Note: This is an abbreviated version of the Shoreline Inventory Appendix prepared by Thurston Regional Planning Council. Text and maps pertaining specifically to shorelines not located within Tumwater or the Tumwater Urban Growth Area have been removed. The complete version of this appendix is available upon request.

Shoreline Inventory for the Cities of Lacey, Olympia, and Tumwater and their Urban Growth Areas
THURSTON REGIONAL PLANNING COUNCIL (TRPC) is a 22-member intergovernmental board made up of local governmental jurisdictions within Thurston County, plus the Confederated Tribes of the Chehalis Reservation and the Nisqually Indian Tribe. The Council was established in 1967 under RCW 36.70.060, which authorized creation of regional planning councils.

TRPC's mission is to “Provide Visionary Leadership on Regional Plans, Policies, and Issues.” The primary functions of TRPC are to develop regional plans and policies for transportation [as the federally recognized Metropolitan Planning Organization (MPO) and state recognized Regional Transportation Planning Organization (RTPO)], growth management, environmental quality, and other topics determined by the Council; provide data and analysis to support local and regional decision making; act as a “convener” to build community consensus on regional issues through information and citizen involvement; build intergovernmental consensus on regional plans, policies, and issues, and advocate local implementation; and provide planning, historic preservation, and technical services on a contractual basis.

### 2009 MEMBERSHIP OF THURSTON REGIONAL PLANNING COUNCIL

<table>
<thead>
<tr>
<th>Governmental Jurisdiction</th>
<th>Name of 2009 Representative</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Lacey</td>
<td>Virgil Clarkson, Councilmember</td>
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<tr>
<td>City of Olympia</td>
<td>Joan Machlis, Councilmember</td>
</tr>
<tr>
<td>City of Rainier</td>
<td>Dennis McVey, Councilmember</td>
</tr>
<tr>
<td>City of Tenino</td>
<td>Ken Jones, Mayor</td>
</tr>
<tr>
<td>City of Tumwater</td>
<td>Ed Stanley, Councilmember</td>
</tr>
<tr>
<td>City of Yelm</td>
<td>Robert Isom, Councilmember</td>
</tr>
<tr>
<td>Town of Bucoda</td>
<td>Kathy Martin, Mayor</td>
</tr>
<tr>
<td>Thurston County</td>
<td>Cathy Wolfe, County Commissioner</td>
</tr>
<tr>
<td>Intercity Transit</td>
<td>Sandra Romero, Transit Authority Board Member</td>
</tr>
<tr>
<td>LOTT Alliance</td>
<td>Graeme Sackrison, Board Member</td>
</tr>
<tr>
<td>Thurston PUD</td>
<td>Paul Pickett, PUD Commissioner</td>
</tr>
<tr>
<td>North Thurston Public Schools</td>
<td>Chuck Namit, School Board Member</td>
</tr>
<tr>
<td>Olympia School District</td>
<td>Frank Wilson, School Board Member</td>
</tr>
<tr>
<td>Confederated Tribes of the Chehalis Reservation</td>
<td>Lennea Magnus, Planning Director</td>
</tr>
<tr>
<td>Nisqually Indian Tribe</td>
<td>Francine Lester, Tribal Councilmember</td>
</tr>
</tbody>
</table>

**Associate Members**

- CAPCOM: Jeff Kingsbury, Board Chairman
- Economic Development Council of Thurston County: Joseph Beaulieu, EDC President
- Lacey Fire District #3: Frank Kirkbride, Commissioner
- Olympic Region Clean Air Agency: Ann Burgman, Board Member
- Puget Sound Regional Council: Norman Abbott, Director
- Timberland Regional Library: Dick Nichols, Library Board Member
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- **Secretary**: Cathy Wolfe, Thurston County

Lon D. Wyrick, Executive Director
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Susan Andrews  Assistant Director

Acknowledgments

The staff at Thurston Regional Planning Council would like to acknowledge the many public and private agencies that have developed information on the shorelines of Thurston County that was used in this report.

This report was prepared with Grant Funding from the Washington State Department of Ecology SMA Grant Agreement No. G0800096

About This Report

Consistent with Governor Gregoire’s Plain Talk Executive Order 05-03 (2005), this report is written in a manner that is brief and to-the-point, uses non-bureaucratic language and features a clean design that promotes fast scanning and reading.

Scientific and legal references are kept to a minimum, replaced by a full list of sources in the report appendix.
# Table of Contents

## I. NOTES AND EXPLANATIONS ................................................................. 3
   A. Water Quality Explanations ................................................................. 3
      State Water Quality Information ......................................................... 3
      Local Water Quality Information ......................................................... 4
      Stream Water Quality Categories ......................................................... 5
      Lake Water Quality Categories .......................................................... 5
   B. Critical Areas .................................................................................. 6
      Wetlands ........................................................................................... 6
      Landslide Hazard Areas .................................................................... 6
      Habitat Conservation Areas ............................................................... 6
      100 Year Floodplains ....................................................................... 7
      Channel Migration Zone .................................................................... 7

## II. MINIMUM AND OPTIONAL JURISDICTION ALONG THE DESCHUTES RIVER.. 8
   A. Overview ....................................................................................... 8
   B. Data Layers for Minimum Jurisdiction ............................................... 8
      Delineation of Ordinary High Water Mark (OHWM) ............................. 8
      Associated Wetlands ........................................................................ 11
      Floodway ........................................................................................ 12
      Floodplain within 200 Feet of Floodway .......................................... 12
      Channel Migration Zone .................................................................. 13
      Deschutes River Channel Migration Zone by Reach .......................... 16
      Minimum Jurisdiction Compared to Channel Migration Zone by Reach .. 24
      100-Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone .................................................. 32

## III. REACH BREAK METHODOLOGY AND RESULTS .............................. 40
   A. Overview ....................................................................................... 40
   B. Rivers ............................................................................................ 42

## IV. ESTABLISHING MINIMUM JURISDICTION FOR SELECT LAKES .............. 44

## V. ANNOTATED BIBLIOGRAPHY .............................................................. 56
List of Tables

| Table A - 1: | Riparian Buffer Widths by Stream Type for Lacey, Olympia, Tumwater and Thurston County... | A6 |
| Table A - 2: | Lake Reaches in Within Lacey, Olympia and Tumwater Urban Areas | A41 |
| Table A - 3: | River Reaches in the Olympia, Lacey, and Tumwater Urban Areas | A42 |
| Table A - 4: | Marine Reaches in the Lacey and Olympia Urban Areas | A43 |

