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NRCS 635 Vegetated Treatment Area Standard Team
MEETING NOTES
Wednesday, September 6, 2023 ▲ 9:00am – 2:30pm ▲

NRCS, 8030 Excelsior Drive, Madison, WI

9:00 **Welcome** (Kate, Team)

Attendance: Kate Brunner, Steve Becker, Justin White, Travis Buckley, Bernard Michaud, Adam Moris, Eric Young, Emily Micolichek (part-time, remote)

Absent: Chase Brouillette
Guests: None

Steve provides a handout draft of proposed Additional Criteria for pumping discharge to a remote VTA to provide flexibility in VTA use. Team likes concept for farm to store some runoff on the lot and lower need for pumping. Team reviews and discusses some changes, including:

- Language will be inclusive for variety of spreading options. Intention was not to force traditional spreader bars, for example.
- Sump design criteria will reference standard 634 for the pumping plant and to allow cost sharing for the pump.

Team will have a chance to review updated text for this additional criteria again when the full revised draft standard is circulated.

9:05 **Notes Review** (Kate & Team)
Goal: Review and approve 8/2/23 draft meeting notes.

Draft meeting notes from 8/2 meeting were emailed to the team for review. There were some action items, completed as part of topics expected to be discussed later in the meeting. No team comments or questions raised on the notes; Kate will finalize and post online.

One open action item is for Bernie to talk to Andrew Craig to get DNR nonpoint program input on accumulating nutrients. This nonpoint input will likely be ongoing throughout the team conversation.

Adam had an action item to look into the historic frequency of the 1-year storm. The summary data from 8 weather stations across the state is in the 8/2 meeting notes. Team discusses summary data—median rainfall event ranges from 0.14 to 0.17 in. In all 8 stations, 50% of the volume was in storm events 0.80 in and less and 75% for events 1.54 in and less. Team agrees that the 1-year storm (2.5 inches statewide) is appropriate to use in this VTA modeling and evaluation.

9:15 – 12:00 **Hydraulics - WinSRFR Modeling** (Adam)
Explain the hydrograph development for the hydraulic model

Proportion the VTA geometry for a 1-year, 24-hour storm.

¼ acre earth lot	¼ acre concrete lot
½ acre earth lot	½ acre concrete lot
1 acre earth lot	1 acre concrete lot
	3 acre concrete lot
	5 acre concrete lot

Evaluate the VTA geometries above for the 25-year, 24-hour storm.

Goals:

- Evaluate the effect of VTA slope in utilizing the full VTA width
- Evaluate the effect of VTA slope in utilizing the available water holding capacity
- Evaluate the effect of an endblock in utilizing the available water holding capacity
- Evaluate the performance expectations for a 1-year and 25-year design storms

At previous meetings, Adam showed some results of WinSRFR hydraulic model and team identified some variations. Adam provides a handout showing the assumptions and sizing results for different soil types for different storm events (VTA sized for 1-year with endblock and max 15% deep percolation, then seeing how that VTA would respond to 25-yr storm).

Team discusses the sizing and infiltration variables. The 3' depth based on assumption for average depth to rock and a deep plant rooting zone. The balance of factors depends on weighing which impact is worse—runoff off the end or deep perc. This could be site-specific depending on things like setbacks (e.g. proximity to surface water). Suggested solution: have a table in standard with feedlot-to-VTA ratio for soil type and whether paved or earth.

The models are just hydraulics and so these feedlot models behave the same as other sources. Pollutants can't discharge to groundwater and Team will look at nutrient part of runoff later.

