Manure Irrigation Workgroup Meeting - February 24, 2014 DRAFT MEETING NOTES

Original Agenda

February 24, 2014, 9:00am – 3:00pm
Dane County Cooperative Extension
First Floor Meeting Room
5201 Fen Oak Ct, Madison, WI 53718

Meeting Overview:

The workgroup will continue discussion of several items from previous meetings: the drift study/QMRA, "risk tables" summarizing information about manure irrigation, scenarios to help visualize how the practice will be applied. We will also discuss the Implements of Husbandry study and implication for the workgroup. Background information is available at the workgroup document site and the project website (fyi.uwex.edu/manureirrigation).

Agenda

8:30am	Room available – coffee
9:00	Welcome, introductions, agenda review/revision
9:05	Review of notes from last meeting (December 13, 2013), announcements, and updates
9:20	Presentation and Discussion: Implements of Husbandry study and implications for our workgroup. Cheryl Skjolaas, UW-Madison Biological Systems Engineering [background: http://www.dot.wisconsin.gov/business/ag/]
10:00	Updates/Discussion/Presentation: Drift study/QMRA: study sites and timeline; related QMRA research in Idaho; review/revisit study assumptions from November workgroup discussion); new literature; preliminary results. Drift study team. Break as needed
12:00pm	Working lunch – box lunches (provided)
1:00	Updates and Discussion: Risk Tables. Becky Larson will present and lead discussion on 3 tables distributed prior to the meeting: drift, odor, air quality.
2:00	Discussion: Using scenarios to illustrate trade-offs
2:30	Discussion: Timeline and general directions for a workgroup report
3:00	Adjourn

NOTES from February 24, 2014 Meeting

1. Attending:

Workgroup members attending: Mark Borchardt, Kenn Buelow, Andrew Craig, Ken Genskow, Suzanne Gibbons-Burgener, Sarah Grosshuesch, Carrie Laboski, Becky Larson, Pat Murphy, Jeff Polenske, Gloria Smedema, Jeff Sommers, Rob Thiboldeaux, Lynn Utesch,
Workgroup members not attending: Todd Boehne, Dana Cook, Shelly Mayer, Jim VandenBrook,
Others attending: Christie Greening (public), AJ Bussan (WPF), Zachary Sutter (WDNR Legal), Tucker Burch (USGS), Cheryl Skjolaas (UW-Madison, BSE), Sarah Koske (WHDS), Randy Ebert (Ebert Enterprises)

2. Review of Discussion Notes from December 13:

See Notes from December 13

3. Updates and Announcements:

- Ebert Enterprises WPDES permit was approved by DNR, allowing for limited use of manure irrigation consistent with nutrient management plan, etc. Approval was on January 14, 2014, and there is a 60-day window for public review and request for a contested case hearing.
- Another Kewaunee County farm has expressed interest in participating in the drift study – Pagel's Ponderosa would use traveling gun technology if included.
- Videos of presentations from the November 16th Rural Health Forum are completed and will be available for purchase as DVDs. Look for a future announcement.
- Andrew Craig is moving to a different position with WDNR but will continue his involvement with this workgroup. Andrew's new position will focus on watershed planning and related water quality and nutrient issues.

4. Presentation/discussion: Implements of Husbandry study and implications for our workgroup. Cheryl Skjolaas, UW-Madison Biological Systems Engineering [background: http://www.dot.wisconsin.gov/business/ag/]

Cheryl Skjolaas provided a presentation addressing traffic safety and worker safety issues related to Manure irrigation. Traffic issues highlighted the Implements of Husbandry (IoH) study (see website above). A pdf copy of the presentation slides are attached to the meeting notes.

