



Technical Development Document for the Final Effluent Limitations Guidelines and Standards for the Meat and Poultry Products Point Source Category (40 CFR 432)

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SECTION 14

LIMITATIONS AND STANDARDS: DATA SELECTION AND CALCULATION

This section describes the data sources, data selection, data conventions, and statistical methodology used by EPA in calculating the long-term averages, variability factors, and limitations. The effluent limitations and standards¹ for meat and poultry subcategories and options are based on long-term average effluent values and variability factors that account for variation in treatment performance within a particular treatment technology over time.

This section only provides information for pollutants for which EPA ultimately promulgated limitations. For the Poultry Subcategories, EPA promulgated limitations for ammonia (as nitrogen (N)), biochemical oxygen demand (BOD₅), total suspended solids (TSS), oil and grease measured as hexane extractable materials (O&G (as HEM)), fecal coliforms and total nitrogen. For the Meat Subcategories, EPA promulgated limitations for ammonia (as N) and total nitrogen.

Section 14.1 gives a brief overview of data sources (a more detailed discussion is provided in Section 3) and describes EPA's evaluation and selection of facility data sets that are the basis of the final limitations. Section 14.2 provides a more detailed discussion of the selection of the data sets used as the basis for the limitations. Section 14.3 describes censoring types associated with the data. Section 14.4 describes data substitutions and exclusions. Section 14.5 presents the procedures for data aggregation. Section 14.6 provides an overview of the limitations. Sections 14.7 and 14.8 describe procedures for estimation of long-term averages, variability factors, and concentration-based limitations. Final limitations are listed in Section 14.9. The attachments for Section 14 are provided in Appendix F.

¹In the remainder of this chapter, references to 'limitations' includes 'standards.'

14.1 OVERVIEW OF DATA SELECTION

To develop the long-term averages, variability factors, and limitations, EPA used wastewater data from facilities with components of the model technology for each subcategory and option. These data were collected from two sources: EPA's sampling episodes, herein referred to as "sampling episodes;" and industry's self-monitoring data, herein referred to as "self-monitoring episodes." EPA qualitatively reviewed the data from the sampling and self-monitoring episodes and selected episodes to represent each option based on a review of the production processes and treatment technologies in place at each facility. EPA only used data from facilities that had some or all components of the model technologies for the option (model technologies for each option are described in Section 9 of TDD).

For some facilities, EPA had data from one or more sampling episodes and/or one or more self-monitoring episodes. In general, EPA analyzed the data from each episode separately in calculating the limitations. If EPA received individual measurements (i.e., not averaged data) from a facility with a sizeable gap (e.g., one year) or data that represented a different treatment train, then each self-monitoring episode was considered separately. As an example, Episode 307 utilized the Option 2 treatment technology during 1999 while this facility used the Option 2.5 technologies beginning in 2001.² This approach to multiple periods data from a single facility is consistent with EPA's practice for other industrial categories. Data from different sources generally characterize different time periods, different treatment technologies, and/or different chemical analytical methods.

²In this section and the record, EPA has referred to the 1999 data as Episode 307a; the 2001 data as Episode 307b; the 2002-2003 data as Episode 307c; and the 2001-2003 data as Episode 307e. Similarly, for Facility 340, EPA refers to the 1999 data as Episode 340a; and the 2001-2002 data as Episode 340b. Where facilities provided daily data and monthly averages, the monthly averages are presented as the episode number followed by 'm.' For example, Episode 307m and 290m.

In developing the promulgated limitations, EPA generally used the self-monitoring data when they were measured by analytical methods specified in or approved under 40 CFR Part 136 that facilities are required to use for compliance monitoring. One exception was EPA's exclusion of some industry self-monitoring data for oil and grease. Consistent with other recently promulgated or amended effluent guidelines limitations for other point source categories,³ EPA excluded all self-monitoring oil and grease data analyzed with methods that require freon, an ozone-depleting agent, as an extraction solvent. EPA is phasing out these freon-based methods and has approved a replacement method, Method 1664, which measures hexane extractable materials (HEM). Consequently, EPA developed the O&G (as HEM) limitations solely on the measurements from Method 1664. For TSS, EPA excluded data from one facility (290) that reported using Method 2540B, because this method measures total solids rather than TSS.

In evaluating the fecal coliforms data, EPA excluded data where the reported methods might have been measuring total rather than fecal coliforms (facilities 11, 26, 32, 290, 308, 326). EPA also excluded data from episodes where the laboratories measured fecal coliforms after the 8-hour holding times consistent with 40 CFR 136. These data were from sampling episodes at poultry facilities (6443, 6445, 6448, 6493).

First, EPA evaluated each data set to determine what technology or series of technologies the data represented. In this manner, EPA eliminated many data sets because they did not represent a technology basis considered during development of this rule. In a few instances, EPA included data from facilities that employ technologies in addition to the technology bases being considered. In these cases, EPA had data from intermediate sampling points representing the model technologies; in other words, the data EPA employed reflected application of only the technologies under consideration. Next, EPA reviewed the remaining data sets to ensure that each facility was effectively operating its technologies particularly in regards to partial denitrification. EPA also excluded treatment data from indirect discharging facilities because, in

³CFR Parts 420, 437, and 438

general, they are not required to treat their effluent discharges to the same levels as directly discharging facilities - particularly for conventional parameters and nutrients.

Second, EPA reviewed the remaining data on a pollutant-by-pollutant basis to determine if any data values appeared to be unreasonable and suitable for possible exclusions. For example, EPA eliminated data for a particular pollutant that were collected while a facility was experiencing exceptional incidents or upsets or pollutant data for time periods that indicate the facility was in violation of its permit. These exclusions, along with justifications, are described in detail in the next section.

14.2 EPISODE SELECTION FOR EACH SUBCATEGORY

This section describes the data selected to calculate the final limitations for each pollutant in each subcategory. Part 1 of Appendix D lists the daily data and sampling points corresponding to the episodes that represent the final technology options considered for which EPA had long-term monitoring or EPA sampling data. Attachment 14-1 in Appendix F provides summary statistics for these same episodes, sorted by subcategory and option.

14.2.1 Poultry Subcategories

For the Poultry Subcategories, EPA is promulgating conventional pollutant and ammonia (as N) limitations based on Option 2. EPA is promulgating total nitrogen limitations based on Option 2.5.

