Total Maximum Daily Load Rule

Powder River Basin - Bacteria

January 2024

State of Oregon
DEQ Department of Environmental Quality

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1. Introduction

This draft Total Maximum Daily Load rule was developed for the Powder River Basin to address water quality impairments of bacteria. A TMDL is a science-based approach to cleaning up polluted water so that it meets state water quality standards. A TMDL is a numerical value that represents the highest amount of a pollutant a surface water body can receive and still meet the standards.

1.1 TMDL history

The Powder River Basin includes the Brownlee (17050201), Burnt (17050202), and Powder (17050203) USGS 4th Field HUC subbasins in eastern Oregon. All streams in these subbasins drain into the Snake River along the border of Oregon and Idaho.

This bacteria TMDL is the first to be issued for the Powder River Basin. As future TMDLs are written to address additional water quality impairments within the Powder River Basin, the WQMP will be updated accordingly. Issuance of this Powder River Basin TMDL does not impact or represent a revision to any existing Snake River Basin TMDLs.

1.2 TMDL administrative and public participation processes

Following completion of Oregon Department of Environmental Quality's drafting process, including engagement of a rule advisory committee on the fiscal impact statement and other aspects of the rule, this Powder River Basin TMDL on bacteria will be proposed for adoption by Oregon's Environmental Quality Commission, by reference, into rule as OAR 340-042-0090(2)(a). Any subsequently amended or renumbered rules cited in this document are intended to apply.

In addition to seeking input on development of these TMDLs through the rule advisory committee, DEQ provided updates and solicited local input from the Powder Basin Watershed Council, Powder Valley Water Control District, Burnt and Powder-Brownlee Agriculture Local Advisory Groups, Oregon Department of Agriculture and other stakeholders and people who live, work and recreate in the basin. The assistance of these groups, along with a 91-day public comment opportunity (June 2, 2023 through August 31, 2023), a second 38-day public comment period (January 3, 2024 through Feb 9, 2024), and public hearing (August 15, 2023), completed the public participation requirements specified in OAR 340-042-0050. DEQ considered all input received during these public participation opportunities, used input to guide the analyses and preparation of documents, and provided response to comments, which are available on DEQ's website.

2. TMDL name and location

Per Oregon Administrative Rule 340-042-0040(a), this element describes the geographic area for which the TMDL is developed. This Powder River Basin TMDL covers all freshwater perennial and intermittent streams in the Powder River Basin (further described below) and a small portion of the Malheur Basin, referred to as the Moore's Hollow assessment unit.

As designated by Oregon's Water Resources Department, the Powder Basin is one of 20 drainage basins in Oregon with basin-specific water quality standards described in OAR 340-041-0260 (as Powder/Burnt Basins) and mapped in that rule on Figure 260A. Within the United States Geologic Survey's Hydrologic Unit Code classification system, the basin is referred to as the Powder River Subbasin via a 6-digit HUC code (170502) and is comprised of three smaller 8-digit HUC code subbasins as listed in Table 2.

Table 2: Powder River Basin Subbasins

HUC8 Code	Subbasin Name
17050201	Brownlee Subbasin
17050202	Burnt River Subbasin
17050203	Powder River Subbasin

The basin forms a portion of the border of Oregon with Idaho and lies mostly within Baker County, with small portions in Union, Wallowa and Malheur Counties, as well as Idaho. The portion of the basin in Oregon drains 3,444 square miles (8,925 square kilometers). Elevation ranges from 1,640 feet (500 meters) above sea level at the junction with the Snake River to 9,563 feet (2,914 meters) above sea level in the Wallowa and Elkhorn Mountain ranges in the northeastern portion of the watershed. The average elevation is 4,237 feet (1,291 meters) above sea level. As shown in Figure 2.0, the Powder River Basin is comprised of three smaller subbasins that drain to Brownlee Reservoir, which sits on the Oregon-Idaho border and is an impoundment of the Snake River.

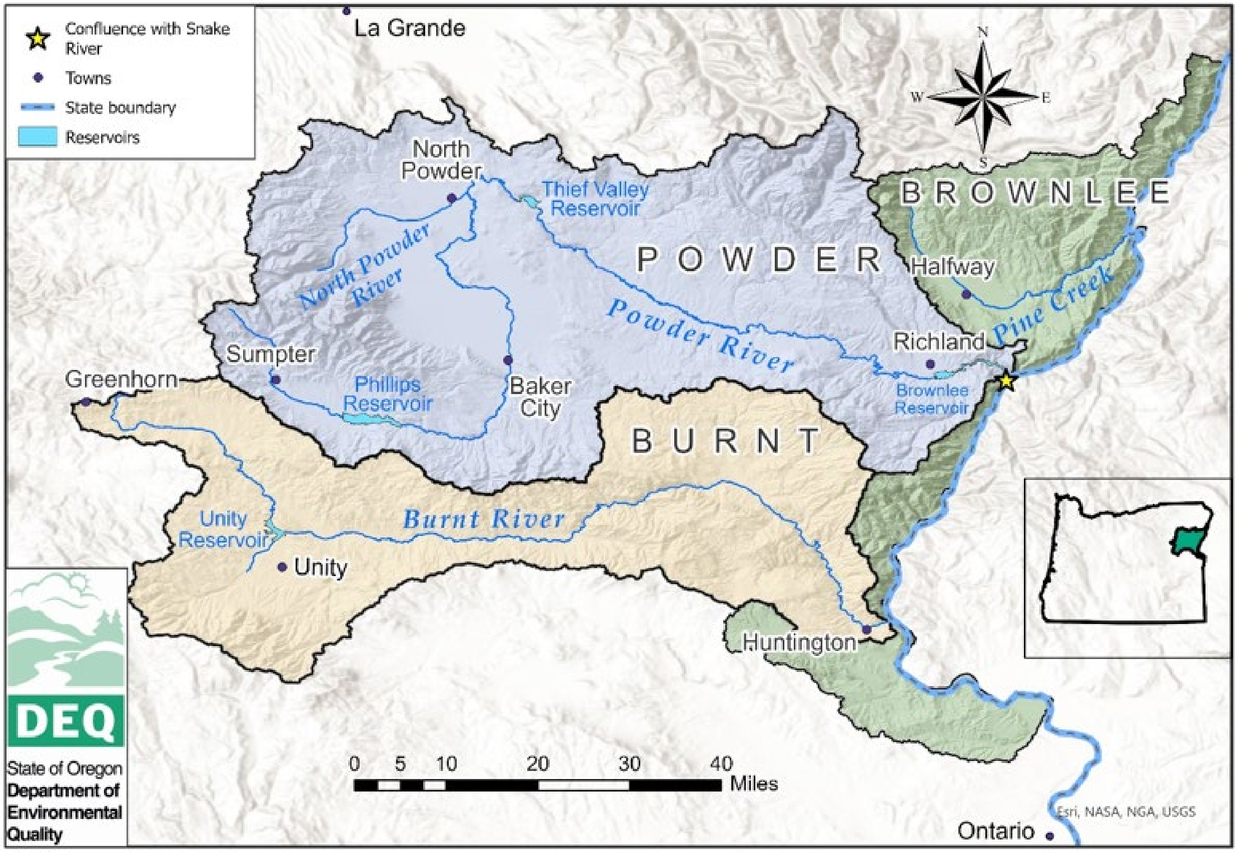

Figure 2.0: Brownlee, Burnt and Powder Subbasins within the Powder River Basin

2.1 Climate

The climate of the Powder Basin is influenced by the Cascade Mountains located approximately 200 miles to the west. This mountain range forms a barrier against the modifying effects of warm, moist fronts from the Pacific Ocean. As a result, the overall climate is classified as Temperate Continental-cool summer phase. Light precipitation, low relative humidity, rapid evaporation, abundant sunshine and wide temperature and precipitation fluctuations are characteristics of this climate. Over the past 30 years (1991 – 2020), the mean annual temperature for the Powder Basin was 45.3°F (7.4°C), with a mean annual minimum temperature of 33.3°F (0.8°C) and a mean annual maximum temperature of 64.9°F (18.3°C).

The majority of annual precipitation falls as snow during winter. Over the past 30 years (1991 – 2020), annual precipitation has averaged 22.0 inches (56.0 cm) across the Powder Basin, with an average of 10.2 inches (25.9 cm) in the valleys and foothills an average of 78.2 inches (198.6 cm) at the highest elevations of the Elkhorn, Wallowa, and Blue Mountains (Daly, et al., 2008). Portions of the basin commonly experience rain-on snow events, which reduce the snow pack and may cause brief localized flooding.

