NRCS Natural Resources Conservation Service

Minnesota

BASELINE NUTRIENT MANAGEMENT FOR LIVESTOCK OPERATIONS

For

Joe Farmer

Address

Any Address

Directions from the nearest post office

Example

7/10/2006

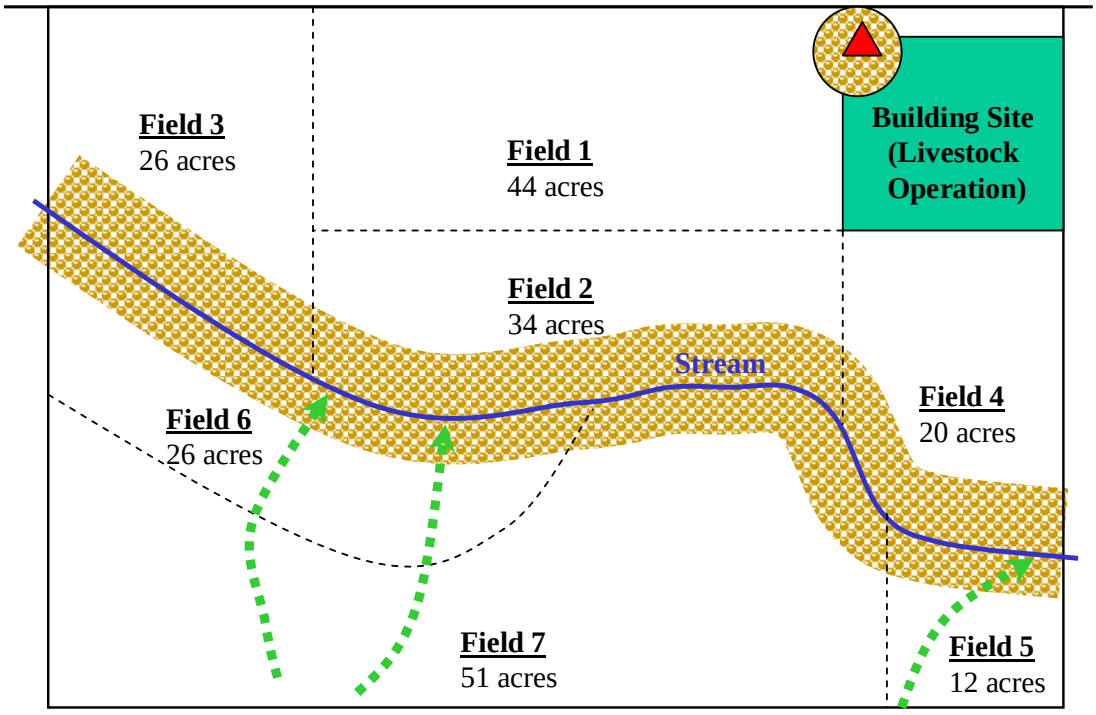
Baseline Nutrient Management Plan for Livestock Operations

TABLE OF CONTENTS

PLANS, ASSESSMENTS AND OTHER INFORMATION

Joe Farmer
Home Farm
(213 tillable acres)
Tract T558

North



Any County
Any Township
Section 14, NW 1/4

Scale: 1 inch = 620 feet

Fields to receive manure applications during rotation(s)
Fields: All

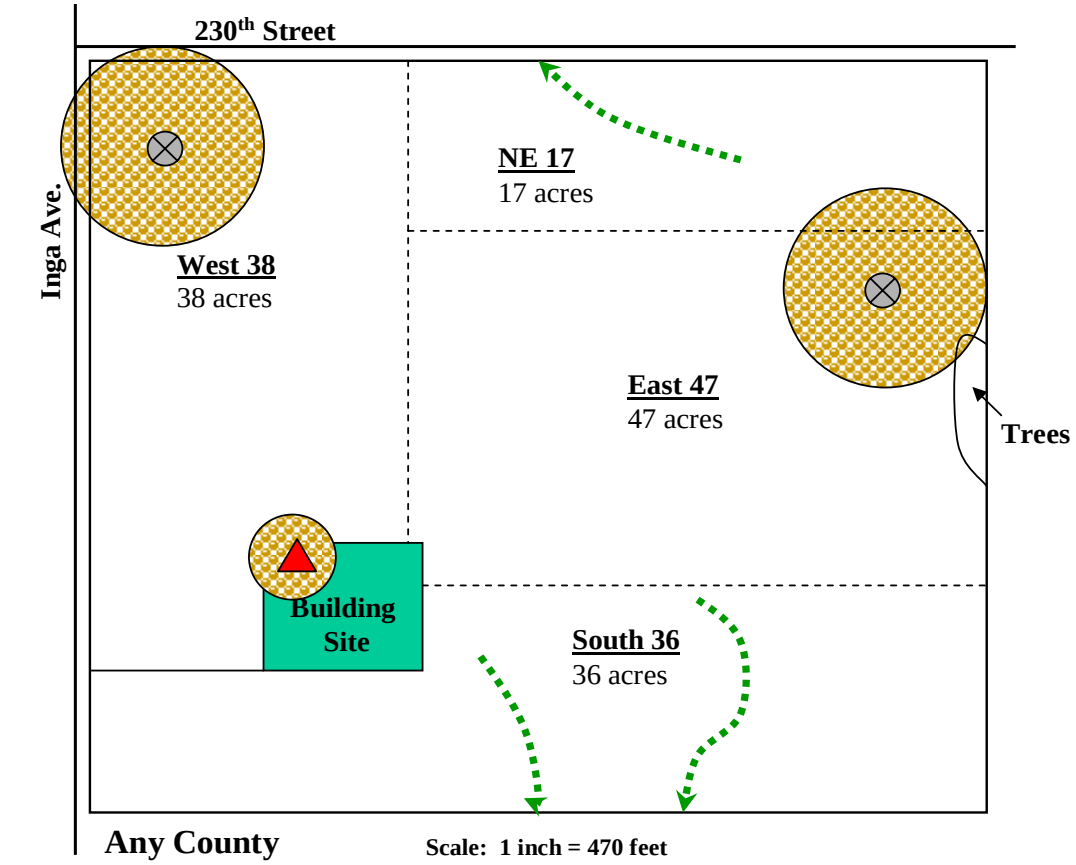
Fields to receive winter-time manure applications during rotation(s)
Fields: None

Fields with 6% or greater slopes
Fields: None

Sensitive Areas

- **Stream**
- **Waterway**
- **Tile Inlet**
- **Water Well**
- **Special Protection Area**

Joe Farmer
Raddle Farm
(138 tillable acres)
Tract 978



Any County
Any Township
Section 7, NW 1/4

Scale: 1 inch = 470 feet

Fields to receive manure applications during rotation(s)
Fields: All

Fields to receive winter-time manure applications during rotation(s)
Fields: None

Fields with 6% or greater slopes
Fields: S36

Sensitive Areas

- Stream
- Waterway
- Tile Inlet
- Water Well
- Special Protection Area

BASELINE NUTRIENT MANAGEMENT PLAN FOR LIVESTOCK OPERATIONS

(Meets Requirements of USDA-NRCS Programs in Minnesota)

for

Joe Farmer

This plan was developed to improve overall ability to safely handle and apply manure at needed rates and to satisfy EQIP requirements. The plan identifies areas sensitive to manure applications and practices to use in those areas; provides additional operation and maintenance guidance; and finally provides nutrient rate recommendations. The rates will need adjusting when subsequent annual field specific nutrient plans are developed.
This plan was developed based on the current crop and animal production practices of the farm operation. Changes in those production practices could result in a need to modify or update this plan.

I. LIVESTOCK; MANURE STORAGE, HANDLING AND TESTING

Appendix 3 contains reports detailing your livestock type(s) and numbers; the quantity of manure produced annually by those livestock; your current storage systems; and your manure testing practices, spreader calibration procedures and application methods.

II. ROTATION, AVAILABLE CROPLAND ACRES, TOTAL NUTRIENTS FROM LIVESTOCK AND ACRES NEEDED TO UTILIZE THOSE NUTRIENTS

This plan was developed for your operations' 424 acres in a rotation of corn/soybeans.
Appendix 3's "Nutrient Summary" report indicates that the total nutrients available to plants in the year of application from a year's supply of manure are:

N 29900 lbs.	P_2O_5 23500 lbs.	K_2O 19150 lbs.

and that the following acres are needed to utilize these nutrients:

N 200 acres	P_2O_5 485 acres	K_2O 475 acres

The available nutrient estimates account for nutrient losses in storage and during application. The acreage estimates for N assume that manure is applied to legumes to satisfy removal rates and to non-legumes to satisfy Univ. of Minnesota recommended crop nutrient requirements . You will need more acres than indicated to utilize manure N if you limit manure applications on legume crops.

III. FIELDS WITH SENSITVE AREAS REQUIRING SPECIAL MANAGEMENT

Sensitive Features and Areas

Your fields may contain sensitive features and/or areas requiring special management to keep fertilizer or manure in the zone of application. These often natural features increase the potential for pathogenic organisms or applied nitrogen and phosphorus to move towards ground water or surface waters. Elevated levels of nitrogen in drinking water can be dangerous to babies and young livestock. Scientific trials show direct relationships between soluble algal available phosphorus in runoff and soil test phosphorus (STP) levels. Potential to accelerate algae growth increases as STP levels increase if a field's runoff reaches surface waters.

