2.0 Study Area Characteristics

This chapter describes the location, physical environment, land uses and zoning, and other general characteristics of the study area that affect this facilities planning effort.

2.1 Study Area

The Eugene-Springfield metropolitan area is located in the heart of Lane County, Oregon, and is situated in the southern Willamette Valley along the Willamette and McKenzie rivers. Eugene-Springfield makes up Oregon's second largest metropolitan area. Interstate 5 divides the metropolitan area; Eugene is located on the west side, and Springfield is located on the east side of Interstate 5. Figure 2.1-1 shows the location of Eugene-Springfield within Lane County. MWMC provides regional sewerage and wastewater services for the Eugene-Springfield metropolitan area. The current MWMC service area is shown in Figure 2.1-2 (the urban growth boundaries of Springfield and Eugene serve as the boundaries of service). Although not in the city limits, service is also provided to the Santa Clara/River Road area, north of the WPCF. MWMC will continue to provide regional services to a growing metropolitan area over the next 20 years. Figure 2.1-2 shows the anticipated urban growth boundary used for planning purposes through the design year 2025.

The focus of this Facilities Plan is future expansion or modifications of MWMC facilities and operations. Impacted facilities include the WPCF, the BMF, the SIWF, and the Biocycle Farm. Study area characteristics for each of these sites and the general metropolitan area need to be well-defined so that any impact to the surrounding environment through facility modifications or operations may be easily quantified relative to the base characteristics. Figure 2.1-3 shows the location of each of the regional wastewater treatment facilities and their associated impact areas. The WPCF is located at 410 River Avenue, on 100 acres, township and range T17S R4W Section 13. The BMF is located at 29689 Awbrey Lane, township and range T16S R4W Section 33. The SIWF is located at 91199 Prairie Road, Junction City, township and range T16S R4W Sections 27, 35, and 34.

2.2 Physical Environment

2.2.1 Climate

The average winter temperature at Eugene is approximately 42 degrees F with an average daily minimum temperature of 35 degrees. The lowest temperature occurred at Eugene on December 8, 1972, and registered –12 degrees F. In summer, the average temperature is 64 degrees F. The average daily maximum temperature is about 76 degrees F (NRCS, 1977).

Average annual rainfall is 43 inches, falling mostly between September and June (City of Eugene, 2004). The average seasonal snowfall is 5 inches at Eugene. The greatest snow depth at any one time during the period of record was 11 inches at Eugene. On an average, Eugene has 2 days with at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The percentage of possible sunshine is 60 percent in summer and 25 percent in winter. The prevailing wind is from the west-northwest. Average windspeed is highest, 8 miles per hour, in winter. In most winters one or two storms over the whole area bring strong and sometimes damaging winds, and in some years the accompanying heavy rains cause serious flooding. Every few years, in winter or summer, a large continental airmass from the east causes abnormal temperatures. During winter, several consecutive days are well below freezing; in summer a week or longer is sweltering. Tables 2.2.1-1 and 2.2.1-2 summarize these data.

TABLE 2.2.1-1
Average Weather in Eugene, Oregon
MWMC Facility Plan, Eugene-Springfield

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average temp. (°F)	39.8	42.8	46.3	49.8	54.8	60.2	66.2	66.4	61.7	52.6	44.7	39.5
High temperature (°F)	45.0	48.4	50.1	55.2	59.7	64.7	69.9	69.3	66.6	56.8	50.3	44.9
Low temperature (°F)	31.2	35.5	41.3	44.7	50.9	55.8	62.1	62.2	57.4	47.9	37.2	32.6
Precipitation (in)	7.65	6.35	5.80	3.66	2.66	1.53	0.64	0.99	1.54	3.35	8.44	8.29
Days with precip.	17.1	15.8	17.3	14.2	10.8	7.4	3.2	4.1	5.9	10.9	17.7	17.3

Source: National Climatic Data Center, Asheville, North Carolina 28801, www.ncdc.noaa.gov

TABLE 2.2.1-2
Normal Climate Around Eugene, Oregon
MWMC Facility Plan, Eugene-Springfield

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed (mph)	7.8	7.8	8.2	7.7	7.4	7.6	8.0	7.6	7.4	6.7	7.4	7.6
Morning humidity (%)	92	92	91	90	91	90	87	88	89	93	93	92
Afternoon humidity (%)	80	72	65	58	55	50	39	39	43	62	78	84
Sunshine (%)	28	38	48	52	57	56	69	66	62	44	28	23
Days clear of clouds	2	3	3	4	6	8	16	14	12	5	2	1
Partly cloudy days	4	4	6	7	9	8	8	9	8	9	6	4
Cloudy days	25	21	22	19	17	14	7	8	9	17	23	26
Snowfall (in)	1.5	1.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.8

Source: http://www.city-data.com/city/Eugene-Oregon.html

2.2.2 Soils

The Eugene-Springfield metropolitan area includes at least eight major soils series (Figure 2.2.2-1) and numerous individual soil phases[1]. Because of the large number of soils and corresponding descriptions, only a brief discussion of the nine soils located within the area immediately underlying and surrounding major MWMC facilities (i.e., SIWF, BMF, Biocycle Farm, and WPCF) is provided below. Soils are categorized according to the facility where they are located and are shown in detail on Figures 2.2.2-2 and 2.2.2-3.

WPCF

- ***Camas.*** The Camas series consists of very deep, excessively drained soils that formed in gravelly and very gravelly coarse textured alluvium of mixed mineralogy. Camas soils are on floodplains 50 to 3,000 feet in elevation and have slopes that range from 0 to 5 percent. They are excessively drained with slow runoff and very rapid permeability. They are subject to rare or occasional flooding. These soils are used for growing cultivated crops and for woodland. Camas soils are usually irrigated. Natural vegetation is Oregon ash, Oregon white oak, red alder, rose, blackberries, annual weeds and grasses.

- ***Newberg fine sandy loam.*** This deep, somewhat excessively drained soil is on flood-plains and bottom lands at elevations of 290 to 850 feet. Slopes are 0 to 3 percent. This Newberg soil formed in recent alluvium and has a moderately rapid permeability. Runoff is slow, and the hazard of water erosion is slight. The soil is occasionally flooded for brief periods from December to March. This unit is used mainly for row crops, hay and pasture, small grain, and orchards. It is also used for urban development and recreation. The vegetation in areas not cultivated is mainly Douglas fir, grand fir, Oregon white oak, bigleaf maple, black cottonwood, shrubs, and grasses.

- ***Newberg-Urban land complex.*** The Newberg-Urban land complex soils are on flood plains at elevation of 300 to 850 feet. Slopes are 0 to 3 percent. It formed in recent silty alluvium. The relatively undisturbed Newberg soil is deep and somewhat excessively drained with a moderately rapid permeability. Runoff is slow, and the hazard of water erosion is slight. The soil is occasionally flooded for brief periods from December to March. The native vegetation is mainly Douglas fir, grand fir, Oregon white oak, bigleaf maple, black cottonwood, shrubs, forbs, and grasses.

  The disturbed Newberg soil has been covered by as much as 40 inches of fill material or has had as much as 30 inches of the original profile removed by cutting or grading. The fill material commonly is from adjacent areas of Newberg, Chehalis, Cloquato, Camas, and McBee soils that have been cut or graded. The characteristics of the disturbed areas are highly variable. Urban land consists of areas where the soils are largely covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soils

[1] Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all of the soils in a series have major horizons that are similar in composition, thickness, and arrangement. Soils of one series can differ in texture of the surface layer or of the underlying layers. They can also differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases* (NRCS, 1977).

so that identification is not feasible. This unit is used mainly for urban development. It is also used for yards, parks, and open areas around and between buildings.

BMF

- ***Malabon.*** Malabon soils are of moderate extent in the Willamette Valley and occur dominantly on stream terraces, but are also recognized on high floodplains in some areas. Elevation is 100 to 1,100 feet. Slopes are 0 to 3 percent. The soils formed in silty and clayey alluvium from mixed materials. Areas of Malabon soils on high floodplains are subject to rare to occasional flooding for brief periods from December to March. The soil series is well-drained with slow runoff to moderately slow permeability. These soils have wide use for growing orchard, berry, vegetable, small grain, hay, pasture, and grass seed crops. Natural vegetation is Douglas fir, Oregon white oak, blackberry, Pacific poison oak, other shrubs, and grasses.
- ***Coburg.*** Coburg soils are on stream terraces of the Willamette Valley at elevations of 100 to 1,100 feet. Slope gradients are dominantly 0 to 7 percent. The soils formed in silty and clayey alluvium from mixed materials. They are moderately well-drained with slow runoff and moderately slow permeability. Some areas of Coburg soils are subject to rare or occasional flooding for brief periods from December to March. An apparent water table is at its uppermost limit from December to March. These soils are used for production of small grain, hay, pasture, and grass seed crops. Natural vegetation is Douglas fir, Oregon white oak, blackberries, Pacific poison oak, other shrubs, and grasses.
- ***Awbrig.*** Awbrig soils are in drainageways and nearly level to slightly concave or depressed parts of stream terraces at elevations of 200 to 600 feet. Slope gradients are 0 to 2 percent. The soils formed in stratified silty and clayey mixed alluvium and weathered from volcanic and sedimentary bedrock. They are poorly drained, ponded or with very slow runoff, and have a very slow permeability. Awbrig soils are subject to rare flooding. A perched water table is at its uppermost limit from November to April and is ponded from December to April. This soil also has an apparent water table. These soils are used for grass seed, hay, pasture, and spring grain crops. Native vegetation is mainly grasses, sedges, rushes, and scattered hawthorn, rose, and Oregon ash.

Biocycle Farm

- ***Holcomb.*** The Holcomb series consists of very deep, somewhat poorly drained soils in nearly level to slightly convex areas on broad valley terraces at elevations are 125 to 650 feet. They have slopes of 0 to 3 percent and formed in stratified silty and clayey mixed alluvium. They are somewhat poorly drained with slow runoff and very slow permeability. A perched water table is at its uppermost limit from November to April. This soil also has an apparent water table. Holcomb soils are under cultivation with small grains, hay, pasture, and grass seed as the principal crops. The vegetation is largely annual and perennial grasses, wild blackberry, wild rose, and oak.
- ***Coburg, Awbrig*** and ***Malabon*** soils also occur at the Biocycle Farm.

SIWF

- ***Salem.*** The Salem series consists of very deep, well-drained soils that formed gravelly medium and moderately fine-textured mixed alluvium over very gravelly coarse textured alluvium. They are on valley terraces at elevations of 100 to 800 feet. Slope gradients range from 0 to 12 percent. They are well-drained with slow runoff and moderately slow permeability over very rapid permeability. Salem soils are used for production of cereal grain, corn, pole beans, berries, orchards, pasture and hay. The native vegetation is ponderosa pine, Douglas fir, Oregon white oak, bigleaf maple, wild rose, and annual and perennial grasses.
- ***Coburg, Malabon*** and ***Awbrig*** soils also occur at the SIWF.

2.2.3 Geologic Hazards

Geologic hazards that reasonably could be expected to occur in the MWMC service area include seismic hazards (earthquakes), volcanic eruptions, and landslides. The following sections include a brief discussion of the geology and geologic hazards in the MWMC service area and a description of historical seismicity and the probability of a seismic event occurring within 60 miles of the Eugene-Springfield metropolitan area. It should be noted that the following discussion on geology was adapted from a geologic description originally published in the Aquatic and Riparian Habitat Assessment for the Eugene-Springfield Area, September 2002, Final Report, by the Eugene-Springfield Metropolitan Endangered Species Act Coordinating Team (MECT).

Geology

The landforms of the study area were created over millions to thousands of years ago by a combination of influences including ice ages, volcanism, and cataclysmic hydrologic events. The area is comprised of numerous geologic units that fall within three major geologic formations comprised of basaltic rock, Missoula flood deposits, and river alluvium. Basaltic units are found below the steeper slopes and their rock outcroppings form the southern boundary of the study area. Specifically, these hills were formed from andesitic basaltic or pyroclastic bedrock formed 10-25 million years ago (Thieman, 2000; U.S. Army Corps of Engineers, 1953). The Missoula flood deposits consist of that part of the main valley floor buried with silts deposited primarily during the Bretz Floods that filled the Willamette Valley with sediment 12,000-600,000 years ago (Allen et al., 1986). The third geologic formation is the river alluvium. This is the area within and near the rivers that has been scoured of silts left over from the Bretz Floods and is characterized by coarse sediments and gravel deposited by rivers originating in the Cascade Mountains (Figure 2.2.3-1).

Prior to the geologically recent series of ice ages (40-50 million years ago), the Willamette Valley was submerged under the Pacific Ocean. Fossil remains of marine mollusks, crabs, and sharks indicate that the climate was tropical (Thieman, 2000). From 25-40 million years ago, the Willamette Valley dried as the Coast Range rose from the ocean floor, blocking marine inundation. Two to three million years ago, a series of ice ages sent glaciers stretching south of Seattle (Kettler, 1995). Glacial melt water flooded the Willamette Valley, leaving behind till and debris (Thieman, 2000). During the Wisconsin ice age, for which there is the best geologic record, sea levels were significantly lower than they are currently

because most water was held on land in the form of ice. As the ice started to melt, however, both coastal and inland areas were inundated (Thieman, 2000; Allen et al., 1986).

The most recent significant geologic events that have shaped the Willamette Valley as we see it today are the Lake Missoula Floods, which occurred from 12,000-15,000 years ago. The most recent of these flood events is the Bretz Flood (Allen et al., 1986). Prior to the Bretz Flood, the Willamette Valley was likely much as it is now, although the valley was likely deeper and the Willamette and McKenzie Rivers larger, roaring with glacial melt from the ice-capped Cascades. Flooding from the Bretz Flood began far up the Columbia River Watershed in Montana and Idaho at Lake Missoula. Lake Missoula was an enormous lake formed behind large ice dams created by a glacial finger of the continental ice sheet that extended into northern Idaho. The ice dams broke suddenly and rapidly, allowing 500 cubic miles of lake water to rush out at 60 miles per hour in volumes greater than ten times the current volume of all the rivers on earth (Parfit, 1995). This flooding may have occurred a number of times starting 600,000 years ago. The most recent flood event, the Bretz Floods, occurred 12,000 years ago (Allen et al., 1986).

Flood water roared through Idaho and down the Columbia River, carrying boulders, icebergs, glacial wash, loess, and other materials from as far away as Idaho and eastern Washington down through the Columbia River Valley and into the Willamette Valley. Water was directed through two gaps at Lake Oswego and Oregon City when a hydraulic dam was created between Kalama Gap and Crown Point. Approximately a third of the flow in the Bretz Flood sluiced down the Willamette Valley. In effect, the Willamette Valley was a backwater alcove for the floods. Each flood inundated the Willamette Valley from the Columbia River as far south as Eugene under nearly 400 feet of water. This lake, named Lake Allison, was one of the four temporary major lakes formed by flooding, glacial melt, and impoundment, and extended as far south as Eugene. As water flowed farther down the valley, it slowed, leaving larger bedload materials lower in the valley and depositing silts and smaller materials farther south. The Eugene area, at the far end of Lake Allison's reach, experienced the finest deposition of silts and clays. Most of these depositions reach to the west of Eugene. These silts form the lower parts of the Willamette Silt soil type (Allen et al., 1986).

Seismic Hazards

The seismic hazards in the region result from three seismic sources: interplate (subduction) events, intraslab events, and crustal events. Each of these events has different causes, and therefore produces earthquakes with different characteristics (that is, peak ground accelerations, response spectra, and duration of strong shaking). All three types of earthquakes threaten the Eugene-Springfield area. However, because the strength of shaking decreases with increasing distance from the earthquake source, the most severe shaking will result from either shallow crustal earthquakes or great subduction zone earthquakes (Mabey and others, 1993).

Two of the potential seismic sources, subduction and intraslab events, are related to the subduction of the Juan de Fuca plate beneath the North American plate. Subduction events occur as a result of movement at the interface of these two tectonic plates. Intraslab events originate in the subducting tectonic plate, away from its edges, when built-up stresses in the subducting plate are released. These source mechanisms are referred to as the Cascadia

Subduction Zone (CSZ) source mechanism. The CSZ originates off the coast of Oregon and Washington and subducts beneath both states. The two source mechanisms associated with the CSZ currently are thought to be capable of producing moment magnitudes of approximately 9.0 and 7.5, respectively (Geomatrix, 1995).

Earthquakes caused by movements along shallow crustal faults, generally in the upper 10 to 15 miles, result in the third source mechanism. In Oregon, these movements occur on the crust of the North American tectonic plate when built-up stresses near the surface are released. According to the Oregon Department of Geology and Mineral Industries (DOGAMI), the two largest earthquakes in recent years in Oregon, Scotts Mills, (magnitude 5.6) and Klamath Falls main shocks (magnitude 5.9 and magnitude 6.0) of 1993 were crustal earthquakes (DOGAMI, 2004).

