CHAPTER 4
NUMERIC TARGETS

Numeric targets are values used in a TMDL to measure attainment of applicable water quality standards. Numeric targets may be defined in terms other than the method through which the standard is expressed when the targets achieve the water quality standard. In addition, multiple indicators and associated numeric target values may be used to interpret an individual water quality standard.

The fecal coliform value described in the Basin Plan for the protection of water contact recreation conformed to the U.S. EPA criteria of the 1970s. Since the 1970s when the objective was established, several key epidemiological studies have evaluated the U.S. EPA criteria for protection of public health from water contact recreation (Cabelli et al. 1982; Cabelli et al. 1983; Dufour 1983; Favero 1985; Seyfried et al. 1985a, Seyfreid et al. 1985b). These studies concluded that the 1976 U.S. EPA recommended fecal coliform bacteria criteria were not protective of public health from swimming recreation. As a result, the U.S. EPA changed the criteria recommendation in 1986 to use the pathogen bacteria indicators of *E. coli* and enterococci bacteria. Detection of fecal coliform bacteria in recreational waters may overestimate the level of fecal contamination because this bacteria group contains a genus, *Klebsiella*, with species that are not necessarily fecal in origin. *Klebsiella* bacteria are commonly associated with soils and the surfaces of plants, so that areas with organic debris may show high levels of fecal coliform bacteria that do not have a fecal-specific bacteria source.

E. coli and enterococci bacteria are found in the fecal material of humans and other animals. Epidemiological studies have demonstrated a link between *E. coli* and enterococci bacteria concentrations and gastrointestinal illness. The U.S. EPA have recommended *E. coli* and enterococci bacteria concentration criteria as an indicator of health risk from water contact recreation.

As discussed in more detail in Chapter 2, this TMDL only addresses impairment of recreational uses. These targets are set at levels designed to protect recreators from illness, using EPA's 2012 recommended criteria (U.S. EPA 2012).

4.1 NUMERIC TARGETS

4.1.1 *E. COLI* BACTERIA

E. coli is a species of fecal coliform bacteria that is found in the fecal material of humans and other animals. U.S. EPA (2012) compiled numerous epidemiological studies and concluded that *E. coli* bacteria are a good indicator of human health risk from water contact in recreational freshwaters. The criteria are established for both the geometric mean and the

statistical threshold value (STV). To assess impairment of REC-1, the geometric mean criterion is compared to the logarithmic average of the bacteria concentration distribution. In addition, the STV criterion is compared to the 90th percentile of the bacteria concentration distribution.

4.1.1.1 E. COLI NUMERIC TARGETS TO PROTECT RECREATIONAL USES

The *E. coli* bacteria numeric targets are expressed as a geometric mean and statistical threshold value in Table 4.1. The numeric targets are used to determine if water quality conditions attain the recreation-specific portion of the bacteria water quality objective and the extent of impairment by pathogen indicator bacteria in the Russian River Watershed. The *E. coli* numeric targets are equivalent to the *E. coli* TMDLs/loading capacities, as described in Chapter 8.

Table 4.1
***E. coli* Bacteria Numeric Targets**

Geometric Mean (cfu/100mL)	Statistical Threshold Value (cfu/100mL)
≤ 100	≤ 320

cfu: colony forming units
ml: milliliters

The *E. coli* bacteria TMDL numeric targets are based on the U.S. EPA (2012) criteria that correspond to an illness rate of 32 gastrointestinal illnesses per 1,000 water contact recreators in order to provide additional protection. The sampling frequency and period of sampling is important to proper interpretation of monitoring results. Any ambient water quality monitoring of fecal indicator bacteria must be in accordance with an approved monitoring plan, which specifies the appropriate sampling frequency and period of sampling, as defined by the monitoring purpose, season of interest, and other relevant factors. The STV approximates the 90th percentile of the water quality distribution and is intended to be a value that should not be exceeded by more than 10% of the samples used to calculate the GM.

4.1.2 ENTEROCOCCI BACTERIA

Enterococci is a genus of fecal indicator bacteria that is found in the fecal material of humans and other animals. U.S. EPA (2012) compiled numerous epidemiological studies and concluded that enterococci bacteria are a good indicator of human health risk from water contact in recreational marine and freshwaters. The criteria are established for both the geometric mean and the statistical threshold value (STV). To assess impairment of REC-1, the geometric mean criterion is compared to the logarithmic average of the bacteria concentration distribution. In addition, the STV criterion is compared to the 90th percentile of the bacteria concentration distribution.

4.1.2.1 Enterococci Numeric Targets to Protect Recreational Uses

The enterococci bacteria numeric targets are expressed as a geometric mean and statistical threshold value in Table 4.2. The numeric targets are used to determine if water quality conditions attain the recreation-specific portion of the bacteria water quality objective and the extent of impairment by pathogen indicator bacteria in the Russian River Watershed. The enterococci numeric targets are equivalent to the enterococci TMDLs/loading capacities, as described in Chapter 8.

Table 4.2
Enterococci Bacteria Numeric Targets

Geometric Mean (cfu/100mL)	Statistical Threshold Value (cfu/100mL)
≤ 30	≤ 110

cfu: colony forming units
ml: milliliters

The enterococci bacteria TMDL numeric targets are based on the U.S. EPA (2012) criteria that correspond to an illness rate of 32 NGI per 1,000 water contact recreators in order to provide additional protection. The sampling frequency and period of sampling is important to proper interpretation of monitoring results. Any ambient water quality monitoring of fecal indicator bacteria must be in accordance with an approved monitoring plan, which specifies the appropriate sampling frequency and period of sampling, as defined by the monitoring purpose, season of interest, and other relevant factors. The STV approximates the 90th percentile of the water quality distribution and is intended to be a value that should not be exceeded by more than 10% of the samples used to calculate the GM.

In summary, numeric targets are set in the Russian River Pathogen TMDL based on the most recent U.S.EPA guidance for protection of recreational uses of water. U.S.EPA (2012) establishes national criteria for *E. coli* and enterococci bacteria, which update the criteria developed in 1986 for the same metrics. The numeric targets are designed to be applied in the receiving water as a marker of progress towards attainment of the bacteria water quality objective and protection of the REC-1 beneficial use. As described in Chapter 8 (TMDLs, Loading Capacities, and Margin of Safety), the waste load allocations and load allocations are also based on U.S. EPA (2012) national criteria. As such, the numeric targets, TMDL, waste load allocations, and load allocations are identical. As described in Chapter 9 (Implementation), the waste load allocations may be expressed differently when translated into effluent limitations in permits or orders.