Several Points:
- Drivers for the IoH study included July 2010 QT Quad tractor was stopped with overall weight of combination questioned; many farmers do/did not realize they are/may be exceeding limits.
- There are eight (8) different and sometimes conflicting standards/regulations for agriculture. State Police document begins with "Implements of Husbandry are exempt"…so adds somewhat to confusion.
- Many driving and highway risks exist for IoH. Drivers are confused about how to deal with IoH. For example, the rule that allows cars to pass vehicle in no passing zone if going less than half of the posted speed.
- Some signage and lighting is uniform, but not frequently recognized. SMV (Slow Moving Vehicle) signage isn't always recognized. An amber rotating beacon (flasher) is an acceptable replacement for SMV emblem.
- Some liquid hauling equipment has additional risk with sloshing, transferring weights, etc…
- Worker safety issues were also discussed.

Q/A:
- Q: What are implications for manure hauling with new rules? Smaller loads and more trips?
  - There is an 80k total limit with specific axle weight limits. An axle distance of greater than 10 feet is needed to get benefits of weight distribution.
  - Additional complications for total tractor weight, for example, if the tractor ("power unit") is already exceeding the axle weight limits, then it is prohibited from pulling tanks.

    - Commercial vehicles will have to stay at weight limit, for example, a 150k unit with tanker would need to reduce that to 2 units, which suggests a greater use of semi-truck tractors.
- There is a fall exemption but IoH are NOT exempt from a frost/freeze rule.
- Q: Suggestion that some of the equipment for sale will not meet these requirements.
- Q: What about manure piping in right of way?
    - Wi Towns Assoc is looking into consistent standards for this
    - First step is to have manure piping recognized as a utility – town by town decision, but would be included in draft legislation currently under consideration.
- The IoH study included 6 public/town hall meetings around the state last Fall. There were some comments about manure hauling, but most of the discussion revolved around IoH width, less about weight, and many general concerns about motor-vehicle interactions with IoH.
- Recommendations differ by use and location. Every county should have a highway safety committee that includes law enforcement, DOT, and public health.
- April 30, 2014 is a likely timeline for signing and initial implementation.

5. Updates/Discussion/Presentation: Drift study/QMRA: study sites and timeline; related QMRA research in Idaho; review/revisit study assumptions from November workgroup discussion); new literature; preliminary results. Drift study team.

5a. Study sites/timeline

- Current funds for the field portion of the study must be used by 6/30/14. Funding for the QMRA portion is extended to 12/31/14. The team is exploring potential extension of the field portion funding.
- Researchers and DNR initially assumed they would have several farms willing to participate. Their study depends on having more operations with variable conditions.
- The remaining study funds will allow 8 remaining "runs" of data collection. The team would like to vary from current sites to include non-digested manure.
- The WPDES permit allowing limited use of manure irrigation for Ebert Enterprises in Kewaunee County was approved by DNR on January 14. (see notes item # 3). Randy Ebert (Ebert Enterprises) commented to the group that, although his permit would allow for manure irrigation, he is considering not participating in the drift study. His operation has been exploring a different treatment option—LWR or Livestock Water Recycling—through a provider in Canada; the new technology could potentially reduce liquid manure volume and decrease his interest in a center-pivot manure irrigation option.
- As announced at the beginning of the meeting, another farm in that area is interested in participating in the study. Pagel's Ponderosa would use a traveling gun method.
- DNR surveyed all Wisconsin CAFOs (about 250) regarding current and planned used of manure irrigation practices. They received 50-60 responses. About 12 (?) confirmed they are currently using manure irrigation; another 12 responded that they are interested in adding the practice over next few years. Some responded that they would consider using once requirements became more clear. DNR is still trying to increase the number of responses; there were no responses from swine facilities.
- The group discussed options for increasing study participation by farmers already using manure irrigation in their operations.

- The study team believes that 8 quality field trials this year, with good field measurement, will allow them to complete the QMRA study by New Years Eve.
- Beyond the field-level data collection, Becky Larson is attempting to build a 100' wind tunnel near UW-Madison. The tunnel would allow researchers to explore other variables such as wind speed, UV, etc, in a controlled environment. Larson's team is hoping to construct the tunnel over the next few months.