The following sensitive features occur on one or more of your fields. Appendix 2 contains one or more reports that identify specific fields containing these sensitive features.

High to very high Soil Test P	Soil feature limitations	Steep Slopes	Lake, Stream Wetland <300'	Water-way, Ditch or ephemeral erosion	Open Tile Intake <300'	Sinkhole, well, mine or quarry	Public Water Supply Mgt. area
☒	☒	☒	☒	☒	☒	☒	☐

Additionally the ability for nitrogen to move off-site on this farm has been evaluated based on timing of commercial fertilizer nitrogen applications, soil textures and other f actors. **Field specific loss ratings are found in Appendix 3's "Field Nitrogen Loss Assessment" report**.

The ability for phosphorus to move off-site on this farm has been determined based on soil loss levels, distance to receiving waters and other factors. **Field specific phosphorus loss information is also found in Appendix 3.**

IV. RECOMMENDED PRACTICES FOR SENSITIVE AREAS AND FEATURES

Land Treatment Practices

The following practices are recommended on sensitive fields receiving nutrient applications. Soil and water conservation practices have not been recommended that keep soil losses at 2-4 tons/acre/year thus allowing for more manure application flexibility. **Animals from CAFO lots must be excluded from waters of the state. Animals from AFO lots must also be excluded from most state waters.**

PRACTICE	FIELDS	INSTALL YEAR
Residue Management	**1,4,7,So. 36, No. 40, So 40**	
Filter Strip	2,4	

Consult your Soil and Water Conservation Plan for additional detail.

Nutrient Management in Sensitive Areas

Consult Appendix 3's Management Practices section for guidance on sensitive area practices.

Winter-time Manure Applications

Fields included in this plan **will not** be receiving wintertime manure applications to frozen or snow-covered surfaces and **are not** identified on the attached aerial photos or maps. Use fields that are the furthest distance from surface water if winter time applications are necessary. *Do not apply manure on actively thawing surfaces. Do not winter apply solid manure on fields with greater than 4 tons/acre/year soil losses. Do not winter apply liquid manure applications on fields with greater than 2 tons/acre/year soil losses*. If this is a CAFO, do not winter-apply liquid manure on fields with greater than 2% slope and do not winter apply solid manure on fields with greater that 6% slope (except with permission from the Minnesota Pollution Control Agency (MPCA)).

June, July or August Manure Applications to Bare, Harvested Fields

Operations where manure management plans are required by state law must plant a cover crop for the remainder of the season on bare fields receiving summertime manure applications. The following cover crops will be established on fields receiving summer–time manure applications: Not applicable

High Soil Phosphorus Levels

You should manage your operation to avoid excessive build-up of soil test phosphorus (STP). Your CNMP and subsequent annual plans may not recommend manure applications on some fields because of very high STP levels. In general, plan the rate and frequency of manure applications to avoid STP buildup to 75 ppm as Bray P1. Cease applications before STP levels reach 150 ppm (300 lbs./ac.) as Bray P1. The following manure application frequencies should be implemented as a phosphorus strategy for either building or maintaining or reducing STP levels.

Manure Applications	List of Fields
every four years	1,4
every three years	2, Raddle So. 36
every 2 years	All other fields

If STP levels continue to rise, two final options are available: 1.) find additional acres for manure applications and/or 2.) change feed management to reduce the amount of nutrients excreted by livestock. **"Livestock Ration Self-Assessment" worksheets" and Feed Management Fact Sheets are found in appendix 5 .**

V. OPERATION AND MAINTENANCE

- The Operation and Maintenance plan for your system's manure storage, treatment, and transfer components should be carefully read, particularly concerning toxic gasses and fumes in confined locations; required fencing around ponds and periodic inspections of system components.
- The storage structure(s) should be emptied at a frequency shown below and as appropriate should be properly agitated prior to pumping to dislodge settled solids from the bottom and insure adequate nutrient mixing.
- Test manure at the frequency shown below. This frequency can be reduced after three years if analyses show consistent results overtime or between pump-out or scraping periods. Always retest following changes in manure storage and handling, livestock types or livestock feed. Your planned manure testing frequencies are listed in the table below. Collect and handle manure samples according **to Appendix 5's fact sheet MN-NUTR-6.** Have the samples analyzed by a Minnesota Department of Agriculture (MDA) certified laboratory.

Storage Facility Identification	**Number of Times and planned months to Empty Per Year**					**Manure Sampling Frequency**
Bldg.1 underground pit	2	Apr.	Nov.			Semi-annually
Bldg 2. underground pit	1	Apr.				Annually

- Sample and analyze soils according to Appendix 6's guidelines (USDA-NRCS-MN Fact Sheet MN-NUTR3 Soil Sampling). Testing for residual soil nitrate should be done annually where appropriate. Sampling and testing for soil nitrate **are not** being planned as a crop N use strategy for this operation.
- Commercial fertilizer and manure application equipment should be cleaned after applications and maintained and calibrated according to manufacturer directions and MN. Dept. of Agriculture and Univ. of Minn. guidelines Equipment will be maintained to insure that applied rates do not deviate from planned rates by more than approximately 15%. **A manure calibration fact sheet is located in Appendix 6**.
- Apply manure in a uniform pattern that delivers the specified amount across the entirety of the planned area. Application method and incorporation timing will also be uniform across the planning area.
- Use safety practices to minimize exposure to manure gases and organic wastes and chemical fertilizers-particularly ammonia forms of fertilizers. Wear protective clothing including footwear, a respirator, and gloves when appropriate. Consult the MN. Dept. of Agriculture web-site for additional detail.
- Protect fertilizer storage areas from weather to minimize runoff, leakage, and loss of material.
- Consider identifying fields (areas) for emergency wintertime or growing-season manure applications.
- Abandoned lots and storage structures should be closed according to NRCS and state law requirements

VI RECORD KEEPING

Maintain records for a six-year period. **Sample record keeping forms are found in appendix 4.**

Farm specific records

- Quantity of manure and other organic by-products produced.
- Dates and amount of manure removed from the system due to feeding, energy production, or export from the operation.
- Carcass disposal techniques
- Quantity and location of manure transported off-site to land not owned or controlled by you.

Field specific records

- Name and address of commercial hauler or applicator receiving manure.
- Crop yields, planting and harvest dates and crop residues removed.
- Type and analyses of nutrients applied to each field (commercial fertilizer, manure, other nutrient source). Application dates and rates, including application methods and time to incorporation.

VII. NUTRIENT MANAGEMENT PLANS

Your **Crop Nutrient Management Plan** found in Appendix 3 recommends manure and fertilizer application methods, timing and rates. The recommendations take into consideration potential for loss of nitrogen and/or phosphorus to air, runoff and leaching and are based on realistic yield goals, soil tests, manure analyses (average values if not available) and University of Minnesota fertilizer guidelines.

The recommendations are: Year and field specific. The recommendations are not valid if any of the following occur. 1.) Manure is not regularly sampled and analyzed. 2.) Application equipment is not regularly calibrated for the recommended rates. 3.) More manure is applied in one part of a target area than in another part even though the same rate is recommended for the entire area (application rate and method is not uniform).

<table>
<tr><td colspan="3">This plan complies with USDA-Natural Resources Conservation Service in Minnesota standards. Additional practices may be necessary to comply with applicable federal, state or local regulations.</td></tr>
<tr><td>Certified Nutrient Specialist

Signature</td><td colspan="2">TSP ID # or agency staff title

Date</td><td>Phone #</td></tr>
<tr><td>Certified Land Treatment Specialist

Signature</td><td colspan="2">TSP ID # or agency staff title

Date</td><td>Phone #</td></tr>
<tr><td>Owner/Operator Signature</td><td colspan="3">Date</td></tr>
</table>

Manure and Wastewater Handling and Storage
APPENDIX 1

Engineering Plans

Engineering plans for your system are located: In your office ☐

Land Treatment APPENDIX 2

Management Practices

Recommended Soil and Water Conservation Practices or	☐
Provide location of recommendations Your case file in the Dakota County SWCD	☒

General Information

"General Farm Field Information"[1] or equivalent information. Equivalents means fields, field names, acres, irrigated or non-inirrigated and location (County, Township, Section)	☒
Soil Maps and Soil Legends	☐

Evaluations

Field Specific Sheet and Rill Soil Loss Estimates Or	☐
Provide location of estimates Dakota Co. SWCD Office	☒
Sensitive Area Determinations. NRCS form MN-CPA-40 (Farming Practices Inventory) or equivalent or 'Management Practice Considerations in Sensitive Fields Report'[1] ((Located in Appendix3) or equivalent MPCA form or equivalent.	☒