Key points of modeling results and team discussions:

- If using even time steps the models were missing some of the peak so Adam adjusted steps to be less frequent near the peak. Hydrograph shape may be too abrupt of peaks, and flood diversions may take off the peak.
- Modeling objective was to size at VTA for a 1-year storm, then also use that size VTA to evaluate same VTA for 25-year storm.
- Effective VTA modelling wasn't achievable for loamy sand, regardless of VTA sizing—this isn't a setting where VTAs will be allowed. Regarding soil type, team agrees:
    - No lab test for soil texture (TBD for nutrients).
    - Planning for soil type would be using web soil survey with verification by a soil scientist.
    - Team thinks the VTA should not be sited in loamy sand or sand. There are some issues with clay as well though smaller size VTAs perform okay.
- VTA is more efficient with flatter slope so modelling used max of ½%.
- Team is mindful that design may start to look like an infiltration basin.

- In the current standard, the VTA length is difficult for many farms. Modelling shows the full length often is not used. More water holding capacity can be used with shorter length and an endblock.
    - Endblock provides much greater infiltration by forcing runoff to slow down, though deep percolation also greater with endblock.
    - Endblocks (and even mid-VTA "speed bumps") become even more important as slope increases.
    - Modelling doesn't calculate volume or duration of overflow with endblock, just when it occurred. Endblocks in models were 12 or 18 inches.
- Tentative Team decisions from modelling, though may be revisited depending on nutrient discussion.
    - No VTAs in sand or loamy sand. Possibly in clay, too.
    - Still to be confirmed lowering the maximum slope. Or require the "speed bumps" with slopes > X%.
    - Require endblocks. With this, Team wants to revisit setbacks.
    - Create lookup tables for sizing. For sites that don't fit the tables (for higher risk sites), modelling required for VTA design. Area engineers are capable of using the models.

12:00 – 12:30 Lunch, provided

12:30 – 1:30 VTA-Nutrient Uptake Balance for Nitrogen
Goal: Evaluate the process for checking nutrient balance.

Explain the concept of using a Feedlot Area (load) to VTA Area (uptake) ratio to check for nutrient balance (Steve)

Steve provides a handout of VTA-nutrient balance for nitrogen. The sample is from Montana and needs update for WI precipitation, but concept is same. It was derived from AWMFH Table 4.9 Precipitation and N Content of Cattle Feedlot runoff.

Backup for the MT table:

- N content 60 lbs N/acre in runoff
- Reduction for denitrification = 20%
- N available after mineralization = 43%
- Nitrogen loading = 20.8 lbs N/acre feedlot/in. runoff
- Alfalfa/grass mix:
    - Yield =1.5 tons/ac
    - N Harvested = 42 lbs/ton
    - N removed = 63 lbs/acre VTA
    - Excess allowable for soil health = 30 lbs/acre
    - SUM: Allowable N application = 93 lbs/acre

An evaluation of nutrients is not number of storms or rainfall, but *runoff*--about half of WI storms are volume that wouldn't even cause runoff (>0.2 inches).

Adam and Eric will create the VTA-Nutrient Balance Table with inches of lot runoff data from **Adam** and yield for WI by **Eric** (average tons/acre, and not tied to precipitation). The table handout from WinSRFR modeling shows feedlot to VTA ratio ranging from 1:1 to 3:1. A table similar to the MT nutrient balance example may be helpful to see how standard could tie inches of runoff and N together for a ratio for WI.

NRCS guidance document says: Nitrogen is generally the limiting nutrient in VTA design for feedlot runoff. Limited movement of P with runoff and settling of significant portions of the phosphorus in the settling basin limits the phosphorus risk.

Other resources:

- Current VTA guidance doc Table 6-1 identifies animal headcount. Adam has tied those to the VTA sizing in the models reviewed earlier today.
- APLE-Lots can't be used for P evaluation here, since that's right off the edge of the lot, not with settling like is in a VTA.
- Current VTA guidance doc Table 6-2 identifies nitrogen uptake by numerous forage vegetation types.
- Discovery Farms research shows large concentrations P and N, more elevated in first flush and tail end of the hydrograph. Uptake is rather low. Over half of P is dissolved and won't settle out. See for example Table 12 of Silage Leachate Runoff Collection Systems paper rev. May 31, 2016. There have been advancements in settling basins.

