

Salem's copy

Animal Waste Management Plan
March 2005

Spring Valley Farm

Operated by:

Filbert Johnston
325 Eckloff Road
Tillamook, OR 97141
PH 503-4030

Facility Address:
325 Eckloff Road
Tillamook, OR 97141

Operation:

Grade A Dairy
Medium-Federal CAFO
STATE

As owner and operator of Spring Valley Farm; I intend to manage in accordance with the practices and operation and maintenance described in this animal waste management plan.

Signature Filbert P. Johnston

Date 4-25-05

RECEIVED 11/1/05

MA# 63379

AWMP# 05206

Due Date: 12/14/05

Approved

**ANIMAL WASTE MANAGEMENT PLAN
MINIMUM REQUIRED ELEMENT**

ANIMAL MORTALITY

Management of Animal Mortalities for: Spring Valley Farms MA#: 63379
NAME OF OPERATION / MA#

Animal mortalities will be disposed of in a manner that will comply with local, state and federal regulations. Please mark and describe the method(s) of animal mortality management used on this operation:

☒ REMOVAL SERVICE: Provided by Averill Trucking on an as-
needed basis.

☐ COMPOSTED: _____

☐ INCINERATED: _____

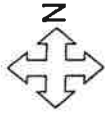
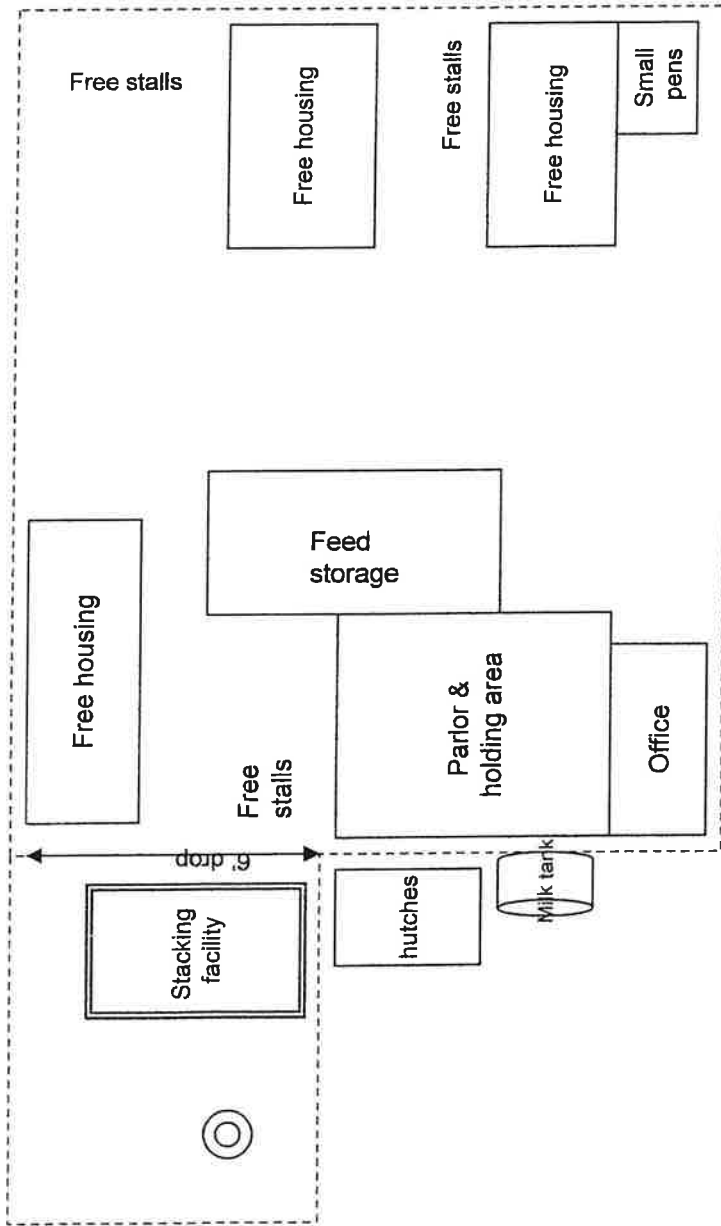
☐ BURIED: _____

☒ OTHER: Natural Disposal—please see Handout “Disposal of Animal
Mortality and Byproducts”

Signature of Legally Authorized Representative: Devin P. Johnston

Print Name: Devin Johnston Date: 7-2-07

Spring Valley Farm Tillamook, OR



- Gutters and downspouts -----
- Curb to solid storage ↔
- Below ground tank ○
- Stacking Facility ==

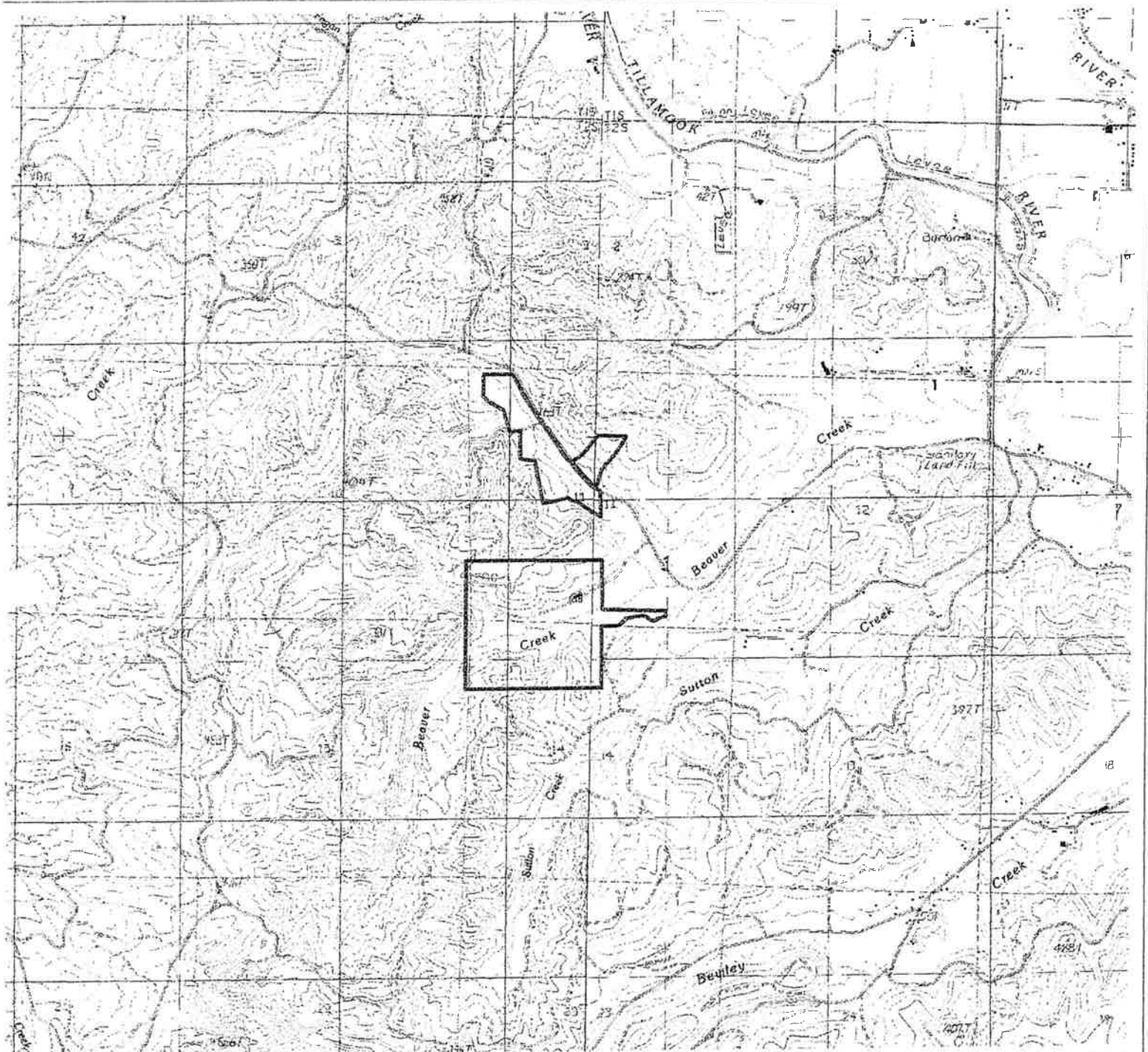
Not to scale

Tillamook County SWCD

Approx. Acres: 235.8

Re: 09/02/2004

7.5 Min. Topo Quad Map



4000 0 4000 8000 12000 Feet



Tract Boundary



Farmstead Lat/Long (NAD83)
45 24' 26.6" N; 123 52' 39.2" W



SOIL DESCRIPTIONS

AsC - Astoria silt loam, 3-12% slopes, consist of well drained, clayey soils. It is over 60 inches deep and occurs on footslopes and terraces. Permeability and runoff are both moderate. Water erosion is a potential hazard. The available water capacity is 9-12 inches. The effective rooting depth is more than 60 inches. The Natural Resources Conservation Service (NRCS) capability classification is IIIe. These soils are suited for use as pastureland.

AsD - Astoria silt loam, 12-20% slopes, consist of well drained, clayey soils. It is 40-60 inches deep and occurs on footslopes. Permeability and runoff are both moderate. Water erosion hazard is moderate on cultivated ground and slight in woodlands. The available water capacity is 9-11 inches. The effective rooting depth is more than 60 inches. The NRCS capability classification is IVe. These soils are suited for timber production and pastures.

AsF - Astoria silt loam, 20-40% slopes, are well drained, silty loam clay soils. The erosion hazard is moderate. Runoff is medium. NRCS capability classification is VIe because of erosion. Permeability is moderate. This soil occupies the steep lower sloped areas of the Coast Range. Available water holding capacity is 11 to 15 inches. Effective rooting depth is greater than 60 inches. These soils are used primarily for timber production.

Br - Brenner silt loams are poorly drained, strongly acid soils. These soils are on bottomlands in the lowest part of the floodplains. The erosion hazard is slight. Permeability is slow. Runoff is slow to ponded. NRCS capability classification is IIIw because of poor drainage. Available water holding capacity is 8.5 to 9.5 inches. Soils are well suited for pastures.

ChB - Chitwood silt loam, 0-7% slopes, consist of somewhat poorly drained clayey soils. It is over 60 inches deep and occurs on terraces and fans. A water table is present during late fall, winter and spring. Permeability is slow and runoff is slow to medium. Water erosion is a potential hazard. The available water capacity is 9-11 inches. The effective rooting depth for water-tolerant plants is more than 60 inches. The NRCS capability classification is IIIw. These soils are suited for use as pastureland.

ChC - Chitwood silt loam, 7-12% slopes, consist of somewhat poorly drained clayey soils. It is over 60 inches deep and occurs on terraces. A water table is present during late fall, winter and spring. Permeability is slow and runoff is medium. Erosion hazard is slight. The available water capacity is 8-11 inches. The effective rooting depth is 20-30 inches. The NRCS capability classification is IIIw. These soils are suited for use as pastureland.

Business Narrative

This dairy is a 153-1,000 lb. Animal unit operation. The herd consists of Holstein, Brown Swiss, and Jerseys. There are 80 lactating cow, 10 dry cows, 30 heifers, and 28 calves. The lactating cows are confined for 188 days and on pasture for 177 days. The dry cows and heifers are confined for 151 days and on pasture for 214 days. The calves are confined for 365 days. Livestock mortality service is provided by the Tillamook County Creamery Association.

The operation consists of two Tracts. There are 62.3 acres in Tract 133. There are 40.3 acres of pastureland that receives manure application. Tract 168, the milking operation, has 173.5 acres. There are 52 pasture acres that receives manure applications. Approximately 6.0 acres in Tract 133 is within the 100-year flood plain. There are approximately 14.0 acres within Tract 168 that is in the 100-year flood plain. The target yield is 6 tons of dry matter per acre per year. The pasture fields are in good condition.

Liquid manure is transported and applied to the field with a 2,200 gallon tank wagon and tractor. Solid manure is transported to the fields and applied with a 450 bushel manure spreader. Each year 1,000 tons of solids are transported off the farm and applied to a neighbor's property. This is approximately 239 lbs of nitrogen removed from the operation.

Manure from the lactating, dry cows, and heifers is handled 65% solids and 35% liquids. All calf manure is handled 100% solids. The manure storage system consists of a 32' x 10' below ground liquid waste storage tank. The waste storage tank can store the liquid waste produced by the 153-1,000 lb. animal units for 23 days. There is an 80' x 36' x 8' solid manure storage facility. This facility can store the solid manure produced by the 153-1,000 lb. animal units for 144 days.

All manure accumulation areas have been roofed. The animal confinement buildings and waste accumulation area roofs have been guttered, down-spouted and outletted in an area free of manure. All the conservation practices installed are maintained and managed in accordance with the enclosed "CONSERVATION PRACTICE OPERATION AND MAINTENANCE WORKSHEETS."

Soils where manure is applied are: Brenner silt loam, Chitwood silt loam, Astoria silt loam, and Nestucca silt loam. The Brenner silt loam soil is poorly drained. The Chitwood and Nestucca silt loam soils are somewhat poorly drained. The Astoria silt loam is well drained.