5b. QMRA Idaho

- Andrew Craig summarized and led discussion of a QMRA study completed in Idaho, focused on municipal wastewater (not manure). A summary paper from Idaho DEQ (attached to meeting notes) was distributed in advance.
- The Idaho study:
  - Investigated adequate buffer for exposure and for disease
  - The effort began over questions of is 300' sufficient buffer
  - Idaho project:
    - Only looking at E. coli 0157:H7, through multiple types of wastewater (did NOT include other pathogens, such as listeria, campo, and others)
    - 1% and 10% of 0157:H7 – the 10% is very conservative (if 10% of total coliform is 0157:H7).
    - Assume 49 applications over year on a single field (in line with a food processing waste system but much more than in Wisconsin).
    - See Figure 2 in paper for illustration of their focus.
    - They assumed a mature adult for exposure (NOT child or immune compromised)
    - Looked at both inhalation and ingestion.
    - Distances: 50 ft, 300 ft, and 1320 feet (1/4 mile)
    - Modelled for 1 in 10k to 1 in 1M exposure thresholds.
    - Defined nuisance on where droplet landed; not based on pathogen presence or odor.
  - Examined center pivot systems with different modeled wind speeds and pressures (simulating calm night time conditions to high wind daylight conditions). They assumed a constant wind speed for entire "run".
  - Included "inactivation" from literature, with uv and without; they included an "impact" factor, based on nozzle type, etc and pathogen pressure change.
  - Completed 3,300 scenarios, manually. They did NOT do a Monte Carlo simulation (which would be over 100,000 scenarios).
  - They have also looked at dairy manure scenario, and they have sent that to AC, but he has not had time to look at yet. Andrew did note that their study did not find any dairy material 200 ft downwind; he will review for more details.
  - IDEQ said only other state interested/looking is CA, which is also looking at ambient air standards.
  - IDEQ is interested in helping out with the Wisconsin study and collaborating where appropriate.
  - Idaho DEQ worked closely with Alan Dungan, who is recognized as expert in this area.

5c. Review assumptions and 5d. new literature/findings (discussed together)

Mark Borchardt and Tucker Burch led a presentation and discussion of QMRA analysis and preliminary results for workgroup feedback. The presentation included a review of the QMRA process, assumptions, and preliminary results of a partial analysis – the team has not yet incorporated air dispersion, just direct from field measures to QMRA; the partial analysis does take into account potential pathogen inactivation (dying) from dessication, uv, and "nozzle impact factor" because of sudden pressure change. Sometimes pathogens are particle associated but increase in count out of the nozzle because the "clump" of particles breaks apart, making pathogens more susceptible to other inactivation (uv, wind, etc…).
Points:

- conceptually: irrigation happens, droplets form, some drop and some aerosolize, and bacteria are dying in the air. Sometimes die-off is seconds and sometimes its minutes.
- The preliminary analysis focuses on 3 scenarios: Scenario 1) 13 mph wind; cloudy fall day; Scenario 2) 3 mph on partly sunny day; Scenario 3) 6 mph on cloudy day
- As a proxy, the study is using bovine baccteroides spp. and assuming that the nozzle impact factor is equal to the pathogen nozzle impact factor.
    - Have some empirical measures of pathogens to check surrogate.
    - Assuming proxy is same rate of inactivation
    - Assuming copies of molecular marker are equivalent to CFU pathogen, but this assumption could be off by factor of 100 – 1000; it assumes that everything in the air leads to illness.
- The study uses qPCR – a molecular tool – for looking at the gene, not the live bug. So results are probably overestimating the presence and risk. (eventually hope to correlate to CFU).
- The calculations are based on values from literature.
    - Pathogen air concentration (variable)
    - Respiration rates (variable)
    - Lung tidal volume (variable)
    - Exposure time (1 hour) and ingestion to inhalation ratio (0.5 from literature)
- Analysis will calculate a dose response, but it is important to remember that infection does note equate to illness. The team is selecting dose response curves from CAMRA – Center for Advancing Microbial Risk Assessment (www.camra.msu.edu).
- The team has looked at dose response curves for several pathogens.
    - Highly variable by strain
    - Even for strains of e coli – from 10^5 to 10^8 for median dose to illness
    - Recommended models tend to be most conservative … but we need to match to purpose, e.g, if ever found in dairy manure.
- This project has advantages ofer the ID study because actual measurements.
- Strengths:
    - Ratios used to predict pathogen concentrations come from source manure
    - Measured campy concentrations can be use to check preductions
- Limitations:
    - Use of surrogate micro-organisms
    - Assumption that molecular marker = CFU
    - Ingestion to inhalation ratio. This comes from assumption that in one hour during an irrigation event, half of the material inhaled would be ingested, based on reference that particles >5 microns inhaled are swallowed.
    - Range of meteorological conditions in data.