14.2.1.1 Exclusions of All Data from Episodes

For Episode 339, EPA excluded the data for all pollutants from one week (7/17-7/23/2000), because all of the effluent was directed to the recycle pond rather than being discharged. The facility indicated there was some type of plant upset that caused it not to meet their limits. Because this was not the facility's normal practice, EPA excluded the data from that time period.

For Episode 304, EPA excluded all data for all pollutants from January 1, 1999 through July 31, 1999. These data were collected during the start-up period of the treatment system and do not represent well-operated conditions.

14.2.1.2 Pollutant Specific Exclusions

The following describes data that EPA excluded for specific parameters. Unless indicated otherwise, these data were ultimately not used to determine the final limitations. Consequently, these exclusions had no effect on the final limitations. They are presented here because they are included in statistical analyses provided in record section 32 for the final rule.

Ammonia (as N)

For Episode 339, EPA excluded all ammonia (as N) data for the months of July through September of 2002 because the ammonia (as N) effluent discharges during this period at this facility were associated with enforcement period for ammonia (as N) discharges. EPA further reviewed the ammonia (as N) data from this facility and similarly excluded ammonia (as N) data that were greater than permit limit of 2.9 mg/L (May 1 to October 31) and 3.9 mg/L (November 1 to April 30).

In addition, for Episode 277, EPA excluded the ammonia (as N) value of 9.0 mg/L collected on 7/7/1999 because the value is extreme in comparison with other data from that facility (DCN333091).

BOD₅

For Episode 273, EPA excluded a BOD₅ value of 47.63 mg/L for 3/19/1999 because the value appears to be an extreme value.

Total Nitrogen

For Episode 304, EPA excluded a total nitrogen data value of 832.92 mg/L for 5/5/2003 because the value is inconsistent with other results for that facility (See DCN 333090). EPA also excluded a data value of 36.51 mg/L for 8/11/1999 because the value is smaller than the corresponding sum of the values of nitrite/nitrate and total kjeldahl nitrogen (TKN).

For Episode 307, EPA excluded the total nitrogen data value of 2934 mg/L in March of 2002 because the value was an order of magnitude greater than any other reported value, and thus, likely to be a typographic error.

14.2.2 Meat Subcategories

For the meat subcategories, EPA considered promulgating total nitrogen limitations based on Option 2.5 and ammonia (as N) limitations based on Option 2. EPA ultimately transferred limitations for these pollutants from Poultry Subcategory K (See discussion in Section 14.8.3). This section discusses the data exclusions that EPA used in evaluating the data from the meat subcategories. However, because these data were ultimately not used to determine the final limitations, these exclusions had no effect on the final limitations.

14.2.2.1 Exclusions of All Data from Episodes

There are two facilities in EPA's database for which EPA performed two separate sampling activities (i.e., once prior to proposal and once after proposal). Based on an assessment of the sampling data collected during the two different sampling episodes for both facilities, EPA concluded that the post-proposal sampling episode at each facility provides a better demonstration of the model technology, and has included only the post-proposal Episodes, 6485 and 6486, in its final database. The excluded Episodes are 6335 and 6446.

14.2.2.2 Pollutant Specific Exclusions

Ammonia (as N)

For Episode 287, EPA excluded the ammonia (as N) data from the first half of January in 1999 (1/1/1999 to 1/17/1999). Time plots of the ammonia (as N) data for this facility (DCN 333070) showed increased values during this time period and much lower values for the remainder of the year.

Similarly, for Episode 277, EPA excluded data value from 7/7/1999 because the value appears to be extreme (DCN 333091).

BOD₅

For Episode 287, EPA excluded the BOD₅ data from the first half of January in 1999 (1/1/1999 to 1/17/1999). Time plots of the BOD₅ data for this facility (DCN 333070) showed increased values during this time period and much lower values for the remainder of the year.

14.3 CENSORING TYPES ASSOCIATED WITH DATA

In its statistical analyses, EPA considered the censoring type associated with the data. EPA considered measured values to be detected. In statistical terms, the censoring type for such data was ‘non-censored’ (NC). Measurements reported as being less than some sample-specific detection limit (e.g., <10 mg/L) were censored and were considered to be non-detected (ND). In the tables and data listings in this document and the record for the rulemaking, EPA has used the abbreviations NC and ND to indicate the censoring types. Laboratories can also report numerical results for specific pollutants detected in the samples as “right-censored.” Right-censored measurements are those that are reported as being greater than the highest calibration value of the analysis (e.g., >1000 µg/L). The next section explains EPA assumptions for the right-censored data.

The distinction between the two censoring types, NC and ND, is important because the procedure used to determine the variability factors considers censoring type explicitly. This estimation procedure modeled the facility data sets using the modified delta-lognormal distribution described in Appendix E. In this distribution, data are modeled as a mixture of two distributions.

14.4 DATA SUBSTITUTIONS AND EXCLUSIONS

In some cases, EPA did not use all of the data described in Section 14.2 in calculating the limitations. Other than the data substitutions and exclusions described in this section and Section 14.2, EPA has used the data from the episodes and sampling points presented in Appendix D.

14.4.1 Data Substitutions

EPA's data substitutions included use of different values and/or censoring assumptions. The following paragraphs describe these substitutions.

In a few data sets, facilities reported their data to have zero values. (See DCN333007) Because laboratory equipment cannot measure 'zero' values, EPA substituted higher values for purposes of the statistical analyses. Some of these reported zero values were for O&G (as HEM) and those values were substituted with the baseline level of 5 mg/L. Some other zero values were for BOD₅, ammonia (as N), and TKN in Episode 326 (EPA did not use data from this episode in calculation of final limitations) and fecal coliforms (Episodes 293 and 297, 314, 326, (EPA did not regulate fecal coliforms based on these data.) EPA substituted baseline values, as defined in Appendix A, instead of zero values.

In EPA's view, some data were more likely to have been detection limits rather than measured (or non-censored) values. With this interpretation, the data are more appropriately modeled as non-detected values in the statistical analyses. This paragraph describes the data that were affected by this interpretation. (Also see DCN 333006.) For Episode 277, 11 percent of the ammonia (as N) data were reported as measured at 0.1 mg/L which was the same value as the

detection limit associated with 61 percent of the data. In addition, for Episode 397, 31 percent of the ammonia (as N) data were reported as measured at 0.1 mg/L. Thus, EPA considered all ammonia (as N) values of 0.1 mg/L at Episodes 277 and 397 to be non-detected. For O&G (as HEM), Episode 309 reported 28 percent of its data to be measured values of 5.1 mg/L. EPA assumed that these values resulted from adjusting the minimum level for slightly smaller sample sizes that required by the analytical method, and thus, assumed that the values were non-detected in its statistical analyses. For TSS, Episode 328 reported 21 percent of its data to be measured at 4 mg/L, which was the same value as the detection limit associated with 21 percent of the data. Thus, EPA assumed that all TSS values of 4 mg/L at Episode 328 were non-detected.