TILLAMOOK SERVICE CENTER
6415 SIGNAL ST
TILLAMOOK, OR 97141-9622
(503) 842-2848

Robert A. Pedersen
Basin Team Leader

Conservation Plan

FILBERT F JOHNSTON
95 ECKLOFF RD
TILLAMOOK, OR 97141

Objective(s)

Develop and implement a comprehensive nutrient management plan, that when implemented, the operation will be in compliance with ODA's CAFO rules, regulations, and permit conditions.

Farmstead

Tract: 168

Comprehensive Nutrient Management Plan

A Comprehensive Nutrient Management Plan consisting of structural and vegetative practices for the handling, collecting, transferring, storage, and application of animal waste in an environmentally safe manner will be developed and implemented.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	9	1986		
Total:	1 no				

Manure Transfer

85 feet of 12 inch and 174 feet of 10 inch low pressure PVC Class Code 125 manure transfer pipe was installed. to transfer liquid manure and milkhouse and parlor waste to the below ground liquid waste storage tank.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	8	1985	85 no	9/4/1985
Total:	1 no			85 no	

Manure Transfer

A concrete curb was installed to prevent manure runoff.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	8	1985	3 no	9/2/1985
Total:	1 no			3 no	

Manure Transfer

A concrete curbs were installed to prevent manure runoff from the manure accumulation areas.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	2 no	2	1987		
Total:	2 no				

Waste Storage Facility

A 3,618 square foot roof was installed over the below ground liquid waste storage tank to prevent rain water from entering the waste storage tank.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	2	1987	1 no	3/5/1987
Total:	1 no			1 no	

Waste Storage Facility

A 32' x 10 below ground liquid manure tank was installed. The 8,042 cubic foot liquid waste storage tank will store the liquid waste produced by the 153-1,000 lb. animal units for 23 days.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	8	1985	1 no	6/24/1985
Total:	1 no			1 no	

Waste Storage Facility

An 80' x 36' x 8 solid manure storage facility was installed. The 23,040 cubic foot storage facility will store the solid manure produced by the 153-1,000 lb. animal units for 144 days.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	9	1985	1 no	5/5/1986
Total:	1 no			1 no	

Waste Storage Facility

An agitator/pump was installed in the below ground liquid waste storage tank to stir the manure for application and prevent solid manure buildup in the facility.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	8	1985	1 no	9/16/1985
Total:	1 no			1 no	

Pasture

Tract: 133

Fence

Watercourse was fenced to exclude livestock from the watercourse and riparian area.

Field	Planned Amount	Month	Year	Applied Amount	Date
1	422 ft	8	1997	422	8/20/1997
2	422 ft	8	1997	422 ft	8/20/1997
3	997 ft	8	1997	997 ft	8/20/1997
4	1630 ft	8	1997	1630 ft	8/20/1997
5	1168 ft	8	1997	1168 ft	8/20/1997
6	330 ft	8	1997	330 ft	8/20/1997
Total:	4969 ft			4547 ft	

Subsurface Drain

A tile drainage system will be installed to manage the water table so manure can be applied on the pastures earlier in the spring and later in the fall without manure runoff occurring.

Field	Planned Amount	Month	Year	Applied Amount	Date
1	3700 ft	3	1986	3790 ft	7/31/1986
4	4200 ft	5	1985	2041 ft	8/27/1985
4	2100 ft	3	1986	2390 ft	8/13/1986
Total:	10000 ft			8221 ft	

Use Exclusion

Livestock have been excluded from the stream corridor.

Field	Planned Amount	Month	Year	Applied Amount	Date
1	0.1 ac	8	1997	0.1 ac	8/20/1997
2	0.1 ac	8	1997	0.1 ac	8/20/1997
3	0.2 ac	8	1997	0.2 ac	8/20/1997
4	0.3 ac	8	1997	0.3 ac	8/20/1997
5	0.2 ac	8	1997	0.2 ac	8/20/1997
6	0.1 ac	8	1997	0.1 ac	8/20/1997
Total:	1 ac			1 ac	

Waste Utilization

Manure will be applied to the pastures in accordance with the enclosed Waste Utilization Conservation Practice Jobsheet(633 OR-JS).

Field	Planned Amount	Month	Year	Applied Amount	Date
1	6.3 ac	9	2005R		
2	2.2 ac	9	2005R		
3	4.2 ac	9	2005R		
4	11.5 ac	9	2005R		
5	9.5 ac	9	2005R		
6	1.4 ac	9	2005R		
7	5.2 ft	9	1997R		
Total:	40.3 ac				

Tract: 168

Fence

Watercourse was fenced to exclude livestock from the watercourse and riparian area.

Field	Planned Amount	Month	Year	Applied Amount	Date
2	924 ft	8	1996	924 ft	8/25/1996
3	924 ft	8	1996	924 ft	8/25/1996
4	1835 ft	8	1996	1835 ft	8/25/1996
5	1835 ft	8	1996	1835 ft	8/25/1996
Total:	5518 ft			5518 ft	

Use Exclusion

Livestock have been excluded from the stream corridor.

Field	Planned Amount	Month	Year	Applied Amount	Date
2	0.2 ac	8	1996	0.2 ac	8/25/1996
3	0.2 ac	8	1996	0.2 ac	8/25/1996
4	0.3 ac	8	1996	0.3 ac	8/25/1996
5	0.3 ac	8	1996	0.3 ac	8/25/1996
Total:	1 ac			1 ac	

Waste Utilization

Manure will be applied to the pastures in accordance with the enclosed Waste Utilization Conservation Practice Jobsheet(633 OR-JS).

Field	Planned Amount	Month	Year	Applied Amount	Date
1	4.3 ac	9	2005R		
2	6.6 ac	9	2005R		
3	14.2 ac	9	2005R		
4	11.9 ac	9	2005R		
5	15 ac	9	2005R		
Total:	52 ac				

CERTIFICATION OF PARTICIPANTS

Filbert F. Johnston
FILBERT F JOHNSTON

4/25/05
Date

CERTIFICATION OF:

Basin Team Leader

Robert A. Pedersen

Date

CONSERVATION DISTRICT

TILLAMOOK SOIL & WATER CO Date

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~ - Designates Recurring Practices

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

**WASTE STORAGE FACILITY
CODE 313**

For: Landowner/Operator Spring Valley Farm

Job Location: R10W T2S Sec 11, 14

County Tillamook SWCD Tillamook Farm/Tract No. T133 & T168

Prepared By M. French Date 03/05

32' X 10" below ground liquid waste storage tank

Operation and Maintenance Items

A properly operated and maintained waste storage structure is an asset to your farm. This waste storage structure was designed and installed for temporary storage of animal wastes. The estimated life span of this installation is at least 10 years. If at any time this structure is taken out of service, the Natural Resources Division of the Oregon Department of Agriculture should be contacted for guidance in decommissioning the structure to avoid environmental concerns. The life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. A good operation and maintenance plan includes:

- ⇒ Do not allow equipment that exceeds the design loading to operate within 20 feet of the structure.
- ⇒ **WARNING: ENTERING AN UNVENTILATED TANK IS EXTREMELY "HAZARDOUS" !** Do not allow human entry into the enclosed structure without safety equipment that includes ladders and breathing apparatus.
- ⇒ Continually maintain all pumps, agitators, piping, valves and all other electrical and mechanical equipment in good operating condition by following the manufacturer's recommendations.
- ⇒ Continually maintain grounding rods and wiring for all electrical equipment in good condition.
- ⇒ Facilities will be empty by October 1st to begin winter storage.
- ⇒ A one foot free board will be maintained to prevent spillage.
- ⇒ The waste storage facility will be inspected weekly to ensure structural integrity.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

**MANURE PUMP
CODE 634**

Landowner/Operator: Spring Valley Farm

Job Location: R10W T2S

County Tillamook SWCD Tillamook Tract No. T133 & T168

Prepared By: M. French Date 03/05

Operation and Maintenance Items

A properly operated and maintained manure pump is an asset to your farm. The manure pump was designed to transfer the liquid waste to the pasture and haylands for application. The estimated life span of this installation is at least 10 years. The life of the manure pump can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. A good operation and maintenance plan includes:

- ⇒ Preventive maintenance will be in accordance with the manufacturer's recommendations.
- ⇒ Periodically examine the pump for proper operation. Clean debris from the propeller, and promptly replace any defective or damaged parts.
- ⇒ Periodically clean and oil as needed to increase the life expectancy of the pump.
- ⇒ Immediately repair any vandalism or livestock damage. Do not allow livestock near equipment during operation.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

**WASTE STORAGE FACILITY (SOLID MANURE STORAGE FACILITY)
CODE 313**

For: Landowner/Operator Spring Valley Farm

Job Location R10W T2S

County Tillamook SWCD Tillamook

Farm/Tract No. T133 & T168

Prepared By M. French Date 03/05

80' x 36' x 8'

Operation and Maintenance Items

A properly operated and maintained waste storage structure is an asset to your farm. This waste storage structure was designed and installed for temporary storage of animal wastes. The estimated life span of this installation is at least 10 years. If at any time a structure is taken out of service, the Natural Resources Division of the Oregon Department of Agriculture should be contacted for guidance in decommissioning the structure to avoid environmental concerns. The life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. A good operation and maintenance plan includes:

- ⇒ Do not allow equipment that exceeds the design loading to operate within 20 feet of the structure
- ⇒ Immediately repair any vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances.
- ⇒ Storage facility will be empty by October 1st to begin winter storage.
- ⇒ During de-watering of the structure, ensure that waste is spread at minimum rates in areas where crops are grown, spread waste no closer than 50 feet from open watercourses during the winter months and apply no manure within 35 feet of an open watercourse during the summer months. Avoid applying waste during heavy rainfall events.
- ⇒ Roofs of the solid manure storage facilities will be inspected annually.
- ⇒ All roof sections that are rusted and leaking will be repaired and/or replaced.
- ⇒ Loose roof sections on the solid manure storage facilities will be secured.
- ⇒ Broken trusses, beams, poles, gutters and downspouts will be repaired or replaced on the solid waste storage facilities.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

**OPERATION AND MAINTENANCE WORKSHEET
ROOF RUNOFF MANAGEMENT**

CODE 558

For: Landowner/Operator Spring Valley Farm

Job Location: R10W T2S

County Tillamook SWCD Tillamook

Farm/Tract No. T133 & T168

Prepared By M. French Date 03/05

Gutters and Downspouts

Operation and Maintenance Items

Properly operated and maintained roof runoff facilities are an asset to the farm. Roof runoff facilities were designed and installed to control roof runoff. Estimated life span of this installation is at least 10 years. Facility life can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require periodic maintenance and may require operational items to maintain satisfactory performance. A good operation and maintenance plan includes:

- ⇒ Perform weekly inspections of gutters, downspouts and above ground pipelines, and appurtenances for proper operation. Repair or replace if needed.
- ⇒ Periodically remove debris from gutters, downspouts and outlet facilities.
- ⇒ Protect downspouts from damage by livestock and equipment. Repair or replace damaged components as needed.
- ⇒ Keep gutters, downspouts, conveyance pipelines and ditches and appurtenances in good operating condition.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
Operation and Maintenance Worksheet

WATERING FACILITY
Code 614

Landowner/Operator Spring Valley Farm

Job Location: R10W T2S

County Tillamook SWCD Tillamook Farm/Tract No. T133 & T168

Prepared By: M. French Date 03/05

Operation and Maintenance Items

Properly operated and maintained water troughs and tanks are an asset to the farm. This practice was designed and installed to provide a source of water to the grazing units so livestock do not need access to open watercourse for drinking water. Practice will prevent pollution and prevent streambank erosion and riparian habitat damage due to livestock access. The estimated life span of this installation is at least 10 years. The life of the practice can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require periodic maintenance and may require operational items to maintain satisfactory performance. A good operation and maintenance plan includes:

- ⇒ Check all above ground connections, valves, gates, rodent guards, inlets and outlets to make sure they are functioning properly. Check troughs and tanks for leaks or cracks and repair or replace.
- ⇒ Make certain the area adjacent to the trough is well protected with gravel, paving, or good cover. Be sure that the outlet pipe has a free outlet and is not causing any serious erosion problems.
- ⇒ Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization and application of herbicides when necessary. Periodical mowing may also be needed to control growth.
- ⇒ Check periodically to see if debris has fallen into the troughs and tanks which may restrict inflow or planned function of the outflow system.
- ⇒ Clean the entire system periodically and remove moss, algae growth, and/or sludge. Chemicals such as copper sulfate and chlorine can be used to prevent moss and algae growth. Local rules and regulations are to be followed when using chemicals to make sure they are safe for animals.
- ⇒ Maintain, when necessary, coverings and insulation to prevent damage by freezing.
- ⇒ Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.
- ⇒ Immediately repair any vandalism, vehicular, or livestock damage to inlets, outlets, valves, and other appurtenances.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

**SUBSURFACE DRAINAGE
CODE 606**

For: Landowner/Operator Spring Valley Farm

Job Location: R10W T2S

County Tillamook SWCD Tillamook

Farm/Tract No. T133 & T168

Prepared By M. French

Date 03/05

Operation and Maintenance Items

Properly operated and maintain subsurface drainage system is an asset to the farm. The drainage system was designed and installed to remove excess subsurface water with a system of buried conduits. The estimated life span of this installation is at least 10 years. The life of the practice can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require periodic maintenance and may require operational items to maintain satisfactory performance. A good operation and maintenance plan includes:

- ⇒ Maintain the designed depth of cover. All settlement or cracks in the soil should be investigated to determine the cause and immediately repaired.
- ⇒ Avoid travel by heavy equipment over drain-lines when the soil is saturated except at designated crossings. Avoid travel over pipelines by tillage equipment when the soil is saturated. Limit traffic to sections that were designed for traffic loads.
- ⇒ Remove all foreign debris and trash that hinders system operation.
- ⇒ Immediately remove any obstructions or blockage of, trash racks, drain inlets or drain outlets.
- ⇒ Maintain all outlets, rodent guards, inlets and access man-holes in good operating condition.
- ⇒ Eradicate or otherwise remove all rodents and/or burrowing animals that have or can potentially damage any part of the system. Immediately repair any damage caused by their activity.
- ⇒ Immediately repair any vandalism, vehicular or livestock damage to any outlets and appurtenances.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

FORAGE HARVEST MANAGEMENT

CODE 511

For: Landowner/Operator: Spring Valley Farm

Job Location: R10W T2S

County Tillamook SWCD Tillamook

Farm/Tract No. T133 & T168

Prepared By M. French

Date 03/05

Operation and Maintenance Items

Forage Harvest Management can provide economic and resource benefits. If applied properly, is an assets to the dairy operation. Forage Harvest Management requires certain operational procedures to be followed and evaluated on an annual basis.