List of Figures

| Figure A - 1(a): | River Channel Overlain on a 2000 Air Photo | A9 |
| Figure A - 1(b): | 2006 Update of the Data Set | A10 |
| Figure A - 1(c): | Old River Channel Visible in a 1993 Air Photo | A10 |
| Figure A - 1(d): | Adjusted Data Layer Used for OHWM Mapping | A11 |
| Figure A - 2: | Associated Wetlands Included in Minimum Shoreline Jurisdiction | A11 |
| Figure A - 3: | OHWM Data Layer Compared to Floodway | A12 |
| Figure A - 4: | Minimum Jurisdiction Extended Beyond the Floodway | A12 |
| Figure A - 5: | LiDAR Derived Elevation Data | A13 |
| Figure A - 6(a): | Updated OHWM Data Layer Shown with Existing Meander Belt Data Layer | A14 |
| Figure A - 6(b): | Updated CMZ Data Layer, Shown with Updated OHWM Data Layer, and Existing Meander Belt Data | A14 |
| Figure A - 7(a): | CMZ - Deschutes River Reaches 6-7 | A16 |
| Figure A - 7(b): | CMZ - Deschutes River Reach 5 | A17 |
| Figure A - 7(c): | CMZ - Deschutes River Reach 4 | A18 |
| Figure A - 7(d): | CMZ - Deschutes River Reach 3 North | A19 |
| Figure A - 7(e): | CMZ - Deschutes River Reach 3 South | A20 |
| Figure A - 7(f): | CMZ - Deschutes River Reach 2 North | A21 |
| Figure A - 7(g): | CMZ - Deschutes River Reach 2 South | A22 |
| Figure A - 7(h): | CMZ - Deschutes River Reach 1 | A23 |
| Figure A - 8(a): | Minimum Jurisdiction Compared to CMZ - Deschutes River Reaches 6 and 7 | A24 |
| Figure A - 8(b): | Minimum Jurisdiction Compared to CMZ - Deschutes River Reach 5 | A25 |
| Figure A - 8(c): | Minimum Jurisdiction Compared to CMZ - Deschutes River Reach 4 | A26 |
| Figure A - 8(d): | Minimum Jurisdiction Compared to CMZ - Deschutes River Reach 3 North | A27 |
| Figure A - 8(e): | Minimum Jurisdiction Compared to CMZ - Deschutes River Reach 3 South | A28 |
| Figure A - 8(f): | Minimum Jurisdiction Compared to CMZ - Deschutes River Reach 2 North | A29 |
| Figure A - 8(g): | Minimum Jurisdiction Compared to CMZ - Deschutes River Reach 2 South | A30 |
| Figure A - 8(h): | Minimum Jurisdiction Compared to CMZ - Deschutes River Reach 1 | A31 |
| Figure A - 9(a): | 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone - Reaches 6 and 7 | A32 |
| Figure A - 9(b): | 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone - Reach 5 | A33 |
| Figure A - 9(c): | 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone - Reach 4 | A34 |
| Figure A - 9(d): | 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone - Reach 3 North | A35 |
| Figure A - 9(e): | 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone - Reach 3 South | A36 |
| Figure A - 9(f): | 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone - Reach 2 North | A37 |
| Figure A - 9(g): | 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone - Reach 2 South | A38 |
| Figure A - 9(h): | Flood Plain - Deschutes River Reach 1 | A39 |
I. Notes and Explanations

A. Water Quality Explanations

Water quality information comes from several sources, including federal, state and local agencies.

State Water Quality Information

The Washington State Department of Ecology measures water quality standards in surface waters, including rivers, lakes, and marine waters. Under the federal Clean Water Act, water quality standards must be adequate for the protection of beneficial uses of water bodies, including recreation, habitat for aquatic and marine life, and water supplies for agriculture and the general public.

The State Department of Ecology measures waterbodies and evaluates how observed measurements of water quality parameter affect each water body. Measurements of each water quality parameter are taken from water, sediment and tissue samples. Water bodies are then divided into categories, separated by varying degrees of degradation. The categories, as defined in Washington State’s Water Quality Assessment for 2004 are as follows:

A. Category 5: Polluted waters requiring a TMDL.\(^1\)

Data has shown that water quality standards have been violated for at least one pollutant, and that there is no TMDL or pollution control plan in place. TMDLs must be created for waterbodies in this category.

B. Category 4: Polluted waters not requiring a TMDL.

Water bodies in this category have pollution problems that are being addressed by one of three methods:

1. Category 4a: Water bodies that already have an approved TMDL.

2. Category 4b: Water bodies that have another pollution control plan in place. They are required to exhibit many features of TMDL plans and must include legal or financial guarantees that the plans will be implemented.

\(^1\) A TMDL or Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. Water quality standards are set by States, Territories, and Tribes. TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The calculation must also account for seasonal variation in water quality. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.
3. Category 4c: Water bodies impaired by a non-pollutant, including low water flow, stream channelization and dams.

C. Category 2: Waters of concern.

Water bodies are placed in this category for several reasons. Pollution levels may not be high enough to violate water quality standards, or there may have been too few violations to characterize the water body as impaired under Ecology’s policies. There could be data that indicates water quality violations, but the data may have been collected improperly.

D. Category 1\(^2\): Meets tested standards for clean waters.

This designation does not mean that a water body is free of pollutants, only that it met standards for the pollutants for which it was tested. Specific monitoring results can be found in each water body’s individual listing.

The “State Information” in this report includes evaluations made by the Department of Ecology, based on water, sediment and tissue samples. Information is provided for Shoreline-regulated waterbodies within WRIA 13, and is separated into categories as defined by Ecology. A comprehensive listing of all water bodies in violation of water quality standards in the State of Washington is available from the Washington State Department of Ecology.

**Local Water Quality Information**

Thurston County also conducts its own water quality testing. In 2006, Thurston County Public Health and Social Services Department, Thurston County Water and Waste Management Department and the Storm and Surface Water Program in conjunction with the Public Works and Water Resources Programs of the cities of Olympia and Lacey, the City of Tumwater’s Public Works Department and the Washington State Department of Ecology collectively published the Thurston County Water Resources Monitoring Report for the 2003-2004 and 2004-2005 Water Years. It includes water quality information on streams and lakes in Thurston County. This study separated water quality parameters into two sets of criteria: water contact recreation and freshwater aquatic life uses.