Historical Seismicity and Earthquake Risk and Probability

Two earthquake databases managed by the U.S. Geological Survey (USGS) National Earthquake Information Center were searched to identify magnitude and location of historical seismic events that have occurred within 60 miles of the Project site (USGS, 2001). The databases searched were, "USGS/NEIC 1973-Present," and "Significant U.S. Earthquakes (1568-1989)." These searches identified 31 seismic events of all magnitudes and intensities that occurred between 1892 and 2004 (the records are more complete for the time period from 1987 to present). Table 2.2.3-1 identifies only those seismic events that meet the following criteria:

- Magnitude and/or intensity data are available.
- The magnitude of the event is 3.0 or higher.
- The intensity of the event using the Modified Mercalli (MM) Intensity Scale (Table 2.2.3-2) is III or higher, or the event was actually "felt." For reference, an intensity of MM III is associated with shaking that is "felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake" (USGS, 2003). In comparison, an event with an intensity of MM VII would produce the following effects: "Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars"(USGS, 2003).
- The seismic event was not an aftershock associated with a larger quake at the same location.

TABLE 2.2.3-1
Historical Seismic Events That Have Occurred Within 60[1] Miles of the MWMC Service Area[2]
MWMC Facility Plan, Eugene-Springfield

Year	Month	Day	Latitude (° North)	Longitude (° West)	Magnitude[3]	Intensity[4]	Distance (miles)
1892	2	4	45.50	122.70	5.0	VF	35.4
1896	4	2	45.20	123.20	5.0	VF	12.4
1953	12	16	45.50	122.70	5.0	VIF	35.4

TABLE 2.2.3-1
Historical Seismic Events That Have Occurred Within 60[1] Miles of the MWMC Service Area[2]
MWMC Facility Plan, Eugene-Springfield

Year	Month	Day	Latitude (° North)	Longitude (° West)	Magnitude[3]	Intensity[4]	Distance (miles)
1957	11	17	45.30	123.80	4.0	VIF	40.4
1959	8	4	45.68	122.27	4.7	VF	57.8
1961	8	19	44.70	122.50	4.5	VIF	36.0
1961	11	7	45.70	122.40	4.5	VIF	54.7
1962	11	6	45.64	122.59	5.2	VIIF	46.6
1963	3	7	44.88	122.74	4.6	VF	19.3
1963	12	27	45.70	123.40	4.5	VIF	47.8
1987	10	2	45.63	122.65	3.0	IVF	44.1
1989	8	1	45.61	122.46	3.9	VF	47.8
1990	4	6	45.47	123.55	3.2	IIIF	37.3
1991	3	5	45.79	122.68	3.1	IVF	53.4
1991	7	22	45.64	122.87	3.5	IVF	41.0
1991	10	18	45.63	122.90	3.1	F	40.4
1991	10	21	45.63	122.89	3.0	IIIF	40.4
1993	3	25	45.03	122.61	5.7	VIIC	21.1
1993	3	25	45.03	122.60	3.0	F	21.7
1993	3	25	45.03	122.61	3.2	IVF	21.7
1993	3	26	45.04	122.62	3.0	--	21.1
1993	3	26	45.05	122.63	3.1	IVF	19.9
1993	6	8	45.03	122.60	3.7	IVF	21.7
1995	2	8	45.13	122.71	3.7	VF	17.4
1995	6	13	45.92	122.98	3.0	IVF	59.7
1996	8	2	44.98	122.65	3.3	F	19.9
1999	7	16	45.65	122.77	3.2	F	42.9
1999	11	25	45.12	122.78	3.4	VF	13.7
2003	4	24	45.64	122.75	3.9	IIIF	42.9
2003	7	25	45.64	122.74	3.0	IIIF	43.5
2004	2	26	45.65	122.75	3.0	IIIF	43.5

[1]The approximate center of the MWMC service area is located at latitude 45° 05' 00" N, longitude 123° 07' 00" W.

[2] Source: USGS Earthquake Hazards Program (see http://neic.usgs.gov/neis/epic/epic_circ.html). The database search included Significant U.S. Earthquakes 1568 to 1989 and USGS/NEIC (PDE) 1973-Present. The only earthquakes in the database recorded prior to 1953 include two events, in 1892 and 1896.

[3] Magnitude values are calculated by the USGS. Magnitude values are Local Magnitudes (LM) and Coda Duration Magnitude (MD). ML magnitude is generally referred to as the true "Richter magnitude." The values are computed for distances less than 600 km with depths less than 70 km. MD estimates are derived from the duration or coda length of earthquake vibrations. Duration or coda magnitude scales are normally adjusted to agree with ML(see http://neic.usgs.gov/neis/epic/code_magnitude.html).

[4] Modified Mercalli intensity scale. Dashed line equals no data for that event.

Based on information from the USGS database, numerous small earthquakes with magnitudes between 3 and 5 have occurred with 60 miles of the MWMC service area during historical times. The closest earthquakes were magnitude 5.0 and 3.4 events that occurred 12.4 and 13.7 miles from the approximate center of the service area. The largest historical event was an estimated magnitude 5.7 earthquake that occurred in 1993, approximately 21 miles from the center of the service area. As noted above, the two largest earthquakes in recent years in Oregon include the Scotts Mills, (magnitude 5.6) and Klamath Falls quakes (magnitude 5.9 and magnitude 6.0) of 1993 (both earthquakes were beyond the 60-mile radius noted in Table 2.2.3-1)

According to the Uniform Building Code Seismic Risk Map of the United States, the Eugene-Springfield metropolitan area (and most counties west of the crest of the Cascades, including the Willamette Valley and the Portland Metro area) are located in Seismic Zone 3 (UBC, 1997). This seismic zone corresponds to an intensity VIII earthquake on the MM Scale. An intensity VIII earthquake can produce slight damage in specially designed structures to considerable damage in ordinary substantial buildings, with partial collapse (see Table 2.2.3-2).

An earthquake magnitude of 9.0 was selected as being the controlling event at the Project site (USGS, 2003). The earthquake magnitude selected for the Project site was based on USGS deaggregation seismic hazard mapping for the Eugene-Springfield metropolitan area. The latitude and longitude of the approximate center of the site was entered into the USGS database to obtain seismic magnitude probability for the Project location. The USGS seismic hazard maps present the average magnitude of all potential sources at a given location, and provide the percent contribution at discrete locations of the overall seismic hazard. This magnitude event (9.0) corresponds to a 475-year mean return interval.

Seismic ground acceleration for the Project site was determined according to the National Earthquake Hazards Reduction Program (NEHRP) maps for probabilistic ground motion (FEMA, 1997), and the USGS National Seismic Hazard Mapping Project database. One of the values generally used to determine an earthquake's relation to building damage is peak ground acceleration (PGA). According to USGS, a PGA of 0.10 g (g equals the acceleration as a result of gravity) may be the approximate threshold of damage to older (pre-1965) dwellings or dwellings not made to resist earthquakes. In comparison, some post-1985 dwellings, built to California earthquake standards, have experienced severe shaking (0.60 g) with only chimney damage and damage to dwelling contents.

The PGA at the site corresponding to a 10 percent probability of exceedance in 50 years (approximately 475-year mean return period) is approximately 0.18 to 0.19 g at the bedrock surface. This value of PGA on rock is an average representation of the acceleration most likely to occur at the site for all seismic events (crustal, intraplate, or subduction) for the 475-year return period.

TABLE 2.2.3-2
Modified Mercalli Scale
MWMC Facility Plan, Eugene-Springfield

MM Intensity	Accel. %g	Description of Intensity Level
I	0.1	Not felt except by a very few under especially favorable circumstances.
II	0.2	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	0.3	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV	0.7	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	1.5	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	3	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	7	Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	15	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	32	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	70	Some well-built wooden structures destroyed; most masonry and frame structures with foundations destroyed. Rails bent.
XI	-	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	-	Damage total. Lines of sight and level distorted. Objects thrown into the air.

Note: The approximate values of acceleration shown are not part of the definition of MM intensity. The values are from Richter, C., *Elementary Seismology*, W.H. Freeman, 1958.

Liquefaction

Liquefaction is a phenomenon in which shaking of a saturated soil causes its material properties to change so that it behaves as a liquid. Lateral spreading is a liquefaction-induced hazard that involves the displacement of essentially intact blocks of soil either downslope or toward a free face, such as a river channel.

In the Eugene-Springfield area the lateral spread hazard ranges from none to moderate, with a moderate lateral-spread hazard within the Holocene meander belts of the Willamette and McKenzie Rivers. Soils that liquefy tend to be young, unconsolidated, water-saturated silts and sands with low clay content. Older (Pleistocene) gravels with a thin veneer of silt (outside the meander belt) or young (Holocene) sand and gravel (inside the meander belt) underlie that part of the Eugene-Springfield area potentially subject to liquefaction. Gravel will liquefy only under exceptional conditions. Within the modern meander belts of the

Willamette and McKenzie Rivers, shear wave velocity measurements indicate that the youngest sands and gravels may liquefy. This unit averages about 5 meters (approximately 16 feet) in thickness with a range of 0-8 meters (approximately 0-26 feet) (DOGAMI, 2000).

A seismic vulnerability evaluation was performed in 1996 to provide a preliminary opinion on major seismic weaknesses and deficiencies at the WPCF. The report revealed that the potential for liquefaction or other permanent ground deformation is low for all structures except the plant outfall (see Section 2.2.4).

Landslides

In the Eugene-Springfield area, slope instability from strong shaking could be a significant threat. However, the movement and characteristics of existing landslides are highly variable, ranging from active movement to stable. Although most earthquake-induced landslides occur in materials not previously involved in sliding (Keefer, 1984), it would require numerous site-specific studies to analyze landslide hazards in the area and to understand the nature of each of the landslides that currently exist in the Eugene-Springfield area. However, hazard characterizations for the area are provided on the Relative Earthquake Hazard Map of the Eugene-Springfield Metropolitan Area (Figure 2.2.3-2).

Seismic Hazard Map

Areas prone to seismic hazards in the Eugene-Springfield area are identified on the Relative Earthquake Hazard Map of the Eugene-Springfield Metropolitan Area[2] (Figure 2.2.3-2) (DOGAMI, 2000). The map depicts the relative risk of earthquake damage that results from local geologic conditions. The composite hazard map was developed by combining single hazard maps for ground motion amplification, and slope instability. The single component maps were developed to show geographic patterns of stronger earthquake effects for two likely sources. Zones that are expected to have the most pronounced damage in any moderate or larger earthquake are shown on the map as having the greatest hazard.

2.2.4 Public Health Hazards

Four types of potential public health hazards were evaluated for the WPCF:

- Air pollution resulting from chlorine or sulfur dioxide releases at the facility
- Air pollution from other facility sources (e.g., wind-blown dust or combustion engine exhaust)
- Worker or public exposure to chlorine or sulfur dioxide, or physical collapse of onsite buildings due to seismic instability
- Potential biohazard from spill of biosolids during offsite transport

[2] The map depicts earthquake hazard zones that are based on limited geologic and geophysical data. The map is not a substitute for site-specific investigations by qualified practitioners. At any point in the map area, site-specific investigations may give results that differ from those shown on the map. For a complete understanding of the earthquake hazard, consultation of the following DOGAMI publication is also recommended: Madin, I.P., and Mabey, M.A., 1996. Earthquake Hazard Maps for Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS100.

The first potential public health hazard (chlorine or sulfur dioxide release) is addressed under EPA's Risk Management Program (RMP) rule. This rule, developed in 1996 following guidance under the Clean Air Act Amendments of 1990, requires companies using more than threshold quantities of certain flammable and toxic substances to develop a Risk Management Plan (RMP). Risk Management Plans include the following features (EPA, 2002):

- **Hazard assessment** detailing potential effects of an accidental release, an accident history over the last 5 years, and an evaluation of worst-case and alternative accidental releases
- **Prevention program** describing safety precautions and maintenance, monitoring, and employee training measures
- **Emergency response program** detailing emergency health care, employee training measures, and procedures for informing the public and response agencies if an accident occurs

Chlorine and Sulfur Dioxide

Usage at Existing Facilities

Currently, the WPCF uses chlorine gas for disinfection of effluent prior to wastewater discharge into the Willamette River. Chlorine has been an effective disinfectant at the WPCF. No chemical release accidents resulting in injury to facility workers or the public have occurred in facility history. Disinfected wastewater has met permit requirements consistently since plant startup in 1984.

Sulfur dioxide gas is used to dechlorinate WPCF effluent prior to discharge into the Willamette River. Sulfur dioxide is transported to the WPCF in pressurized 1-ton containers. It is metered by one to two sulfonators to the effluent channel just upstream of the outfall pipe. The sulfur dioxide system has proven effective in controlling chlorine residual to meet effluent requirements.

A 2-ton capacity emergency scrubber is located in the chemical building. The neutralizing chemical in the scrubber used during a chlorine or sulfur dioxide leak is sodium hydroxide. The scrubber has been operational since plant startup.

Accident History for Chlorine and Sulfur Dioxide

No accidents involving chlorine or sulfur dioxide releases have occurred on Oregon roads since 1980, according to the Oregon Department of Transportation - Accident Data Unit (ODOT-ADU; 2004). No reportable leaks of sulfur dioxide have occurred since plant startup in 1984. No reportable chlorine leaks occurred at the plant between 1984 and August 14, 1993. On August 15, 1993, the plant experienced a major chlorine leak totaling 1,300 pounds. The leak occurred when a galvanized nipple on an in-use cylinder, with contents remaining, was exposed to liquid chlorine from a leak caused by a ruptured disc. The leak was fully contained within the chemical storage building and contaminated air was neutralized by emergency scrubbers prior to release. No plant personnel were injured, and the leak posed no public health hazard. Between August 16, 1993 and July 15, 1996, four minor chlorine leaks of less than one pound each occurred at the facility. Since July 1996, nine additional minor leaks occurred. These minor leaks were fully contained, and the air was scrubbed

prior to release. The minor leaks have mainly been from connections at gaskets, valves, and other seals.

EPA Risk Management Program Regulation

Chlorine (threshold quantity > 2,500 pounds) and sulfur dioxide (threshold quantity > 5,000 pounds) are regulated under RMP guidelines. WPCF plant operations exceed these threshold quantities; therefore, the EPA RMP rule applies to the WPCF. Under the RMP rule, the WPCF was required to prepare an RMP by June 21, 1999. The WPCF is operating under an RMP and will update the Plan (following the RMP rule for 5-year updates) in 2004.

Hazard Assessment

Under the RMP rule, the hazard assessment focused on the offsite environment and neighbors around the facility. The assessment included an evaluation using an EPA air dispersion computer model[3]. The results of the assessment were based on a range of releases, including worst-case and alternative release scenarios, an analysis of potential offsite consequences, and a 5-year accident history at the facility. The worst-case scenario involves 100 percent release of a 1-ton container of chlorine or sulfur dioxide. The model calculates the concentration of the chemical in a dispersion pattern of 360 degrees until an endpoint of three parts per million (ppm) is reached (City of Eugene, 2001).

The alternative scenarios were determined by facility staff in accordance with typical accidents, such as leaks during container exchanges. In all release scenarios, the regulated substance concentrations at the nearest public and/or environmental receptor were estimated based on either air dispersion models or other available data.

For the worst-case scenario, the computer model indicated that an endpoint concentration of three ppm chlorine would reach a distance of 0.9 mile from the source. However, an important feature of the facility is the fact that both chlorine and sulfur dioxide are stored within a containment building constructed specifically for the purpose. The structure is constructed of concrete and steel, so the risk from fire is negligible. The containment building is designed with tight-fitting doors and normally closed inlet louvers to contain a potential leak and to facilitate the use of a chemical scrubber system. In addition, air dispersion models are intentionally conservative in nature. This means the endpoint concentration of three ppm would not likely reach a distance of 0.9-mile as suggested by the model.

For the alternative scenario[4], the endpoint concentration was reached at a distance of less than 0.1 mile. The radius does cross the fenceline of the facility on the east side, but no dwellings exist in this area. The only offsite consequences under this scenario are a bike path, and a recreational vehicle dump site on the north side. Both chlorine and sulfur

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[3] The scenario was modeled using RMP*Comp version 1.06, which is available via the Internet from EPA's CEPPO Web site. Only passive mitigation is allowed in this scenario, so the containment building was factored in at 55 percent according to guidance documents. The containment building at the facility would exceed the passive mitigation factor of 55 percent.

[4] The alternative release scenario allows the use of active mitigation such as the scrubber system. The scrubber system was assumed to be 99 percent efficient and the endpoint concentration was reached at a distance of less than 0.1 miles. he scenario itself was based on a break in a one-inch pipeline used to transport liquid chlorine or sulfur dioxide from the cylinder to the evaporator. A pipeline break was chosen for the analysis not because it represents the most likely scenario, but it does represent a more conservative estimate. The release rate from the broken pipeline in pounds per minute was determined using tables furnished in the guidance documents from EPA for wastewater treatment facilities.

dioxide were analyzed under the alternative release scenario and similar endpoints were determined.

Prevention Program

The EPA prevention program is a substantial element of the RMP rule. This program focuses on employees at the facility and includes a list of ten components of compliance. These components can be satisfied by complying with similar requirements of the Occupational Safety and Health Association (OSHA) Process Safety Management (PSM) program. The WPCF met the final OSHA PSM compliance deadline of May 1997.

Risk Management Plan

The risk management component of the RMP consists of completing general paperwork and submitting it to responsible agencies and to the public. The risk management section completed for the WPCF includes the following sections:

- Description of major hazards, such as equipment failure, human error, and natural phenomena, that could lead to a significant accidental release
- Description of the consequences of failing to control for major hazards
- Summary of all actions taken or planned to address these hazards, including starting states
- Methods for prevention or mitigation of significant accidental releases

Public Health Risk from Chlorine and Sulfur Dioxide

Chlorine and sulfur dioxide are extremely hazardous substances. Increasing concerns about security and the potential severity of life safety consequences of an uncontrolled major release resulted in a review of alternative disinfection technologies. The MWMC is interested in replacing gaseous chemical disinfection with a safer alternative disinfection technology such as hypochlorite and bisulfite solutions. Until then, the risks associated with the use of chlorine and sulfur dioxide will continue to be managed through controls such as regular maintenance, engineering features to contain and treat contaminated air, training and work rules at the facility, and operational safety procedures.