On the other hand, EPA assumed that some data that were reported as non-detected were measured (or non-censored values) for purposes of the statistical analyses. These values were for total nitrogen from Episode 304 (See DCN 3333006.) For measurements of total nitrogen, Episode 304 reported some data as being less than ('<') some value. In this case, the total nitrogen values were the sum of TKN and nitrate/nitrite. EPA suspects that the facility used this convention when the TKN value was measured below detection and the nitrate/nitrite was reported at a value substantially above the nominal quantitation limit. In such cases, the TKN would have been a very small fraction of the total nitrogen value. For this reason, EPA considered it was more appropriate to consider such total nitrogen values to be non-censored for purposes of its statistical analyses.

14.4.2 Data Exclusions

In addition to the data exclusions as part of the engineering reviews as described in Sections 14.1 and 14.2, EPA excluded some data from the statistical analyses.

EPA excluded right-censored data in the self-monitoring episodes from its calculations. Right-censored measurements are those that are reported as being greater than the highest calibration value of the analysis (e.g., >1000 µg/L). Episode 334 reported four right-censored values for BOD₅ and fecal coliforms. Those data points were excluded from the analysis as they

happened during a short time period and indicated some abnormal situation at the facility. EPA also had some right-censored data from the sampling episodes. None of the right-censored data were in the episode data sets selected as the basis for the final limitations. In its preliminary evaluations of the sampling episode data, EPA assumed that right-censored values were non-censored.

14.5 DATA AGGREGATION

In some cases, EPA determined that two or more samples had to be mathematically aggregated, or averaged, to obtain a single value that could be used in other calculations. In some cases, this meant that field duplicates and grab samples were aggregated for a single sampling point. Appendix D lists the data after these aggregations were completed and a single daily value was obtained for each day for each pollutant. See DCN 330001 for a listing of the data before aggregation.

Because each aggregated data value entered into the modified delta-lognormal model as a single value, the censoring type associated with that value was also important. In many cases, a single aggregated value was created from unaggregated data that were all either detected or non-detected. In the remaining cases with a mixture of detected and non-detected unaggregated values, EPA determined that the resulting aggregated value should be considered to be detected because the pollutant was measured at detectable levels.

This section describes each of the different aggregation procedures. They are presented in the order that the aggregation was performed. That is, field duplicates were aggregated first and grab samples second.

14.5.1 Aggregation of Field Duplicates

During the EPA sampling episodes, EPA collected a small number of field duplicates. Generally, ten percent of the number of samples collected were duplicated. Field duplicates are two samples collected for the same sampling point at approximately the same time, assigned different sample numbers, and flagged as duplicates for a single sampling point at a facility.

Because the analytical data from each duplicate pair characterize the same conditions at that time at a single sampling point, EPA aggregated the data to obtain one data value for those conditions. The data value associated with those conditions was the arithmetic average of the duplicate pair.

In most cases, both duplicates in a pair had the same censoring type. In these cases, the censoring type of the aggregate was the same as the duplicates. In the remaining cases, one duplicate was a non-censored value and the other duplicate was a non-detected value. In these cases, EPA determined that the appropriate censoring type of the aggregate was ‘non-censored’ because the pollutant had been present in one sample. (Even if the other duplicate had a zero value⁴, the pollutant still would have been present if the samples had been physically combined.) Table 14-1 summarizes the procedure for aggregating the analytical results from the field duplicates. This aggregation step for the duplicate pairs was the first step in the aggregation procedures for both influent and effluent measurements.

Table 14-1. Aggregation of Field Duplicates

If the field duplicates are:	Censoring type of average is:	Value of aggregate is:	Formulas for aggregate value of duplicates:
Both non-censored	NC	arithmetic average of measured values	$(NC_1 + NC_2)/2$
Both non-detected	ND	arithmetic average of sample-specific detection limits	$(DL_1 + DL_2)/2$

⁴This is presented as a ‘worst-case’ scenario. In practice, the laboratories cannot measure ‘zero’ values. Rather they report that the value is less than some level (see Section 4).

Table 14-1. Aggregation of Field Duplicates (Continued)

If the field duplicates are:	Censoring type of average is:	Value of aggregate is:	Formulas for aggregate value of duplicates:
Both non-detected	ND	arithmetic average of sample-specific detection limits	$(DL_1 + DL_2)/2$

NC - non-censored (or detected).
 ND - non-detected.
 DL - sample-specific detection limit.

14.5.2 Aggregation of Grab Samples

During the EPA sampling episodes, EPA collected two types of samples: grab and composite. Typically, EPA collected composite samples. Of the pollutants promulgated for regulation, O&G (as HEM) was the only one for which the chemical analytical method specifies that grab samples must be used. EPA collected multiple (usually four) grab samples during a sampling day at a sampling point. To obtain one value characterizing the pollutant levels at the sampling point on a single day, EPA mathematically aggregated the measurements from the grab samples.

The procedure arithmetically averaged the measurements to obtain a single value for the day. When one or more measurements were non-censored, EPA determined that the appropriate censoring type of the aggregate was ‘non-censored’ because the pollutant was present. Table 14-2 summarizes the procedure.

Table 14-2. Aggregation of Grab Samples

If the grab or multiple samples are:	Censoring type of Daily Value is:	Daily value is:	Formulas for Calculating Daily Value:
All non-censored	NC	arithmetic average of measured values	$\frac{\sum_{i=1}^n NC_i}{n}$
All non-detected	ND	arithmetic average of sample-specific detection limits	$\frac{\sum_{i=1}^n DL_i}{n}$

Table 14-2. Aggregation of Grab Samples (Continued)

If the grab or multiple samples are:	Censoring type of Daily Value is:	Daily value is:	Formulas for Calculating Daily Value:
Mixture of non-censored and non-detected values (total number of observations is n=k+m)	NC	arithmetic average of measured values and sample-specific detection limits	$\frac{\sum_{i=1}^k NC_i + \sum_{i=1}^m DL_i}{n}$

NC - non-censored (or detected).
 ND - non-detected.
 DL - sample-specific detection limit.

