

Engineering for Agriculture

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November 30, 2004

Engineering – Sample Dairy, Comprehensive Nutrient Management Plan,
Evaluation of Existing Components
Sand County, Michigan

Mr. David and Joe Brown;

This letter is provided as documentation for your evaluation of existing components to be included in the Comprehensive Nutrient Management Plan (CNMP) for your farm operation.

On May 5, 2004, an inspection of the waste storage facilities were conducted at the Sample Dairy farm operation located in Sand County, Michigan. This is a family owned and operated farm with three concrete tanks and one earthen storage facility.

The inspection of these facilities addressed the suitability of using the existing waste storage facilities as components of the CNMP. As-Built documentation was available for review on all of the waste storage facilities for this evaluation of existing component document.

Freeboard for each storage type and estimated usable storage capacity is identified below. The capacities calculated may be less due to limitations of pumping accumulated solids out of each storage facility.

Ag CNMP consultants provided the manure and wastewater production amounts for each facility. Based on this information the estimated number of available storage days for each storage facility is calculated.

The Michigan Agricultural Environmental Assurance Program has identified the conditions under which existing components may be included in a Comprehensive Nutrient Management Plan (CNMP). These conditions are described below.

Existing Components may be included as part of a CNMP only if all of the following are met:

1. The existing component is consistent with the safety guidance of the CNMP.
2. An investigation/inspection of the existing component indicates it is in good operating condition, based on observable and/or measurable features and conditions;
3. The failure of an existing component will not impair the structural integrity or operation of new components;
4. The existing component can be managed as part of the CNMP.

This letter reports the finding of Ag Engineering's inspection in terms of the criteria described above. This investigation and evaluation is **not a certification** of the components, only an investigation of existing conditions. Refer to the CNMP site map for the locations of the existing components.

Waste Storage Facilities Evaluated

Waste Storage Facility # 1 – Pre-cast concrete ADL tank (transfers waste to # 5)

Waste Storage Facility # 5 – Pre-cast concrete ADL tank

Waste Storage Facility # 2 – Milkhouse wastewater storage pond (clay lined)

Waste Storage Facility # 4 – Pre-cast concrete ADL tank (transfers waste to # 2)

Carcass Composting – Remodeled lean-to barn

Waste Storage Facility # 1 – ADL tank:

This facility is located between the Freestall Barn # 2 (North Barn) and the Freestall Barn # 1 (South Barn). Manure from 500 lactating cows, sand bedding, and 5,000 sq.ft. area runoff is stored in this facility. The dimensions of this waste storage facility is 80 ft x 112 ft x 8 ft deep. It was constructed in 1998 by ADL, Inc and approved for cost share dollars from NRCS. This structure is constructed with pre-cast, reinforced concrete panels and the floor and access ramp are poured in place concrete. The facility contained approximately 1 foot of waste during the day of inspection. The panel joints were visible along the sides and at the top and appeared to be tight and well sealed. The walls showed no bowing or tilting. There is a fence barrier around the entire facility. No signs of deterioration in the concrete were evident. The top of the storage facility is only slightly above ground level so there appears to be no potential for a failure of the structure that would not affect surface water quality. Clean runoff adjacent to the storage facility is diverted away. As long as the facility joints remain in the conditions observed, the waste storage facility should provide adequate protection from seepage and ground water contamination. ADL uses designs that have been approved as meeting NRCS Waste Storage Facility practice standard and American Concrete Institute for reinforced concrete structures. Accumulation of waste stored is visible and is monitored.

Fabricated storage structures must maintain 0.5 feet of freeboard plus the volume generated from a 25yr/24hr storm event on the storage surface and from the 5,000 sq.ft. area. This equates to a depth of 1.25 ft of which must be maintained open in order to store the 25yr/24hr storm event while maintaining the required freeboard depth.

The usable storage capacity of this tank is calculated to be 402,125 gallons. Based on production information given in the CNMP this facility can store a little over 4 months of waste, generated from the N and S freestall facilities and normal monthly rainfall.