1. These reports are from "Nutrient Management Planner for Minnesota" software

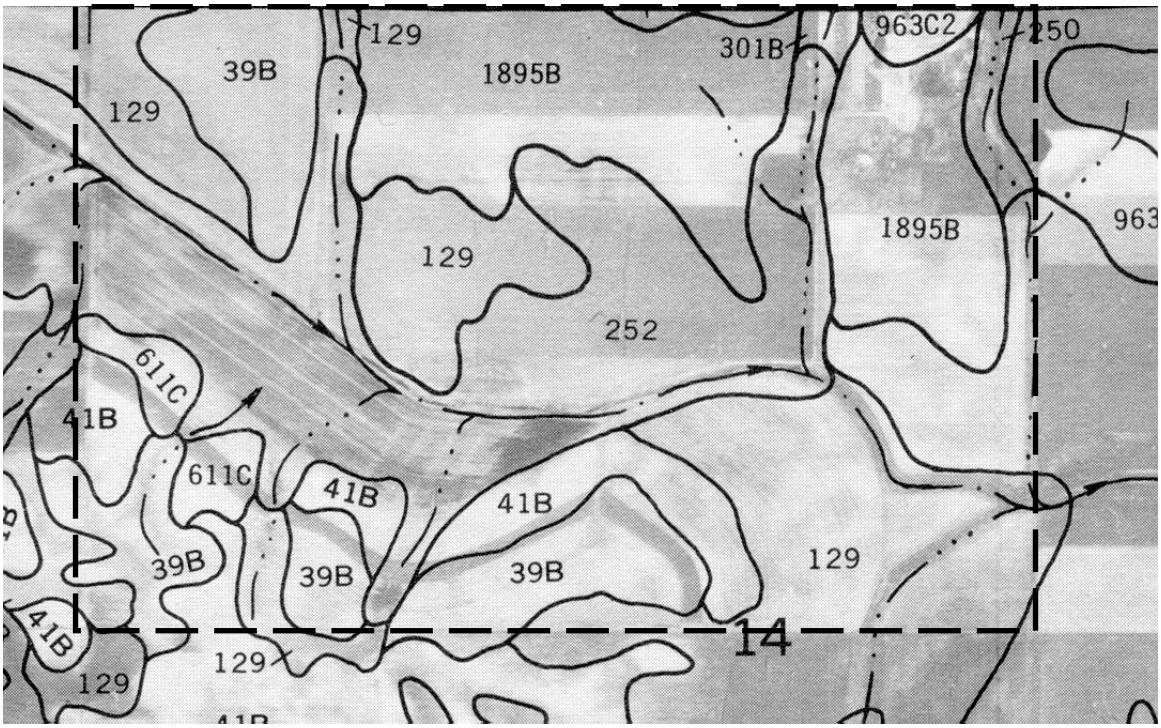
Operator/Producer **Joe Farmer** **Planning Year** **2002** **Date Printed** **Jan 29, 2002**

General Farm Field Information

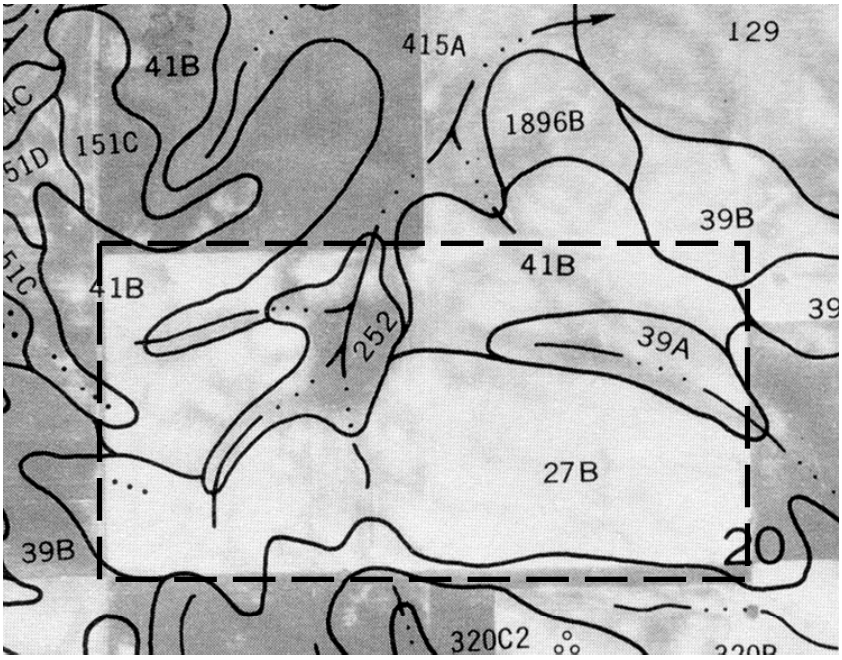
Field	Acres	Irrigated	Location/Description
Home T558			
1	44.0		Dakota County, Hampton Twp, Section 14, NW1/4
2	34.0		Hampton Twp, Section 14, NW 1/4
3	26.0		Hampton Twp, Section 14, NW1/4
4	20.0		Hampton Twp, Section 14, NE 1/4
5	12.0		Hampton Twp, Section 14, NE 1/4
6	26.0		Hampton Twp, Section 14, NW 1/4
7	51.0		Hampton Twp, Section 14, NW 1/4
Raddle T978			
East 47	47.0		Dakota County, Douglas Twp, Section 7, NW 1/4
NE 17	17.0		Douglas Twp, Section 7, NW 1/4
South 36	36.0		Douglas Twp, Section 7, NW 1/4
West 38	38.0		Douglas Twp, Section 7, NW 1/4
Ricke T1157			
North 40	36.0		Dakota County, Douglas Twp, Section 20, NW 1/4
South 40	37.0		Douglas Twp, Section 20, NW 1/4
Total Acres	**424.0**		

Soil Maps

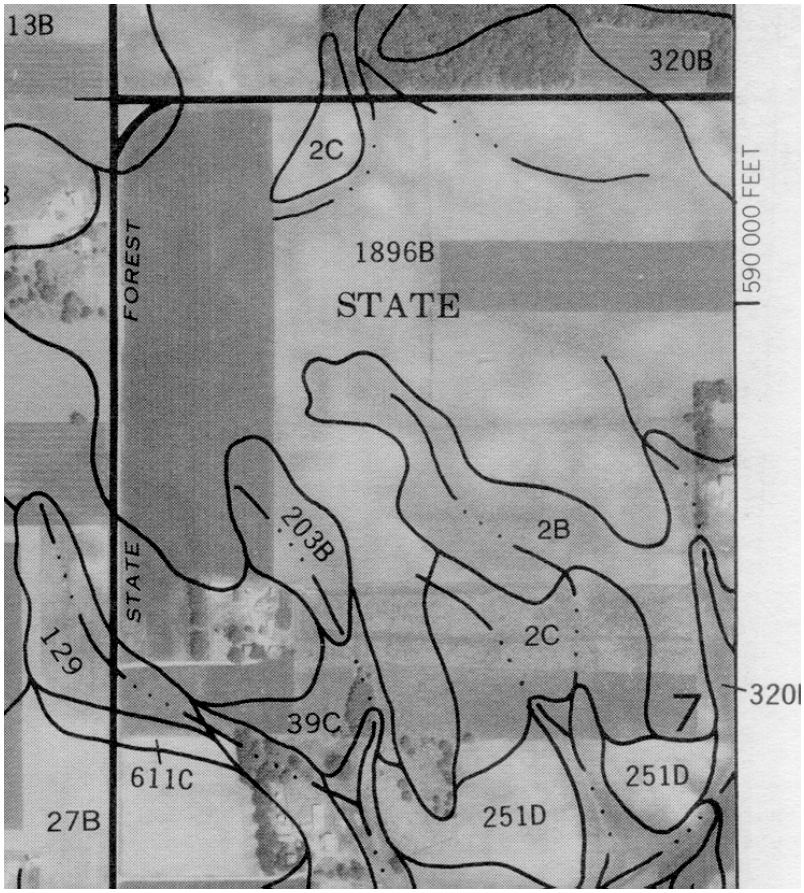
Home Farm (213 tillable acres)



Ricke Farm (73 tillable acres)



Raddle Farm (138 acres)



SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is eroded.

