Nutrient Management Plan

Moo Cow Dairy

Example Farms, LLC

6947 Lougheed Hwy

Agassiz BC V0M 1A1

Prepared for the 2020 season, dated April 2, 2020

Josh Andrews, MSc, A.Ag

Nutrient Management Agrologist

BC Ministry of Agriculture

Ph. 778-666-0538

Josh.Andrews@gov.bc.ca

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Emergency Procedures and Contact Information

In the event of a spill, the following actions should be taken:

1. Stop the source of the spill/leak
   - Stop and turn off all pumps, valves, and siphons from the structure
   - Move liquid manure into another structure if necessary
   - Plug or close the source of the spill/leak if possible

2. Contain the spill/leak
   - Prevent the movement of liquid manure across the soil surface by constructing an earthen berm using agricultural equipment, such as backhoes or front-end loaders on tractors. Try to prevent entry into waterbodies, ditches, or seasonally-high water tables
   - Plug drainage intakes and tile drain outlets
   - Use tillage equipment to assist infiltration of liquid manure into the soil where it cannot be contained
   - Contact any contractors and/or equipment operators that may assist in containing the spill/leak. See the contact table below
3. Report the spill/leak to the Provincial Emergency Program (PEP)/Emergency Management British Columbia (EMBC) if greater than 200 litres
   - Be prepared to provide:
     - The contact information for:
       - The individual making the report
       - The responsible person in relation to the spill
       - The owner of the substance spilled
     - The date and time of the spill
     - The location of the spill site
     - A description of the spill site and the surrounding area
     - A description of the source of the spill
     - The type and quantity of the substance spilled
     - A description of the circumstances, cause, and adverse effects of the spill
     - Details of any actions taken and planned to contain the spill/leak
4. Clean up the spill/leak
   - If possible, pump the contained liquids into a functional storage facility
   - Use absorbent materials to soak up the liquid manure, such as bedding, feed, hay, stray, or sawdust
   - Check tile drains and other drainage pipes/pathways for contamination. Use a pump to clear out contaminated lines if necessary

5. Review the Spill Reporting Factsheet and document the spill/leak and actions taken

Name	Type of contact	Phone number
Provincial Emergency Program (PEP)/Emergency Management British Columbia (EMBC)	Spill Reporting	1-800-663-3456
	Municipality contact	
	Fire Department	
	On-farm Equipment Operator	
	Excavation Contractor	
	Manure Hauler	
	Septic Tank Pumping Truck	
	Neighbour	
	Neighbour	
	Neighbour	

In the event of other emergencies, call 911 immediately.

Application Schedule - Summary

Field: West field	Area: 45.4 ac	2020 Crops:	Corn silage Fall rye

Nutrient Source	Application Timing	Rate
Dairy, liquid (quite watery)	Spring	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	5,000 US gallons/ac
Urea (46-0-0)	Jun-2020	100 lb/ac

Field: Front field	Area: 10 ac	2020 Crops:	Corn silage Fall rye

Nutrient Source	Application Timing	Rate
Dairy, liquid (quite watery)	Spring	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	5,000 US gallons/ac
Urea (46-0-0)	Jun-2020	100 lb/ac

Field: BF-1	Area: 13.4 ac	2020 Crops:	Grass or mixed stand (4-5 cuts)

Nutrient Source	Application Timing	Rate
Dairy, liquid (quite watery)	Spring	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Summer	4,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	3,000 US gallons/ac
Urea (46-0-0)	Jun-2020	125 lb/ac

Field: Back field	Area: 28.5 ac	2020 Crops:	Grass or mixed stand (5-6 cuts)

Nutrient Source	Application Timing	Rate
Dairy, liquid (quite watery)	Spring	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Summer	4,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	3,000 US gallons/ac
Urea (46-0-0)	Jun-2020	225 lb/ac

Field: East field	Area: 11.8 ac	2020 Crops:	Corn silage Fall rye

Nutrient Source	Application Timing	Rate
Dairy, liquid (quite watery)	Spring	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	5,000 US gallons/ac
Urea (46-0-0)	Jun-2020	100 lb/ac

Farm Description

The farm is located at 6947 Lougheed Highway in Agassiz BC and is a dairy cattle operation. The farm is owned by Esmeralda and Geraldo DeForest and has 1 additional employee.

Location

This farm is located in both a vulnerable aquifer recharge area and a high-precipitation area, as defined by the Code of Practice for Agricultural Environmental Management.

As it is in a high-precipitation area, nutrient applications are prohibited during November, December, and January.

Starting 15 July 2021, a nutrient management plan will be required if post-harvest nitrate soil tests are greater than 100 kg N/ha (89 lb N/ac) for any field.

Farmstead and cropping areas

- Total farm size: 120.4 acres
- Cropped area size: 109.6 acres
- Spreadable area size: 109 acres

Spreadable area is the total cropped area that can receive nutrient applications. The minimum required setbacks from the drainage ditch are not expected to affect the spreadable area based on current cropped areas. The setback from the well on the edge of Back field is approximately a half acre space where manure should not be applied.