14.6 OVERVIEW OF LIMITATIONS

The preceding sections discuss the data selected as the basis for the limitations and the data aggregation procedures EPA used to obtain daily values in its calculations. This section provides a general overview of limitations before returning to the development of the limitations for the MPP industry. This section describes EPA’s objective for daily maximum and monthly average limitations, the selection of percentiles for those limitations, and compliance with final limitations. EPA has included this discussion in Section 14 because these fundamental concepts are often the subject of comments on EPA’s effluent guidelines regulations and in EPA’s contacts and correspondence with the MPP industry.

14.6.1 Objective

In establishing daily maximum limitations, EPA’s objective is to restrict the discharges on a daily basis to a level that is achievable for a facility that targets its treatment at the long-term average. EPA acknowledges that variability around the long-term average results from normal operations. This variability means that occasionally facilities may discharge at a level that is greater than or lower than the long-term average. This variability also means that facilities may occasionally discharge at a level that is considerably lower than the long-term average. To allow for these possibly higher daily discharges, EPA has established the daily maximum limitation. A facility that discharges consistently at a level near the daily maximum limitation would not be operating its treatment system to achieve the long-term average, which is part of EPA’s objective

in establishing the daily maximum limitations. That is, targeting treatment to achieve the limitations may result in frequent values exceeding the limitations due to routine variability in treated effluent.

In establishing monthly average limitations, EPA's objective is to provide an additional restriction to help ensure that facilities target their average discharges to achieve the long-term average. The monthly average limitation requires continuous dischargers to provide on-going control, on a monthly basis, that complements controls imposed by the daily maximum limitation. In order to meet the monthly average limitation, a facility must counterbalance a value near the daily maximum limitation with one or more values well below the daily maximum limitation. To achieve compliance, these values must result in a monthly average value at or below the monthly average limitation.

In estimating the limitations, EPA first determines an average performance level (the "option long-term average") that a facility with well-designed and operated model technologies (that reflect the appropriate level of control) is capable of achieving. This long-term average is calculated from the data from the facilities using the model technologies for the option. EPA expects that all facilities subject to the final limitations will design and operate their treatment systems to achieve the long-term average performance level on a consistent basis because facilities with well-designed and operated model technologies have demonstrated that this can be done.

Next, EPA determines an allowance for the variation in pollutant concentrations when wastewater is processed through extensive and well-designed treatment systems. This allowance incorporates all components of variability, including shipping, sampling, storage, and analytical variability. This allowance is incorporated into the limitations through the use of the variability factors that EPA calculated from the data from the facilities using the model technologies. If a facility operates its treatment system to achieve the relevant option long-term average, EPA expects the facility will be able to comply with the limitations. Variability factors assure that

normal fluctuations in a facility's treatment are accounted for in the limitations. By accounting for these reasonable excursions above the long-term average, EPA's use of variability factors results in limitations that are generally well above the actual long-term averages.

EPA calculates the percentile used as a basis for the daily maximum limitation using the product of the long-term average and the daily variability factor. EPA also calculates the percentile used as a basis for the monthly average limitation using the product of the long-term average and the monthly variability factor. The following subsection describes EPA's rationale for selecting the certain percentiles as the basis for the limitations.

14.6.2 Selection of Percentiles

EPA calculates limitations based upon percentiles chosen, on one hand, to be high enough to accommodate reasonably anticipated variability within control of the facility and, on the other hand, to be low enough to reflect a level of performance consistent with the Clean Water Act requirement that these effluent limitations be based on the "best" technologies. The daily maximum limitation is an estimate of the 99th percentile of the distribution of the *daily* measurements. The monthly average limitation is an estimate of the 95th percentile of the distribution of the *monthly* averages of the daily measurements.

The 99th and 95th percentiles do not relate to, or specify, the percentage of time a discharger operating the "best available" or "best available demonstrated" level of technology will meet (or not meet) the daily maximum and monthly average limitations. Rather, EPA used these percentiles in developing the limitations. If a facility is designed and operated to achieve the long-term average on a consistent basis and the facility maintains adequate control of its processes and treatment systems, the allowance for variability provided in the limitations is sufficient for the facility to meet the requirements of the rule. EPA used 99 percent and 95 percent to draw a line at a definite point in each statistical distributions (100 percent is not feasible because it represents an infinitely large value) while setting the percentile at a level that would ensure that operators work hard to establish and maintain the appropriate level of control.

By targeting its treatment at the long-term average, a well-operated facility would be able to comply with the limitations at all times because EPA has incorporated an appropriate allowance for variability into the limitations.

In conjunction with the statistical methods, EPA performs an engineering review to verify that the limitations are reasonable based upon the design and expected operation of the control technologies and the facility process conditions. As part of that review, EPA examines the range of performance by the facility data sets used to calculate the limitations. Some facility data sets demonstrate the best available technology. Other facility data sets may demonstrate the same technology, but not the best demonstrated design and operating conditions for that technology. For these facilities, EPA will evaluate the degree to which the facility can upgrade its design, operating, and maintenance conditions to meet the limitations. If such upgrades are not possible, then EPA will modify the limitations to reflect the lowest levels that the technologies can reasonably be expected to achieve.

14.6.3 Compliance with Limitations

EPA promulgates limitations with which facilities can comply at all times by properly operating and maintaining their processes and treatment technologies. EPA uses a percentile of a statistical distribution in developing the daily maximum limitation and the monthly average limitation because statistical methods provide a logical and consistent framework for analyzing a set of effluent data and determining values from the data that form a reasonable basis for effluent limitations. EPA establishes the limitations on the basis of percentiles estimated using data from facilities with well-operated and controlled processes and treatment systems. However, because EPA uses a percentile basis, the issue of exceedances (i.e., values that exceed the limitations) or excursions is often raised in public comments on limitations. For example, comments often suggest that EPA include a provision that allows a facility to be considered in compliance with permit limitations if its discharge exceeds the daily average limitations one day out of 100 and the monthly average discharge exceeds the monthly average limitation one month out of 20. This

issue was, in fact, raised in other rules, including EPA's final Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) rulemaking. EPA's general approach there for developing limitations based on percentiles is the same in this rule, and was upheld in *Chemical Manufacturers Association v. U.S. Environmental Protection Agency*, 870 F.2d 177, 230 (5th Cir. 1989). The Court determined that:

EPA reasonably concluded that the data points exceeding the 99th and 95th percentiles represent either quality-control problems or upsets because there can be no other explanation for these isolated and extremely high discharges. If these data points result from quality-control problems, the exceedances they represent are within the control of the plant. If, however, the data points represent exceedances beyond the control of the industry, the upset defense is available.

