

3.2.7.3 Maximums and Averages

Applicability:

This topic describes reporting maximums and calculating averages for permitted effluent limitations.

Content:

Definitions of the common measurements describing effluent limitations are found in 10 CSR 20-2.010. Those relating to maximums and averages are presented below.

- Daily maximum. An effluent limitation that specifies the total mass or average concentration of pollutants that may be discharged in a calendar day.
- Discharge. The causing or permitting of one or more water contaminants to enter waters of the state.
- Monthly average. The total mass or concentration of all daily discharges sampled during a calendar month divided by the number of daily discharges sampled or measured during that month.
- Weekly average. The total mass or concentration of all daily discharges sampled during any calendar week divided by the number the number of daily discharges sampled or measured during that week.

Missouri state operating permit (NPDES permit) activities are aligned with U.S. EPA NPDES permit program requirements. Unless flexibility is granted by the federal regulations and the state acts upon that flexibility, state program provisions and details are consistent with federal program provisions and details. This is the case with Missouri's use of the word "average" when describing effluent limitations. While the type of average (i.e. the arithmetic mean) is clearly implied in the Missouri definitions above, the word "average" is not specifically defined or qualified in the Missouri Clean Water Law, 10 CSR 20-2.010 Definitions, 10 CSR 20-7.015 Effluent Regulations, 10 CSR 20-7.031 Water Quality Standards or the Missouri Standard and Special Conditions for NPDES Permits. Hence, the following applies:

40 CFR 122.41(l)(4)(iii) states "Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit."

The permit writer needs to keep this in mind when developing effluent limitations for the various pollutant parameters. If an average other than the arithmetic mean is preferred (e.g. the geometric mean), this needs to be specified in the permit. Use of a note in the Effluent Limitations and Monitoring Requirements table of the permit is an appropriate way to do this.

The federal regulations have several definitions that address average and maximum monitoring and reporting values. They are presented below for reference and background purposes.

40 CFR 122.2 Definitions state:

- Average monthly discharge limitation means the highest allowable average of “daily discharges” over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of “daily discharges” measured during that month.
- Average weekly discharge limitation means the highest allowable average of “daily discharges” over a calendar week, calculated as the sum of all the “daily discharges” measured during a calendar week divided by the number of “daily discharges” measured during that week.
- Daily discharge means the “discharge of a pollutant” measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the “daily discharge” is calculated as the total mass of pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the “daily discharge” is calculated as the average measurement of the pollutant over the day.
- Maximum daily discharge limitation means the highest allowable daily discharge.

Additional clarification is found in EPA guidance (July 2000) Section 4.7 for calculating weekly or monthly averages. Calculations should use one-half of the method detection limit (instead of zero) for laboratory non-detects when calculating averages. Monthly and weekly averages are calculated using the same methods in examples one through three. Calculating of averages should be completed as follows unless specified otherwise within the permit:

Example 1

Facility P has four samples for their AML (average monthly limit) for pollutant X which has a detection limit of <5 mg/L

Week 1 = 11.4
 Week 2 = <5.0
 Week 3 = 7.1
 Week 4 = <5.0

First take ½ of 5.0, then add and average. Calculate as follows:
 $11.4 + 2.5 + 7.1 + 2.5 = 23.5 \div 4$ (number of samples) = 5.875 mg/L
 (report 5.9) monthly average. Daily maximum is 11.4. Note the < sign was dropped in the answer.

Example 2

Facility Q has five samples for their AWL (average weekly limit) for pollutant Y that has a detection limit of <9 µg/L

Day 1 = <9.0
 Day 2 = <9.0
 Day 3 = <9.0
 Day 4 = <9.0
 Day 5 = <9.0

Establish both the maximum daily value and weekly average value as <9.0 µg/L (retain the 'less than' symbol).

Example 3

Facility R has four samples for their AML (average monthly limit) for pollutant Z where the laboratory indicated a detection limit of <4 mg/L and then <6 mg/L

Week 1 = <4.0

Week 2 = <4.0

Week 3 = <6.0

Week 4 = <6.0

First take ½ of 4.0 and 6.0, then add and average. Calculate as follows:
 $2 + 2 + 3 + 3 = 10 \div 4$ (number of samples) = 2.5 mg/L monthly average.
(Note the < sign was dropped in the averaged answer), daily maximum is <6.0.

When calculating averages, the permittee should not include a day or week where there was no discharge or no sample was acquired unless specifically indicated otherwise within the permit.

Example 4

Facility T did not discharge week three within the month. They would calculate their monthly average as:

Week 1 = 7.1

Week 2 = 6.4

Week 3 = no discharge or not sampled

Week 4 = 7.5

Average the three numerical values as $(7.1 + 6.4 + 7.5) \div 3$ (number of actual samples) = 7.0 for their average monthly value.

References:

Code of State Regulations:

10 CSR 20-2.010

10 CSR 20-7.015

Definitions, (17), (22), (40) and (84)

Effluent Regulations -

(2) Missouri and Mississippi River Limitations

(3) Lakes and Reservoirs Limitations

(4) Losing Streams Limitations

(5) Metropolitan No-Discharge Streams Limitations

(6) Special Stream Limitations

(7) Subsurface Waters Limitations

(8) Other Waters

Code of Federal Regulations:

40 CFR 122.2

40 CFR 122.44(i)

40 CFR 122.45(d), (e), (f)

EPA Administered Programs: The NPDES - Definitions

EPA Administered Programs: The NPDES - Establishing limitations, standards, and other permit conditions

EPA Administered Programs: The NPDES - Calculating NPDES permit conditions

EPA Guidance:

EPA/600/R-96/084
July 2000

“Guidance for Data Quality Assessment; Practical Methods for Data Analysis”

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