SYMBOL	NAME
2B	Ostrander loam, 1 to 6 percent slopes
2C	Ostrander loam, 6 to 12 percent slopes
7A	Hubbard loamy sand, 0 to 1 percent slopes
7B	Hubbard loamy sand, 1 to 6 percent slopes
7C	Hubbard loamy sand, 6 to 12 percent slopes
7D	Hubbard loamy sand, 12 to 18 percent slopes
8A	Sparta loamy fine sand, 0 to 1 percent slopes
8B	Sparta loamy fine sand, 1 to 6 percent slopes
12C	Emmert very gravelly sandy loam, 3 to 15 percent slopes
27A	Dickinson sandy loam, 0 to 2 percent slopes
27B	Dickinson sandy loam, 2 to 6 percent slopes
39A	Wadena loam, 0 to 2 percent slopes
39B	Wadena loam, 2 to 6 percent slopes
39B2	Wadena loam, 2 to 6 percent slopes, eroded
39C	Wadena loam, 6 to 12 percent slopes
39C2	Wadena loam, 6 to 12 percent slopes, eroded
39D	Wadena loam, 12 to 18 percent slopes
41A	Estherville sandy loam, 0 to 2 percent slopes
41B	Estherville sandy loam, 2 to 6 percent slopes
42C	Salida gravelly coarse sandy loam, 2 to 12 percent slopes
49B	Antigo silt loam, 1 to 8 percent slopes
81B	Boone loamy fine sand, 2 to 6 percent slopes
81C	Boone loamy fine sand, 6 to 12 percent slopes
81E	Boone loamy fine sand, 12 to 40 percent slopes
94C	Terril loam, 4 to 12 percent slopes
98	Coto silt loam, occasionally flooded
100A	Copaston loam, 0 to 2 percent slopes
100B	Copaston loam, 2 to 6 percent slopes
100C	Copaston loam, 6 to 12 percent slopes
106B	Lester loam, 2 to 6 percent slopes
106C	Lester loam, 6 to 12 percent slopes
106C2	Lester loam, 6 to 12 percent slopes, eroded
106D2	Lester loam, 12 to 18 percent slopes, eroded
109	Cordova silty clay loam
113	Webster clay loam
114	Glencoe silty clay loam
129	Cylinder loam
150B	Spencer silt loam, 2 to 6 percent slopes
151C	Burkhardt sandy loam, 6 to 12 percent slopes
151D	Burkhardt sandy loam, 12 to 18 percent slopes
155B	Chetek sandy loam, 3 to 8 percent slopes
155C	Chetek sandy loam, 8 to 15 percent slopes
155E	Chetek sandy loam, 15 to 25 percent slopes
173F	Frontenac loam, 25 to 40 percent slopes
176	Garwin silty clay loam
177A	Gotham loamy fine sand, 0 to 2 percent slopes
177B	Gotham loamy fine sand, 2 to 6 percent slopes
177C	Gotham loamy fine sand, 6 to 12 percent slopes
189	Auburndale silt loam
203B	Joy silt loam, 1 to 5 percent slopes
208	Kato silty clay loam
213B	Klinger silt loam, 1 to 5 percent slopes
226	Lawson silt loam
239	Le Sueur loam
250	Kennebec silt loam
251D	Marlean loam, 12 to 18 percent slopes
251E	Marlean loam, 18 to 25 percent slopes
252	Marshan silty clay loam
253	Maxcreek silty clay loam
255	Mayer silt loam
279B	Otterholt silt loam, 1 to 6 percent slopes
279C	Otterholt silt loam, 6 to 15 percent slopes
283A	Plainfield loamy sand, 0 to 2 percent slopes
283B	Plainfield loamy sand, 2 to 6 percent slopes
283D	Plainfield loamy sand, 6 to 18 percent slopes
285A	Port Byron silt loam, 0 to 2 percent slopes
285B	Port Byron silt loam, 2 to 6 percent slopes
285C	Port Byron silt loam, 6 to 12 percent slopes
299A	Rockton loam, 0 to 2 percent slopes
299B	Rockton loam, 2 to 6 percent slopes
299C	Rockton loam, 6 to 12 percent slopes
301B	Lindstrom silt loam, 1 to 4 percent slopes
313	Spillville loam, occasionally flooded
317	Oshawa silty clay loam
318	Mayer loam, swales
320B	Tallula silt loam, 2 to 6 percent slopes
320C2	Tallula silt loam, 6 to 12 percent slopes, eroded
342B	Kingsley sandy loam, 3 to 8 percent slopes
342C	Kingsley sandy loam, 8 to 15 percent slopes
342E	Kingsley sandy loam, 15 to 25 percent slopes
342F	Kingsley sandy loam, 25 to 40 percent slopes
344	Quam silt loam
377B	Merton silt loam, 1 to 6 percent slopes
378	Maxfield silty clay loam
382B	Blooming silt loam, 1 to 6 percent slopes
408	Faxon silty clay loam
409B	Etter fine sandy loam, 2 to 6 percent slopes
409C	Etter fine sandy loam, 6 to 12 percent slopes
411A	Waukegan silt loam, 0 to 1 percent slopes
411B	Waukegan silt loam, 1 to 6 percent slopes
411C	Waukegan silt loam, 6 to 12 percent slopes
414	Hamel silt loam
415A	Kanaranzi loam, 0 to 2 percent slopes
415B	Kanaranzi loam, 2 to 6 percent slopes
415C	Kanaranzi loam, 6 to 12 percent slopes
449B	Crystal Lake silt loam, 1 to 8 percent slopes
454B	Mahtomedi loamy sand, 3 to 8 percent slopes
454C	Mahtomedi loamy sand, 8 to 15 percent slopes
454E	Mahtomedi loamy sand, 15 to 25 percent slopes
463	Minneiska loam, occasionally flooded
465	Kalmarville sandy loam, frequently flooded
495	Zumbro fine sandy loam
522	Boots muck
539	Palms muck
540	Seelyeville muck
545	Rondeau muck
611C	Hawick coarse sandy loam, 6 to 12 percent slopes
611D	Hawick coarse sandy loam, 12 to 18 percent slopes
611E	Hawick loamy sand, 18 to 25 percent slopes
611F	Hawick loamy sand, 25 to 50 percent slopes
857A	Urban land-Waukegan complex, 0 to 1 percent slopes
857B	Urban land-Waukegan complex, 1 to 8 percent slopes
858C	Urban land-Chetek complex, 1 to 15 percent slopes
860C	Urban land-Lester complex, 3 to 15 percent slopes
861C	Urban land-Kingsley complex, 3 to 15 percent slopes
861E	Urban land-Kingsley complex, 15 to 25 percent slopes
865B	Urban land-Hubbard complex, 0 to 6 percent slopes
880F	Brodale-Rock outcrop complex, 18 to 45 percent slopes
888B	Kingsley-Lester complex, 2 to 6 percent slopes
888C	Kingsley-Lester complex, 6 to 12 percent slopes
888D	Kingsley-Lester complex, 12 to 18 percent slopes
889B	Wadena-Hawick complex, 2 to 6 percent slopes
889C	Wadena-Hawick complex, 6 to 12 percent slopes
889D	Wadena-Hawick complex, 12 to 18 percent slopes
895B	Kingsley-Mahtomedi-Spencer complex, 3 to 8 percent slopes
895C	Kingsley-Mahtomedi-Spencer complex, 8 to 15 percent slopes
896E	Kingsley-Mahtomedi complex, 15 to 25 percent slopes
896F	Kingsley-Mahtomedi complex, 25 to 40 percent slopes
963C2	Timula-Bold silt loams, 6 to 12 percent slopes, eroded
963D2	Timula-Bold silt loams, 12 to 18 percent slopes, eroded
963E2	Timula-Bold silt loams, 18 to 25 percent slopes, eroded
1013	Pits, quarry
1027	Udorthents, wet
1029	Pits, gravel
1039	Urban land
1055	Aquolls and Histosols, ponded
1072	Udorthents, moderately shallow
1815	Zumbro loamy fine sand
1816	Kennebec Variant silt loam
1821	Algansee sandy loam, occasionally flooded
1824	Quam silt loam, ponded
1825C	Seelyeville muck, sloping
1827A	Waukegan silt loam, bedrock substratum, 0 to 2 percent slopes
1827B	Waukegan silt loam, bedrock substratum, 2 to 6 percent slopes
1827C	Waukegan silt loam, bedrock substratum, 6 to 12 percent slopes
1848B	Sparta loamy sand, bedrock substratum, 2 to 8 percent slopes
1894B	Winnebago loam, 2 to 6 percent slopes
1895B	Carmi loam, 2 to 8 percent slopes
1896B	Ostrander-Carmi loams, 2 to 6 percent slopes
1898F	Etter-Brodale complex, 25 to 60 percent slopes
1902B	Jewett silt loam, 1 to 6 percent slopes

Nutrient Management APPENDIX 3	
Crop Nutrient Management Plan	
NRCS form MN-CPA-38 or "Field Specific Summary of Nutrient Applications" report[1] or equivalent	☒
Nutrient Management Practices	
"Nutrient Application Restrictions in Sensitive Areas" report[1] or analogous NRCS hard copy or equivalent or	☐
"Management Practice Considerations in Sensitive Fields" report [1] This is an optional report that can be used in place of the "Nutrient Application Restrictions in Sensitive Areas" Report	☒
"Management Practice Considerations for Nitrogen and Phosphorus" report [1] or analogous NRCS hard copy or equivalent	☒
MPCA Sensitive areas and Practices Report. Optional and can replace one or more of the above listed reports	☐
Inventories	
"Crop Information" report [1] or NRCS form MN-CPA-41 (Cropping History and Soil Fertility Inventory) or equivalent[2]	☐
NRCS form MN-CPA-43 (Nutrient Management Practices Inventory) or equivalent[2]	☐
"Manure Storage, Handling and Testing" report [1] or NRCS form MN-CPA-42 (Livestock and Manure Information) or equivalent MPCA report or equivalent	☒
Soil Test Results or provide information in report form such as on MN-CPA-41 or "Soil Information" report[1]	☒
Manure Test Results for existing facilities or provide information in report form such as MN-CPA-42 or "Manure Storage, Handling and Testing" report [1]	☐
Evaluations and Computations	
Minimum acres computations. "Nutrient Summary" reports [1] or equivalent	☒
NRCS Minnesota Field Nitrogen Loss Assessment[1] or analogous NRCS hard copy[2]	☒
NRCS Minnesota Field Phosphorus Loss Assessment[1] or analogous NRCS hard [2] copy	☒
Manure Spreader Calibration Worksheets for manure from existing facilities. Updated after new facilities are constructed. [2]	☐
Nutrient Budgets: NRCSs form MN-CPA-023 or "Field Nutrient Budget" report[1,2] or equivalent	☐
[1]. **These reports are from "Nutrient Management Planner for Minnesota" software**	
[2] **These assessments are located in the NRCS/SWCD copy of your CNMP if you do not want hard copies at this time.**	☒