Animal description

- Milking cows: 151
- Heifers (15 to 26 months): 17
- Heifers (6 to 15 months): 13
- Calves (3 to 6 months): 16
- Calves (0-3 months): 11
- Dry cows: 18
- **Total animals: 226**

Manure Handling and Storage System description

Refer to the Animal Housing and Manure Storage map.

All animals are housed together in Building 2. Solid manure from Building 2 (Milking cows, heifers, dry cows) and manure/washwater from Building 3 (Milking cows) is mechanically collected via drains and a scraping system. The manure slurry is then separated by a solid/liquid separation system. Liquid manure is transported through pipes to the Liquid Storage structure (4). The Liquid Storage structure is uncovered and accumulates precipitation throughout the year. A bedding master system is used to compost solid manure from the solid/liquid separator and re-use the material as

bedding. Solid manure and bedding from calves in Building 2 is regularly collected and stored in Building 5.

The farm does not use any temporary field storage sites for solid manure.

Manure storage capacity

Liquid storage system is an aboveground, glass lined steel structure (81ft diameter, 28ft height) with 1,041,191 US Gallons of total storage.

- Total storage volume and storage capacity account for maintaining 30 cm of freeboard and typical yearly precipitation
- This assessment assumes the liquid storage system is close to empty at the beginning of October, as discussed by the planner and owner/operator of this farm operation.
- Based on book values for manure and waste generation, the farm has enough liquid manure storage for the November to January no spread period.
    - 933,779 US gallons of manure generated from October to end of March = 5,160 US gallons of manure generated per day during this period
    - Storage volume of 1,041,191 US gallons / 5,160 US gallons per day = 202 days storage capacity

Liquid storage: October through March

Liquid Storage System	October to March volume	
Materials Generated or Imported	800,111	US gallons
Yard/Roof Runoff	0	US gallons
Material Stored (October to March)		
Materials Stored (after Solid/Liquid Separation)	720,100	US gallons
Precipitation, Direct into Storage	213,679	US gallons
Total Stored	**933,779**	**US gallons**
Storage Volume	**1,041,191**	**US gallons**

Cropping summary

The West, Front, BF-1, fields are all typically planted with silage corn in each year and are harvested in September/October. After harvest, they are planted with fall rye (cereal rye), which is harvested in March/April before being terminated with herbicides.

The Back and East field is cropped with perennial forage that is typically harvested 5, sometimes 6 times per year.

The farmer gradually rotates fields, and in 2020 they plan to plow the forage in East field under and switch to corn. BF-1 was previously used for corn silage but seeded was to perennial grass in the fall of 2019. It is expected to be harvested 4-5 times over the next year.

Irrigation summary

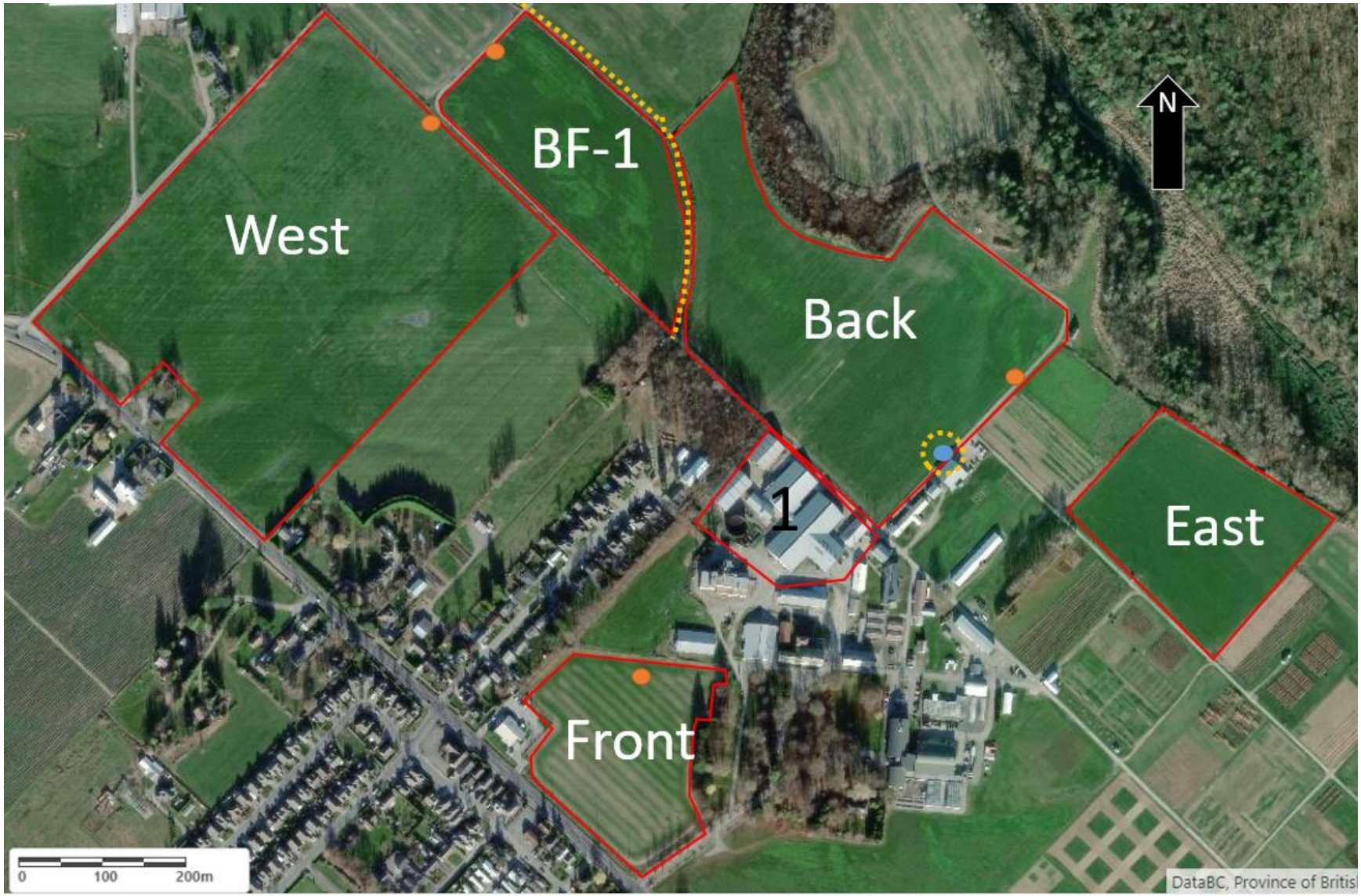
All fields are irrigated on an as-needed basis to return soil moisture to field capacity using a reel-type travelling gun system.