2.2 Hydrology

The Burnt River headwaters are located in the southern Blue Mountains near the town of Unity, from there it flows approximately 100 miles east to the Snake River near the town of Huntington. The Powder River has headwater areas in the Elkhorn Mountains west of Baker City near the town of Sumpter, where Cracker Creek and McCully Fork join to form the Powder River. The river flows north through the Baker Valley, and then southeast through the Keating Valley and reaches Brownlee Reservoir on the Snake River near the town of Richland. The total length of the Powder River is approximately 144 miles. Major tributaries include the North Powder River and Eagle Creek. The Brownlee Subbasin includes all the streams that drain directly to the Snake River from an area just north of Ontario to the Hells Canyon area just north of the Wallowa County-Baker County line. The largest stream in the Brownlee Subbasin is Pine Creek, which is located in the northern portion of the subbasin near the town of Halfway. The major streams and several reservoirs in the basin are shown on Figure 2.2.

Operation of the multiple reservoirs and irrigation conveyance systems described below significantly defines hydrologic patterns in the Powder River Basin. DEQ's analyses found that increased bacteria loads are delivered to waterways during irrigation season higher flows, even in areas where livestock access occurs only during non-irrigation season (DEQ 2024a). DEQ considered seasonal hydrological patterns in determining bacteria load capacities, excess loads and allocations.

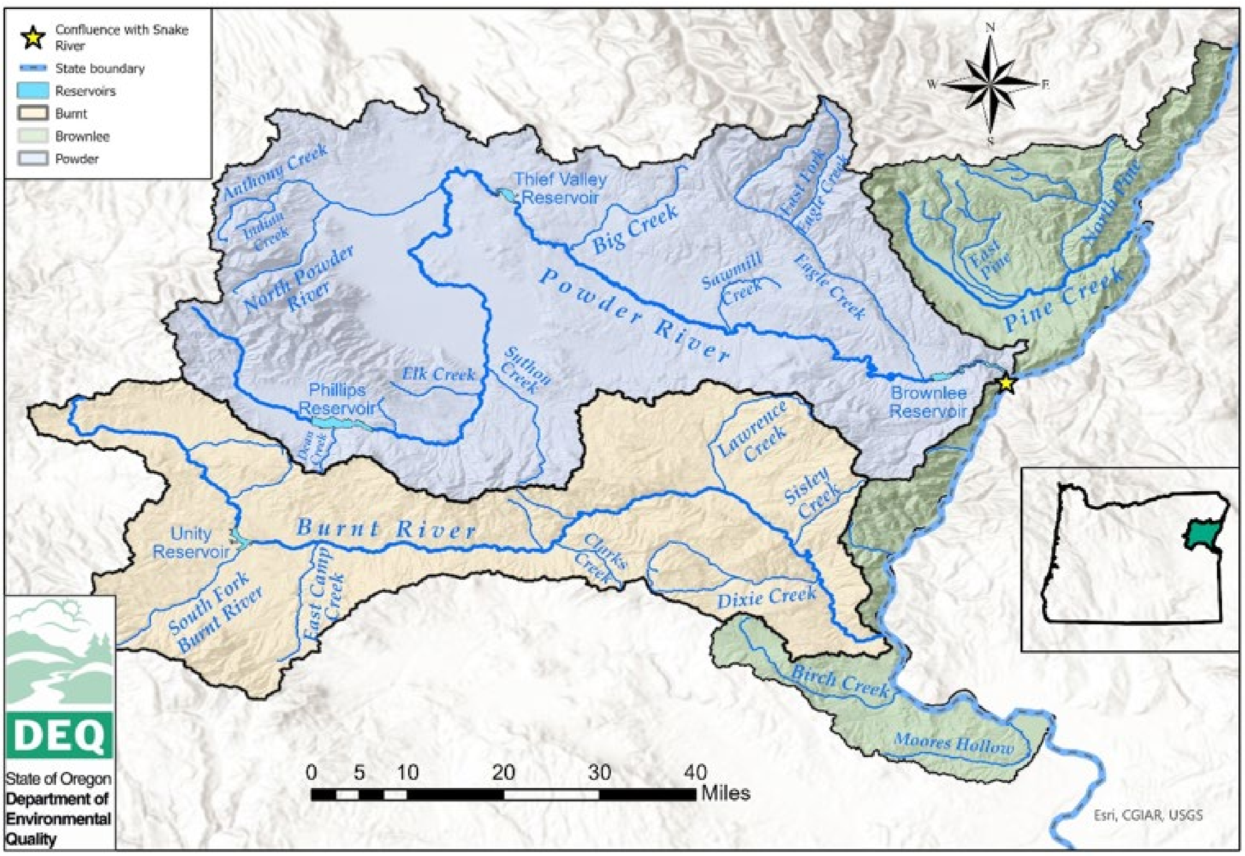

Figure 2.2: Major streams and reservoirs in the Powder River Basin

According to Oregon Water Resources Department records, there are 69 dams with a height over 10 feet in the Powder Basin and most of the water impounded by these reservoirs is used for irrigation. There are three irrigation or water control districts in the Powder Subbasin: Baker Valley Irrigation District, Lower Powder Irrigation District, and Powder Valley Water Control District (divided into the Wolf Creek and Pilcher Creek sub-districts). Irrigation in the Burnt River Subbasin is managed by the Burnt River Irrigation District. There are no formal irrigation or water control districts in the Brownlee Reservoir Subbasin, irrigation is managed by individuals or informal user groups. Available water in the Powder Basin is fully appropriated. In low water years, reservoirs are often drawn down to minimum levels and there is not enough water to supply all users.

There are five reservoirs in the Powder Basin with a storage capacity greater than 5,000 acre-feet. Unity Dam (Unity Reservoir) on the Burnt River, and Thief Valley Dam (Thief Valley Reservoir) and Mason Dam (Phillips Reservoir) on the Powder River, were constructed by the U.S. Bureau of Reclamation and are operated by local irrigation districts. Pilcher Creek Dam and Wolf Creek Dam (not shown on Figure 2.2) are owned and operated by the Powder Valley Water Control District. These projects are discussed in more detail in following subsections.

2.2.1 Burnt River Irrigation Project

As shown on Figure 2.2, Unity Dam and Reservoir are located on the upper Burnt River about 40 miles southwest of Baker City. Lands served by the irrigation project are scattered along the Burnt River downstream from Unity Reservoir near the towns of Hereford, Bridgeport, Durkee, Weatherby, Dixie, Lime, and Huntington. In addition, some lands upstream from the reservoir are included in the project. Based on 1992 data, 15,070 acres received project water for growing forage crops (approximately 13,670 acres) and cereal crops such as corn and barley.

The Bureau of Reclamation reports that Unity Dam is a zoned earthfill dam 82 feet high and 694 feet long and the maximum reservoir capacity is 25,800 acre-feet with a surface area of 926 acres. Unity Dam was completed in 1937 to take advantage of the existing distribution system and the dam and reservoir have since been operated and maintained by the Burnt River Irrigation District and offer no flood control benefits.

Along with irrigation, Unity Reservoir provides area residents with recreation benefits such as camping, fishing and boating administered by the Oregon State Parks Department.

2.2.2 Baker Irrigation Project

The Upper Division of the Baker Project furnishes irrigation water from Phillips Reservoir to 18,500 acres of land along both sides of the Powder River just north of Baker City. The Lower Division provides a supplemental water supply from Thief Valley Reservoir to about 7,300 acres of land along the Powder River in the Keating Valley about 10 miles northeast of Baker City. The Bureau of Reclamation reports that Thief Valley Dam is a concrete slab and buttress dam 390 feet long and 73 feet high with a maximum reservoir capacity of 17,600 acre-feet and a surface area of 740 acres. Water stored in Thief Valley Reservoir is released for diversion downstream into existing distribution canals and laterals. The operation of Thief Valley Dam and facilities of the Lower Division were taken over by the Lower Powder River Irrigation District on June 1, 1932.

Mason Dam is a zone earth and rockfill embankment dam, 173 feet high and 895 feet long and impounds the Powder River near Sumpter, OR. Phillips Reservoir has a maximum capacity of 95,500 acre-feet and a surface area of 2,235 acres and stored water is released into the Powder River for diversion downstream into existing distribution canals and laterals. Operation and maintenance of Upper Division facilities was transferred to the Baker Valley Irrigation District on August 23, 1968.

2.2.3 Powder Valley Water Control District

The Powder Valley Water Control District owns and operates Wolf Creek and Pilcher Creek Reservoirs, which provide irrigation water to land located in the North Powder and northern Baker valleys in the vicinity of the City of North Powder (see Figure 2.0 for general location). Completed in 1974, the reservoir behind Wolf Creek dam is approximately 220 acres in area and stores approximately 12,000 acre-feet. Pilcher Creek Reservoir was completed in 1984 and is approximately 222 acres in area and stores approximately 5,900 acre-feet. Operated as one pool, Wolf Creek Reservoir usually draws down quicker than Pilcher Creek Reservoir, so to balance out the system, water is transferred via a canal between the two sites. Additional water from Pilcher Creek Reservoir is also put instream via the North Powder River for irrigation both to the north and south of the river. Due to the connectivity of the system, the project is often referred to as the Wolf Creek Reservoir Complex.