Operator/Producer Joe Farmer **Planning Year** 2002 **Date Printed** Jan 29, 2002

Field Specific Summary of Nutrient Applications

Field	Crop	Nutrient Source	Source	Application Rate	Application Timing	Method	Planning Year Nutrients (lbs/acre) N	P2O5	K2O	
Home T558										
2		corn	Fertilizer	Liquid 7-21-7 5	gallons per acre	Planting	Row	4	12	4
2		corn	Manure	Building 1 - Fall 3800	gallons per acre	Fall (Oct - Dec)	Knife Inject	126	107	98
						Totals For Field	**130**	**119**	**102**	
3		corn	Fertilizer	Liquid 7-21-7 5	gallons per acre	Planting	Row	4	12	4
3		corn	Manure	Building 1 - Fall 3800	gallons per acre	Fall (Oct - Dec)	Knife Inject	126	107	98
						Totals For Field	**130**	**119**	**102**	
4		corn	Fertilizer	Liquid 7-21-7 5	gallons per acre	Planting	Row	4	12	4
4		corn	Manure	Building 2 3800	gallons per acre	Fall (Oct - Dec)	Knife Inject	141	119	99
						Totals For Field	**145**	**131**	**103**	
6		corn	Fertilizer	Liquid 7-21-7 5	gallons per acre	Planting	Row	4	12	4
6		corn	Manure	Building 1 - Fall 3800	gallons per acre	Fall (Oct - Dec)	Knife Inject	126	107	98
						Totals For Field	**130**	**119**	**102**	

Field Specific Summary of Nutrient Applications

Field	Crop	Nutrient Source	Source	Application Rate	Application Timing	Method	Planning Year Nutrients (lbs/acre) N	P2O5	K2O
Raddle T978									
NE 17	corn	Fertilizer	Liquid 7-21-7	5 gallons per acre	Planting	Row	4	12	4
NE 17	corn	Manure	Building 1 - Spring	5300 gallons per acre	Spring (Apr-Jun)	Bdcst-Inc 12-96 hrs	138	152	143
						Totals For Field	**142**	**164**	**147**
West 38	corn	Fertilizer	Urea	250 pounds per acre	Spring preplant	Broadcast-Inc	115	0	0
West 38	corn	Fertilizer	Liquid 7-21-7	5 gallons per acre	Planting	Row	4	12	4
						Totals For Field	**119**	**12**	**4**
Ricke T1157									
North 40	corn	Fertilizer	Liquid 7-21-7	5 gallons per acre	Planting	Row	4	12	4
North 40	corn	Manure	Building 2	5300 gallons per acre	Fall (Oct - Dec)	Knife Inject	197	165	138
						Totals For Field	**201**	**177**	**142**

Operator/Producer Joe Farmer **Planning Year** 2002 **Date Printed** Jan 29, 2002

Farm/Field	Sensitive Features and Conditions	Management Practice Considerations in Sensitive Fields Management Practices
Home T558		
1	Road ditches	Do not apply manure directly into road ditches (MN State Requirement)
2	Surface water within 300 feet No effective filter strip Soil phosphorus test levels 21-75 ppm (Bray) or 16-60 ppm (Olsen) Sheet and rill soil losses <= 6 tons/acre/year	Do not apply manure within 25 feet of surface water (MN State Requirement) Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement) Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement) Base manure applications on P2O5 removal (MN State Requirement) Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement) Installation of appropriate filter strip next to surface water is encouraged
3	Surface water within 300 feet No effective filter strip Soil phosphorus test levels <21 ppm (Bray) or < 16 ppm (Olsen) Sheet and rill soil losses <= 6 tons/acre/year Road ditches	Do not apply manure within 25 feet of surface water (MN State Requirement) Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement) Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement) Do not apply manure directly into road ditches (MN State Requirement) Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement) Installation of appropriate filter strip next to surface water is encouraged

Management Practice Considerations in Sensitive Fields

Farm/Field	Sensitive Features and Conditions	Management Practices
4	Surface water within 300 feet No effective filter strip Soil phosphorus test levels 76-150 ppm (Bray) or 61-120 ppm (Olsen) Sheet and rill soil losses < 4 tons/acre/year	Do not apply manure within 25 feet of surface water (MN State Requirement) Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement) Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement) Base manure applications on P2O5 removal (MN State Requirement) If applying manure from an operation with more than 300 animal units, the owner must apply for an interim permit and submit a manure management plan that includes phosphorous management to minimize risk to surface water. (MN State Requirement) Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement) Installation of appropriate filter strip next to surface water is encouraged
5	Surface water within 300 feet No effective filter strip Soil phosphorus test levels <21 ppm (Bray) or < 16 ppm (Olsen) Sheet and rill soil losses <= 6 tons/acre/year Established waterways, ditches and other water conveyances	Do not apply manure within 25 feet of surface water (MN State Requirement) Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement) Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement) Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement) Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement) Installation of appropriate filter strip next to surface water is encouraged

Management Practice Considerations in Sensitive Fields

Farm/Field	Sensitive Features and Conditions	Management Practices
6	Surface water within 300 feet	Do not apply manure within 25 feet of surface water (MN State Requirement)
	No effective filter strip	Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement)
	Soil phosphorus test levels <21 ppm (Bray) or < 16 ppm (Olsen)	Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement)
	Sheet and rill soil losses <= 6 tons/acre/year	Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
	Established waterways, ditches and other water conveyances	Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement)
		Installation of appropriate filter strip next to surface water is encouraged
7	Surface water within 300 feet	Do not apply manure within 25 feet of surface water (MN State Requirement)
	No effective filter strip	Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement)
	Soil phosphorus test levels <21 ppm (Bray) or < 16 ppm (Olsen)	Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement)
	Sheet and rill soil losses <= 6 tons/acre/year	Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
	Established waterways, ditches and other water conveyances	Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement)
		Installation of appropriate filter strip next to surface water is encouraged

Management Practice Considerations in Sensitive Fields

Farm/Field	Sensitive Features and Conditions	Management Practices
Raddle T978		
East 47	Open (Surface) tile intakes	Do not apply manure within 300 feet open tile inlets when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement)
		Within 300 feet of open tile inlets, inject or incorporate manure within 24 hours (MN State Requirement)
NE 17	Road ditches	Do not apply manure directly into road ditches (MN State Requirement)
	Established waterways, ditches and other water conveyances	Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
South 36	Road ditches	Do not apply manure directly into road ditches (MN State Requirement)
	Established waterways, ditches and other water conveyances	Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
West 38	Open (Surface) tile intakes	Do not apply manure within 300 feet open tile inlets when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement)
	Road ditches	Within 300 feet of open tile inlets, inject or incorporate manure within 24 hours (MN State Requirement)
		Do not apply manure directly into road ditches (MN State Requirement)

Management Practice Considerations in Sensitive Fields

Farm/Field	Sensitive Features and Conditions	Management Practices
Ricke T1157		
North 40	Road ditches	Do not apply manure directly into road ditches (MN State Requirement)
	Established waterways, ditches and other water conveyances	Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
	Coarse textured soils	In fall, delay manure applications until daily average soil temperatures at a 6 inch depth are below 50 degrees F. (NRCS-MN Program Requirement)
		In fall, avoid liquid manure applications when possible
		In fall, do not apply commercial nitrogen fertilizer (NRCS-MN Program Requirement)
		Use sidedress or split applications of commercial nitrogen fertilizer
South 40	Road ditches	Do not apply manure directly into road ditches (MN State Requirement)
	Established waterways, ditches and other water conveyances	Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
	Coarse textured soils	In fall, delay manure applications until daily average soil temperatures at a 6 inch depth are below 50 degrees F. (NRCS-MN Program Requirement)
		In fall, avoid liquid manure applications when possible
		In fall, do not apply commercial nitrogen fertilizer (NRCS-MN Program Requirement)
		Use sidedress or split applications of commercial nitrogen fertilizer

Management Practice Considerations for Nitrogen and Phosphorus

Nitrogen Best Management Practices for Southeastern Minnesota

- Adjust nitrogen rate according to soil organic matter content, previous crop and manure applications
- Use a soil nitrate test where appropriate
- Use prudent manure management to optimize nitrogen credit

1. Injection of manure is preferable, especially on strongly sloping soils
2. Avoid manure application to sloping, frozen soils
3. Incorporate manure applications whenever possible

- Plan nitrogen application timing to achieve high efficiency of nitrogen use

1. Do not apply fertilizer nitrogen in the fall
2. Spring preplant application of anhydrous ammonia or urea is encouraged. Broadcast urea should be incorporated within three days of application
3. Apply sidedress applications to corn before it is 12 inches high
4. Inject or incorporate sidedress applications of urea and UAN to a minimum depth of 4 inches
5. Use a nitrification inhibitor with preplant nitrogen applications if soils are poorly drained and soil moisture levels are high near the surface
6. Minimize direct movement of surface-water runoff to sinkholes

