



# TMDL Implementation Plan

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City of Wilsonville, Oregon

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## List of Abbreviations

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BMP	best management practice
C	Celsius
CIP	capital improvement project
City	City of Wilsonville
CD	Community Development
CWA	Clean Water Act
CWR	cold-water refugia
DEQ	Oregon Department of Environmental Quality
DMA	Designated Management Agency
I-5	Interstate 5
LA	load allocation
LID	low-impact development
OAR	Oregon Administrative Rules
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
PHS	Pacific Habitat Services
PW	Public Works
Plan	2014 TMDL Implementation Plan update
SMP	Wilsonville Stormwater Master Plan (2012)
SWMP	Stormwater Management Plan (2012)
TMDL	total maximum daily load
USEPA	U.S. Environmental Protection Agency
WCC	Wilsonville City Code
WLA	waste load allocation
WQMP	Water Quality Management Plan

## Section 1

# Introduction and Background

The Federal Clean Water Act (CWA) of 1977 authorized the U.S. Environmental Protection Agency (USEPA) to restore and maintain water quality in all water bodies within the U.S. In response to the CWA, the USEPA designated certain state agencies, (the Oregon Department of Environmental Quality [DEQ] for the State of Oregon), to develop water quality standards, perform water quality monitoring to understand current conditions, determine sources of pollution, and develop total maximum daily loads (TMDLs) as a tool to improve water quality and restore the beneficial uses of surface waters. When a water body is found not to meet water quality standards, it is first placed on USEPA's 303(d) list as an impaired water body, and the development of a TMDL follows.

A TMDL specifies the maximum amount of a pollutant load that a water body can receive and still meet water quality standards. A TMDL allocates pollutant loadings among point and nonpoint sources, background levels, reserves for future growth, and a margin of safety. Point sources are typically defined as those sources that enter surface waters through a pipe or defined conveyance system (i.e., municipal and industrial stormwater and/or wastewater). Waste load allocations (WLAs) are provided in the TMDL for point sources. Nonpoint sources are typically defined as those sources that enter surface waters through more diffuse and dispersed overland flow (e.g., surface runoff from agricultural and forested lands). Load allocations (LAs) are provided in the TMDL for nonpoint sources.

Any agency or municipality that has legal authority over activities or areas that are sources of TMDL pollutants that impact water quality are known as Designated Management Agencies (DMAs). A DMA responsible for areas that discharge to a TMDL water body must develop a TMDL Implementation Plan that describes strategies to be undertaken to address LAs for nonpoint sources of TMDL pollutants. WLAs for point sources of pollutants are addressed through National Pollutant Discharge Elimination System (NPDES) permits (e.g., NPDES permits for Municipal Separate Storm Sewer System [MS4] discharges and NPDES permits for discharges from wastewater treatment plants).

This report represents an update to the 2014 Willamette River TMDL Implementation Plan developed for the City of Wilsonville (City). This report outlines strategies to address LAs for temperature and references strategies to address WLAs for bacteria and mercury, as implemented through the City's NPDES MS4 permit.

## 1.1 Jurisdiction and Organization

Wilsonville is located about 20 miles south of Portland, Oregon. The city encompasses 4,975 acres and has a population of approximately 24,300 (as reported in 2017). The Interstate 5 (I-5) freeway corridor divides the City into distinct eastern and western zones. The I-5 corridor falls under Oregon Department of Transportation jurisdiction for stormwater management and is not part of the City's TMDL Implementation Plan coverage.

Wilsonville is adjacent to a primary transportation route and has been undergoing rapid development over the last decade. Land use in the city is a combination of residential, commercial, and industrial. Industrial areas, both developed and undeveloped are located primarily along the I-5 corridor. Commercial areas are clustered around the I-5 and Wilsonville Road intersection and the I-5 and Elligsen Road intersection. Residential land use is distributed throughout the city. Open space is found throughout the city and includes a number of parks, wetlands, and riparian areas.

General topography within Wilsonville consists of either low lying wetland areas (Coffee Lake Creek Basin) or steep sloped ravines (Boeckman Creek Basin). There are two primary soil types within the city, a silty loam derived from basalt in the upper basin areas and soil derived from glacial deposits located adjacent to the Willamette River. Soils in both areas have slow to moderate infiltration rates and are characterized as either soil hydrologic group B or C (*City of Wilsonville Stormwater Master Plan, 2012*) (SMP).

The City obtained its most recent NPDES MS4 permit from DEQ in 2012 for its municipal stormwater discharges to surface waters. Wilsonville is one of 13 co-permittees on the Clackamas County NPDES MS4 permit (number 101348). The City’s Department of Community Development (CD) is responsible for coordinating and implementing the stormwater program and meeting regulatory requirements. The Department of Public Works (PW) also implements stormwater program activities. The PW and CD departments work cooperatively during the land development application process to ensure that City development code and policies are followed related to land use, transportation, and environmental regulations including water resource and riparian buffers. Figure 1-1 identifies the City’s organizational structure.

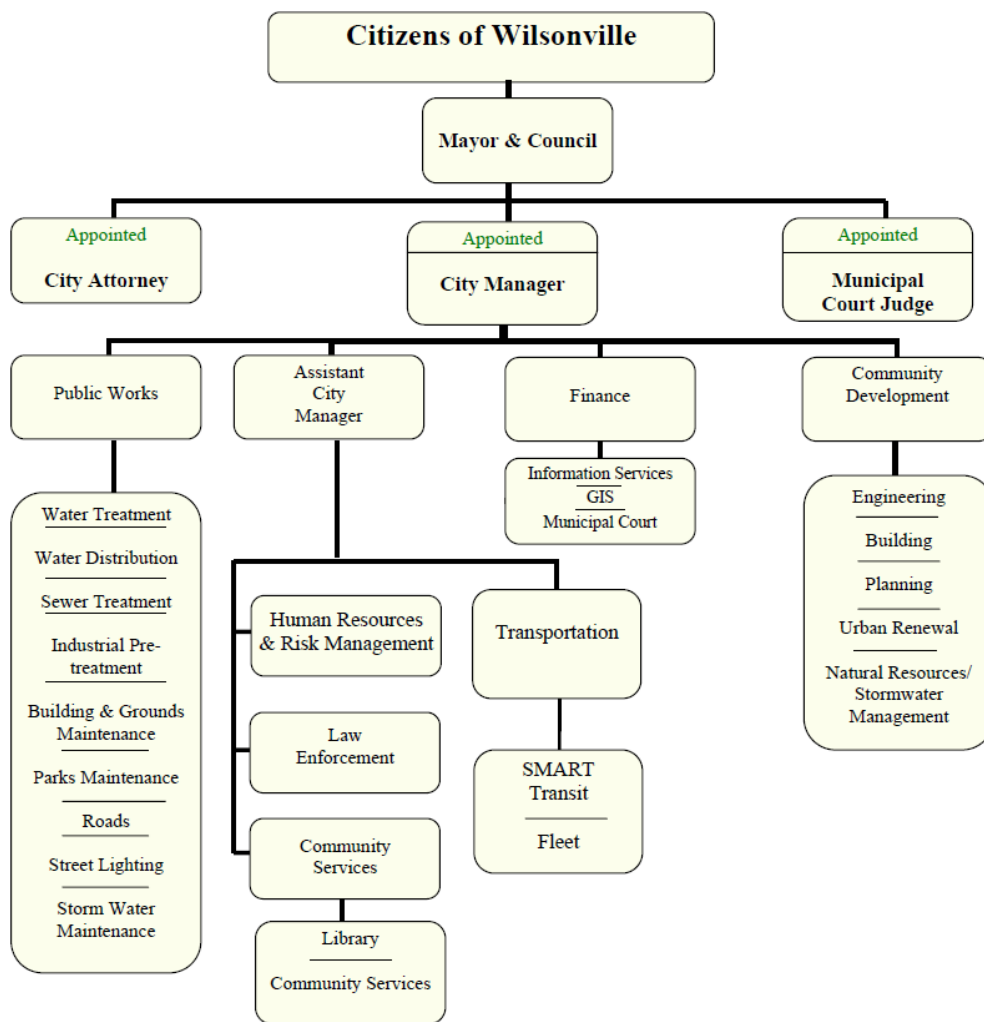


Figure 1-1. City of Wilsonville organizational structure



## 1.2 Wilsonville Watersheds and Drainage Patterns

Wilsonville is located in the Middle Willamette River watershed, and all areas discharge either directly or indirectly to the Willamette River between river mile (RM) 37 and 39.8. There are six major drainage basins in the city: Coffee Lake Creek/ Seely Ditch, Boeckman Creek, Meridian Creek, Mill Creek, Charbonneau, and a sixth basin comprised of those areas draining directly to the Willamette River.

Together, Coffee Lake Creek/ Seely Ditch and Boeckman Creek drain about 71 percent of the total city area, and their watershed boundaries extend outside the city limits and the urban growth boundary (UGB). The Coffee Lake Creek watershed is the largest, covering 2,480 of the 5,126 acres in Wilsonville's UGB, or approximately 48 percent (*City of Wilsonville Stormwater Master Plan, 2012*).

Figure 1-2 shows the Wilsonville city limits and UGB and also shows the major water bodies. Both city limits and UGB are shown because areas of potential annexation are included as part of the overall stormwater program (and NPDES MS4 permit implementation).

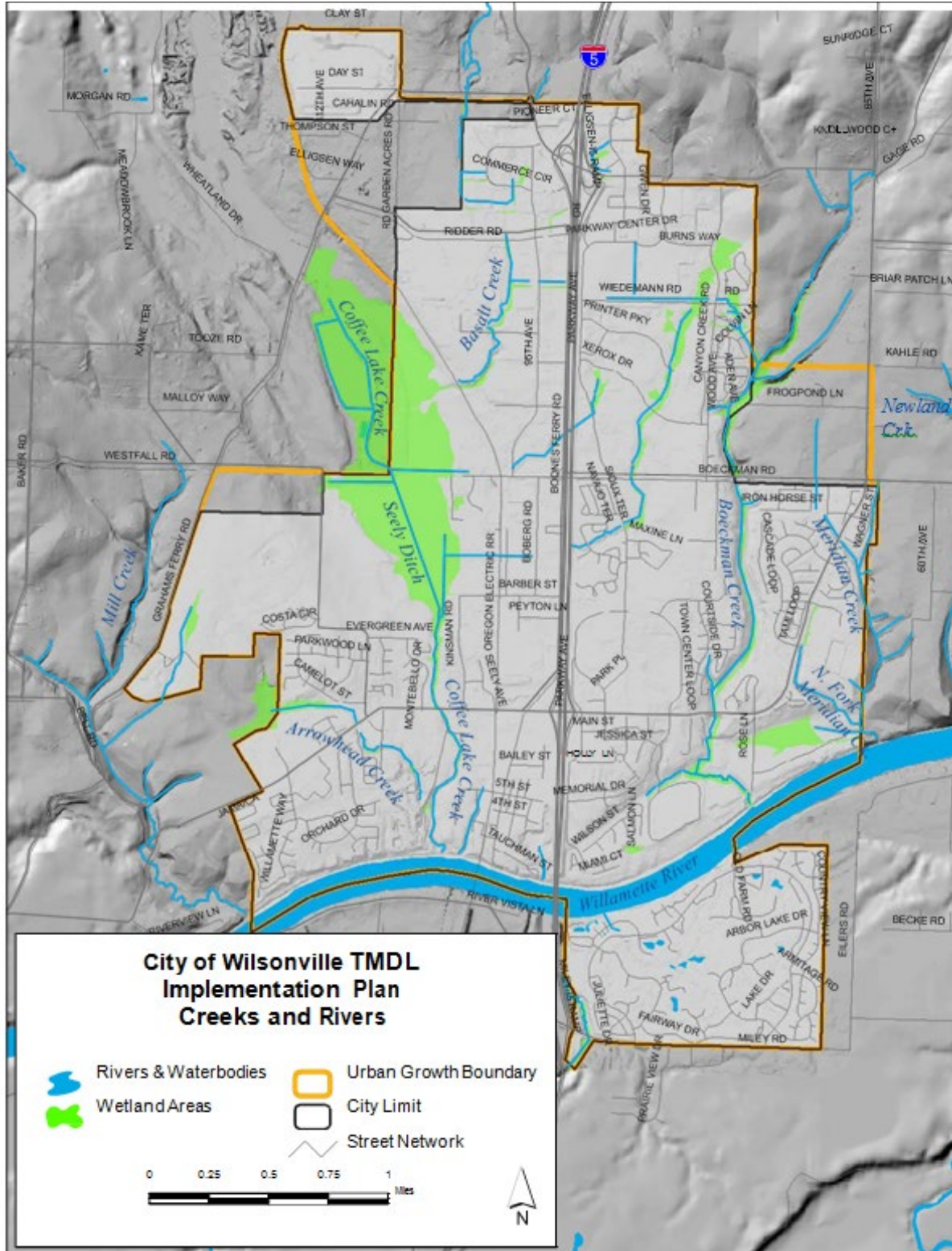


Figure 1-2. Wilsonville city limits and drainage patterns (2014)

### 1.3 TMDL Applicability and Coverage

On September 21, 2006, DEQ finalized a TMDL for the Willamette Basin. The TMDL addressed water quality impairment of the Middle Willamette River and its tributaries and included previously-approved TMDLs by reference. The Willamette Basin TMDL addressed bacteria, mercury, and temperature, and included WLAs and LAs specific to DMAs.

Table 1-1 summarizes the TMDL pollutants and associated LAs and WLAs applicable to Wilsonville.

Table 1-1. TMDL Summary for Wilsonville						
TMDL	Year	Subbasin(s)	TMDL parameters	TMDL surrogate parameters	WLA	LA
Willamette River	2006	Middle Willamette	<ul style="list-style-type: none"> <li>Mercury</li> <li>Bacteria (<i>E. coli</i>)</li> <li>Temperature</li> </ul>	<ul style="list-style-type: none"> <li>Effective shade (surrogate for temperature)</li> </ul>	<ul style="list-style-type: none"> <li>Mercury = NA<sup>a</sup></li> <li>Bacteria = 75-88% reduction<sup>b</sup></li> </ul>	Temperature = 85-95% effective shade

a. Mercury is listed in the Willamette River TMDL but a WLA has not yet been established. WLAs are scheduled to be adopted in 2019.

b. The WLA for bacteria varies according to season and discharge location. A 75 percent annual reduction in bacteria load is applicable for area directly discharging to the Willamette River and a 75 percent reduction is applicable during the fall, winter, and spring seasons for area discharging to tributaries. An 88 percent reduction during the summer season is applicable for areas that discharge to tributaries.

### 1.4 TMDL Implementation Plan Update and Organization

In 2007, DEQ prepared a guidance document for developing TMDL Implementation Plans in conjunction with issuance of the Willamette River TMDL. The requirements for a TMDL Implementation Plan are listed as follows:

- (a) Prepare an implementation plan and submit the plan to the Department for review and approval according to the schedule specified in the WQMP. The implementation plan must:
- (A) Identify the management strategies the DMA or other responsible person will use to achieve load allocations and reduce pollutant loading;
  - (B) Provide a timeline for implementing management strategies and a schedule for completing measurable milestones;
  - (C) Provide for performance monitoring with a plan for periodic review and revision of the implementation plan;
  - (D) To the extent required by ORS 197.180 and OAR chapter 340, division 18, provide evidence of compliance with applicable statewide land use requirements; and
  - (E) Provide any other analyses or information specified in the WQMP.

Note: It should be emphasized that under the first requirement above; this implementation plan is associated with strategies to achieve load allocations, which are associated with non point sources. Waste load allocations are associated with point sources and are covered through water quality permits for those sources (in this case the City's MS4 NPDES permit).

The City submitted a TMDL Implementation Plan for the Middle Willamette River and tributaries in March 2008. The TMDL Implementation Plan was approved by DEQ in May 2009 with updates, and implementation was initiated thereafter. In conjunction with the end of the 5-year implementation period, the City submitted an updated TMDL Implementation Plan to DEQ in August 2014 that reflected progress associated with the 2008 TMDL Implementation Plan and future goals for the next 5-year implementation timeframe.