2.3 Land use

As summarized in Table 2.3 and shown in Figure 2.3, the largest percentage land cover in the basin is scrub-shrub, followed by forest and grasslands; developed urban areas are minimal, with the largest being Baker City (population approximately 9,700), located near the center of the basin; and private and federal ownership are about equal and dominant. Areas of irrigated agriculture are found along: the Burnt River; the North Powder River; the Powder River in Baker Valley north of Baker City, in the Keating Valley, near Richland; and in the Pine Valley near Halfway (see Figure 2.0). Grassland/shrub areas are located in the plains and foothill areas and forested areas are concentrated in the mountains.

Table 2.3: 2019 Land cover classes and percentages in the Powder River Basin

NLCD Land Cover Class	Acres	Percent of the basin
Shrub/Scrub	1016650	46.1
Evergreen Forest	593939	26.9
Herbaceous	366166	16.6
Hay/Pasture	78513	3.6
Cultivated Crops	65532	3.0
Developed, Open Space	24548	1.1
Emergent Herbaceous Wetlands	20737	0.9
Open Water	13869	0.6
Barren Land	7770	0.4
Developed, Low Intensity	6675	0.3
Woody Wetlands	5871	0.3
Developed, Medium Intensity	3527	0.2
Developed, High Intensity	215	<0.1
Deciduous Forest	103	<0.1
Mixed Forest	45	<0.1
Total:	2204160	100.0

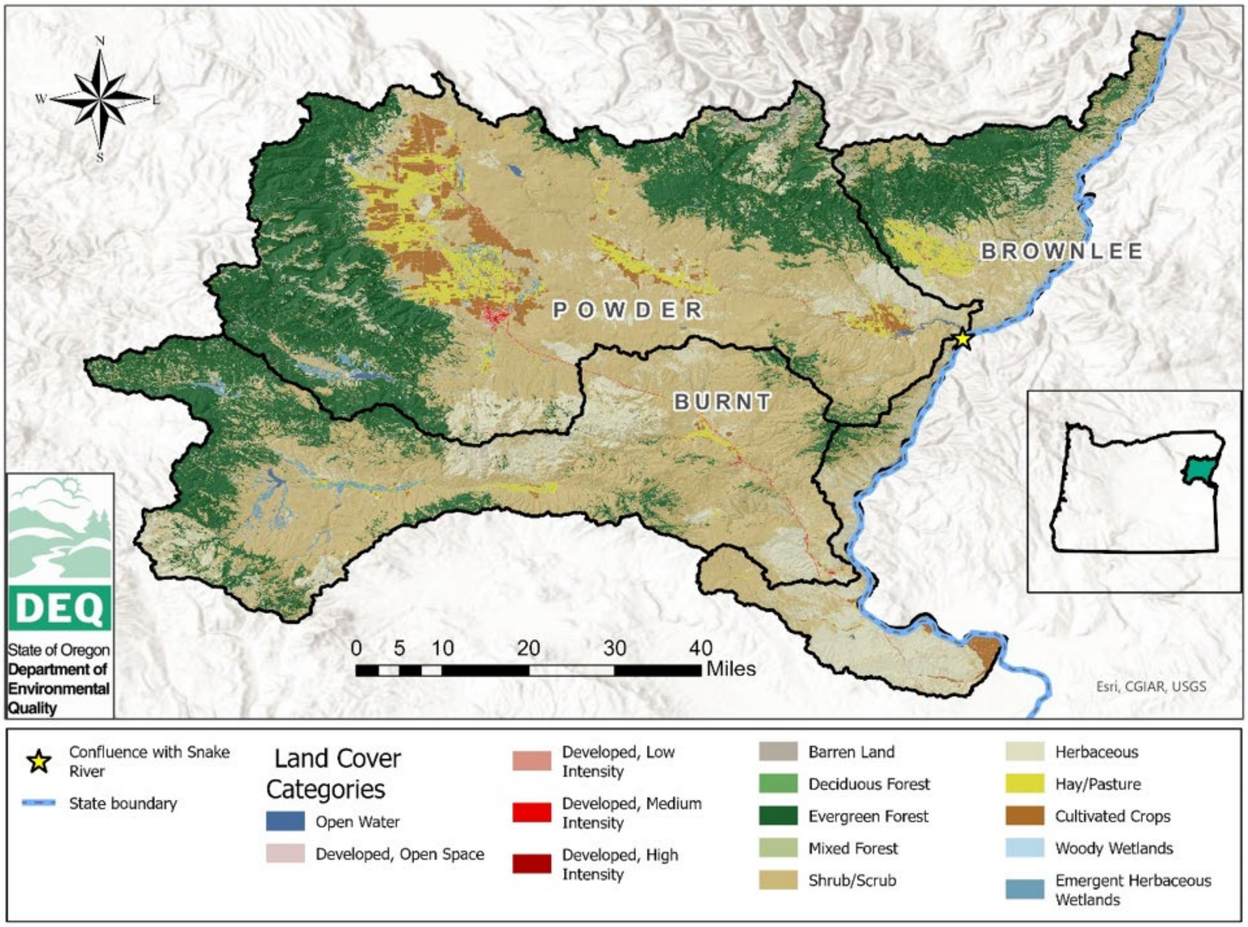

Figure 2.3: 2019 National land cover database classes in Powder River Basin

3. Pollutant identification

As stated in OAR 340-042-0040(4)(b), this element identifies the pollutants causing impairment of water quality that are addressed by this TMDL. The associated water quality standards and beneficial uses are identified in Chapter 4.

The table and figure in this section presents stream and watershed assessment units within the Powder River Basin that were listed as impaired for bacteria on DEQ's 2022 Clean Water Act Section 303(d) List (as part of DEQ's Integrated Report), which was approved by EPA on September 1, 2022. Status category designations are prescribed by Sections 305(b) and 303(d) of the Clean Water Act and are summarized in Section 3 of the TMDL Technical Support Document. Assessment units listed in Category 5 (designated use is not supported or a water quality standard is not attained) require development of a TMDL.

DEQ's evaluations include data and information collected within the basin spanning decades and includes consideration of past EPA-approved Integrated Reports, specifically the 2012 and 2018-20 impairment listings and categories. Comparisons between these and the 2022 impairments indicate some divergences. Tabulated comparisons and explanations are provided in the TMDL Technical Support Document (DEQ, 2024a). DEQ developed this TMDL to be implemented to achieve attainment of the applicable water quality criteria to support the associated beneficial uses, as specified in Section 4 of this document.

DEQ developed this TMDL to address Category 5 listed assessment units and to serve as a protection plan for all other assessment categories, including unimpaired and unassessed. The allocations and implementation framework apply year-round to all freshwater perennial and intermittent streams in the basin, as described in Sections 5, 8 and 9 of this document. The implementation framework is presented in the Powder River Basin TMDL Water Quality Management Plan (DEQ, 2024b) and includes implementation activities and timeframes to improve water quality, as well as measures of success. These and other protection plan elements are further explained in Section 12, below.

Table 3.0 presents the relevant bacteria listings and assessment units for which DEQ developed this TMDL. The extent of Category 5 assessment units (for both stream segment and watershed assessment types) are mapped in Figure 3.0. Further information is available in Section 3 of the TMDL Technical Support Document (DEQ, 2024a).

Table 3.0: Powder River Basin bacteria assessment units and status on 2022 Integrated Report

Waterbody	Assessment Unit	AU Description	Pollutant	Listing Category
North Powder River	OR_SR_1705020305_05_102817	Anthony Cr. To Powder R.	*E. coli*	5
Powder River	OR_SR_1705020309_05_102829	Goose Cr. To Eagle Cr.	*E. coli*	5
Eagle Creek	OR_SR_1705020310_05_102830	Two Color Cr. To Powder R.	*E. coli*	5
South Fork Burnt River	OR_SR_1705020202_05_103265	Whited Res. To Unity Res.	*E. coli*	5
Burnt River	OR_SR_1705020205_05_102805	Indian Cr. To Marble Cr.	*E. coli*	5
HUC 12: Middle Fork Burnt River	OR_WS_170502020107_05_103118	1st through 4th order streams	*E. coli*	5
HUC 12: Moores Hollow	OR_WS_170502010101_05_103097	1st through 4th order streams	*E. coli*	5*
Powder River	OR_SR_1705020306_05_102821	Thief Valley Reservoir to Big Creek	*E. coli*	3
Unity Reservoir	OR_LK_1705020201_05_100584	Lake/Reservoir Unit	*E. coli*	2
Phillips Lake	OR_LK_1705020301_05_100588	Lake/Reservoir Unit	*E. coli*	2
Thief Valley Reservoir	OR_LK_1705020306_05_100597	Lake/Reservoir Unit	*E. coli*	2
Brownlee Reservoir	OR_LK_1705020311_05_100605	Lake/Reservoir Unit	*E. coli*	2
Pine Creek	OR_SR_1705020106_05_102790	West Fork Pine Creek to Dry Creek	*E. coli*	2
Pine Creek	OR_SR_1705020106_05_102793	North Pine Creek to confluence with Snake River	*E. coli*	2
Burnt River	OR_SR_1705020204_05_102803	Unity Reservoir to Indian Creek	*E. coli*	2
Burnt River	OR_SR_1705020208_05_102810	Durkee Creek to confluence with Snake River	*E. coli*	2
Dixie Creek	OR_SR_1705020208_05_102811	Thornton Gulch to confluence with Burnt River	*E. coli*	2
Powder River	OR_SR_1705020301_05_102814	McCully Fork to Phillips Lake	*E. coli*	2
Powder River	OR_SR_1705020302_05_102815	Phillips Lake to Sutton Creek	*E. coli*	2
Powder River	OR_SR_1705020303_05_102816	Sutton Cr. To Old Settlers Slough	*E. coli*	2
Powder River	OR_SR_1705020304_05_102818	Old Settlers Slough to North Powder River	*E. coli*	2
Powder River	OR_SR_1705020308_05_102826	Big Creek to Goose Creek	*E. coli*	2
HUC12 Name: West Fork Burnt River	OR_WS_170502020106_05_103117	Watershed Unit (1st through 4th order streams)	*E. coli*	2
Note: * DEQ's 2022 Integrated Report listed Moores Hollow in error as Category 4A, in association with the Malheur Basin TMDL, but it remains Category 5 until addressed by this TMDL.				

