in the forestry or agricultural open space tax program or are designated for long-term agriculture or forestry. Capital Forest is an example of this type of land use.

Table 1 summarizes the distribution of generalized land uses within the WOAS study area.

**Table 1 - Generalized Land Use Activities within the WOAS Study Area**

<b>Land Use Categories</b>	<b>Upland Acres</b>	<b>Percent of Study Area</b>
Commercial or Mixed Use	488.1	14.0%
Government or Institutional	226.7	6.5%
Industrial	82.0	2.3%
Natural Resources ( <i>Public and Private</i> )	233.5	6.8%
Parks, Preserves, & Open Space	302.4	8.8%
Residential Uses (All residential uses)	788.9	22.7%
<i>Residential High Density (6.5 to &lt;14.5 du/acre)</i>	<i>107.0</i>	<i>3.0%</i>
<i>Residential Low Density (0 to &lt;3.5 du/acre)</i>	<i>363.3</i>	<i>10.5%</i>
<i>Residential Moderate Density (3.5 to &lt;6.5 du/acre)</i>	<i>191.7</i>	<i>5.5%</i>
<i>Residential Very High Density (14.5 or more du/acre)</i>	<i>126.9</i>	<i>3.6%</i>
Roads, Railroads, & Rights of Way	767.4	22.1%
Vacant Land	586.1	16.9%
<b>TOTAL</b>	<b>3,475.1</b>	<b>100%</b>

**Source:** Thurston Regional Planning Council

**Notes:** Total upland acres does not include water bodies

## Zoning

Zoning refers to the set of development regulations that govern the way in which land can be used. It includes such things as permitted uses; housing densities; setbacks for yards; and height of the building. Zoning provisions may specify design guidelines, historic regulations and uses

which may require special review. Zoning is intended to be complementary to the land use designated within the local Comprehensive Plan.

The City of Olympia first adopted zoning in 1935 and had a city-wide ordinance by 1961. Tumwater adopted its first zoning code in 1969. Thurston County did not adopt countywide zoning until 1980.

The siting of The Evergreen State College on Olympia's westside generated a great deal of land use speculation in the late 1960's and early 1970's. Residents of Cooper Point petitioned the Thurston County Commissioners to adopt countywide zoning. This was rejected in favor of sub-area planning which could be limited to a specific geography.

Thurston County adopted an interim zoning designation for the Cooper Point peninsula in March 1968. This was followed by the Cooper Point Sub-Area Plan in October 1972. Local residents funded development of the sub-area plan which was prepared by a consultant. Due in part to speculative land use pressures as well as being the first of its kind and undergoing a less rigorous environmental process than is employed today, the densities in the Cooper Point Plan included much higher zoning densities than those adopted in current zoning regulations. The sub-area zoning remained in effect until Thurston County adopted countywide zoning designations in September 1980.

Passage of the Growth Management Act and subsequent development of detailed long-range Comprehensive Plans resulted in significant zoning changes in all three jurisdictions in the early 1990s. Today the cities of Olympia, Tumwater and Thurston County have a combined total of 96 different zoning districts. A total of 38 zoning districts are located within the WOAS study area.

# Environment

## Critical Areas

The Washington State Growth Management Act requires that Critical Areas be addressed. This is done by local Comprehensive Plan goals and policies as well as Critical Areas Ordinances (CAO) associated with development regulations. The City of Olympia updated its CAO regulations in 2005 and 2006 and Tumwater updated its CAO provisions in 2004. These updates addressed the required issues of Best Available Science and the protection of anadromous (salmonid) fisheries. Both CAO updates have been accepted by the state. Thurston County is updating its CAO in 2007 to address these GMA requirements.

## **Hydraulic Resources**

The entire 5.6 square mile West Olympia Access Study area lies within the Water Resources Inventory Area 13 – Deschutes River (WRIA-13). It also spans the distance between Budd Inlet to the east and Eld Inlet to the west. It includes 8 drainage basins, 285 acres of lakes, 242 acres of wetland, and almost 8 miles of stream riparian habitat.