In addition to reporting on the status of various water quality parameters found during the study, water bodies were rated on a scale from “Excellent” to “Poor”. The guidelines below, taken from the Water Resources Monitoring Report, show what considerations were used to rate water bodies in the study.

\(^2\) Category 1 listings were not included in this report.
Stream Water Quality Categories

“Excellent” - No water quality standard violations, and very low fecal coliform and nutrient concentrations.

“Good” - Usually meets water quality standards; OR violates only one part of the two part fecal coliform standard; OR the violation is most likely the result of natural conditions rather than pollution.

“Fair” - Frequently fails one or more water quality standards and other parameters such as nutrients indicate water quality is being impacted by pollution.

“Poor” - Routinely fails water quality standards by a large margin; other parameters such as nutrients are at elevated concentrations.

Lake Water Quality Categories

“Excellent” - Very low nutrient and chlorophyll $a$ concentrations, and very high water clarity; Classified as Oligotrophic; Uses not impaired.

“Good” - Low to moderate nutrient and chlorophyll $a$ concentrations, and moderate to high water clarity; Classified as Mesotrophic; Uses not impaired.

“Fair” - Moderate to high nutrient and chlorophyll $a$ concentrations, and low to moderate water clarity; Classified as Eutrophic; Uses sometimes impaired.

“Poor” - High nutrient and chlorophyll $a$ concentrations, and low water clarity; Classified as Eutrophic; Uses impaired during most of the summer season by excess algae and/or aquatic macrophyte (plant) growth.
B. Critical Areas

Wetlands

Wetland Indicator maps were prepared for the cities of Lacey, Olympia, Tumwater, and their urban growth areas during the early 1990s. Wetland consultants were used as described in Keany and Rozenbaum (1992), and on the TRPC web site - Wetland Mapping for the Thurston Region.

Landslide Hazard Areas

Each jurisdiction has identified steep slopes while developing their Critical Areas Ordinances. For local jurisdictions they are defined as follows:

- Lacey – not applicable (no steep slopes or landslide hazard areas)
- Olympia – 40 percent or greater slopes
- Tumwater – 40 percent or greater slopes
- Thurston County – 50 percent or greater slopes

Habitat Conservation Areas

Habitat conservation areas are the riparian buffer around streams protected under local Critical Area Ordinances by a riparian buffer. Buffers have been generalized for mapping purposes, and are shown in the table below:

| TABLE A - 5: Riparian Buffer Widths by Stream Type for Lacey, Olympia, Tumwater and Thurston County. |
|---|---|---|---|---|
| Streams | Lacey | Olympia | Tumwater | Thurston County |
| Current Washington State Department of Natural Resources Stream Typing System |
| Type S | n/a | 250 ft | n/a | n/a |
| Type F | n/a | 200 ft | n/a | n/a |
| Type N | n/a | 150 ft | n/a | n/a |
| Type U (unknown) | n/a | 100 ft | n/a | n/a |
| Previous Washington State Department of Natural Resources Stream Typing System |
| Type I | 200 ft | n/a | 200 ft | 100 ft |
| Type II | 200 ft | n/a | 200 ft | 100 ft |
| Type III | 200 ft | n/a | 100 ft | 100 ft |
| Type IV | 150 ft | n/a | 50 ft | 50 ft |
| Type V | 150 ft | n/a | 50 ft | 25 ft |

In addition to the stream buffers listed above, habitat conservation areas also include Important Riparian Areas identified within only the City of Olympia. They are located on marine or lake shorelines with high riparian quality. These areas are designated along three marine shorelines segments in southern Budd Inlet, and three shoreline segments along Capitol Lake.
100 Year Floodplains

Floodplains with a one in one hundred chance of flooding (hereafter know as 100 Year Floodplains) were mapped by FEMA within the three cities and Thurston County during the late 1970s and early 1980s. Field data collection and surveying was accomplished along the major rivers within Thurston County, including the Deschutes River. The results of the studies were published by FEMA in a report for each local jurisdiction City of Lacey (FEMA, 1981), City of Olympia (FEMA, 1981), City of Tumwater (FEMA 1984) and Thurston County (1982).

FEMA undertook a hydrologic study of Capitol Lake following the 2001 Nisqually earthquake. The recommendation of that report (URS & Dewberry, 2003) was to raise the elevation of the 100 Year Floodplain of Capitol Lake from 11.0 feet NVGD to 11.5 feet NVGD. FEMA then changed the FIRM panels for Capitol Lake. In response a slight berm was designed into the landscaping of Heritage Park which surrounds the eastern shore of the North Basin. (Schilperoot and Morrison, 2002) Improvements to the park and this landscaping to prevent flooding of downtown Olympia from the lake during a 100 year flood event were completed in 2006.

Channel Migration Zone

A “channel migration zones” (CMZ) is the area where a stream or river is susceptible to channel erosion. (Rapp & Abbe, 2003).

Delineation of the Deschutes River channel migration zone from historic aerial photography was completed from Tumwater Falls (RM 2) upstream to Deschutes Falls (RM 42) by TRPC staff in 1996. Historic river channels from 1941 and 1955 were plotted on the 1996 base map (Morrison, 1999). The portion of the channel migration zone within the urban areas was updated in 2008 based on LiDAR-derived elevation and 2006 air photos.
II. Minimum and Optional Jurisdiction along the Deschutes River

A. Overview

The Deschutes River is a dynamic river subject to natural flooding events and channel migration. While the goal of the SMA is to regulate development activities along the shoreline of the Deschutes River, the dynamic nature of the river makes the shoreline difficult to predict in the future. This is compounded by the lack of accurate mapped data on floodplains and floodways along the river, data sets that were developed before detailed aerial photography and topography were available.

The following pages document the development of an updated Ordinary High Water Mark and Channel Migration Zone delineation for the SMA update, as steps in establishing minimum jurisdiction. All data were developed for planning level purposes only.

The second section shows the updated channel migration zone in relation to the FEMA 100-year flood plain, as a basis for discussion for the policy choice of what to include in Optional Jurisdiction.

Minimum Jurisdiction:

Those shorelines along the Deschutes River that fall under Minimum Jurisdiction include:

- Ordinary High Water Mark plus 200 feet of upland areas
- Associated Wetlands
- Floodways
- Floodplains (100 year) if they are within 200 feet of the floodway.