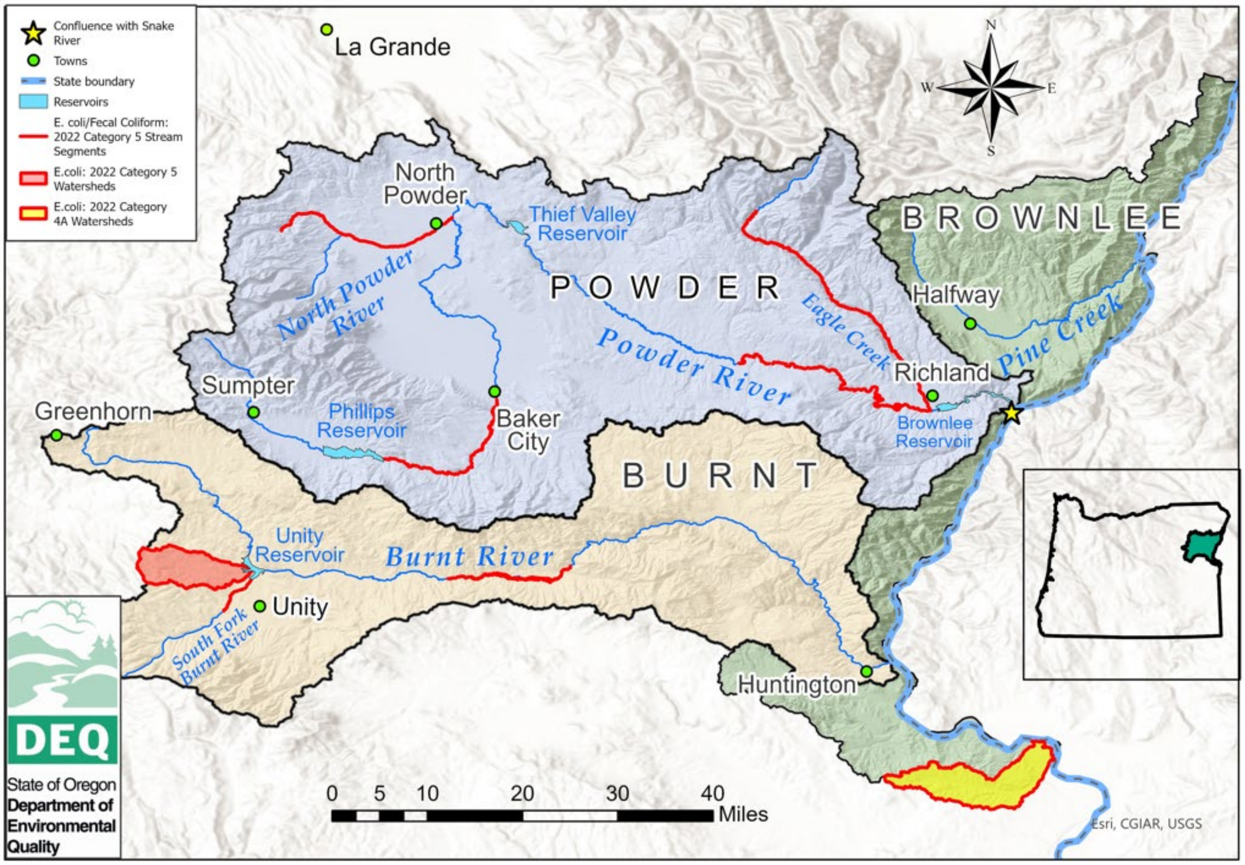

Figure 3.0: Powder River Basin bacteria impaired assessment units

4. Water quality standards and beneficial uses

As stated in OAR 340-042-0040(4)(c), this element identifies the beneficial uses in the basin, specifying the most sensitive beneficial use, and the relevant water quality standards established in OAR 340-041-0202 through 340-041-0975. By design, achievement of Oregon's water quality criteria protective of the most sensitive beneficial use protects all beneficial uses.

Tables 4.0a and 4.0b specify designated beneficial uses of Powder River Basin surface water and the applicable numeric and narrative water quality standards addressed by this TMDL, as well as indicated the most sensitive beneficial uses related to each standard.

As explained in Section 3 of the TMDL Technical Support Document and Section 4 of this document, elevated *E. coli* bacteria loads impair the most sensitive beneficial use (water contact recreation) in freshwaters. *E. coli* bacteria impairments are addressed by this TMDL to support water contact recreation and, hence, protects all beneficial uses.

Table 4.0a: Powder River Basin designated beneficial uses

All streams and tributaries thereto
Public Domestic Water Supply
Private Domestic Water Supply
Industrial Water Supply
Irrigation
Livestock Watering
Fish and Aquatic Life
Wildlife and Hunting
Fishing
Boating
Water Contact Recreation
Aesthetic Quality

Table 4.0b: Applicable water quality standards and most sensitive beneficial uses

Parameter	Citation	Summary of applicable standards	Applicable water	Most sensitive beneficial use
Bacteria	OAR 340-041-009(1)(a)	(A) 90-day geometric mean (of 5 or more samples) of 126 E.coli organisms per 100 mL (B) No single sample may exceed 406 *E. coli* organisms per 100 mL	Fresh water	Water contact recreation
Statewide Narrative Criteria	OAR 340-041-0007(1)	The highest and best practicable treatment and/or control of wastes, activities, and flows must in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor and other deleterious factors at the lowest possible levels.	All waters of the state	Fish and aquatic life

Exceedances of the *E. coli* log mean criterion (126 organisms/100 mL) and single sample criterion (406 organisms/100 mL) have both been observed year-round, although exceedances are more common during the irrigation season. As explained in Section 4.5.2 of the TMDL Technical Support Document, DEQ used the single sample maximum criterion as the maximum daily concentration for the TMDL and specified that this concentration will not be exceeded over the 90-day period, so that the geometric mean criterion is also met.

As noted in Table 4.0b, fecal contamination threatens or impairs multiple beneficial uses, the most sensitive of which is human contact of waters for recreational purposes with respect to potential exposure by pathogens found with bacteria in fecal material. The *E. coli* criterion is established to protect the beneficial use of human contact of waters for recreational purposes (water contact recreation) with respect to potential exposure to pathogens found with bacteria in fecal material. Recreational use not only includes swimming but any activity that could result in ingestion of water, such as: fishing, through contact of hands with water; any water sports; children playing along the banks or shores; and others. Recreational use of fecal contaminated waters can lead to mild to severe illnesses in humans.

Water with high levels of fecal contamination can also pose a disease risk to livestock and wildlife. Infections like Johne's disease are caused by ingestion of bacteria in manure of infected animals, which serves as an ongoing reservoir of the bacteria. The disease reduces weight gain in cattle, can be fatal and leads to wasting symptoms in deer. Fecal contamination of irrigation water also raises the risk of produce crop contamination. Although not the most sensitive beneficial use, irrigation and livestock watering are prevalent beneficial uses in the Powder River Basin and will also be protected through implementation of this TMDL.