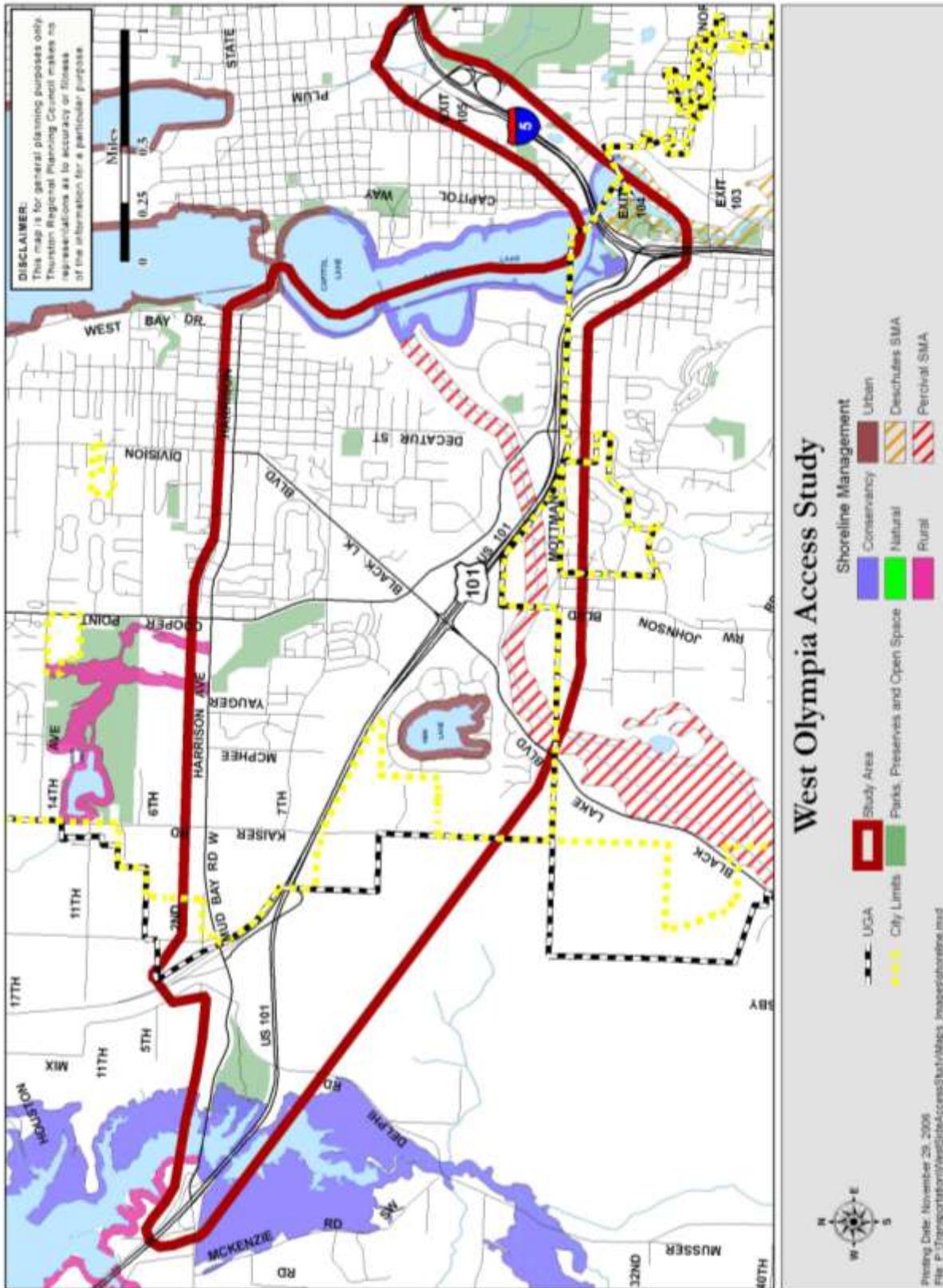
## Shorelines

There are many shorelines within the WOAS study area which are subject to the Shoreline Management Act (SMA). These are identified in Figure 3. Areas subject to these regulations are referred to as a “Shoreline Jurisdiction” and include marine shorelines, large lakes, and large streams and rivers. In the case of lakes or rivers, shoreline jurisdiction also extends to the edge of the associated wetland and includes the 100-years floodplain.

State law requires local jurisdictions to adopt a Shoreline Master Program (SMP) to guide development along these shorelines. The SMP for Olympia, Thurston County and Tumwater is the same document. It contains policies and regulations for designated shoreline jurisdictions.

Shoreline designation guides the kind of land uses that can be accommodated in these areas. Much of the Olympia marine shoreline and the Port of Olympia peninsula is designated “Urban”. Ken Lake is also designated “Urban” because of its pre-existing high residential density. “Rural” shorelines are generally limited to residential use while “Conservancy” includes natural resource use such as agriculture, forestry and open space preserves. “Urban” designation allows the most intense uses while “Rural” is much more limited. “Conservancy” is the most restrictive designation. Table 2 summarizes the upland acres associated with each of these shoreline designations within the WOAS study area.

Figure 3 – Map of WOAS Shoreline Management Areas



**Table 2 Shoreline Designations within the WOAS Study Area**

Shoreline Designation	Upland Acres	Percent of Study Area
Conservancy	123.3	---
Deschutes SMA	21.3	---
Percival SMA	112.6	---
Rural	7.1	---
Urban	39.4	---
TOTAL	309.7	8.6%

**Source:** Thurston Regional Planning Council  
**Notes:** SMA = Special Management Area

Within the Shoreline Master Program are “Special Management Areas” (SMA). Special Management Areas include additional policies and regulations specific to each individual area and which are more detailed than those found in the Master Program. SMA’s were adopted for Percival Creek, the National Historic District in the South Basin of Capitol Lake and along the Deschutes River.

### Watershed Terms

The terms “*water resource inventory area*,” “*watershed*,” and “*drainage basin*” are often used to describe similar and sometimes the same physical geography:

- **Drainage Basin** describes that area in which all of the surface runoff resulting from precipitation is concentrated into a particular stream.
- **Water Resource Inventory Area (WRIA)** is a term provided by Washington State in WAC 173.500.040. The State has been divided into 62 geographic regions based upon topography and economic conditions. Sometimes a WRIA coincides with a watershed. In other cases it may include all or part of several watersheds, or a watershed may be so large that it is divided so that all the units are of similar proportions.
- **Watershed** is the area drained by a river or stream. Watershed boundaries are ridges that divide one drainage area from another. These are similar to, but not always the same as, a Water Resource Inventory Area or WRIA.