Does team want to require sediment settling basins? Moderated flow would change the hydraulic modelling and pollutant loads quite a bit—settling doesn't decrease volume but spreads it out. To understand how the settling basins change design, **Adam** will revise the WinSRFR models to a depth of about 2 inches, with different discharge rates

(e.g. a few between 0.2 and 1 cfs).

WinSRFR Modeling (Adam)
Evaluate the VTA wetting front for 1" rainfall event representing about 75% of precip events.

¼ acre earth lot	¼ acre concrete lot
½ acre earth lot	½ acre concrete lot
1 acre earth lot	1 acre concrete lot
	3 acre concrete lot
	5 acre concrete lot

1:30 – 2:30 **Group Discussion** (Steve)

Goals:

- Discuss technical details for uniform flow and leveling systems.
- Discuss whether to include CAFOs.

Discuss the design storm and evaluate the VTA performance expectations

Earlier discussions were longer than expected. These topics will be covered at a later meeting.

2:00-2:30 Plan of Action

- Develop a feedlot area to VTA ratio for Phosphorous
- Develop a feed storage area to VTA ratio for diluted leachate runoff

Next meeting was to be October 4, but needs to be cancelled due to conflicts. Next meeting will be Nov. 1 as a remote meeting 9:00 to noon. Agenda will include some topics the Team didn't get to today, and review of homework by Adam and Eric.

Monthly meetings are currently scheduled through February 2024 and will likely need to be extended out to address remaining issues for this standard, and responding to comments from the 2 review periods. **Kate** will review schedule and adjust calendar entries.

Some previous parked topics:

1) How to incorporate nutrient balance in VTA site assessment and sizing. Eric is looking at Discovery Farms research (and other research) and Bernie is talking to Andrew Craig for DNR nonpoint program input on accumulating nutrients.
2) IN PROGRESS: What level to treat to? For example, should we design for full infiltration without deep perc for 1 yr event (modest treatment on 25-yr storm)? Or full infiltration without deep percolation for 25-yr storm?
3) IN PROGRESS: How to include end berm in the standard (general criteria, additional criteria for specific situation, or consideration).
4) Reviewing and refining technical details like uniform flow and leveling systems.
5) How/whether to include CAFOs.
6) Sizing adjustments, which may include:
   a) Adjustments for removing collected/stored volumes before runoff hits VTA (first flush collection) or collection (for recirculation or other disposal) at end of the VTA.
   b) Adjustments for amount of feed being stored.
   c) Adjustments for runoff from tarped (clean) vs untarped (leachate) feed.
7) Are there other substantive requirements in the current federal standard that are different from current WI standard?

Action Items developed today:

1. Carried forward from previous meeting: **Bernie** to talk to Andrew Craig to get DNR nonpoint program input on accumulating nutrients (and other topics as appropriate).
2. **Adam and Eric** will create a VTA-Nutrient Balance Table
   a. Inches of lot runoff data from **Adam.**
   b. Yield for WI by **Eric** (lbs N, and not tied to precipitation).
   c. **Eric** – look at Kolsch research paper on animal lots, and APLE Lots total and dissolved P values to come up with P loading data, with assumption of like 80% efficiency.

3. **Eric** – do some evaluation based on Disc Farms paper to see if VTAs appropriate for feedlots.
4. To understand how the settling basins change design, **Adam** will revise the WinSRFR models. Some options are depth adjustments (~2 or 2.5 inches, with different orifice restrictions (e.g. a few between 0.2 and 1 cfs).
5. **Kate** will prepare draft meeting notes from today, then reviewed by full **Team**.
6. **Kate** and **Steve** will prepare agenda for Nov. 1. Kate will send to the full team about 1 week in advance along with any reading materials.
7. **Kate** will review project schedule and adjust calendar entries.

2:30 Meeting End