Because waters of the Powder River, Burnt River and Brownlee Subbasins drain to the Snake River, which forms the border between the northeast portion of Oregon and Idaho, DEQ considered downstream water quality standards, impairments and effects of implementation of this TMDL. The mainstem Snake River does not currently have Category 5 bacteria listings by either Oregon or Idaho at or downstream of discharges from the Powder Basin. The flow volumes of the Powder, Burnt and Brownlee Subbasins are very small, relative to the Snake River flows. These smaller flows at multiple discharge points are unlikely to measurably improve or degrade bacteria conditions in the Snake River. However, because Oregon and Idaho share comparable *E. coli* criteria (IDEQ, 2023), DEQ concluded that implementation of the TMDL allocations in Powder, Burnt and Brownlee Subbasins will result in attainment of both state's bacteria water quality criteria at the points of discharge to the Snake River. *[Paragraph moved from Section 3 and reference to ID water quality standards included, per EPA request.]*

5. Seasonal variation and critical conditions for bacteria

Per OAR 340-042-0040(4)(j) and 40 Code of Federal Regulation130.7(c)(1), TMDLs must also identify any seasonal variation and the critical condition or period of each pollutant, if applicable.

Seasonal variations are observed in the hydrologic conditions of the Powder River Basin due to alternating dryer conditions in late spring through early fall and wetter conditions in late fall through early spring. DEQ evaluated these periods as "irrigation season" and "non-irrigation season," respectively, which allowed assessment of the role of irrigation return water in instream bacteria loads. As detailed in the Powder River Basin TMDL Technical Support Document, DEQ captured these variations in the load duration curve and time-series plots analyses and found that bacteria criteria are exceeded year-round, but generally with reduced impacts during the non-irrigation season.

Although critical conditions could be considered to occur during irrigation season, late spring through early fall (approximately May through October), stream flow-based nonpoint source load allocations and the actions needed to support them must be applied year-round.

6. Bacteria water quality data evaluation overview

DEQ used EPA's flow-based load duration curve method to determine pollutant loading capacity, assess current conditions and calculate the necessary pollutant reductions to comply with Oregon's bacteria water quality criteria, as summarized in Figure 6.0 and detailed in Sections 4.4 and 4.5 of the Technical Support document (DEQ, 2024a). The approach allows comparison of observed bacteria loads to water quality criteria under various flow categories and seasonal conditions and can be used to help target appropriate water quality restoration efforts.

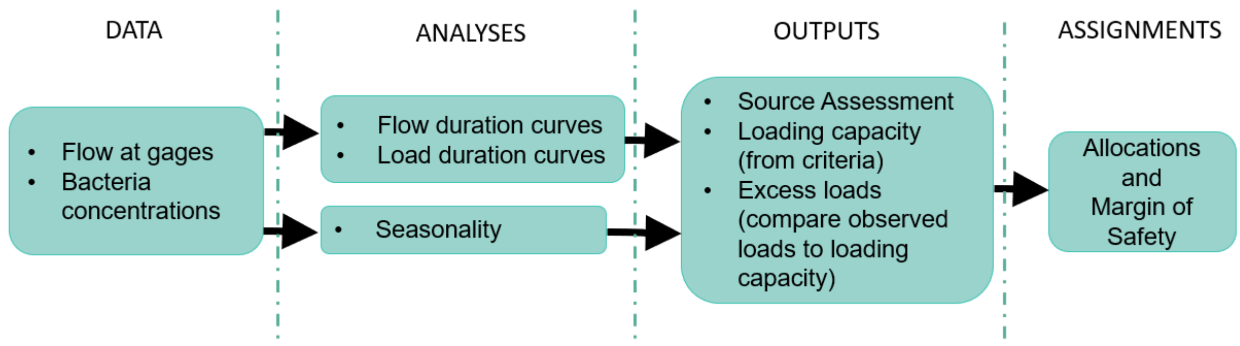

Figure 6.0: Powder River Basin bacteria analysis overview

DEQ used the following simplified flow categories to describe the range of potential flow conditions with common intervals of exceedance probability: High (0% to 10%); Medium-High (10% to 40%); Medium (40% to 60%); Medium-Low (60% to 90%); and Low (90% to 100%), as defined in Table 4.4 of the TMDL Technical Support Document (DEQ, 2024a).

DEQ developed load duration curves for various reaches within the watershed by multiplying estimated stream flows by: 1) the *E. coli* water quality criterion concentration to determine loading capacity; and, 2) measured *E. coli* concentrations to determine observed loads. Excess loads are indicated by the differences between loading capacities and observed loads and are expressed as reductions needed at various reaches. DEQ linked potential point and nonpoint sources of bacteria that could influence stream bacteria concentrations during differing hydrologic conditions using area land use information and specific local knowledge. Additional information on bacteria analyses is provided in Section 4 of the TMDL Technical Support Document (DEQ, 2024a).

7.0 Pollutant sources or source categories

As noted in OAR 340-042-0040(4)(f) and OAR 340-042-030(12), a source is any process, practice, activity or resulting condition that causes or may cause pollution or the introduction of pollutants to a waterbody. This section identifies the various pollutant sources and estimates, to the extent existing data allow, the significance of pollutant loading from existing sources.

Specific sources are described below and are subsequently assigned allocations. Sources of pollutants to streams include point and nonpoint sources. OAR 340-045-001(17) defines point source as “any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged.” OAR 340-41-0002 (42) defines nonpoint sources as “diffuse or unconfined sources of pollution where wastes can either enter, or be conveyed by the movement of water, into waters of the state.”

By definition (OAR 340-042-0030(1)), background sources include all sources of pollution or pollutants not originating from human activities. Background sources may also include anthropogenic sources of a pollutant that the DEQ or another Oregon state agency does not have authority to regulate, such as pollutants emanating from another state, tribal lands, or sources otherwise beyond the jurisdiction of the state.

There are a variety of potential anthropogenic-influenced sources of fecal contamination to Powder River Basin surface waters. Each source varies in significance of fecal contributions, based on prevalence of the activities, size of the land area on which the activities occur, locations of activities in relation to surface water and transport mechanisms. By mass, nonpoint sources are far greater contributors of bacteria in the Powder River Basin than point sources. Further information on source assessment is available in Section 5 of the TMDL Technical Support Document (DEQ, 2024a).

7.1 Bacteria nonpoint and background sources

Nonpoint sources of bacteria in the Powder River Basin include activities associated with livestock on reservoir, agricultural and forest lands, residential septic systems and wildlife.

DEQ’s analyses identified runoff from grazed and irrigated areas, including reservoirs grazed during draw down and irrigation return water, as primary sources of the bacteria load to streams in the basin. High bacteria concentrations were most common in areas where land use includes irrigated pastures and hayfields, seasonal livestock use and livestock feeding areas. DEQ found higher concentrations of bacteria in the Powder River: downstream of Phillips Reservoir; along the Keating Valley; downstream of Richland near the discharge into the Brownlee Reservoir; and above the Eagle Creek-Powder confluence. Bacteria was also higher along the south fork of the Burnt River and from Unity Reservoir to Bridgeport. Further details can be found in the source assessment provided in Section 5 of the Technical Support Document.

DEQ concluded that the low and dispersed population on septic systems and small percentage of systems that could be failing at the same time constitutes a possible, but likely insignificant source of bacteria to Powder River Basin waterways. Further information is available in Section 5.2.2 of the TMDL Technical Support Document.

While wildlife contributions are considered background, DEQ considered human practices that enhance delivery of bacteria from wildlife, such as elk congregating at artificial feeding areas in the Elkhorn Wildlife Area. DEQ concluded that wildlife, including migrating waterfowl, may make minor seasonal contributions, but are not a significant source of bacteria loading to surface waters in the Powder River Basin. Further information is available in Section 5.2.4 of the TMDL Technical Support Document. DEQ did not attempt to separate background from anthropogenic sources in the load duration curve analyses. Rather, background sources were included with all nonpoint sources of bacteria in the analyses and load allocations, such that they are components of surface water runoff transported to streams from land uses including forests, pastures and rural residential.

7.2 Bacteria point sources

Table 7.2 lists the NPDES permitted point sources with potential to contribute bacteria to surface waters in the basin. These include three permitted point source wastewater discharges and Oregon Department of Transportation's statewide MS4 permit, which regulates stormwater discharges from highways following collection, treatment and conveyance. Information is available in Section 5.2.3 of the TMDL Technical Support Document to support DEQ's conclusion that these point sources contribute minimal bacterial loads to surface waters in the basin.

Table 7.2: Point sources with bacteria contributions in the Powder River Basin

DEQ file number	EPA number	Permittee	Facility type	Permit type	Receiving water	River Mile
40981	OR0020052	City of Huntington	sewage treatment	DOM-Db	Burnt River	2
61600	OR0022403	City of North Powder	sewage treatment	DOM-Db	Powder River	82.4
5324	OR0020699	City of Baker City	sewage treatment	DOM-C1b	Powder River	116.3
101822	ORS110870	Oregon Department of Transportation	highway stormwater	MS4 - Phase I	various	NA

8.0 Bacteria loading capacity and excess load

Summarizing OAR 340-042-0040(4)(d) and 40 CFR 130.2(f), loading capacity is the amount of a pollutant or pollutants that a waterbody can receive and still meet water quality standards. In accordance with OAR 340-042-0040(4)(e), the excess load calculation evaluates, to the extent existing data allow, the difference between the actual pollutant load in a waterbody and the loading capacity of that waterbody.