### **Drainage Basins**

A large number of drainage basins are within the City of Olympia. The WOAS study area includes eight stream or lake drainage basins. These are listed in Table 3. Of these the Eld, McLane and Green Cove Creek basins all flow into Eld Inlet and account for less than 20 percent of the study area. The remaining 80 percent of the study area drains into Capitol Lake and Budd Inlet. All of the study area is within the Deschutes WRIA 13.

**Table 3 Drainage Basins within the WOAS Study Area**

Drainage Basin	Acres	Percent of Study Area
Capitol Lake	532.7	14.9%
Eld Inlet	622.2	17.4%
Green Cove Creek	10.6	< 1%
McLane Creek	7.9	< 1%
Indian-Moxlie Creek	171.1	4.8%
Percival Creek	2,028.7	56.7%
Schneider Creek	139.7	3.9%
West Bay ( <i>Budd Inlet</i> )	66.4	1.9%
<b>Total</b>	<b>3,579.3</b>	<b>100%</b>

**Source:** Thurston Regional Planning Council

**Streams**

Streams are a type of Critical Area for Olympia, Tumwater, and Thurston County. Figure 4 indicates the stream type categories using the Washington State Department of Natural Resources typing system. This stream system can be found in WAC 222-16-030 and includes four types of streams.

- The largest water class is for rivers and large streams. It is typed as “S” – ‘Shorelines of the State.’ These have over 20 cubic feet per second mean annual flow and are subject to the Shoreline Management Act.
- The second stream type is “F” – ‘Fish bearing.’ These streams flow year round and directly support fish habitat.
- The third stream category is type “N.” This category includes type “Np,” which are referred to as ‘perennial non-fish habitat.’ Type “Ns” is called ‘seasonal, non-fish habitat’ and refers to streams where the stream bed goes dry for part of the year.
- The last stream type is “U” for unclassified.

Table 4 summarizes the various types of streams in the WOAS study area. Percival Creek and the Black Lake Drainage Ditch are the largest streams; both are type “S.” The Black Lake Drainage Ditch was constructed in 1922 and drains Black Lake into Percival Creek. Percival Creek drains into Capitol Lake at Percival Cove. Upstream of the confluence with the ditch, Percival Creek is Type “F” and extends south to Trosper Lake. Moxlie Creek is Type “F” and drains the extreme easterly part of the study area around the I-5 / Henderson Avenue / Plum Street interchange. Outside the study area to the west, McLane Creek drains into Eld Inlet. Outside of the study area to the south, the Deschutes River drains into Capitol Lake at Tumwater Falls.

**Table 4 Stream Types Found in WOAS Study Area**

Stream Type	Stream Distance	
	Feet	Miles
S	16,495'	3.12
F	10,150'	1.92
N	10,700'	2.02
U	4,570'	0.86
<b>Total</b>	<b>41,915'</b>	<b>7.92</b>

**Source:** Thurston Regional Planning Council

Figure 4 – Map of WOAS Stream Types



## **Wetlands**

Wetlands are a type of Critical Area for Olympia, Tumwater, and Thurston County. Wetland mapping indicates that there are 242.4 acres of vegetated wetlands within the WOAS study area. These are illustrated in Figure 4, on the previous page. These wetlands are associated with Capitol Lake, Grass Lake, the Black Lake Drainage Ditch and Eld Inlet.

While the Washington State Department of Ecology rating manual rankings for these wetlands are not available, there are several sites within the study area which contain high quality wetlands.

- The most significant wetlands within the WOAS study area are the salt marsh wetlands adjacent to Eld Inlet. Estuarine wetlands are very rare within the WRIA 13 marine shoreline.
- Harrison Avenue crosses the associated wetland of Grass Lake west of Cooper Point Road. The western most arm of this wetland system contains a multi-acre stand of Quaking Aspen which is unique within the wetlands of Thurston County.
- The Black Lake Drainage Ditch was constructed in 1922 to drain a wetland system which extends north of Black Lake. The ditch drains a large peat wetland to the south and the City of Olympia has constructed a water storage area for West Olympia called “Black Lake Meadows” adjacent to the ditch.
- The riparian forest wetlands along the lower 1/4 mile of Percival Creek are sheltered within the Percival Creek Canyon and lie to the west of Percival Cove basin of Capitol Lake.

## **Lakes**

There are only two lakes within the WOAS study area: Capitol Lake and Ken Lake. Both are over 20 acres in size and are subject to the State Shoreline Management Act jurisdiction described previously. Grass Lake, which is also subject to the State Shoreline Management Act, lies just to the north of the study area.

Capitol Lake is located in the eastern part of the WOAS study area. It was created in 1951 by damming estuaries in the southern part of Budd Inlet. Capitol Lake extends from Tumwater Falls to the Capitol Lake dam along 5<sup>th</sup> Avenue in downtown Olympia. It is 260 acres in size and is divided into four smaller basins. Both the Deschutes River and Percival Creek drain into the lake with the Deschutes providing about 90 percent of the fresh water flow. Interstate 5 crosses Capitol Lake and the eastern terminus of Highway 101 at milepost 104, the Capitol Lake interchange.

Ken Lake is located south of Highway 101 and west of Black Lake Boulevard. The lake is 24.5 acres in size and drains via a partially blocking culvert into the Black Lake Drainage Ditch. The residential community of Lakemoor surrounds Ken Lake.