This update reflects the required 5-year update to the 2014 TMDL Implementation Plan for the Willamette River and applicable tributaries. It outlines updated strategies and activities the City is proposing to continue compliance with the Willamette River TMDL and addresses requirements (A) through (E) as listed above.

This plan is organized as follows:

- Section 2 provides an overview and reference regarding strategies for point sources in the City's NPDES MS4 permit that address TMDL compliance related to WLAs for bacteria and mercury.
- Section 3 addresses the first three requirements (A, B, and C) specifically for temperature (as a nonpoint source pollutant with LAs not otherwise addressed by NPDES MS4 permit compliance).
- Section 4 addresses the fourth requirement, (D), and reflects the evaluation of this Plan's conformance with the City's land use goals and comprehensive plan.
- Section 5 addresses additional items identified in the water quality management plan requirement (E) that the DMA must address. These items include the following:
  - Determine how best to provide for public involvement.
  - Analyze funding to determine what additional resources are necessary to develop, implement, and maintain the management strategies.
  - Include citations and brief descriptions of legal authority used to carry out the management strategies.
  - Address cold-water refugia.

## Section 2

# Management Strategies for Point Sources (WLAs)

As described in Section 1, a total maximum daily load (TMDL) specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and it allocates pollutant loadings among point and nonpoint sources. Waste load allocations (WLAs) are provided for point sources (e.g., municipal stormwater and wastewater covered by permits) and load allocations LAs are provided for nonpoint sources (e.g., surface runoff from agricultural and forested lands).

The City obtained its most recent National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit from the Oregon Department of Environmental Quality (DEQ) in 2012 for its municipal stormwater discharges to surface waters. Wilsonville is one of 13 co-permittees on the Clackamas County NPDES MS4 permit. The City of Wilsonville (City) Public Works and Community Development departments work cooperatively to implement provisions and requirements of the NPDES MS4 permit. The 2012 NPDES MS4 permit expired in February 2017 and is currently (as of January 2019) in administrative extension.

Discharges to surface waters via the City's MS4 are considered to be point sources since they are covered by an NPDES MS4 permit. The City also has stormwater discharges that flow over land and enter receiving waters directly without first entering the City's MS4. While these discharges are typically considered to be nonpoint sources, they have been informally included and covered under the City's NPDES MS4 permit for ease in management, and thus are considered to be subject to WLAs for stormwater discharges. Therefore, the City does not have any nonpoint sources of bacteria or mercury that would be subject to LAs under the TMDL. The management strategies discussed in this section apply to point and nonpoint sources of bacteria and mercury as covered under the City's NPDES MS4 permit.

Because stormwater is not considered to be a source of water quality temperature exceedance, temperature is managed as a nonpoint source issue that needs to be addressed through this TMDL Implementation Plan as opposed to being addressed through the NPDES MS4 permit. Temperature is addressed in Sections 3 through 5 of this plan.

The purpose of this section is to provide an overview and reference of the strategies, schedules, and monitoring activities that address bacteria, mercury, toxics, and nutrients under the NPDES MS4 permit.

## 2.1 Management Strategies to Address WLAs

Requirements of the City's NPDES MS4 permit are addressed through implementation of a Stormwater Management Plan (SWMP). The SWMP outlines various management strategies in the form of best management practices (BMPs) that address specific permit requirements and specific TMDL parameters. BMPs include control techniques, system design and engineering methods, and other measures the City implements to reduce the discharge of pollutants in stormwater and protect water quality.

The City prepared and submitted the current SWMP to DEQ in May 2012, in conjunction with reissuance of its NPDES MS4 permit. BMPs are listed and summarized in Appendix A as applicable to the City's 2012 SWMP. The City's SWMP is an evolving document. Adaptive management may result in changes to BMPs that would be reported in the annual compliance reports. However, because the NPDES MS4 permit is currently in administrative extension, no changes to the SWMP can be made. Upon permit reissuance (anticipated in 2020), the BMP names, measurable goals, and tracking measures may change for consistency with the reissued permit language and requirements. Therefore, BMPs summarized in Appendix A represent the 2012 SWMP only, as currently implemented.

In conjunction with management strategies outlined in the SWMP, the City implements stormwater-related projects and policies through implementation of the *City of Wilsonville Stormwater Master Plan* (SMP). The SMP includes 43 funded and ten unfunded projects to address a variety of water quality and water quantity control objectives. Stormwater policies referenced encourage use of low-impact development (LID) techniques for treatment of stormwater runoff, riparian and wetland restoration and conservation, and habitat improvement for fish and wildlife. Capital improvement projects (CIPs) referenced in the SMP are prioritized and scheduled according to a proposed 5-year implementation window.

Since 2012, the City has completed CIPs associated with pipe improvement/ replacement, channel and outfall repair, and LID. The City completed the Memorial Park Parking Lot LID retrofit project in 2013 (CIP LID1) in the SMP, which promotes reduction of TMDL pollutants into surface waters.

Per requirements of the NPDES MS4 permit, the City conducted a pollutant load reduction evaluation in 2015 and developed TMDL benchmarks in 2017 to show progress toward meeting TMDL WLAs. The pollutant load reduction evaluation and benchmarks reflect implementation of stormwater controls (both structural and non-structural) as documented in the City's SWMP. TMDL benchmarks for bacteria were included in the City's permit renewal application submitted to DEQ in 2017.

## 2.2 Timeline and Implementation Schedule

The City's SWMP includes measurable goals and tracking measures for each BMP. These represent the schedule for implementing the TMDL management strategies for bacteria and mercury. The table in Appendix A includes the measurable goals and tracking measures that are currently listed in the City's SWMP for each BMP. These goals have the potential to change on an annual basis through adaptive management.

Implementation of CIPs per the SMP occurs in conjunction with the documented schedule that identifies projects as short-term (implementation in 0 to 5 years), mid-term (implementation in 6 to 10 years), and long-term (implementation in 11 to 20 years), and as funds are available. In conjunction with the SMP, the City conducted a financial study to review and update the stormwater fees and system development charges to support the additional capital and operating requirements identified in the SMP.

## 2.3 Monitoring and Reporting

The City is required to monitor for program compliance. It does this by conducting two types of monitoring: implementation monitoring and environmental monitoring. Implementation monitoring relates to the tracking of BMP (management strategy) implementation and evaluating whether BMP measurable goals and tracking measures are met. Environmental monitoring relates to the analysis and evaluation of stormwater and in-stream pollutant concentrations.

### 2.3.1 Implementation Monitoring

With respect to implementation monitoring, the City submits NPDES MS4 annual compliance reports November 1 of each year to summarize implementation activities for all BMPs in its SWMP. Each BMP has a defined measurable goal and tracking measure. Appendix A lists the measurable goals and tracking measures for each BMP.

### 2.3.2 Environmental Monitoring

The City has been conducting environmental monitoring in the form of sample collection and analysis at various in-stream and stormwater outfall sites throughout Wilsonville. Environmental monitoring activities are conducted in conjunction with the monitoring requirements listed in the NPDES MS4 permit. Separate from the NPDES MS4 requirements the City is also independently conducting some additional monitoring to inform water quality conditions at locations with historic data and/or locations with observed pollutant spikes or anomalies.

The City is a participant in the Comprehensive Clackamas County Stormwater Monitoring Plan (CCCSMP), a coordinated monitoring plan developed by 11 Clackamas co-permittees to comply with monitoring requirements under the 2012 NPDES MS4 permit. The latest version of the CCCSMP was submitted to DEQ in December 2016 and implementation began in July 2017. Under the CCCSMP, Wilsonville is collecting water quality samples from two in-stream sites on Boeckman Creek and one stormwater outfall site. Samples collected from these sites are analyzed for various parameters that include bacteria, nutrients, metals, sediment, pesticides, and field parameters (e.g., pH, dissolved oxygen, temperature). Biological monitoring is also a requirement under the CCCSMP, and the City conducted biological monitoring in 2018, which included biological sampling and physical condition monitoring at three instream sites. Data from environmental monitoring efforts are included in the NPDES MS4 annual reports.

Separate from the CCCSMP, the City began conducting independent instream monitoring on Coffee Lake Creek and Boeckman Creek. The City is using temperature loggers to collect continuous temperature information on Boeckman Creek and Coffee Lake Creek/Seely Ditch. Additionally, the City is collecting grab samples for conductivity and bacteria in Coffee Lake Creek/Seely Ditch. These efforts were initiated in 2018, due to the discontinuation of instream monitoring on Coffee Lake Creek under the CCCSMP and to inform pollutant source investigations. Such activities will be conducted over this TMDL implementation period.





## Section 3

# Management Strategies for Nonpoint Sources (LAs)

The Willamette River TMDL requires Designated Management Agencies (DMAs), including the City of Wilsonville (City) to develop total maximum daily load (TMDL) Implementation Plans to address elevated temperature. These plans must describe how each DMA will conduct efforts to reduce temperature to meet water quality standards.

Salmonids require cool, well-oxygenated water to survive. Elevated water temperature is a common problem in many tributaries to the Willamette River, resulting in TMDL load allocations (LAs) designed to protect and remedy impaired aquatic habitats. Water temperatures in excess of water quality standards make streams unsuitable for cold-water fish and other cold-water aquatic species. Excessively warm streams lead to a variety of ill effects on many salmon and trout species, ranging from decreased spawning success to death (Willamette River TMDL, 2006). Depending on the life-stage and species, water temperature of less than 18 degrees Celsius (C) is necessary for habitat. For spawning, water temperature of less than 11 degrees C is needed.

This section describes the City's TMDL implementation plan to address temperature. Section 3.1 provides a summary of the LAs and shade curves provided in the Willamette Basin TMDL document. Section 3.2 summarizes the existing shade conditions of stream channels in Wilsonville. Section 3.3 summarizes current management strategies to address the temperature LAs including results of the 2008 modeling effort to define a Functional Shade Area and Riparian Shade Zone (RSZ) specific for Wilsonville. Section 3.4 provides a summary of the City's proposed, future temperature management strategies to make progress toward meeting the TMDL LAs. Section 3.5 outlines the timeline and schedule for implementation, and Section 3.6 summarizes proposed monitoring and reporting.

### 3.1 TMDL LAs for Temperature

Several factors can contribute to elevated in-stream temperatures such as changes in channel morphology, climate, geographic location, riparian vegetation, dams, reservoirs, and point sources such as industrial wastewater discharges (Oregon Department of Environmental Quality [DEQ], 2006). DEQ has found that the largest contributor to elevated temperature in the Willamette watershed is the increased impacts from solar radiation loads due to disturbances of riparian vegetation. In response to this finding, DEQ has defined effective shade targets as a surrogate measure for addressing temperature. Effective shade is determined through the use of shade curves developed specifically for particular geomorphic classifications. DEQ has developed 15 shade curves for the Middle Willamette Basin, five of which are deemed appropriate for Wilsonville (*TMDL Implementation Plan*, 2008). The shade curves, along with stream orientation and width, provide a target for percent effective shade and corresponding solar radiation loading (DEQ, 2006).

Shade is generally more effective in reducing the temperature in narrower streams (less than 25 feet wide) than in wider streams because shadows from trees in the riparian zone will cover a larger percentage of the water surface. In Wilsonville, all tributary streams have an average summer width of less than 25 feet, so it is anticipated that the City can achieve a high level of shade through the protection and restoration of streamside vegetation.

Using Figure 7.8 in Chapter 7 of the Middle Willamette Subbasin in the Willamette Basin TMDL, there are five potential geomorphic classifications and associated shade curves that can be applied in Wilsonville (geomorphic classifications Qff2, Qfc, Qalc, Qff1, and Qalf). Given Wilsonville's average stream width of approximately 25 feet, the average effective shade goal should range between 70 and 90 percent. This is interpreted to mean that historically prevalent riparian vegetation should block the majority (at least 70 percent) of solar radiation loading from the streams' water surfaces.

To meet the effective shade goal established by DEQ, the City will need to plant and/or retain the system potential vegetation capable of providing significant shade benefit to surface waters. System potential does not consider management or land use as limiting factors; it is an estimate of the vegetated condition where the human-generated impacts to riparian vegetation that cause stream warming are minimized.

## 3.2 Existing Shade Conditions

All tributary water bodies in Wilsonville discharge to the Willamette River. The largest tributary watersheds are the Coffee Lake Creek/ Seely Ditch and Boeckman Creek watersheds that collectively account for approximately 70 percent of the city area.

### 3.2.1 Waterbody Overview

Short descriptions of each tributary watershed and existing shade conditions follow.

#### 3.2.1.1 Coffee Lake Creek/Seely Ditch Watershed

The Coffee Lake Creek/Seely Ditch Watershed contains the largest stream system within Wilsonville. In addition to Coffee Lake Creek and Seely Ditch, streams within this system include several unnamed tributary streams and Arrowhead Creek.

Coffee Lake Creek and Seely Ditch comprise the largest wetland complex within Wilsonville. Within the City of Wilsonville this stream can be characterized into three segments. The upstream reaches located north of the Barber Street bridge are characterized as Seely Ditch. Seely ditch is bordered by an extensive emergent and scrub-shrub wetland. Seely Ditch is a historically significant ditch that was dug around 1858 to drain the surrounding wetlands for farmland. Additional ditches were also dug throughout the wetland complex. Due to the width and depth of these ditches, no forested stream buffer is present or feasible in this area.. The middle segment of the Coffee Lake Creek/Seely Ditch Watershed, is located between Barber Street and Wilsonville Road. This middle section begins to take on the characteristic of a stream as opposed to a ditch and is surrounded by residential and industrial lands. This section of stream receives minimum shade from surrounding vegetation and the watershed is largely non-forested. The lower section of Coffee Lake Creek watershed is located south of Wilsonville Road, just upstream of its confluence with the Willamette River. This southernmost segment passes through a forested riparian corridor dominated by Douglas fir, Oregon ash, and western red cedar.

Three unnamed tributaries to Coffee Lake Creek and Seely Ditch are present in the northern portion of the City: the North Tributary (Basalt Creek), the Middle Tributary, and the South Tributary. Each tributary has been significantly channelized, impounded, and in some locations piped. A majority of the buffers are non-forested, with the exception of small remnant forest patches.

Arrowhead Creek is a tributary of Coffee Lake Creek in the southwestern portion of Wilsonville. Arrowhead Creek flows through relatively gently sloped lands, except for the central reach, which is contained within a steep ravine. The upstream portion of Arrowhead Creek has been ditched and channelized with little to no forest cover, because it is adjacent to commercial and residential areas including Inza R. Wood Middle School and residential neighborhoods. The middle portion of Arrowhead Creek is bordered by a forested wetland and the stream buffer is largely forested. The lowest portion of

the stream, just upstream of its confluence with Seely Ditch and adjacent to an existing gravel quarry, flows through a culvert for approximately 200 feet. Each end of the culvert is located within a forested canopy. South of the confluence with Arrowhead Creek, a historic concrete structure, located in the channel of Coffee Lake Creek, blocks fish passage to the upper reaches of the creek.

### **3.2.1.2 Boeckman Creek Watershed**

Boeckman Creek flows south through the eastern third of Wilsonville. In the northern portion of the UGB, Boeckman Creek is less than 3 feet wide and shallow. Slopes bordering the creek in the far northern portion are relatively gentle until it reaches Boeckman Road, where the slopes quickly become very steep. This area is being redeveloped from an agricultural land use to a residential development beginning in 2018. There is an existing forested stream buffer that will remain intact as part of the Significant Resource Overlay Zone (see Section 3.2.2).

South of Boeckman Road, Boeckman Creek widens to approximately 10 feet with wetlands and a connected floodplain.

Along the central and southern reaches of Boeckman Creek, much of the stream buffers are forested and largely undisturbed, but dense stands of Himalayan blackberry and English ivy have invaded areas disturbed by adjacent development.