Table 8.0 presents a summary of estimated *E. coli* loading capacities and excess loads at monitored stream reaches at the flow categories of the greatest observed exceedances. Excess loads are presented as the highest percent reduction at each monitored reach, across a range of flow categories, during both irrigation and non-irrigation seasonal times and based on a mix of single sample maximum and geomean criterion exceedances. Estimated loading capacities for all other flows can be calculated for either criterion using the following equations and are presented for each flow category and location in Tables 9.1b-9.1f:

Loading Capacity = 126 org/100 mL x Flow x conversion factor to org/day (geomean)

Loading Capacity = 406 org/100 mL x Flow x conversion factor to org/day (single sample)

Section 4.5 of the TMDL Technical Support Document presents modeled estimations and calculation details of the amount of *E. coli* bacteria that the Powder River Basin streams can receive and still meet water quality standards.

Estimated loading capacities apply to all streams tributary to each stream reach described in association with each downstream monitoring station. Year-round implementation of the highest relative percent reduction indicated at any flow and for either criterion is protective of all flows and both criteria (DEQ, 2024a).

Table 8.0: Bacteria loading capacities and excess loads as highest reductions needed

Downstream station	Stream reach description	Measured Load (orgs/day)	Loading Capacity (orgs/day)	Excess Load (percent reduction)	Flow Category (for highest reduction)	Criterion (for highest reduction)
36382-ORDEQ: Pine Creek at Hwy 71	Pine Creek upstream of Highway 71	1.17E+13	1.30E+13	0%	All	both
34250-ORDEQ: Powder River above Phillips Reservoir Dam	Powder River upstream of Philips Reservoir	1.18E+11	4.58E+11	0%	All	both
11490-ORDEQ: Powder River at Hwy 7 (in Baker City)	Powder River from Phillips Reservoir to Baker City	4.20E+12	7.05E+11	83%*	Medium	single sample max
36192-ORDEQ: North Powder River at Miller Rd. Bridge	North Powder River from USFS Boundary to Miller Rd	3.26E+12	5.46E+11	83%	Medium-High and Medium-Low	single sample max
36193-ORDEQ: Eagle Creek at Snake River Rd	Eagle Creek from New Bridge to Brownlee Reservoir	2.97E+10	1.08E+10	64%	Low	geomean
36191-ORDEQ: North Powder River at Hwy 30 Bridge	North Powder River from Miller Road to Confluence with Powder River	2.48E+11	1.25E+10	95%	Low	geomean
34256-ORDEQ: Burnt River at Clarks Cr. Bridge	Burnt River from Unity Reservoir to Clarks Creek Rd	4.61E+12	7.74E+11	83%	Medium-High	single sample max
36195-ORDEQ: Burnt River at Unity Reservoir Dam	Burnt River at Unity Reservoir Dam	3.83E+11	2.63E+12	0%	All	both
11857-ORDEQ: Powder River at Snake River Rd. (Richland)	Powder River from Thief Valley Reservoir to near Richland	4.34E+11	1.07E+11	75%	Medium-Low	geomean
11494-ORDEQ: Burnt River at Snake River Rd (Huntington)	Burnt River from Clarks Creek Rd to Snake River near Huntington	5.12E+12	3.10E+12	40%	High	geomean
Notes: * Indicates the only location where the highest percent reduction is during non-irrigation season.						

9.0 Allocations, reserve capacity and margin of safety

OAR 340-042-0040(4)(g),(h),(i) and (k) [and 40 CFR 130.2(h) and (g) and 130.7(c)(2)] respectively define the required TMDL elements of apportionment of the allowable pollutant load: point source wasteload allocations; nonpoint source load allocations; margin of safety; and, reserve capacity. Collectively, these elements add up to the maximum load a pollutant that still allows a waterbody to meet water quality standards. OAR 304-042-0040(5) and (6) describe the potential factors of consideration for determining and distributing these allocations of the allowable pollutant loading capacities. Water quality data analysis must be conducted to determine allocations, potentially including statistical analysis and mathematical modeling.

9.1 Bacteria allocations

Bacteria allocations are the amount of *E. coli* allowed in discharges from each source. Table 9.1a presents *E. coli* allocations as a relative percentage of the maximum *E. coli* load that Powder River Basin streams can receive and still meet the bacteria criteria, distributed among the known point and nonpoint sources in the watershed, after accounting for a margin of safety with both implicit and explicit components. Tables 9.1b through 9.1f present the daily loads allowable from sources to each stream reach relative to the daily flow ranges measured for each flow category. Background sources were not able to be separated from other human caused nonpoint sources. However, in keeping with the definition of background sources in OAR 340-042-0030(1), actions to implement the load allocations will be focused on sources arising from human activities.

Bacteria load allocations correspond to the loading capacities based on a maximum *E. coli* concentration of 126 organisms/100 mL and apply to all streams tributary to each stream reach described in association with each downstream monitoring station. *[This text was moved from the Notes in Table 9.1a]*

Bacteria waste load allocations apply at the point of discharge.

As noted in Sections 5.2.3 and 6.1 of the TMDL Technical Support Document, the three industrial wastewater permits and the NPDES 1200Z industrial stormwater general permit registrants are not sources of bacteria and are not assigned numeric wasteload allocations. Instead, the permittees and 1200Z registrants must follow their permit conditions to meet the narrative wasteload allocation of their current bacteria loads, if any.

Wastewater treatment plants are allocated permitted effluent limits at the bacteria standard (Table 4.0b) and maximum permitted discharge (1 MGD for North Powder and Huntington and 2 MGD for Baker City), to ensure that recreation-based criteria are attained. Individual NPDES permits issued to the cities of Huntington, Baker City and North Powder for treatment of domestic wastewater do not require further modification at renewal as they currently implement the *E. coli* criteria as permit limits. *[This text was moved from a Note in Table 9.1a and Baker City wasteload allocation was added.]*

Table 9.1a: Bacteria allocations by sources and areas as a relative percentage of loading capacity

Stream reach description	Relative allocation of loading capacity					Totals
	Nonpoint source and background	ODOT MS4	Wastewater treatment	Reserve capacity	Margin of safety	
Pine Creek upstream of Highway 71 Powder River upstream of Philips Reservoir Powder River from Phillips Reservoir to Baker City North Powder River from USFS Boundary to Miller Rd Eagle Creek from New Bridge to Brownlee Reservoir North Powder River from Miller Rd to Confluence with Powder River Burnt River from Unity Reservoir to Clarks Creek Rd Burnt River at Unity Reservoir Dam	89.0%	1.0%	0.0%	0.0%	10.0%	100.0%
Powder River from Thief Valley Reservoir to near Richland	42.9 to 88.7%	1.0%	0.3 to 46.1%	0.0%	10.0%	100.0%
Burnt River from Clarks Creek Rd to Snake River near Huntington	80.3 to 88.8%*	1.0%	0.2 to 8.7%	0.0%	10.0%	100.0%
Notes: Ranges represent values across the gradient of the five flow categories. * Applies to portion of reach below Huntington wastewater treatment plant with all other areas of reach allocated 89.0%						

[Values in red were altered to provide a wasteload allocation for the Baker City wastewater treatment plant. Note added for clarity regarding ranges of allocations.]

[Tables 9.1b through 9.1f added to address EPA request to include allocations and load capacities at all flow categories.]

Table 9.1b: High flow bacteria allocations by source and stream reach

Stream reach description	Mean daily flow ranges (cubic feet per second)	Loading capacity (orgs/day)	Excess load (maximum reduction needed)	Nonpoint source and background LAs (orgs/day)		Point source WLAs (org /day)		Reserve capacity (orgs/day)	Margin of safety (orgs/day)
				Irrigation return and stormwater	Improper septic systems	ODOT MS4	Wastewater treatment		
Pine Creek upstream of Highway 71	1,010.00 to 7,000.00	8.26E+12	0%	7.36E+12	0	8.26E+10	0	0	8.26E+11
Powder River upstream of Philips Reservoir	191.35 to 906.00	1.53E+12	0%	1.36E+12	0	1.53E+10	0	0	1.53E+11
Powder River from Phillips Reservoir to Baker City	226.0 to 669.00	1.31E+12	83%	1.17E+12	0	1.31E+10	0	0	1.31E+11
North Powder River from USFS Boundary to Miller Rd	83.50 to 904.00	1.23E+12	83%	1.10E+12	0	1.23E+10	0	0	1.23E+11
Eagle Creek from New Bridge to Brownlee Reservoir	754.40 to 3,000.00	5.32E+12	64%	4.73E+12	0	5.32E+10	0	0	5.32E+11
North Powder River from Miller Rd to Confluence with Powder River	83.50 to 904.00	1.23E+12	95%	1.10E+12	0	1.23E+10	0	0	1.23E+11
Burnt River from Unity Reservoir to Clarks Creek Rd	155.00 to 1,840.00	2.39E+12	83%	2.12E+12	0	2.39E+10	0	0	2.39E+11
Burnt River at Unity Reservoir Dam	160.00 to 1,390.00	1.99E+12	0%	1.77E+12	0	1.99E+10	0	0	1.99E+11
Powder River from Thief Valley Reservoir to near Richland	592.00 to 3,300.00	4.65E+12	75%	4.12E+12	0	4.65E+10	1.43E+10	0	4.65E+11
Burnt River from Clarks Creek Rd to Snake River near Huntington	249.00 to 2,130.0	3.10E+12	40%	2.75E+12	0	3.10E+10	4.77E+09	0	3.10E+11
Notes: LA = Load allocation; WLA = Wasteload Allocation									