## **Important Riparian Areas**

Important Riparian Areas are a new type of Critical Area within the City of Olympia. They are located on marine or lake shorelines with high riparian quality. There are two shorelines within the study area with this designation: Percival Cove and Port Lagoon. Within the WOAS study area 22.3 acres are mapped as Important Riparian Areas. Refer to Figure 3.

- The western shoreline of the Port Lagoon, located north of 4<sup>th</sup> Avenue, is one of Budd Inlet's intact marine shorelines.
- The steep western shoreline of Percival Cove was also a part of Budd Inlet before Capitol Lake was constructed.
- The eastern shore of the Middle and South Basins of Capitol Lake are also designated as Important Riparian Areas, but both lie just outside the WOAS study area.

## **Important Habitats and Species**

Important Habitats and Species are a type of Critical Area within the City of Olympia and Thurston County. Within the City of Tumwater these areas are called "Fish and Wildlife Habitat Protection" areas. These terms refer to habitat areas which are critical to the survival of threatened or endangered species. "Important species" could include the Bald Eagle and the Peregrine Falcon. "Important habitats" could include the Quaking Aspen grove (described in the Wetlands section) and some sensitive plant species found along the Green Cove Creek wetland (located just north of the WOAS study area).

Within the Washington State Department of Fish and Wildlife (WDFW) these are "Priority Habitats and Species" or PHS. This statewide classification system is more extensive and includes sensitive or monitored species such as the Olympic Mud Minnow which can be found in the Green Cove Creek Drainage. WDFW maintains a habitat database with the most current locations for PHS species.

A review of the PHS data indicated there are no known Important Species located within the WOAS study area although some are located nearby but outside the study area. Chinook salmon is a listed species and has a presence in Budd Inlet and Capitol Lake. The streams of the WOAS study area are home to several other salmon species which are not currently listed as threatened or endangered species. Due to the sensitive nature of the PHS data, WDFW does not allow this data to be mapped.

## **Fish Passage Barriers**

In 1999 the WDFW, the WSDOT and Thurston County Roads and Transportation Services prepared an inventory of all the public road crossings in Thurston County which might contain

fish bearing streams. No attempt was made to inventory crossings on private land or within the forested regions of the county. The report identified a total of 70 culverts countywide which were blocking upstream migration of fish.

In 2004 the South Sound Salmon Enhancement Group (SSSEG) updated this information for WRIA 13. Since that time, some culverts have been made passable. There are three blocking culverts within the WOAS study area, as summarized in Table 5. The two most significant barriers are associated with Capitol Lake and are described below. See Figure 4 for locations.

**Table 5 – Fish Passage Barriers Within the WOAS Study Area by Drainage Basin**

Drainage Basin	Passable for Most Fish	Passable for Some Fish	Passable for Few Fish	Total Blocking Culverts
Budd Inlet ( <i>West Bay</i> )	---	---	---	---
Capitol Lake	---	---	2	2
Percival Creek	1	---	---	1
Green Cove Creek	---	---	---	---
Ellis Creek	---	---	---	---
Eld Inlet	---	---	---	---
<b>Total</b>	<b>1</b>	<b>---</b>	<b>2</b>	<b>3</b>

Source: Thurston Regional Planning Council

### **Capitol Lake Fish Passage Barriers**

The northern most fish blockage in the Capitol Lake basin is the Capitol Lake dam. The dam was constructed in 1951 to create Capitol Lake which used to be a part of southern Budd Inlet. Figure 5 shows the dam, looking north from the Capitol Lake side. There are two sets of tide gates to the west of the eight foot wide fish ladder. The tide gates and fish ladder are to the right in the photo. The fish ladder was designed to provide access into and out of the lake for salmonids. This occurs when there is six inches of water flowing over the top step in the ladder.

**Figure 5 - Capitol Lake Dam and Fish Ladder**



The Capitol Lake dam is managed by the State Department of General Administration (GA). Because of possible flooding concerns for downtown Olympia, GA maintains the winter lake at a height one foot lower than in the summer. This is below the top of the fish ladder and so during the winter fish can only access the lake during low tide when water is being passed through the gates of the dam, or during a spring high tide when salt water passes back into the lake. Figure 6 shows the fish ladder at high tide.

**Figure 6 - Capitol Lake Dam and Fish Ladder at High Tide**



The southern most fish blockage in the Capitol Lake basin is a fish barrier at the Percival Creek bridge along Deschutes Parkway. The barrier was installed in the 1980's by WDFW to provide a contained rearing area for yearly Chinook salmon. After problems with predator control the salmon were moved to temporary net pens which were discontinued in 2007. The hatchery run was transferred to the rearing ponds at Tumwater Falls Park adjacent to the Deschutes River. It is likely that the barrier will remain until 2011 while the Chinook run becomes acclimatized to the water of the Deschutes River.

## **Wellhead Protection Areas**

Wellhead protection planning is required under the 1987 Federal Safe Drinking Water Act. Washington State has a Wellhead Protection Program, defined in Chapter 246-290 of Washington's Administrative Code (WAC) and administered by the Washington State Department of Health (DOH).

Currently, Olympia's water quality is considered to be very good. However, as the city and areas around its wellheads develop, the potential threats to its drinking water supply will increase.