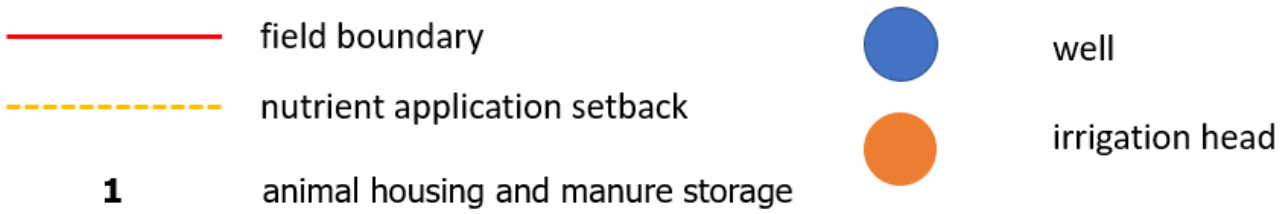
Manure application summary

Liquid manure is broadcast applied using a splash plate on a 4,200 US gallon vacuum tanker that is pulled behind the farm's tractor. All the fields on the farm have had regular manure applications every year. Fertilizer (urea) is surface-applied in bands for corn and broadcast on grass forage.

Farm Maps

Property and field map

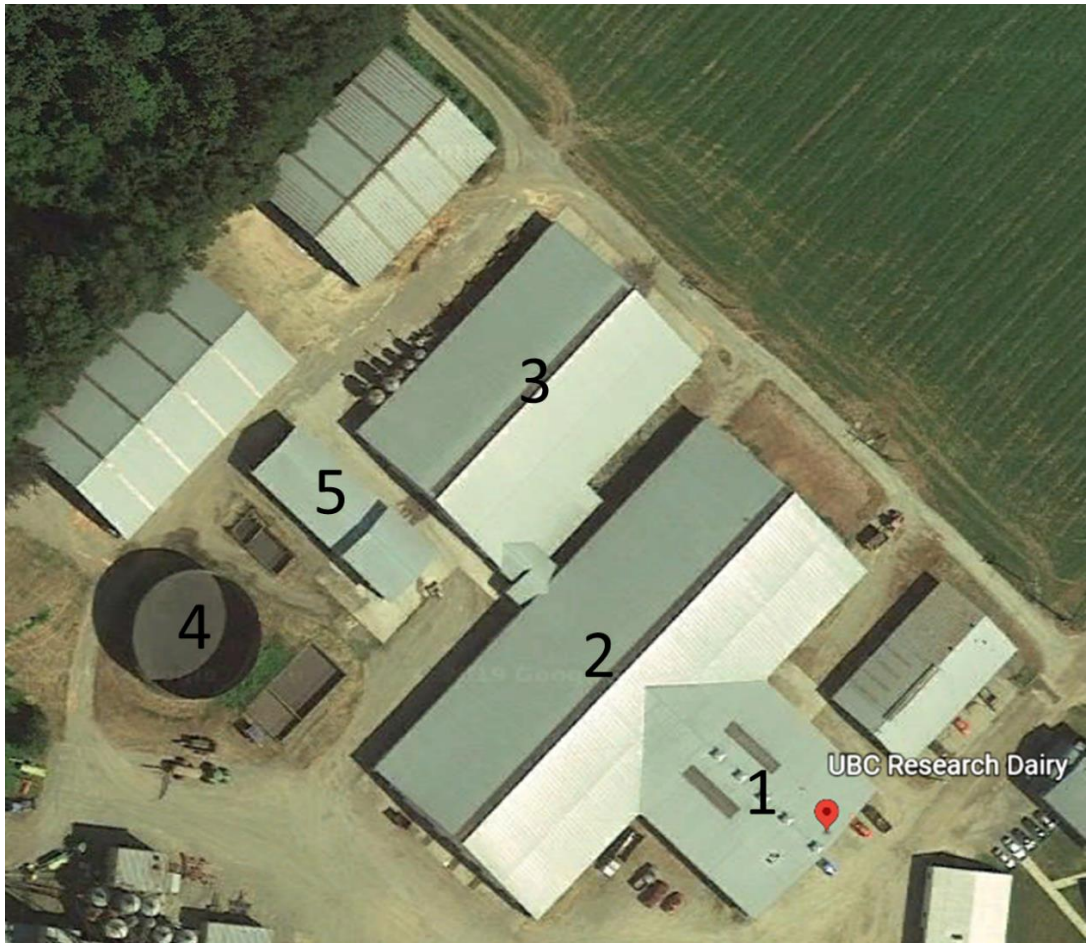




Property and Field Map Key