Id. at 230.

More recently, this issue was raised in EPA's Phase I rule for the pulp and paper industry. In that rulemaking, EPA used the same general approach for developing limitations based on percentiles that it had used for the OCPSF rulemaking and for today's rule. This approach for the monthly average limitation was upheld in *National Wildlife Federation, et al v. Environmental Protection Agency*, 286 F.3d 554 (D.C. Cir. 2002). The Court determined that:

EPA's approach to developing monthly limitations was reasonable. It established limitations based on percentiles achieved by facilities using well-operated and controlled processes and treatment systems. It is therefore reasonable for EPA to conclude that measurements above the limitations are due to either upset conditions or deficiencies in process and treatment system maintenance and operation. EPA has included an affirmative defense that is available to mills that exceed limitations due to an unforeseen event. EPA reasonably concluded that other exceedances

would be the result of design or operational deficiencies. EPA rejected Industry Petitioners' claim that facilities are expected to operate processes and treatment systems so as to violate the limitations at some pre-set rate. EPA explained that the statistical methodology was used as a framework to establish the limitations based on percentiles. These limitations were never intended to have the rigid probabilistic interpretation that Industry Petitioners have adopted. Therefore, we reject Industry Petitioners' challenge to the effluent limitations.

As that Court recognized, EPA's allowance for reasonably anticipated variability in its effluent limitations, coupled with the availability of the upset defense, reasonably accommodates acceptable excursions. Any further excursion allowances would go beyond the reasonable accommodation of variability and would jeopardize the effective control of pollutant discharges on a consistent basis and/or bog down administrative and enforcement proceedings in detailed fact-finding exercises, contrary to Congressional intent. See, as an example, Rep. No. 92-414, 92d Congress, 2d Sess. 64, *reprinted in A Legislative History of the Water Pollution Control Act Amendments of 1972 at 1482; Legislative History of the Clean Water Act of 1977 at 464-65.*

EPA expects that facilities will comply with promulgated limitations *at all times*. If the exceedance is caused by an upset condition, the facility would have an affirmative defense to an enforcement action if the requirements of 40 CFR 122.41(n) are met. If an exceedance is caused by a design or operational deficiency, then EPA has determined that the facility's performance does not represent the appropriate level of control. For promulgated limitations, EPA has determined that such exceedances can be controlled by diligent process and wastewater treatment system operational practices such as frequent inspection and repair of equipment, use of back-up systems, and operator training and performance evaluations.

EPA recognizes that, as a result of the rule, some dischargers may need to improve treatment systems, process controls, and/or treatment system operations in order to consistently

meet the effluent limitations. EPA believes that this consequence is consistent with the Clean Water Act statutory framework, which requires that discharge limitations reflect the best technology.

14.7 SUMMARY OF THE LIMITATIONS

The limitations for pollutants for each option are provided as ‘daily maximums’ and ‘maximums for monthly averages’ (except for pH). Definitions provided in 40 CFR 122.2 state that the daily maximum limitation is the “highest allowable ‘daily discharge’” and the maximum for monthly average limitation (also referred to as the “average monthly discharge limitation”) is 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.” Daily discharges are defined to be 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 the MPP rule, EPA has calculated daily maximum and monthly average limitations expressed in terms of allowable pollutant discharge in concentration-based units of milligrams per liter (mg/L).

14.8 ESTIMATION OF LIMITATIONS

This section discusses the calculation of the daily maximum and monthly average limitations. In the tables provided in this section, either the mean or long-term average is provided. If the column is labeled ‘mean’, then the arithmetic average is presented. The column labeled ‘LTA’ presents the long-term average which was calculated following the procedures in Appendix E.

14.8.1 Episode Long-Term Averages and Variability Factors

For each episode data set that contained individual daily measurements (e.g., monitored daily or weekly) EPA calculated the episode long-term average (LTA) and daily variability factor (VF) by using the modified delta-lognormal distribution (see Appendix E). In the following

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discussion, these are considered to be based on the statistical model. Attachment 14-2 in Appendix F provides the episode long-term average and variability factors for all pollutants of concern for all options.

For the regulated pollutants, where appropriate, EPA has incorporated autocorrelation into the estimates from the data sets containing individual daily measurements. (See Attachment 14-3 in Appendix F for changes of the LTA and VF before and after incorporation, DCN 333050 for evaluation methodology). When data are said to be positively autocorrelated, it means that measurements taken at specific time intervals (such as 1 day or 2 weeks apart) are related. To determine if autocorrelation exists in the data, a statistical evaluation is required using many measurements for equally spaced intervals over an extended period of time. Where such data were available for the final rule, EPA performed a statistical evaluation of autocorrelation and if necessary provided adjustments to the limitations as explained in DCN 333050. As a result of its evaluation of autocorrelation, EPA determined that adjustments should be incorporated into the limitations for total nitrogen, ammonia (as N), BOD₅, and TSS for both the Meat and Poultry subcategories. EPA was only able to evaluate the autocorrelation in some data sets selected as the basis for the limitations for those pollutants. Where a data set was insufficient for purposes of evaluating autocorrelation, EPA transferred the values it used in the adjustment (“rho values”) as shown in Attachments 14-3 in Appendix F. These autocorrelation adjustments resulted in higher limitations for pollutants for which adjustment was performed. Appendix E explains autocorrelation and the adjustments for these limitations in further detail. DCN 333050 describes EPA’s evaluation of autocorrelation in the episode data sets.

For other episode data sets that contained monthly averages (listed in Part 2 of Appendix D), EPA calculated the mean of those values using the arithmetic average. In the final rule, EPA has included these monthly averages in developing the option LTA used as the basis for the limitation. EPA determined that it was appropriate to include these averages, so the limitations would be based upon a broader section of the industry.

14.8.2 Limitations

For each regulated pollutant, this section explains the selection process and method that EPA used to calculate each of the promulgated limits.