Once contaminated, treatment options may be both expensive and have long-term adverse effects. As finding additional sources of water becomes increasingly difficult, protection of the supply becomes even more important. Table 6 indicates the threats and relative risk of groundwater pollution to Olympia’s three drinking water sources, with the column for Allison Springs shaded. Allison Springs is located within the WOAS study area.

**Table 6 – Generalized Risks to Olympia’s Groundwater Sources**

<b>Risks</b>	<b>McAllister Springs</b>	<b>Allison Springs</b>	<b>East Olympia</b>
Use, storage, and disposal of hazardous materials	High	High	High
Leaking underground storage tanks	Medium	High	Medium
Transportation spills	High	Medium	Medium
Stormwater runoff	Medium	High	Medium
Animal wastes	Medium	N/A	N/A
Septic systems	Medium	Low	High
Abandoned wells	Medium	Medium	Low
Existing and abandoned landfills	Medium	Medium	None
Pesticides and fertilizers	High	Medium	Medium
Agriculture and golf courses	Medium	Low	High
Sea water intrusion	N/A	Low	N/A

**Source:** City of Olympia Water System Plan, (2004).  
**Notes:** The Allison Springs wellhead is located within the West Olympia Access Study area boundary.

“Wellhead Protection Areas” are a type of Critical Area for Olympia, Tumwater, and Thurston County. Each uses the same general terms and protection zones around the wellhead. In West Olympia, there are two well fields which supply about 20 percent of Olympia’s domestic water supply. Only the Allison Spring wellhead protection area is located within the WOAS study area. The City’s Grass Lake well is located just to the north of the study area.

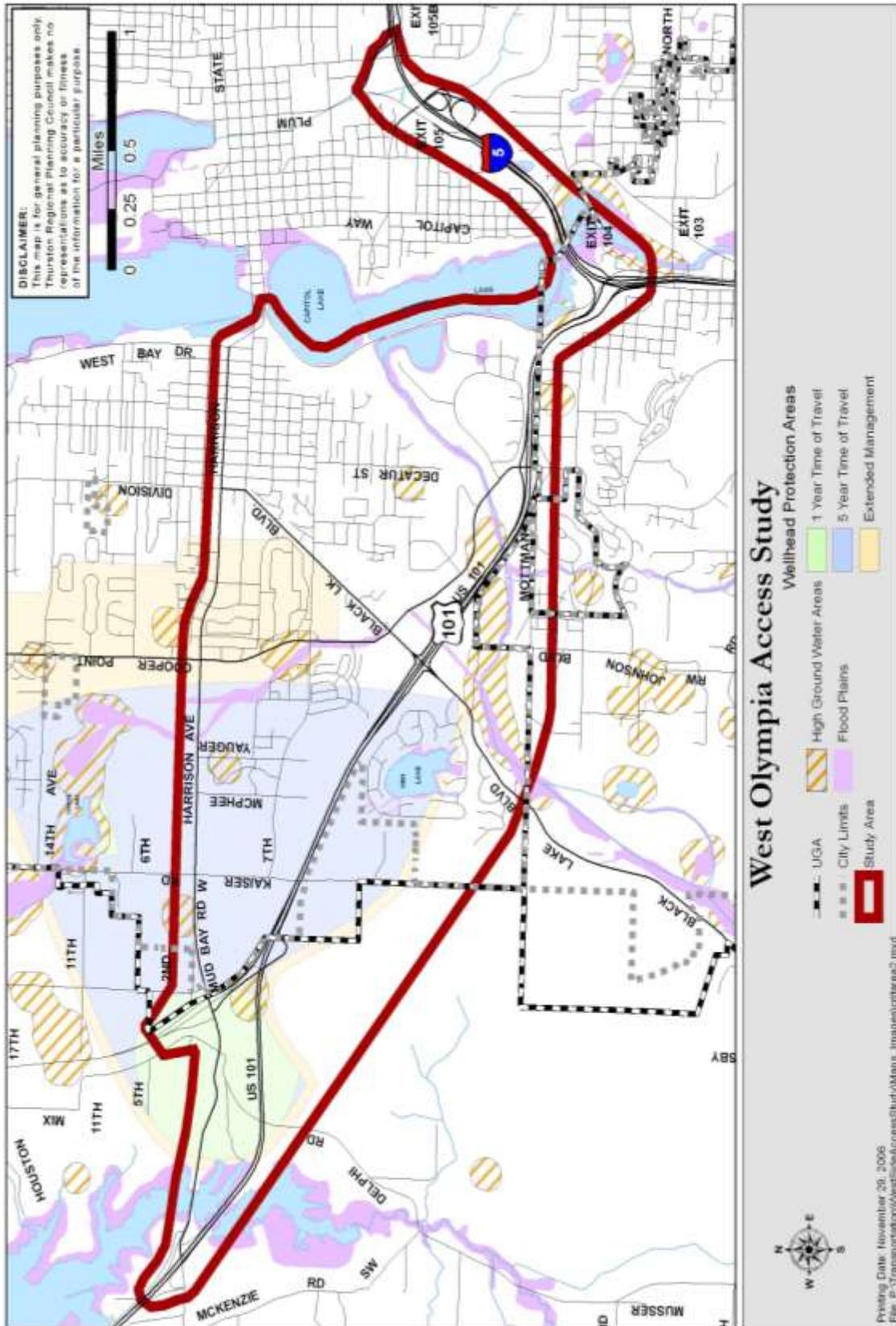
Wellhead protection areas are drawn around drinking water supply wells to represent the primary recharge areas for the drinking water wells. Generally, these zones are determined by estimating the travel paths – based on 1-, 5, and 10-year time of travel values – of a hypothetical particle of water traveling through the aquifer to the pumping well. Olympia uses these three categories to establish different levels of protection around each wellhead. For example, land acquisition is a preferred management approach within the 1-year time of travel zone in order to prevent development or at least control development in the area.