Phosphorus Management Practices

- When possible apply manure at rates which satisfy crop phosphorus needs (recommended University of Minnesota rates or crop P removal) instead of crop nitrogen needs on fields testing high in phosphorus. This will prevent long-term buildup.
- Subsurface band or row apply commercial phosphorous fertilizer
- Immediately incorporate broadcast commercial fertilizer
- Control soil losses and runoff to levels considered safe for the soil resource; control to lower levels when fields have very high to excessive soil test phosphorus levels

1. Control sheet and rill losses by installing conservation practices including conservation tillage, contour farming, strip cropping, terraces and cover crops
2. Control ephemeral erosion by installing water and sediment control basins, waterways and diversions

Additional Manure Application Considerations

- Use a cover crop for summer applied manure to fallow ground or early harvested crops (Required by MPCA rules)
- Apply manure to:
  1. All available acres
  2. Land that is the furthest from surface waters
  3. The flattest ground
  4. Fields with the least amount of runoff and erosion
  5. Fields testing lowest in phosphorus
- Avoid manure applications when precipitation causing runoff is likely within 24 hours
- Inject or incorporate manure applications within 24 hours
- Eliminate applications when ground is frozen, snow covered or actively thawing
- Consider agronomic, nutritional and managerial practices which reduce the amount of nitrogen and phosphorous excreted by animals including:
  1. Using high quality protein sources
  2. Feeding low protein, amino acid supplemented diets
  3. Avoiding excessive overages of dietary P
  4. Balancing diets on an available P basis
  5. Using feed ingredients that possess highly available P
  6. Using enzyme additives such as phytase to improve ability to utilize P in rations

Manure Storage, Handling & Testing

Manure & Crop Nutrient Calculator

January 29, 2002

Joe Farmer

Building 1

Livestock Information

Grow-finish pig	800 @ 165 lbs.

Manure Storage

Storage	Underfloor liquid storage
Capacity	350000
Storage	270

Application Methods

Handling	Liquid
Commercial Hauler:	No
Spreader Type:	Slurry spreader
Calibrated:	Yes
Calibration	Volume in spreader load
First App Method:	Knife Inject
First App Timing:	Fall (Oct - Dec)
Second App Method:	Broadcast-Inc. 12-96 hrs
Second App Timing:	Spring (Apr - Jun)

Manure Analysis

Sampling Frequency:	Annually
Sampling Method:	From spreader after loading, well agitated
Date Analyzed:	11/2/2001
N (lbs./ton or 1000 gal):	47.2
P2O5 (lbs./ton or 1000 gal):	35.8
K2O (lbs./ton or 1000 gal):	29.9

Annual Manure/Nutrients Generated

Estimated Volume: [1]	348480	gallon
Measured Volume:	420000	gallon
Total N (lbs): [2]	19824	
Total P2O5 (lbs): [2]	15036	
Total K2O (lbs): [2]	12558	

Building 2

Livestock Information

Grow-finish pig (wet/dry feeder)	800 @ 165 lbs.

Manure Storage

Storage	Underfloor liquid storage
Capacity	350000
Storage	365

Application Methods

Handling	Liquid
Commercial Hauler:	No
Spreader Type:	Slurry spreader
Calibrated:	Yes
Calibration	Volume in spreader load
First App Method:	Knife Inject
First App Timing:	Fall (Oct - Dec)
Second App Method:	
Second App Timing:	

Manure Analysis

Sampling Frequency:	Annually
Sampling Method:	From spreader after loading, well agitated
Date Analyzed:	
N (lbs./ton or 1000 gal):	
P2O5 (lbs./ton or 1000 gal):	
K2O (lbs./ton or 1000 gal):	

Annual Manure/Nutrients Generated

Estimated Volume: [1]	261360	gallon
Measured Volume:		gallon
Total N (lbs): [2]	13939	
Total P2O5 (lbs): [2]	14375	
Total K2O (lbs): [2]	8712	

1. Estimated volume does not include dilution from bedding or water.
2. Total N, P2O5 and K2O from manure after accounting for storage losses.

Operator/Producer **Joe Farmer** **Planning Year** **2002** **Date Printed** **Jan 29, 2002**

Soil Information

Field	Soil Texture	Soil Map Unit and Name	Date Sampled	Organic Matter	pH	Buffer pH	P ppm	K ppm	Other Nutrient	ppm	Soil Nitrate Nitrogen Date Sampled	NO3 lbs/acre	NO3 PPM
Home T558													
1	Loam	1895B Carmi	10/22/99	3.6	6.6		78 (B1)	221					
2	Silty clay loam	252 Marshan	10/22/99	4.1	6.3		23 (B1)	188					
3	Loam	39B Wadena	10/22/99	3.7	6.5		17 (B1)	148					
4	Loam	1895B Carmi	10/12/00	3.4	6.6		82 (B1)	206					
5	Loam	129 Cylinder	10/12/00	3.8	6.4		17 (B1)	121					
6	Silty clay loam	252 Marshan	10/12/00	4.2	6.3		14 (B1)	108					
7	Loam	39B Wadena	10/18/01	3.2	6.8		19 (B1)	126					
Raddle T978													
East 47	Loam	1896B Ostr-Ca	10/22/01	3.4	6.2		17 (B1)	122					
NE 17	Loam	1896B Ostr-Ca	10/22/01	3.6	6.2		14 (B1)	119					
South 36	Loam	2C Ostrander	10/22/01	3.5	6.4		23 (B1)	147					
West 38	Loam	1896B Ostr-Ca	10/22/01	3.7	6.2		19 (B1)	141					
Ricke T1157													
North 40	Sandy loam	41B Estherville	10/18/01	2.7	6.1		14 (B1)	112					
South 40	Sandy loam	27B Dickinson	10/18/01	2.5	6.3		17 (B1)	98					

Nutrient Summary

Manure & Crop Nutrient Calculator

January 29, 2002

Name **Joe Farmer** **Address** **Any Street**

Phone **(651) 000-0000** **Any City , MN 55555**

Description Follow-up plan after construction of a new 800 head swine finishing building with 350,000 gallons under-floor liquid manure storage. Livestock operation now consists of two 800 head swine finishing buildings each having 350,000 gallons of storage. Land receiving manure consists of 424 acres planted to 50/50 Corn/Soybeanrotation.

Manure Nutrient Supply

Total Nutrients From All Manure Sources After Storage and Handling Losses

Pounds	
Nitrogen (N)	29891
Phosphate ($P_2 0_5$)	23529
Potash (K_2O)	19143

Crop Nutrient Demand

Total Annual Nutrient Demand Based On The Crop Rotation

Pounds	
Nitrogen	62752
Phosphate	20564
Potash	17172

Per Acre Average Nutrient Demand Based On The Crop Rotation

Pounds per Acre	
Nitrogen	148
Phosphate	49
Potash	41

Spreadable Acres Needed To Utilize Manure Nutrients

Acres	
Nitrogen	202
Phosphate	485
Potash	473

Additional Spreadable Acres Required (If Needed)

Acres	
Nitrogen	0
Phosphate	61

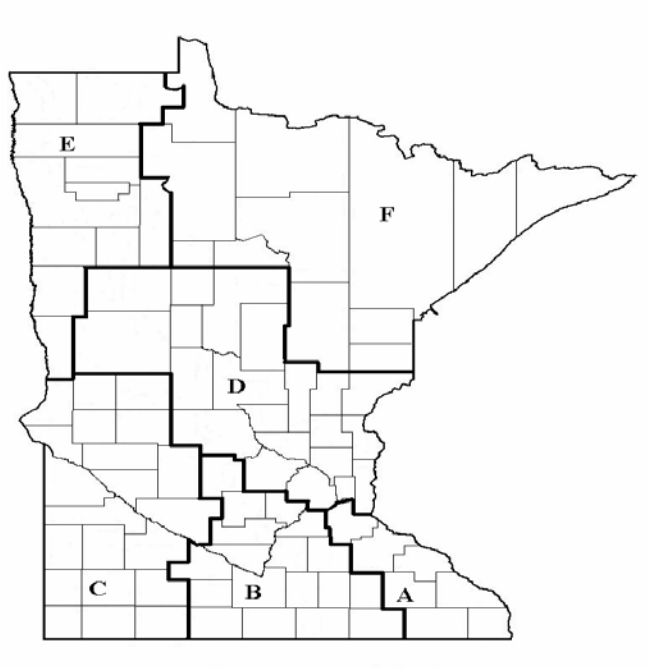
Note:
The rotational average calculations for the “Crop Nutrient Demand” and “Nutrient Summary” reports assume application of manure to both legumes (soybeans in this example plan) and non-legumes (corn in this example). This is generally not a preferred practice, but is used to determine the minimum acres needed to meet state feedlot rules for the operation. Efficient use of nitrogen and prevention of phosphorus buildup in the soil would usually emphasize application of manure to non-legumes only in the rotation. The “Annual Crop Nutrient Plan” section contains the actual field specific manure and fertilizer nutrient rates to be applied.