14.8.2.1 Poultry Subcategory, K

EPA promulgated limitations for ammonia (as N), BOD₅, O&G (as HEM), TSS, total nitrogen, and fecal coliforms for the Poultry Subcategory K. The basis of these limitations is discussed below.

BOD₅ and TSS

To develop the final limitations for BOD₅ and TSS for the Poultry Subcategory K, EPA first determined the median of the BOD₅ and TSS effluent mean concentrations of all of the poultry facilities in its database that utilize Option 2 or Option 2.5 technologies. In order to respond to comments, EPA eliminated all Option 2 and Option 2.5 facilities with a filter or chemical phosphorus removal from the analysis. The Option 2 and Option 2.5 technologies are the same except that Option 2.5 technology also includes partial denitrification. For this calculation, EPA combined the data from facilities using either option because EPA does not want to interfere with denitrification (which is required to achieve BAT limits for total nitrogen) and the data indicate that effluent discharges of BOD₅ and TSS are sometimes higher at facilities that employ partial denitrification. Table 14-3 provides information on the facilities and BOD₅ and TSS effluent mean concentrations used to calculate the median BOD₅ and TSS effluent concentrations. Based on comments that EPA should use all of the data available to it, EPA used its full effluent database for Option 2 and 2.5 facilities (i.e., including data from facilities that only provided data reported as summarized monthly averages) to select a model facility for use in developing the BOD₅ and TSS option LTAs for the final rule. This ensures that facilities operating the selected technology would be able to achieve the limitations of the final rule (including the BAT limitations for total nitrogen).

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Table 14-3. Data Used to Determine the Median of BOD₅ and TSS Mean Effluent Concentrations from Treatment with Option 2 or Option 2.5 Technologies^a

Facility Number	Treatment Option	Mean BOD ₅ Effluent Concentration ^a mg/L	Mean TSS Effluent Concentration ^a mg/L
11	2.5	N/A	12.8
22	2	N/A	15.65
26	2.5	N/A	13.9
27	2	13.02	N/A
32	2.5	N/A	4.98
39	2	5.30	6.00
42	2	7.82	8.34
45	2.5	1.77	4.17
133	2	7.00	31.50
291	2	3.77	5.57
300	2.5	19.40	22.90
307a	2	7.87	10.1
309	2	Exceeds Permit Limit	11.1
312	2	3.51	8.94

^a For facilities in EPA's BAT database, these values reflect the final values after data exclusions.

N/A - Not Available

Using the information in Table 14-3, EPA determined that the median BOD₅ and TSS effluent mean concentrations for all poultry facilities in EPA's database employing the Option 2 or Option 2.5 technologies are 7.0 mg/L and 10.1 mg/L, respectively. However, for purposes of calculating the option LTA and VFs for use in developing limitations for the final rule, EPA is limited to using only those episodes with individual data points (i.e. unsummarized daily/weekly monitoring or EPA's 3-5 day sampling episodes.) For TSS, the facility with its mean closest to 7.0 mg/L (Episode 307a) did provide individual data, so EPA used this data to develop the LTAs and VFs for the final limitations. For BOD₅, the facility with the median of means (Episode 133)

did not provide individual data points (only summarized monthly average data), therefore, EPA selected the facility whose mean was closest to the median value but that also provided individual data. For BOD₅, this facility is again Episode 307a, so EPA used this data to develop the option LTAs and VFs for the final limitations.

Because LTAs for most episode data sets are calculated from the statistical model, they are not necessarily the same as arithmetic averages of the data. EPA notes that LTAs for BOD₅ and TSS for facility 307a are just slightly higher than the mean concentrations provided in Table 14-3 (i.e. the BOD₅ option LTA = 7.98 mg/L and the TSS option LTA = 10.2 mg/L.) Using the methodology described in Appendix E and multiplying the LTA by the VFs for facility 307a, the BOD₅ daily maximum limit is 7.98 mg/L x 3.25 = 26 mg/L and the monthly average limitation is 7.98 mg/L x 1.96 = 16 mg/L. The TSS daily maximum limitation is 10.2 mg/L x 2.94 = 30 mg/L and the monthly average limitation is 10.2 x 1.87 = 20 mg/L. These limit numbers have all been rounded up to the nearest integer.

O&G (as HEM)

As explained above for BOD₅ and TSS, EPA selected Episode 307a as the model facility for the BOD₅ and TSS parameter limitations in the Poultry Subcategory K. EPA is unable to base the O&G (as HEM) limitations on data from Episode 307a because EPA's database does not contain any O&G (as HEM) data for Facility 307a.

Thus, to develop the final limitations for O&G (as HEM), as was done for BOD₅ and TSS, for the Poultry Subcategory K, EPA first determined the median of the O&G (as HEM) effluent LTA concentrations of all of the poultry facilities in its database that utilize Option 2 or Option 2.5 technologies. In response to comments, EPA eliminated all Option 2 and Option 2.5 facilities with a filter or chemical phosphorus removal from the analysis. The Option 2 and Option 2.5 technologies are the same except that Option 2.5 also includes partial denitrification. However, EPA found that no Option 2 facilities had any O&G (as HEM) data, so was left with only Option 2.5 facilities. Since EPA has no basis to conclude that this additional step would have any effect

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on the O&G (as HEM) effluent concentrations, EPA concluded that it is appropriate to calculate the O&G (as HEM) limitations for the Poultry Subcategory K from Option 2.5. Table 14-4 provides information on the facilities and O&G (as HEM) effluent discharges used to calculate the median of the O&G (as HEM) effluent LTA concentrations. Based on comments that EPA should use all of the data available to it, EPA used its full effluent database for options 2 and 2.5 facilities (i.e., including data from facilities that only provided data reported as summarized monthly averages) to calculate the O&G (as HEM) LTAs and limitations for the final rule. This ensures that facilities operating the selected technology would be able to achieve the limitations of the final rule.

Table 14-4. Data Used to Establish O&G (as HEM) Limitations in the Poultry Subcategory K^a

Episode Number	LTA, mg/L	1-Day VF	4-Day VF	Daily Max Limit, mg/L	Monthly Average Limit, mg/L
11	5.75	1.93	1.23		
26	6.21	2.51	1.37		
32	6.13	2.12	1.29		
6448	5.93	b	b		
312	c	c	c		
Final Limitation	6.03	2.19	1.30	13.2	7.8

^a Limits are calculated as product of median LTA and mean VF.