An analytical model was used to create the time of travel zones. The orientation and shape of the capture zone is controlled by local groundwater flow directions. The capture zone for Allison Springs was truncated along the Black Hills basalt bedrock south of Highway 101.

Only 1,342 acres of the WOAS study area are within a Wellhead Protection Area. Approximately 15 percent (204 acres) lies within the critical one year time of travel zone. The five year time of travel zone includes the majority of the coverage at 817 acres, with the extended management area containing an additional 319 acres.

Figure 7 shows the location of the wellhead and its recharge zones.

Figure 7 – Map of Allison Springs Wellhead Protection Area, Floodplains and High Groundwater



## **Areas of Known Soil or Groundwater Concern**

Landfills can provide a source of contaminants to the groundwater system. Recently constructed landfills are designed to minimize leachate production and contaminant movement from landfills to the groundwater system. Older landfills were constructed without many of these features.

Based on information from the Thurston County Health Department (TCHD) the former Olympia Municipal Dump was located within the WOAS study area but outside the Wellhead Protection Area for Allison Springs. The former Conifer Landfill lies just to the south of the WOAS study area. Investigations by the TCHD in 1985 and 1992 at the Olympia Municipal Dump did not reveal a contaminant problem. The Conifer Landfill has not been investigated.

Other potential contaminant sites within the WOAS study area include the Lew Rents store at the corner of Harrison Avenue and McPhee Street, although no problems have ever been reported. Fuel as well as heavy vehicles are stored at this facility. Also, the Puget Sound Energy Eld Inlet Substation is located north of the study area and near to the Grass Lake well.

There are some limited areas of Elevated Chloride due to salt water intrusion along Eld Inlet. The basalt geology south of Highway 101 is an area of Very Limited Groundwater. Also within the study area are Filled Lands, including Deschutes Parkway and much of downtown Olympia. All of these filled lands are High Liquefaction Hazards which are described below.

## **Floodplains**

Floodplains and floodways are defined by the state Growth Management Act as a type of Critical Area. Within the City of Olympia and Thurston County flooding is not part of the CAO regulations and have separate regulations as a part of the City or County Municipal Code.

Floodplains are primarily adjacent to stream corridors or constructed stormwater facilities. Mapping depicts what is known as the “100 year floodplain” from Federal Emergency Management Agency (FEMA) data. This is more accurately described as areas with a “one in one hundred” chance of flooding. Within the WOAS study area 328.1 acres are mapped as 100 year floodplains, typically occurring along major streams but also found around Capitol Lake and Ken Lake. Major stormwater facilities within the study area include Yauger Park, the drainage corridor along Cooper Point Road, and Black Lake Meadows which is located adjacent to the Black Lake Drainage Ditch at Mottman Road. See Figure 7.

## **Areas of High Groundwater**

Thurston County has many locations where flooding need not be associated with river or stream flood events. The subsurface geology of the county limits the infiltration of rainfall. During “wetter” than normal rainfall years water will pond in depressions. During the wet cycle of 1999 aerial photographs were taken. Thurston County created a High Groundwater map. Within the WOAS study area 269.8 acres are mapped as High Groundwater. See Figure 7.

The U.S. Army Corps of Engineers defines a local wet cycle causing local high groundwater areas as reoccurring once every 30 years. At this frequency they are considered to be “floodplains” but have not been officially added to the FEMA flood maps. Only Thurston County has adopted regulations in its Critical Area Ordinance for these areas.

## **Terrestrial Resources**

### **Landslide Hazard Areas**

Landslide Hazard Areas are a type of Critical Area regulated by Olympia, Tumwater, and Thurston County. Landslide hazard areas describe those hillsides which exceed a 40 percent slope. Within the WOAS study area 363.8 acres are designated as Landslide Hazard Areas.

At the east end of the study area steep slopes abut Capitol Lake and Budd Inlet. Highway 101 crosses the Percival Creek canyon near the southern boundary of the study area. The canyon extends northeasterly for one mile then connects to Capitol Lake. At the west end of the study area, Highway 101 skirts an outcrop of the Black Hills which divides Black Lake from Eld Inlet.