Optional Jurisdiction:

SMA Minimum Jurisdiction may be extended by the use of Optional Jurisdiction, which can include critical areas and their buffers. Local policy makers determine Optional Jurisdiction. Channel Migration Zones must be addressed under the SMP, but do not change Minimum Jurisdiction. They could be considered part of Optional Jurisdiction.

B. Data Layers for Minimum Jurisdiction

Delineation of Ordinary High Water Mark (OHWM)

The existing HYDRO layer provides an approximation of the Ordinary High Water Mark for the Deschutes River, and includes obvious gravel bars and other areas inundated during high water events. This layer was modified in the following ways:

- The data layer was slightly out of date, and due to channel migration along the Deschutes River did not accurately reflect current conditions. It was modified to reflect 2006 conditions.

- In some areas side-channels (with open water) were discernable that were not originally included in the HYDRO layer. Usually these are in places where the river channel had undergone an abrupt change or shifted to a new location in the last ten years. Both the old channel and new channel were included in the updated layer.
This data layer is adequate for general planning purposes. To accurately delineate the OHWM on a site specific development will require field delineations.

Figures 1 (a-d) show examples of how the OHWM data set was updated.

**Figure A - 2(a):** River channel (shown in blue) was last updated around 2000, and is overlain on a 2000 air photo. This example is in reach 3 of the Deschutes River – just south of the confluence with Chambers Creek.
**FIGURE A - 1(b):** By 2006 significant migration of the river channel had occurred, requiring an update of the data set. Original mapping is overlain in blue.

This example is in Reach 3 of the Deschutes River – just south of the confluence with Chambers Creek.

**FIGURE A - 1(c):** Old river channel (to the right) is clearly visible in a 1993 air photo.

This example is in Reach 3 of the Deschutes River – just south of the confluence with Chambers Creek.
Associated Wetlands

Wetlands with a hydrologic connection to the Deschutes River also fall under SMA Minimum Jurisdiction. Associated wetlands were identified through refinement of the existing TRPC and NWI wetlands data layers of wetlands within the Deschutes River floodplain.

**Figure A - 2:** Associated wetlands are also included in minimum shoreline jurisdiction. In this case the connection to the river is likely through a culvert.

Wetlands are shown in light green; the ordinary high water mark and 200 foot buffer are shown in light blue. Both are overlain on 2002-LiDAR derived elevation data.

This example is in Deschutes River reaches 5 and 6.
**Floodway**

For the Deschutes River most of the floodway is fairly well mapped, given the age and scale from which it was derived. It is usually larger than the adjusted Ordinary High Water Mark, but within a 200 feet of its edge. There are some areas where the river channel has migrated significantly where the floodway is outside of the river channel, but this is rare within the urban area.

**Floodplain within 200 Feet of Floodway**

Portions of the floodplain that fall within 200 feet of the edge of the floodway also fall under Minimum Jurisdiction.
Channel Migration Zone

Channel migration zones are not part of Minimum Jurisdiction, but they can be included as part of Optional Jurisdiction under the SMA.

Channel migration zones are defined in the SMA as “the area along a river within which the channel(s) can be reasonably predicted to migrate over time as a result of natural and normally occurring hydrological and related processes when considered with the characteristics of the river and its surrounding areas.”

The available meander belt or CMZ data layer for the Deschutes River was developed prior to LiDAR derived elevation data being available for the region. It was developed using aerial photos from 1944, 1956, and 1996. The CMZ data layer was updated using:

- 2002 LiDAR-derived topography (Figure A-5)

*FIGURE A - 5: LiDAR derived elevation data was useful in identifying abandoned river channels. These helped define the outer limit of the Channel Migration Zone.*

*Yellow is OHWM. This example of LiDAR imagery is from Deschutes River Reach 2.*

Overall, the updated data layer captures a larger meander zone than identified in the original data layer. Figures A-6(a) and (b) show the difference between the existing available data layer, and the updated data layer.
**FIGURE A - 6(A):** Updated OHWM data layer (yellow) shown with existing meander belt data layer (pink). Both are overlain on 2002 LiDAR-derived elevation data where remnant channels are identifiable. This example is in Deschutes River reach 2.

**FIGURE A - 6(B):** Updated CMZ data layer (purple) shown with updated OHWM data layer (yellow) and existing meander belt data layer. Overlaid on 2002 LiDAR-derived elevation data.
The figures on the following pages show the adjusted channel migration zone for the Deschutes River, along with reach delineations of the OHWM. The figures are arranged north to south.

Figures A - 7(a) through (h) show the channel migration zone.

Figures A - 8(a) through (h) show the channel migration zone in comparison to Minimum Jurisdiction.

Figures A - 9(a) through (h) show the channel migration zone in comparison to Minimum Jurisdiction and the 100-year floodplain.
Deschutes River Channel Migration Zone by Reach

**Figure A - 7(a): CMZ - Deschutes River Reaches 6-7**

CMZ outer line shown in dashed yellow.
Reach breaks shown on OHWM in blue (DES-7) and purple (DES-6).
Urban Growth Area line shown in dashed black and white.
Overlain on 2002 LiDAR-derived elevation.
Scale approx 1:6,215
**Figure A - 7(b): CMZ - Deschutes River Reach 5**

CMZ outer line shown in dashed yellow. (Note: none mapped for this reach break through the Tumwater Golf Course.)

Reach breaks shown on OHWM in green (DES-5).

Urban Growth Area line shown in dashed black and white. City limits are shown in dashed white line.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
FIGURE A - 7(c): CMZ - Deschutes River Reach 4

CMZ outer line shown in dashed yellow.
Reach breaks shown on OHWM in green (DES-5), blue (DES-4), and salmon (DES-3).

Urban Growth Area line shown in dashed black and white. City limits are shown in dashed white line.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
FIGURE A - 7(d): CMZ - DESCHUTES RIVER REACH 3 NORTH

CMZ OUTER LINE SHOWN IN DASHED YELLOW.

REACH BREAKS SHOWN ON OHWM IN SALMON (DES-3) AND PURPLE (CHAMBERS CREEK – 1).

URBAN GROWTH AREA LINE SHOWN IN DASHED BLACK AND WHITE. TUMWATER UGA IS TO THE WEST; OLYMPIA UGA IS TO THE EAST. RURAL COUNTY IS TO THE SOUTHEAST AND OUTSIDE OF STUDY AREA.

OVERLAIN ON 2002 LiDAR-DERIVED ELEVATION.