### **3.2.1.3 Meridian Creek Watershed**

Meridian Creek and its tributaries are located along the extreme eastern edge of Wilsonville. Meridian Creek originates in agricultural fields north of Boeckman Road and flows south through a residential subdivision before flowing through a culvert under Wilsonville Road. North of Wilsonville Road, the creek buffer is largely non-forested. East of Wilsonville Road, the buffer is forested.

### **3.2.1.4 Unnamed Willamette River Tributaries**

Three short unnamed tributaries to the Willamette River are also present within the Wilsonville UGB. One of these is south of the Willamette River in the Charbonneau District, and the other two are north of the Willamette River between Interstate 5 and Coffee Lake Creek. The buffers of these streams are largely forested.

### **3.2.1.5 Mill Creek Watershed**

An unnamed tributary of Mill Creek is present in the southwestern portion of the Wilsonville UGB in the vicinity of the former Dammasch State Hospital. This stream flows through forested and non-forested riparian corridors with varying amounts of shade cover within the buffer.

### **3.2.1.6 Newland Creek Watershed**

Two unnamed tributaries to Newland Creek are located east of the Wilsonville UGB and were evaluated in conjunction with Pacific Habitat Services (PHS) shade modeling effort (Section 3.2.2). These streams flow southeast outside of the Wilsonville UGB, toward Newland Creek. Much of the stream buffer is forested, but the uppermost reaches of these streams are bordered by agricultural fields.

## **3.2.2 Wilsonville Shade Modeling and Defining the Riparian Shade Zone (RSZ)**

In 2008, PHS developed a shade model and conducted an inventory of riparian vegetation along Wilsonville's streams. Results were documented in the City's 2008 *TMDL Implementation Plan*.

The shade model was developed to compare summer condition radiation loading with and without a vegetated buffer. Model results were used to establish a minimum and optimum vegetated buffer width for stream reaches, depending on orientation and slope. According to the PHS modeling effort, a minimum of 35 feet of vegetated buffer is needed (from the edge of bank), with an optimum range of 35 to 55 feet. There was a significant increase in effective shade when the opposite bank was vegetated

(some of the daily solar radiation occurs when the sun is shining at low angles through the vegetation on the north bank), which supports establishment of a minimum 35-foot buffer along all stream segments.

Using geographic information system data and results of the shade model, PHS delineated a functional shade buffer along Wilsonville streams. The functional shade buffer was delineated as a variable-width buffer, reflecting a minimum width of 35 feet and a maximum width appropriate for the stream's orientation. The total functional shade buffer area for the city was calculated as approximately 236 acres.

A separate exercise was completed to identify constraints to planting. These include hard constraints (areas that cannot be planted) and soft constraints (areas where plant communities other than preferred system potential vegetation are needed). Constraint area was subtracted from the total functional shade buffer area to result in a plantable RSZ of 135 acres. Of the 135 acres, 12 were located on public property and 123 were located on private property.

As documented in the *2008 TMDL Implementation Plan*, approximately 90 percent of the plantable RSZ area is located within the Significant Resource Overlay Zone (SROZ) as adopted by the City, and thus is protected according to land use planning regulations associated with Title 3. Additionally, about 70 percent of the RSZ within the city limits currently has moderate to significant shade.

Maps depicting the RSZ delineation and identification of public and private land ownership within the RSZ were developed as shown in Figure 3-1 of the *2008 TMDL Implementation Plan*.

### 3.3 Management Strategies to Address LAs

Since 2009, the City has been implementing activities targeted at temperature reduction. Past efforts result from the shade modeling (Section 3.2.2) and include assessing riparian restoration and planting projects identified in the *2012 City of Wilsonville Stormwater Master Plan (SMP)*. Other efforts include updates to the City's ordinances and comprehensive plan to comply with Title 13 requirements, incentives to the public to encourage planting riparian corridors on private property, updates to the City's design and construction standards to promote infiltration of stormwater, and public education and outreach targeted at riparian planting and restoration. Details related to past efforts are included in the *2012 TMDL Implementation Plan*.

Management strategies identified for this TMDL Implementation Plan update build upon these past efforts, but also reflect results of temperature monitoring (conducted by the City and through partnership efforts with the United States Geologic Service [USGS]), indicating presence of cold water refugia and general concurrence with instream water quality standards. Proposed management strategies are detailed in Appendix B and described below.

#### 3.3.1 Riparian Area Management

The Willamette Basin TMDL defines shade as the surrogate for thermal LAs. Preserving and enhancing riparian vegetation is an important method for reducing stream temperatures. This preservation and enhancement is conducted through enforcement, planting efforts, implementation of stormwater design standards, and education.

##### 3.3.1.1 Enforcement of Riparian Buffers

Metro developed Title 3 and Title 13, two sections of its *Urban Growth Management Functional Plan* that address development in the riparian corridor. Specifically, Title 3 prohibits new development within specified established buffers, and provides replanting requirements for unavoidable new development. Title 13 establishes protected areas (habitat conservation areas) for both upland and riparian wildlife. Appendix C provides additional detail related to Titles 3 and 13.

Since preserving and restoring shade are important strategies for addressing the temperature TMDL, jurisdictions that comply with Titles 3 and/or 13 are already utilizing strategies for addressing temperature. The City implements Title 3 and Title 13 requirements through Section 4.139 of the Wilsonville City Code (WCC). This section of the WCC describes the SROZ, established specifically by the City to encompass the outer boundary of a significant Goal 5 resource, lands protected under Title 3, riparian corridors, and significant wildlife habitat. The SROZ reflects a variable buffer width (i.e., a minimum 50 foot buffer for all streams, extending upwards to 300 feet for some riparian corridors), which encompasses the riparian corridor, riparian impact area, and the area of limited conflicting use (as defined by the City).

Development within the SROZ is extremely limited. Provisions of the WCC allow for activities such as removal of invasive species, public improvements (only in conjunction with an approved master plan), and minor encroachments. Mitigation standards are provided that require an area of mitigation ranging from 1.5 to 5 times the original disturbance area.

Tree protection standards are also referenced in the WCC (Section 4.600). The removal of any native tree with a diameter of 6 inches or taller is allowed only with a City-issued permit. Any proposed tree cutting in the SROZ requires submittal of a significant resource impact report unless exempt from the requirements of the section (e.g., hazardous tree removal).

Continued enforcement of the WCC ensures that adequate riparian buffer and potential shade are preserved with new and redevelopment activities. The City will annually track any updates to the WCC and Comprehensive Plan related to riparian corridors and the SROZ.

#### **3.3.1.2 Riparian Planting and Revegetation**

As shown in the City's 2008 *TMDL Implementation Plan*, there are limited riparian areas in Wilsonville that are not already planted or vegetated or within an SROZ protected buffer area. The two largest riparian areas in the city are Coffee Lake Creek/Seely Ditch and Boeckman Creek. The two uppermost sections of Coffee Lake Creek/Seely Ditch within City limits are defined by a historically significant ditch unsuitable for riparian plantings. A portion of the southernmost section is constrained by a Bonneville Power Authority easement that doesn't allow for overstory trees due to the proximity of the wires. Boeckman Creek is almost entirely forested within City limits and protected within the SROZ.

The City will continue to assess riparian planting and revegetation opportunities in conjunction with the riparian planting and restoration CIPs identified in the City's upcoming Stormwater Master Plan (SMP). Ongoing maintenance is required to ensure continued vegetative coverage.

Additionally, the City will continue to partner and provide financial contributions in conjunction with other organizations (e.g., Friends of Trees) in support of riparian planting projects. Efforts will be documented in annual reports.

The City's upcoming SMP update provides additional opportunity for stream assessment and the evaluation of public property planting and future capital project (see Appendix B).

#### **3.3.2 Design Standards for New Development and Redevelopment**

Although shade is the surrogate measure defined by DEQ to address the temperature TMDL, implementation of the City's stormwater design standards (public works standards) also can promote the reduction in surface water temperatures. This occurs through requirements for the installation of stormwater treatment facilities that utilize infiltration.

The City's 2012 NPDES MS4 permit required an update to their post-construction stormwater management standards by November 1, 2014 to ensure that standards prioritize LID and green infrastructure and reduce site-specific post-development stormwater runoff volume, duration, and rates. Installation of facilities that promote infiltration address these needs. The City developed its *Stormwater*

and Surface Water Design and Construction Standards in September 2014 to address these requirements.

The City requires use of their *Stormwater and Surface Water Design and Construction Standards* for both public and private projects. They are available in hard copy and on the web to city staff and the public. The City provides trainings to staff and the engineering community on use of their Standards and the associated BMP Sizing Tool. The City periodically reviews and updates their Standards to clarify and correct information. By April 1, 2021, the City will prepare a user's manual for developers and engineers with standard details and site layout recommendations in conjunction with their Standards.

### 3.3.3 Public Awareness and Education

A number of public education efforts and campaigns are implemented in conjunction with the City's NPDES MS4 permit (see Appendix A).

As part of this plan, targeted public education efforts will focus on stewardship and enhancement of riparian buffers and vegetated corridors on private property. The City will continue to provide incentives in the form of training and planting materials upon request. Educational information will be promoted through City mailings, staff participation in public schools, and other regional programs. Staff training and conference attendance related to temperature management activities will continue to be supported.

### 3.3.4 Environmental Monitoring

The City is conducting environmental monitoring under its NPDES MS4 permit and the associated CCCSMP. Water quality samples are collected from two in-stream sites and one stormwater outfall site and the samples are analyzed for various parameters including temperature. The City will continue collecting stream temperature samples in accordance with the CCCSMP using grab sampling techniques.

In addition to instream monitoring conducted under the NPDES MS4 permit and CCCSMP, the City will conduct instream temperature monitoring in the Coffee Lake Creek and Boeckman Creek watersheds at select locations to build on historic data sets and identify any anomalies in the data. The City will compile and evaluate the data and submit with their TMDL annual reports. By April 1, 2021, the City will determine whether updates to the CCCSMP to add the Coffee Lake Creek instream monitoring locations are warranted based on the collected data.

## 3.4 Timeline and Schedule

This Plan is effective for 5 years from the date of approval by DEQ.

Specific to the management strategies reported in Section 3.3, Appendix B summarizes measurable goals and tracking measures for each activity. The tracking measures reflect the timeframe and schedule for implementing the specific strategies.

## 3.5 Monitoring and Reporting

The 2006 TMDL Guidance Document requires the DMA to submit two types of reports to DEQ on a regular basis: a progress report and an implementation plan review report.

The progress report is submitted to DEQ annually and provides information related to implementation of identified management strategies, as described in Section 3.3. To consolidate reporting requirements, DEQ allows the TMDL Implementation Plan annual progress report to be submitted with the NPDES MS4 annual report. Such annual reports are due November 1 of each year, reflecting implementation of activities over the previous fiscal year (July 1 to June 30). Appendix B is formatted in a manner that is consistent with how the TMDL Implementation Plan progress reports will be submitted in the future and includes measurable goals and tracking measures for purposes of monitoring progress.

Every 5 years, the City is required to review the TMDL Implementation Plan to assess progress toward meeting goals and propose changes to the management strategies as appropriate. This plan reflects the second update. It is based on review of existing data and activities relative to pollutant reduction goals. Existing strategies have been refined to reflect progress made over the last 5 years. New strategies have been identified to further address in-stream temperature.





## Section 4

# Evidence of Compliance with Applicable Land Use Requirements

Oregon Administrative Rules (OAR) 340-042-0080(3) (a) (D) defines one of the required elements of a total maximum daily load (TMDL) Implementation Plan to be evidence of compliance with applicable statewide land use requirements. Per the TMDL Implementation Plan Guidance Document, this consists of the following:

- Identify applicable acknowledged local comprehensive plan provisions and land use regulations.
- Explain how the implementation plan is consistent with these local planning requirements or what steps will be taken to make the local planning requirements consistent with the implementation plan.

Wilsonville's comprehensive plan has been acknowledged by the Land Conservation and Development Commission (LCDC) to be in compliance with Oregon Statewide Land Use Goals. The comprehensive plan is periodically reviewed by the City of Wilsonville (City) in coordination with LCDC and updated to ensure that it continues to comply with these goals. The comprehensive plan was revised in its entirety on October 16, 2000 and was last updated July 2013. An update in 2009 included incorporation of Ordinance 674 addressing Metro Title 13 (Nature in Neighborhood) compliance. In addition, other miscellaneous ordinances that refine master plans (i.e., the *City of Wilsonville Stormwater Master Plan*) and update land development code provisions have been completed. The periodic updates to the comprehensive plan allow for consistency with other planning documents and standards.

The comprehensive plan is organized into four sections: citizen involvement, urban growth management, public facilities and services, and land use and development. Within each section are specific goals, policies, and implementation measures that the City has developed to provide the framework for land use decisions within Wilsonville to comply with state land use planning goals. Several of these goals, policies, and implementation measures, specifically those contained in Section C (Public Facilities and Services) and Section D (Land Use and Development), are consistent with the intent of this TMDL Implementation Plan update.

Section C contains several implementation measures to maintain or improve the condition of natural features and fish and wildlife. Implementation measure 3.1.7.d states that "*major natural drainage ways shall be retained and improved as the backbone of the drainage system and designated as open space. The integrity of these drainage ways shall be maintained as development occurs....*" Implementation measure 3.1.7.p states that "*developers may be subject to retaining or improving native riparian vegetation in order to "decrease the amount of surface water run-off, to shade areas of surface water, to preserve areas of natural percolation, help stabilize landslide-prone areas, and reduce erosion"*. Implementation measure 3.1.7.q also provides measures for prevention of channel erosion through the stabilizing of discharge points of culverts and storm drainage systems, using energy dissipaters if required. In addition, Implementation measures 3.1.11.i and 3.1.11.k provide measures for the protection of natural corridors such as river-connected wildlife habitat by limiting and restricting access to specified natural areas. These implementation measures are consistent with strategies in Section 3 of this *plan*.

Section D includes a sub-section dedicated to environmental resources and community design. Several implementation measures described in this section relate to Titles 3 and 13 provisions that were developed by Metro to implement the Oregon Statewide Land Use Goals 6 and 7. In efforts to implement Metro's Titles 3 and 13, the City has developed the Significant Resource Overlay Zone as a way to protect beneficial uses and functional values of resources within the Water Quality and Flood Management Areas (areas defined by Metro in Title 3) and Habitat Conservation Areas (areas defined by Metro Title 13). Under Policy 4.1.5 (Protect valuable resource lands from incompatible development and protect people and property from natural hazards), a number of implementation measures are consistent with strategies included in this *Plan*, especially those discussed in Section 3. Applicable implementation measures include 4.1.5.e, 4.1.5.f, 4.1.5.z, 4.1.5.aa, and 4.1.5.bb. The Implementation measures reflect use of performance standards, developing limited or restricted access areas, and regarding contiguous natural corridors as priorities in open space land use decisions specifically for the protection of watersheds and wildlife.

## Section 5

# Additional Requirements

The fifth component of total maximum daily load (TMDL) Implementation Plans required by Oregon Administrative Rules 340-042-0025 is “any other analyses or information as specified in the Water Quality Management Plan (WQMP).” The WQMP for the *Willamette Basin TMDL* requires a fiscal analysis, a summary of legal authority, a summary of how the City will address public involvement, and how the City will address cold-water refugia (CWR) below river mile 50 of the Willamette River main stem. This section addresses these requirements.

### 5.1 Legal Authority

The City of Wilsonville (City) has existing ordinances that provide authority for implementation of portions of this TMDL Implementation Plan. The City currently operates under a National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit that has ordinances for illicit discharges, erosion control, and post-construction site runoff, as necessary to implement the best management practices outlined within it, and also to implement the management strategies described in Section 2 to address bacteria and mercury.

The City also has ordinances to implement natural resource protection efforts. The current land development code, as described in Section 3.3.1.1, and comprehensive plan, as described in Section 4, pertain to the City’s authority to implement management strategies proposed to address the temperature TMDL (Section 3).