Field description			
Field ID	Total acreage	Spreadable acreage	Planned Crop for 2020
West field	45.4	45.4	Corn Silage
Back field	29.0	28.5	Grass
BF-1	13.4	13.4	Grass
East field	11.8	11.8	Corn Silage
Front field	10.0	10.0	Corn Silage

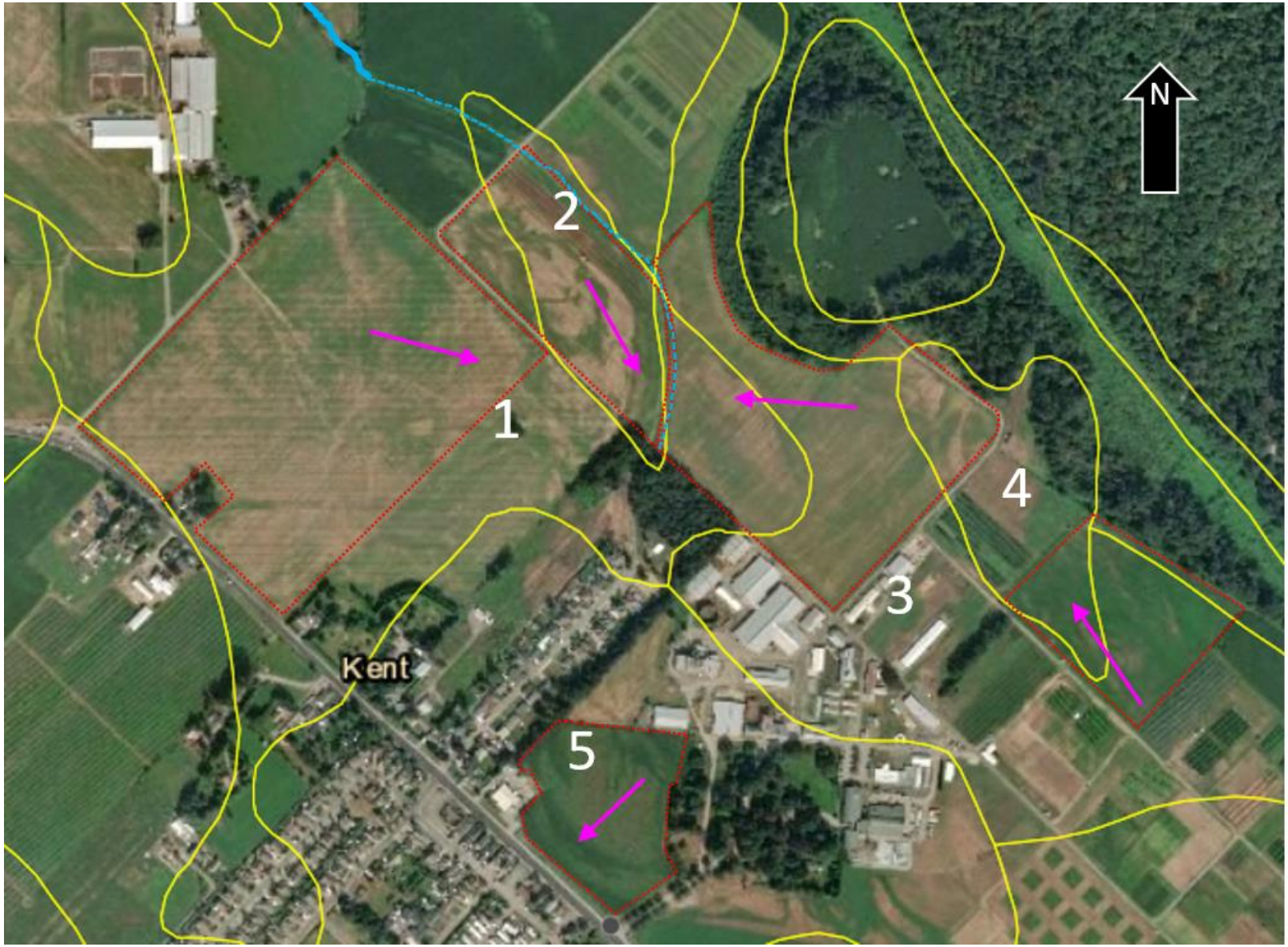
Animal Housing and Manure Storage map



Manure storage and animal housing description

1. Administrative area
2. Animal housing and feeding area
3. Milking parlour
4. Liquid manure storage
5. Solid manure storage