Air Toxics and Regulatory Assessment

Based on regulatory review, there are no significant, outstanding air quality compliance issues for the WPCF. The facility is in compliance with all federal regulations and with requirements of the Lane Regional Air Pollution Authority (LRAPA), the primary agency working with WPCF Regional Wastewater Program staff on air quality issues.

An emissions inventory was conducted in 1997 to identify and describe all possible sources of air emissions found at the WPCF. Calculations based on EPA-approved/reviewed methodologies were performed for the significant emissions sources identified at the WPCF. The results indicate that the WPCF is not a major source of criteria pollutants or hazardous air pollutants (HAPs) (see Section 2.2.8).

Given the chlorine and sulfur dioxide storage capacities at the WPCF, the facility is required under federal rule to implement an RMP. The WPCF currently is operating under an EPA RMP No. 1000 0006 0293 and filed for resubmittal in June 2004.

- Future issues that could prompt compliance-related discussions with LRAPA include:
- Public nuisance issues
- Dust blowing off site
- Emissions from internal combustion engines on site

Proactive air quality measures currently are in place at the facility to achieve the following:

- Identification of the next project activity that is likely to require an LRAPA permit and activities necessary to meet the permit/construction schedule
- Review of the air emission inventory list on file with LRAPA, and identification of any additional emissions units or emissions activities that could be updated or expanded
- Tracking of emerging regulatory issues

Public Health Risk from Air Emissions

The WPCF currently is in compliance with federal air quality regulations and with LRAPA guidelines (see Section 2.2.8). Public health risks from WPCF-related air quality issues are low.

Seismic Vulnerability

A seismic vulnerability evaluation was performed in 1996 to provide a preliminary opinion on major seismic weaknesses and deficiencies at the WPCF.

The evaluation indicated that the existing facility is in good repair, with no signs of damage from past wind storms or seismic events. Potential for liquefaction or other permanent ground deformation is low for all structures except the plant outfall. Forty-two seismic deficiencies for individual elements at the plant were discovered, and short-term improvements were recommended for 16 of the 42. Structural improvements were completed in 1998 for the following facilities:

- Sludge transfer pump station building
- Gas mixing building No. 2
- Pretreatment facility building
- Secondary control complex building
- Maintenance building
- Final treatment complex

The upgrade qualified all nine buildings to meet the current building code requirements for seismic loading.

Public Health Risk from Catastrophic Release of Chlorine and Sulfur Dioxide

Structural deficiencies at the plant could pose health risks if a seismic event resulted in structural damage to facilities and building collapse (risk to plant workers), or chemical release (risk to plant workers and the public). However, the recommended seismic upgrades have been completed and, therefore, potential public health risks from seismic activity near the WPCF are low. Additional information on the RMP for chlorine and sulfur dioxide is presented above.

Biosolids Transport

Biosolids are transported from the WPCF via pipeline to the BMF at a separate site. There, they are put into a sludge lagoon and subsequently processed (dewatered). The dewatered cake is transported via trucks to cooperative farms for land application. These are Class B biosolids, highly regulated, and not fit for land application on crops for human consumption. Alternatively, biosolids will be pumped in liquid form to the Biocycle Farm for liquid land application, or dewatered cake will be transported via truck for land application. Because biosolids are transported offsite, via pumping or by truck, and spread for land application, there is potential for a spill. However, a cleanup and response protocol for biosolids spills is in place, and the potential for public health hazards resulting from a biosolids spills is low.

Public Health Risks from Biosolids Transport

As noted above, biosolids are transported to onsite application areas through an enclosed biosolids distribution system, and dewatered cake is transported via trucks to cooperative farms for land application. If additional neighboring land is required for disposal, biosolids will be transported off site by truck. MWMC has developed a spill response plan that details actions to take in the event of a biosolids spill. The plan includes over-the-road spill response and clean-up procedures[5].

2.2.5 Energy Management and Consumption

During development of the 1997 Master Plan (CH2M HILL, 1997), a condition assessment of the WPCF was performed. This evaluation confirmed that the facility's energy consumption is extremely low in comparison to other similar treatment facilities. The plant operating staff has been very cognizant of energy consumption in the operation of the facility, and has been aggressive in both implementing improvements to reduce energy consumption and in obtaining grant funding to implement those improvements. Staff also have further managed continuous improvement of energy consumption through development and implementation of a Environmental Management System. The WPCF is ISO 14001 certified and includes an ongoing objective to reduce energy consumption. Numerous work programs have been implemented that include targets and measures to manage its continuous improvement strategy.

Table 2.2.5-1 shows the annual energy consumption on a per million gallon treated basis for 10 years. Also shown is the typical range of energy consumption for an activated sludge secondary treatment plant. Energy consumption in 1997 was unusually low because it was a particularly wet year. Rainfall for the year totaled 42 inches, measured at the Eugene Airport, as opposed to 26 inches, which is typical for the Eugene-Springfield area from January to June (1995-96 Weathernet, Inc., data from 1961-90). As a result, although more wastewater was treated, additional energy was required simply for pumping the wastewater, not necessarily additional pollutant removal, which is the more energy-intensive portion of the process.

[5] MWMC's biosolids spill response and cleanup procedures are adapted from the Biosolids Hauler Spill Response Procedure—CWEA Manual of Good Practice for Agricultural Land Application of Biosolids, 1998.

TABLE 2.2.5-1
Energy Consumption During Fiscal Years 1994-2003
MWMC Facility Plan, Eugene-Springfield

Year	Unit Energy Consumption (kWh/MG)
FY 1994	1,386
FY 1995	1,221
FY 1996	1014
FY 1997	914
FY 1998	1094
FY 1999	1085
FY 2000	1059
FY 2001	1075
FY 2002	1006
FY 2003	1105
Typical range for activated sludge plant	1,300 to 2,300

Additionally, the energy audit determined that management of peak demands (i.e., the instantaneous power requirement) is excellent at the facility. The WPCF's load factor (the ratio of average energy use –to peak energy use) is approximately 77 percent, a number significantly above typical treatment plants and nearing the 80 percent load factors of such highly managed facilities as hospitals. High peak demand requirements (i.e., low load factors) are typically a major contributor to the overall cost of energy in a treatment plant. To reduce energy demand at the WPCF, MWMC employs management practices such as control schemes that inhibit the simultaneous operation of large horsepower motors during equipment staging, and operator awareness training aimed at eliminating overlapping operation of large energy users during startup and shutdown procedures.

2.2.6 Water Resources

The following discussion focuses on water quality parameters including maximum water temperature, bacteria, heavy metals and nutrients. Each represents a class of pollutants that have the potential to influence fish and other aquatic organisms. In the discussion regarding bacteria, nutrients, and heavy metals, data obtained from ambient monitoring programs in rivers and streams have been separated from data obtained by sampling stormwater discharges during wet weather events. Typically, pollutant concentrations of bacteria, nutrients, and heavy metals are higher in wet weather stormwater discharges than in rivers and streams. The water quality monitoring programs that generate data used for this study do not include analysis for pesticides. Because the mainstem of the Willamette River is the water body that would be most directly affected by potential expansion of major MWMC facilities, this section only examines selected characteristics for water quality in the mainstem. For a more detailed description and comparison of treated wastewater discharge

and water quality in the Willamette River in the vicinity of the WPCF outfall, see section 5.3, Water Quality Impact.

It should be noted that the following discussion on water quality was adapted from a description on water quality originally published in the Aquatic and Riparian Habitat Assessment for the Eugene-Springfield Area, September 2002, Final Report, by the Eugene-Springfield MECT (MECT, 2002).

Natural Influences on Water Quality

Streams in the MWMC study area (e.g., Amazon Creek, Willow Creek) are influenced primarily by the geology of the flat valley floor, a landscape that does not promote infiltration of water or delayed release of winter precipitation into the dry season. These water bodies tend to warm quickly in the summer and are relatively high in sediment and nutrients at other times of the year.

Water quality in the mainstem of the Willamette River is directly affected by underlying surface geology. Creeks and rivers that flow into the Willamette mainstem upstream of the MWMC service area (i.e., McKenzie River and Middle Fork Willamette River) originate in the Cascade Mountains in porous rock that is young in geologic age and favors deep infiltration and delayed transfer of water to channels, where there are few opportunities for warming and incorporation of nutrients or other substances. Further downstream, these two rivers flow through rock of older geologic age consisting of porous, fractured basalt that also promote deep infiltration of runoff and delayed transfer of water to the rivers, although the effect is not as significant as further upstream. Upon reaching the flat valley bottoms, groundwater influx to the rivers is low, warming accelerates, fine-grained substrates that line the stream banks are readily incorporated, and nutrient-rich lenses of water within the Missoula flood deposits leach into the rivers.

Human Influences on Water Quality

In addition to structural modifications to water bodies in the area such as channelization and dredging, human influence on the river includes non-point source discharges from stormwater runoff and permitted point source discharges. Permitted discharges include discharge of treated sanitary wastewater into the Coast Fork downstream of Cottage Grove, and into the Willamette River downstream of Eugene. In addition, cooling water is discharged from power generation facilities at the University of Oregon into the Eugene Mill Race (an artificial side channel of the Willamette River), and from both treated and non-contact process water from numerous industries in both Eugene and Springfield that discharge to the McKenzie and Willamette rivers. Other activities upstream of the study area may result in water quality changes.

These activities and possible altered parameters include forestry (sediment, herbicides, temperature), agriculture (sediment, herbicides, nutrients, pesticides, bacteria, temperature), rural residences (sediment, bacteria, nutrients, temperature), and old mines (heavy metals).

Water Temperature

Per DEQ Figure 340A (OAR 340-041-0340), the upper Willamette River includes a designation of salmon and trout rearing and migration fish use. The Oregon water temperature standard in a basin for which salmon and trout rearing and migration is a

designated beneficial use is 64.4º F (OAR 340-041-0028(4)(c)). Per DEQ Figure 340B (OAR 340-041-0340), the upper Willamette River also includes a designation of salmon and steelhead spawning fish use from October 15 through May 15. The Oregon water temperature standard in a basin for which salmon and steelhead spawning is a designated beneficial use is 55.4º F (OAR 340-041-0028(4)(a)). Although the Willamette River may exceed these standards, the aim of the standard is to protect beneficial uses most sensitive to water temperature—in this instance, salmonid fish. The mainstem Willamette River exceeds the numeric criteria and, therefore, the river has been identified as water quality-limited for temperature.

In order to determine the magnitude of the temperature change on the Willamette River, the WPCF wastewater staff collected in-stream temperature data in 2003 at locations upstream and downstream of the diffuser outfall, and of WPCF effluent[6]. The sections below discuss results of the in-stream temperature monitoring program.

MWMC staff believe the impact of the WPCF effluent on the actual Willamette River temperature is insignificant because:

- Temperature-monitoring results for the period of April to November 2003 show that river temperatures downstream of the outfall are less than those measured upstream. These results are consistent with those reported to the DEQ for river temperature monitoring done in 2002.
- Under conditions of 7Q10 river flow[7] and maximum measured effluent temperature, the calculated temperature increase of the Willamette River downstream of the WPCF outfall at the edge of the mixing zone is 0.3 F˚, less than the 0.5 F˚ human use allowance specified under OAR 340-41-0028(12)(b)(A).
- Daily regulatory mixing zone (RMZ) calculated temperatures using upstream temperature and plant effluent data, and a mixing ratio of Willamette River flow to effluent flow of 12:1, indicate no exceedance of the 0.5 F˚ human use allowance over the monitoring period. Similarly, no exceedance was observed for maximum 7-day average temperatures.

In the unlikely event that the Willamette River were to somehow achieve the 64.4º F criteria from May 15 through October 15 at some point in the future, then the WPCF effluent would potentially have a significant impact.

In addition, management staff anticipate that the WPCF will not be a significant thermal load source under the biologically based numeric criteria of 55.4 ˚F (13 ˚C) for salmon and steelhead spawning from October 15 through May 15, and a human use allowance temperature increase of 0.5 F˚ (0.3 C˚).

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[6] In addition, probes were deployed throughout the plant to evaluate the relative temperature change over each treatment stage. Monitoring locations included the influent waste stream, preliminary treatment, primary clarification, activated sludge return, aeration, and secondary clarification. These data were used to assess waste stream thermal loads due to treatment processes, and to aid E-S wastewater management staff in assessing options for process temperature management.

[7] The 7Q10 refers to the lowest consecutive 7 day streamflow that is likely to occur in a ten year period. It is used by many states and the federal government in setting discharge limits in NPDES water quality permits. A permit will only be granted if the proposed amount of pollutant that will be discharged into a river will not significantly impair the designated uses, such as drinking or swimming, when the streamflow falls to the 7Q10 level.

To put the water temperature data in perspective, in general, the coolness of water at night has some bearing on the ability of cool-water fish to withstand maximum water temperatures during the day. Because fish are cold-blooded, their energy needs increase with increasing water temperature. Trout usually leave water that regularly exceeds 70° F during the day. Rivers and streams with low water temperature at night enable fish to rejuvenate and be better prepared for the next day's increased water temperatures.

Bacteria

Monitoring for *E. coli* in the Willamette River in the MWMC service area has occurred over a number of years and for a large number of sites. The mainstem of the Willamette River had no exceedances of the state water quality standard.

Currently, *Escherichia coli* (abbreviated as *E. coli*) is widely used as an indicator organism to evaluate the level of harmful bacterial contamination in water. In Oregon, the receiving water quality standard for *E. coli* is 406 organisms/100 milliliter (mL) to protect swimming and aquatic life; the drinking water standard is <1 organisms/100 mL. The point source discharge criteria is a 30-day log mean of 126 organisms per 100/mL and no single sample shall exceed 406 organisms per 100/mL. These organisms, along with other, more harmful types, have their origin in the intestinal tracts of humans and some animals. While *E. coli* counts alone do not measure contamination risk for humans, they are indicative of whether or not treated wastewater is being properly disinfected before discharge, whether collection system overflows are occurring, and the quality of stormwater entering rivers and streams. Perhaps more importantly, they are indicators of potentially more significant water quality issues that are generally associated with land development.

Although naturally occurring bacteria in streams generally have no affect on fish, other aquatic organisms, or wildlife, certain types of bacteria or high concentrations may pose a health risk to people through recreational contact with the water. In addition to bacteria, other water-borne protozoa and disease-causing microorganisms can adversely affect human and animal health. Because of the number of various organisms with the potential to affect health, monitoring commonly focuses on easily-detected but relatively harmless bacterium that frequently occur with the other, more harmful varieties.

Heavy Metals

Heavy metal concentrations in Oregon streams and rivers are generally well below water quality standards. Where concentrations above water quality standards are found, it is usually a result of contamination from human sources, such as industrial sites, paved surfaces, mining operations, galvanized metal siding and roofs on buildings, and water treatment plants. Aquatic insects and algae are organisms most affected by high concentrations of heavy metals, many of which readily adhere to sediment particles so they may not appear in the water column except at short distances downstream from their source.

With few exceptions, heavy metal concentrations in the Willamette River are, on average, less than the water quality criteria specified by DEQ. In many instances, the concentrations are several orders of magnitude less than the criteria. Water quality data in the MWMC service area are available for a number of heavy metals that are harmful to aquatic life, such as zinc, cadmium, chromium, copper, lead, mercury, and nickel. Above a certain

concentration, these metals have been determined to be toxic to aquatic life; thus, the Oregon DEQ has established a set of water quality standards for their protection. These are specified in OAR 340-41. When applicable, the standards consider water hardness (a measure of mineral salts dissolved in the water). A discussion of the heavy metals found in the Willamette River within the MWMC service area is presented below.

Mercury has been found in some species of fish caught in the Willamette River and its major tributaries. The mercury in the fish is believed to come from natural volcanic and mineral sources and mining wastes in the headwaters of the Willamette River, and from human sources along the river. Fish with high levels of mercury are resident fish that eat other fish, such as largemouth bass and northern pike minnow. Potential sources of human-derived mercury include household products, food products, dental waste, wrecking yards (mercury-based automobile switches), fluorescent and compact lamps, and deposition of air-borne particles.

In Lane County, perhaps one of the largest single sources of mercury in the Coast Fork Willamette River is runoff from the Black Butte mine, which was once the second largest mercury mine in Oregon until operations ceased in 1968. It is estimated that mine tailings on the site contain about 90,000 pounds of mercury, and that between 180 and 1,800 pounds of mercury is potentially mobilized into the environment each year (Weiss and Wright, 2001). The Oregon DEQ is currently conducting a TDML study of mercury in the Willamette basin. The Oregon Health Division has issued a health advisory for mercury in fish for the Willamette River.