- ⇒ Before forage harvest, clear fields of debris that could damage machinery, or if ingested by livestock, lead to sickness (for example, hardware disease) or death.
- ⇒ Monitor weather conditions and take action accordingly before and after cutting to optimize forage wilting or cutting time to preserve feed quality and prevent forage swaths or windrows from smothering underlying plants.
- ⇒ Inspect and repair harvesting equipment following manufacturer's preventive maintenance procedures.
- ⇒ All shields shall be in place during machine operation to prevent injury or death. Shut off machinery before working or unplugging moving parts.
- ⇒ Select equipment sizes and capabilities that will in a timely and economically feasible manner handle the acreage normally harvested.
- ⇒ Operate all forage harvesting equipment at the optimum setting and speeds to minimize loss of leaves.
- ⇒ Set shear-plate on forage chopper to the proper theoretical cut for the crop being harvested. Keep knives well sharpened. Do not use re-cutters or screens unless forage moisture levels fall below recommended levels for optimum chopping action.
- ⇒ Regardless of silage/haylage storage method, ensure good compaction and an air-tight seal to exclude oxygen and mold formation.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

**WASTE UTILIZATION
CODE 633**

For: Landowner/Operator Spring Valley Farm

Job Location: R10W T2S

County Tillamook SWCD Tillamook

Farm/Tract No. T133 & T168

Prepared By M. French Date 03/05

Operation and Maintenance Items

Waste Utilization can provide economic and resource benefits if applied properly which are assets to the dairy operation. Proper waste utilization requires certain operational procedures to be followed and evaluated on an annual basis.

- ⇒ Manure application equipment is calibrated at least once per year to ensure uniform distribution and accurate application rates.
- ⇒ Records are maintained of manure applications.
- ⇒ Manure application equipment is cleaned up and residual material from the equipment is disposed of properly and in a place where surface runoff does not occur.
- ⇒ Nutrient management plans are reviewed annually and adjustments are made as needed.
- ⇒ Unnecessary exposure to manure is avoided. Protective clothing is worn when necessary.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

STREAM HABITAT IMPROVEMENT AND MANAGEMENT

CODE 395

For: Landowner/Operator Spring Valley Farm

Job Location: R10W T2S

County Tillamook SWCD Tillamook

Farm/Tract No. T133 & T168

Prepared By M. French Date 03/05

Operation and Maintenance Items

A properly operated and maintained stream habitat and management structure is an asset to your farm. The structure was designed and installed to improve in stream fish habitat. The structure will reduce downstream sedimentation and improve fish spawning and rearing areas. The estimated life span of this practice is at least 10 years. The life of this practice can be assured and usually increased by developing and carrying out a good operation and maintenance program

This practice will require you to perform periodic maintenance and may also require operation items to maintain satisfactory performance. Some recommendations to assist you develop a good operation and maintenance program:

- ⇒ Check annually the large woody debris structure for damage.
- ⇒ Maintain a vigorous growth of streambank vegetation adjacent to the large woody debris.
- ⇒ Maintain the fences to prevent unauthorized or livestock entry.
- ⇒ Remove debris that accumulates in the large woody debris structure area and immediately upstream or downstream of the structures.
- ⇒ Eradicate all rodents or burrowing animals. Immediately repair any damages caused by their activity.
- ⇒ Determine cause of any structural failure and take appropriate actions to prevent further loss of the structure.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

TREE/SHRUB ESTABLISHMENT

CODE 612

For: Landowner/Operator Spring Valley Farm

Job Location: R10W T2S

County Tillamook SWCD Tillamook

Farm/Tract No. T133 & T168

Prepared By M. French Date 03/05

Operation and Maintenance Items

A properly operated and maintained riparian zone is an asset to your farm. This riparian was designed and installed to remove sediment and pollutants from runoff and improve the wildlife habitat benefits. The estimated life span of this practice is at least 20 years. The life of this practice can be assured and usually increased by developing and carrying out a good operation and maintenance program

This practice will require you to perform periodic maintenance and may also require operation items to maintain satisfactory performance. Some recommendations to assist you develop a good operation and maintenance program:

- ⇒ Replace all dead trees or shrubs the following planting season.
- ⇒ Determine cause of planting failure and take appropriate actions to prevent further loss of seedlings or cuttings.
- ⇒ Perform regular inspections to check for animal, insect or disease damage. Seek professional assistance to implement damage control measures.
- ⇒ Inspect at least annually, tree tubes and stakes making repairs as needed. Adjust any tubes to protect new leader growth.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

UPLAND WILDLIFE HABITAT MANAGEMENT

CODE 645

For: Landowner/Operator Spring Valley Farm

Job Location: R10W T2S

County Tillamook SWCD Tillamook Farm/Tract No T133 & T168

Prepared By M. French Date 03/05

Operation and Maintenance Items

A properly operated and maintained riparian zone is an asset to your farm. This Upland Wildlife Habitat Management is designed to improve and diversify the wildlife habitat benefits. The estimated life span of this practice is at least 20 years. The life of this practice can be assured and usually increased by developing and carrying out a good operation and maintenance program

This practice will require you to perform periodic maintenance and may also require operation items to maintain satisfactory performance. Some recommendations to assist you develop a good operation and maintenance program:

- ⇒ Replace all dead trees or shrubs the following planting season.
- ⇒ Perform regular inspections to check for animal, insect or disease damage. Seek professional assistance to implement damage control measures.
- ⇒ Biological control of pest is encouraged.
- ⇒ Exclude livestock from the area.
- ⇒ Maintain the fence.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

WETLAND WILDLIFE HABITAT MANAGEMENT JOB SHEET

CODE 644

Landowner/Operator: Spring Valley Farm

Job Location: R10W T2S

County: Tillamook SWCD: Tillamook

Farm/Tract No. T-133 & T-166

Prepared By M. French

Date 03/05

- ⇒ **Purpose: To improve and maintain riparian habitat diversity for fish, waterfowl and wetland flora and fauna associated with wetlands.**

Specifications:

- ⇒ The native plant species will be maintained. Native willows, conifers, and hardwoods will be planted to improve the riparian area.
- ⇒ The sloughs will be fenced to exclude livestock from the riparian and slough areas..
- ⇒ Dead and dying woody plant species should be preserved for their habitat values.
- ⇒ Dead and dying woody plant species from a restoration project will be replaced with new vegetation when required by a restoration plan.
- ⇒ Noxious weeds such as Tansy Ragwort and Canada Thistle are controlled in accordance with an Integrated Pesticide Management Plan. Weeds will be controlled by pulling, cutting with brush tools, and or by biological control.
- ⇒ Manure will not be applied to the areas.
- ⇒ Landowner will obtain the required permits to install the practice required to improve and maintain the area as a wetland wildlife habitat area.

NRCS, OR

A & L WESTERN AGRICULTURAL LABORATORIES

REPORT NUMBER
05-075-057

PORTLAND OFFICE • 503-968-9225
10220 S.W. Nimbus Ave., Bldg. K-9 • Portland, OR 97223
Client No: 99999

SEND

TO: MARY FRENCH
1029 SW CHARLEMAGNE PL
CORVALLIS, OR 97330

GROWER:

SPRING VALLEY FARMS

SUBMITTED BY:



GRAPHICAL SOIL ANALYSIS REPORT

DATE OF REPORT: 03/23/2005 LAB NO: 59427 SAMPLE ID: T133 PAGE: 1

RATING	ORGANIC MATTER %	NITROGEN NO ₃ -N ppm	PHOSPHORUS WEAK BRAY ppm	PHOSPHORUS NaHCO ₃ -P ppm	POTASSIUM K ppm	MAGNESIUM Mg ppm	CALCIUM Ca ppm	SODIUM Na ppm	SULFUR SO ₄ -S ppm	ZINC Zn ppm	MANGANESE Mn ppm	IRON Fe ppm	COPPER Cu ppm	BORON B ppm	PERCENT CATION SATURATION (comp)				
															POTASSIUM K %	MAGNESIUM Mg %	CALCIUM Ca %	SODIUM Na %	
VERY HIGH																100			
MEDIUM																50			
LOW																0			
VERY LOW																			
TEST RESULTS	15.0	6	25	36	387	418	1200	31	12							6.5	22.5	39.2	0.9

LOW AVERAGE HIGH

ECe dS/m

CEC meq/100g

EX. LIME

pH

BUFFER pH: 5.1

CROP:

SOIL FERTILITY GUIDELINES

DOLOMITE (100 score)	LIME (100 score)	GYPSON	ELEMENTAL SULFUR	NITROGEN N	PHOSPHATE P ₂ O ₅	POTASH K ₂ O	MAGNESIUM Mg	SULFUR SO ₄ -S	ZINC Zn	MANGANESE Mn	IRON Fe	COPPER Cu	BORON B	REFER TO BACK

COMMENTS

Can for
DARCY PEEBLES, CCA

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PHOSPHORUS LOSS RATING							Weighted Rating Value	
TRANSPORT FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned
Soil Erosion - tons/ac/yr (RUSLE)	1.50	< 1 (0)	1 - 3 (1.5)	4 - 6 (3.0)	7 - 15 (6.0)	> 15 (12.0)	0	0
Soil Erosion from Sprinkler Irrigation	0.75	No sprinkler Irrigation (0)	Application rate < Infiltration rate OR No visible runoff at field borders (0.75)	Application rate = Infiltration rate OR Little to no visible runoff at field borders (1.5)	Application rate > Infiltration rate OR Visible runoff at field borders (3.0)	Application rate > Infiltration rate OR Excessive runoff visible at field borders. Rills and gullies present. (6.0)	0	0
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	1.0	1.0
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	.75	.75
Distance to Perennial Surface Waters / Buffer Widths	0.75	> 500 feet OR buffer > 30 ft. wide (or meets NRCS standards) next to surface waters (0)	300 - 500 feet OR buffer 20 - 30 ft. wide next to surface waters (0.75)	200 - 299 feet OR buffer 10 - 19 ft. wide next to surface waters (1.5)	100 - 199 feet AND buffer < 10 ft. wide next to surface waters (3.0)	< 100 feet AND No buffer next to surface waters (6.0)	0	0
Subsurface Drainage	0.50	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141 - 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)	.5	.5
Transport Factors Subtotal (TFS)							2.25	2.25

A & L WESTERN AGRICULTURAL LABORATORIES

REPORT NUMBER
05-075-067

PORTLAND OFFICE • 503-968-9225
10220 S.W. Nimbus Ave., Bldg. K-9 • Portland, OR 97223
Client No: 99999

SEND

TO: MARY FRENCH
1029 SW CHARLEMAGNE PL
CORVALLIS, OR 97330-

GROWER:

SPRING VALLEY FARMS

SUBMITTED BY:



GRAPHICAL SOIL ANALYSIS REPORT

DATE OF REPORT: 03/23/2005 LAB NO: 59428

SAMPLE ID:

T158

PAGE: 2

RATING	PERCENT CATION SATURATION (comp)									
	POTASSIUM K %	MAGNESIUM Mg %	CALCIUM Ca %	SODIUM Na %	POTASSIUM K %	MAGNESIUM Mg %	CALCIUM Ca %	SODIUM Na %	POTASSIUM K %	MAGNESIUM Mg %
VERY HIGH	100	100	100	100	100	100	100	100	100	100
MEDIUM	50	50	50	50	50	50	50	50	50	50
LOW	0	0	0	0	0	0	0	0	0	0
VERY LOW	0	0	0	0	0	0	0	0	0	0
TEST RESULTS	14.6	6	43	80	367	467	1196	25	13	5.4

LOW AVERAGE HIGH

ECe dS/m INCREASING SALINITY →

NaHCO₃-P unreliable at this soil pH

CEC meq/100g 17.5

EX. LIME

5.1 pH

ACIDIC BASIC

INCREASING NEED FOR LIME

BUFFER pH: 5.0

RATE:

SOIL FERTILITY GUIDELINES

DOLOMITE (100 score)	LIME (100 score)	GYP SUM	ELEMENTAL SULFUR	NITROGEN N	PHOSPHATE P ₂ O ₅	POTASH K ₂ O	MAGNESIUM Mg	SULFUR SO ₄ -S	ZINC Zn	MANGANESE Mn	IRON Fe	COPPER Cu	BORON B	REFER TO BACK

COMMENTS

Can for
DARCY PEEBLES, CCA

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PHOSPHORUS LOSS RATING							Weighted Rating Value	
TRANSPORT FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned
Soil Erosion – tons/ac/yr (RUSLE)	1.50	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)	0	0
Soil Erosion from Sprinkler Irrigation	0.75	No sprinkler Irrigation (0)	Application rate < Infiltration rate OR No visible runoff at field borders (0.75)	Application rate = Infiltration rate OR Little to no visible runoff at field borders (1.5)	Application rate > Infiltration rate OR Visible runoff at field borders (3.0)	Application rate > Infiltration rate OR Excessive runoff visible at field borders. Rills and gullies present. (6.0)	0	0
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	1.0	1.0
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	.75	.75
Distance to Perennial Surface Waters / Buffer Widths	0.75	> 500 feet OR buffer > 30 ft. wide (or meets NRCS standards) next to surface waters (0)	300 – 500 feet OR buffer 20 - 30 ft. wide next to surface waters (0.75)	200 – 299 feet OR buffer 10 -19 ft. wide next to surface waters (1.5)	100 – 199 feet AND buffer < 10 ft. wide next to surface waters (3.0)	< 100 feet AND No buffer next to surface waters (6.0)	0	0
Subsurface Drainage	0.50	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141- 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)	.5	.5
Transport Factors Subtotal (TFS)							2.25	2.25

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

Type of Animal	Number of Animals	Average Weight (lbs.)	Animal Units (1,000 lbs.)	Milk Production in Pounds/Cow/Day=									
				Nutrient Production						65			
				(lbs./day/1000 lb. Animal Unit)						(lbs./day)			
				N	P	K	N	P	K				
MILKER	▼	80	1,300	104.0	0.55	0.09	0.31	57.46	9.55	32.09	Manure CF/D/AU	Days Confined	Days Grazed
MILKER (DRY)	▼	10	1,300	13.0	0.36	0.05	0.23	4.68	0.65	2.99	1.52	188	177
HEIFERS (12-24 Months)	▼	30	800	24.0	0.31	0.04	0.24	7.44	0.96	5.76	1.10	151	214
CALVES (1-12 Months)	▼	28	400	11.2	0.31	0.04	0.24	3.47	0.45	2.69	1.30	151	214
	▼										1.30	365	0
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Type of Animal	Percent of Month and Number of Animals Grazing												
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AU-YR.
MILKUR	83%	0%	0%	0%	0%	0%	82%	83%	83%	83%	83%	83%	
	80	80	80	80	80	80	80	80	80	80	80	80	603
MILKER (DRY)	100%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	
	10	10	10	10	10	10	10	10	10	10	10	10	91
HEIFERS (12-24 Months)	100%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	
	30	30	30	30	30	30	30	30	30	30	30	30	168
CALVES (1-12 Months)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	28	28	28	28	28	28	28	28	28	28	28	28	0
													0
													0
													0
													0
													0
													0
													0
Total AUM's Available>	99						102	102	102	101	101	101	708
Total AUM's Needed>>>	123	0	0	0	0	0	122	123	123	123	123	123	862
Total AUM's >>>>>>>>>>>>	-24	0	0	0	0	0	-20	-21	-21	-22	-22	-22	-154

CLIENT: Spring Valley Farms

ASSISTED BY: M. French

CHECKED BY:

Version: 1.0

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

BEDDING VOLUME

Type of Animal	Type of Bedding Facility	Bedding Material	Unit Weight Lbs/CF	Amount Needed Lbs/Day/AU	Volume CF/Day/AU	Total Volume CF/Day	Total Weight Lbs/Day
MILKER	Free Stall	Chopped Straw	7.00	2.70	0.39	40	281
MILKER (DRY)	Free Stall	Chopped Straw	7.00	2.70	0.39	5	35
HEIFERS (12-24 Months)	Free Stall	Chopped Straw	7.00	2.70	0.39	9	65
CALVES (1-12 Months)	Loose Housing	Chopped Straw	7.00	11.00	1.57	18	123

SOLIDS SEPARATION FACTOR

Type of Animal	Type of Separator	Separation Factor %	Volume of Solids Separated CF/Day	Volume of Solids in Liquids CF/Day	Volume of Manure in Liquids CF/Day	Volume of Manure in Solids CF/Day	Accumulated Sludge in Storage CF/Day	Density of Separated Solids Lbs/CF	Weight of Separated Solids Lbs/Day
MILKER	Dry Scrape System	65%	129	69	55	103	37	36	4,634
MILKER (DRY)	Dry Scrape System	65%	13	7	5	9	2	36	452
HEIFERS (12-24 Months)	Dry Scrape System	65%	26	14	11	20	4	36	947
CALVES (1-12 Months)	Dry Scrape System	100%	32	0	0	15	0	36	1,158
Total Solids			200	90	71	147	42		7,191

CLIENT: Spring Valley Farms
ASSISTED BY: M. French

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY NUTRIENT PRODUCTION

Month	Pounds of Nutrients from LIQUIDS				Pounds of Nutrients from SOLIDS				Pounds of Nutrients from GRAZING				Pounds of Nutrients going OFF-FARM				Total Pounds of Nutrients from ALL SOURCES			
	N	P2O5	K2O		N	P2O5	K2O		N	P2O5	K2O		N	P2O5	K2O		N	P2O5	K2O	
October	106	40	71		304	107	233		1,854	677	1,322		0	0	0		2,265	824	1,626	
November	731	268	517		1,461	529	1,057		0	0	0		0	0	0		2,192	798	1,573	
December	755	277	534		1,510	547	1,092		0	0	0		0	0	0		2,265	824	1,626	
January	755	277	534		1,510	547	1,092		0	0	0		0	0	0		2,265	824	1,626	
February	682	250	482		1,364	494	986		0	0	0		0	0	0		2,046	744	1,469	
March	755	277	534		1,510	547	1,092		0	0	0		0	0	0		2,265	824	1,626	
April	109	41	73		306	108	233		1,777	649	1,267		0	0	0		2,192	798	1,573	
May	106	40	71		304	107	233		1,854	677	1,322		0	0	0		2,265	824	1,626	
June	103	39	69		295	103	225		1,794	655	1,279		0	0	0		2,192	798	1,573	
July	106	40	71		304	107	233		1,854	677	1,322		0	0	0		2,265	824	1,626	
August	106	40	71		304	107	233		1,854	677	1,322		0	0	0		2,265	824	1,626	
September	103	39	69		295	103	225		1,794	655	1,279		0	0	0		2,192	798	1,573	
Annual	4,415	1,632	3,097		9,467	3,405	6,934		12,783	4,668	9,112		0	0	0		26,665	9,704	19,143	

CLIENT: Spring Valley Farms
ASSISTED BY: M. French

Version 1.8

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

SOLIDS STACKING FACILITY

MONTHLY SOLIDS VOLUME STACKED IN FACILITY

Solids Storage Facility Parameters	Value	Month	Number of Days	Manure CF	Bedding CF	Solids to Store CF	Normal Runoff CF
Storage Period, Days=	144	October	31	992	683	1,003	0
Stacking Width, W in Feet=	36	November	30	4404	1,589	2,996	0
Stacking Height, H in Feet=	8.00	December	31	4551	1,641	3,096	0
Wall Height, h in Feet=	6.00	January	31	4551	1,641	3,096	0
Stack Side Slope (X:1)=	1.00	February	28	4110	1,483	2,796	0
Existing Storage, Cubic Feet=	0	March	31	4551	1,641	3,096	0
Surface Area of Existing Storage, SF=	0	April	30	991	669	830	0
25 Year-24 Hour Storm Runoff, CF=	0	May	31	992	683	838	0
Volume Needed, Cubic Feet=	21,382	June	30	960	661	811	0
Design Volume, Cubic Feet=	21,530	July	31	992	683	838	0
Is Facility Covered? YES	▼	August	31	992	683	838	0
		September	30	960	661	811	0
		Annual	365	29,047	12,718	21,048	0

Width, W = 36 Feet

Storage Period = 144 Days

Volume of Solids to Store = 21382 Cubic Feet

Stack Height, H = 8 Feet

Wall Height, h = 6 Feet

Length, L = 80 Feet

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TANK WAGON APPLICATION OF LIQUIDS

593,362 gallons of liquids generated from the operation it will take approximately 270 trips annually. Based on applying NITROGEN, N at agronomic rates use the application depths, travel lengths, and loads per acre listed below for each crop.												
Field Number	Acres	Crop	Tank Wagon Capacity Gallons	Spread Width Feet	NITROGEN, N Concentration in Storage Facility		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Inches of Liquids to Apply	Travel Length per Load Needed in Feet	Loads per Acre	
					PPM	Lbs/1000Gal						
T-133 1-7	40.3	Hay/Pasture Mix 16 % Protein	2,200	30	869	7.25	307	1.00	0.70	168	8.7	
T-168 1-5	52	Hay/Pasture Mix 16 % Protein	2,200	30	869	7.25	307	1.00	0.70	168	8.7	
0												
0												
0												
0												
0												
0												
0												
0												

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

PERCENT OF MANURE TO BE APPLIED TO FIELD AND UTILIZATION ACRES NEEDED BASED ON

Field Number	Acres	Crop	LIQUIDS			SOLIDS			GRAZING		
			Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients
T-133 1-7	40.3	Hay/Pasture Mix 16 % Protein	50%	795	3	42%	1,252	4	60%	4,142	13
T-168 1-5	52.0	Hay/Pasture Mix 16 % Protein	50%	795	3	50%	1,491	5	40%	2,761	9
0											
0											
0											
0											
0											
0											
Off-Farm	50.0		0%	0		8%	239		0%	0	
			100%	1,589	5	100%	2,982	9	100%	6,903	22
TOTALS-											

NUTRIENT BALANCE BASED ON AVAILABLE ACRES

Field Number	Acres	Crop	NUTRIENTS APPLIED			NUTRIENTS REMOVED			NUTRIENT BALANCE		
			Nitrogen, N Lbs/Acre	Phosphorous, P ₂ O ₅ Lbs/Acre	Potassium, K ₂ O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorous, P ₂ O ₅ Lbs/Acre	Potassium, K ₂ O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorous, P ₂ O ₅ Lbs/Acre	Potassium, K ₂ O Lbs/Acre
T-133 1-7	40.3	Hay/Pasture Mix 16 % Protein	154	120	235	307	85	235	-154	34	0
T-168 1-5	52.0	Hay/Pasture Mix 16 % Protein	97	79	157	307	85	235	-210	-6	-78
0											
0											
0											
0											
0											
0											
Off-Farm											

Pounds of Nitrogen to be applied

LIQUID - 1934
SOLIDS - 3628
GRAZING - 8349

Pounds of Nitrogen to be removed

40.3 acres x 307 lbs N/acre = 12372
52.0 acres x 307 lbs N/acre = 15964
28336

13961 # of N to be applied

13961 - 28,336 = -14375 #N balance (no expectation)

ASSISTED BY: Kathryn Higgs

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

Type of Animal	Number of Animals	Average Weight (lbs.)	Animal Units (1,000 lb.)	Milk Production in Pounds/Cow/Day=									
				Nutrient Production							6.5		
				(lbs./day/1000 lb. Animal Unit)				(lbs./day)					
				N	P	K	N	P	K				
MILKER	▼	85	1,300	110.5	0.55	0.09	0.31	61.05	10.14	34.09	1.52	188	177
MILKER (DRY)	▼	15	1,300	19.5	0.36	0.05	0.23	7.02	0.98	4.49	1.10	151	214
HEIFERS (12-24 Months)	▼	30	800	24.0	0.31	0.04	0.24	7.44	0.96	5.76	1.30	151	214
CALVES (1-12 Months)	▼	27	400	10.8	0.31	0.04	0.24	3.35	0.43	2.59	1.30	365	0
	▼												
	▼												
	▼												
	▼												
	▼												
Totals/Averages-		157	950	164.8	0.48	0.08	0.28	78.9	12.5	46.9	1.4		

Type of Animal	Percent of Month and Number of Animals Grazing												
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AU-YR.
MILKER	83%	0%	0%	0%	0%	0%	82%	83%	83%	83%	83%	83%	
	85	85	85	85	85	85	85	85	85	85	85	85	641
MILKER (DRY)	100%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	
	15	15	15	15	15	15	15	15	15	15	15	15	137
HEIFERS (12-24 Months)	100%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	
	30	30	30	30	30	30	30	30	30	30	30	30	168
CALVES (1-12 Months)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	27	27	27	27	27	27	27	27	27	27	27	27	0
													0
													0
													0
													0
													0
													0
Total AUM's Available>	99						102	102	102	101	101	101	708
Total AUM's Needed>>>	135	0	0	0	0	0	134	135	135	135	135	135	945
Total AUM's>>>>>>>>>>>>>>	-36	0	0	0	0	0	-32	-33	-33	-34	-34	-34	-237

* ORAWM prepared for permitted # of animals. ORAWM also includes no exportation. Sprin

Nutrients balance. ✓ LH

Page 1 of 3

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

[illegible][illegible]