Table 9.1c: Medium-High flow bacteria allocations by source and stream reach

Stream reach description	Mean daily flow ranges (cubic feet per second)	Loading capacity (orgs/day)	Excess load (maximum reduction needed)	Nonpoint source and background LAs (orgs/day)		Point source WLAs (org /day)		Reserve capacity (orgs/day)	Margin of safety (orgs/day)
				Irrigation return and stormwater	Improper septic systems	ODOT MS4	Wastewater treatment		
Pine Creek upstream of Highway 71	262.00 to 1,009.99	1.81E+12	0%	1.61E+12	0	1.81E+10	0	0	1.81E+11
Powder River upstream of Philips Reservoir	27.03 to 191.34	2.64E+11	0%	2.35E+11	0	2.64E+09	0	0	2.64E+10
Powder River from Phillips Reservoir to Baker City	80.25 to 225.99	4.66E+11	83%	4.15E+11	0	4.66E+09	0	0	4.66E+10
North Powder River from USFS Boundary to Miller Rd	19.00 to 83.49	1.19E+11	83%	1.06E+11	0	1.19E+09	0	0	1.19E+10
Eagle Creek from New Bridge to Brownlee Reservoir	157.00 to 754.39	1.18E+12	64%	1.05E+12	0	1.18E+10	0	0	1.18E+11
North Powder River from Miller Rd to Confluence with Powder River	19.00 to 83.49	1.19E+11	95%	1.06E+11	0	1.19E+09	0	0	1.19E+10
Burnt River from Unity Reservoir to Clarks Creek Rd	49.80 to 154.99	2.40E+11	83%	2.13E+11	0	2.40E+09	0	0	2.40E+10
Burnt River at Unity Reservoir Dam	80.00 to 159.99	3.59E+11	0%	3.20E+11	0	3.59E+09	0	0	3.59E+10
Powder River from Thief Valley Reservoir to near Richland	110.00 to 591.99	8.83E+11	75%	7.72E+11	0	8.83E+09	1.43E+10	0	8.83E+10
Burnt River from Clarks Creek Rd to Snake River near Huntington	71.70 to 248.99	3.63E+11	40%	3.19E+11	0	3.63E+09	4.77E+09	0	3.63E+10
Notes: LA = Load allocation; WLA = Wasteload Allocation									

Table 9.1d: Medium flow bacteria allocations by source and stream reach

Stream reach description	Mean daily flow ranges (cubic feet per second)	Loading capacity (orgs/day)	Excess load (maximum reduction needed)	Nonpoint source and background LAs (orgs/day)		Point source WLAs (org /day)		Reserve capacity (orgs/day)	Margin of safety (orgs/day)
				Irrigation return and stormwater	Improper septic systems	ODOT MS4	Wastewater treatment		
Pine Creek upstream of Highway 71	100.00 to 261.99	5.41E+11	0%	4.82E+11	0	5.41E+09	0	0	5.41E+10
Powder River upstream of Philips Reservoir	12.00 to 27.02	5.86E+10	0%	5.22E+10	0	5.86E+08	0	0	5.86E+09
Powder River from Phillips Reservoir to Baker City	30.00 to 80.24	4.66E+11	83%	4.15E+11	0	4.66E+09	0	0	4.66E+10
North Powder River from USFS Boundary to Miller Rd	14.00 to 18.99	5.22E+10	83%	4.64E+10	0	5.22E+08	0	0	5.22E+09
Eagle Creek from New Bridge to Brownlee Reservoir	88.30 to 156.99	3.84E+11	64%	3.42E+11	0	3.84E+09	0	0	3.84E+10
North Powder River from Miller Rd to Confluence with Powder River	14.00 to 18.99	5.22E+10	95%	4.64E+10	0	5.22E+08	0	0	5.22E+09
Burnt River from Unity Reservoir to Clarks Creek Rd	34.10 to 49.79	1.33E+11	83%	1.19E+11	0	1.33E+09	0	0	1.33E+10
Burnt River at Unity Reservoir Dam	13.00 to 79.99	1.28E+11	0%	1.14E+11	0	1.28E+09	0	0	1.28E+10
Powder River from Thief Valley Reservoir to near Richland	48.00 to 109.99	2.31E+11	75%	1.91E+11	0	2.31E+09	1.43E+10	0	2.31E+10
Burnt River from Clarks Creek Rd to Snake River near Huntington	52.50 to 71.69	1.98E+11	40%	1.71E+11	0	1.98E+09	4.77E+09	0	1.98E+10
Notes: LA = Load allocation; WLA = Wasteload Allocation									

Table 9.1e: Medium-Low flow bacteria allocations by source and stream reach

Stream reach description	Mean daily flow ranges (cubic feet per second)	Loading capacity (orgs/day)	Excess load (maximum reduction needed)	Nonpoint source and background LAs (orgs/day)		Point source WLAs (org /day)		Reserve capacity (orgs/day)	Margin of safety (orgs/day)
				Irrigation return and stormwater	Improper septic systems	ODOT MS4	Wastewater treatment		
Pine Creek upstream of Highway 71	33.00 to 99.99	2.06E+11	0%	1.83E+11	0	2.06E+09	0	0	2.06E+10
Powder River upstream of Philips Reservoir	1.70 to 11.99	1.98E+10	0%	1.76E+10	0	1.98E+08	0	0	1.98E+09
Powder River from Phillips Reservoir to Baker City	12.81 to 29.99	1.64E+11	83%	1.46E+11	0	1.64E+09	0	0	1.64E+10
North Powder River from USFS Boundary to Miller Rd	5.40 to 13.99	3.00E+10	83%	2.67E+10	0	3.00E+08	0	0	3.00E+09
Eagle Creek from New Bridge to Brownlee Reservoir	5.59 to 88.29	1.24E+11	64%	1.10E+11	0	1.24E+09	0	0	1.24E+10
North Powder River from Miller Rd to Confluence with Powder River	5.40 to 13.99	3.00E+10	95%	2.67E+10	0	3.00E+08	0	0	3.00E+09
Burnt River from Unity Reservoir to Clarks Creek Rd	17.80 to 34.09	8.25E+10	83%	7.34E+10	0	8.25E+08	0	0	8.25E+09
Burnt River at Unity Reservoir Dam	4.10 to 12.99	2.54E+10	0%	2.26E+10	0	2.54E+08	0	0	2.54E+09
Powder River from Thief Valley Reservoir to near Richland	18.80 to 47.99	1.07E+11	75%	8.07E+10	0	1.07E+09	1.43E+10	0	1.07E+10
Burnt River from Clarks Creek Rd to Snake River near Huntington	28.00 to 52.49	1.29E+11	40%	1.10E+11	0	1.29E+09	4.77E+09	0	1.29E+10
Notes: LA = Load allocation; WLA = Wasteload Allocation									

Table 9.1f: Low flow bacteria allocations by source and stream reach

Stream reach description	Mean daily flow ranges (cubic feet per second)	Loading capacity (orgs/day)	Excess load (maximum reduction needed)	Nonpoint source and background LAs (orgs/day)		Point source WLAs (org /day)		Reserve capacity (orgs/day)	Margin of safety (orgs/day)
				Irrigation return and stormwater	Improper septic systems	ODOT MS4	Wastewater treatment		
Pine Creek upstream of Highway 71	0.01 to 32.99	8.02E+10	0%	7.13E+10	0	8.02E+08	0	0	8.02E+09
Powder River upstream of Philips Reservoir	0.03 to 1.69	2.38E+09	0%	2.12E+09	0	2.38E+07	0	0	2.38E+08
Powder River from Phillips Reservoir to Baker City	3.20 to 12.80	3.02E+10	83%	2.68E+10	0	3.02E+08	0	0	3.02E+09
North Powder River from USFS Boundary to Miller Rd	0.01 to 5.39	1.25E+10	83%	1.12E+10	0	1.25E+08	0	0	1.25E+09
Eagle Creek from New Bridge to Brownlee Reservoir	0.00 to 5.59	1.08E+10	64%	9.62E+09	0	1.08E+08	0	0	1.08E+09
North Powder River from Miller Rd to Confluence with Powder River	0.01 to 5.39	1.25E+10	95%	1.12E+10	0	1.25E+08	0	0	1.25E+09
Burnt River from Unity Reservoir to Clarks Creek Rd	5.90 to 17.79	4.30E+10	83%	3.83E+10	0	4.30E+08	0	0	4.30E+09
Burnt River at Unity Reservoir Dam	0.00 to 4.09	4.98E+09	0%	4.43E+09	0	4.98E+07	0	0	4.98E+08
Powder River from Thief Valley Reservoir to near Richland	0.00 to 18.79	3.11E+10	75%	1.33E+10	0	3.11E+08	1.43E+10	0	3.11E+09
Burnt River from Clarks Creek Rd to Snake River near Huntington	0.00 to 27.99	5.51E+10	40%	4.43E+10	0	5.51E+08	4.77E+09	0	5.51E+09
Notes: LA = Load allocation; WLA = Wasteload Allocation									

9.2 Reserve capacity

DEQ did not identify any projected needs for reserve capacity of bacteria due to future growth and new or expanded sources. DEQ reserved zero percent of the bacteria loading capacity. Future permitted sources may discharge effluent containing fecal bacteria at concentrations in compliance with water quality standard criteria (see Table 4.0b), which is consistent with the requirements in this TMDL for currently permitted sources and does not constitute a lowering of bacterial water quality.