SCALE APPROX 1:6,215
**Figure A - 7(e): CMZ - Deschutes River Reach 3 South**

CMZ outer line shown in dashed yellow.

Reach breaks shown on OHWM in salmon (DES-3).

Urban Growth Area line shown in dashed black and white. To the east is rural County and outside of study area.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
**FIGURE A - 7(f): CMZ - Deschutes River Reach 2 North**

CMZ outer line shown in dashed yellow.

Reach breaks shown on OHWM in purple (DES-2).

Urban Growth Area line shown in dashed black and white. To the east is rural County and outside of study area.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
**FIGURE A - 7(g): CMZ - Deschutes River Reach 2 South**

CMZ outer line shown in dashed yellow.

Reach breaks shown on OHWM in purple (DES-2).

Urban Growth Area line shown in dashed black and white. To the east is rural county and outside of study area.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
FIGURE A - 7(h): CMZ - DESCHUTES RIVER REACH 1

CMZ OUTER LINE SHOWN IN DASHED YELLOW.

REACH BREAKS SHOWN ON OHWM IN PURPLE (DES-2) AND DARKER PURPLE (DES-1).

URBAN GROWTH AREA LINE SHOWN IN DASHED BLACK AND WHITE. TO THE EAST IS RURAL COUNTY AND OUTSIDE OF STUDY AREA.

OVERLAIN ON 2002 LiDAR-DERIVED ELEVATION.

SCALE APPROX 1:6,215
Minimum Jurisdiction Compared to Channel Migration Zone by Reach

**Figure A - 8(a): Minimum Jurisdiction compared to CMZ - Deschutes River Reaches 6 and 7**

The channel migration zone (CMZ) (bright yellow) is within minimum jurisdiction (shown in blue).

Urban Growth Area line shown in dashed black and white.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
**FIGURE A - 8(b): Minimum Jurisdiction compared to CMZ - Deschutes River Reach 5**

The channel migration zone (CMZ) (bright yellow) is within minimum jurisdiction (shown in blue). (Note: none mapped for this reach break through the Tumwater Golf Course.)

Urban Growth Area line shown in dashed black and white. City limits shown in dashed white line.

Overlain on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
FIGURE A - 8(c): Minimum Jurisdiction compared to CMZ - Deschutes River Reach 4

Parts of the channel migration zone (CMZ) (bright yellow) may be outside of minimum jurisdiction (shown in blue).

Urban Growth Area line shown in dashed black and white. City limits shown in dashed white line.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
FIGURE A - 8(d): Minimum Jurisdiction compared to CMZ - Deschutes River Reach 3 North

Parts of the channel migration zone (CMZ) (bright yellow) may be outside of minimum jurisdiction (shown in blue).

Urban Growth Area line shown in dashed black and white. City limits shown in dashed white line.

To the southeast is rural County and outside of study area.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
FIGURE A - 8(e): Minimum Jurisdiction Compared to CMZ - Deschutes River Reach 3 South

Parts of the Channel Migration Zone (CMZ) (bright yellow) may be outside of minimum jurisdiction (shown in blue).

Urban Growth Area line shown in dashed black and white. To the east is rural county and outside of study area.

Overlain on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
**FIGURE A - 8(f): Minimum Jurisdiction compared to CMZ - Deschutes River Reach 2 North**

The channel migration zone (CMZ) (bright yellow) is within minimum jurisdiction (shown in blue) within the UGA; the east side of the river is the rural county and outside of the study area.

Urban Growth Area line shown in dashed black and white.

Overlain on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
FIGURE A - 8(g): Minimum Jurisdiction compared to CMZ - Deschutes River Reach 2 South

The channel migration zone (CMZ) (bright yellow) is within minimum jurisdiction (shown in blue) within the UGA; the east side of the river is the rural county and outside of the study area.

Urban Growth Area line shown in dashed black and white.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
**FIGURE A - 8(h): Minimum Jurisdiction Compared to CMZ - Deschutes River Reach 1**

The channel migration zone (CMZ) (bright yellow) is within minimum jurisdiction (shown in blue) within the UGA; the east side of the river is the rural county and outside of the study area.

Urban Growth Area line shown in dashed black and white.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
100-Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone

**Figure A - 9(a):** 100 year floodplain compared to minimum jurisdiction and channel migration zone – Reaches 6 and 7

- 100-year floodplain is dark blue
- Minimum jurisdiction is light blue
- CMZ is bright yellow

Urban Growth Area line shown in dashed black and white.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
FIGURE A - 9(B): 100 YEAR FLOODPLAIN COMPARED TO MINIMUM JURISDICTION AND CHANNEL MIGRATION ZONE – REACH 5

100-YEAR FLOODPLAIN IS DARK BLUE
MINIMUM JURISDICTION IS LIGHT BLUE
CMZ IS BRIGHT YELLOW

URBAN GROWTH AREA LINE SHOWN IN DASHED BLACK AND WHITE. CITY LIMITS SHOWN IN DASHED WHITE LINE.

OVERLAIN ON 2002 LiDAR-DERIVED ELEVATION.

SCALE APPROX 1:6,215
**Figure A-9(c):** 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone – Reach 4

100-Year Floodplain is dark blue
Minimum Jurisdiction is light blue
CMZ is bright yellow

Urban Growth Area line shown in dashed black and white. City limits shown in dashed white line.

Overlay on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
Figure A - 9(d): 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone – Reach 3 North

100-Year Floodplain is dark blue
Minimum Jurisdiction is light blue
CMZ is bright yellow

Urban Growth Area line shown in dashed black and white. City limits shown in dashed white line.

Rural County is to the southeast of the river and outside of the study area.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
FIGURE A - 9(E): 100 YEAR FLOODPLAIN COMPARED TO MINIMUM JURISDICTION AND CHANNEL MIGRATION ZONE – REACH 3 SOUTH

100-YEAR FLOODPLAIN IS DARK BLUE
MINIMUM JURISDICTION IS LIGHT BLUE
CMZ IS BRIGHT YELLOW

URBAN GROWTH AREA LINE SHOWN IN DASHED BLACK AND WHITE. RURAL COUNTY IS TO THE EAST OF THE RIVER AND OUTSIDE OF THE STUDY AREA.

OVERLAIN ON 2002 LiDAR-DERIVED ELEVATION.