FIELD NITROGEN LOSS ASSESSMENT

Table 1: Long Term Annual Relative Nitrogen Loss Potential[1]

Zone	Application Method	Soil Texture: Coarse[2]	Medium	Fine
A	Fall	VH	H	M
	Spring preplant	H	M	M
	Sidedress or split	M	L	L
B	Fall	VH	M	M
	Spring preplant	H	L	L
	Sidedress or split[3]	M	L	L
C,D	Fall	VH	L	L
	Spring preplant	H	L	L
	Sidedress or split[3]	M	L	L
E	Fall	M	L	L
	Spring preplant	L	L	L
	Sidedress or split[3]	L	L	L
F	Fall	H	L	L
	Spring preplant	M	L	L
	Sidedress or split[3]	M	L	L

Figure 1: Nitrogen Loss Zones



[1]Potential Rating: VH-Very High, H-High, M-Moderate, L-Low.

[2] Coarse-textured soils apply to the surface soil texture and/or the subsoil texture within three feet of the surface. These textures include sand, loamy sand, loamy coarse sand, fine sand, loamy fine sand, loamy very fine sand, coarse sand, very fine sand, and any of the above listed textures with gravelly or very gravelly modifiers.

[3] If applied after June 15, the loss rating is reduced to Low on Coarse textured soils. However, late nitrogen applications on most soils that are followed by conditions that reduce yield (i.e. below average precipitation) can cause nitrogen loss to occur due to the crop not utilizing the applied nitrogen. To reduce the potential for this to occur on corn ground, apply no later than the 8th leaf stage.

PRODUCER: Joe Farmer **FARM: Home T558, Raddle T978, Ricke T1157**
MAP ZONE OR LOCATION: A

FIELD	APPLICATION METHOD	SOIL TEXTURE	RATING
Home 2	Spring preplant	Medium	Moderate
Home 3	Spring preplant	Medium	Moderate
Home 4	Spring preplant	Medium	Moderate
Home 6	Sidedress or split	Medium	Low
Raddle NE 17	Sidedress or split	Medium	Low
Raddle West 38	Spring preplant	Medium	Moderate
Ricke North 40	Sidedress or split	Coarse	Moderate

When ratings are M or higher select management options from UMES' Regional Nitrogen Best Management Practices. Please note that the management option of most importance in Zone A and on coarse textured soils statewide is eliminating fall application of commercial N fertilizers.

FIELD PHOSPHORUS LOSS ASSESSMENT

Manure applications are not recommended when ephemeral erosion is not controlled.

Distance to Surface Water (feet)	Effective 100 ft. Filter Strip	Soil Test Phosphorous (STP) Levels (ppm)		Sheet and Rill Erosion (Tons/Acre/Year)	**Base Manure Application Rate on:**
		Bray P1	Olsen		
NA	NA	NA	NA	**> 6**	**No Application**
< 300	**No**	≤ 21	≤ 16	< 6	**Nitrogen Needs**
		22 - 75	**17 - 60**	< 6	**P_2O_5 Removal**
		76 - 150	61 - 120	**< 4**	**P_2O_5 Removal**
				4 - 6	**No Application**
		> 150	**>120**	< 6	**No Application**
	Yes	≤ 21	≤ 16	< 6	**Nitrogen Needs**
		22 - 75	17 - 60	< 4	**Nitrogen Needs**
				4 - 6	**P_2O_5 Removal**
		76 - 150	**61 - 120**	< 6	**P_2O_5 Removal**
		> 150	>120	**≤ 2**	**P_2O_5 Removal**
				> 2	**No Application**
≥ 300	**No**	< 76	< 61	< 6	**Nitrogen Needs**
		76 – 150	61 - 120	< 6	**P_2O_5 Removal**
		> 150	> 120	**< 4**	**P_2O_5 Removal**
				> 4	**No Application**
	Yes	≤ 150	≤ 120	< 6	**Nitrogen Needs**
		>150	>120	< 4	**Nitrogen Needs**
				4 – 6	**P_2O_5 Removal**

PRODUCER: **FARM:**

FIELD	**DISTANCE TO WATER**	**FILTER STRIP**	**STP LEVEL**	**SOIL LOSSES**	**RECOMMENDATION**
Home 1	greater than 300 ft	No	78B ppm	5.5 ton	P2O5 Removal
Home 2	less than 300 ft	No	23B ppm	4 ton	P2O5 Removal
Home 3	less than 300 ft	No	17B ppm	4.8 ton	Nitrogen Needs
Home 4	less than 300 ft	No	82B ppm	3.9 ton	P2O5 Removal
Home 5	less than 300 ft	No	17B ppm	5 ton	Nitrogen Needs
Home6	less than 300 ft	No	14B ppm	4 ton	Nitrogen Needs
Home 7	less than 300 ft	No	19B ppm	4 ton	Nitrogen Needs
Raddle E. 47	greater than 300 ft	No	17B ppm	6 ton	Nitrogen Needs
Raddle NE 17	greater than 300 ft	No	14B ppm	6 ton	Nitrogen Needs
Raddle S. 36	greater than 300 ft	No	23B ppm	5 ton	Nitrogen Needs
Raddle W 38	greater than 300 ft	No	19B ppm	6 ton	Nitrogen Needs
Ricke N. 40	greater than 300 ft	No	14B ppm	6 ton	Nitrogen Needs
Ricke S 40	greater than 300 ft	No	17B ppm	6 ton	Nitrogen Needs

Recordkeeping Forms APPENDIX 4

Manure and Wastewater Storage and Handling Records[1] or analogous NRCS hardcopy or equivalent MPCA Recordkeeping forms[2]	☐
Fertilizer and Manure Application Records[1] or analogous NRCS hardcopy or equivalent MPCA forms or equivalent[2]	☐
Crops Production Records[1] or analogous NRCS hardcopy or equivalent[2]	☐
NRCS Form MN-CPA-046 (Practices Certification Recordkeeping Form) [2]	☐
Permits	☐
[1.] These reports are from "Nutrient Management Planner for Minnesota" software	
[2.] NRCS recordkeeping and certification forms can be found at the following location if you do not want a hard copy at this time : http://www.mn.nrcs.usda.gov/technical/ecs/nutrient/nutrient.html	☒

Fact Sheets and Guidesheets APPENDIX 5

NRCS Fact Sheet MN-NUTR-3 ("Soil Sampling")[1]	☒
NRCS Fact Sheet MN-NUTR-6 ("Manure Sampling and Analysis")[1]	☒
University of Minn. Extension Service Fact Sheet "Calibrating Manure Spreaders"[1]	☐
Calibration Worksheets	☐

[1]This information can be found at the following web-site if you do not want a hard copy at this time: http://www.mn.nrcs.usda.gov/technical/ecs/nutrient/nutrient.html ☐

SOIL SAMPLING

Economic fertilizer recommendations should be developed based on analysis of properly sampled soil. This fact sheet focuses on soil sampling and soil testing laboratories.

Soil Sampling Procedures

Soil test results are no better than the samples collected. Proper soil sampling techniques are critical to determine the average nutrient status in a field as well as the nutrient variability across a field. Fertilizer recommendations based on samples not representative of a field may result in over-application and/or under-application of nutrients. This can have a negative impact on both economics and the environment.

The Natural Resources Conservation Service (NRCS) requires producers to test their soil every 4 years. These analyses will include pH, organic matter, phosphorous and potassium. Producers are also encouraged to test for soil nitrate levels, when applicable.

The first step is to determine the number of samples needed per field. This is dependent upon the amount of variability within the field. Factors that should be considered include soil types and textures, slopes, cropping history, manure history, drainage, and erosion. Each sample is comprised of 15-20 cores. A core is an individual boring or coring at one spot in the field.

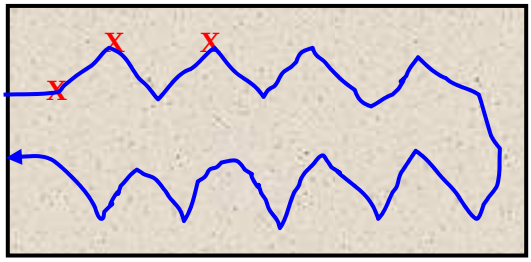
Ideally, large uniform fields should have 1 composite sample collected per 20 acres or less. Smaller fields, including contour strips, should have 1 composite sample collected per 5 acres, especially on hilly or rolling ground. Separate samples should be taken from unique areas such as low spots, eroded knolls, terraces, old fence rows, lime or fertilizer spill areas, headlands and saline areas.

Fewer samples can be taken provided there is little in-field variability; the number of cores representing an individual sample is increased; or fertility management of small individual areas is not practical. In these cases, samples from larger fields and uniform landscapes may be divided into areas that are no larger than 40 acres. Smaller fields and hilly or rolling ground should be divided into uniform areas that are no larger than 20 acres.

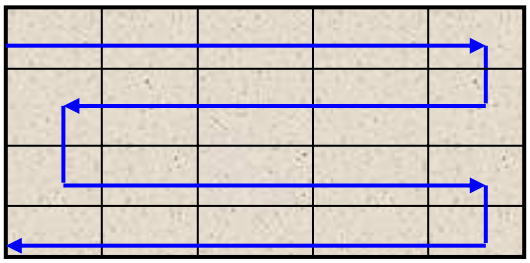
Once you have defined your sampling areas, mark them on a map before you begin. Label them with a unique name or number. You may also want to mark the corresponding sample containers before heading into the field.