9.3 Margin of safety

As required by OAR 340-042-0040(4)(i), this element explains how a margin of safety was derived and incorporated into the TMDL to account for uncertainty in available data or in the actual effect controls will have on loading reductions and receiving water quality. For bacteria in the Powder River Basin, DEQ used an explicit margin of safety. As shown in Tables 9.1a through 9.1f, a value of 10 percent was explicitly applied in the TMDL calculation. A detailed description of margin of safety calculations can be found in Section 6.4 of the Powder River Basin TMDL Technical Support Document.

In addition, the following conservative analytical assumptions were included to incorporate an additional, implicit margin of safety. DEQ used reasonable maximum scenarios for each part of the analysis to ensure that estimated loads would be the highest actual loads that may be encountered. For instance, death and decay of *E. coli* is likely during the time spent on land and in runoff and stream/river transport, given the long distances to downstream monitoring sites and the presence of reservoirs in some reaches. However, DEQ assumed that all source bacteria reach the streams, rather than accounting for die-off of bacteria. In calculating wasteload allocations for wastewater treatment facilities, DEQ used permitted discharge limits for *E. coli* without considering the bacteria reduction from chlorination applied to remove all pathogens from effluent prior to discharge. Because differing sources contribute differing magnitudes of bacteria during differing flow conditions, DEQ also chose to apply reductions needed as the maximum from among those calculated based on geometric mean or single sample criteria across all flow categories and both seasons. This approach ensures additional reductions are applied to sources contributing during flows other than those associated with the maximum observed concentration.

10.0 Water quality management plan

As described in OAR 340-042-0040(4)(l)(A)-(O), an associated WQMP is an required element of a TMDL and must include the following components: (A) Condition assessment and problem description; (B) Goals and objectives; (C) Proposed management strategies design to meet the TMDL allocations; (D) Timeline for implementing management strategies; (E) Explanation of how TMDL implementation will attain water quality standards; (F) Timeline for attaining water quality standards; (G) Identification of persons, including Designated Management Agencies, responsible for TMDL implementation; (H) Identification of existing implementation plans; (I)

Schedule for submittal of implementation plans and revision triggers; (J) Description of reasonable assurance of TMDL implementation; (K) Plan to monitor and evaluate progress toward achieving TMDL allocations and water quality standards; (L) Plan for public involvement in TMDL implementation; (M) Description of planned efforts to maintain management strategies over time; (N) General discussion of costs and funding for TMDL implementation; and, (O) citation of legal authorities relating to TMDL implementation.

DEQ sought and considered input from various persons, including DMAs responsible for TMDL implementation and other interested public, and prepared the Powder River Basin WQMP as a stand-alone document. DEQ intends to propose the draft WQMP as an element of the Powder River Basin TMDL for adoption as rule by the Oregon Environmental Quality Commission [OAR 340-042-0090(2)(b)].

11.0 Reasonable assurance

OAR 340-042-0030(9) defines Reasonable Assurance as “a demonstration that a TMDL will be implemented by federal, state or local governments or individuals through regulatory or voluntary actions including management strategies or other controls.” EPA’s TMDL guidance describes that when a TMDL is developed for waters impaired by both point and nonpoint sources and WLAs are based on an assumption that NPS load reductions will occur, the TMDL must provide “reasonable assurances” that NPS control measures will achieve expected load reductions (USEPA 1991). Comprehensive explanations of reasonable assurances of implementation are provide in Section 7 of the Powder River Basin TMDL Water Quality Management Plan.

[Section 12.0 added to address EPA's request for a separate section summarizing where information supporting acceptance of the TMDL as a protection plan can be found throughout the documents.]

12.0 Protection plan

The scope of this bacteria TMDL includes all perennial and intermittent streams in the Powder River Basin. As such, these TMDLs also serve as a “protection plan” to prevent impairment in waters currently attaining the applicable water quality standards, whether those waters are assessed or unassessed. The protection of these unimpaired waters has watershed-wide benefits such as:

- Clarity and consistency for implementation of management strategies throughout the watershed;
- Proactively applying management strategies and protections to waters where data is not available for establishing listing status;
- Improving TMDL outcomes by maintaining or improving water quality in streams that are tributary to listed streams;
- Creating efficiencies between TMDL and protection plan implementation (including monitoring, evaluating progress, adaptive management, enforcement and leveraging partner entities’ efforts); and,

- Assisting with funding opportunities for implementation when grants require projects to be part of a larger watershed plan.

Protection plan core elements, as described in materials available on EPA's webpage (EPA 2023a and 2023b), are fulfilled by the statements and references to specific sections of the TMDLs, WQMP and TMDL Technical Support Document in the subsections that follow.

12.1 Identification of specific waters to be protected and risks to their condition

Table 3.0 lists all the assessments units within the watershed with 2022 Integrated Report assessment status. Those assessment units with the status of Category 2, Category 3 or unassessed are included in the protection plan, along with other unassessed waters that may be found to be unimpaired for bacteria in the future. The same sources and processes described in Section 7 that have caused bacteria impairments to some reaches in the basin also pose a risk to unimpaired waters.

12.2 Quantification of loads and activities expected to resist degradation

The implementation of management practices specified in Sections 2 and 5 of the WQMP also protect against risks to unimpaired waters.

Monitoring stations that provided bacteria data used in the TMDLs analyses are shown in TSD Tables 4.3a and 4.3b and on figures and text throughout TSD Section 5.1. The associate flow gaging stations used are listed in TSD Tables 4.3a and 4.3b and in text of TSD Section 5.1. These data and flow measurements were used to calculate loading capacities of *E. coli* within the basin as shown in the load durations curves, presented as TSD Figures 4.5.1a – 4.5.1j. Applicable loading capacities for any unimpaired stream reaches that fall within the studied reaches are shown in Tables 8.0, and 9.1b through 9.1f. Instructions for calculating loading capacities for any unimpaired stream reaches outside the studied reaches are provided in Section 8.0. Applicable loading capacities for bacteria for any unimpaired stream reaches at the varying flow categories are shown in TSD Table 4.5.2pp.

Similar to loading capacities, relative percentages of the bacteria loading capacity are allocated to sources to any stream reach within the watershed in Table 9.1a. Relevant allocations for anthropogenic sources of bacteria loads are shown by studied reach in Tables 9.1.b through 9.1f.

12.3 Timeframes for protection

Timelines for watershed-wide implementation of the TMDLs are described in Section 5 of the WQMP and estimated timelines for attainment of water quality standards in the impaired stream reaches are provided in Section 4 of the WQMP. DEQ's watershed-wide approach ensures that the TMDLs and the protection plan will be implemented in a prioritized manner over the same timeframe that will be required to demonstrate effectiveness of management strategies in reducing excess pollutant loads.

12.4 Measures of success

The WQMP describes in detail DEQ's approach to quantitative and qualitative measures of progress in attaining and maintaining water quality standards, which is applied watershed-wide. Section 6 of the WQMP discusses quantitative and qualitative evaluation of implementation of management strategies, development of a plan for periodic monitoring and an approach to adaptive management. Section 7 of the WQMP details the interconnected framework for accountability of implementation, including: engaging with sources; setting measurable objectives; evaluating progress; conducting enforcement; and tracking status and trends.

13.0 References

DEQ. 2024a. Draft Powder River Basin Bacteria TMDL Technical Support Document. Oregon Department of Environmental Quality.

DEQ. 2024b. Draft Powder River Basin Water Quality Management Plan. Oregon Department of Environmental Quality.

EPA. 1991. Guidance for Water Quality-based Decisions: The TMDL Process. EPA/440/4-91-001. Washington, D.C.

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