Soil and Surface Feature map



Soil and Surface Feature map key

- Arrows indicate general slope direction
- Yellow lines distinguish between soil types
- Dashed blue line is drainage ditch which connects to surface water (off farm property)
- Red dashed lines indicated field boundaries

Soil ID	Soil name	Texture	Drainage class
1	Fairfield	Silty Clay Loam	Imperfect
2	Dewdney	Silt Loam	Imperfect
3	Monroe	Silt Loam	Moderately Well
4	Hjorth	Silt Loam	Poor
5	Matsqui	Silty Clay Loam	Well

Application notes

The drainage ditch which runs between the Back and BF1 fields empties into a creek, and therefore is considered as a watercourse by regulation. The areas of Back and BF-1 fields which are near the ditch are imperfectly drained and have a gradual slope downwards towards the ditch (approximately 4% at the steepest near the ditch).

Subsurface tile drainage is not present and therefore does not pose a risk of off-site losses or impact on surface water quality.

Setbacks

- A minimum 3 m setback from the drainage ditch between BF-1 and Back fields is required for broadcast manure applications (1.5m for fertilizer)
    - Recommend a minimum of 5 m in October, February, and March when runoff risk is greater
- A 30 m for manure applications and 3 m for fertilizer from the well found on the boundary of Back field
- No required setback for irrigation heads, however a 3 m setback is recommended

Nutrient Inventory for Manure and Fertilizers

All liquid manure generated on the farm is expected to be land-applied. Solid manure generated by calves is sold off farm exported. No manure is imported onto the farm. Urea fertilizer (46-0-0) is imported to the farm for use as supplemental N.

Annual nutrient generation and use

Material	Annual Amount	Land-Applied	Amount Remaining
Material in Liquid Storage System	**1,666,193 US Gallons**	**1,502,100 US Gallons (90%)**	**164,093 (10%)**
Material in Solid Storage System	**122 tons**	**0 tons (0%)**	**122 (100%)**
Material in Bedding master	**532 tons**	**0 tons (0%)**	**532 (100%)**

Material	Annual Amount	
Material in Liquid Storage System	**1,666,193**	**US gallons**
Animal manure		
Milking Cow,151 animals	1,092,104	US Gallons
Heifers (15 to 26 months old),17 animals	80,330	US Gallons
Heifers (6 to 15 months old),13 animals	35,104	US Gallons
Dry Cow,18 animals	121,506	US Gallons
Milking Center Wash Water	275,575	US gallons
Precipitation	222,036	US gallons
Material in Solid Storage System	**122**	**tons**
Animal manure		
Calves (3 to 6 months old),16 animals	91	tons
Calves (0 to 3 months old),11 animals	31	tons
Material in Bedding master	**532**	**tons**
Animal manure		
Separated solids	532	tons

*Note: solids from solid liquid separation are composted and used as bedding

Fertilizer Required

Material	Total Amount Required in 2020
Urea (46-0-0)	6,716.57 kg

Manure import and export

No manure is expected to be imported over the time period described in this nutrient management plan. Solid manure is given away or sold to neighbours and a nearby vegetable farm.

Records of solid manure export

For exported manure, the following records should be kept:

- For small batches to neighbours (less than a truck load)

    - The total amount from all the batches
- For large loads sold to the nearby farm
    - A receipt that is signed by the receiver with the following information
        - The total amount exported (in m^3)
        - The dates that manure was exported
        - The type of manure exported (solid calf manure)
        - The name and contact information of the receiver

Manure storage and seasonal manure use

872,800 US gallons of the 933,779 US gallons of liquid manure generated from October to March are expected to be applied in early spring 2020. Another 629,300 US gallons are expected to be applied in the summer and fall of 2020. 164,093 US gallons are expected to remain in the liquid storage system at the end of September 2020 but may be higher or lower based on actual manure generation compared to the book values used in this plan. The farmer should determine at this time if there is enough storage space for manure generated from October 2020 through March 2021.

Field Summaries

West field

Area: 45.4 ac

Crop	Yield	Previous crop ploughed down (N credit)
Corn silage	7.0 ton/ac	non-legume cover crop (winter wheat, fall rye, etc.)
Fall rye	2.0 ton/ac	

Soil Test Results: Mar 2020	Soil test P & K Method: A and L Canada (Bray-1 and Mehlich 3)		
Nitrate-N: 4 ppm	Phosphorus: 108 ppm (High)	Potassium: 115 ppm (Med)	pH: 6.4
Field Comments:			

Nutrient Application Plan: 2020

Nutrient Source	Application Timing	Method	Rate
Dairy, liquid (quite watery)	Spring	Incorporated 1 day after	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	Broadcast, not incorporated	5,000 US gallons/ac
Urea (46-0-0)		Banded	100 lb/ac

	Agronomic Balance (lb/ac)			Crop Removal Balance (lb/ac)		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Corn silage [1]	-179	-18	-71	-179	-64	-168
Fall rye	-35	0	0	-114	-34	-150
Previous year's manure application	60	0	0	0	0	0
Soil nitrate	7	0	0	0	0	0
Dairy, liquid (quite watery)	73	43	128	97	61	128
Dairy, liquid (medium slurry) [2]	30	40	125	67	57	125
Urea (46-0-0)	46	0	0	46	0	0
Balance	2	65	182	*-83*	20	*-65*

Considerations:

Crop requirement for P2O5 is met; 65 lb/ac adds no benefit to the crop
Crop requirement for K2O is met, 182 lb/ac adds no benefit to the crop

Assumptions:

1 Crude protein adjusted to 8%
2 1st Yr Organic N Availability adjusted to 10%

Note: Urea (46-0-0) should be surface-banded around the V5-V6 stage of corn growth, generally in June.