### 5.2 Funding

The City’s stormwater utility rate funds public works, operation and maintenance, and administrative activities to comply with conditions specified in its NPDES MS4 permit. Funds from the stormwater utility rate are also used to design and construct capital improvement projects identified in the City of Wilsonville’s current and updated Stormwater Master Plan. Additionally, funds from the stormwater utility are used to provide planting materials and other incentives for private property owners to conduct planting activities.

Annually, the City contributes a minimum of \$5,000 to Friends of Trees to support their planting and habitat enhancement activities on public property.

### 5.3 CWR

Per the WQMP, the TMDL Implementation Plans for areas below river mile 50 of the Willamette River main stem “shall look at identifying existing cold water refugia and provide options for protecting or enhancing such areas.” CWR can be described as patches of water within a stream that are 1 or 2 degrees cooler than the surrounding ambient stream temperature, resulting from the cool inflow of tributaries and/or upwelling of groundwater. Studies indicate that CWR may provide critical habitat for salmonids in basins affected by warm temperatures (Bartholow, 1995).

CWR are associated with different aspects of stream morphology, including side channels, alcoves, lateral seeps, and floodplain spring brooks (Ebersole, 2003). Alteration to river channel structure including removal or lack of large woody debris and modifications to deep pools and overhanging bank areas can reduce the presence of CWR. McIntosh et. al. (1998), in its study of CWR in the Klamath Basin using forward-looking infrared technology, concluded that areas of CWR appeared to be at a junction where tributaries meet.

In 2017, the City participated in a study with the United States Geological Survey (USGS) and other jurisdictions including the City of Lake Oswego to evaluate water temperature in tributaries and the mainstem Willamette River. Water temperature readings were collected using continuous temperature sensors and point measurements along a 5-km reach of the Willamette River (the Wilsonville Reach) where Wilsonville tributaries including Coffee Lake Creek and Boeckmann Creek discharge. Findings showed that tributaries along the Wilsonville Reach were consistently 1-10 degrees C cooler than the main channel of the Willamette River, except for short periods where Coffee Lake Creek was warmer. Findings confirm that the junctions where Wilsonville's tributaries meet the Willamette River are consistent with the definition of CWR. The City's riparian planting and restoration activities and regulations regarding riparian buffers are effective management strategies to address locations of CWR.

## 5.4 Public Involvement

The City addresses public involvement for management strategies described in Section 2 in conjunction with its NPDES MS4 permit requirements.

Public involvement will be provided for this TMDL Implementation Plan update (and associated management strategies highlighted in Section 3.3) through use of the City's website. The plan will be posted on the City's website, available for public review, for a minimum of 7 days. Comments will be received, logged, and considered by City staff.

## Section 6

# Limitations

This document was prepared solely for the City of Wilsonville (City) in accordance with professional standards at the time the services were performed and in accordance with the contract between the City and Brown and Caldwell dated May 16, 2017. This document is governed by the specific scope of work authorized by the City; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the City and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.



## Section 7

# References

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## **Appendix A: SWMP Implementation Activities**

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Key to pollutant symbols: A full circle (●) indicates the BMP is expected to address the parameter. An empty circle (○) indicates the BMP may be expected to address the parameter. A blank cell indicates that the effect of the BMP is unknown at this time.

Table A-1. Wilsonville (City) Implementation Activities							
BMP Title	BMP Name	Program Element(s)	Addresses bacteria?	Addresses mercury?	Responsible City Department	Measurable goals (2012 SWMP)	Annual tracking measures
CD1	Illicit Discharge Detection and Elimination	Illicit Discharge Detection and Elimination	○	○	Community Development Public Works	<ul style="list-style-type: none"> <li>Conduct annual dry weather illicit discharge screening/inspections for all major (15 total) and priority minor outfalls (85 total).</li> <li>Continue to follow dry weather field screening procedures for all outfalls suspected of illicit discharges.</li> <li>Notify the Public Works Director of all positively identified illicit connections and take necessary actions to eliminate them.</li> <li>Revise procedures for conducting the illicit discharge elimination and investigation program in accordance with permit requirements by November 1, 2012.</li> </ul>	<ol style="list-style-type: none"> <li>Track number of outfalls inspected annually.</li> <li>Summarize inspection results and indicate outfalls requiring monitoring (sampling) and/or investigations.</li> <li>Document the outcome and resolution of any investigation activities conducted.</li> </ol>
PW/CD2	Spill Prevention, Training, and Response	Illicit Discharge Detection and Elimination Education and Outreach	○	○	Community Development Public Works	<ul style="list-style-type: none"> <li>City staff to respond to non-hazardous material spills.</li> <li>Notify appropriate parties, including State and National Emergency Response Systems as necessary, of all known spills within the City.</li> <li>Train city staff to the OSHA First Responder Operations level.</li> </ul>	<ol style="list-style-type: none"> <li>Track number of City employees attending OSHA spill-response training and/or refresher courses.</li> <li>Track the number of spills responded to by City staff.</li> <li>Track the type/source of pollutant discharges associated with each reported spill.</li> </ol>
PW/CD3	Industrial and Commercial Facilities	Industrial and Commercial Facilities	○	○	Community Development Public Works	<ul style="list-style-type: none"> <li>Review business license applications and SIC codes for new businesses to identify potential high source facilities. Obtain Environmental Survey from new businesses (i.e., non-residential sewer users) identified as a potential high pollutant source.</li> <li>Update facility information by sending the Environmental Survey to applicable, existing businesses every three years.</li> <li>Identify facilities needing NPDES 1200-Z permits and notify the facility and DEQ within 30 days.</li> <li>Annually inspect facilities identified as warranting inspection.</li> <li>Ensure illicit discharges are eliminated, if discovered.</li> </ul>	<ol style="list-style-type: none"> <li>Track the number of facilities inspected annually.</li> <li>Track the number of existing and potential new NPDES 1200-Z permitted facilities identified annually.</li> <li>Track any enforcement actions associated with inspections.</li> </ol>
CD4	Erosion Control and Construction Site Management	Construction Site Runoff Control Education and Outreach	●	●	Community Development	<ul style="list-style-type: none"> <li>Require all new and redevelopment disturbing over 500 square feet to submit an erosion and sediment control plan.</li> <li>Conduct weekly erosion control inspections on all construction sites disturbing over 500 square feet.</li> </ul>	<ol style="list-style-type: none"> <li>Track the number of erosion and sediment control plans approved.</li> <li>Track the number of 1200-CN and 1200-C permits issued.</li> <li>Track the number and frequency of erosion control inspections conducted.</li> <li>Track the number and type of enforcement actions taken by the City or DEQ.</li> </ol>
CD5	Public Education Participation	Education and Outreach Pollution Prevention for Municipal Operations Stormwater Management Facilities Operation and Maintenance Activities	○	○	Community Development	<ul style="list-style-type: none"> <li>Publish stormwater related articles in the City newsletter and website.</li> <li>Organize public outreach programs such as Adopt-a-Road and volunteer monitoring of stream corridors.</li> <li>Label catch basins as necessary.</li> <li>Distribute door hangers as necessary in neighborhoods where non-stormwater discharges have been identified.</li> <li>Coordinate with other, local Phase I jurisdictions in providing/compiling information regarding public education effectiveness. Provide the results to DEQ by July 1, 2015.</li> </ul>	<ol style="list-style-type: none"> <li>Track the number of educational articles published per year.</li> <li>Estimate public participation in City-sponsored volunteer events.</li> <li>Track the number of catch basins labeled.</li> </ol>
CD6	Public Reporting for Spills, Illicit Discharges, and Dumping	Education and Outreach	○	○	Community Development	<ul style="list-style-type: none"> <li>Continue to implement the "Citizen Concern" form for public reporting of spills, illicit discharges, and dumping.</li> <li>Include the phone number and website for reporting illicit discharges in a minimum of one published article each year.</li> </ul>	Track the number of citizen reports of spills, illicit discharges, and dumping received each year and follow-up actions resulting from the requests.
PW/CD7	Municipal Staff Training for Stormwater Pollution Prevention	Education and Outreach Pollution Prevention for Municipal Operations			Community Development Public Works	<ul style="list-style-type: none"> <li>Conduct municipal staff training related to stormwater pollution prevention as appropriate.</li> <li>Coordinate with other Clackamas County co-permittees regarding regional water quality efforts through scheduled co-permittee meetings.</li> <li>Attend applicable conferences and trainings as appropriate.</li> </ul>	<ol style="list-style-type: none"> <li>Track the number of municipal staff training activities.</li> <li>Track number of conferences attended.</li> <li>Track any cost share or joint projects conducted annually with Clackamas County or other permitted agencies.</li> </ol>

Key to pollutant symbols: A full circle (●) indicates the BMP is expected to address the parameter. An empty circle (○) indicates the BMP may be expected to address the parameter. A blank cell indicates that the effect of the BMP is unknown at this time.

Table A-1. Wilsonville (City) Implementation Activities							
BMP Title	BMP Name	Program Element(s)	Addresses bacteria?	Addresses mercury?	Responsible City Department	Measurable goals (2012 SWMP)	Annual tracking measures
CD8	Public Involvement and Participation	Public Involvement and Participation			Community Development	<ul style="list-style-type: none"> <li>Provide for public review and comment with the monitoring plan, SWMP revisions, and pollutant load reduction benchmarks.</li> </ul>	N/A
CD9	Planning and Development Review	Post-Construction Site Runoff Pollution Prevention for Municipal Operations	●	●	Community Development	<ul style="list-style-type: none"> <li>Continue to require new and redevelopment projects that add or replace over 5,000 square feet of impervious surface to install stormwater quality controls.</li> <li>Review all new and redevelopment plans that add or replace over 5,000 square feet for compliance with stormwater control requirements.</li> </ul>	<ol style="list-style-type: none"> <li>Track number of development applications reviewed for compliance with the City's stormwater requirements.</li> <li>Track the number and type of structural water quality and quantity facilities installed.</li> <li>Track the number of CIPs or retrofits proposed/initiated for water quality improvement.</li> </ol>
CD10	Review and Update Applicable Code and Development Standards Related to Stormwater Control	Post-Construction Site Runoff	○	○	Community Development	<ul style="list-style-type: none"> <li>Review the City's current public works standards to minimize or eliminate identified barriers related to the use of low impact development and green infrastructure techniques.</li> <li>Review the City's current stormwater treatment and detention standards for compliance with new MS4 NPDES permit language (e.g., design storm, etc.).</li> <li>Update the City's post-construction stormwater design standards and code language by November 1, 2014.</li> </ul>	Track progress related to the review and update of the City's stormwater treatment and detention standards for compliance with the MS4 NPDES permit.
PW11	Routine Road Maintenance	Pollution Prevention for Municipal Operations	●	●	Public Works	<ul style="list-style-type: none"> <li>Sweep all curbed City streets monthly.</li> <li>Schedule and conduct street maintenance activities during dry weather conditions.</li> <li>Continue to sponsor Adopt-a-Road program.</li> </ul>	<ol style="list-style-type: none"> <li>Track street sweeping frequency.</li> <li>Track length of roadway swept annually.</li> <li>Track volume of debris removed annually.</li> </ol>
PW/CD12	Pest Management	Pollution Prevention for Municipal Operations			Community Development Public Works	<ul style="list-style-type: none"> <li>Follow the Integrated Pest Management principles and Pest Management Program for public landscape maintenance.</li> <li>Require all staff and hired contractors applying chemicals within the City to be certified.</li> </ul>	<ol style="list-style-type: none"> <li>Track amount of pesticides and fertilizers applied to public property and general area of application.</li> <li>Estimate number and area of sites where the planting of native vegetation was incorporated into the maintenance activities.</li> </ol>
PW/CD13	Municipal Facility Stormwater Management	Pollution Prevention for Municipal Operations	○	○	Community Development Public Works	<ul style="list-style-type: none"> <li>Inventory municipal facilities subject to this permit requirement.</li> <li>Identify and implement strategies to minimize discharges from identified municipal facilities by July 1, 2013.</li> </ul>	Inventory municipal facilities and develop strategies to reduce the impact of stormwater runoff from municipal facilities.
PW14	Conveyance System Cleaning	Stormwater Management Facilities Operation and Maintenance Activities	○	○	Public Works	<ul style="list-style-type: none"> <li>Inspect public conveyance system annually for maintenance needs.</li> <li>Maintain and repair public conveyance system as needed based on inspections.</li> </ul>	<ol style="list-style-type: none"> <li>Estimate the length of conveyance system serviced each year.</li> <li>Estimate type and volume of debris removed.</li> </ol>
PW15	Catch Basin Cleaning	Stormwater Management Facilities Operation and Maintenance Activities	●	●	Public Works	<ul style="list-style-type: none"> <li>Clean all high-priority public catch basins (approximately 25% of all public catch basins) annually and the remaining public catch basins over a four-year period.</li> <li>Inspect catch basins for maintenance and repair needs during catch basin cleaning activities.</li> <li>Schedule catch basin repair activities as needed, based on inspections.</li> </ul>	<ol style="list-style-type: none"> <li>Track percent of total catch basins cleaned each year.</li> <li>Track number of catch basin repair activities conducted each year.</li> <li>Estimate volume of debris removed annually.</li> </ol>
PW/CD16	Structural Control Cleaning	Stormwater Management Facilities Operation and Maintenance Activities	●	●	Community Development Public Works	<ul style="list-style-type: none"> <li>Inspect public structural controls annually and maintain and repair as needed.</li> <li>Ensure maintenance of new private structural stormwater facilities serving 5,000 square feet of area or greater through the tracking of Stormwater Maintenance and Access Easement agreements.</li> <li>Maintain GIS "atlas" for both public and private water quality structural controls.</li> </ul>	<ol style="list-style-type: none"> <li>Track number of public stormwater structural controls inspected.</li> <li>Track number of public stormwater structural controls maintained.</li> <li>Track covenant agreements on file and annual maintenance reports submitted for private stormwater structural control facilities.</li> <li>Track number of private stormwater structural controls inspected and maintained.</li> </ol>

