ncasi

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Mr. Tom Driscoll
Measurement Policy Group (Mail Code D243-02)
Sector Policies and Programs Division
US Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Re: NCASI Comments on EPA's December 16, 2010, Release of GHG Estimation Methodologies for Biogenic Emissions

Dear Mr. Driscoll:

On December 16, 2010, the United States Environmental Protection Agency (EPA) released a report titled *Greenhouse gas emissions estimation methodologies for biogenic emissions from selected source categories: Solid waste disposal, wastewater treatment, ethanol fermentation*, which was prepared by RTI International. On its Technology Transfer Network Clearinghouse for Inventories & Emissions Factors website EPA states that the information contained in the report is needed to fill gaps in the availability of technical guidance for estimation of biogenic greenhouse gas (GHG) emissions, including biogenic CO_2 from waste management. EPA has not provided an opportunity to comment on the report, but during informal communications EPA has indicated they would be willing to entertain comments. NCASI submits the following comments in regard to the methods provided in the report for estimating biogenic CO_2, CH_4, and N_2O from solid waste disposal and wastewater treatment operations.

Solid Waste Disposal

Methods for estimating biogenic GHG (CO_2 and CH_4) emissions from landfills, composting operations, and land treatment units are provided in the report. The report states that the methods presented are applicable for estimating long-term (e.g., monthly or annual) average emissions, and that methods for estimating short-term (e.g., hourly) emissions are not available except for systems that include biogas recovery. EPA should justify (e.g., cite published literature recommending) the suggestion in the report that hourly emissions can be estimated as the annual average hourly emission rate multiplied by a factor of 4.

The report describes land treatment units as "large areas of land where waste is applied or incorporated with the soil near the surface… used for the disposal of biosolids and petroleum sludge." Carbon in the materials that are applied to land treatment units is assumed to be

converted to CO_2 and new biomass, with the further assumption that there is a constant biomass population ("dying and decaying biomass equal[s] new biomass growth"). In other words, the potential for increasing soil carbon content as a result of land application is not acknowledged. Therefore, the method presented for estimating GHG emissions from land treatment units is based on the presumption that all carbon applied to the land is converted to and emitted as CO_2, which may represent an overly simplistic approach. EPA's methodology does not recognize that the materials applied to land treatment units may contain inorganic as well as organic carbon, and that some of the carbon containing material may be recalcitrant to degradation (i.e., inert). EPA should allow facilities to use appropriate site-specific detailed information, where available, to estimate emissions from land treatment units.

Wastewater Treatment

The report addresses biogenic GHG emissions from both anaerobic and aerobic wastewater treatment systems. EPA should include a discussion and description of aerated stabilization basins (ASBs) in the section on aerobic treatment processes, which currently addresses only activated sludge treatment (AST). The report includes a description of "facultative treatment processes" (separate from the discussion of "anaerobic treatment processes") which are lagoons that "… in some applications surface aerators may be used to enhance aerobic degradation." This description conflicts with that found in EPA's *Wastewater Technology Fact Sheet* on facultative lagoons which describes them as "earthen lagoons … that are not mechanically mixed or aerated" (USEPA 2002). In order to be consistent with this 2002 guidance, EPA should revise the report's description of facultative lagoons to clarify that facultative lagoons do not include basins with aerators.