Ambient water quality monitoring of the Willamette River at four stations above, within, and below the Eugene-Springfield urban growth boundary suggests minimal mercury discharges from urban stormwater runoff and permitted point-source discharges. The average total mercury concentration upstream of the urban growth boundary is 0.00217 µg/L, while the average downstream of the urban growth boundary is 0.00232 µg/L. Effluent from the Eugene-Springfield wastewater treatment plant averages 0.00553 µg/L of mercury. These values are lower than the state chronic criteria standard of 0.012 µg/L. Flow-weighted averages for those days on which samples were collected are 60 grams per day (g/day) of mercury in the Willamette River, and 0.71 g/day of mercury in effluent from the treatment plant. The City of Eugene reported no statistically significant difference between mercury concentrations detected upgradient and downgradient of the urban growth boundary.

An evaluation of the long-term concentration trends for metals by the City of Eugene found that arsenic was decreasing over time. This was the only analyte demonstrating a statistically significant trend. Arsenic, a metalloid, is included in this discussion because it is toxic to aquatic organisms. Its chronic criterion is 48 µg/L and it is hardness- dependent. The decreasing trend is significant at 1 percent; that is, there is a 1 percent probability that the observed trend is caused by random sample variability. The cause for the decreasing trend is unknown, although changes in land use or practices within the drainage basin could lead to this phenomenon.

Nutrients

The productivity of fish and their food base hinges on the amount of bioavailable nitrogen and phosphorus in the water. In natural waters of the Pacific Northwest, phosphorus is usually the nutrient that limits primary productivity, which includes algae and zooplankton. This means that, unless extra phosphorus becomes available, there will still be spare bioavailable nitrogen in the water column.

Phosphorous

The bioavailable form of phosphorus is referred to as soluble reactive phosphorus. There is another portion that is attached to sediment particles that is not immediately available for uptake by aquatic organisms, but has the potential to be released into the water column if dissolved oxygen levels become low. Shallow reservoirs, such as Fern Ridge Reservoir, can have low dissolved oxygen levels and release phosphorus from sediments, especially at night and during early fall when plant material begins dying off.

Median values for total phosphorus concentrations are relatively low in the Willamette River upstream of the urban growth boundary at 0.03mg/L, and rise slightly to 0.06 mg/L downstream of the urban growth boundary near the Beltline Road bridge (MECT, 2002).

Nitrogen

Nitrogen has three bioavailable forms that include nitrate ($NO3^-$), nitrite ($NO2^-$), and ammonia. The term ammonia refers to two chemical species that are in equilibrium in water: un-ionized (NH3), and ionized (NH4+). Tests for ammonia usually measure total ammonia; that is, NH3 plus NH4+. The toxicity of ammonia is primarily attributable to the un-ionized NH3, as opposed to the ionized form NH4+. In general, the toxicity of NH3 to fish is a function of pH and water temperature. In the presence of NH3, an increase in either pH or temperature can be harmful to aquatic organisms.

Nitrite ($NO2^-$) and ammonium (NH4+) are rarely found in Pacific Northwest streams and rivers except immediately downstream of point sources of pollution because chemical and biochemical processes in a river quickly transform them into nitrate. Consequently, most bioavailable nitrogen in the Pacific Northwest is in the form of nitrate for streams, rivers, and groundwater. Nitrate and nitrite data evaluated below are reported as nitrate plus nitrite as nitrogen. This is abbreviated to the form NO3+NO2 (as N).

Median values for combined nitrate+nitrite as nitrogen (NO3+NO2 as N) are 0.03 mg/L in the Willamette River upstream of the urban growth boundary, and rise slightly to 0.10 mg/L downstream of the Beltline Road bridge (MECT, 2002). A review of the long-term trend of NO3+NO2 data downstream of the urban growth boundary shows that concentrations are increasing with time. This is likely the result of continued development of land immediately upstream of the monitoring location.

Stormwater

The median value for total phosphorus at all composite stormwater-monitoring sites in Eugene is 0.25 mg/L, with values ranging from 0.09 to 11 mg/L. Concentrations of NO3+NO2 (as N) in Eugene stormwater samples ranged from not detected to 3.7 mg/L; the median was 0.06 mg/L. Sources for NO3+NO2 (as N) are similar to those for phosphorus. Phosphorus in stormwater drains is likely a combination of runoff containing fertilizers, soaps, animal feces, soil erosion, atmospheric deposition, and potential leakage of hookups from adjacent sewage pipes or industrial sources.

Summary

As the Willamette River flows through the study area, it experiences increases in pollutants that can be tied to human activities, but concentrations are far below state water quality standards (*E. coli* and total zinc) or levels of concern (nitrogen and phosphorus). Nevertheless, nitrogen concentrations have been increasing in recent years. Arsenic, copper, lead, zinc, *E. coli*, nitrogen, and phosphorus are, on average, statistically lower in the Willamette River upstream of the Eugene-Springfield urban growth area than at downstream locations.

2.2.7 Flora and Fauna

This section provides a general description of wildlife species and habitat conditions in the vicinity of the MWMC BMF, SIWF, Biocycle Farm, and WPCF. Because of the potential for expansion of these facilities, this section focuses on habitat in and along the stretch of the Willamette River in the immediate vicinity of the above mentioned facilities (Figure 2.2.7-1).

Habitat Types in the Eugene Metropolitan Area

According to the Aquatic and Riparian Habitat Assessment for the Eugene-Springfield Area (MECT, 2002), greater than 85 percent of the land area immediately (within 100 feet) surrounding the Upper Willamette River in Eugene (River Reaches 15-21) is vegetated. Of the vegetated land, approximately 75 percent supports hardwood trees, 13 percent supports shrubs, and 13 percent is pastureland, fields, or grass. Approximately 14 percent of land along the Upper Willamette River is not vegetated, with 5 percent of total riverside land covered by gravel bars and greater than 9 percent of the land developed (Table 2.2.7-1; Figure 2.2.7-2).

TABLE 2.2.7-1
Percent Vegetated Areas, Developed Areas, and Gravel Bars Within 100 Feet of the Upper Willamette River (River Reaches 15-21), Eugene, Oregon[1]
MWMC Facility Plan, Eugene-Springfield

Area Description	Percent (%) of Total Area
Hardwood trees	64.1
Shrubs (including Willow)	10.8
Grass, pasture, fields	10.7
Total Vegetated	*85.6%*
Gravel Bars	4.8
Developed Areas	9.5

TABLE 2.2.7-1
Percent Vegetated Areas, Developed Areas, and Gravel Bars Within 100 Feet of the Upper Willamette River (River Reaches 15-21), Eugene, Oregon[1]
MWMC Facility Plan, Eugene-Springfield

Area Description	Percent (%) of Total Area
Total Nonvegetated	*14.3%*
Total	100%

[1]Adapted from MECT, 2002.

Wildlife habitat along or near the Willamette River and its tributaries includes riparian habitat and wetland areas.

Riparian Habitat

Riparian areas are transitional between aquatic and upland habitat and, as such, support elements of both aquatic and terrestrial ecosystems (Lev, 1988). A 1987-1988 survey by Lev (Lev, 1988) describes vegetation and wildlife species common in riparian habitat in the Eugene-Springfield metropolitan area. Riparian vegetation within the metropolitan area is characterized by herbaceous ground cover, understory shrubs, and deciduous (hardwood) trees. Plant species common in riparian habitat in the Eugene-Springfield area include black cottonwood (*Populus trichocarpa*), willow (*Salix* spp.), Oregon white ash, creek dogwood (*Cornus stolinifera*), snowberry (*Symphoricarpos albus*), Himalayan blackberry (*Rubus discolor*), rush species (*Juncus* spp.), sedge species (*Carex* spp.), and reed canarygrass (*Phalaris arundinaceae*). Other plant species found in area riparian habitat include English hawthorne (*Crataegus monogyna*) and cattail (*Typha latifolia*).

Riparian areas in the Eugene metropolitan area provide habitat for a variety of wildlife. Mammals common in these riparian areas include raccoon (*Procyon lotor*), beaver (*Castor canadensis*), nutria (*Myocastor coypus*), and bats. Willamette River habitat supports as many as 173 species of birds (Roesler, 2004), including wading birds (e.g., great blue heron [*Ardea herodias*], waterfowl (e.g., mallard ducks [*Anas platyrhynchos*]), shorebirds, raptors (e.g., osprey [*Pandion haliaetus*], red-tailed hawks [*Buteo jamaicensis*], and bald eagles [*Haliaeetus leucocephalus*]), kingfishers (*Ceryle alcyon*), and a variety of passerine birds (e.g., warblers and swallows) (Lev, 1988; CH2M HILL, 2001). In addition to birds and mammals, as many as 14 species of amphibians and reptiles, such as the western pond turtle (*Clemmys marmorata*) use Willamette River riparian habitat (Roesler, year). The riparian corridors serve as travel routes for wildlife between wetland and upland areas and as stopover sites for migrating birds (Lev, 1988).

The Willamette River and its tributaries are the primary riparian features in the vicinity of the WPCF. Following primary treatment (scum and solid removal), secondary treatment (bacterial digestion), and final processing (chlorination followed by addition of sulfur dioxide to dechlorinate), effluent is discharged into the Willamette River (City of Eugene Public Works Department, 2003a).

Wetland Habitat

The U.S. Fish and Wildlife Service (USFWS) defines wetlands as follows (USFWS, 2004):

- Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Additionally, wetlands have one or more of the following attributes:
  - At least periodically, the land supports predominantly hydrophytes
  - The substrate is predominantly undrained hydric soil
  - The substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year

Wetlands in the Eugene-Springfield metropolitan area are characterized by plant species such as willow, Douglas spirea (*Spirea douglasii*), least spikerush (*Eleocharis acicularis*), reed canarygrass, rushes, sedges, cattail, and introduced species such as grasses (*Poa* spp., *Fescue* spp., *Canthonia californica*), hawthorne, and Himalayan blackberry. These metropolitan wetlands support a variety of wildlife, including reptiles (e.g., Western pond turtle[*Clemmys marmorata]*), amphibians (Clouded salamander [*Aneides ferreus*], birds (e.g., great blue heron, mallard, red-winged blackbird [*Agelaius phoeniceus*]), and mammals (e.g., nutria, raccoon, beaver, red fox [*Vulpes vulpes*]) (Lev, 1988). The location of wetland areas at or near the WPCF, as well as in the vicinity of the Biosolids Waste Management Facility and Seasonal Industrial Waste Facility are shown on Figure 2.2.7-3.

Threatened, Endangered, and Sensitive Species

Riparian and wetland habitat in the Eugene Metropolitan area supports several species listed under the Endangered Species Act (ESA) as Federally or State Endangered or Threatened, or as Federal Species of Concern or State Sensitive Species. Such designated species observed or likely to occur in Willamette River riparian and/or wetland habitat include two plants, one bird, one reptile, two bats, and two fish species (Table 2.2.7-2).

TABLE 2.2.7-2
Species Classified as Endangered, Threatened, Sensitive, or Species of Concern Found in Wetland and/or Riparian Areas in the Greater Eugene Metropolitan Area
MWMC Facility Plan, Eugene-Springfield

Species Type	Common Name	Species Name	Federal Status	State Status
Plant	White-topped aster	*Aster curtus*	Species of Concern	Threatened
Plant	Willamette daisy	*Erigeron decumbens*	Endangered	Endangered
Bird	Bald eagle	*Haliaeetus leucocephalus*	Threatened	Threatened
Reptile	Western pond turtle	*Clemmys marmorata*	Species of Concern	Sensitive
Mammals	Long-eared bat	*Myotis evotis*	Species of Concern	Sensitive
Mammals	Yuma bat	*Myotis yumanensis*	Species of Concern	None
Fish	Spring chinook	*Oncorhynchus tshawytscha*	Threatened	None
Fish	Cutthroat trout	*Oncorhynchus clarki*	None	Stock of Concern[1]

[1] Oregon Department of Fish and Wildlife stock of concern status for cutthroat trout is an Agency designation (i.e., not a state listing). This designation applies to cutthroat trout in the entire Willamette Valley and is based on a lack of information on population abundance and distribution for this species.

Facility Upgrades and Habitat

Potentially sensitive habitat in the vicinity of the major MWMC facilities (including the Biocycle Farm, SIWF, BMF, and WPCF) include wetland and riparian areas.

Wetland Habitat

Wetland types in the Eugene metropolitan area include open water/riparian wetlands, wet prairie grasslands, scrub-shrub wetlands, forested wetlands, agricultural wetlands, and pasture/old field wetlands (City of Eugene, 2003b). Wetlands in the Eugene area, and the Willamette Valley generally, have largely been lost to agriculture and urban development (e.g., drained and/or filled in). For example, native prairie wetlands in the Willamette Valley currently occupy less than 1 percent of their former area, and the remaining remnants are highly fragmented. The West Eugene area supports the greatest concentration of native prairie remnants and associated rare species in the Willamette Valley (Nelson and Beall, 1995).

Wetland habitat is located within the boundaries of the major MWMC facilities, as shown in Figure 2.2.7-3. These wetland areas are limited in extent as a result of agricultural activity and commercial and municipal land use.

Riparian Habitat

The Willamette River, the main riparian feature in the vicinity of the WPCF, totals 187 main-stem miles and 16,000 total stream miles in the Willamette River Basin (Willamette American Heritage River Partnership, 2004). The nearly 200-mile reach of the Willamette River between Springfield and Portland has been designated an American Heritage River under the American Heritage River Initiative (Executive Order 13061; EPA, 2004a). This stretch of the river flows through the three largest cities in the state: Eugene-Springfield, Salem, and Portland. More than two million people live in the Willamette basin, the fastest-growing region in Oregon (EPA, 2004b).

The WPCF has been discharging treated wastewater into the Willamette River from the facility at 410 River Avenue in North Eugene since beginning operation in 1984. Discharged effluent has undergone primary treatment (scum and solids removal), secondary treatment (bacterial digestion), and final processing (chlorination followed by addition of sulfur dioxide to dechlorinate) (City of Eugene Public Works Department, 2003a). The facility uses an activated sludge process that consistently removes more than 95 percent of pollutants from the waste stream before wastewater is discharged into the Willamette River (City of Eugene Public Works Department, 2003a).

2.2.8 Air Quality and Noise

Air Quality

Based on a 1997 regulatory review (CH2M HILL, 1997), "there are no significant, outstanding air quality compliance issues for the WPCF and the facility is in compliance with all Lane Regional Air Pollution Authority (LRAPA) and federal regulations." An emissions inventory was conducted to identify and describe all possible sources of air emissions found at the WPCF. Operations at the facility were reviewed, and a list of potential emission sources was developed. Calculations, prepared following EPA-approved/reviewed methodologies, were performed for the significant sources identified at

the WPCF. The results indicate that the WPCF is not a major source under Title V regulations, including criteria pollutants and hazardous air pollutants (HAPs). Facilities are considered major sources if they emit more than 100 tons per year (tpy) of a criteria pollutant, and/or greater than 25 tpy of total HAPs or 10 tpy of an individual HAP.

Because the facility is considered a minor source, a Title V operating permit is not required. However, EPA and LRAPA may impose additional record keeping and monitoring requirements in the future because actual annual carbon monoxide (CO) and nitrogen oxides (NO_x) emissions at the WPCF exceed the 50 percent major source threshold and the potential to emit (PTE) is very close to a major source trigger level. However, under EPA guidance, true natural minor sources (the WPCF) are exempted from meeting these additional compliance requirements because both their actual and PTE emissions are below major source triggers for criteria pollutants and HAPs.

The most likely issues that could create compliance-related actions concern nuisance issues. Other activities at the WPCF that may impact air quality include fugitive dust blowing offsite, or visible emissions from the internal combustion engines or other combustion sources. However, WPCF staff have been proactive in implementing favorable air quality activities and have been mitigating these factors with actions such as conducting odor evaluations and planning; implementing proper boiler, flare, and internal combustion engine maintenance programs; watering dirt roads and construction sites; and dealing with public concerns in an effective and timely manner. Table 2.2.8-1 presents the results of the emissions estimates.

TABLE 2.2.8-1
Estimated Emissions from the E-S WPCF
MWMC Facility Plan, Eugene-Springfield

Pollutant	PTE (tpy)	Actual (tpy)
CO	86.1	57.8
NO_x	89.9	55.2
SO_x	7.1	5.7
PM-10	1.0	0.3
Total VOCs	23.9	16.5
Total HAPs	8.4	6.0

It should be noted that 65 percent of the residents in the vicinity of the WPCF rate the WPCF as a good or excellent neighbor, according to results of the Wastewater Facilities Good Neighbor Survey performed by the Oregon Survey Research Laboratory at the University of Oregon as part of the master planning effort. Furthermore, an additional 16 percent rate the WPCF as a fair neighbor. The overall good-neighbor rating of the WPCF considers the residents' attitudes about the facility's appearance, odors, traffic, noise, and use of chemicals.

Process Hazards Analysis of Chlorine and Sulfur Dioxide Systems

A comprehensive process hazards analysis (PHA) evaluation was performed at the WPCF in August 1996. The PHA is a requirement for regulated substances as stipulated by the Occupational Safety and Health Administration (OSHA) and the Oregon Process Safety Management (PSM) program. More than 100 "what if" scenarios were evaluated, including determining the scenario's consequences and existing protections, and developing and implementing recommendations for improvements, new procedures and policies, and additional maintenance or monitoring of key process and safety equipment to address each scenario, when needed. The PHAs and release scenarios in the PSM manual adequately cover all regulated substance usage, storage, and handling scenarios to meet PSM requirements.