## **Appendix B: Temperature Management Strategies**



Table B-1. Management Strategies for Temperature Reduction							
BMP or Activity	Commitment/ Implementation Strategy	Measurable Goal(s) <i>Methods to meet strategies</i>	Implementation Tracking/Performance Measure <i>Demonstration of implementation</i>	Timeline	Milestones <i>Intermediate indicators of progress</i>	Responsible City Department	Status (to be populated with each annual report)
Riparian Area Management	Enforce riparian buffers to protect existing vegetation and minimize impacts to surface waters due to development.	Continue to implement Wilsonville Municipal Code (WMC), Chapter 4 – Planning and Land Development, related to the following: <ul style="list-style-type: none"> <li>Section 4.139 - Implementation of the Significant Resource Overlay Zone (SROZ). The SROZ reflects compliance with Title 3 and Title 13 requirements.</li> <li>Section 4.600 – Limitations on tree removal and tree cutting in the SROZ.</li> </ul>	<ul style="list-style-type: none"> <li>Annually track WMC and Comprehensive Plan updates related to Title 3/ 13 compliance.</li> </ul>	Ongoing	N/A – WMC is currently consistent with Title 3/13 compliance.	Community Development	
	Evaluate opportunities for targeted planting to improve shade conditions throughout Wilsonville waterbodies	Conduct a desktop GIS evaluation and inspect/ ground truth sites identified as public planting opportunity areas in Appendix D.	<ul style="list-style-type: none"> <li>Document planting progress and overall site feasibility based on the desktop GIS evaluation and inspection/ ground truthing efforts.</li> <li>In conjunction with site inspection results, identify ongoing replanting and maintenance needs.</li> </ul>	November 2022	<ul style="list-style-type: none"> <li>By June 30, 2021., compile mapping information per Appendix D and updated aerial imagery.</li> <li>By April 1, 2022, ground truth public planting sites identified per Appendix D.</li> <li>By November 1, 2022, prepare a maintenance and planting schedule for applicable public planting sites based on ground truthing exercise.</li> </ul>		
		Continue participation in opportunistic planting efforts with local and state agencies and organizations.	<ul style="list-style-type: none"> <li>As applicable, document planting and habitat enhancement activities on public property and private property.</li> </ul>	Ongoing	N/A – Implementation is ongoing and opportunistic.	Community Development	
		Continue partnerships and financial contributions to Friends of Trees in support of riparian planting projects. Partnership may include in-kind staff participation on governing boards, technical/ permitting support for sponsored projects within the City, or financial contributions.	<ul style="list-style-type: none"> <li>Annually contribute a minimum of \$5,000 to Friends of Trees.</li> <li>Annually obtain status reports from Friends of Trees to identify planting locations over the reporting year.</li> </ul>	Ongoing	Beginning with the FY 2020-21 annual report, report on financial contributions to Friends of Trees.	Community Development	
		Assess riparian planting and restoration capital project needs in accordance with DEQ’s March 2020 cold water refugia (CWR) study and efforts associated with the City’s Stormwater Master Plan (SMP) update.	<ul style="list-style-type: none"> <li>Review results of DEQ’s CWR study (March 2020) and identify potential CWR opportunity areas relevant to the City.</li> <li>Assess feasibility of planting activities at CWR opportunity areas using GIS mapping and/or field investigation efforts.</li> <li>Conduct stream assessment to assess vegetative cover conditions along specific stream reaches and identify restoration-related capital project needs as part of the SMP update.</li> <li>As applicable, incorporate planting and restoration project needs into the City’s stormwater capital improvement program.</li> <li>Annually document completion of riparian planting and restoration capital projects per the City’s SMP update.</li> </ul>	Ongoing	<ul style="list-style-type: none"> <li>By June 30, 2021, review the DEQ CWR study and summarize findings and relevant CWR opportunity areas.</li> <li>By June 30, 2022, evaluate the continued applicability of unconstructed riparian planting and restoration CIPs per the City’s 2012 SMP, for inclusion in the 2020 SMP Update.</li> <li>By June 30, 2022, summarize results from the stream assessment effort.</li> <li>Please note that capital project implementation is subject to prioritization schedules and approval of the SMP by City Council.</li> </ul>	Community Development	
Design Standards for New and Redevelopment	Implement design standards that promote infiltration for public and private development projects.	Promote the use of infiltration for stormwater management through updated stormwater design standards, facility details, sizing tools, and the City’s SMP update.	<ul style="list-style-type: none"> <li>As applicable, document changes or updates to the City’s stormwater design standards.</li> <li>As applicable, incorporate water quality project needs into the City’s stormwater capital improvement program.</li> </ul>	Ongoing	<ul style="list-style-type: none"> <li>By April 1, 2021, prepare a user manual for developers and engineers with standard details for recommended stormwater treatment facilities.</li> <li>Please note that capital project implementation is subject to prioritization schedules and approval of the SMP by City Council.</li> </ul>	Community Development	

Table B-1. Management Strategies for Temperature Reduction							
BMP or Activity	Commitment/ Implementation Strategy	Measurable Goal(s) <i>Methods to meet strategies</i>	Implementation Tracking/Performance Measure <i>Demonstration of implementation</i>	Timeline	Milestones <i>Intermediate indicators of progress</i>	Responsible City Department	Status (to be populated with each annual report)
Education for Temperature Management	Continue to provide information regarding temperature related issues and shade preservation efforts to the public.	Using the City newsletter, annually distribute a minimum of one article related to temperature issues and management approaches.	<ul style="list-style-type: none"> <li>Annually track the number and content of temperature – related articles distributed to City residents by the City.</li> <li>Annually document shade planting incentives (materials, trainings, etc.) provided to citizens.</li> </ul>	Ongoing	Beginning with the FY 2020-21 annual report, report on article publications related to temperature management.	Community Development	
		Promote regional programs targeted at improving habitat on private property. Continually distribute information regarding regional programs in City outlets.	<ul style="list-style-type: none"> <li>Annually document the methods of information distribution conducted by the City.</li> </ul>	Ongoing	N/A – Implementation is ongoing.	Community Development	
		Participate in student education and outreach activities in local schools, providing instruction on the importance of maintaining riparian buffers for shade and temperature management.	<ul style="list-style-type: none"> <li>As applicable, document participation and activities conducted with local schools.</li> </ul>	Ongoing	N/A – Implementation is ongoing.	Community Development	
		Support staff training opportunities related to water quality, TMDL compliance, and temperature management through conference attendance and other education activities.	<ul style="list-style-type: none"> <li>Annually provide up to 8-hours of staff training activities.</li> </ul>	Ongoing	Beginning with the FY 2020-21 annual report, report on staff trainings and conference attendance.		
Environmental Monitoring	Monitor surface water temperature to document status and evaluate trends with respect to water quality standards.	In conjunction with NPDES MS4 requirements, conduct sampling for temperature at required instream monitoring locations.	<ul style="list-style-type: none"> <li>As applicable, annually report any modification to existing temperature monitoring activities.</li> </ul>	Ongoing	N/A – Implementation is ongoing.	Community Development	
		Conduct ongoing temperature monitoring in the Coffee Lake Creek and Boeckman Creek watersheds over this 5-year TMDL implementation period to build on historic datasets and identify anomalies.	<ul style="list-style-type: none"> <li>Annually summarize this supplemental monitoring in tabular and narrative format.</li> </ul>	November 2022	<ul style="list-style-type: none"> <li>By June 30, 2021, determine whether updates to the CCCSMP to include additional Coffee Lake Creek monitoring sites may be warranted.</li> <li>Please note that CCCSMP updates are subject to issuance of the City’s NPDES MS4 permit.</li> </ul>	Community Development	



## **Appendix C: Summary of Title 3/Title 13 Requirements**



## Appendix C

# Metro Title 3 and Title 13 Summary

## Metro Title 3

Title 3, specifically the Title 3 model ordinance, was developed in 1997 by Metro, which is a regional government serving the Portland metropolitan area including 25 cities. The purpose of Title 3 is to implement the Oregon Statewide Land Use Goals 6 and 7 that address protecting streams, rivers, wetlands, and floodplains. Title 3 provides this protection by avoiding, limiting, or mitigating the impact on these areas from development. This title limits development in identified water quality resource areas (WQRAs) and flood management areas (FMAs) and it limits development that would cause any extent of erosion within the Metro Boundary. Title 3 defines the WQRA as the protected water feature and associated vegetated corridor adjacent to the water feature and provides the method for determining the appropriate width of this vegetated corridor. Native vegetation within the WQRA should be maintained, enhanced or restored, if disturbed. Metro developed the Water Quality and Flood Management Areas map identifying these areas with input from the cities and counties within the Metro region. Table 3.07-3 in Title 3 is shown on the following page and summarizes the vegetated buffer widths for protected water features.

The cities and counties within the Metro region were given three alternatives for implementing Title 3:

1. Amend comprehensive plans and ordinances to adopt all or part of the Title 3 model ordinance or language that substantially complies with the Title, and adopt either the Metro Water Quality and Flood Management Area map or a map that substantially complies with the Metro map;
2. Demonstrate that existing city and county comprehensive plans and ordinances already substantially comply with the performance standards and the intent of Title 3; or
3. A combination of the first two alternatives that substantially complies with all performance standards of Title 3.

To implement Title 3, many cities have adopted Table 3.07-3, along with a portion of the Title 3 model ordinance into their city code. Several exemptions are allowed for various reasons and are outlined specifically in Title 3 (Metro 1998).

## Title 13

The Title 13 model ordinance was also created by Metro in 2006. However, it was created to provide clear objective standards and a discretionary review process for implementation of Oregon Statewide Land Use Goal 5. Goal 5 is focused on the protection of natural resources and open space. The purpose of Title 13 is to provide guidelines in order for local jurisdictions to 1) conserve, protect, and restore a continuous ecologically viable streamside corridor that is integrated with upland wildlife habitat, and 2) control and prevent water pollution in order to protect public health and improve the region's water quality.

Title 13 focuses on regulating development that would affect riparian or upland wildlife habitat, as documented on the Habitat Conservation Area (HCA) map that Metro has produced. The HCA map was created by Metro and was intended for adoption by local jurisdictions in the same manner as the Water Quality and Flood Management Areas map developed for Title 3 compliance. HCA priority levels (high, medium, and low) were assigned to areas by cross-referencing habitat classifications (e.g., Class I and Class II Riparian and Class A and Class B Upland Wildlife) and urban development values.

**Table 3.07-3 - Protected Water Features**  
(Section 3.07.340(B)(2)(a))

Protected Water Feature Type (see definitions)	Slope Adjacent to Protected Water Feature	Starting Point for Measurements from Water Feature	Width of Vegetated Corridor
Primary Protected Water Features <sup>1</sup>	< 25%	<ul style="list-style-type: none"> <li>Edge of bankfull flow or 2-year storm level;</li> <li>Delineated edge of Title 3 wetland</li> </ul>	50 feet
Primary Protected Water Features <sup>1</sup>	≥ 25% for 150 feet or more <sup>5</sup>	<ul style="list-style-type: none"> <li>Edge of bankfull flow or 2-year storm level;</li> <li>Delineated edge of Title 3 wetland</li> </ul>	200 feet
Primary Protected Water Features <sup>1</sup>	≥ 25% for less than 150 feet <sup>5</sup>	<ul style="list-style-type: none"> <li>Edge of bankfull flow or 2-year storm level;</li> <li>Delineated edge of Title 3 wetland</li> </ul>	Distance from starting point of measurement to top of ravine (break in ≥25% slope) <sup>3</sup> , plus 50 feet. <sup>4</sup>
Secondary Protected Water Features <sup>2</sup>	< 25%	<ul style="list-style-type: none"> <li>Edge of bankfull flow or 2-year storm level;</li> <li>Delineated edge of Title 3 wetland</li> </ul>	15 feet
Secondary Protected Water Features <sup>2</sup>	≥ 25% <sup>5</sup>	<ul style="list-style-type: none"> <li>Edge of bankfull flow or 2-year storm level;</li> <li>Delineated edge of Title 3 wetland</li> </ul>	50 feet

<sup>1</sup> Primary Protected Water Features include: all perennial streams and streams draining greater than 100 acres, Title 3 wetlands, natural lakes and springs

<sup>2</sup> Secondary Protected Water Features include intermittent streams draining 50-100 acres.

<sup>3</sup> Where the Protected Water Feature is confined by a ravine or gully, the top of ravine is the break in the ≥ 25% slope (see slope measurement in Appendix).

<sup>4</sup> A maximum reduction of 25 feet may be permitted in the width of vegetated corridor beyond the slope break if a geotechnical report demonstrates that slope is stable. To establish the width of the vegetated corridor, slope should be measured in 25-foot increments away from the water feature until slope is less than 25% (top of ravine).

<sup>5</sup> Vegetated corridors in excess of 50-feet for primary protected features, or in excess of 15-feet for secondary protected features, apply on steep slopes only in the *uphill* direction from the protected water feature.

**Figure C-1. Title 3 (Table 3.07-3) - required width of vegetated corridor**

New development restrictions differ depending on the HCA priority level as well as zoning type.

Cities and counties are given three alternatives for implementation of Title 13:

1. Adopt Title 13 model ordinance and map;
2. Demonstrate that the existing or amended comprehensive plan and ordinances “substantially” comply with the title, and existing or adopted maps also comply with Metro’s HCA map; or
3. Demonstrate that an alternative program with comparable protection and restoration results has been implemented.

Several exemptions are allowed for various reasons and are outlined specifically in the title. In essence, Title 13 promotes vegetative buffers around water bodies for protection of wildlife habitat through the preservation and improvement of designated habitat conservation areas. Title 13 and its corresponding model ordinance describe specific design and construction practices to minimize impacts on wildlife corridors and fish passage. Performance and implementation objectives and measurable targets are outlined in the title, specifically related to design and construction practices that would be employed.

Metro monitors the region’s progress toward implementation of Title 13, and cities and counties are required to submit progress reports on their efforts (Metro 2005).

### **Title 3 and Title 13 Comparison**

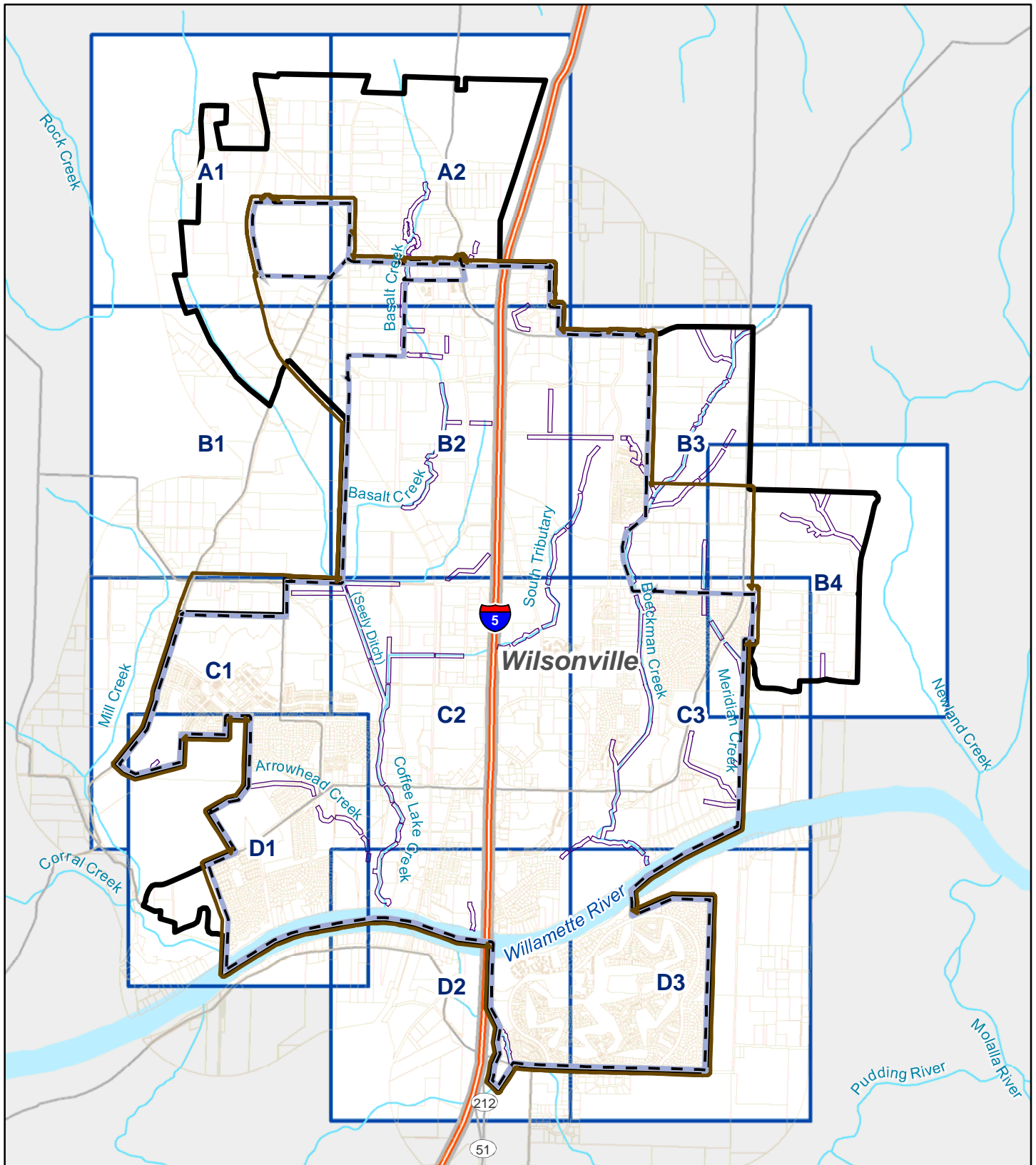
Both Title 3 and Title 13 promote the protection of vegetative buffers around water bodies. The goal for Title 3 is to protect water quality and flood areas while Title 13 aims to protect and improve riparian and wildlife habitat. Because Title 3 and Title 13 have different goals, the methods for implementation and performance standards are not identical. Title 13 is more specific than Title 3 in that it has specific numerical targets. However, Title 13 also enables the cities to use their own discretion when defining the protective buffer areas by evaluating the economic effects (urban development values), which is not a component of Title 3 (Metro 1998 and Metro 2005).

