## Appendix A – Reasonable Potential Analysis and Limit Derivation

For establishing facility-specific effluent limits, EPA will conduct a reasonable potential analysis and, if necessary, derive effluent limits according to the methodology described below. This methodology distinguishes between freshwater and marine discharges and may be applied to any pollutants of concern, including total phosphorus (for freshwater discharges only), ammonia nitrogen, total recoverable metals and other pollutants for which the facility has submitted monitoring data.

A reasonable potential analysis is completed using a single set of critical conditions for flow and pollutant concentration that will ensure the protection of water quality standards. To determine the critical condition of the effluent, EPA projects an upper bound of the effluent concentration based on the observed monitoring data and a selected probability basis. EPA generally applies the quantitative approach found in Appendix E of the *Technical Support Document for Water Quality-based Toxics Control* (TSD)[1] to determine the upper bound of the effluent data. This methodology accounts for effluent variability based on the size of the dataset and the occurrence of non-detects (*i.e.*, sample results in which a parameter is not detected above laboratory detection limits). For datasets of 10 or more samples, EPA uses the upper bound effluent concentration at the 95$^{th}$ percentile of the dataset. For datasets of less than 10 samples, EPA uses the maximum value of the dataset.

### For Freshwater Discharges

For freshwater discharges, EPA uses the calculated upper bound of the effluent data, along with a concentration representative of the parameter in the receiving water, the critical effluent flow, and the critical upstream flow to project the downstream concentration after complete mixing using the following simple mass-balance equation:

$$C_s Q_s + C_e Q_e = C_d Q_d$$

Where:

$C_s$ = upstream concentration[2]
$Q_s$ = upstream flow (critical low flow upstream of the outfall)
$C_e$ = effluent concentration[3]
$Q_e$ = effluent flow of the facility (design flow)
$C_d$ = downstream concentration
$Q_d$ = downstream flow ($Q_s + Q_e$)

[1] Available at: https://www3.epa.gov/npdes/pubs/owm0264.pdf
[2] Median concentration for the receiving water just upstream of the facility's discharge taken from all available information (including WET testing data) during the review period for each Permittee.
[3] The 95$^{th}$ percentile (for $n \geq 10$) or maximum (for $n < 10$) concentrations from all available data (including DMR data and/or WET testing data) during the review period for each Permittee.

Solving for the downstream concentration results in:

$$C_d = \frac{C_s Q_s + C_e Q_e}{Q_d}$$

When both the downstream concentration ($C_d$) and the effluent concentration ($C_e$) exceed the applicable criterion, there is reasonable potential for the discharge to cause, or contribute to an excursion above the water quality standard. *See* 40 CFR § 122.44(d). When EPA determines that a discharge causes, has the reasonable potential to cause, or contribute to such an excursion, the permit must contain WQBELs for the parameter. *See* 40 CFR § 122.44(d)(1)(iii). Limits are calculated by using the criterion as the downstream concentration ($C_d$) and rearranging the mass balance equation to solve for the effluent concentration ($C_e$). Refer to the pollutant-specific section of the Fact Sheet for a discussion of these calculations, any assumptions that must be made and other relevant permit requirements.

**For Marine Discharges**

For marine discharges, EPA uses the dilution factor, the calculated upper bound of the effluent data and a concentration representative of the parameter in the receiving water outside of the zone of influence of the discharge to project the downstream concentration after complete mixing using the following simple mass-balance equation:

$$C_s(DF - 1) + C_e = C_d(DF)$$

Where:

$C_s$ = upstream concentration[4]
$C_e$ = effluent concentration[5] (95th percentile or maximum of effluent concentration)
$C_d$ = downstream concentration
DF = dilution factor (See Dilution Factor section of Fact Sheet)

Solving for the downstream concentration results in:

$$C_d = \frac{C_s(DF - 1) + C_e}{DF}$$

When both the downstream concentration ($C_d$) and the effluent concentration ($C_e$) exceed the applicable criterion, there is reasonable potential for the discharge to cause, or contribute to an excursion above the water quality standard. *See* 40 C.F.R. § 122.44(d). When EPA determines that a discharge causes, has the reasonable potential to cause, or contribute to such an excursion, the permit must contain WQBELs for the parameter. *See* 40 C.F.R. § 122.44(d)(1)(iii). Limits are calculated by using the criterion as the downstream concentration ($C_d$) and rearranging the mass balance equation to solve for the effluent concentration ($C_e$). Refer to the pollutant-specific

[4] Median concentration for the receiving water outside of the zone of influence of the facility's discharge taken from all available information over the most recent 5-year period, including WET testing data, for each Permittee.
[5] The 95th percentile (for $n \geq 10$) or maximum (for $n < 10$) concentrations from all available date over the most recent 5-year period, including DMR data and/or WET testing data, for each Permittee.

section of the Fact Sheet for a discussion of these calculations, any assumptions that must be made and other relevant permit requirements.

For any pollutant(s) with an existing WQBEL, EPA notes that the analysis described in 40 CFR § 122.44(d)(1)(i) has already been conducted in a previous permitting action demonstrating that there is reasonable potential to cause or contribute to an excursion of WQS. Given that the permit already contains a WQBEL based on the prior analysis and the pollutant(s) continue to be discharged from the facility, EPA has determined that there is still reasonable potential for the discharge of this pollutant(s) to cause or contribute to an excursion of WQS. Therefore, the WQBEL will be carried forward unless it is determined that a more stringent WQBEL is necessary to continue to protect WQS or that a less stringent WQBEL is allowable based on anti-backsliding regulations at CWA §§ 402(o) and 303(d)(4) and 40 CFR § 122.44(l). For these pollutant(s), if any, the mass balance calculation is not used to determine whether there is reasonable potential to cause or contribute to an excursion of WQS, but rather is used to determine whether the existing limit needs to be more stringent in order to continue to protect WQS.

From a technical standpoint, when a pollutant is already being controlled as a result of a previously established WQBEL, EPA has determined that it is not appropriate to use new effluent data to reevaluate the need for the existing limit because the reasonable potential to cause or contribute to an excursion of WQS for the uncontrolled discharge was already established in a previous permit. If EPA were to conduct such an evaluation and find no reasonable potential for the controlled discharge to cause or contribute to an excursion of WQS, that finding could be interpreted to suggest that the effluent limit should be removed. However, the new permit without the effluent limit would imply that existing controls are unnecessary, that controls could be removed and then the pollutant concentration could rise to a level where there is, once again, reasonable potential for the discharge to cause or contribute to an excursion of WQS. This could result in an illogical cycle of applying and removing pollutant controls with each permit reissuance. EPA's technical approach on this issue is in keeping with the Act generally and the NPDES regulations specifically, which reflect a precautionary approach to controlling pollutant discharges.

For each eligible WWTF, the facility-specific table showing the calculations described above is part of the administrative record for the Draft General Permit and will be made available for review on EPA's website during the public comment period as an addendum to this Appendix.