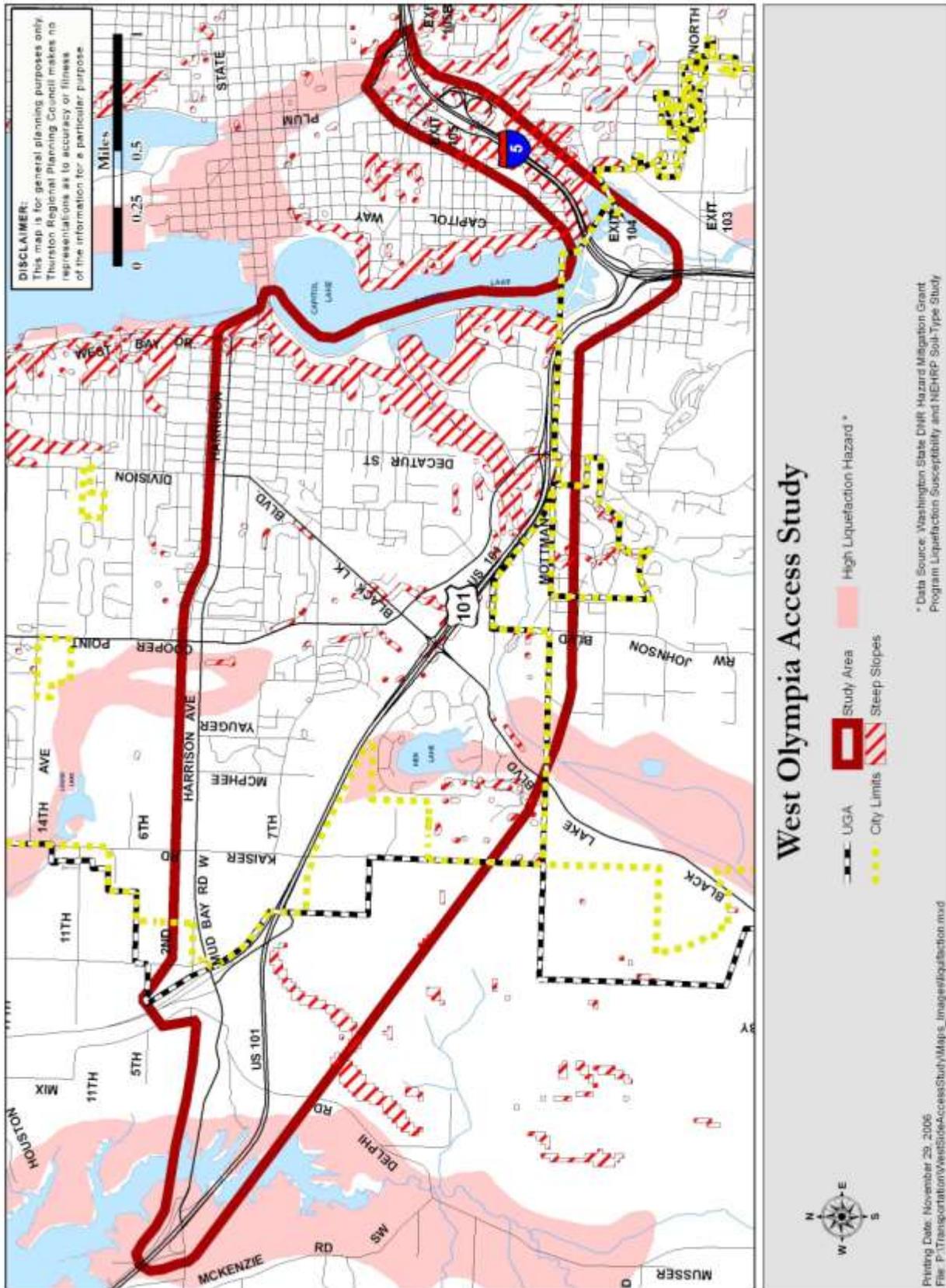
Recent landslide events have occurred within the WOAS study area. They include:

- The 2001 Nisqually earthquake triggered a 400 foot slide on the northeast side of the South Basin of Capitol Lake, close to where the Union Pacific Railroad tracks failed after the 1965 earthquake.
- A landslide occurred at this same location in February 1996. That landslide broke two sewer mains carrying the majority of Tumwater's and the Brewery's wastewater to the LOTT treatment plant. That line was relocated into Deschutes Parkway in 2003 as part of the 2001 earthquake repair.
- Damage from the 2001 Nisqually earthquake included three crescent shaped pavement depressions in the west bound lanes of Highway 101 above Capitol Lake. This hillside is near the inferred and buried location of the Olympia Fault as depicted by the Washington State Department of Natural Resources, Division of Geology and Earth Resources.
- A 2001 Nisqually earthquake event occurred along SR-101 just west of the WOAS study area, temporarily closing both northbound lanes of SR-101 and Madrona Beach Road.

### **Liquifaction Areas**

Liquefaction occurs when ground shaking causes loose soils to lose strength and act like viscous fluid. It causes two types of ground failure: lateral spread and loss of bearing strength. Lateral spreads develop on gentle slopes and entail sidelong movement of large masses of soil as an underlying layer liquefies. Loss of bearing strength results when soil supporting structures liquefies. This can cause structures to tip and topple.

Figure 8 – Map of WOAS Landslide or High Liquefaction Hazard Areas



Areas susceptible to High Liquefaction Hazard are found in floodplains, wetlands, or filled land such as in downtown Olympia. Within the WOAS study area, 270.9 acres are mapped as High Liquefaction Areas.

Within the WOAS study area, two areas suffered liquefaction damage during recent seismic events.

