The Ammonia Standard: Addressing Difficulties with Regulatory Compliance

The following actions are being undertaken or are being considered by DEQ for the purpose of addressing the difficulties small communities face in meeting wastewater ammonia standards:

(**1**) researching optimization and best management practices (BMPs) to achieve the best ammonia (and total nitrogen and phosphorus) removal possible from wastewater lagoons; (**2**) re-calculate ammonia criteria so they are only applicable to specific, naturally-occurring aquatic life; (**3**) collect better pH and temperature datasets for their receiving waters; (**4**) understand mixing-zones; (**5**) include appropriate compliance schedules in permits; (6) provide opportunity to request a variance; (**7**) review stream classification where needed, but only after substantial work has been done to improve lagoon ammonia removal.

Additional details pertaining to each of these subjects is provided below.

(1) BMPs to achieve best ammonia, TN and TP removal from wastewater lagoons: DEQ commissioned a report (completed 5/2015) to identify available technologies, best management practices (BMPs), and optimization methods for increasing ammonia (NH_3), total nitrogen (TN), and total phosphorus (TP) removal efficiencies of facultative lagoon systems in Montana. Emerging, innovative technologies were reviewed along with more established methods. All technologies were evaluated in their overall ability to remove ammonia, total nitrogen, and total phosphorus, as well as site specific limitations and performance criteria related to Montana. No single technology or approach was found to be optimal; rather, several technologies and BMPs were offered up as having very good potential, depending upon the site-specific characteristics of the lagoon and the community. For example, a technology showing good promise for ammonia removal is floating barriers in accompaniment with mechanical aeration. Both can be added to existing lagoons. A User's Guide was also developed which can be used by lagoon operators to assist them in selecting the most appropriate approach for their situation. The report and the User's Guide are available on DEQ's website at:

http://deq.mt.gov/wqinfo/srf/WPCSRF/technicalassistance.mcpx

DEQ intends to work with several communities in 2016 to pilot selected technologies, BMPs, and optimization methods in their lagoons. Water quality improvements resulting from the changes will be monitored and reported upon at a later date.

(2) Re-calculate ammonia criteria for specific, naturally-occurring aquatic life: Ammonia criteria are toxicity-based, and are calculated by EPA using groups of organisms intended to represent the overall aquatic community. It is permissible under federal rules to recalculate ammonia criteria based only on the sensitivity of the organisms that are naturally present. Thus a different, and less stringent, ammonia criterion might be developed for waterbodies where specific fauna and age classes are naturally absent, and which contain organisms which are less sensitive to ammonia. Specifically, the natural absence of mussels, and the absence of early life stages of fish during certain times of the year would provide the greatest relaxation of the criteria, primarily in eastern Montana.

(3) Collect better pH and temperature datasets for their receiving waters: Permits are currently developed on relatively small (or even non-existent) pH and temperature datasets collected from the receiving waterbody. Collecting more accurate, longer-term pH and temperature datasets from their receiving streams will be beneficial. Potentially, ammonia permits could then be written to reflect

seasonal pH and temperature patterns (i.e., different limits for summer, fall, winter, and spring runoff). Evaluations show that ammonia concentrations would often be somewhat relaxed in fall, winter, and spring, compared to summer. At times of the year when early fish life stages are absent (September 1st to January 31st) *and* mussels are naturally absent, major relaxation of the standard would occur (see **2** above). DEQ training of operators in calibration and use of low-cost pH meters would be essential (temperature monitoring is fairly straight forward using low-cost units).

(4) Understanding mixing-zones: Presently, the Department allows small fractions of the 7Q10 flow for mixing with ammonia standards. The 7Q10 is a relatively low flow, and these fractions of that low flow drastically cut the volume of water available for mixing. Understanding the science behind the appropriate mixing may provide for higher low flow volumes. These fractions could then be revisited to see if higher values (e.g.,100%, 40%,10%) *may* protect the fish passage and still prevent "toxics in toxic amounts" on a case-by-case basis.

(5) Include appropriate compliance schedules in permits: 75-5-401(2), MCA gives DEQ authority to grant permittees compliance schedules. Compliance schedules allow permittees to come into compliance with a water-quality standard over time; DEQ policy has usually restricted this to about one permit cycle (5 years). Scenarios may exist where longer compliance schedule may be necessary.

(6) Provide opportunity to request a variance: A variance from a water quality standard is an appropriate tool when you have certainty that the water quality criteria are accurate (see 2 above) and designated uses are appropriate and accepted. Most likely an individual permittee would request a variance supported by an individual economic demonstration that shows the permmittee cannot afford to improve treatment to comply with the standard. The variance and justification would be reviewed regularly and adjusted if economic conditions or affordable technology improve.

(7) Review stream classification where needed, but only after substantial work has been done to improve lagoon ammonia removal: DEQ could request that the Board of Environmental Review change the underlying classification of stream reaches downstream of lagoons which release ammonia at concentrations above current or future standards. A reclassification example might be "marginal aquatic life tolerant of ammonia", with associated ammonia standards reflecting instream ammonia concentrations as influenced by the lagoon.

Technology ad Best Management Practices Applicable to Facultative Lagoons for the Purpose of Reducing Ammonia and Nutrients in Effluent

Prepared for WPIC by DEQ Water Quality Standards, 7/30/2015

DEQ commissioned a report (completed 5/2015) to identify available technologies, best management practices (BMPs), and optimization methods for increasing ammonia (NH_3), total nitrogen (TN), and total phosphorus (TP) removal efficiencies for facultative lagoon systems in Montana. The goal was to provide a thorough review of the technical literature and identify the most promising approaches for future application in Montana. A variety of literature was consulted including the primary scientific and engineering literature as well as the gray literature which was likely to contain studies, technical reports, and company brochures describing the application of lagoon optimization methods and BMPs. Emerging, innovative technologies were also reviewed. All technologies were evaluated in their overall ability to remove ammonia, total nitrogen, and total phosphorus, as well as site specific limitations and performance criteria related to Montana.

No single technology or approach was found to be optimal; rather, several technologies and BMP approaches were offered up as having very good potential, depending upon the site-specific characteristics of the lagoon and the community. For example, a technology showing good promise for ammonia removal is floating barriers in accompaniment with mechanical aeration. Both of these can be added to existing lagoons.

In addition to a compendium of technologies, BMPs, and optimization methods, a general User's Guide was developed which can be used by lagoon operators to assist them in selecting the most appropriate approach for their situation. The best approach will depend on the lagoon, available land and financing, and the pollutant which is of greatest concern in the effluent. The compendium and the User's Guide are available on DEQ's website at:

http://deq.mt.gov/wqinfo/srf/WPCSRF/technicalassistance.mcpx

DEQ intends to work with several communities in 2016 to apply selected technologies, BMPs, and optimization methods to their lagoons. Water quality improvements resulting from the changes will be monitored and reported upon at a later date.