SCALE APPROX 1:6,215
**Figure A - 9(f):** 100-year floodplain compared to minimum jurisdiction and channel migration zone - Reach 2 North

- 100-year floodplain is dark blue
- Minimum jurisdiction is light blue
- CMZ is bright yellow

Urban Growth Area line shown in dashed black and white. Rural County is to the east of the river and outside of the study area.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
Figure A - 9(G): 100 Year Floodplain Compared to Minimum Jurisdiction and Channel Migration Zone – Reach 2 South

100-Year Floodplain is dark blue
Minimum Jurisdiction is light blue
CMZ is bright yellow

Urban Growth Area line shown in dashed black and white. Rural County is to the east of the river, and outside of the study area.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
**Figure A - 9(h): Flood Plain - Deschutes River Reach 1**

The 100 year flood plain (shown in dark blue) is completely within minimum jurisdiction for Reach 1.

CMZ outer line shown in dashed yellow.

Urban Growth Area line shown in dashed black and white. Rural County is to the east of the river, and outside of the study area.

Overlaid on 2002 LiDAR-derived elevation.

Scale approx 1:6,215
III. Reach Break Methodology and Results

A. Overview

Reach breaks were developed by ESA Adolphson working in conjunction with TRPC staff, and with the Scientific and Technical Advisory Group review.

Main data sources used to develop the reach breaks included:

- Draft minimum SMA jurisdiction map developed by the TRPC;
- WA DNR shorezone mapping (2000);
- Recent (2006) NAIP aerial photography;
- WA DNR hydro streams GIS layer;
- The Draft Shoreline Inventory (TRPC, 2008); and
- The Capitol Lake Sediment Transport Study (USGS, 2006).

Lakes

In general, shoreline lakes in Lacey, Olympia and Tumwater area were considered to be each one reach. Most of the lakes within the study area have relatively consistent surrounding land uses, and generally homogenous morphologies. Reach breaks were assigned for lakes if:

1. There was a mapped inlet and outlet channel;
2. A city boundary ran along or through the lake (e.g., Chambers Lake);
3. Distinct land use and/or critical areas (e.g., wetlands or floodplains)

Capitol Lake was treated differently, and was broken into several segments (south, middle, north, and Percival Cove) to be consistent with past work. These breaks also constitute constructions in the lake.
<table>
<thead>
<tr>
<th>Lake</th>
<th>Reach ID</th>
<th>Reach Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capitol</td>
<td>CAP-1</td>
<td>East side of southern basin</td>
</tr>
<tr>
<td></td>
<td>CAP-2</td>
<td>West side of southern basin</td>
</tr>
<tr>
<td></td>
<td>CAP-3</td>
<td>East side of middle basin</td>
</tr>
<tr>
<td></td>
<td>CAP-4</td>
<td>West side of middle basin</td>
</tr>
<tr>
<td></td>
<td>CAP-5</td>
<td>Percival Cove</td>
</tr>
<tr>
<td></td>
<td>CAP-6</td>
<td>East side of northern basin</td>
</tr>
<tr>
<td></td>
<td>CAP-7</td>
<td>West side of northern basin</td>
</tr>
<tr>
<td>Long Lake</td>
<td>LONG-1</td>
<td>Residential area in north basin</td>
</tr>
<tr>
<td></td>
<td>LONG-2</td>
<td>Residential area in south basin</td>
</tr>
<tr>
<td></td>
<td>LONG-3</td>
<td>Residential, wetland area, and inlet channel/ditch in south basin</td>
</tr>
<tr>
<td></td>
<td>LONG-4</td>
<td>Residential area in south basin</td>
</tr>
<tr>
<td></td>
<td>LONG-5</td>
<td>Residential area in north basin</td>
</tr>
<tr>
<td></td>
<td>LONG-6</td>
<td>Wetland and outlet channel in north basin.</td>
</tr>
<tr>
<td>Chambers Lake</td>
<td>CHAM-1</td>
<td>Eastern basin</td>
</tr>
<tr>
<td></td>
<td>CHAM-2</td>
<td>Less developed portion, generally within Olympia</td>
</tr>
<tr>
<td></td>
<td>CHAM-3</td>
<td>Developed portion, generally within Lacey.</td>
</tr>
<tr>
<td>Black</td>
<td>BLK-1</td>
<td>Less developed portion in southeast portion of lake</td>
</tr>
<tr>
<td></td>
<td>BLK-2</td>
<td>Residential portion of northeast portion of lake.</td>
</tr>
<tr>
<td>Trosper</td>
<td>TROS-1</td>
<td></td>
</tr>
<tr>
<td>Barnes</td>
<td>BARNES-1</td>
<td></td>
</tr>
<tr>
<td>Ken</td>
<td>KEN-1</td>
<td></td>
</tr>
<tr>
<td>Grass</td>
<td>GRASS-1</td>
<td></td>
</tr>
<tr>
<td>Munn/Susan</td>
<td>MUNN-1</td>
<td>East side of Munn Lake</td>
</tr>
<tr>
<td></td>
<td>MUNN-2</td>
<td>West side of Munn Lake</td>
</tr>
<tr>
<td></td>
<td>MUNN-3</td>
<td>Susan Lake</td>
</tr>
<tr>
<td>Ward</td>
<td>WARD-1</td>
<td></td>
</tr>
<tr>
<td>Hewitt</td>
<td>HEW-1</td>
<td></td>
</tr>
<tr>
<td>Bigelow</td>
<td>BIG-1</td>
<td></td>
</tr>
<tr>
<td>Southwick</td>
<td>SOU-1</td>
<td></td>
</tr>
<tr>
<td>Hicks</td>
<td>HICKS-1</td>
<td>Wetland along south rim</td>
</tr>
<tr>
<td></td>
<td>HICKS-2</td>
<td>Residential area</td>
</tr>
<tr>
<td>Pattison</td>
<td>PAT-1</td>
<td>Residential area north of road crossing</td>
</tr>
<tr>
<td></td>
<td>PAT-2</td>
<td>Residential area in southwest portion</td>
</tr>
<tr>
<td></td>
<td>PAT-3</td>
<td>Less developed and wetland area</td>
</tr>
<tr>
<td></td>
<td>PAT-4</td>
<td>Mix of residential and wetland area, including outlet.</td>
</tr>
</tbody>
</table>
B. **Rivers**

Reach breaks were typically assigned along river shorelines at:

1. Confluences of major tributaries;
2. City or UGA boundaries; and/or
3. Major morphologic breaks (e.g., Tumwater Falls on the Deschutes).