- Olympia's 4<sup>th</sup> Avenue Bridge was one of four bridges in the state to suffer substantial damage from the 2001 Nisqually earthquake. Constructed in 1920 and retrofitted after the 1949 earthquake, the bridge had been scheduled for replacement even before the 2001 earthquake. The closure of the bridge severely restricted access from downtown Olympia to West Olympia. The new bridge was opened in December 2003. It cost \$39 Million and was the largest public works project in the City's history.
- The 1965 and 2001 Nisqually earthquake both damaged Deschutes Parkway along Capitol Lake. The 2001 earthquake resulted in a closure of Deschutes Parkway. Waterlogged soil under the road liquefied during the shaking and huge voids were created beneath portions of the concrete road surface. The Figure 9 photo was taken the day of the earthquake. Sections of road and sidewalk buckled from the force of the earthquake. According to the State Emergency Management, it suffered the most damage of any road in the state. This vital link between downtown Olympia, West Olympia, and Tumwater was closed to traffic for 20 months. It was opened in October 2003 at a replacement cost of \$7 million.

**Figure 9 - Effects of 2001 Nisqually Earthquake on Deschutes Parkway**



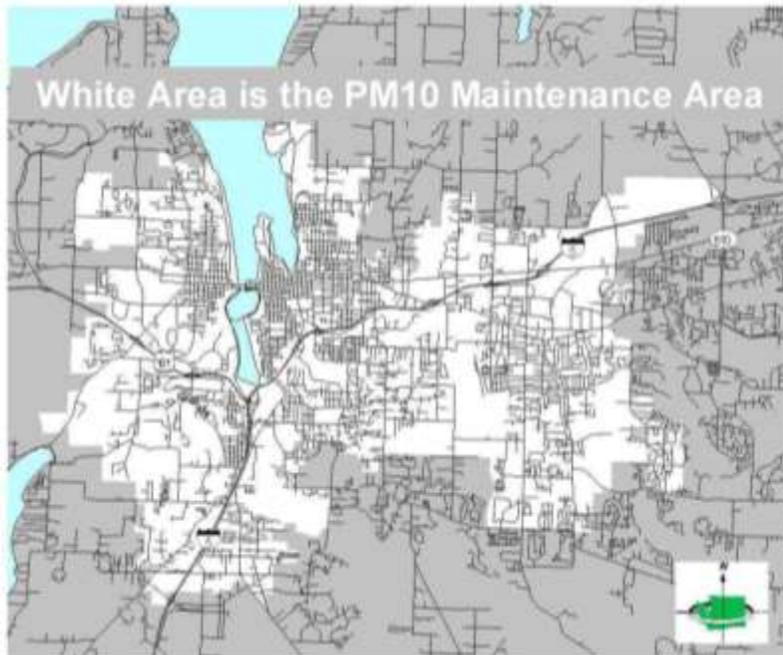
## Air Quality

The federal Clean Air Act and Washington State's Clean Air Act identify air quality standards that regions must meet. These standards govern air pollution caused by mobile sources - like motor vehicles and other transportation modes - as well as by stationary sources like manufacturing plants or home fireplaces. Transportation conformity ensures transportation investments do not contribute to a worsening of air quality in a region or preclude its ability to improve unhealthy air quality. Federal 40 CFR Part 93 and State WAC 173-420 identify governing rules.

State and federal guidelines establish standards for healthy air quality. A region that meets these standards is considered to be an attainment area. Nonattainment areas do not meet the standards and are deemed to have unhealthy levels of air pollutants. A region may be an attainment area for one pollutant and a nonattainment area for another pollutant. A region may be redesignated from nonattainment to maintenance area if it successfully demonstrates an ability to address its air quality problems for a period of time. This redesignation status applies to the Thurston region.

The Thurston region is an attainment area for Carbon Monoxide (CO) and Ozone (O<sub>3</sub>). Part of the Thurston region is a maintenance area for Particulate Matter (PM<sub>10</sub>). PM<sub>10</sub> refers to airborne particulate matter that is less than 10 microns in size, making it too small to be filtered by the nose and lungs. Components of mobile source particulates include vehicle emissions, road dust, tire wear, and brake wear. These result in tiny airborne particles that pose hazards to people with asthma or other respiratory problems, as well as the very young and the very old that have vulnerable respiratory systems. Significantly, it is also a by-product of wood burning. Figure 10 illustrates the Thurston County maintenance area for PM<sub>10</sub>.

**Figure 10 – Map of Thurston Region PM<sub>10</sub> Maintenance Area**



In 2007, Thurston Regional Planning Council (TRPC) performed emissions analysis for the 2007 amendment to the 2025 Regional Transportation Plan. Calculations were performed using MOBILE 6.2 software with input values provided by the Air Quality Program of Washington State Department of Ecology. PM<sub>10</sub> emissions were well within the maintenance area threshold of 776.36 tons per year. Analysis showed that transportation projects identified in the regional plan do not degrade the region's air quality and the plan complies with all clean air requirements.

This is one of four background reports for the West Olympia Access Study:

- Report #1 – Significant Transportation and Land Use Events
- Report #2 – Transportation Characteristics
- Report #3 – Land Use and Environment Characteristics
- Report #4 – Social and Economic Characteristics

Additional information on the study area can be found in the report,  
*Synopsis of Previous Plans and Studies Associated with the Study Area.*

These reports and maps were prepared for the City of Olympia and the Washington State Department of Transportation (WSDOT) by Thurston Regional Planning Council with the generous assistance of staff from the Olympia, WSDOT and various stakeholders in the West Olympia Access Study.

Information on the West Olympia Access Study can be found on-line at

[www.wsdot.wa.gov](http://www.wsdot.wa.gov)  
and  
[www.trpc.org/westolympia](http://www.trpc.org/westolympia)

or by calling 360.956.7575.