2019 Post Harvest Nitrate:

Field	Sampling date	2019 Crop	NO_3-N (ppm)	NO_3-N (kg/ha)
West field	09/22/2019	Silage Corn	18	70

PHNT in 2019 was lower than other corn fields. Maintain default N credits.

Front field

Area: 10 ac

Crop	Yield	Previous crop ploughed down (N credit)
Corn silage	7.0 ton/ac	non-legume cover crop (winter wheat, fall rye, etc.)
Fall rye	2.0 ton/ac	

Soil Test Results: Mar 2020	Soil test P & K Method: A and L Canada (Bray-1 and Mehlich 3)		
Nitrate-N: 6 ppm	Phosphorus: 38 ppm (Med)	Potassium: 85 ppm (Low)	pH: 6.2
Field Comments:			

Nutrient Application Plan: 2020

Nutrient Source	Application Timing	Method	Rate
Dairy, liquid (quite watery)	Spring	Incorporated 1 day after	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	Broadcast, not incorporated	5,000 US gallons/ac
Urea (46-0-0)		Banded	100 lb/ac

	Agronomic Balance (lb/ac)			Crop Removal Balance (lb/ac)		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Corn silage [1]	-179	-36	-134	-179	-64	-168
Fall rye	-35	0	0	-114	-34	-150
Previous year's manure application	60	0	0	0	0	0
Soil nitrate	10	0	0	0	0	0
Dairy, liquid (quite watery)	73	43	128	97	61	128
Dairy, liquid (medium slurry) [2]	30	40	125	67	57	125
Urea (46-0-0)	46	0	0	46	0	0
Balance	5	47	119	*-83*	20	*-65*

Considerations:

Crop requirement for P2O5 is met; 47 lb/ac adds no benefit to the crop
Crop requirement for K2O is met, 119 lb/ac adds no benefit to the crop

Assumptions:

1 Crude protein adjusted to 8%
2 1st Yr Organic N Availability adjusted to 10%

Note: Urea (46-0-0) should be surface-banded around the V5-V6 stage of corn growth, generally in June.

2019 Post Harvest Nitrate:

Field	Sampling date	2019 Crop	NO_3-N (ppm)	NO_3-N (kg/ha)
Front field	10/03/2019	Silage corn	19	74

PHNT is lower than for other corn fields. Nitrogen credits kept consistent with default values for the next season.

BF-1

Area: 13.4 ac

Crop	Yield	Previous crop ploughed down (N credit)
Grass or mixed stand (4-5 cuts)	5.0 ton/ac	not applicable (no N credit)

Soil Test Results: Mar 2020	Soil test P & K Method: A and L Canada (Bray-1 and Mehlich 3)		
Nitrate-N: 1 ppm	Phosphorus: 44 ppm (Med)	Potassium: 104 ppm (Low)	pH: 6.6
Field Comments:			

Nutrient Application Plan: 2020

Nutrient Source	Application Timing	Method	Rate
Dairy, liquid (quite watery)	Spring	Broadcast, not incorporated	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Summer	Broadcast	4,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	Broadcast, not incorporated	3,000 US gallons/ac
Urea (46-0-0)		Broadcast	125 lb/ac

	Agronomic Balance (lb/ac)			Crop Removal Balance (lb/ac)		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Grass or mixed stand (4-5 cuts)	-240	-27	-54	-240	-80	-228
Previous year's manure application	70	0	0	0	0	0
Soil nitrate	2	0	0	0	0	0
Dairy, liquid (quite watery)	61	43	128	86	61	128
Dairy, liquid (medium slurry)	30	32	100	49	46	100
Dairy, liquid (medium slurry) [1]	18	24	75	40	34	75
Urea (46-0-0)	58	0	0	58	0	0
Balance	-1	72	249	-7	61	75

Considerations:

Crop requirement for P2O5 is met; 72 lb/ac adds no benefit to the crop
Crop requirement for K2O is met, 249 lb/ac adds no benefit to the crop

Assumptions:

1 1st Yr Organic N Availability adjusted to 10%

Note: Urea (46-0-0) should be surface broadcast in spring when field conditions allow after the first cut.

2019 Post Harvest Nitrate:

Field	Sampling date	2019 Crop	NO_3-N (ppm)	NO_3-N (kg/ha)
BF-1	10/03/2019	Silage corn	27	105

Compared to the other corn fields, BF-1 has higher PHNT. There may be greater carry over and mineralization of organic N in this field. Field was seeded to perennial grass in fall 2019, and a greater credit provided for carry over of manure N.