CLIENT: Spring Valley Farm
 ASSISTED BY: Kathryn Higgs

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY NUTRIENT PRODUCTION

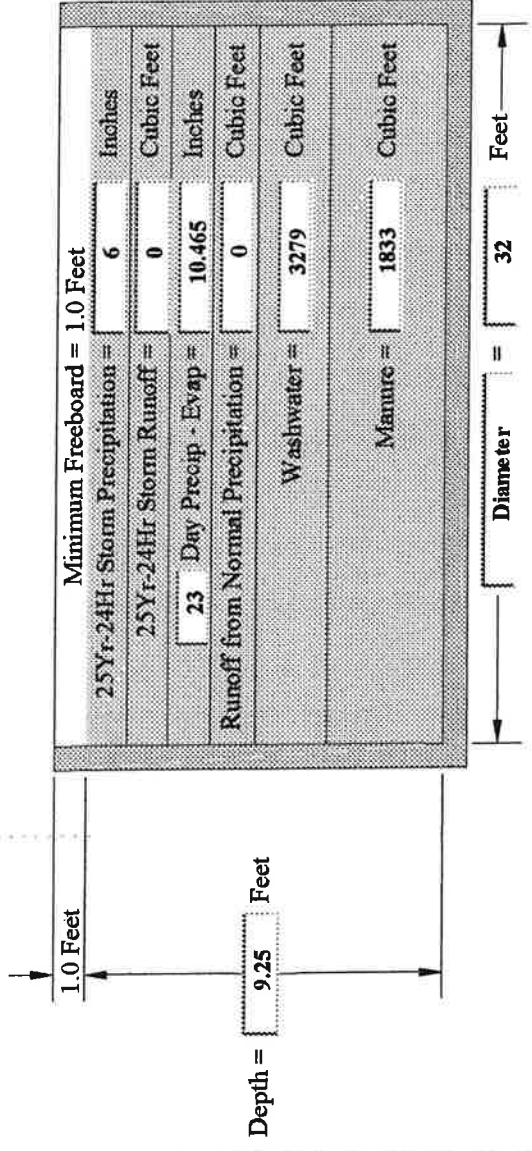
Month	Pounds of Nutrients from LIQUIDS				Pounds of Nutrients from SOLIDS				Pounds of Nutrients from GRAZING				Pounds of Nutrients going OFF-FARM				Total Pounds of Nutrients from ALL SOURCES			
	N	P ₂ O ₅	K ₂ O		N	P ₂ O ₅	K ₂ O		N	P ₂ O ₅	K ₂ O		N	P ₂ O ₅	K ₂ O		N	P ₂ O ₅	K ₂ O	
October	113	43	76		313	110	238		2,019	735	1,440		0	0	0		2,445	889	1,753	
November	793	291	561		1,573	569	1,136		0	0	0		0	0	0		2,366	860	1,696	
December	819	300	580		1,625	588	1,173		0	0	0		0	0	0		2,445	889	1,753	
January	819	300	580		1,625	588	1,173		0	0	0		0	0	0		2,445	889	1,753	
February	740	271	524		1,468	531	1,060		0	0	0		0	0	0		2,208	803	1,583	
March	819	300	580		1,625	588	1,173		0	0	0		0	0	0		2,445	889	1,753	
April	115	44	78		315	111	238		1,936	705	1,381		0	0	0		2,366	860	1,696	
May	113	43	76		313	110	238		2,019	735	1,440		0	0	0		2,445	889	1,753	
June	109	41	73		303	107	230		1,954	712	1,393		0	0	0		2,366	860	1,696	
July	113	43	76		313	110	238		2,019	735	1,440		0	0	0		2,445	889	1,753	
August	113	43	76		313	110	238		2,019	735	1,440		0	0	0		2,445	889	1,753	
September	109	41	73		303	107	230		1,954	712	1,393		0	0	0		2,366	860	1,696	
Annual	4,775	1,761	3,351		10,089	3,631	7,363		13,921	5,069	9,926		0	0	0		28,785	10,461	20,640	

CLIENT: Spring Valley Farm
ASSISTED BY: Kathryn Higgs

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

MONTHLY INFLOWS INTO TANK									
Tank Parameters	Value	Month	Number of days	Rain-Evap on Tank CF	Rain-Exap on Existing Storage, CF	Normal Runoff CF	Washwater CF	Manure CF	
Storage Period, Days=	23	October	31	0	0	0	4,277	310	
Tank Diameter, Feet=	32	November	30	0	0	0	4,139	2,315	
		December	31	0	0	0	4,277	2,392	
Existing Storage, Cubic Feet=	0.00	January	31	0	0	0	4,277	2,392	
Surface Area of Existing Storage, SF=	0	February	28	0	0	0	3,863	2,160	
25 Year-24 Hour Storm Runoff, CF=	0	March	31	0	0	0	4,277	2,392	
Volume Needed, Cubic Feet=	7,440	April	30	0	0	0	4,139	317	
Design Volume, Cubic Feet=	7,435	May	31	0	0	0	4,277	310	
Is Tank Covered? YES	▼	June	30	0	0	0	4,139	300	
Tank Dimensions? Circular	▼	July	31	0	0	0	4,277	310	
		August	31	0	0	0	4,277	310	
		September	30	0	0	0	4,139	300	
		Annual	365	0	0	0	50,358	13,805	



CLIENT: Spring Valley Farm
TED BY: Kathryn Higgs

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

CENT OF MANURE TO BE APPLIED TO FIELD AND UTILIZATION ACRES NEEDED BASED ON														NITROGEN, N								
														LIQUIDS			SOLIDS			GRAZING		
		Acres	Crop	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds to be Applied	Acres Needed for Utilization of Nutrients							
133	1-7	40.3	Hay/Pasture Mix 16 % Protein	50%	1,074	3	50%	1,986	6	50%	4,698	15										
168	1-5	52.0	Hay/Pasture Mix 16 % Protein	50%	1,074	3	50%	1,986	6	50%	4,698	15										
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'RIENT BALANCE BASED ON AVAILABLE ACRES[illegible]

Natural Resources Conservation Service, Oregon

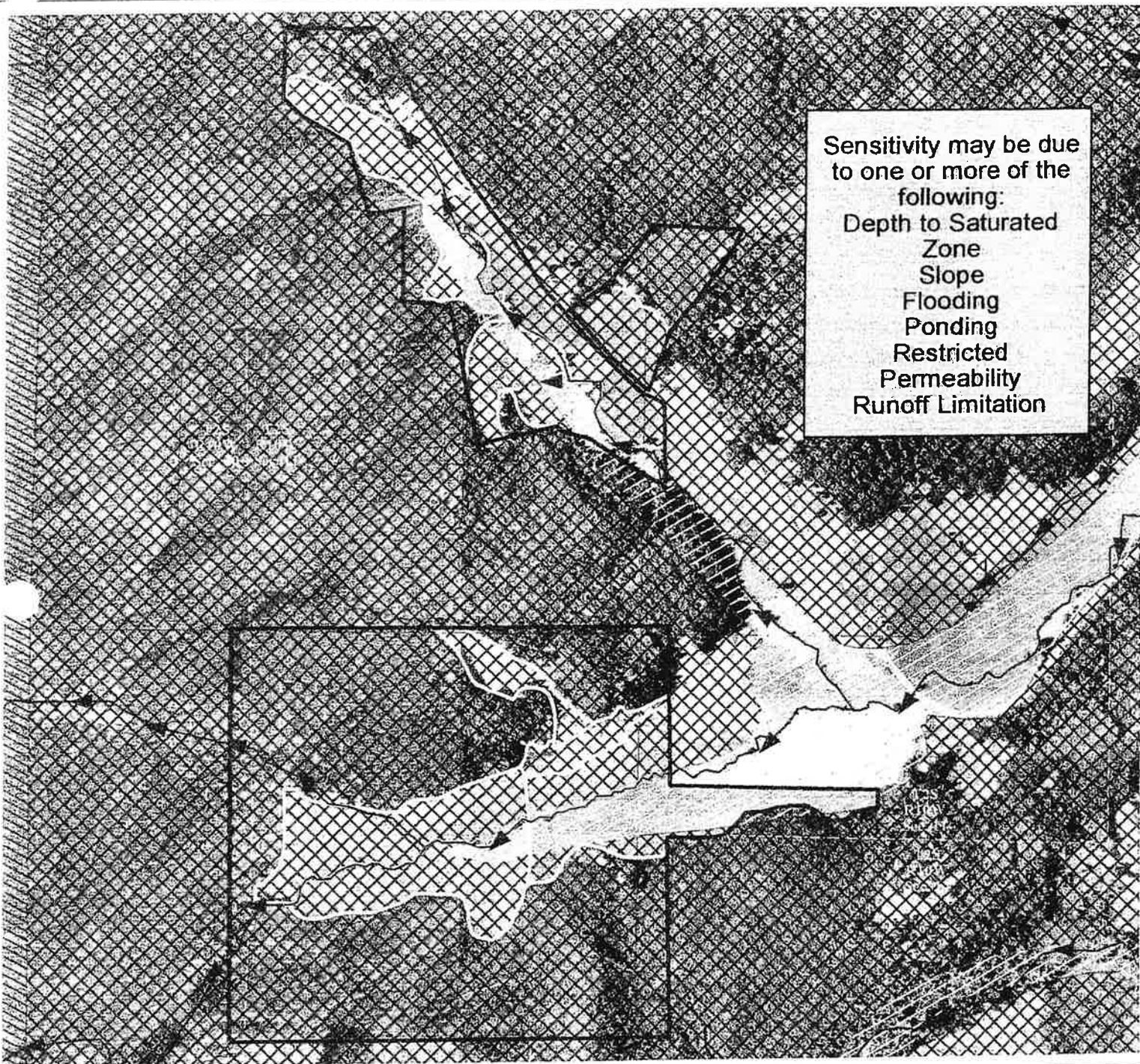
WASTE UTILIZATION SPECIFICATION SHEETClient Filbert JohnstonLocation: 325 Eckloff Road, Tillamook, Oregon 97141Tillamook County SWCD _____ Tract No. 133 & 168Prepared By M. FrenchDate 03/29/05**Perform the following operations:**

- ☐ Have your technical assistance provider review the resource management system plan for your operation at least once every 5 years.
- ☐ Maintain records for all waste applications that includes the amount of N&P applied during each application and records of exported manure/litter/processed waste. This information will be reported annually to ODA (This follows ODA requirements).
- ☐ Calibrate application equipment to apply wastes in accordance with the recommended amount and timing specified on the nutrient budget specification sheet, NRCS practice code 590, for the crop being grown.
- ☐ Chemical analysis of soils, plant tissue and waste should be used annually to monitor and adjust amounts of waste applied. Refer to Oregon State University Extension Service publication EC1478, "Soil Test Interpretation Guide" for guidance in getting soil tested and interpreting soil test results. Refer to Oregon State University Extension publication EM8585, "Manure Application Rates for Forage Production" and EM8768, "Calculating Dairy Manure Nutrient Application Rates" for guidance in getting animal waste tested for nutrient concentrations and computing application rates.
- ☐ Apply waste in a manner that will cover no more than 25 percent of the leaf surface with solids unless clean water applications are planned immediately after wastes are applied. For pasture/hayland it is best to apply waste 7 days after harvesting forage by haying or grazing.
- ☐ To reduce odor problems, apply waste in mid morning when temperatures are warming and air is rising rather than in the afternoon or evening when air is cooling and settling. Avoid applications during periods of fog.
- ☐ Do not apply waste directly into an open watercourse or where waste is likely to enter an open watercourse. Observe all waste application setbacks identified in the resource management system plan.
- ☐ Do not apply waste to fields where there is no growing crop. If applications are needed during fall and winter periods due to unforeseen circumstances, such as the storage facilities being full, use the following guidelines for waste applications:
 - a) Only spread waste on fields that are growing a crop, preferably grass.
 - b) Increase all waste application setbacks from open watercourses identified in the conservation Plan by 35 feet.
 - c) Don't apply waste during any rainfall event that will cause runoff.
 - d) Use maximum travel rates for the traveling big gun sprinkler and solids spreader.
 - e) Use soil tests, such as the Pre-side-dress Soil Nitrate test, to determine if additional applications of waste are needed on those fields receiving emergency winter applications.
- ☐ Do not apply waste to fields with frozen or snow covered soil conditions unless provisions are made to control runoff.
- ☐ Do not spread waste on fields where soils are saturated, ponded, flooded and/or during times when waste is likely to runoff into open watercourses.
- ☐ Be aware of the location of sensitive areas, concerns of neighbors or concerns of the public which require special application procedures
- ☐ Handle all waste material with caution. Wear appropriate protective clothing.
- ☐ Clean up residual materials from equipment and dispose of properly.
- ☐ Equipment used in waste utilization should be regularly inspected and maintained as needed in accordance with equipment operation and maintenance guidelines from the manufacturer or provided by NRCS.

Additional Guidance and Notes: Any discharge will be reported orally to ODA within 24hrs. Within 5 days a written statement describing this discharge will also be submitted to ODA. Annual CAFO permit reports will be submitted on time.