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## **Appendix D: Shade Opportunity Mapping (2008)**

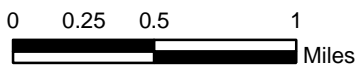










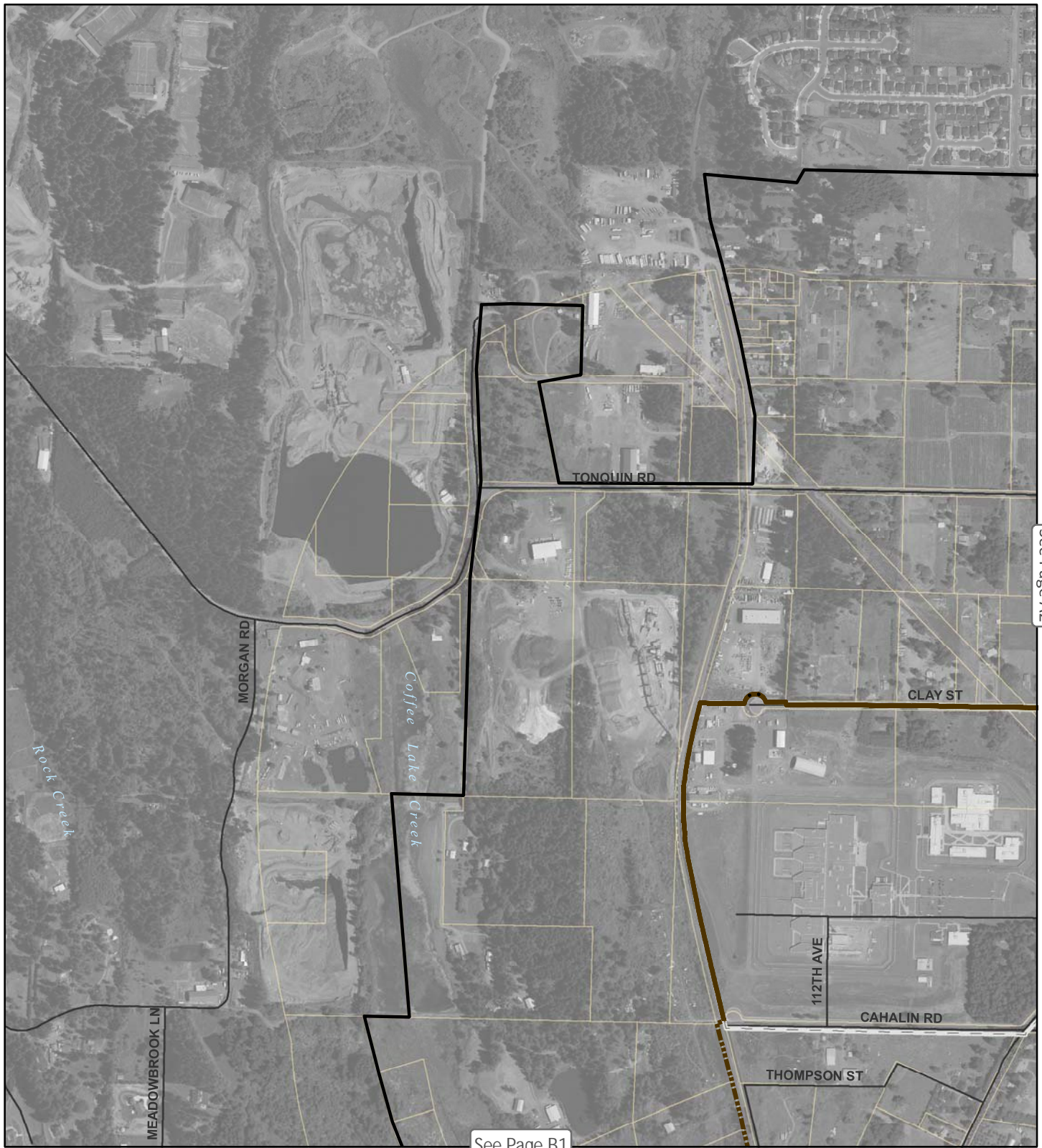


**City of Wilsonville  
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Figure 3-1. Riparian Shade Index Map

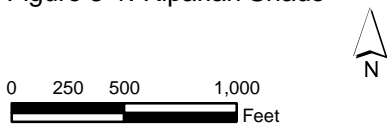


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|---|---------------------|---|--------------|
|  | Study Area          |  | Tax Lots     |
|  | TMDL Policy Extents |  | UGB Boundary |
|  | Stream/River        |  | City Limits  |



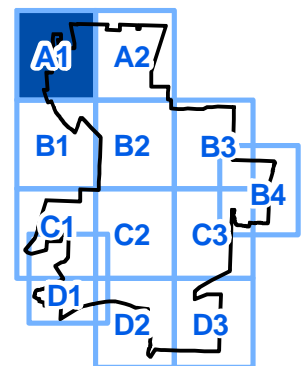
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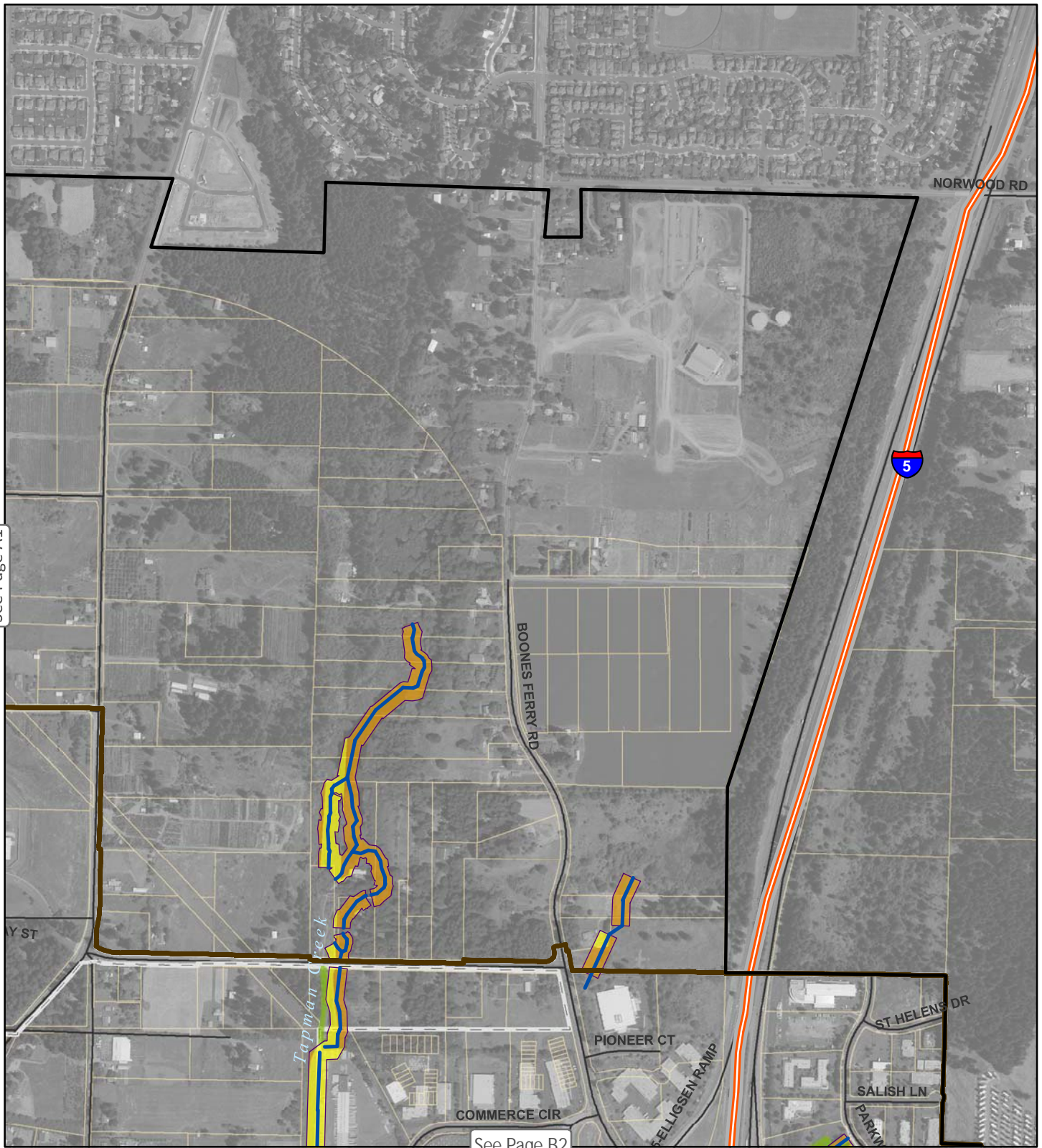
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- Riparian Shade on Private Lands
- Hard Constraints
- Soft Constraints

- Study Area
- Tax Lots
- UGB Boundary
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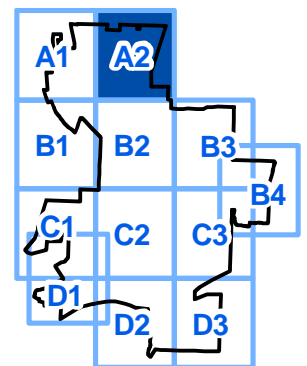
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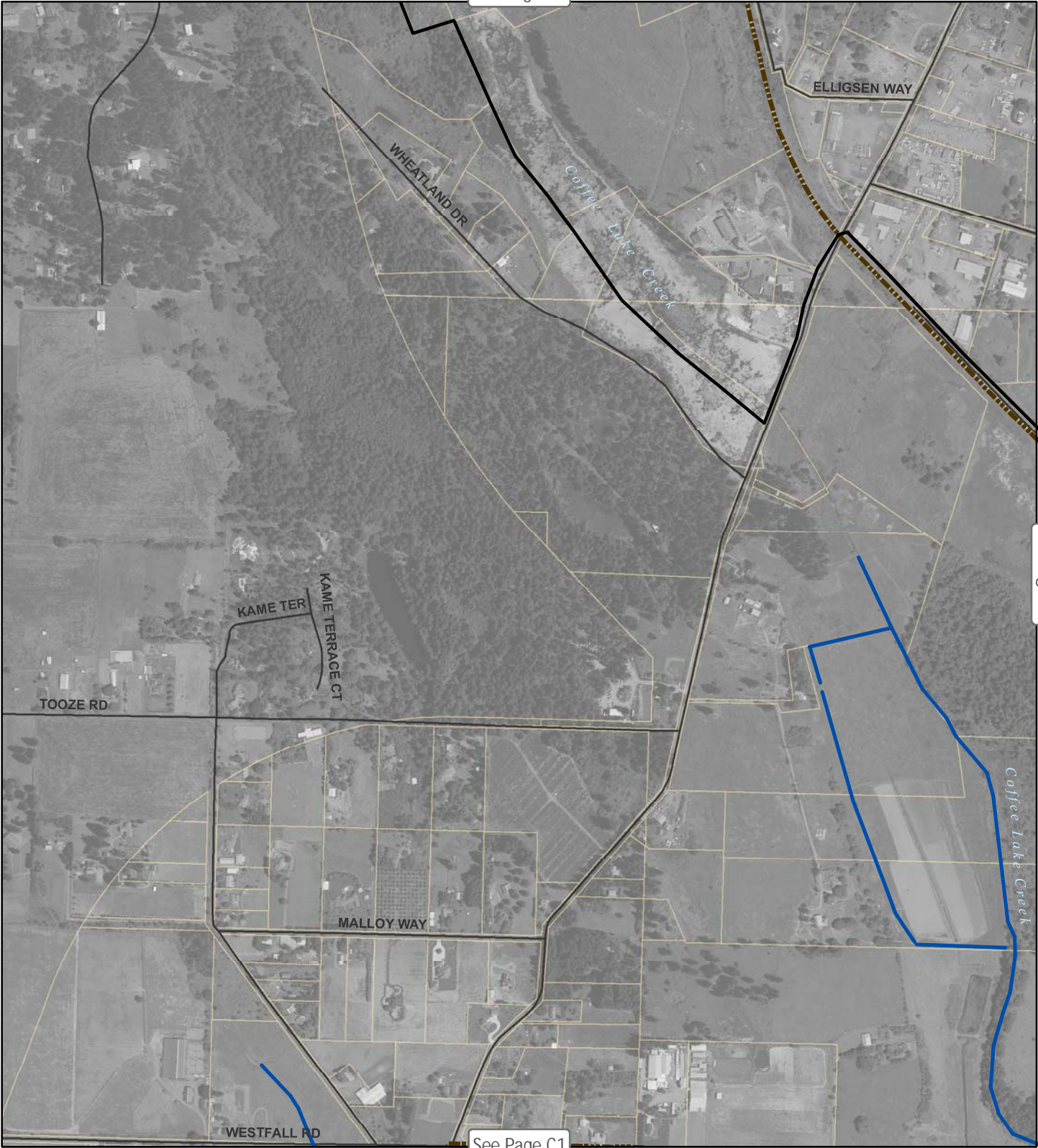


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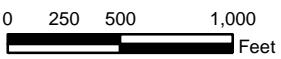


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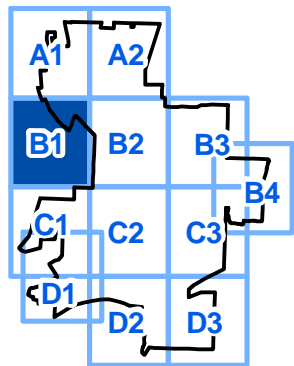
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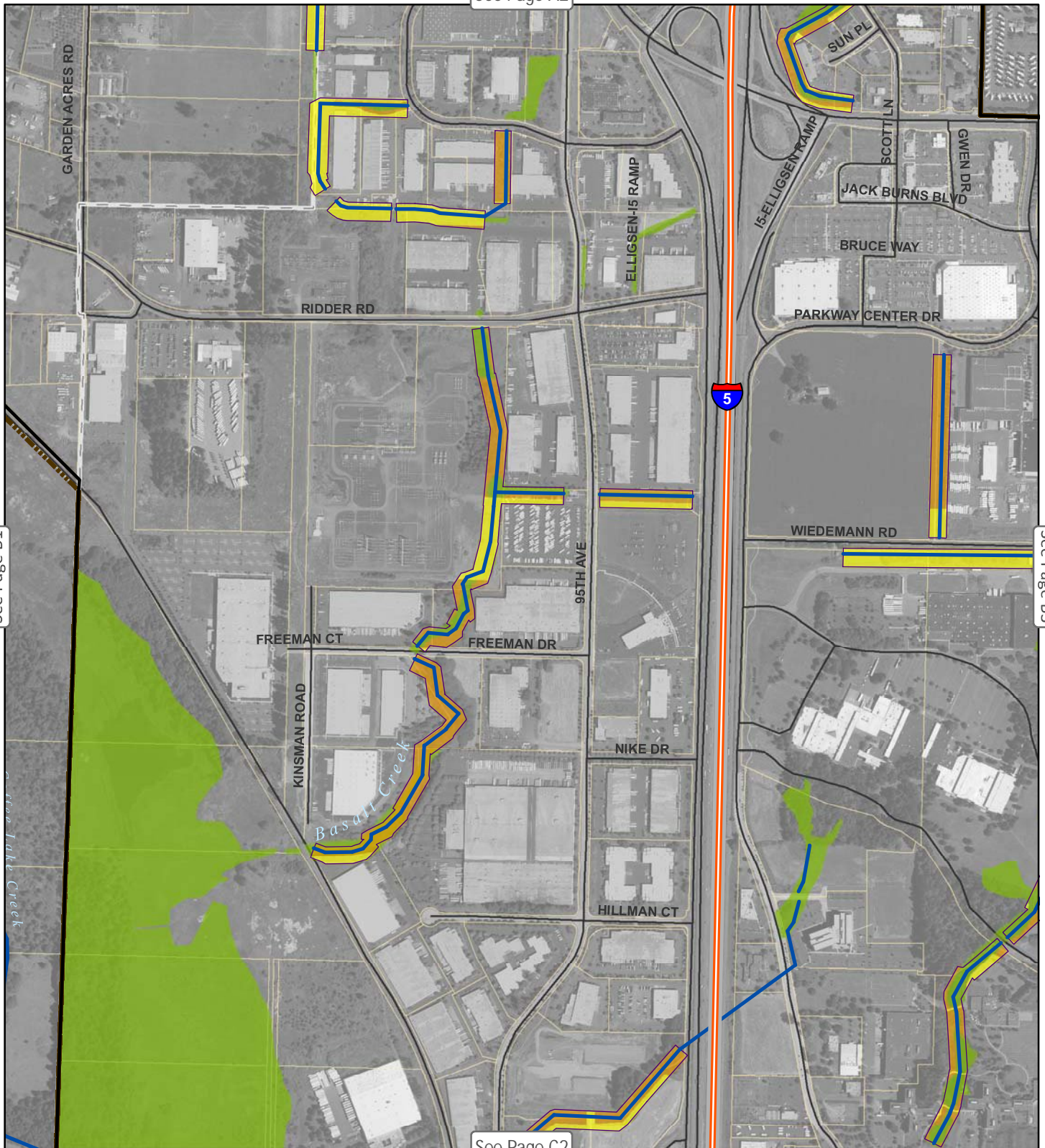