Noise

Noise from the existing facilities does not appear to be a significant issue in the areas surrounding the WPCF. According to results of the Wastewater Facilities Good Neighbor Survey, performed by the Oregon Survey Research Laboratory at the University of Oregon as noted above, 65 percent of the residents in the vicinity of the WPCF rate the WPCF as a good or excellent neighbor. An additional 16 percent rate the WPCF as a fair neighbor. (The overall good-neighbor rating of the WPCF considers the residents' attitudes about the facility's appearance, odors, traffic, noise, and use of chemicals.)

2.3 Socioeconomic Environment

2.3.1 Demographics

Selected year 2000 demographic characteristics associated with the major service population of the E-S WPCF are shown in Table 2.3.1-1.

TABLE 2.3.1-1
Selected 2000 Demographic Characteristics of the E-S WPCF Service Population[1]
MWMC Facility Plan, Eugene-Springfield

Subject	Eugene		Springfield	
	Number	Percent	Number	Percent
AGE				
Under 20 years	34,531	25	15,912	30.2
20 to 24 years	17,390	12.6	4,374	8.3
25 to 34 years	20,591	14.9	8,423	15.9
35 to 44 years	18,656	13.5	8,186	15.5
45 to 54 years	20,184	14.6	6,719	12.7
55 to 64 years	9,884	7.2	3,827	7.3
65 years and over	16,657	12.1	5,423	10.3
EMPLOYMENT STATUS[2]				

TABLE 2.3.1-1
Selected 2000 Demographic Characteristics of the E-S WPCF Service Population(1)
MWMC Facility Plan, Eugene-Springfield

Subject	Eugene		Springfield	
	Number	Percent	Number	Percent
Employed	69,094	61.2	24,855	62.1
Unemployed	4,596	4.1	2,373	5.9
Not in Labor Force	39,158	34.7	12,762	31.9
INDUSTRY(3)				
Arts, Entertainment, Recreation, Accommodation and Food Services	6,125	8.9	2,002	8.1
Professional, Scientific, Management, Administrative, and Waste Management Services	6,970	10.1	1,900	7.6
Manufacturing	8,365	12.1	4,282	17.2
Retail Trade	9,390	13.6	3,896	15.7
Education, Health and Social Services	18,210	26.4	4,494	18.1

(1) Data from Portland State University's Population Research Center (http://www.upa.pdx.edu/CPRC/publications/2000census/index.html)
(2) Based on population 16 years and over
(3) Represents the largest industry employers. Does not include all industry for which the service population is employed.

2.3.2 Economic Conditions and Trends

The Oregon economy experienced a "jobless recovery" through 2003. As the U.S. economy builds strength in 2004, Oregon should follow the same path. According to the Oregon Office of Economic Analysis (OEA), the jobless recovery will slowly become a job generating recovery, with jobs regaining their pre-recession levels in early 2005. OEA forecasts employment to grow 1.6 percent in 2004 and 2.2 percent in 2005. Table 2.3.2-1 is a summary of the forecast outlook.

The table compares OEA's forecast to other published forecasts. Economy.com has the most pessimistic outlook for 2004 and 2005. OEA's forecast follows more closely the direction of the Global Insights[8] forecast, but believes the recovery will be stronger although still milder compared to other recovery periods. The outer years continue to add jobs.

[8] Global Insights is a consulting firm that provides business and economic forecasts, industry analysis, strategic consulting, financial data and software.

TABLE 2.3.2-1
Oregon Total Non-Farm Employment and Personal Income Growth
MWMC Facility Plan, Eugene-Springfield

Forecaster	Date of Forecast	Employment Growth			Personal Income Growth		
		2004	2005	2006	2004	2005	2006
Economy.com	Dec. 2003	0.6	2.0	1.9	4.3	4.2	4.6
Global Insight	Winter 2003-04	1.2	2.1	1.7	5.2	5.4	5.3
Wells Fargo & Co.	Dec. 2003	2.2	NA	NA	5.5	NA	NA
U.S. Bank	Dec. 2003	2.5	NA	NA	5.5	NA	NA
Conerly Consulting	Feb. 2004	2.4	3.8	NA	5.9	5.1	NA
OEA	Jan./Feb. 2004	1.6	2.2	1.9	5.0	5.0	5.9

Source: Oregon Economic and Revenue Forecast, March 2004.

Looking back at 2002 economic data for Lane County, the County showed a total employment rate of 6.8 percent, with total employment numbers at 157, 267 for 2002 (OEA, 2004). More recently, during the first quarter of 2004, Lane County's unemployment rate decreased to 7.8 percent in February compared with a revised 8.1 percent in January. In March 2004, it was below the state's seasonally unadjusted rate of 8.4 percent, but above the nation's seasonally unadjusted rate of 6.0 percent. Non-farm payroll employment increased in February due mostly to seasonal gains in education. There typically is little change in the unemployment rate between January and February. The rate this February is 0.5 percentage points lower than the 8.3 percent rate recorded in February of 2003. The number of unemployed people decreased by 505 from January and is now 762 lower than February of last year, to 13,443. In February, total non-farm payroll employment increased by 1,100 to 141,100. The gain was due largely to seasonal increases in state and local education. Total non-farm employment is up by 100 compared to February of last year, for an annualized gain of .07 percent (OEA, 2004).

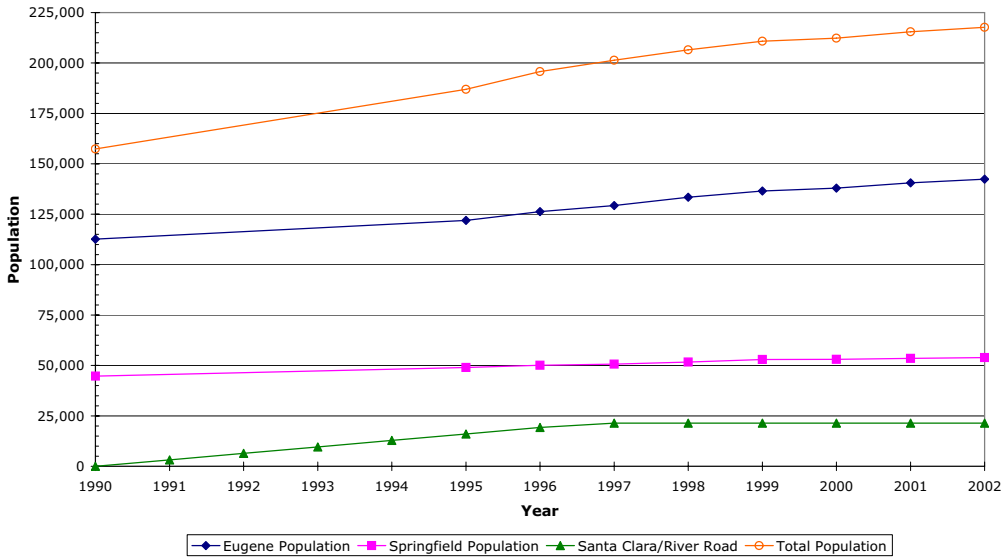
2.3.3 Historical Population

Populations from the City of Eugene, the City of Springfield, and the Santa Clara/River Road area contribute to the WPCF. Historical population data obtained from the Lane Council of Governments for both Eugene and Springfield were collected for years 1990 and 1995 through 2002 (Figure 2.3.3-1). Beginning in 1991, fifteen percent of the Santa Clara/River Road area population was connected to the WPCF collection system each year. The total Santa Clara River Road population, of 21,400, was completely connected as of 1997. Historical population data have been summarized and presented in Table 2.3.3-1. The total MWMC service area population equals the sum of the Eugene, Springfield, and Santa Clara/River Road populations.

TABLE 2.3.3-1
Historical Population Data for the Eugene-Springfield Service Area, 1990-2002
MWMC Facility Plan, Eugene-Springfield

Year	Eugene Population	Springfield Population	Santa Clara/ River Road Population	Total Population Served
1990	112,669	44,683	0	157,352
1995	121,905	49,005	16,050	186,960
1996	126,325	50,140	19,260	195,725
1997	129,300	50,670	21,400	201,370
1998	133,460	51,700	21,400	206,560
1999	136,490	52,945	21,400	210,835
2000	137,914	53,005	21,400	212,319
2001	140,571	53,483	21,400	215,454
2002	142,391	53,946	21,400	217,737

FIGURE 2.3.3-1
Historical Population for MWMC Service Area
MWMC Facility Plan, Eugene-Springfield



2.4 Land Use Regulations

2.4.1 Relation to the Eugene-Springfield Metropolitan Area General Plan

Modifications to the MWMC sanitary system and major treatment facilities would be consistent with the overall policy framework and planning and land use designations set forth in the Eugene-Springfield Metropolitan Area General Plan 2004 Update (Metro Plan; 2004). The Metro Plan is the official long-range comprehensive plan (public policy document) of metropolitan Lane County and the cities of Eugene and Springfield. The Metro Plan sets forth general planning policies and land use allocations and serves as the basis for the coordinated development of programs concerning the use and conservation of physical resources, furtherance of assets, and development or redevelopment of the metropolitan area.

The Public Facilities and Services element of the Metro Plan provides direction for the future provision of MWMC infrastructure and services to planned land uses within the Metro Plan, Plan Boundary.

MWMC Facilities Located Within the Urban Growth Boundary

For planning and coordination of services within the urban growth boundary (UGB), the Public Facilities and Services Plan identifies jurisdictional responsibility for the provision of wastewater services, describes respective service areas and existing and planned wastewater facilities, and contains planned facilities maps for these services[9].

MWMC facility development will remain consistent with Metro Plan policies by using planned facilities maps of the Public Facilities and Services Plan to guide the general location of water, wastewater, stormwater and electrical projects in the metropolitan area. In addition, MWMC will use local facility master plans, refinement plans, and ordinances as the guide for detailed planning and project implementation.

MWMC Facilities Outside the Urban Growth Boundary

In accordance with statewide planning goals and administrative rules, MWMC facilities may be located on agricultural land and forest land outside the UGB when the facilities exclusively serve land within the UGB[10]. Furthermore, in accordance with statewide planning goals and administrative rules, MWMC facilities are allowed in the public right-of-way of public roads and highways. The ultimate construction of planned public facilities outside the UGB and Plan Boundary will require close coordination with and permitting by Lane County, and possible Lane County Rural Comprehensive Plan amendments.

MWMC will remain consistent with local regulations by locating new urban wastewater facilities on farm land and forest land outside the UGB only when the facilities exclusively serve land inside the UGB and there is no reasonable alternative. In addition, MWMC will

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[9] These provisions are made in accordance with Oregon Department of Land Conservation and Development Statewide Planning Goal 11 and Oregon Administrative Rule (OAR) 660.

[10] Pursuant to OAR 660-006 and 660-033

locate urban water and wastewater facilities in the public right-of-way of public roads and highways outside the UGB, as needed to serve land within the UGB.

2.4.2 MWMC Facility Zoning Designations

The MWMC sanitary system and major treatment facilities are located throughout the Eugene-Springfield metropolitan area. These facilities are situated in numerous zoning designations within the UGB and on adjacent lands immediately outside the boundary. However, to describe all of the various zoning designations occupied by MWMC infrastructure would be overly complex and beyond the scope of this discussion. Therefore, to simplify the description, the discussion is limited to the following major facilities that would be subject to potential expansion:

- Eugene-Springfield Water Pollution Control Facility
- Biosolids Management Facility (BMF)
- Seasonal Industrial Waste Facility (SIWF)
- Biocycle Farm

All four of the facilities are located in central Lane County in the northwest section of the City of Eugene (Figures 2.4.2-1 and 2.4.2-2). The population density surrounding the facilities ranges from high to medium. The following sections summarize land use and zoning designations for areas adjacent to each of the four facilities:

- The WPCF is located within the UGB of Eugene-Springfield near Beltline Highway and along the Willamette River. The facility is zoned as Industrial; government land use including wastewater treatment facility is a sub-zoning approved use. The areas to the south of the WPCF are zoned Agricultural with an Urbanizable Land overlay zone and Low-Density Residential with an Urbanizable Land overlay zone. The area to the west of the facility is zoned Medium-Density Residential. The areas to the north of the facility are zoned Community Commercial and Light-Medium Industrial with Urbanizable Land overlay zone, and the area to the East is zoned as Medium-Density Residential with a Planned Unit Development overlay zone.

- The BMF is located outside but adjacent to the UGB of Eugene-Springfield. The facility is zoned as Exclusive Farm Use 40-Acre Minimum. Adjacent land use is designated as Rural Residential 5-Acre Minimum and Exclusive Farm Use 40-Acre Minimum to the west, Rural Industrial and Exclusive Farm Use 30-Acre Minimum to the east, and Light-Medium Industrial with Urbanizable Land and Commercial Airport Safety overlay zones inside the UGB to the south.

- The SIWF is also located outside of the Eugene-Springfield UGB to the north on the northwestern-most portion of Eugene. The site and surrounding area are zoned as Exclusive Farm Use 30-Acre Minimum, with a portion of the area to the south zoned Rural Industrial.

- The Biocycle Farm is bounded on the west by Highway 99. The facility is approximately half in and half outside of the Eugene-Springfield UGB. The area of the site inside the UGB is zoned Heavy Industrial with Site Review, Urbanizable Land, and Commercial Airport Safety overlay zones, while the area of the site outside the UGB is zoned Rural Industrial. The area to the west of the Biocycle Farm across Highway 99 is the Eugene

Airport, zoned for Airport Operations; the area to the north includes zoning for Rural Residential 5-Acre Minimum, Rural Industrial and Exclusive Farm Use 40-Acre Minimum; the area to the east includes Rural Residential 5-Acre Minimum and Exclusive Farm Use 40-Acre Minimum zoning, and the area to the south is inside the UGB and zoned for Heavy Industrial with Urbanizable Land and Commercial Airport Safety overlay zones.