Responses to the existing component criteria are as follows:

- ? This facility appears to be consistent with the safety guidance of the CNMP with the presents of a fence barrier around the entire facility.
- ? Based on observable features and conditions, the waste storage tank appears to be in good operating condition. This facility has been in operation for 5 years without any evidence of deterioration in the structure.
- ? The failure of an existing component will not impair the structural integrity or operation of new components.
- ? The existing component can be managed as part of the CNMP.

Waste Storage Facility # 5 – ADL tank:

This facility is located south of the Freestall Barn # 1 (South Barn). Liquid waste that accumulates in the ADL # 1 storage tank is transferred via an under ground pipe to this facility. The dimensions of this waste storage facility is 172 ft x 172 ft x 12 ft deep. It was constructed in 2002 by ADL, Inc and approved for cost share dollars from NRCS. This structure is constructed with pre-cast, reinforced concrete panels and the floor and access ramp are poured in place concrete. The facility contained

approximately 2.5 foot of waste during the day of inspection. The panel joints were visible along the sides and at the top and appeared to be tight and well sealed. The walls showed no bowing or tilting. There is a fence barrier around the entire facility. No signs of deterioration in the concrete were evident. The top of the storage facility is slightly above ground level so there appears to be no potential for a failure of the structure that would affect surface water quality. Clean runoff adjacent to the storage facility is diverted away. As long as the facility joints remain in the conditions observed, the waste storage facility should provide adequate protection from seepage and ground water contamination. ADL uses designs that have been approved as meeting NRCS Waste Storage Facility practice standard and American Concrete Institute for reinforced concrete structures. Accumulation of waste stored is visible and is monitored.

Fabricated storage structures must maintain 0.5 feet of freeboard plus the volume generated from a 25yr/24hr storm event on the storage surface. This equates to a depth of 1.0 ft of which must be maintained open in order to store the 25yr/24hr storm event while maintaining the required freeboard depth.

The usable storage capacity of this tank is calculated to be 2,326,460 gallons. Based on the percentage of production information transferred given in the CNMP that is transferred into this storage facility from ADL # 1(75%), ADL # 5 can store approximately 11 months of waste and normal monthly rainfall.

Responses to the existing component criteria are as follows:

- ? This facility appears to be consistent with the safety guidance of the CNMP with the presents of a fence barrier around the entire facility.
- ? Based on observable features and conditions, the waste storage tank appears to be in good operating condition. This facility has been in operation for 2 years without any evidence of deterioration in the structure.
- ? The failure of an existing component will not impair the structural integrity or operation of new components.
- ? The existing component can be managed as part of the CNMP.

Milkhouse Wastewater Waste Storage Pond (Waste Storage Facility # 2)

The waste storage facility (pond) is located in the southwest part of the farm headquarters. It is an earthen structure with a clay liner that was constructed in accordance with a design developed and approved by NRCS in 1997. It was designed to store the volume of milkhouse wastewater produced in 180 days. Currently, this facility receives wastewater generated in the milkhouse parlor and wastewater from ADL # 4 (silage leachate/ runoff collection storage tank) is pumped into this storage. The As-Built dimensions of this storage facility are 230 ft x 164 ft x 8 ft deep and indicate that one foot of clay liner material was installed along with 1 foot of soil cover. The maximum outside embankment height is approximately 7 ft in the southwest corner of the facility.

The facility was ½ empty on the day of inspection for the facility evaluation. Based on what could be observed of the embankment it appeared to be in good condition with no bulging, erosion, rodent holes or trees. There is a fence around the entire facility. No signs of deterioration in the embankment material were evident. The Browns use a float on the end of the pump-out pipe in order to prevent damage to the clay liner during emptying. As long as the embankment remains in good condition and the liner is not damaged, the waste storage facility should provide adequate protection from seepage and ground water contamination and the risk of a failure of the structure and the potential contamination to surface water is minimal. Accumulation of waste stored is visible and is monitored.

Earthen storage structures must maintain 1.0 feet of freeboard plus the volume generated from a 25yr/24hr storm event on the storage surface. This equates to a depth of 1.4 ft of which must be maintained open in order to store the 25yr/24hr storm event while maintaining the required freeboard depth.

The usable storage capacity of this storage pond is calculated to be 1,212,067 gallons. Based on milk house waste production and amount of wastewater pumped from ADL # 4 information given in the CNMP this facility can store approximately 7.5 months of wastewater generated from the milkhouse, normal monthly rainfall and an estimated 461,320 gallons transferred from the runoff collection and silage leachate storage tank – ADL # 4.