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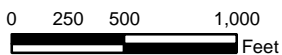
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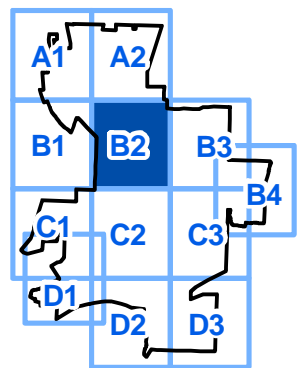
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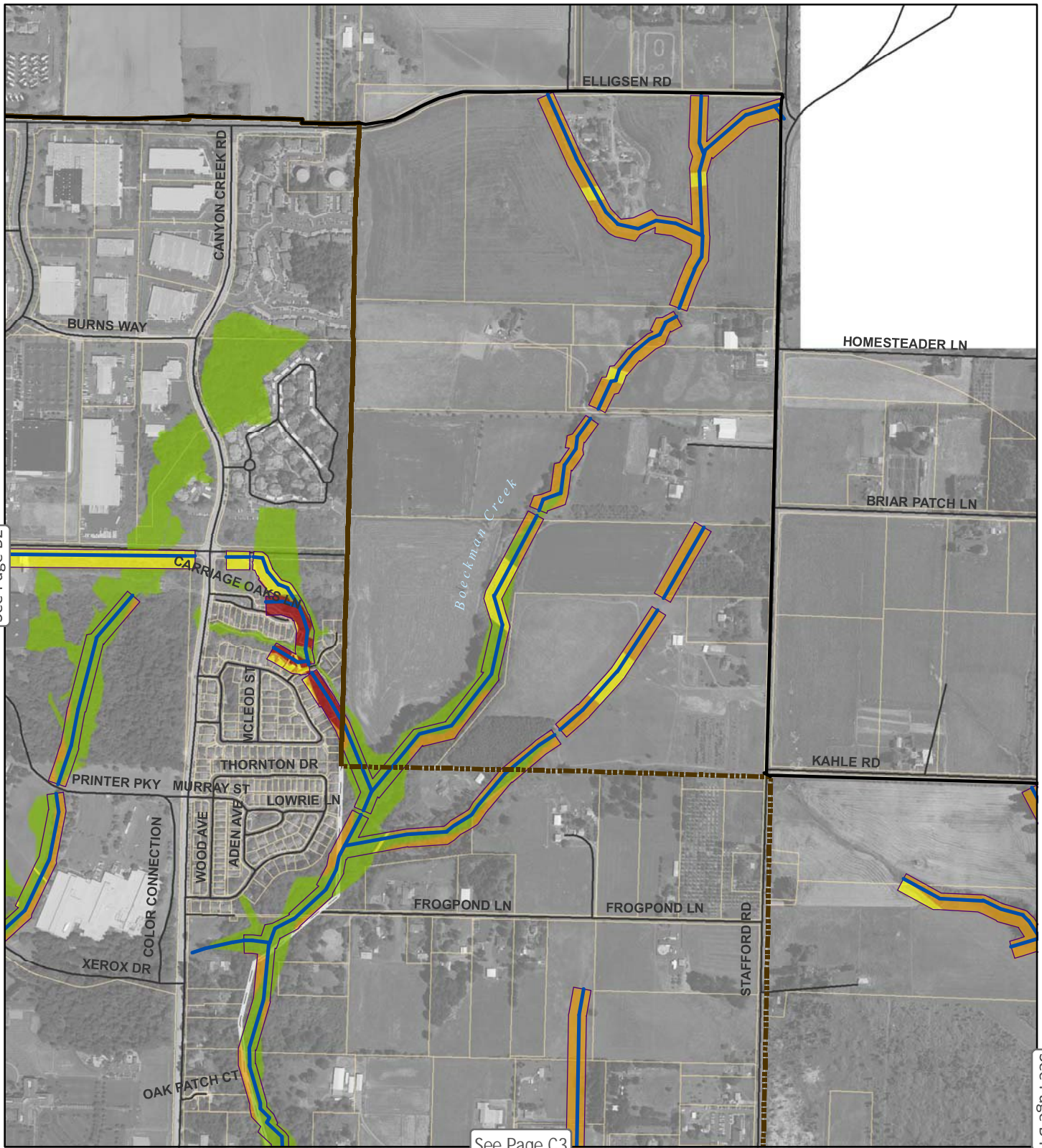
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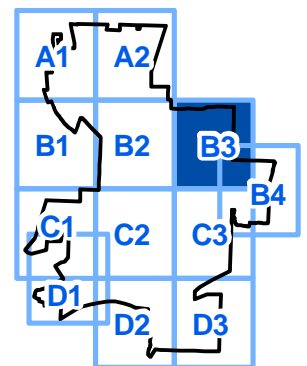




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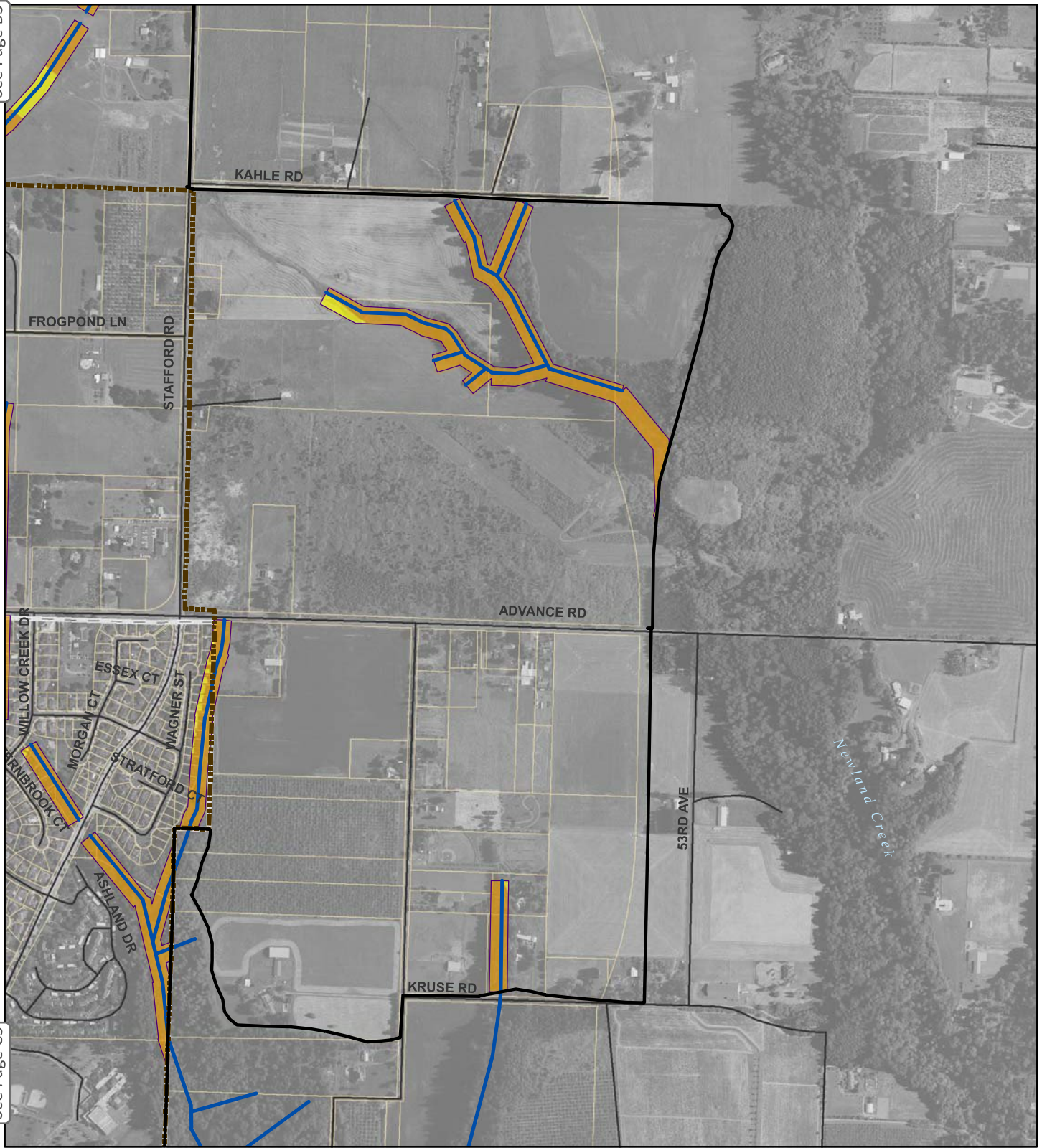
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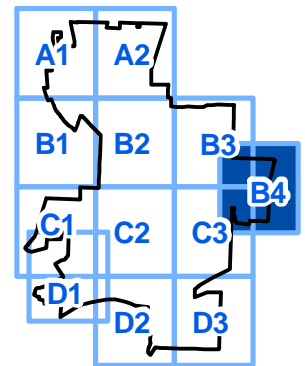
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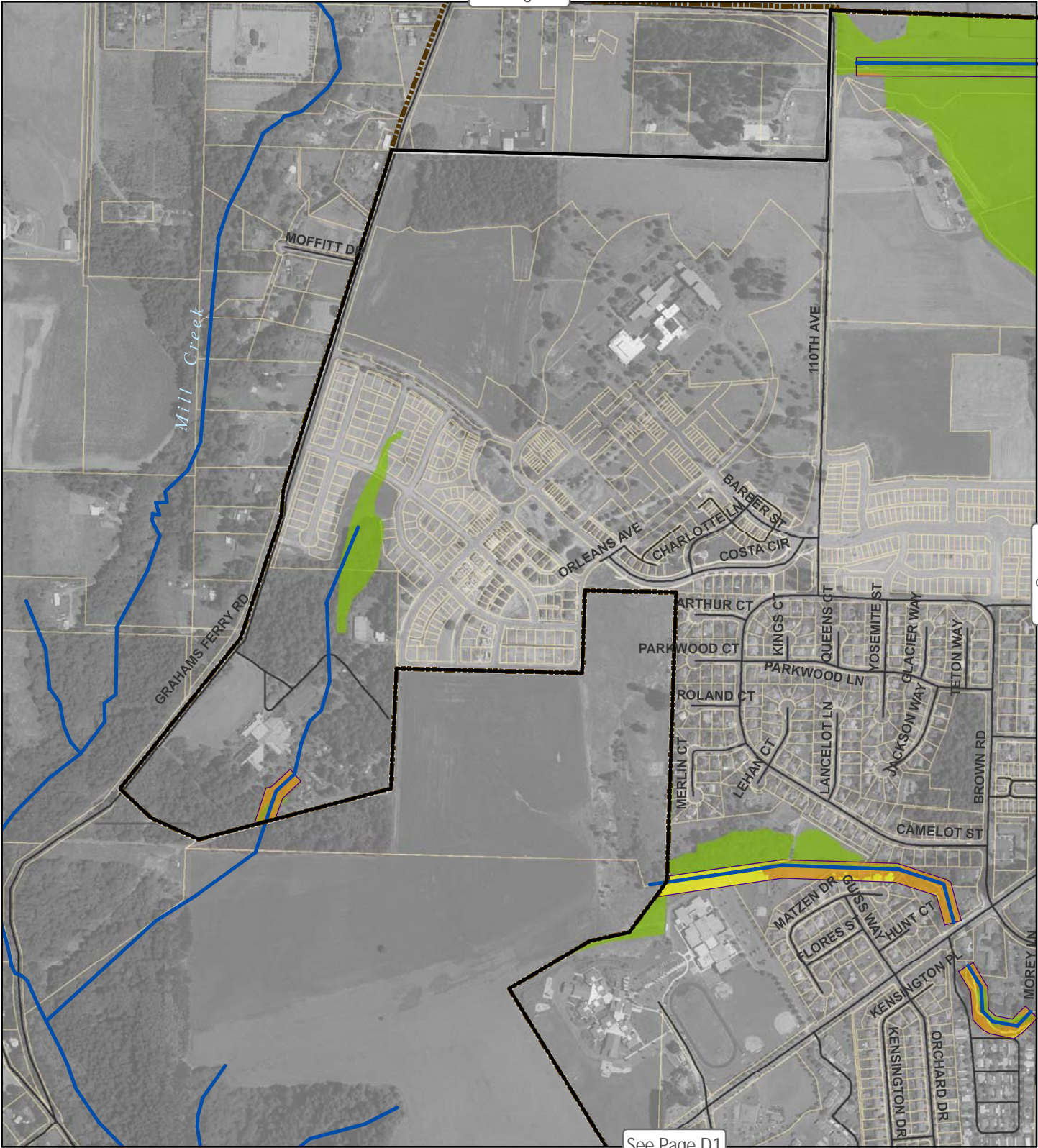


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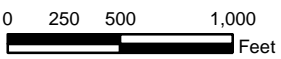