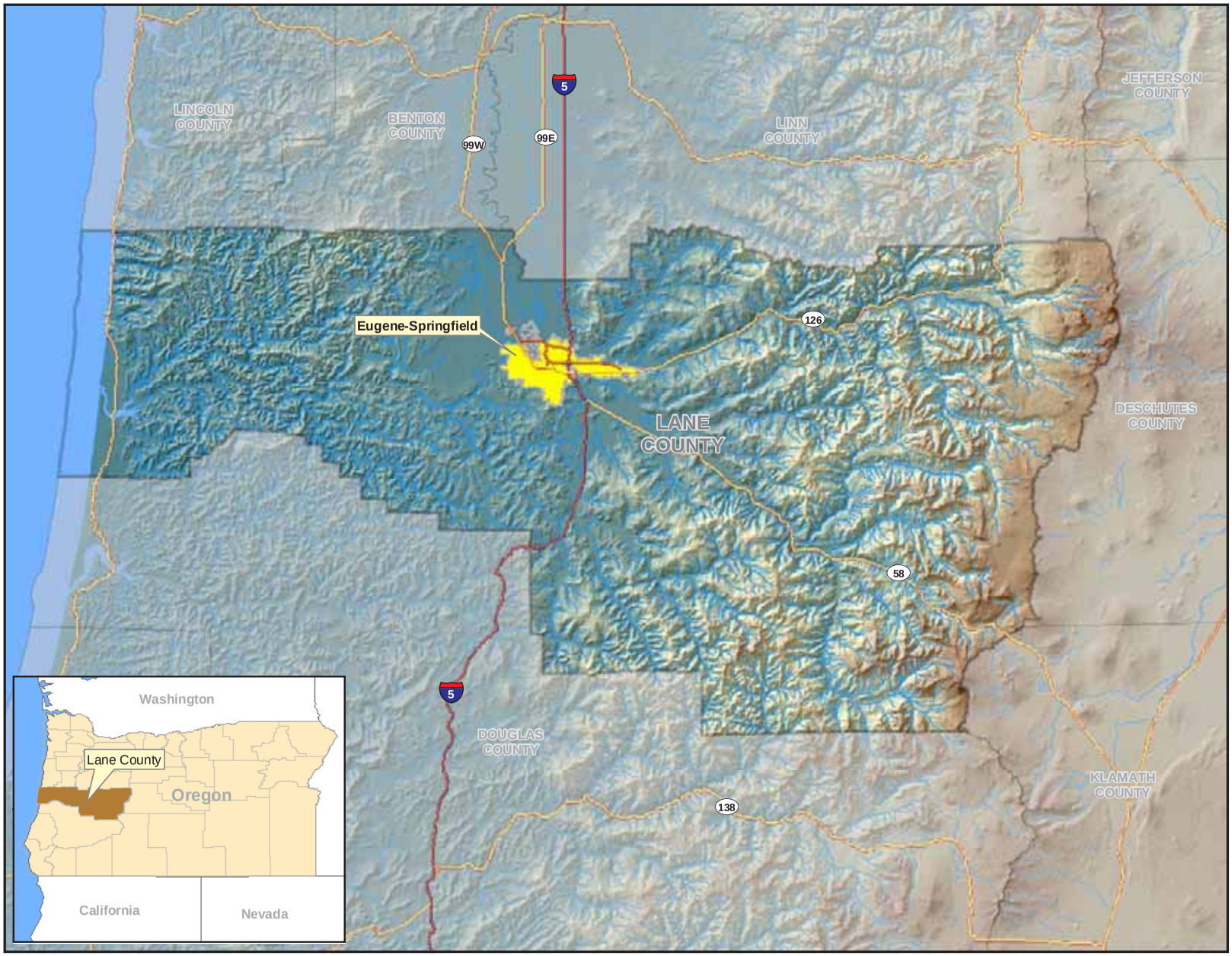

Figure 2.1-1

Site Map

Eugene & Springfield

Legend

- Limited Access Highway
- Highway
- Eugene-Springfield City Limits
- Counties

N
W E
S

0 5 10 15 20
Miles

CH2MHILL

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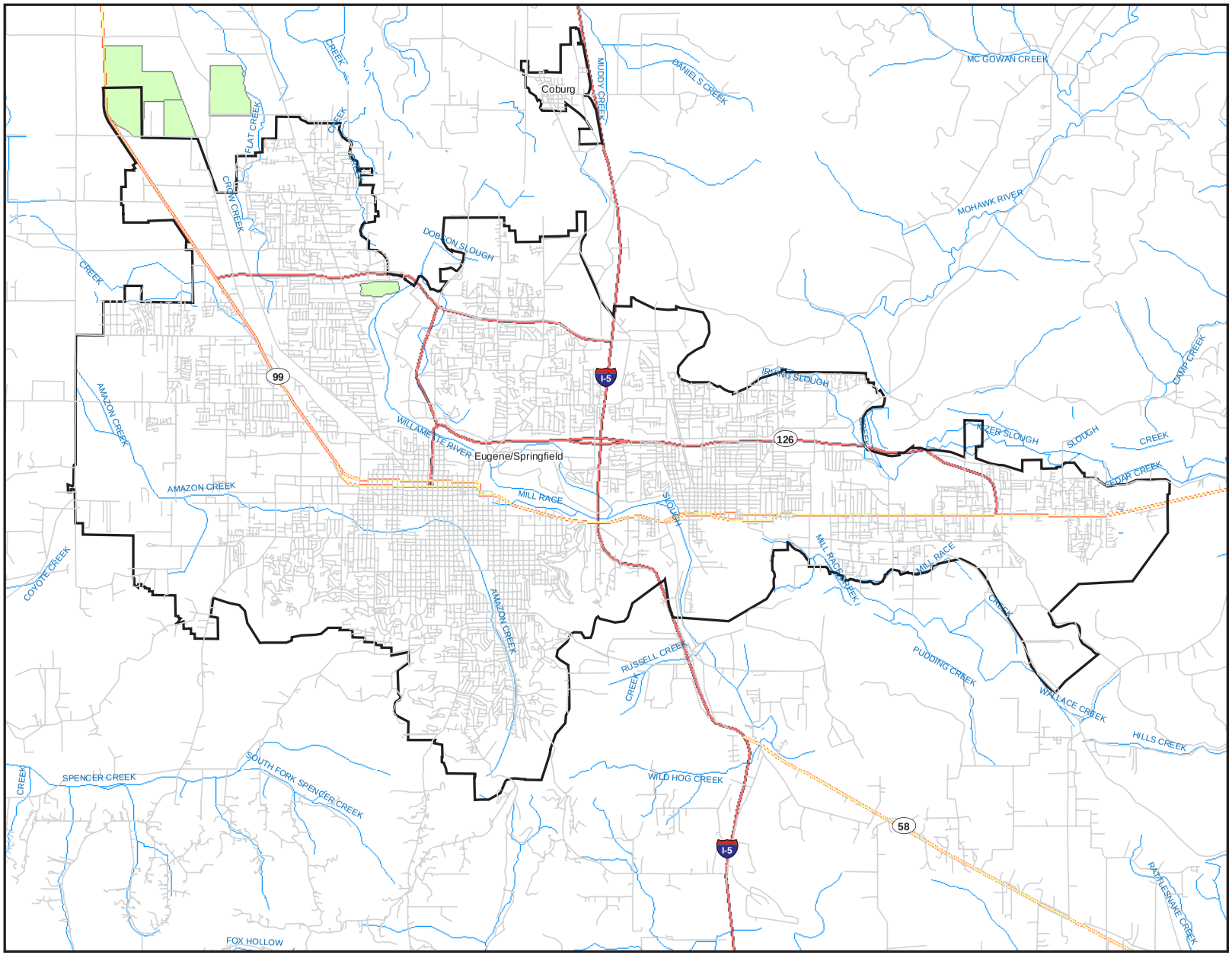

Figure 2.1-2
City Map
Eugene & Springfield

Legend

- Limited Access Higwhay
- Highway
- Roads
- Rivers
- Facilities
- Urban Growth Boundary
- Eugene-Springfield City Limits

N
W E
S

0 0.5 1 1.5 2 2.5 3
Miles

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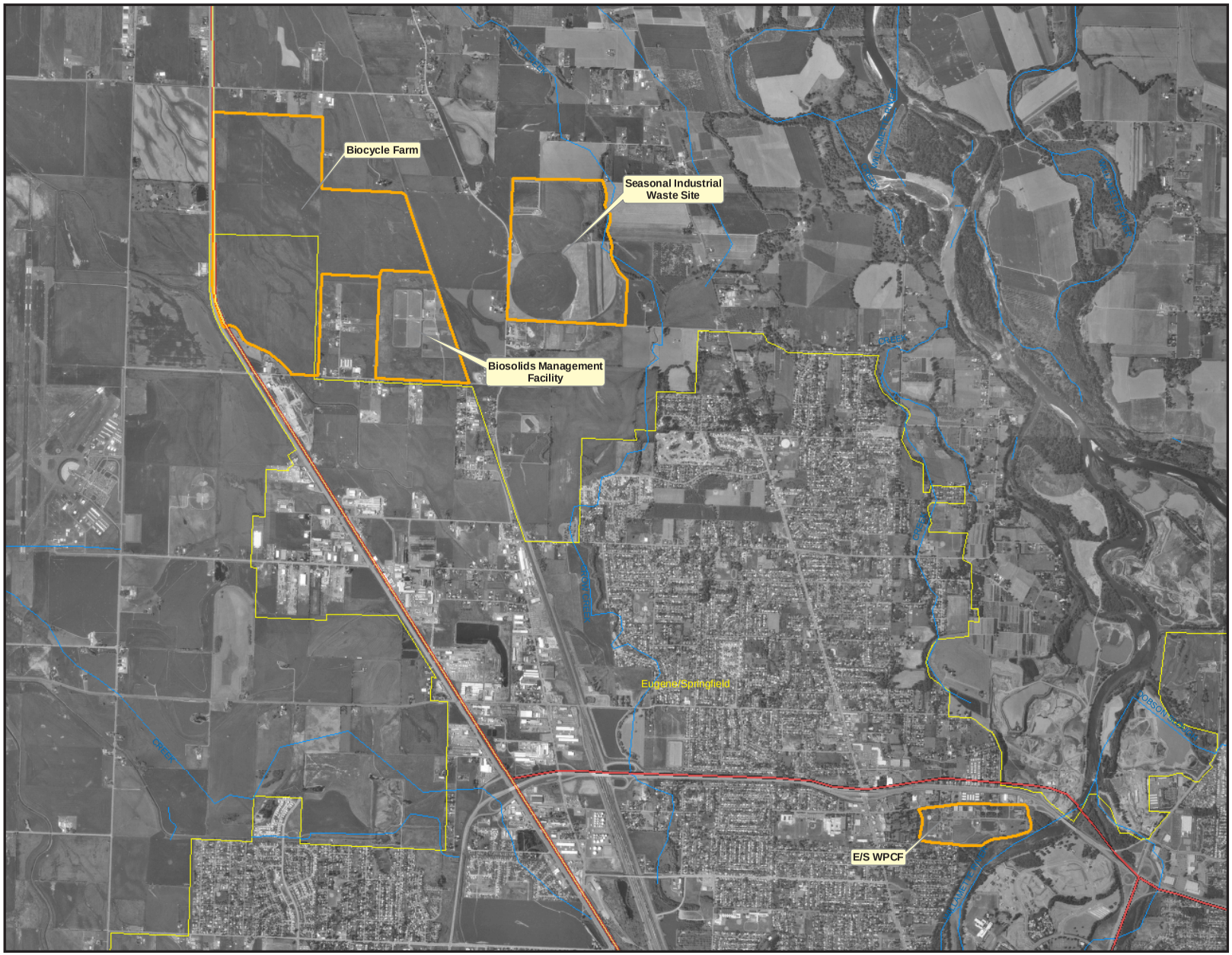

Figure 2.1-3
Facility Map
Eugene & Springfield

Legend

- Limited Access Higwhay
- Highway
- Rivers
- Facilities
- Urban Growth Boundary

N
W E
S

0 0.25 0.5 0.75 1
Miles

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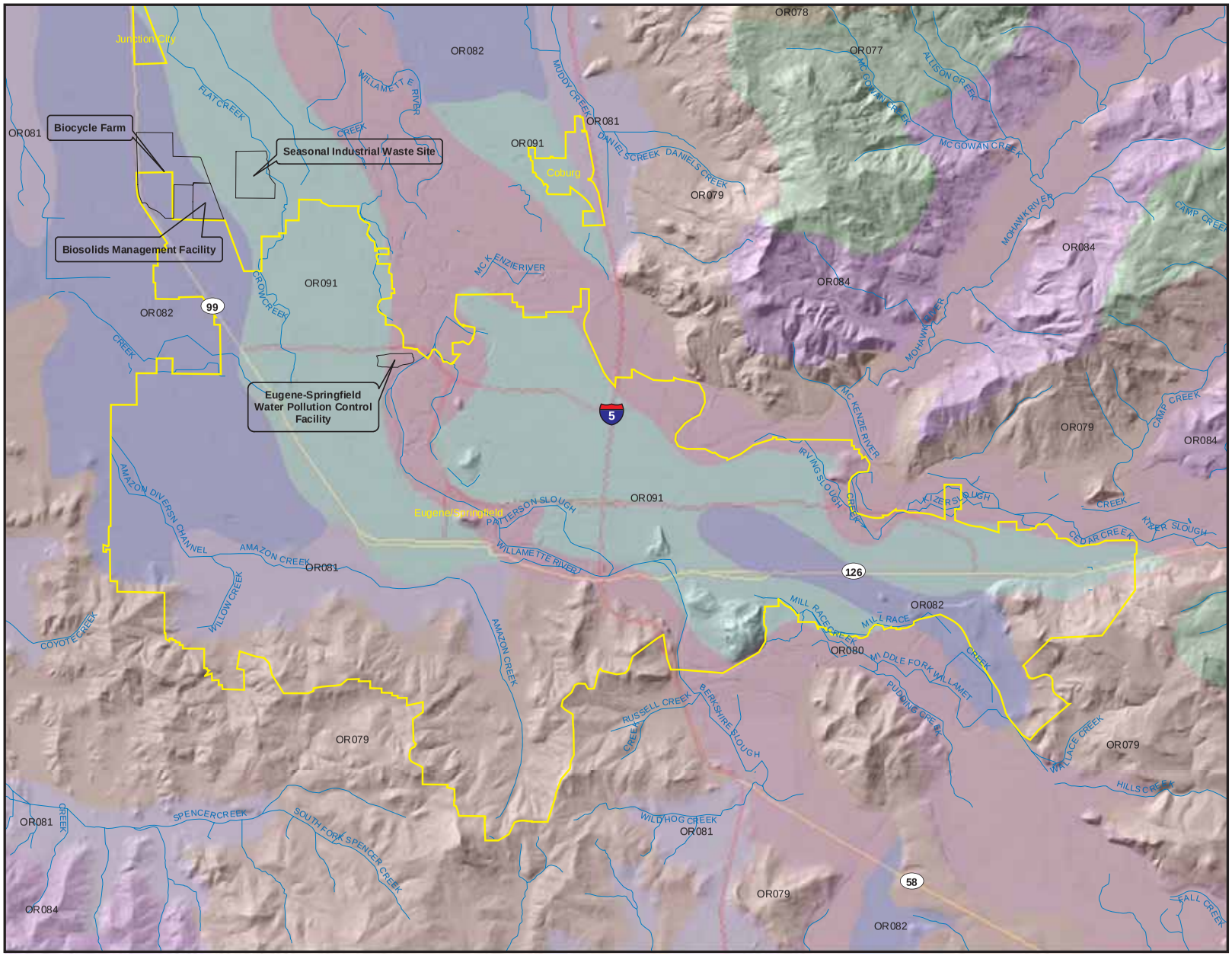

Figure 2.2.2-1

Soils of the MWMC Service Area

Eugene & Springfield

Legend

- Limited Access Higwhay
- Highway
- Rivers and Steams
- Urban Growth Boundary
- Facilities

Soils

- BELLPINE-JORY-NEKIA (OR084)
- DAYTON-AMITY-ALOHA (OR082)
- HAZELAIR-WILLAKENZIE-BELLPINE (OR079
- KLICKITAT-KINNEY-MCCULLY (OR078)
- MALABON-COBURG-SALEM (OR091)
- NEWBERG-CHEHALIS-CLOQUATO (OR080)
- PEAVINE-HONEYGROVE-ORFORD (OR077)
- WAPATO-BASHAW-MCALPIN (OR081)
- WATER (ORW)

N
W E
S

0 0.5 1 1.5 2 2.5 3
Miles

CH2MHILL

Source:
U.S. Department of Agriculture, Soil Conservation Service
Lane County, Oregon Soil Survey

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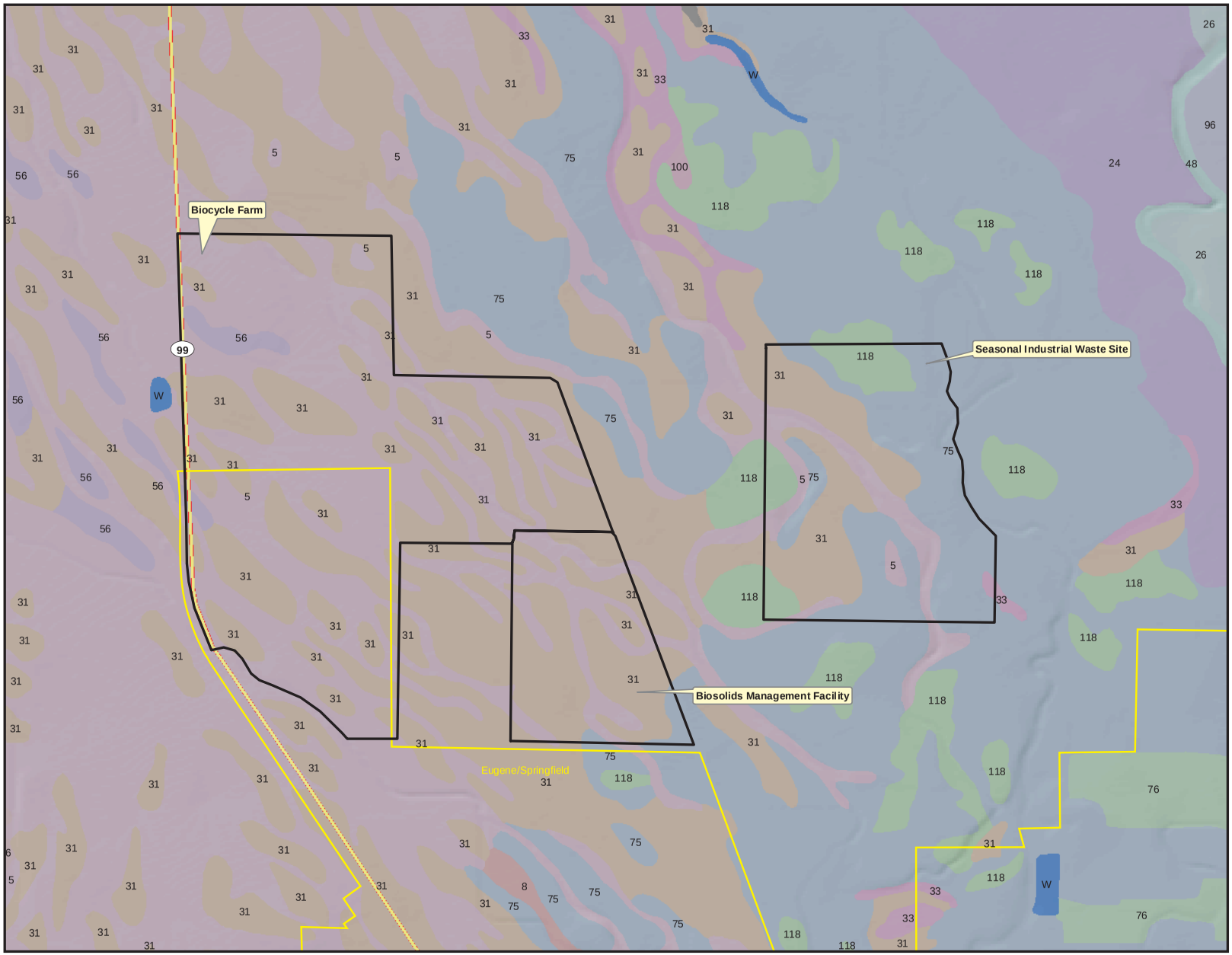

Figure 2.2.2-2

Soils in the Vicinity of the Biocycle Farm, Seasonal Industrial Waste Site and Biosolids Management Facility

Eugene & Springfield

Legend

- Facilities
- citylimits
- newgeology
- UGB
- Limited Access Higwhay
- Highway
- Awbrig silty clay loam (5)
- Bashaw clay (8)
- Coburg silty clay loam (31)
- Conser silty clay loam (33)
- Holcomb silty clay loam (56)
- Malabon silty clay loam (75)
- Malabon-Urban land complex (76)
- Salem gravelly silt loam (118)
- Water (W)