Responses to the existing component criteria are as follows:

- ? This facility appears to be consistent with the safety guidance of the CNMP with the presents of a fence barrier around the entire facility.
- ? Based on observable features and conditions, the waste storage pond appears to be in good operating condition. This facility has been in operation for 6 years. As-Built design documentation was also reviewed indicating evidence of a clay liner installed to the depth indicated on the design.
- ? The failure of an existing component will not impair the structural integrity or operation of new components.
- ? The existing component can be managed as part of the CNMP.

Waste Storage Facility # 4 – ADL tank:

This storage facility is located north of the bunker silo. The facility collects polluted runoff from the Old Cow Barn concrete lot (38,400 sq.ft. area), silage leachate and the bunkers initial runoff is stored in this facility. The dimensions of this waste storage facility is 120 ft x 20 ft x 4 ft deep. It was constructed in 2003 by ADL, Inc and approved for cost share dollars from NRCS. This structure is constructed with pre-cast, reinforced concrete panels and the ramp and floor is poured in place concrete. The facility contained approximately 1 foot of waste during the day of inspection. The panel joints were visible along the sides and at the top and appeared to be tight and well sealed. The walls showed no bowing or tilting. There is no fence barrier around the facility. No signs of deterioration in the concrete were evident. The top of the storage facility is slightly above ground level so there appears to be no potential for a failure of the structure that would affect surface water quality. Clean runoff adjacent to the storage facility is diverted away into a well established vegetative channel. As long as the facility joints remain in the conditions observed, the waste storage facility should provide adequate protection from seepage and ground water contamination. ADL uses designs that have been approved as meeting NRCS Waste Storage Facility practice standard and American Concrete Institute for reinforced concrete structures. Accumulation of waste stored is visible and is monitored.

Fabricated storage structures must maintain 0.5 feet of freeboard plus the volume generated from a 25yr/24hr storm event on the storage surface, and the Old Cow Lot runoff area (38,400sq.ft.), plus the bunker silo runoff area. This equates to a depth of 1.58 ft of which must be maintained open in order to store the 25yr/24hr storm event while maintaining the required freeboard depth.

The usable storage capacity of this tank is calculated to be 43,384 gallons. This structure is considered a temporary storage where liquids are transferred on a regular basis through an underground pipe to the earthen storage pond # 2. Based on the runoff calculated this storage needs to transfer waste to the earthen storage pond # 2 every 34 days.

Responses to the existing component criteria are as follows:

- ? This facility is NOT consistent with the safety guidance of the CNMP. A safety fence or barrier needs to be installed around the entire facility.
- ? Based on observable features and conditions, the waste storage tank appears to be in good operating condition. This facility has been in operation for over one year now without any evidence of deterioration in the structure.

- ? The failure of an existing component will not impair the structural integrity or operation of new components.
- ? The existing component can be managed as part of the CNMP once the safety fencing or barrier is installed.

In summary, the ADL Tank (Waste Storage Facility # 1), (Waste Storage Facility # 5), and the milkhouse wastewater storage pond (Waste Storage Facility # 2) are suitable for use in the CNMP. The ADL tank (Waste Storage Facility # 4) is not suitable for use in the CNMP until it meets the safety requirements by installing a fence or barrier around the entire facility.

It is also recommended that waste depth gauges be installed in each waste storage facility. This will add through recordkeeping to better estimate the volume of waste generated in each storage facility along with the volume of waste transferred to ADL # 5 and the earthen storage pond # 2. The depth gauges will also provide good information on the volume of waste hauled to the fields during land applications, and verify the land application rates.

In 2004 the carcass composting was moved into an remodeled lean too structure. This structure has a concrete floor, existing roof and modular blocks were brought in to construct the bins needed.

- ? This facility appears to be consistent with the safety guidance of the CNMP.
- ? Based on observable features and conditions, the remodeled structure appears to be in good operating condition.
- ? The failure of this component will not impair the structural integrity or operation of new components.
- ? The existing component can be managed as part of the CNMP.

Sincerely,

I. M. Engineer

I. M. Engineer, PE
Environmental Engineer