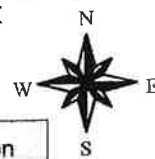
Tillamook County SWCD
Approx. Acres: 235.8
te: 09/02/2004

Flood Boundary Sensitive Manure Application Area



Sensitivity may be due to one or more of the following:
Depth to Saturated Zone
Slope
Flooding
Ponding
Restricted Permeability
Runoff Limitation

1000 0 1000 2000 3000 4000 Feet



Legend



Tract Boundary

Planned Land Units

Public Land Survey



Sensitive Manure Application Area (100 Yr. Flood Plain)

Undetermined Flood Plain



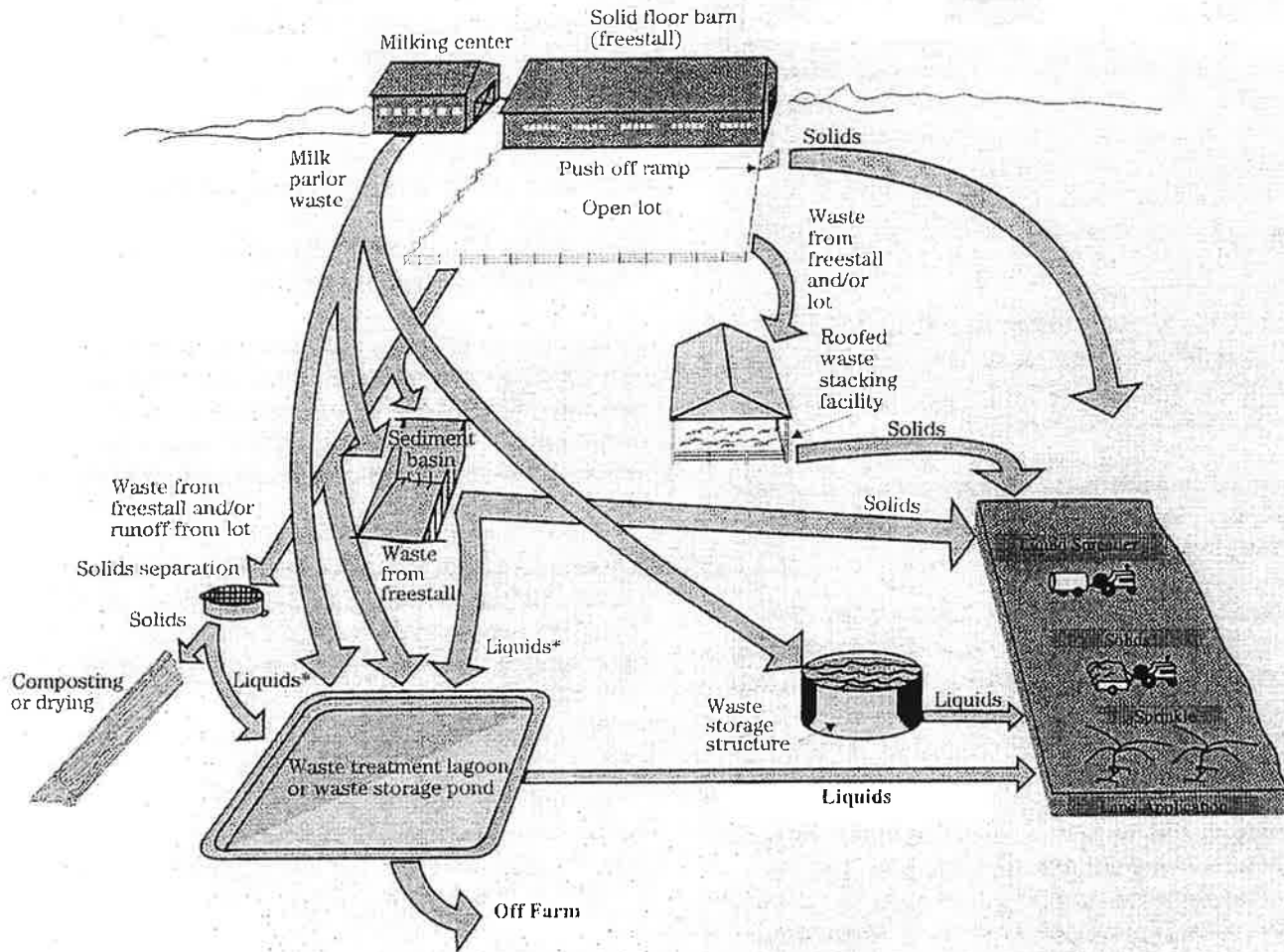
Winter Manure Application Area (Outside 500 Yr. Flood)



500 Yr. Flood Plain



Open Water Course



* Liquids from lot runoff discharged to waste storage pond only

Schematic of a Resource Management System for a Dairy

Operation and maintenance

Operation and maintenance activities shall include record keeping for 5 years or longer that includes the following:

- Quantity of manure and other agricultural wastes produced, and their nutrient content.
- Soil test results.
- Dates and rates of waste application where land applied, and the dates and amounts of waste removed from the system due to feeding, energy production, or export from the operation.
- Waste application methods.
- Crops grown and yields (both yield goals and measured yield).
- Other tests as needed, such as determining the nutrient content of the harvested product.

- Calibration of the application equipment.
- Changes in soil condition (SCI).
- Plan map showing fields where waste is applied.

Specifications

Site specific requirements for waste utilization are listed on specification sheets. Specifications are prepared in accordance with the NRCS Field Office Technical Guide. See NRCS practice standard, Waste Utilization, code 633. Use NRCS's Agricultural Waste Management Field Handbook or locally accepted references for procedures to calculate values such as residual nitrogen from past waste applications, and to estimate available nutrients in wastes where lab analyses are not available.

WASTE UTILIZATION WORKSHEET**Spreader Equipment Calibration**

(Using a Full Spreader Load)

Name: _____ Date: _____

Operator: _____ Spreader ID: _____

Perform the following operations to calibrate the solids spreader equipment:

- ✓ Determine the weight of the waste material loaded in the spreader by using truck scales to weigh the spreader equipment when it is empty and full.
- ✓ Spread the loaded spreader on the field using consistent speed and spreader settings to cover the field uniformly. Spread in a rectangular pattern so the area calculation will be simple. Record engine rpm and gear settings used.
- ✓ Measure the length and width covered by the full load and compute the application rate in tons per acre using this worksheet.

Data and Calculations:

ID of Calibration Test**Steps****A****B****C****D****E****F**

1. Date of calibration test-

2. Engine RPM during spreading -

3. Gear selected during spreading -

4. Weight of empty spreader (lb) =

5. Weight of loaded spreader (lb) =

6. Weight of Waste in spreader (lb) -
line 5 - line 4 =

7. Length of spreading area (ft) =

8. Width of spreading area (ft) =

9. Area spread (sq ft) -
line 7 x line 8 =10. Waste applied (lb/sq ft) -
line 6 ÷ line 9 =11. Convert to tons per acre -
Line 10 x 21.78 =12. Average Application Rate (tons per
acre) - Sum of values in cells A11
through F11 divided by the total
number of calibrations completed =

Additional Notes:

WASTE UTILIZATION WORKSHEET**Traveling Big Gun Sprinkler Calibration****(Using Catch Cans)**

Name: _____ Date: _____

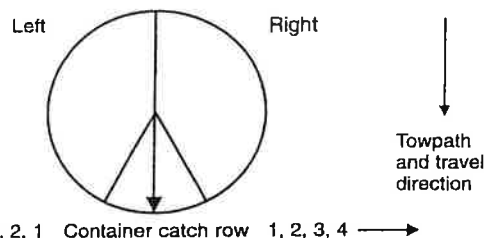
Perform the following operations to calibrate the traveling big gun sprinkler:

- ✓ Use 5 to 10 catch cans to collect the sprinkler-irrigated waste. Use straight-sided buckets for catch cans. Two pound coffee cans work well. Make sure all of the catch cans have the same diameter.
- ✓ Place one of the catch cans on a level surface and fill it with water to a known depth (1-3 inches). Pour the water from the catch can into a large measuring cup. Determine how many measuring cups of water are equal to an inch of water in the catch can.
- ✓ Place at least five catch cans across the towpath of the big gun sprinkler. Try to space the catch cans uniformly from the center of the towpath to the outer edge of the wetted area of the sprinkler. Stake the catch can in place or put a rock in the bottom of the catch can to keep it upright. Allow the traveling big gun sprinkler to completely pass over the catch cans. Use the measuring cup previously used to calibrate the catch cans to measure the amount of liquid collected in each can and convert the volume to inches. Be sure to add together the amount measured from the catch cans that would receive overlap from the adjacent towpath. For example, if catch can #4 will receive liquids from the adjacent towpaths, add the amount from container #4 on the left to container #4 on the right side to compute the total amount applied at the location of container #4 on the right and left sides of the towpath.

Catch Can Calibration:

Example: 1 inch = 5 Cups
 1 cup = 0.2 Inches

Your Catch Cans: 1 inch = _____ Cups
 1 cup = _____ Inches

**Travel Rate Setting During Test:**

Data and Calculations:

Catch Can ID	Volume of Liquid							
	Cups	Inches	Cups	Inches	Cups	Inches	Cups	Inches
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
Average =								

WASTE UTILIZATION WORKSHEET**Phosphorus Based Waste Application**

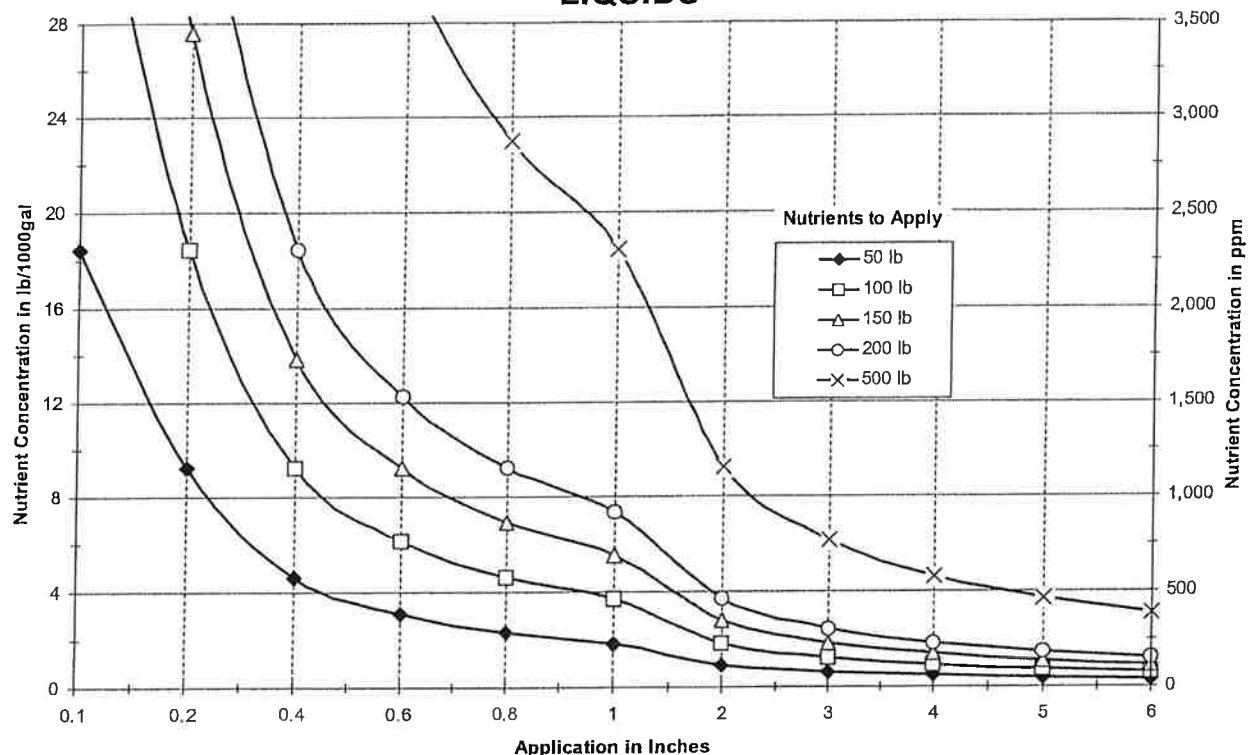
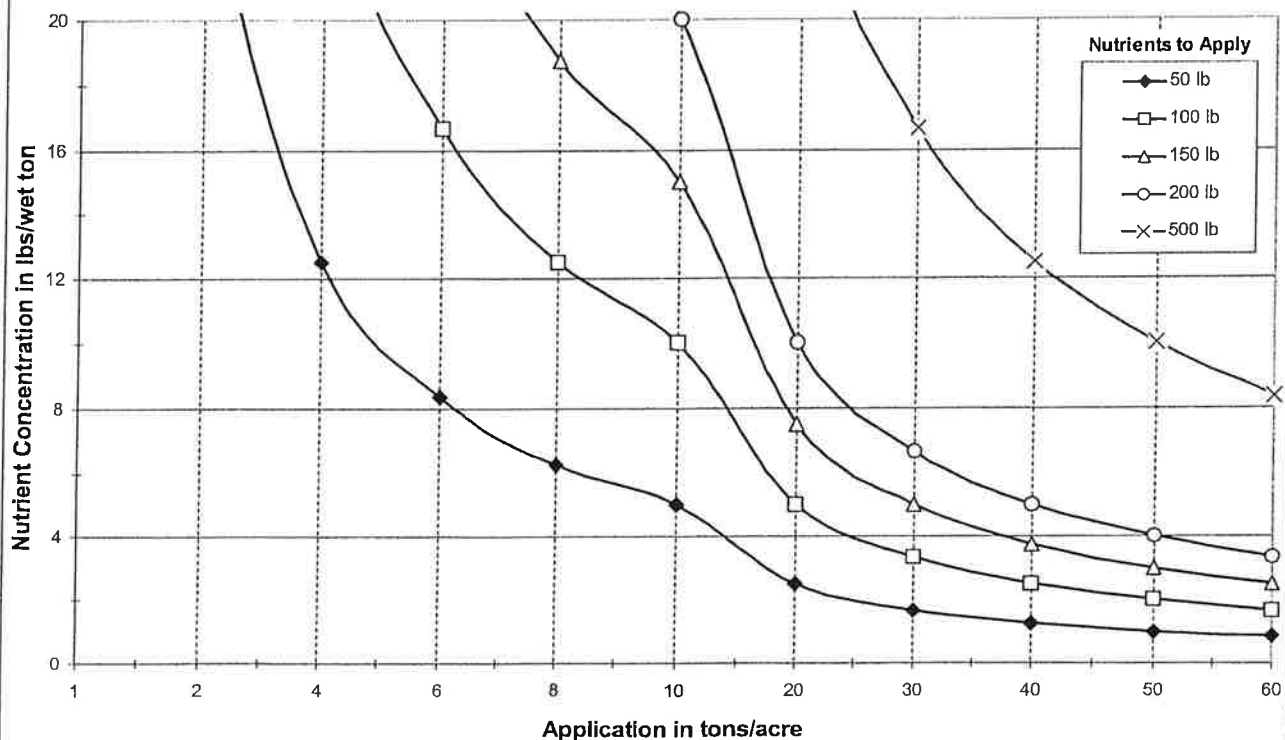
Name: _____ Date: _____