^b EPA is unable to calculate VFs for data sets that contain only a single non-censored value.

^c Although this facility provided EPA with some summary effluent data, the data included boiler blowdown wastewater and is therefore not representative of poultry process wastewaters alone.

First, EPA calculated the option LTA for O&G (as HEM) as the *median* of the episode-specific LTAs. The median is the midpoint of the values ordered (i.e., ranked) from smallest to largest. For example, for O&G (as HEM), when the four episode LTAs are ordered, this midpoint value is 6.03 mg/L.

Second, EPA selected the option daily VF. After calculating the episode-specific VFs, EPA calculated the option daily VF as the mean of the episode-specific daily VFs for that pollutant in the subcategory and option. Likewise, the option monthly VF was the mean of the episode-specific monthly VFs for that pollutant in the subcategory and option. In this case, the option daily VF and the monthly VFs are 2.19 and 1.30, respectively.

Ammonia as N

Similar to the manner in which EPA selected Episode 307a to calculate the BOD₅ and TSS limitations, EPA first determined the median of the ammonia (as N) effluent mean concentrations of all the poultry facilities in its database that utilize the Option 2.5 technologies. In order to respond to comments, EPA eliminated all Option 2.5 facilities with a filter or chemical phosphorus removal. The Option 2 and Option 2.5 technologies are the same except that Option 2.5 also includes partial denitrification. For this evaluation, EPA used only the data from facilities using Option 2.5 because EPA does not want to discourage denitrification and the data indicate that effluent discharges of ammonia (as N) are sometimes higher from facilities that employ partial denitrification. Table 14-5 provides information on the facilities and ammonia (as N) effluent discharges used to calculate the median of the ammonia (as N) effluent mean concentrations. Based on comments that EPA should use all of the data available to it, EPA used its full effluent database for Option 2.5 facilities (i.e., including data from facilities that only provided data reported as summarized monthly averages) to select a model facility for use in developing the ammonia (as N) option LTA for the final rule. This ensures that facilities operating the selected technology would be able to achieve the limitations of the final rule (including the BAT limitations for total nitrogen).

Table 14-5. Mean Ammonia (as N) Effluent Concentration Data from Treatment with Option 2 or Option 2.5 Technologies^a

Facility Number ^b	Treatment Option	Mean Ammonia (as N) Effluent Concentration ^a mg/L
11	2.5	2.2
22	2	0.36
26	2.5	1.4
27	2	2.2
32	2.5	0.69
39	2	0.60
42	2	0.38
45	2.5	0.17
133	2	2.0
291	2	0.89
300	2.5	2.5
307a	2	0.303
307c	2.5	0.36
309	2	0.66

^a For facilities in EPA’s model facility database, these values reflect the final values after data exclusions.

^b EPA also has data for EPA sampling Episode 6448. EPA did not include Episode 6448 in this table because its ammonia (as N) effluent concentration is already accounted for by Episode 307e. This is because the data for Episode 307e encompass the time period of Sampling Episode 6448.

First, EPA calculated the option LTA for ammonia (as N) as the *median* of the episode-specific effluent mean concentrations. The median is the midpoint of the values ordered (i.e., ranked) from smallest to largest. Using the information in Table 14-5, EPA determined that the median ammonia (as N) effluent mean concentration for all poultry facilities in EPA’s database employing the Option 2.5 technologies is 1.05 mg/L. However, for purposes of calculating the option LTA and VFs for use in developing limitations for the final rule, EPA is limited to using

only those episodes with individual data points (i.e. unsummarized daily/weekly monitoring or EPA’s 3-5 day sampling episodes.) EPA selected the facility whose LTA was the closest to the median but that also provided individual data. Table 14-6 presents the episode data that could be used to develop limitations for the final rule. For ammonia (as N), the episode with an LTA closest to 1.05 mg/L for ammonia (as N) is Episode 26, so EPA used this episode data set to develop the LTAs and VFs for the final limitations. The ammonia (as N) daily maximum limitation is 5.9 mg/L (1.1 mg/L x 5.37) and the monthly average limitation is 2.81 mg/L (1.1 mg/L x 2.55).

Table 14-6. Data Used to Establish the Ammonia (as N) Limitations in the Poultry Subcategory K^a

Episode Number	Option	LTA, mg/L	1-Day VF	4-Day VF
11	2.5	1.93	7.69	3.08
26	2.5	1.1	5.37	2.55
32	2.5	.69	2.46	1.66
45	2.5	.153	4.57	2.33
291	2	0.82	7.68	3.08
307a	2.	.303	5.02	2.40
307e	2.5	.36	5.83	2.0
309	2	0.56	7.49	3.16
6448	2.5	1.28	1.69	1.21

However, EPA received comments about the seasonal variability of ammonia (as N). In order to address these comments, EPA summarized all of the information for poultry facilities with ammonia (as N) permit limits in its database. For each facility that had tiered limits based on the time of the year, EPA compared the highest value to the lowest value. Tables 14-7 shows this comparison.

Table 14-7. Comparison of Winter and Summer Ammonia (as N) Permit Limitations for Poultry Facilities

Episode Number	Ammonia (as N) Daily Maximum Limit, mg/L		Ammonia (as N) Monthly Average Limit, mg/L	
	Winter High	Summer Low	Winter High	Summer Low
20	14	8	9	5
26	39	29	26	19
27	30	7.5	20	5
291	4	2.4	2.7	1.6
297	12	8	8	5
307	2.7	1.3	1.7	0.7
310	11	7.5	5.5	5
314	18	5	12	3
339	3.9	2.9	1.2	0.9

For each facility and each type of limit, EPA calculated the ratio between the winter high permit limit and mean of the winter and summer permit limit. EPA found that the average of these ratios was 1.30 for both the daily maximum permit limits and the monthly average permit limits.

Therefore, in order to account for seasonal variability, EPA calculated the final ammonia (as N) limits by multiplying the daily maximum and monthly average limitations determined previously by the average of the ratio determined above. The ammonia (as N) daily maximum and monthly average limitations are 8 mg/L (5.9 x 1.3) and 4 mg/L (2.8 x 1.3), respectively. These limit numbers have all been rounded up to the nearest integer.