The next step is to properly collect the samples. Most samples should be collected after harvest. Do not sample shortly after lime, fertilizer or manure applications. Using a soil probe, soil auger or spade, collect 15-20 cores at random or in a grid pattern, making sure that the sampling area is adequately represented. Be sure to scrape any crop residue and manure off of the soil surface.

Samples collected randomly



Samples collected in a grid pattern



The cores should be collected from between the rows of row crops, except for ridge-till plantings. In a conventional tillage system, samples should be collected from the surface layer to a depth of 6 inches for all nutrients except nitrogen.

Where ridge till is used, collect core 6 inches to the side of banded fertilizer applications. In reduced and no-tillage systems, the depth sampled has a much greater impact on the soil test results because of the stratification of non-mobile nutrients and pH. Surface samples (0-6 inch) may need to be separated into 0-2 and 2-6 inch depths.

Mix cores thoroughly in a clean plastic pail to obtain an individual composite sample. Fill sample boxes or bags provided by soil labs from the pail to the fill line. A 60 -acre field with 3 sampling areas would require 15-20 cores for each of 3 composite boxed or bagged samples. All samples should be kept cool until delivered to the soil-testing lab.

Obtain and complete a laboratory soil sample information sheet before submitting samples. Typically you will be asked for sample identification information, crops to be grown, yield goals, previous crops and the tests you want conducted. Make sure the completed information is consistent with your maps and sample bags or boxes and that sample depths are also noted.

Samples for nitrate-nitrogen should be collected to a depth of 24 inches. Nitrate-nitrogen samples can be collected in Western and Northwestern Minnesota in fall (preferably after Sept. 15) or in early spring. Collect nitrate-nitrogen samples in South-Central, Southeastern and East-Central Minnesota before planting, at planting, or immediately after planting corn. Nitrate-nitrogen samples should be kept cool and shipped immediately overnight to the lab or immediately frozen and sent via normal mail. In either case, ensure that the sample does not arrive at a lab on a Saturday or Sunday.

Soil Test Laboratories

For NRCS program participants, samples should only be submitted for analysis to a laboratory that participates in the Minnesota Department of Agriculture (MDA) Soil Testing Lab Certification program. A list of certified laboratories is available on-line at: http://www.mda.state.mn.us/ by going to “MDA A to Z” and clicking on “S” and then “Soil Testing Laboratories”.

Labs that participate in this program do so to ensure that their analytical methods have been collectively endorsed by midwestern universities. This significantly reduces variability from lab to lab. These labs also use the same reporting units as are used in University of Minnesota Fertilizer Recommendations such as parts per million of elemental Phosphorous (P). This reduces the risk of error that could result from developing fertilizer recommendations based on different reporting units or using different analytical procedures.

Some soil testing laboratories participating in MDA’s certification program may also provide crop nutrient need recommendations. These recommendations may be different than current University of Minnesota Fertilizer Recommendations. It is important to recognize and understand these differences.

MANURE SAMPLING AND ANALYSIS

This fact sheet was prepared by Jan Jarman, formerly with the Mn. Dept. of Agriculture.

Manure nutrients applied to cropland should be accounted for when determining commercial fertilizer needs. Manure nutrient composition varies widely between farms due to differences in animal species and management and manure storage and handling. Sampling and laboratory analysis is the only method for determining the actual nutrient content of manure. Published average values should only be used for initial application rate planning when no previous analyses are available, for estimating total nutrients generated in a specific time period, or for MPCA permitting requirements.

WHEN TO SAMPLE

Manure is very heterogeneous and nutrients stratify in storage. Sample manure at application time following adequate agitation of liquids in storage or mixing of solids in the spreader loading process. If no previous analyses are available, use published average values for initial application rate planning, then use the analysis results to calculate commercial fertilizer needs. Sample manure each time it is applied, over the course of several applications. Track analysis results to determine the needed sampling frequency and develop farm-specific average value to use for application rate planning. Nutrient content will change with changes in management (housing, feed, bedding, storage, handling) and can vary between years or seasons depending on precipitation (for manure stored outdoors).

WHAT TO SAMPLE

Agitated liquid slurries: Agitate liquid in entire structure for 2-4 hours just prior to application. Take one sample per 300,000 gallons of pumped manure. Avoid sampling near beginning and end of pump-out. Each sample may consist of several subsamples mixed together. If it is not possible to agitate liquid slurries before application, several samples taken throughout pump-out will be needed to characterize the manure. Keep track of which sample results correspond to manure applied to which fields.

Unagitated lagoon liquids (single/multiple stage, settling basins): Lagoons, which act as settling basins or are used in flush/recycle systems, are usually not agitated. Take out sample per 300,000 gallons of pumped liquid. Avoid sampling near beginning and end of pump-out. Each sample may consist of several subsamples mixed together.

Stored solids: Depending on the size of the pack, pile or stack, take at least three samples during application, each consisting of 5-10 subsamples from different loads. More samples are needed for stored solids because of its extreme variability. Avoid sampling the outside foot of a pile or stack.

Scrape and haul: Sample when applying to fields where nutrients will be credited. Fall is probably the most important time to sample. Take several subsamples from consecutive applications and mix together. Samples may be taken throughout the year to characterize variability.

Poultry in-house systems: For litter or manure that is not stored for any length of time prior to application. Use a pitchfork or shovel to sample to the depth of the floor in 5-10 locations in each house. Mix subsamples to obtain 1 or 2 samples for analysis. Take subsamples from around feeders and waterers in proportion to the areas they occupy.

HOW TO SAMPLE

Liquid manure: Samples can be taken in the field (for broadcast manure) or from the application equipment. Sampling in the field can be done by placing catch cans throughout the area where manure will be spread. Mix the subsamples in a bucket and take a smaller sample for analysis. Sampling from the application equipment is the easiest and most effective way to get a good sample. Take subsamples from the filling hose or from a bottom unloading port, mix together in a bucket and take a sample for analysis. Sampling from liquid storage structures is not recommended since it is much safer and easier to sample from application equipment or in the field.

Solid manure: Samples can be taken in the field or from the spreader. In the field, spread tarps to catch manure as it is applied. For each sample, take several small subsamples from the tarps and place in a bucket or pile. Avoid larger pieces or chunks of bedding. Collect other subsamples throughout application and keep cool. Subsamples can be mixed by placing in a pile and repeatedly shoveling the outside of the pile to the inside. Use a trowel or plastic gloves to take a smaller sample for analysis. Samples can also be taken with a pitchfork or shovel from the spreader box after it is loaded. Collect subsamples throughout application, keep cool, mix and take a smaller sample for analysis. Again, sampling from the field or spreader is much easier and safer than trying to sample from a pack or pile.

SAMPLE HANDLING AND ANALYSIS

Laboratories: A listing of manure testing laboratories is available from the Minnesota Department of Agriculture Manure Testing Laboratory Certification Program, (612) 297-2530.

Preparing samples: For liquids and solids, clean, leakproof plastic jars with wide mouths may be used for the samples. Solids with lower water content can also be placed in leakproof plastic ziplock bags. Most laboratories will provide sample jars and postpaid mailing packages. Jars should be filled no more than 2/3 – ¾ full, tightly sealed and placed in a leakproof plastic bag. For solids, plastic bags can be partially filled and all the air squeezed out. Fill the sample container with about 1-2 cups or 1-2 pounds (a large handful) of manure for analysis. Tightly seal containers and label with the farmer's last name and a sample ID using a waterproof marker. Place in a second plastic bag and freeze overnight if possible. Do not let samples sit in the sun or at room temperature for more than 12 hours. Mail samples early in the week and avoid weekends and holidays. Be sure to include payment and the sample information sheet.

Analyses: Analyses needed for developing a manure application plan are total nitrogen (N), phosphate (P_2O_5) and potash (K_2O). Laboratories usually provide these analyses plus dry matter (solids) and sometimes ammonium-N (NH_4-N) for a set fee. Knowing NH_4-N can be useful if this fraction makes up a large percentage of the total N in the manure. All of the NH_4-N is usually available the first year of application. If this fraction is high (70% or more of total N), then total N availability the first year may be higher than average. It is usually not necessary to analyze manure for other mineral constituents such as calcium, magnesium, zinc, sulfur or boron. Most manures contain significant quantities of these minerals, and fields with manure histories are rarely deficient.

Results: Manure nutrient content should be reported in units of lbs/ton or lbs/1000 gallons, on an as-is basis. Phosphate and potash should be reported as such, rather than as P and K. A table of conversion factors is given below. Always check results to make sure they fall within normal ranges for that particular species and storage system. Use University of Minnesota nutrient availability factors to calculate total available nutrients applied.

CONVERSION FACTORS

To convert Column 1 into Column 2, multiply by	Column 1	Column 2	To convert Column 2 into Column 1, multiply by
10,000	percent (%)	parts per million (ppm)	0.0001
% DM / 100	%, DM basis	%, as-is basis	100 / % DM
83.3	%, as-is basis	lbs/1000 gal	0.012
20	%, as-is basis	lbs/ton	0.05
2.29	P, any unit	P_2O_5, any unit	0.44
1.2	K, any unit	K_2O, any unit	0.83