N
W E
S

0 750 1,500 2,250 3,000
Feet

CH2MHILL

Source:
U.S. Department of Agriculture, Soil Conservation Service
Lane County, Oregon Soil Survey

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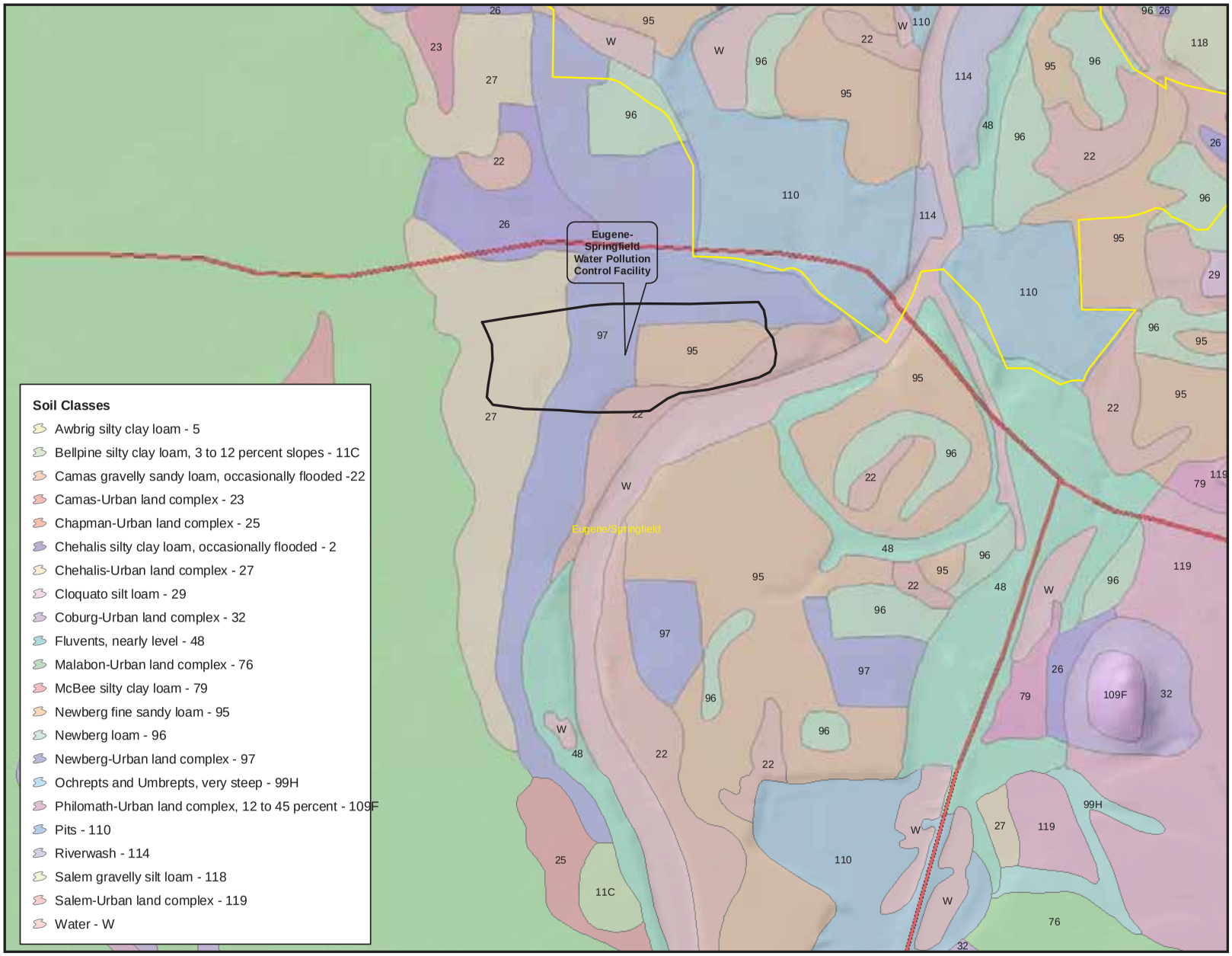

Figure 2.2.2-3

Soils in the Vicinity of the Eugene-Springfield Water Pollution Control Facility

Eugene & Springfield

Legend

- Facilities
- citylimits
- newgeology
- UGB
- Limited Access Higwhay
- Highway

N
W E
S

0 500 1,000 1,500 2,000
Feet

CH2MHILL

Source:
U.S. Department of Agriculture, Soil Conservation Service
Lane County, Oregon Soil Survey

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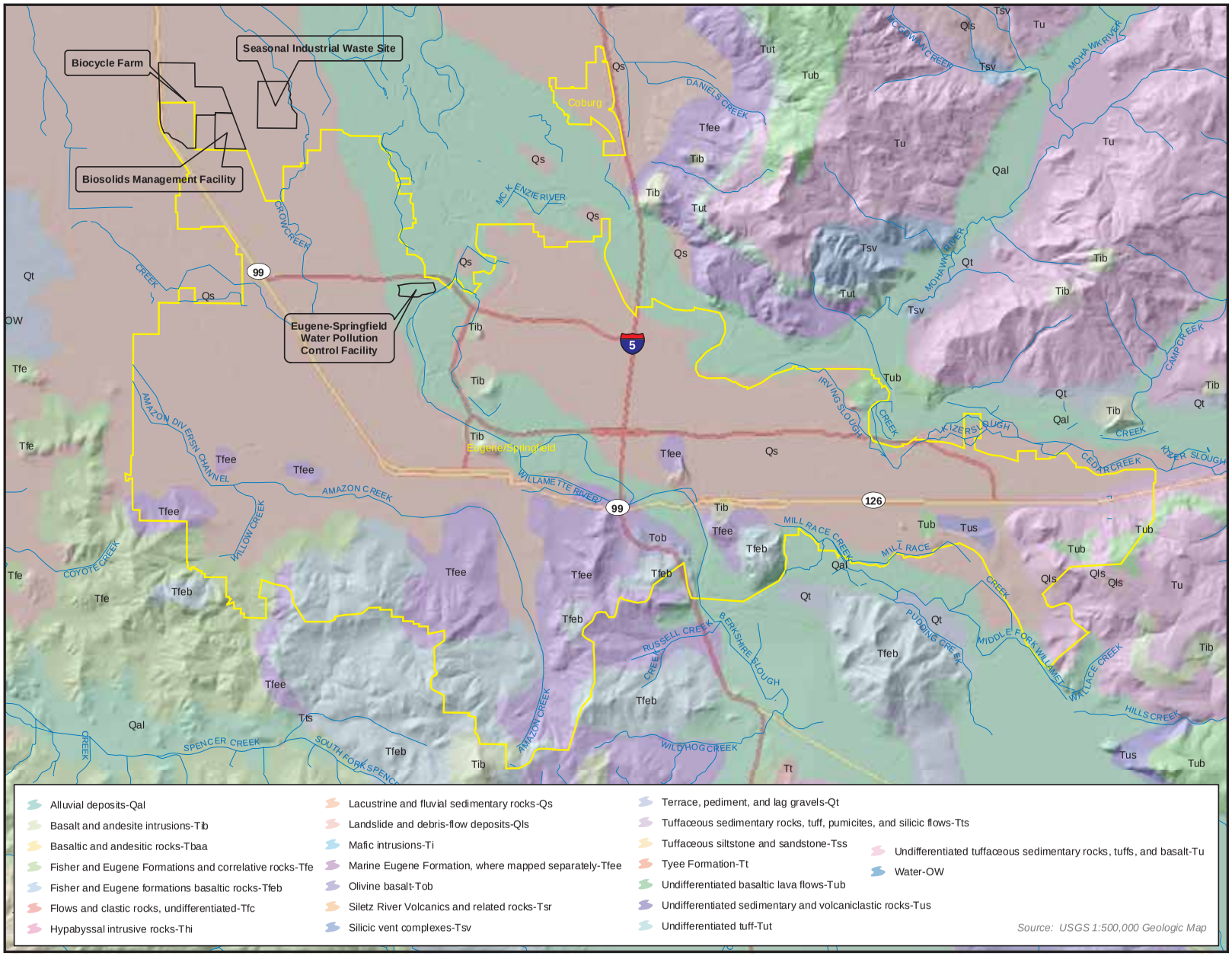

Figure 2.2.3-1

Geology of the MWMC Service Area

Eugene & Springfield

Legend

- Limited Access Highway
- Highway
- Facilities
- Rivers
- Urban Growth Boundary

N
W E
S

0 0.5 1 1.5 2 2.5 3
Miles

CH2MHILL

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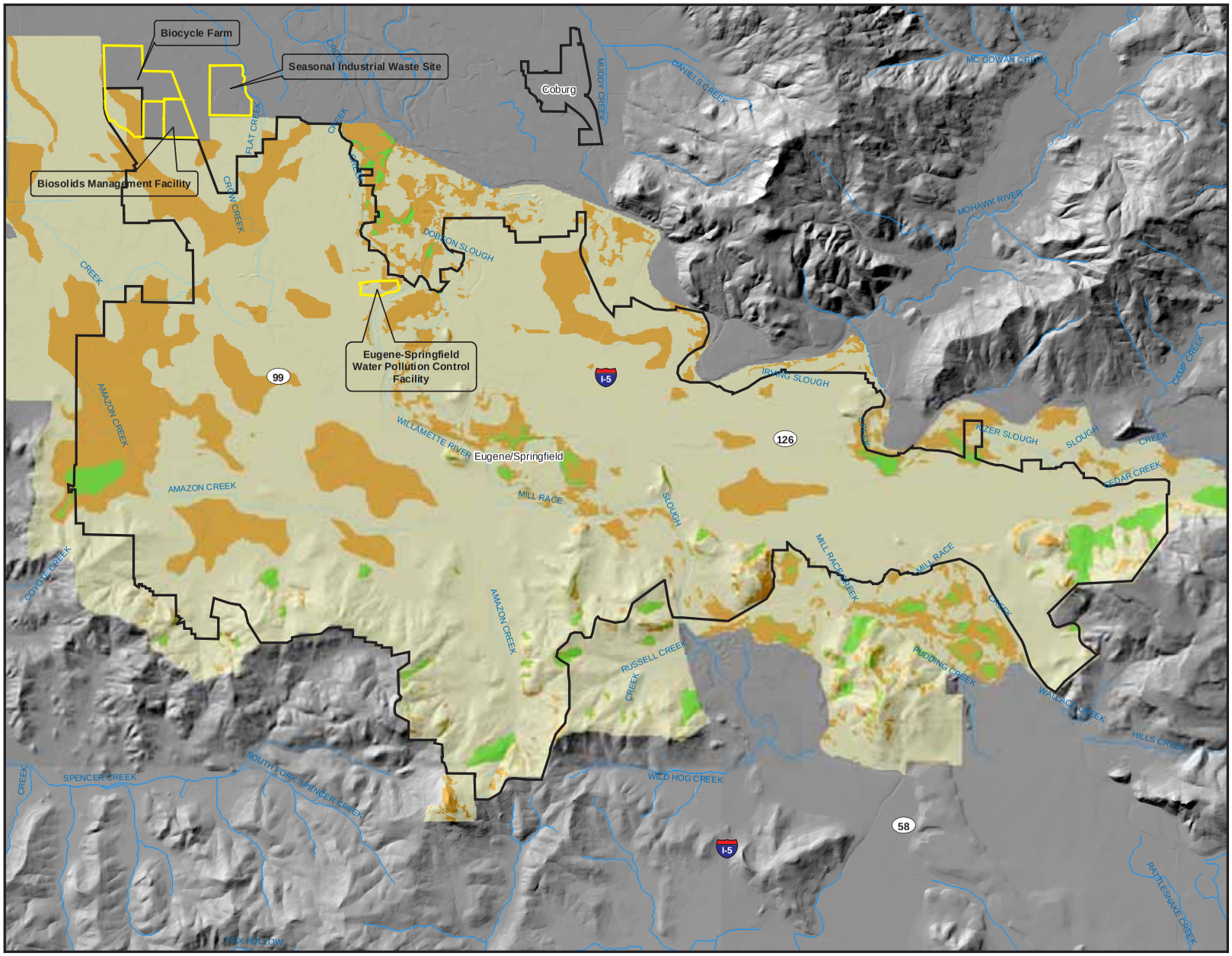

Figure 2.2.3-2

Relative Earthquake Hazard Map of the Eugene-Springfield Metropolitan Area

Eugene & Springfield

Legend

- Limited Access Higwhay
- Highway
- Roads
- Rivers
- Facilities
- Urban Growth Boundary

Relative Earthquake Hazard *

- Greatest Hazard
- High Hazard
- Moderate Hazard
- Low Hazard

** Source: Oregon Department of Geology and Mineral Industries, 2000*

N
W E
S

0 0.5 1 1.5 2 2.5 3
Miles

CH2MHILL

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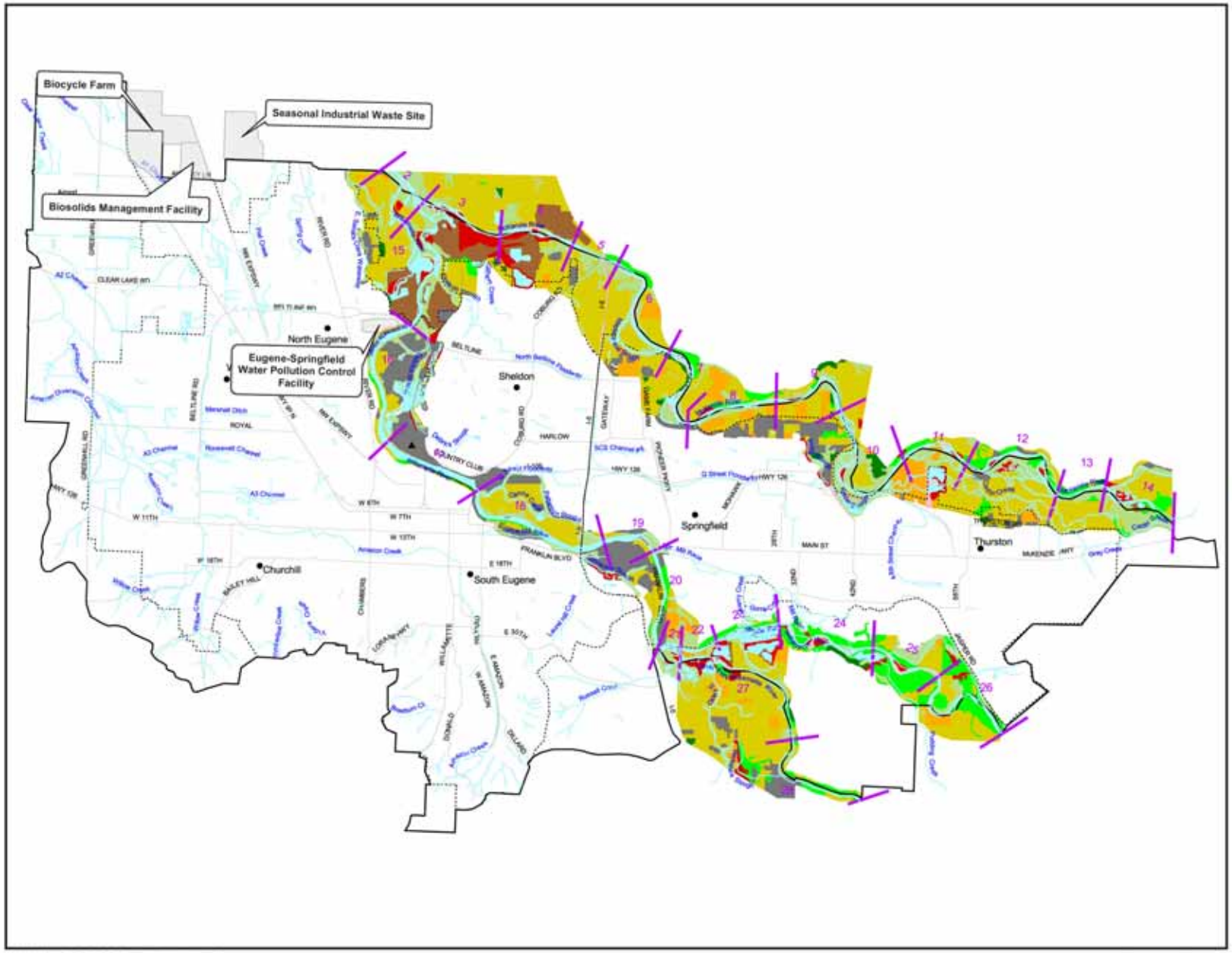

Figure 2.2.7-1

Dominant Vegitation Along Rivers

Eugene & Springfield

Legend

Dominant vegetation type

- Hardwood trees
- Conifer trees
- Mixed hardwood/conifer trees
- Shrubs
- Grass, pasture, field, or golf course
- Orchard
- Gravel bar
- Gravel extraction areas, or bare ground
- Pavement, buildings, or landscaping

- Text Reach number
- Reach breaks on rivers
- Rivers, streams, and ponds
- Urban growth boundary
- Major roads
- MECT study area
- High schools

Map produced by the City of Eugene Public Works Department, Parks and Open Space Division and the City of Eugene Planning and Development Department.
Data provided by the participatin agencies of the Metro ESA Coordinating Team.
C:/user/ArcView Projects/MECT assessment maps.apr/Map 10a
October 4, 2002