Reach breaks along the Deschutes River have been developed as part of several past reports (e.g., McNichols 1984, Collins 1994, Anchor 2008, etc.) These reach breaks were reviewed for applicability to the SMP process, and some were used, but in general it was found that they were either (1) not resolved enough in the case of Collins and Anchor, or (2) resulted in too many reaches to allow for meaningful comparisons along the portion of the channels within the study area (as was the case for the McNichols reach breaks.) The purpose of the McNichols reach breaks was to group together areas with “relatively homogenous physical characteristics ranging in length from a quarter mile to three miles.” (McNichols, 1984 page 19). The McNichols study identified 12 breaks within the study area, ranging in distance between 1,300 feet and 10,000 feet long. The McNichols study was geared toward an overall assessment of channel condition, sediment sources, and resulting in overall estimate of sediment production throughout the watershed.

Seven reach breaks were assigned along the Deschutes to capture either (1) significant shifts in morphology, most often using sinuosity or belt width, or (2) land use (e.g., golf course), or (3) major profile breaks (e.g., Tumwater Falls).

**Table A - 7: River Reaches in the Olympia, Lacey, and Tumwater Urban Areas.**

<table>
<thead>
<tr>
<th>Waterbody</th>
<th>Reach</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deschutes</td>
<td>DES-1</td>
<td>UGA boundary to end of straight reach</td>
</tr>
<tr>
<td></td>
<td>DES-2</td>
<td>Meandering reach to tributary confluence</td>
</tr>
<tr>
<td></td>
<td>DES-3</td>
<td>Tributary confluence to Chambers Creek Confluence</td>
</tr>
<tr>
<td></td>
<td>DES-4</td>
<td>Meandering reach between Chambers Creek confluence to the golf course</td>
</tr>
<tr>
<td></td>
<td>DES-5</td>
<td>Golf Course</td>
</tr>
<tr>
<td></td>
<td>DES-6</td>
<td>Golf Course to Tumwater Falls</td>
</tr>
<tr>
<td></td>
<td>DES-7</td>
<td>Falls to South Basin of Capitol Lake</td>
</tr>
<tr>
<td>Woodland Creek</td>
<td>WOOD-1</td>
<td>I-5 to confluence with tributary</td>
</tr>
<tr>
<td></td>
<td>WOOD-2</td>
<td>Tributary to UGA boundary</td>
</tr>
<tr>
<td>Black Lake Drainage Ditch</td>
<td>BLDD-1</td>
<td>Black Lake Drainage Ditch in wetland from Black Lake to Mottman Road</td>
</tr>
<tr>
<td></td>
<td>BLDD-2</td>
<td>Black Lake Drainage Ditch in ravine from Mottman Road to Percival Creek confluence</td>
</tr>
<tr>
<td>Percival Creek</td>
<td>PC-1</td>
<td>Downstream of confluence with Black Lake Drainage Ditch to Percival Cove</td>
</tr>
<tr>
<td>Chambers Creek</td>
<td>CHAM-1</td>
<td>Extent of SMA jurisdiction to Deschutes River</td>
</tr>
</tbody>
</table>
IV. Establishing Minimum Jurisdiction for Select Lakes

The following study was undertaken to establish the Ordinary High Water Mark and/or Associated Wetlands for select lakes within the Olympia, Lacey, and Tumwater urban areas as part of the Shoreline Master Program Update process.
SHORELINE REVIEW

FOR THE

SHORELINE MASTER PROGRAM

Lacey, Olympia, Tumwater, Thurston County

APRIL 2008

prepared for:

Thurston Regional Planning Council
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prepared by:

Steve Shanewise, PWS
Senior Ecologist
CONTENTS

Executive Summary ...........................................................................1

Introduction .........................................................................................2

Methods ..............................................................................................3

Results ...............................................................................................4
  A. Barnes Lake ..................................................................................4
  B. Bigelow Lake ................................................................................4
  C. Chambers Lake .............................................................................4
  D. Long Lake North ..........................................................................5
  E. Setchfield Lake ............................................................................5
  F. Smith Lake ..................................................................................5
  G. Susan, Munn, and Trails End Lakes ............................................6

Appendix: Maps

  Barnes Lake
  Bigelow Lake
  Chambers Lake
  Long Lake North
  Setchfield Lake
  Smith Lake
  Susan, Munn, and Trails and Lake
EXECUTIVE SUMMARY

This report documents work performed to assist Thurston Regional Planning Council (TRPC) in updating the Shoreline Master Program (SMP) for the cities of Lacey, Olympia and Tumwater and their urban growth areas.

Field work was performed during winter high water conditions to determine the Ordinary High Water Mark (OHWM) and associated wetlands for all or portions of seven separate lake systems. Washington Department of Ecology personnel provided assistance through field review, particularly if any determination was difficult. TRPC provided detailed GIS maps for use in field review, including aerial photographs, topography and LIDAR depictions of each system reviewed.

Two systems reviewed, Smith and Setchfield Lakes, were determined to be below the 20-acre minimum for Shoreline jurisdiction. Trail’s End Lake was determined to not be associated with the Susan/Munn Lake system, and would therefore also fall below the 20-acre Shoreline minimum.

Barnes Lake, which was not previously administered through Shoreline jurisdiction, was mapped at over 34 acres; putting it well within the 20-acre minimum limit for such jurisdiction.

Long Lake North had minor adjustments (increases) to the mapped OHWM, resulting in slight extensions of Shoreline jurisdiction within the adjacent landscape. The final two systems reviewed, Chambers, and especially Bigelow Lake, had significant expansions of OHWM and, for Bigelow, associated wetlands. Indeed, Bigelow Lake changed from being below the 20-acre minimum for Shoreline jurisdiction to exceeding 78 acres of OHWM area.
INTRODUCTION

Thurston Regional Planning Council (TRPC) is updating the Shoreline Master Program (SMP) for the cities of Lacey, Olympia, and Tumwater and their urban growth areas. This SMP update is being done in cooperation with Thurston County. Assistance was sought by TRPC to help locate the Ordinary High Water Mark (OHWM) and the extent of associated wetlands on several lakes within the three cities. This report documents the findings of that field review.
METHODS

1. **Winter Ordinary High Water Mark Conditions**
   Field reviews for this project were primarily conducted during the month of March to coincide with the normal, seasonal occurrence of the OHWM conditions within the lakes. This allowed for maximum ease and certainty of locating the OHWM by simply identifying the extent of surface water conditions within each landscape.