Example:

Corn silage is being grown and the recommended nutrient application from the nutrient budget worksheet is 100 pounds of phosphorus (P_2O_5) per acre. A traveling big gun sprinkler will be used to make 1 application of liquids from a non-agitated waste storage pond and a tractor spreader will be used to make 1 application of solids from a dry stacking facility that will not be incorporated into the field.

Waste application rates and amounts:

Steps	Example		Your Calculations			
	Liquid	Solids	Liquid	Solids	Liquid	Solids
1. Type of waste-	Dairy	Dairy				
2. Crop receiving waste-	Corn	Corn				
3. Desired phosphorus application rate, lb/acre-	50	50				
4. Nutrient concentrations in storage from laboratory analysis or from Table 1-1:	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
Nitrogen (N)-	4	9				
Phosphorus (P_2O_5)-	1	4				
Potassium (K_2O)-	6	19				
5. Determine phosphorus application rate from the nutrient application charts:	<u>Inches/acre</u>	<u>tons/acre</u>	<u>inches/acre</u>	<u>tons/acre</u>	<u>inches/acre</u>	<u>tons/acre</u>
Phosphorus (P_2O_5)-	1.0	14				
6. Plant availability of nitrogen from Table 1-1 in percent-	100 %	100 %	%	%	%	%
7. Nitrogen retained, in percent, after application from Table 1-2-	75 %	70 %	%	%	%	%
8. Calculate nitrogen availability- line 4 N x line 6 x line 7 ÷ 10,000=	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
	3	6.3				
9. Determine the amount of nitrogen and potassium applied from nutrient concentration data on line 8, line 4 and the nutrient application charts:	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>
Nitrogen (N)-	75	75				
Potassium (K_2O)-	150	250				
10. Total Nutrients Applied, lb/acre:						
Nitrogen (N)- (Sum of liquids and solids from line 9)	150 lb/acre		lb/acre		lb/acre	
Phosphorus (P_2O_5)- (Sum of liquids and solids from line 3)	100 lb/acre		lb/acre		lb/acre	
Potassium (K_2O)- (Sum of liquids and solids from line 9)	400 lb/acre		lb/acre		lb/acre	

WASTE UTILIZATION WORKSHEET**NUTRIENT APPLICATION CHART****for
LIQUIDS****NUTRIENT APPLICATION CHART****for
SOLIDS**

NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer: Spring Valley Farms	Tract(s): 133	Field(s): T-133 1-7
Assisted by: M. French	Date: March 26, 2005	

PURPOSE (Check all that apply)			
Budget and supply for plant production	☒	Utilize manure/organic materials as a nutrient source	☒
Minimize agricultural non-point source pollution (water quality)	☒	Maintain or improve soil condition	☒

Table 1. Field Conditions and Recommendations

CROP SEQUENCE/ROTATION (circle current crop)					EXPECTED YIELD			
Hay/Pasture Mix 16 % Protein					6			
CURRENT SOIL TEST LEVELS (ppm or lb/ac)								
N		P		K		pH	S.O.M.%	EC
6		25		387		5.3		
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD								
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)		LIME		Other
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B	6.5		
307		85		235				

Table 2. Nutrient Sources

Table 2: Nutrient Sources

Credits		N		P ₂ O ₅		K ₂ O	
		pounds per acre					
1. Nitrogen credits from previous legume crop							
2. Residual from long-term manure application							
3. Irrigation water							
4. Other (e.g., atmospheric deposition)							
5. Total Credits-		0		0		0	
Plant-Available Nutrients Applied to Field		N		P ₂ O ₅		K ₂ O	
(Circle column that is landuser's decision)		Trial A	Trial B	Trial A	Trial B	Trial A	Trial B
6. Credits (from row 5, above)		0	0	0	0	0	0
7. Fertilizer	Starter						
	Other						
8. Manure / Organic Materials (Source-) Dairy		154	0	120	0	235	0
9. Subtotal (sum of lines 6, 7 and 8)		154	0	120	0	235	0
10. Nutrients Recommended (from Table 1)		307	0	85	0	235	0
11. Nutrient Status (subtract line 10 from line 9)		-153	0	35	0	0	0
If line 11 is a negative number, this is the amount of additional nutrients needed to meet the crop recommendation.							
If line 11 is a positive number, this is the amount by which the available nutrients exceed the crop requirements.							

PLANNED NUTRIENT APPLICATIONS							
Amount to be Applied (lb/ac)		N	154	P ₂ O ₅	120	K ₂ O	235
Method, Form, and Timing of Application							
Recommended application rates are based on crop uptake.							
For meeting maximum nutrient uptake and production the acreage is deficient in Nitrogen (-153 lbs/acre). Potassium soil test levels are high. (387 ppm) medium levels of potassium are 150-250 ppm so no commercial fertilizer is recommended. Increased levels of potassium could lead to herd health problems. According to "Nutrient Sources" Phosphorus levels are high, but soil test levels reveal lower actual phosphorus levels in the soil. Soil phosphorus levels should be monitored on a 5 year basis to ensure management strategies are not leading to phosphorus accumulation in the soil. Manure application should be applied in split applications between late February to late September. Apply 60lbs of Nitrogen/Acre per application. Manure should be applied to the acreage evenly during the application season. A soil test is recommended in late October every 5 years to evaluate the bio solid application rate matches the nitrogen requirements of the soil.							
Manure should be reduced or not applied if soil tests show Phosphorus and Potassium concentrations continue to increase over time and approach							

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

NUTRIENT MANAGEMENT SPECIFICATION SHEET
CODE 590

Landowner/Operator: Spring Valley Farms

Job Location: T2S R10W Sed 11,14

County: Tillamook SWCD Tillamook County Farm/Tract No. T133 & T168

Field No. T133 Feilds1-7 & T168 Fields 1-5

Prepared By: M. French

Date: 03/05

Purpose:

- ☐ To budget and supply nutrients for plant production.
- ☐ To properly utilize manure and organic by-products as a plant nutrient source.
- ☐ To minimize agricultural non-point source pollution of surface and ground water resources.
- ☐ To maintain or improve the physical, chemical and biological condition of soil.

Specifications:

- ☐ Manure is applied to the surface of permanent pastures in accordance with the enclosed Waste Utilization Conservation Practice Jobsheet.
- ☐ A target yield of 6 tons of dry matter per acre per yield is planned to utilize the nitrogen in the manure and/or commercial applied fertilizer.
- ☐ Manure and commercial fertilizer is applied in accordance with soil tests.
- ☐ Manure and/or commercial fertilizer is applied in split applications.
- ☐ Soil tests are taken at least every 5 years.
- ☐ Manure test are taken annually. Samples will be collected from the equipment that applies the manure and wastewater to the fields.
- ☐ No more than 307 lbs. of nitrogen is applied per acre per year in accordance with the below Nutrient Distribution, Soil and forage tests will be used to justify the rates.

Manure Application Equipment to be used:

152.2-1,000 lb. animal units
Manure Tank Wagon
Manure Spreader

DESIGN APPROVAL:

Practice Code No.	Practice	Leand Discipline	Controlling Factor	Units	Job Class				
					I	II	III	IV	V
590	Nutrient Management	CED-EE& BCSD-Agron	Area	Acres	160	320	640	All	All

This practice is classified as Job Class II

Design approved by: /s/ _____ Date: _____

Job Title: _____

CLIENTS ACKNOWLEDGEMENT STATEMENT:

The client acknowledges that:

a. They have received a copy of this specification and under-stands the contents and requirements.

b. The following information must be provided NRCS by the client before this practice can be certified as applied:

☐ Nutrient management application records including soil, water, plant and organic by-product test results.

☐ Documentation showing amount, rate, form and application method of nutrient applied

☐ Annual review of nutrient management including adjustments made.

c. It shall be the responsibility of the client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

d. Maintain records of nutrient application as required by state and local regulations.

Accepted by: /s/ Kevin P. Johnston

Date: 4-25-05

CERTIFICATION;

I have completed a review of the nutrient management and the specification's application and certify this practice has been applied.

Certification by: /s/ _____

Date: _____

Job Title: _____

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

**FILTER STRIP SPECIFICATION SHEET
CODE 393**

Landowner/Operator: Spring Valley Farm

Job Location: R10W T2S

County: Tillamook SWCD Tillamook

Farm/Tract No. T-133 & T-168

Field No. T-133 F# 1-7 & T-168 F# 1-5

Prepared By: M. French Date 03/05

Purpose: To reduce manure runoff into an adjacent open watercourse and the resulting fecal and organic contamination in the watercourse.

Specifications:

- ⇒ A 35 foot grass filter strip will be maintained adjacent to all open water courses that flow through the farm.
- ⇒ No manure will be applied to the filter strip area.
- ⇒ Noxious weeds such as Tansy Ragwort and Canada Thistle are controlled in accordance with an Integrated Pesticide Management Plan.
- ⇒ Excessive accumulation of sediment and/or manure will be removed. The filter strip will be harrowed at least once each year prior to May 1st to shape and maintain at least a 1 % grade sloping away from the existing open water courses. Filter strip grade will be maintained to allow the runoff to occur along the entire length of the filter strip and not occur in only certain areas of the filter strip.
- ⇒ Depressions will be prevented from forming in the filter strip area where manure and sediment can be trapped.
- ⇒ Debris will not be allowed to accumulate in the filter strip.
- ⇒ Filter strips will be clipped, dragged, and or grazed at least twice during the growing season.
- ⇒ Grass will be at least 3 inches high by October 15th.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

PRESCRIBED GRAZING SPECIFICATION SHEET

CODE 528A

Landowner/Operator: Spring Valley Farm

Job Location: R10W T2S Sec 11, 14

County: Tillamook SWCD Tillamook County Farm/Tract No. T-133 & T-168

Field No.: T-133 F# 1-7 & T-168 F# 1-5

Prepared By: M. French

Date: 03/05

⇒ **Purpose:**

- ⇒ Improve or maintain the health and vigor of the forage stand
- ⇒ Maintain and improve water quality
- ⇒ Maintain or improve animal health and productivity.
- ⇒ Attain grazing and management efficiency to promote economic stability.

Specifications:

- ⇒ Pastures are managed to assure at least 6 tons of dry matter is produced per acre per year.
- ⇒ Pastures are reestablished when forage yields fall below 4 tons of dry matter per acre per year.
- ⇒ A rotational grazing system is used. There are 4 pasture units used in the rotation. The pasture units are stripped grazed. A 21 day re-growth period is used during the normal years. During low rainfall years, the re-growth period varies between 30 to 35 days.
- ⇒ Noxious weeds such as Tansy Ragwort and Canada Thistle are controlled in accordance with an Integrated Pesticide Management Plan.
- ⇒ Pastures are clipped and dragged, if needed, at least twice during the growing season.
- ⇒ Manure and commercial fertilizer applications are based on soil tests. Soil tests will be taken at least every 3 years. Nitrogen applications will not exceed 307 lbs. of nitrogen per acre per year unless soil tests and forage production justifies higher application rates.
- ⇒ Manure is applied to pastures in accordance with the enclosed Waste Utilization Conservation Practice and Nutrient Management Specification Sheets.
- ⇒ Spring grazing is delayed until the grasses have at least 6 inches of growth and the soil is firm.
- ⇒ Pastures are not grazed below 2 inches any time during the growing season.
- ⇒ Excess forage will be cut for silage. See Forage harvest Management Specification Code 511.