The discussion revisited many aspects of the study, including use of genetic markers, the use of proxies versus actual measured data, the "cleanliness" of irrigated material used so far in tests. There was a clarification that "dire" pathogens includes those already measured in the study plus the others listed in Nov notes. Other questions included:

- What difference does it matter what disease is present?
- How does the workgroup use this information in coming to a set of recommendations?
- Is campy the best bug to give us a sense of risk?
- Is campy a bug of average hardiness that can serve as the best proxy for others?

More general discussion included questions about whether it is feasible/reasonable to have manure tested before manure irrigation applications as well as the capacity of current infrastructure for sampling manure, especially during application periods, versus the ability to rely on databases of national samples of prevalence. Related to the discussion was a reminder from the last meeting that North Carolina regulations include requirements for for showing microbial decreases for spray applications: For a new facility, facilities above a certain size, or brand new swine, the operator must demonstrate that they have reduced microbial load in manure in order to get permit.

The research team ended by stating they have all assumption information needed for now, but they anticipate requesting future feedback from the workgroup on these and additional assumptions as well as other emerging issues, such helping sort out the qualitative differences between different pathogens under study.

6. Risk Tables – updates and next steps.

Becky Larson shared updates to three risk tables since the last meeting; tables had been distributed to workgroup prior to the meeting. Several edits were suggested on additional research and references to be reviewed and included before the next meeting. There was also a suggestion that we identify potential external expert reviewers for each table.

Specifically for the air quality table, Rob Thiboldeaux highlighted information presented at the December meeting by (section 5b of December 13th notes), specifically regarding hydrogen sulfide and ammonia. The information serves as a reminder that ammonia is a hazardous pollutant because once it enters atmosphere, it leads to PM2.5 formation, which reacts largely over urban areas where the particle formation occurs. The concerns over volatilization was the reason that manure irrigation was not included as a recommended practice for air quality, yet as a potential protection for water quality/groundwater, volatilization might be beneficial. This is a trade-off issue.

The tables will be discussed at future meetings.

7. Manure irrigation scenarios:

Building on the presentation by Kenn Buelow at the December meeting, Ken Genskow presented a concept for using scenarios to help illustrate manure irrigation practices in comparison to other manure management practices available. The scenarios could hold some conditions constant (e.g.,

number of milking cows, acres of land, soil types, etc) and vary manure application methods (trucked or piped to field) to examine impacts on timing of applications, numbers of applications, traffic issues, and other factors identified in the risk tables. The scenarios will be discussed further at the next meeting.

8. Planning for 2014 Report.

The workgroup briefly discussed content and timing for a report. Broadly, as discussed at the December meeting, a workgroup report would consist of a narrative summary of findings and any recommendations emerging from the workgroup, risk tables, and scenarios comparing use/non use of manure irrigation. There are questions about how much the workgroup can do before the drift/QMRA study is completed in December 2014. Workgroup activities and timeline will be discussed at the next meeting.

9. Actions for next meeting.

- QMRA team will provide an update on literature
- Spend time working through the tables and scenarios
- Other issues not yet addressed

Attachments:

- Powerpoint slides from Cheryl Skjolaas
- Idaho DEQ report on QMRA