2. **Ordinary High Water Mark Review**
   Specific field reviews involved accessing each system at as many points as possible around the perimeter shorelines. The number of individual points accessed at each lake was based on Best Professional Judgment of what would be necessary to determine the OHWM condition for the entire system. Public access points were always used where available, but access permission from private landowners was also requested if no public access was available. However, not all private access requests were successful; Some landowners denied access and others were not available for consent.

3. **Associated Wetland Review**
   Determination of the extent of associated wetlands was performed simultaneously with the OHWM field review in many cases, and also included review of Thurston County Soil Maps, aerial photography, topography and LIDAR maps. Finally, personal knowledge from previous field work was frequently used.

4. **GIS Mapping**
   Thurston Regional Planning Council generated all the GIS maps for this analysis. They provided high quality, matched sets of aerial photography and LIDAR depictions of the shoreline landscapes reviewed. These maps also displayed the existing designated shoreline boundaries, as well as photo-interpreted wetland conditions. These maps were especially helpful in determining the extent of associated wetlands. TRPC remapped the location of the OHWM based upon field reconnaissance. TRPC also provided the area of calculations from these GIS maps to determine the SMA Jurisdiction in this report.

5. **Washington Department of Ecology Assistance**
   On 10 March and 7 April 2008, Brad Murphy of the Washington Department of Ecology assisted with field reviews and made jurisdictional determinations where conditions were not clear. Specifically, Mr. Murphy made the determination of OHWM association for Trails End Lake and the north end of Long Lake North. He also reviewed portions of OHWMs for Barnes, Bigelow and Setchfield Lakes.
RESULTS

A. Barnes Lake
Much of the Barnes Lake shoreline was viewable from public roads. Direct shoreline access was made at two locations. This system has almost no associated wetlands due to the highly developed shoreline. It appears that past grading activities have basically pushed upland ground right up to the edge of the OHWM. Only minor adjustments were made to the previous OHWM depiction. The area of the OHWM for Barnes Lake is well above the SMA jurisdictional threshold at approximately 34.7 acres. TRPC remapped the location of the OHWM based upon the new delineation.

B. Bigelow Lake
The mapped OHWM for this system was confined to the open water portion of the lake. Field review determined that the actual OHWM extends dramatically beyond this limit into densely vegetated emergent, shrub and forested wetlands around the entire perimeter of open water. In addition, because the overall system has been significantly drained by past ditching, extensive areas of associated wetlands occur well beyond the current OHWM limit.

Field access to this system was fairly comprehensive except for portions of the central east and west shorelines, and most of the southwest lobe, where access was limited to only a handful of sites. In this latter location, the extent of the OHWM was primarily identified through vegetation patterns on aerial photography and not from ground-truthed review of the existing waterline. However, the edge of associated wetlands here, as well as throughout the remainder of the system, were precisely identified through topography (uplands rise distinctly from a flat wetland bottom) and previous delineation work. The area of the OHWM for Bigelow Lake is now well above the SMA jurisdictional threshold at approximately 78.1 acres. TRPC remapped the location of the OHWM based upon the new delineation.

C. Chambers Lake
Field review for this system only included the south end of both lake basins. The mapped OWBM for this system was limited to the visible open water of the lake. The actual OHWM is located another 10 to 100 feet further out into the lake from this old limit within vegetated wetland, and the associated wetlands then extend another 10 to 200 feet beyond this. Nearly the entire shoreline reviewed for this system was directly checked in the field because it is primarily public land. Chambers Lake has been drained in the past and is managed by an active Drainage District. The area of the OHWM for Chambers Lake is well above the SMA

SHORELINE REVIEW FOR THE SHORELINE MASTER PROGRAM

THE COOT COMPANY
jurisdictional threshold at approximately 142.7 acres. TRPC remapped the location of the OHWM based upon the new delineation.

D. Long Lake North
Review of this system was limited to the outfall channel at the north end of the lake. The mapped OHWM for Long Lake North stops at a vegetation break between emergent and shrub habitat conditions. Field review confirmed that the OHWM extends throughout the shrub as well as emergent areas. TRPC remapped the location of the OHWM based upon the new delineation.

Review here also focused on whether the Long Lake North SMA jurisdiction should extend north to include Long Pond and its associated wetlands. WDOE aided in the field delineation at this site, and concluded that the railroad embankment crossing the outfall from Long Lake North constituted a significant break in hydrology and sustained a “uni-directional” flow through this artificial barrier. The railroad embankment therefore will constitute the new northern limit of SMA jurisdiction for Long Lake North. Long Pond, by itself, is below the jurisdictional minimum of 20 acres for shoreline designation.

E. Setchfield Lake
The mapped OHWM for this system was confined to the open water of the lake. Field review determined that the actual OHWM extends considerably beyond this limit into densely vegetated shrub and forested wetlands around the entire perimeter of interior open water. Field review included walking nearly all of the northern and southern portions of the system, plus some of the west side; access to the east side was not achieved.

The northern limit of the OHWM was determined (Brad Murphy, WDOE) to be the point where surface water from the lake begins to drain out through a defined, excavated channel, separating Setchfield Lake from an extensive, connected wetland system to the north. Even though the true OHWM designation for this system increased considerably to 18.88 acres from the previous shoreline depiction, it continues to falls below the 20 acre minimum threshold for SMA jurisdiction. TRPC remapped the location of the OHWM based upon the new delineation.

F. Smith Lake
The primary focus for this system was to determine if the mapped OHWM was accurate because it was within one acre of the SMA’s jurisdictional 20-acre threshold. However, brief review of the north and south ends of the lake determined that the mapped depiction was actually excessive. The area of the

SHORELINE REVIEW FOR THE SHORELINE MASTER PROGRAM
OHWM for Smith Lake is well below the SMA jurisdictional threshold at approximately 17.1 acres. TRPC remapped the location of the OHWM based upon the new delineation.

G. Susan, Munn, and Trails End Lakes
This site was investigated to determine whether or not Trails End Lake would be considered connected to Munn Lake, and therefore part of Shoreline Management Act (SMA) jurisdiction. Because the water flow through the road culvert connecting Trails End Lake to Munn Lake was determined to be "uni-directional" (water only flows from Trails End to Munn, and never the reverse). Trails End Lake was determined to not be a part of the Munn/Susan Lake system for purposes of determining SMA jurisdiction. Once this determination was made, no further review of the OHWM or associated wetland conditions for Trails End Lake were performed.