Back field

Area: 28.5 ac

Crop	Yield	Previous crop ploughed down (N credit)
Grass or mixed stand (5-6 cuts)	6.0 ton/ac	not applicable (no N credit)

Soil Test Results: Mar 2020	Soil test P & K Method: A and L Canada (Bray-1 and Mehlich 3)		
Nitrate-N: 11 ppm	Phosphorus: 120 ppm (Very High)	Potassium: 52 ppm (Low)	pH: 6.3
Field Comments:			

Nutrient Application Plan: 2020

Nutrient Source	Application Timing	Method	Rate
Dairy, liquid (quite watery)	Spring	Broadcast, not incorporated	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Summer	Broadcast	4,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	Broadcast, not incorporated	3,000 US gallons/ac
Urea (46-0-0)		Broadcast	225 lb/ac

	Agronomic Balance (lb/ac)			Crop Removal Balance (lb/ac)		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Grass or mixed stand (5-6 cuts)	-348	0	-89	-348	-110	-288
Previous year's manure application	90	0	0	0	0	0
Soil nitrate	19	0	0	0	0	0
Dairy, liquid (quite watery)	61	43	128	86	61	128
Dairy, liquid (medium slurry)	30	32	100	49	46	100
Dairy, liquid (medium slurry) [1]	18	24	75	40	34	75
Urea (46-0-0)	104	0	0	104	0	0
Balance	-26	99	214	-69	31	15

Considerations:

- Add 26 lb N/ac to meet crop requirements
- Crop requirement for P2O5 is met; 99 lb/ac adds no benefit to the crop
- Crop requirement for K2O is met, 214 lb/ac adds no benefit to the crop

Assumptions:

1 1st Yr Organic N Availability adjusted to 10%

Note: Urea (46-0-0) should be surface broadcast in spring when field conditions allow after the first cut. This application may be split into a spring and summer application based on the farmers' assessment of crop need.

2019 Post Harvest Nitrate:

Field	Sampling date	2019 Crop	NO_3-N (ppm)	NO_3-N (kg/ha)
Back field	09/22/2019	Grass	14	55

PHNT is comparable with other grass fields. Nitrogen credits kept consistent with default values for the next season.

East field

Area: 11.8 ac

Crop	Yield	Previous crop ploughed down (N credit)
Corn silage	7.0 ton/ac	non-legume cover crop (winter wheat, fall rye, etc.)
Fall rye	2.0 ton/ac	

Soil Test Results: Mar 2020	Soil test P & K Method: A and L Canada (Bray-1 and Mehlich 3)		
Nitrate-N: 2.6 ppm	Phosphorus: 115 ppm (Very High)	Potassium: 166 ppm (Med)	pH: 6.1
Field Comments:			

Nutrient Application Plan: 2020

Nutrient Source	Application Timing	Method	Rate
Dairy, liquid (quite watery)	Spring	Incorporated 1 day after	8,000 US gallons/ac
Dairy, liquid (medium slurry)	Fall	Broadcast, not incorporated	5,000 US gallons/ac
Urea (46-0-0)		Banded	100 lb/ac

	Agronomic Balance (lb/ac)			Crop Removal Balance (lb/ac)		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Corn silage [1]	-179	0	-54	-179	-64	-168
Fall rye	-35	0	0	-114	-34	-150
Previous year's manure application	60	0	0	0	0	0
Soil nitrate	5	0	0	0	0	0
Dairy, liquid (quite watery)	73	43	128	97	61	128
Dairy, liquid (medium slurry) [2]	30	40	125	67	57	125
Urea (46-0-0)	46	0	0	46	0	0
Balance	0	83	199	*-83*	20	*-65*

Considerations:

Crop requirement for P2O5 is met; 83 lb/ac adds no benefit to the crop
Crop requirement for K2O is met, 199 lb/ac adds no benefit to the crop

Assumptions:

1 Crude protein adjusted to 8%
2 1st Yr Organic N Availability adjusted to 10%

Note: Urea (46-0-0) should be surface-banded around the V5-V6 stage of corn growth, generally in June.

2019 Post Harvest Nitrate:

Field	Sampling date	2019 Crop	NO_3-N (ppm)	NO_3-N (kg/ha)
East field	09/22/2019	Grass	10	39

PHNT is comparable with other grass fields. Field is switching to corn in 2020. Nitrogen credits kept consistent with default values for the next season.

Plan Recommendations

Nutrient applications

The application schedule includes suggested nutrient application rates by season. The following general strategies are recommended:

Corn Silage fields:

Urea surface-banded at the V6 stage, generally in June. Nutrient balances aim for a low PHNT after corn crop, but if they are high (greater than 80 kg/ha) no additional manure is needed prior to planting the fall rye.

- Manage for optimal yields and feed quality of both the cover crop and silage corn. Early / low heat unit corn varieties may provide greater results for fall establishment of cover crop.
- Consider use of a relay crop in place of fall cover crop. This practice can help reduce the time crunch around fall harvest and planting and ensures soil cover for more of the year. The continued uptake of mid to late season N may help reduce PHNT. Info found here: https://farmwest.com/node/1039

Forage fields:

Manure applications in throughout the season should be split. Largest application prior to 1st cut, then smaller applications after each cut. Ideally urea applications split to distribute benefit of N top up through season as well.