The report includes a set of equations for calculating CO_2 and CH_4 from wastewater treatment operations that are based on influent flow rate, oxygen demand (expressed as either BOD_5 or COD–equations based on organic load characterized by TOC are also included), the treatment unit's oxygen demand removal efficiency, conversion factors for maximum CO_2 or CH_4 generation per unit of oxygen demand, and the methane correction factor (MCF) of the treatment unit, which indicates the fraction of influent oxygen demand that is converted anaerobically. The conversion factors (1.375 g CO_2 or 0.5 g CH_4 per gram of oxygen demand) neglect oxygen required for oxidation of hydrogen, nitrogen, and sulfur in wastewaters, and therefore will over estimate emissions. For ASTs, Equation 3-3 is provided to calculate biomass yield/removal based on the wasting volumetric flow rate (Qs) and the mixed liquor volatile suspended solids concentration (MLVSSs). However, wasting at most ASTs is done from the return activated sludge line, so that using the MLVSSs concentration would understate the mass wasting rate because the solids concentration in the return sludge is greater than it is in the mixed liquor, typically by a factor of 2. This problem could be addressed by replacing MLVSSs in Equation 3-3 with the more general volatile suspended solids of the wasted stream (VSS), be it mixed liquor, return sludge, or other.

Default values of MCF provided for different treatment processes are attributed to IPCC (2006), however the values for various treatment operations in the report are different than those from IPCC. For example, default values in the report for "facultative lagoon" are equivalent to those

IPCC provides for "anaerobic lagoons" (0.8 for depth ≥ 2 m, 0.2 for depth < 2 m), and default values in the report for "aerated treatment process (e.g., activated sludge system), well managed" are those IPCC provides for "aerobic treatment plant (must be well managed; some CH_4 can be emitted from settling basins and other pockets)." It is unclear which values are expected to be used for ASBs. Furthermore, the EPA report does not address, define, nor provide default MCF values for anaerobic lagoons. EPA should revise the default MCF values provided in Table 3-1 of the report to make them consistent with the IPCC literature cited as the source of these values.

The report provides an equation for estimating biogenic N_2O emissions from wastewater treatment plants that is based upon methods developed by the IPCC (2006), EPA (USEPA 2010), and WERF (Chandran 2010) for application to domestic wastewater treatment plants. As stated in the report "the amount of nitrogen in the wastewater influent is the principal factor in determining the extent of the N_2O generation potential in wastewater treatment plants…" and "N_2O is a byproduct of the nitrification process and an intermediate product of the denitrification process…" IPCC (2006) includes language that implies that only industrial wastewater containing significant amounts of protein (e.g., "from grocery stores and butchers") would be expected to generate significant quantities of N_2O. IPCC further states that "typically, [direct emissions from nitrification and denitrification at wastewater treatment plants] may only be of interest to … advanced centralized wastewater treatment plants with nitrification and denitrification steps." The WERF research (Chandran 2010) "represents one of the first attempts at characterizing nitrogenous GHG emissions from wastewater treatment plants, and at developing a methodology for collection of full scale plant data from a range of nutrient removal facilities…" EPA should modify the report to specify that the N_2O emissions methods apply to domestic wastewater treatment operations only. It should be noted that N_2O emissions from pulp and paper mill industrial wastewater treatment plans, if they occur, would originate from nitrogen added to the treatment plant as a nutrient to promote biological degradation rather than from proteins and other biogenic forms of nitrogen contained in raw untreated wastewater. Therefore, it is unlikely that any N_2O emissions from pulp and paper industry wastewater treatment facilities would be of biogenic origin, if they occur at all.

Sincerely,

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References

Chandran, K. 2010. *Greenhouse Nitrogen Emissions from Wastewater Treatment Operations: Interim Report*. Report Number U4R07a. Water Environment Research Foundation (WERF).

Intergovernmental Panel on Climate Change (IPCC). 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol. 5. Waste*. Intergovernmental Panel on Climate Change.

United States Environmental Protection Agency (USEPA). 2002. *Wastewater technology fact sheet. Facultative Lagoons*. EPA 832-F-02-014. Washington, DC: United States Environmental Protection Agency, Office of Water. September 2002. (http://www.epa.gov/owmitnet/mtb/faclagon.pdf).

USEPA. 2010. *2010 U.S. Greenhouse Gas Inventory Report: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008*. EPA-430-R-10-006. Washington, DC: United States Environmental Protection Agency, Office of Atmospheric Programs.

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