N
W E
S

0 0.5 1 1.5 2 2.5 3
Miles

CH2MHILL

W:\0320\04011\CVO Fig2-2-7-1_DominantVegetation.pdf

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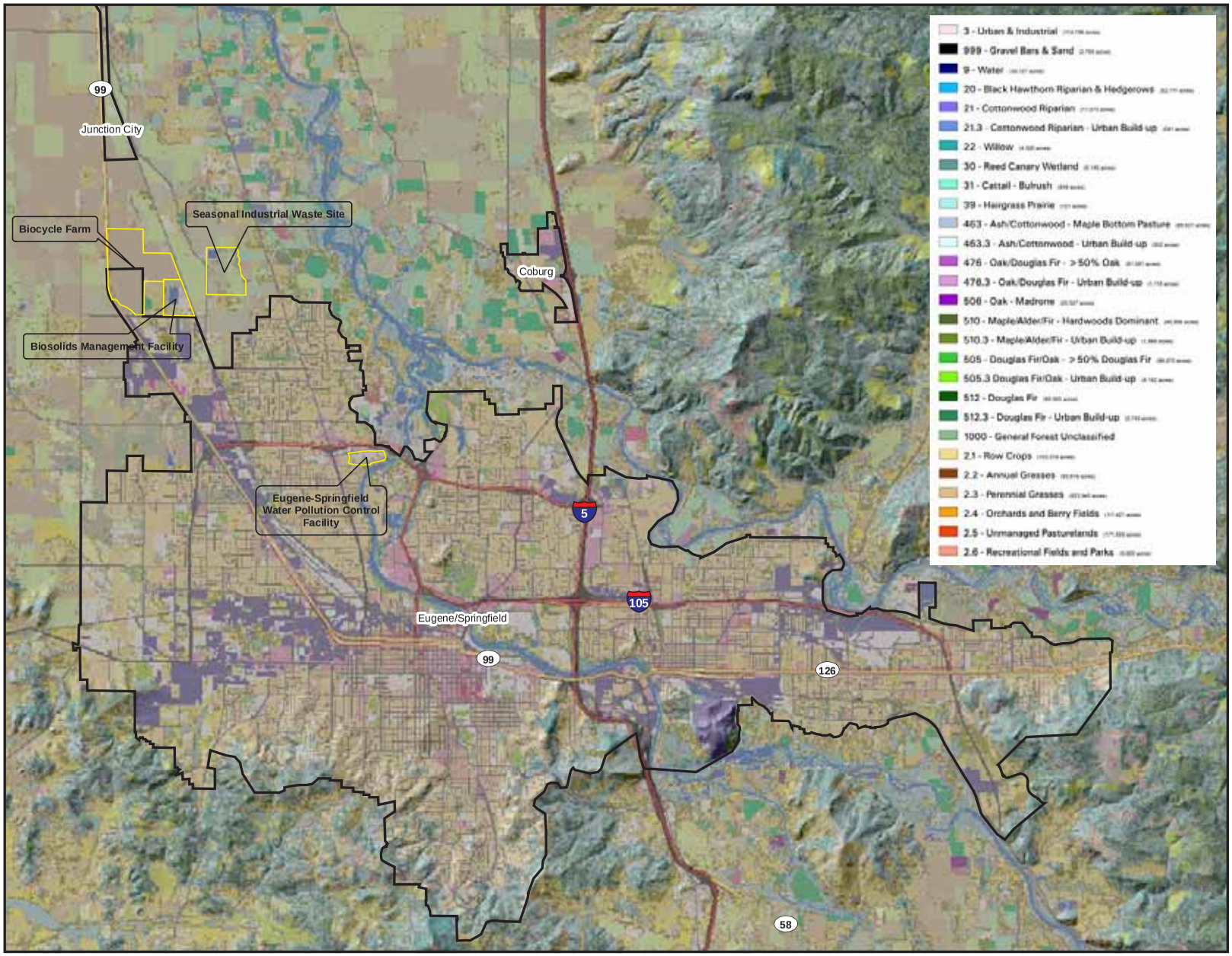

Figure 2.2.7-2

Land Cover Map for the Eugene-Springfield Area

Eugene & Springfield

Legend

- Limited Access Highway
- Highway
- Facilities
- UGB

The information depicted in the LC GIS layer is the result of digital image interpretation and extensive field work. The accuracy of the information presented is limited to the collective accuracy of the methods involved. The information is believed accurate and reasonable efforts have been made to ensure the accuracy of the data.

N
W E
S

0 0.5 1 1.5 2 2.5 3
Miles

CH2MHILL

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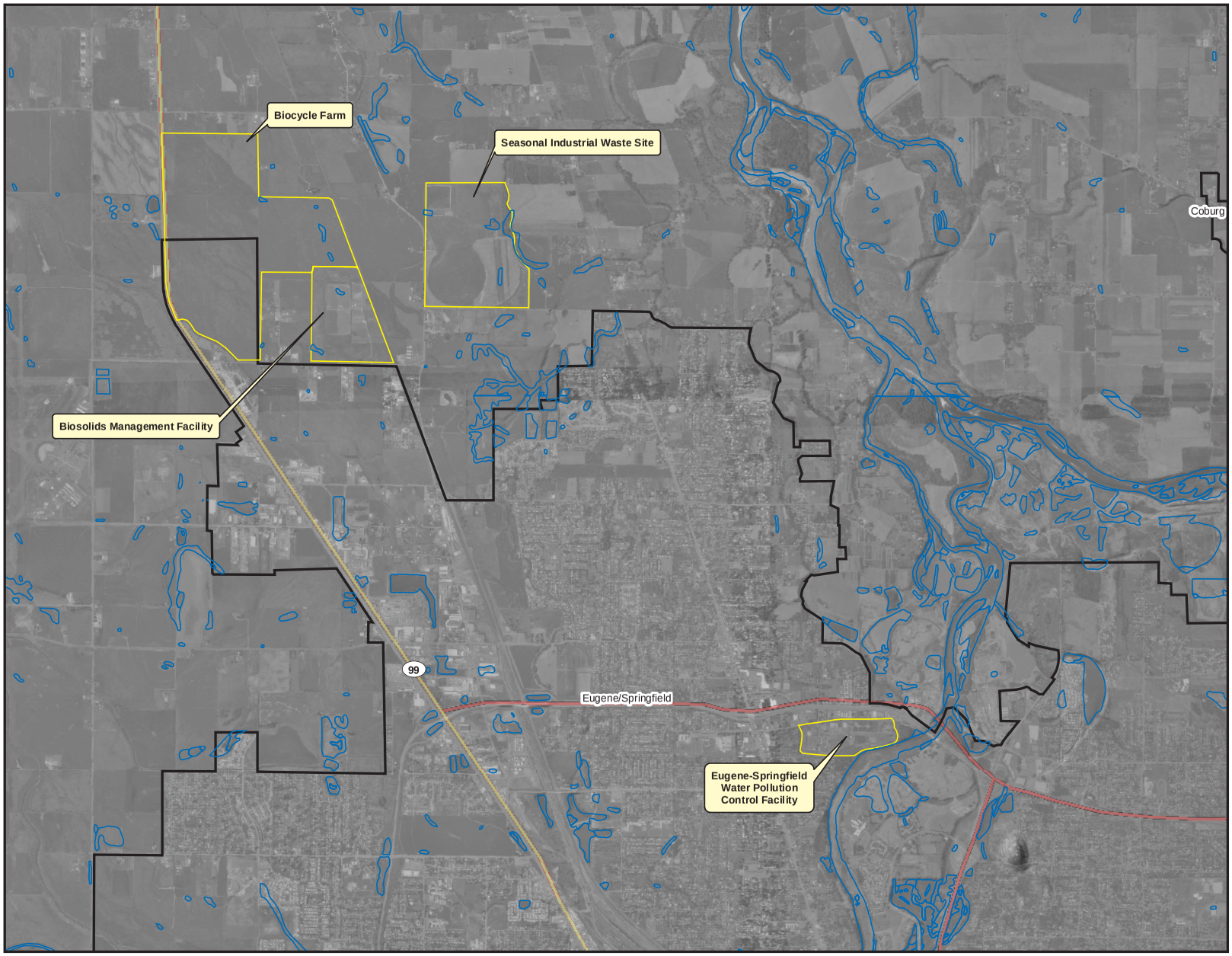

Figure 2.2.7-3

Wetlands Map for the Eugene -Springfield area

Eugene & Springfield

Legend

- Limited Access Higwhay
- Highway
- Biosolids Management Facility
- E/S WPCF
- Poplar Farm
- Seasonal Industrial Waste Site
- Urban Growth Boundary
- Wetlands*

** Source: National Wetlands Inventory*

N
W E
S

0 0.25 0.5 0.75 1
Miles

CH2MHILL

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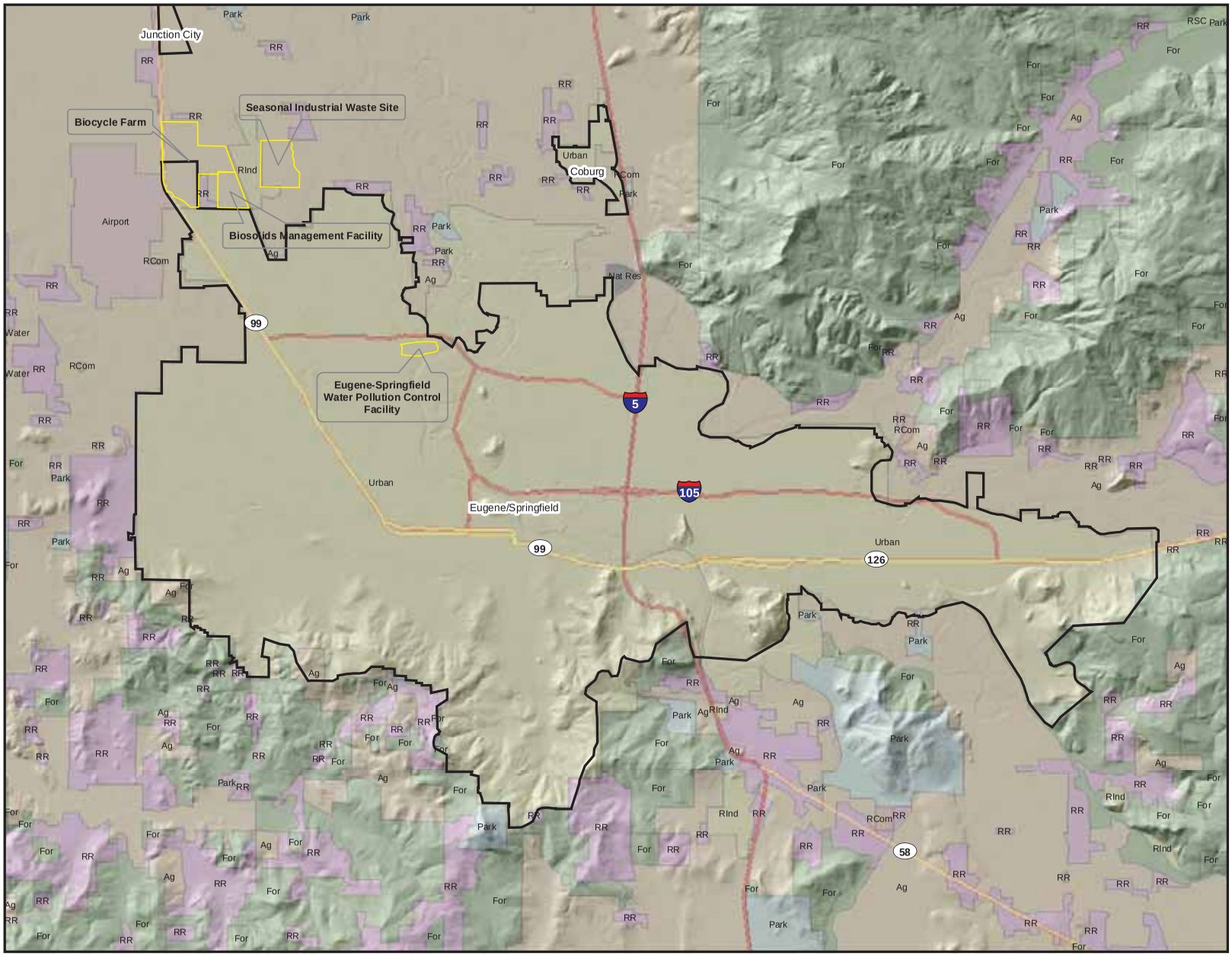

Figure 2.4.2-1

Zoning Map Eugene-Springfield Metropolitan Area

Eugene & Springfield

Legend

- Limited Access Higwhay
- Highway
- Biosolids Management Facility
- E/S WPCF
- Poplar Farm
- Seasonal Industrial Waste Site
- Urban Growth Boundary

Zoning

- Agriculture - A/F
- Agriculture - Ag
- Forestry - A/F
- Forestry - For
- Mixed Ag and RR - Mixed Use
- Natural Resource - Min/Agg
- Park and Recreation - Park
- Public Facility - Airport
- Public Facility - Public
- Public Facility - Reserve
- Rural Commercial - RCom
- Rural Industrial - Airport
- Rural Industrial - RInd
- Rural Residential - RR
- Rural Service Center - RSC
- Urban - Urban

N W E S

0 0.5 1 1.5 2 2.5 3
Miles

CH2MHILL

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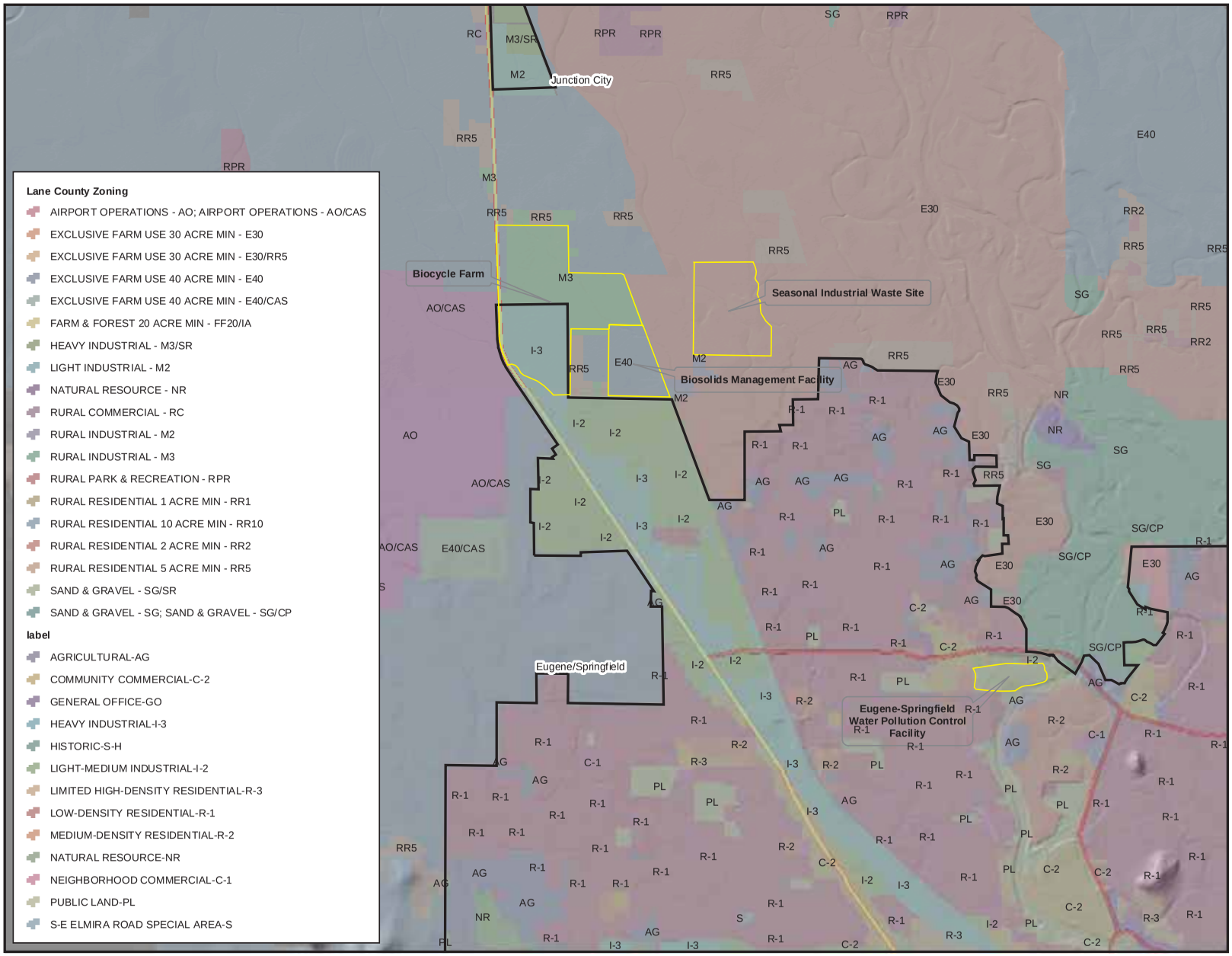

Figure 2.4.2-2

Zoning Map Facility Area

Eugene & Springfield

Legend

- Limited Access Highway
- Highway
- Biosolids Management Facility
- E/S WPCF
- Poplar Farm
- Seasonal Industrial Waste Site
- Urban Growth Boundary

Source: City of Eugene, Lane County.

N W E S

0 0.25 0.5 0.75 1 1.25 1.5
Miles

CH2MHILL

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