- Monitor farmwest.com T-sum 200 calculator, and time early manure application after 200 is reached and the BC Application Risk Management tool indicates field conditions are appropriate for spreading. https://farmwest.com/climate/tsum
- Where possible time summer manure applications at cooler time of day to reduce ammonia loss

Manure Estimates

Book values were used to estimate liquid manure nutrient content. During liquid manure application, use containers to collect a sample of manure to be sent for laboratory analysis. Having the liquid manure nutrient analysis will allow for more accurate application recommendations when the plan is updated next year.

Use manure application records to monitor annual manure generation and verify estimate values when reviewing the NMP.

Yield and plant nutrient content

During harvest of both corn and annual ryegrass, collect records on average yields for each field. Both the yield and feed analysis data can be used to calculate the crop nutrient removal and increase the accuracy of updated versions of this nutrient management plan.

Soil sampling

Before fall precipitation washes nitrate out of the soil (roughly October 1), each field's soil should be sampled to a 30-cm depth and analyzed for post-harvest nitrate. Data from post-harvest nitrate testing (PHNT) can be used to determine if N was over- or under-applied.

Basic soil fertility samples should be taken in March 2020 to a 15-cm depth. Records of soil testing should be kept for at least 5 years.

Updating this nutrient management plan

Following soil sampling in fall of 2020, this plan should be reviewed and updated to more accurately reflect soil nutrient levels, manure generation, crop yields, and crop nutrient uptake.

Strategies to meet regulatory requirements

Nutrient Application

As this farm is in a high-precipitation area, manure or fertilizer cannot be applied from November through January.

Before any nutrient applications in October, February, or March, an application risk assessment must be completed, preferable within 24 hours before application. The BC Application Risk Management (ARM) tool can be used for this.

No manure or fertilizer applications should be made during high-risk conditions. This includes strong, divergent windy conditions, storm events, when water table is high and close to surface, or flooding.

Recordkeeping for nutrient application and crop yields

The record keeping sheets found in your .nmp file can be used to record rates during nutrient application and crop yields during harvest.

Disclaimer

The writer of this plan, Josh Andrews, is not responsible for actions taken that deviate from this plan. Additionally, this plan should not be considered an exhaustive list of actions for nutrient management on this farm. The owner and operators of this farm are responsible for following all local, provincial, and federal rules relating to nutrient management.

Appendix

Drainage classes

Drainage Classes		
Code	**Class**	**Description**
W	Well	Water is removed from the soil readily but not rapidly; excess water flows downward into underlying pervious material or laterally as subsurface flow. These soils commonly retain optimum amounts of moisture for plant growth after rains or addition of irrigation water.
M	Moderately well	Water is removed from the soil somewhat slowly in relation to supply due to low perviousness, a shallow water table, lack of gradient, or a combination of these factors; precipitation is the dominant source of water in medium to fine textured soils; precipitation and significant additions by subsurface flow are necessary in coarse-textured soils.
I	Imperfect	Water is removed from the soil sufficiently slowly in relation to supply leaving the soil wet for a significant part of the growing season; excess water moves slowly downward if precipitation is the major supply; if subsurface water, groundwater, or both are the main source the flow rate may vary.
P	Poor	Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time that the soil is not frozen; excess water is evident in the soil for much of the time; subsurface flow, groundwater flow, or both, in addition to precipitation, are the main sources of water; a perched water table may also be present.

Soil and Manure Testing

Manure

Manure and Compost Analysis

All results are provided on an as-received (wet weight) basis.

Source of Material	Material Type	Moisture (%)	Total N (%)	NH_4-N (ppm)	P (%)	K (%)
Liquid Storage System	Dairy, liquid (quite watery)	95-98%	0.20	1110	0.04	0.16
Liquid Storage System	Dairy, liquid (medium slurry)	92-95%	0.28	1450	0.06	0.25
Solid Storage System	Dairy, solid (dry)	≤72%	0.76	317	0.20	0.43

Soil

Pre-plant

Soil Test Results

Soil Test P and K Method	A and L Canada (Bray-1 and Mehlich 3)

Field	Sampling Date	2020 Crops	pH	NO_3-N (ppm)	Soil Test P (ppm)	Soil Test K (ppm)
West field	Mar-2020	Corn silage Fall rye	6.4	4	108 High	115 Med
Front field	Mar-2020	Corn silage Fall rye	6.2	6	38 Med	85 Low
BF-1	Mar-2020	Grass or mixed stand (5-6 cuts)	6.6	1	44 Med	104 Low
Back field	Mar-2020	Grass or mixed stand (5-6 cuts)	6.3	11	120 Very High	52 Low
East field	Mar-2020	Corn silage Fall rye	6.1	2.6	115 Very High	166 Med

2019 Post-Harvest Nitrate Test Results

Results for 0-30 cm

Field	Sampling date	2019 Crop	NO_3-N (ppm)	NO_3-N (kg/ha)
West field	09/22/2019	Silage Corn	18	70
Back field	09/22/2019	Grass	19	74
BF-1	10/03/2019	Silage corn	27	105
East field	09/22/2019	Grass	10	39
Front field	10/03/2019	Silage corn	19	74