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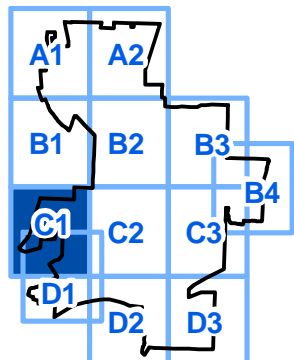
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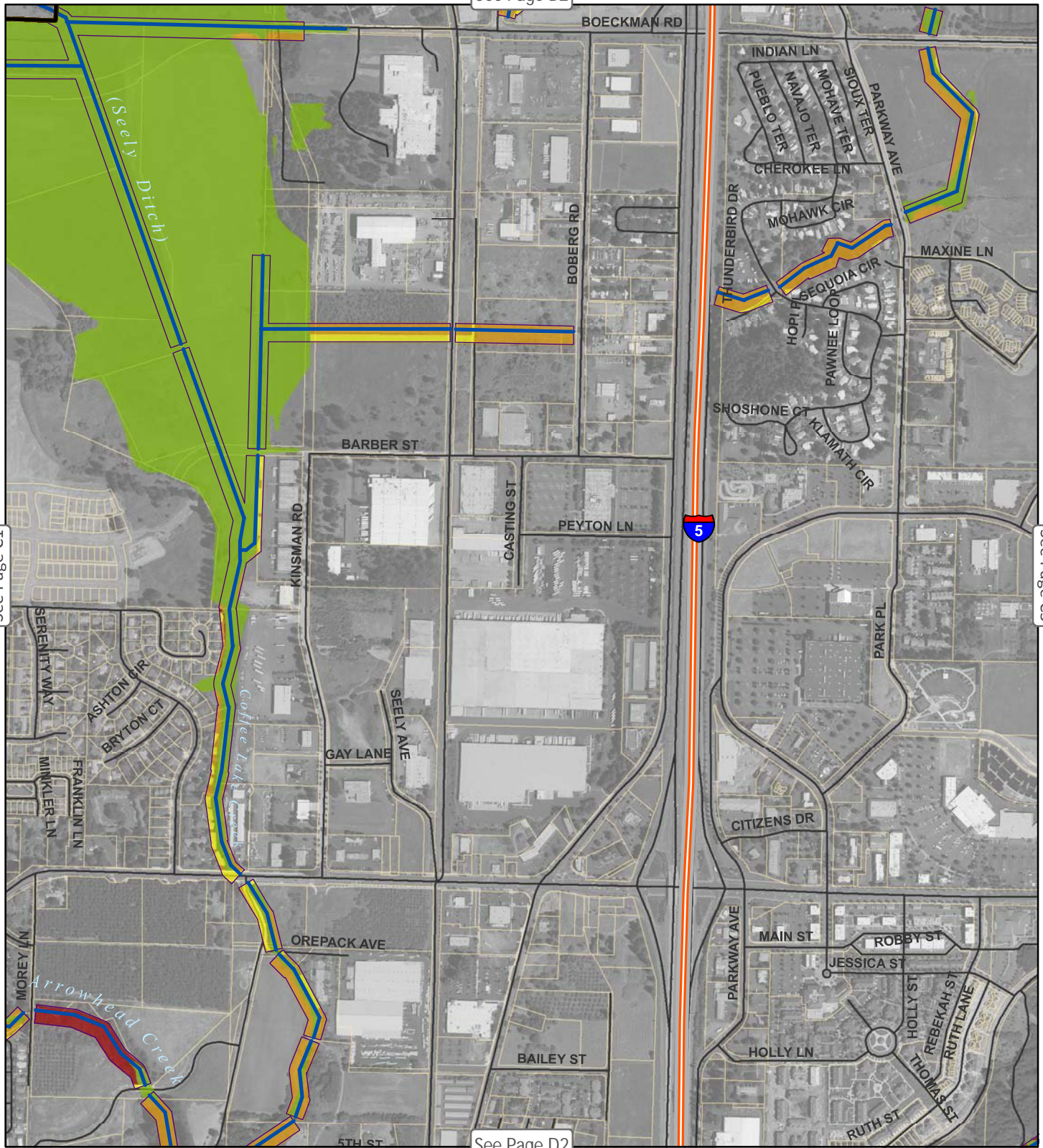
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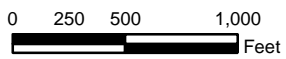
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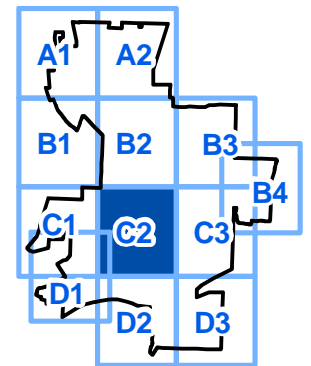
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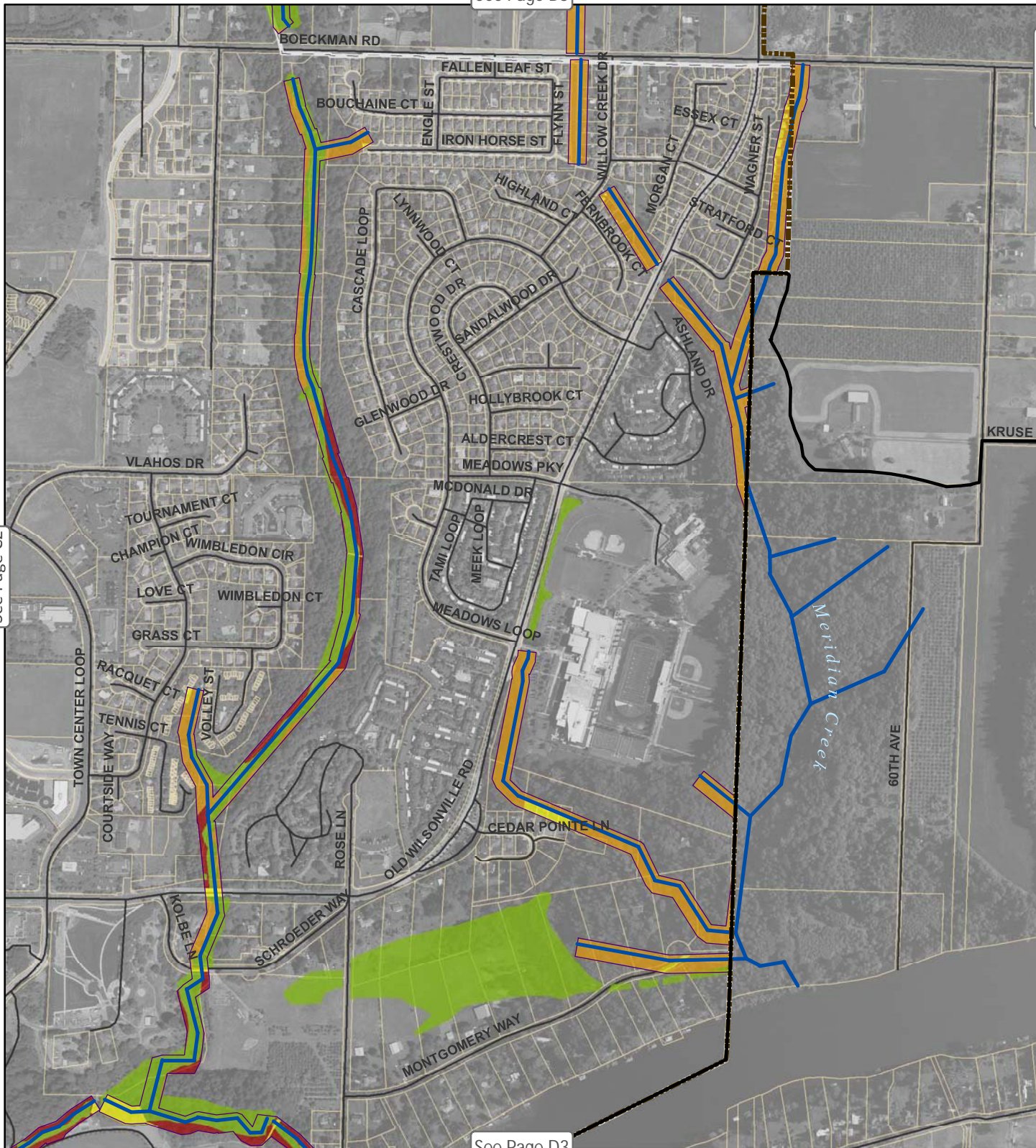


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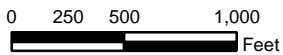
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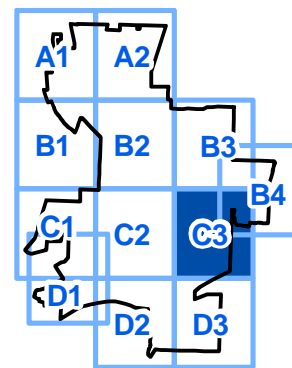
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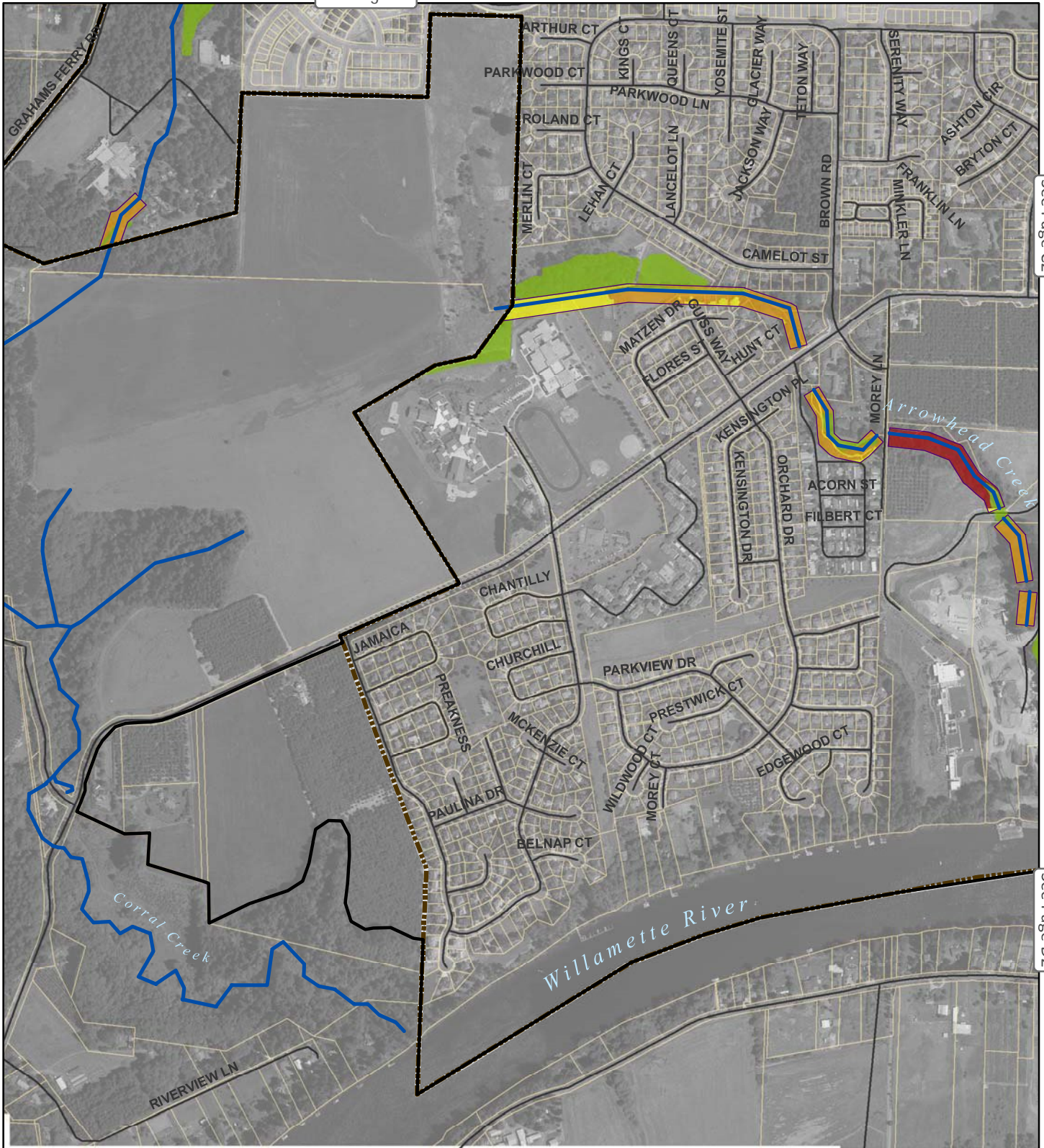


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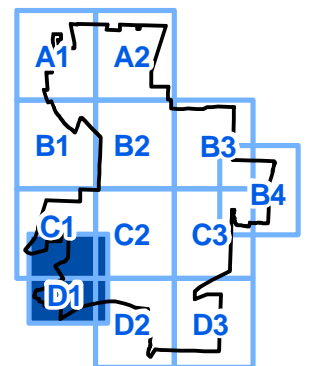
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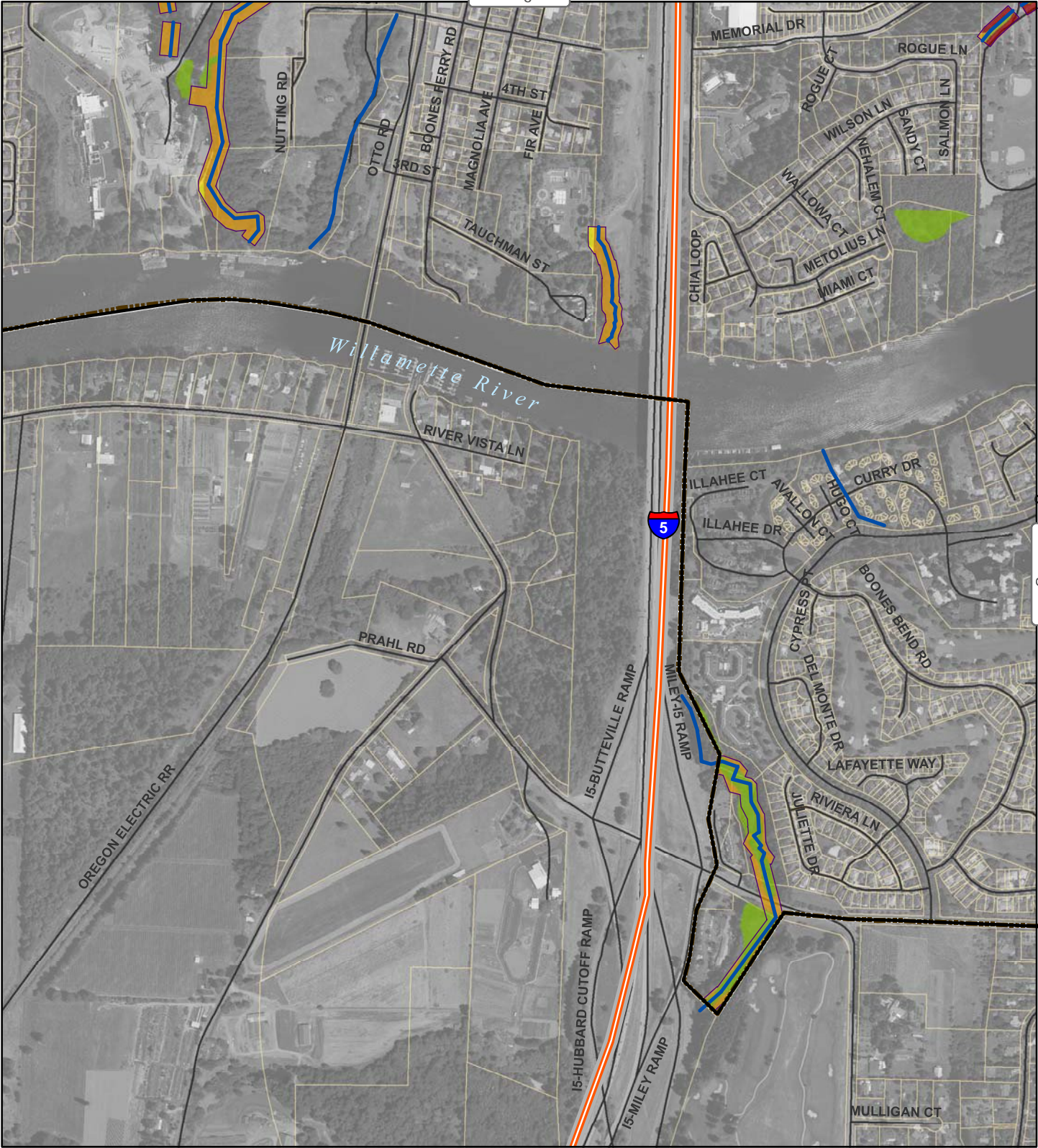
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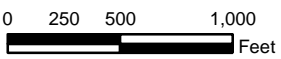
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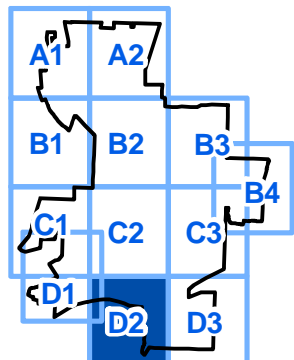


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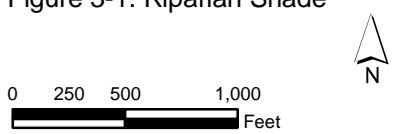
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