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To: The EPA Science Advisory Board Integrated Nitrogen Committee

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RE: Comments on the draft *Reactive Nitrogen in the United States—An Analysis of Inputs, Flows, Consequences, and Management Options*, August 27, 2009 prepared by the EPA, Science Advisory Board Integrated Nitrogen Committee

General comments:

First let me commend the INC on the preparation of the report. It is an important document that provides valuable guidance to the EPA. The large and quickly growing quantity of reactive nitrogen being released to the environment is a major concern, posing risks to public health and the environment.

Hopefully my comments will in some small way help to improve the final draft of this report. I have not yet completed my review of the document and will provide the product of my continued review at or before the meeting on September 23<sup>rd</sup>, 2009.

In my opinion, the document would be improved by adding references for numerous unreferenced factual statements made throughout the document. In particular, many EPA and USDA citations are missing from the bibliography. I have pointed out several of these situations in my specific comments below but after it was apparent that this was a systemic issue, I discontinued identifying further instances.

Specific Comments

Page 29: Table 1: There is no estimate of N input by fixation in aquatic environment. If this value is unavailable, at least a note identifying this source would be appropriate perhaps with a qualitative estimate of its significance (or lack thereof.)

Table 1: Most of the references are not included in the bibliography.

Pg 32, line 10: need reference

Page 39 lines 6 – 9 and Figure 7: need references

Pg 46. line 2: Klopfenstein et al., 2008 not in bibliography

Pg 50, line 18: aerosol formation also occurs with reactions between NH<sub>3</sub> and SO<sub>x</sub>. (only NO<sub>x</sub> rxn mentioned in text.)

Pg 50 , lines 16-26: should also mention acidification of low buffer capacity lakes and streams especially in alpine regions.

Pg 51, lines 21-22 and 24-26: references needed.

Pg 51- lines 30 – 33. unclear whether 1976 diet recommendations are being compared to 2007 or 1996 recommendations. There are also no references for these recommendations.

Page 72 line 18 – page 73 line 40: this is a very important discussion that is unfortunately very confusing. It seems like two different accounting approaches are being used (with a switch at line 17 on page 73.) The whole section should be reworked so that it is internally consistent and made more clear. For example, on page 72, (line 35) the statement is made that 38% of total N input is contained in main crop commodities. However, page 73 (lines 23-25) states that almost 40% of N input is lost through various processes. These two statements are confusing. What happens to the 20% of the N that is not contained in crops and not lost through various processes? Is this account for in the 4.2 Tg of N<sub>r</sub> used for industrial livestock? Why is this N<sub>r</sub> left out of the flow discussion and Table 14?

Page 74, lines 10 – 14 (Finding 9 and table 14). I am concerned that the summary statement in Finding 9 seems to imply that agricultural lands (which in this categorization appears to be limited only to crops grown for direct human consumption) are the most efficient land use type with regard to N use. (The vegetated category is composed largely of livestock agricultural pastures and timber harvesting with some natural forests (percentages not provided) and seem to be described as something other than agricultural lands. Furthermore, the input into the populated category are largely agricultural products.) This implication is contrary to the narrative of the rest of the document. Such an implication is not helpful to inducing the EPA and other agencies to place the proper amount of emphasis on improving NFUE and capturing what N<sub>r</sub> is currently being lost from agricultural operations. The problem with Finding 9, Table 14 and the discussion in page 73 from lines 17 – 40, appears to be related to how the Environmental Systems were categorized. It is not clear to this reader what the rationale for such categorizations was or how this section can be clarified without recategorization.

Page 149, line 39 – page 150, line 10 and page 158, line 34 – page 159, line 1: The latter paragraph (pg 158 – 159) is essentially a repeat of the former paragraph (pg 149-150) but without most of the references and clarifying phrases. The latter paragraph needs to be either deleted or amended to reflect the more complete discussion found in the former paragraph.

Target recommendation 3 (page 159) appears to be an elaboration of Target recommendation 2 (page 158) instead of having the intended focus on NH<sub>3</sub> emissions. The current language in Target recommendation 3 should replace the current language in Target recommendation 2. New language is needed for Target recommendation 3 and should include the goals for the

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reduction in NH<sub>3</sub> emissions discussed in lines 1 – 7 (page 159) and displayed in Table 27. The section title for Target recommendation 2 (page 157, line 14) should also be changed by eliminating the words “and emissions” as emissions are only discussed in the target recommendation 3 section (page 158, line 3.) Lastly, given the excess in N in manure relative to local crop needs in many regional livestock production centers, the discussion of reductions in ammonia losses should include a discussion of the need to either provide more land for the application of the additional reactive nitrogen or provide a means to denitrified when sufficient land is not.

Page 158, line 43 – pg 159: The reduction in ammonia referenced in Aneja et al 2008 only includes ammonia emissions from hog lagoons and sprayfields not from hog houses. Therefore, from a whole farm perspective, ammonia emission reductions are lower. For example, if one assumes that barn emissions equal about one-third of whole farm emissions and the other two-thirds are reduced by 90%, then the reduction in total on farm NH<sub>3</sub> emissions would be about 60%. This estimate falls close to the moderate reduction of 50% currently included in the text (page 159, line 3.)