Total Nitrogen

EPA conducted a thorough evaluation of all poultry subcategory facilities as possible BAT facilities to calculate total nitrogen limitations. This evaluation is discussed thoroughly in

DCN 300001 and is summarized as follows. First, EPA eliminated all facilities that do not employ the Option 2.5 technologies. This Option includes partial denitrification. Next, EPA eliminated all facilities that did not provide total nitrogen effluent data (or both TKN and nitrate/nitrite) or only provided summary data. EPA eliminated facilities that only provided summary data because daily variability cannot be determined from summary data. Next, EPA carefully reviewed the remaining facilities and eliminated some facilities because they were not operating their technology consistent with the BAT definition of partial denitrification. One facility was eliminated because it additionally treated tannery wastewater which is not subject to this rule. As a result of this evaluation, EPA concluded that data from two facilities could be used to establish the total nitrogen limitations. These Episodes are 307c and 339.

Table 14-8 provides information on the facilities and total nitrogen effluent discharges used to calculate the total nitrogen limitations.

Table 14-8. Data Used to Establish the Total Nitrogen Limitations in the Poultry Subcategory K^a

Episode Number	LTA, mg/L	1-Day VF	4-Day VF
307c	55.5	2.79	1.93
339	35.5	2.35	1.66

First, EPA calculated the option LTA for total nitrogen as the *median* of the episode-specific LTAs. The median is the midpoint of the values ordered (i.e., ranked) from smallest to largest. For total nitrogen, this midpoint value is 45.5 mg/L.

Second, EPA selected the option daily VF. After calculating the episode-specific VFs, EPA calculated the option daily VF as the mean of the episode-specific daily VFs for that pollutant in the subcategory and option. Likewise, the option monthly VF was the mean of the episode-specific monthly VFs for that pollutant in the subcategory and option. In this case, the option daily VF and the monthly VFs are 2.57 and 1.795 respectively.

The total nitrogen daily maximum limit is 117 mg/L (45.5 mg/L x 2.57) and the monthly average limitation is 82 g/L (45.5 mg/L x 1.79).

However, EPA received comments that both Episode 307c and 339 have excess detention times in their anoxic basins. Therefore, EPA identified and used an additional factor to ultimately calculate the final total nitrogen limitations. This factor was related to the consideration of several variables, including the anoxic basin, BOD₅/TKN ratio, and influent total nitrogen variability and increased the effluent total nitrogen limits by 25 percent (DCN 300017). Therefore, the final total nitrogen limitations for Subcategory K are 147 mg/L and 103 mg/L for the daily maximum and monthly average limitations, respectively. These numbers have been rounded up to the nearest integer.

Fecal Coliforms

During EPA sampling episodes, EPA collected and analyzed for fecal coliforms. However, when EPA conducted this sampling, it exceeded the holding time specified for analysis for many samples. Subsequent analyses indicated that exceeding holding times could affect the results. (DCN 165310) Therefore, EPA proposed to establish fecal coliforms limitations for the Poultry Subcategory K equivalent to the existing limitations/standards for the Meat Subcategories (i.e., 400 MPN per 100 mL at any time). For the final rule, EPA has concluded this transfer is appropriate because EPA determined this level is achievable by the poultry facilities.

14.8.2.2 Poultry Further Processing Subcategory, Subcategory L

EPA promulgated limitations for ammonia (as N), BOD₅, O&G (as HEM), TSS, total nitrogen, and fecal coliforms for the Poultry Further Processing Subcategory L. EPA transferred all of these limitations from the Poultry Subcategory K.

In general, EPA sought to transfer data from first processors to further processors due to the lack of available effluent data for further processing facilities. With the available data, EPA

performed a comparison of influent from the two subcategories. EPA found the wastewater characteristics to be comparable. Therefore, EPA concludes this transfer is reasonable.

14.8.3 Meat Subcategories

EPA promulgated limitations for ammonia (as N) and total nitrogen for the Meat Subcategories. Ammonia (as N) and total nitrogen limitations were transferred from the Poultry Subcategory. Each of these transfers is discussed below.

Total Nitrogen

EPA did not identify any meat facilities that were operating the BAT Option 2.5 technology as defined in the final regulation and that were able to provide total nitrogen (or TKN and nitrate/nitrite) data for their effluent. Consequently, EPA evaluated the appropriateness of transferring the poultry total nitrogen limitations to these subcategories. EPA performed a comparison of the wastewater characteristics and wastewater treatment kinetics of poultry and meat facilities. EPA found that with the exception of higher influent TKN concentrations at meat facilities, the wastewaters concentrations are very similar. In order to account for the higher TKN concentrations, EPA transferred the LTA and VFs from the poultry BAT Option 2.5 facility with the influent TKN concentration that is most comparable to the average meat facility influent TKN concentration (i.e., Episode 307, 2002-2003 data only). Data for this facility has been provided above in Table 14-8.

In addition, for the same reasons explained in the discussion for the total nitrogen limitation in the Poultry Processing subcategory, EPA identified and used an additional factor to ultimately calculate the final total nitrogen limitations for the Meat Subcategories. This factor was related to the consideration of several variables, including the anoxic basin, BOD₅/TKN ratio, and influent total nitrogen variability and increased the effluent total nitrogen limits by 25 percent (DCN300017). The resulting limitations are 194 mg/L and 134 mg/L for the daily maximum and monthly average limitations, respectively.

Ammonia as N

As explained above, EPA performed a comparison of the wastewater characteristics and wastewater treatment kinetics of poultry and meat facilities. EPA found that with the exception of higher influent TKN concentrations at meat facilities, the wastewaters concentrations are very similar. In addition, EPA found that due to the nature of the design of biological treatment systems, the wastewaters were similar in treatability. Since the general wastewater characteristics of meat facilities are similar to poultry facilities, and the biological processes used to treat the wastewater are the same, EPA concludes that transferring ammonia (as N) limitations from the Poultry Subcategories to the Meat Subcategories is appropriate.

14.9 Summary of Final Limitations

Table 14-9 presents a summary of the limitations for the MPP industry.

Table 14-9. Final Limitations for the MPP Industry.

Subcategory	Pollutant	Daily Maximum Limitation, mg/L	Monthly Average Limitation, mg/L
Poultry Subcategories K and L	Ammonia (as N)	8.0	4.0
	BOD ₅	26	16
	TSS	30	20
	O&G (as HEM)	14	8
	Total Nitrogen	147	103
Meat Subcategories	Ammonia (as N)	8.0	4.0
	Total Nitrogen	194	134