NRCS, OR

SOIL AND MANURE SAMPLING INSTRUCTIONS FOR ANIMAL WASTE MANAGEMENT SYSTEMS

SOIL SAMPLES

Job Sheet 5

Spring Soil Samples

- Spring soil samples are to be collected the last 2 weeks of March or the first 2 weeks in April when soils are not saturated
- Soil samples are to be collected on fields that have not received manure applications within the last 30 days.
- Collect several samples (about 10 one-fourth cup samples) of soils from just below the thin sod layer to a depth of 6 to 9 inches and add to bucket.
- Mix the samples in the bucket and remove about 1 cup from the mixture and place into a sample bag.
- The bags should be labeled with;
 - Farm or operator name
 - Sample date
 - Field and tract (see NRCS plan map)
 - Sample depth (0 to 9 inches)
 - Soil type if determined
- Keep soil sample cool (small cooler with some ice) in the field until sample can be put in refrigerator or into freezer. Soil can be stored in refrigerator for up to 1 week or can be stored in a freezer for longer periods.
- Ship samples to lab (see shipping instructions below).

MANURE SAMPLES

Liquid Manure Samples

- Liquid manure samples should be sampled after agitating the storage facility for the first application made in the spring (March-April) and for the last application in the fall (September-October).
- Put a bucket in the path of the gun or carefully take bucket sample of liquid manure from the liquid manure tank wagon.
- Fill a sample bottle with some of the liquid manure from the bucket and keep cool while in the field. (you can put the sample in a small cooler with some ice).
- Label the sample with the farm or operator name, date, and liquid manure sample.
- Freeze the sample until ready to ship to the lab.

Post-harvest Soil Nitrate Testing for Manured Cropping Systems West of the Cascades

D.M. Sullivan and C.G. Cogger

Contents

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What's in this publication?

This publication describes the use of post-harvest soil nitrate testing as a tool for assessment of nitrogen (N) management in manured cropping systems west of the Cascade Mountains in Oregon, Washington, and south coastal British Columbia.

The first section of this publication gives general information on the test and is designed for use by growers and dairy operators. This section gives a brief introduction to soil sampling, but does not provide all of the technical details. The focus is on how to use the post-harvest test to improve nutrient management. This section describes:

- ◆ What the post-harvest test measures
- ◆ How to collect soil samples
- ◆ Units used in soil nitrate testing
- ◆ How to interpret soil nitrate test results for grass and silage corn crops

In addition, background information explains the rationale for the test:

- ◆ How to use the post-harvest test as a management tool (page 3)
- ◆ Crop and soil response to excess plant-available N (page 4)

How to use the post-harvest test as a management tool

Sampling depth and timing are critical. Interpretation tables for this test apply only to samples taken to a 12-inch depth. Surface soil (0 to 12 inches) typically contains the highest nitrate-N levels and requires the least time and effort for sample collection. Samples must be taken before heavy fall rains move nitrate below the 12-inch depth. The target sampling period generally is August 15 to October 15.

To get the most value from this test, it is important to understand:

- ◆ How the test fits into an overall nutrient management program
- ◆ Limitations to interpretation of test results
- ◆ How *not* to use the test

Using the test as part of a nutrient management program

The post-harvest test is but one measure of success in nutrient management. Post-harvest nitrate test data should be assessed in the context of the current N management plan and records of manure application. Successful N management involves a number of components, including:

- ◆ Assessing crop N needs
- ◆ Planning manure application to meet crop N needs
- ◆ Applying manure according to the plan
- ◆ Recording manure application amount and estimated plant-available N amount
- ◆ Measuring crop yield and N content
- ◆ Monitoring success of the plan

All components of the nutrient management system should be evaluated together.

Limitations to test results

Interpretive values for post-harvest soil nitrate are:

- ◆ Calibrated only for high-rainfall portions of the Pacific Northwest (west of the Cascades). Extrapolation to other environments is not recommended.

- ◆ Provided only for corn silage and grass hay/silage crops. Field research has been used as the basis for interpretive levels for these crops. Applicable research data are not available for other crops to determine post-harvest nitrate-N levels associated with good crop and nutrient management practices. However, the test may be used for relative comparisons among fields planted to another crop (e.g., comparisons among grass pasture fields).
- ◆ Based on the assumption that summer irrigation is less than, or close to, evapotranspiration to ensure that significant nitrate leaching does not occur before the fall test.
- ◆ Designed for fields with a history of applied manure (more than 3 consecutive years of regular manure application). Lower post-harvest soil nitrate test values are attainable where only fertilizer N is used, or where manure is applied infrequently.
- ◆ Based on good management of the crop and normal yields. Crop moisture stress, insect damage, or plant disease will reduce crop yield and crop uptake of nitrogen, thus increasing post-harvest soil nitrate test levels.

How *not* to use the post-harvest test

The test will *not*:

- ◆ Detect a shortage of plant-available nitrogen for crop production. Continual mineralization of nitrogen (conversion of organic N forms to plant-available N forms in the soil) can provide enough plant-available nitrogen for a crop without accumulation of nitrate-N in soil.
- ◆ Determine the source(s) of excess plant-available N. Sources of N may include manure slurry, lagoon water, fertilizer, soil organic matter, or previous crop residues.
- ◆ Predict crop response to fall manure or N fertilizer applications. The test does not predict the amount of plant-available N that will be mineralized from soil organic matter or crop residues in the fall.

Table 1.—Average calendar date when cumulative rainfall (after September 1) reaches 5 inches west of the Cascades.^a

Cumulative rainfall after Sept. 1 (inches)	Calendar date to reach specified cumulative rainfall							
	Medford (OR)	Salem (OR)	Tillamook (OR)	Coupeville (WA)	Centralia (WA)	Lynden (WA) Abbotsford (BC)	Agassiz (BC)	Comox (BC)
3	10 Nov	20 Oct	26 Sep	31 Oct	8 Oct	1 Oct	26 Sep	10 Oct
5	29 Nov	1 Nov	8 Oct	24 Nov	23 Oct	15 Oct	9 Oct	25 Oct
7	16 Dec	13 Nov	18 Oct	15 Dec	4 Nov	27 Oct	19 Oct	6 Nov

^aAverage daily precipitation data for many other locations is available at: Western Regional Climate Center (<http://wrcc.dri.edu>) or Environment Canada (http://www.msc-smc.ec.gc.ca/climate/climate_normals/index_e.cfm).

3 inches of cumulative fall rainfall. The starting date for calculating cumulative fall rainfall is September 1. Include inches of irrigation water applied after September 1 in your estimate of cumulative rainfall.

Table 1 shows the average calendar date when cumulative fall rainfall (after September 1) reaches 5 inches at a variety of locations. For most locations, sampling prior to October 15 is acceptable in an average year. In high rainfall areas (coastal areas and the Cascade foothills), plan to sample earlier. A late October sampling date usually is acceptable in lower rainfall areas of southern Oregon, the Puget Sound islands, Olympic Peninsula, or Vancouver Island.

Units used in soil nitrate testing

In this publication, interpretation of a post-harvest soil nitrate test (Tables 3 and 4) is based on units of parts per million (ppm). Some labs report soil test nitrate-N in units of lb/acre by assuming a standard value for soil bulk density. If the lab reports nitrate-N results in pounds per acre, ask them to provide a conversion factor to express data in units of ppm. The conversion factor assumed by laboratories usually is between 3 and 4, because 1 acre-foot of dry soil usually weighs

Table 2.—Units used to report soil nitrate analyses.

Name	Interpretation	Equivalent units
nitrate-N or NO ₃ -N	N present in the nitrate form, soil dry weight basis	mg/kg or ppm (dry weight basis)

about 3.5 million pounds (3.5 lb per acre-foot = 1 ppm).

Interpreting soil nitrate test results

Data quality and variability

The first step in evaluating your soil nitrate data is to verify data quality. Determine whether the sample collection method, timing of sample collection, sample preservation, and laboratory analysis methods are acceptable. Reject data that did not result from reasonable protocols. For example, Tables 3 and 4 should not be used for soil samples collected in November after heavy fall rains.

Make sure that you understand the units used to report test results. See Table 2 for an explanation of units found in soil test reports.

Table 3.—Silage corn. Suggested interpretation for post-harvest soil nitrate-N (0- to 12-inch depth).^a

If post-harvest nitrate-N is less than 20 ppm (less than approximately 70 lb N per acre)

- ◆ Continue present N management.

If post-harvest nitrate-N is 20 to 45 ppm (approximately 70 to 160 lb N per acre)

- ◆ Reduce or eliminate sidedress N fertilizer application. Use the pre-sidedress nitrate test (PSNT). Apply sidedress N only when PSNT indicates a need.
- ◆ Reduce lagoon water application after August 1.
- ◆ Keep records to document crop yield, dry matter, and crop N removal. Total applied manure-N + fertilizer-N should be less than 125 percent of documented crop N removal.
- ◆ Reduce manure application on fields where corn follows grass sod plow-down.
- ◆ Plan to reduce manure-N application by 10 to 25 percent.
- ◆ Improve whole farm N balance.

If post-harvest nitrate-N is greater than 45 ppm (greater than approximately 160 lb N per acre)

- ◆ Apply only starter N (20 to 40 lb N/acre at planting).
- ◆ Plan not to sidedress N fertilizer in June. Apply sidedress N only when PSNT indicates a need.
- ◆ Eliminate lagoon water application after August 1.
- ◆ Keep records to document crop yield, dry matter, and crop N removal. Apply manure N at a rate less than or equal to crop N removal (approximately 200 lb total N per acre).
- ◆ Eliminate manure application on a few fields or a few strips within a field next year to determine the contribution of mineralized N vs. current-season application of manure.
- ◆ Plan to reduce manure-N application by 25 to 40 percent.
- ◆ Consult experts to improve whole farm nutrient balance.

^aThe post-harvest test values listed above are for the *end* of a growing season. Management changes (if needed) should be implemented in future years. Interpretive values assume near-optimum crop yields. If yield is below average, improve agronomic practices to increase crop yield and crop N uptake.

Detailed suggestions for soil sampling and planning

Collecting, preserving, and analyzing the soil sample

Tools for field sampling

Collect a sample that is representative of the entire sampling depth. For example, a representative sample for a 0- to 12-inch depth has the same amount of soil from the soil surface (0 to 6 inches) and from the bottom of the sampling depth (6 to 12 inches).

Always use a tool specifically designed for soil sampling. Don't use a shovel, because the samples won't be uniform with depth. Tools for soil sampling often are called soil probes or augers. There are several kinds available.

Push probes are tubes that you push into the soil. They have a T-shaped handle attached to a cylindrical tube (about 1 inch diameter) with a beveled tip. The tube collects a cylinder, or "core," of soil. Push probes work well in soft, uncompacted soils.

Hammer probes are designed for hard or compacted soils. They have a sliding weight (hammer) instead of a T-handle to drive the probe into soil.

Soil test consultants often use hydraulic probes mounted on a tractor or pickup to sample soils. These reduce the time and effort of sampling in hard soils. Gravelly and rocky soils are difficult to sample. A hydraulic probe with a rotating auger can sample some gravelly soils.

A mud auger or bucket auger is the best tool for hand-sampling at sites that are difficult to sample with push probes. Use an auger for compacted, muddy, rocky, or dry soils. Augers can be purchased from several manufacturers. A 2- to 4-inch diameter mud auger (open-sided) works best for most situations because it is easy to remove the sample from the bucket. Use a larger

diameter auger for soils with large rocks.

Augers sample a 4- to 6-inch depth. You will need to take several bites from the same hole to sample to 12-inch depth. You will collect a larger sample volume, about 5 to 10 times that collected with a push tube. Because of the extra effort required for auger sampling, use this method only if other sampling methods are difficult or impossible.

Field sampling protocol

Plan ahead. Use field maps and soil maps to divide the farm into different management units. A management unit is usually a field, but you may want to subdivide a large field if sections can be managed separately for nutrient application. The simplest approach is to collect a composite sample from the entire management unit. You may choose to restrict sampling to the dominant soil type if the management unit has soils that differ markedly in visual appearance (soil color, texture, organic matter).

Alternatively, you can restrict your sampling to a representative area (usually about an acre in size) within the management unit. Choosing a representative area within the field where manure application rate, timing, and uniformity are well documented is essential. If you use the "representative area" sampling approach, record the sampling location using a GPS receiver or record the distance from a fixed location (e.g., fenceline).

Avoid large buffer zones that are sometimes present adjacent to water bodies or roads, especially with big gun manure applicators. Avoid small atypical areas such as:

- ◆ Swales
- ◆ Very rocky or shallow soil (less than 12 inches deep)
- ◆ Site of an old manure pile or a feeding, watering, or resting area for livestock
- ◆ Abandoned field roads
- ◆ Field edges

Find out how the lab reports soil test data. Standard units for soil nitrate-N are parts per million (ppm, Table 2). If you aren't familiar with the lab, it's a good idea to obtain a copy of a sample laboratory report.

Because you will use sample results to compare post-harvest soil nitrate across years, laboratory consistency over time is a major issue. A standard reference sample (soil sample with known concentration of nitrate) can help you assess laboratory variability. Consider submitting a standard reference sample (approximately 50 to 100 g dry weight) with a nitrate-N concentration of 20 to 45 ppm with each batch of soil samples. Keep track of test results for the standard reference sample over time. If you note a major error in the nitrate concentration reported for the standard reference sample, then the test data is questionable.

Standard reference samples are available from the North American Proficiency Testing Program (see "For more information," page 15). Standard reference samples must be dried, ground, and thoroughly mixed.

We do not recommend that you split a field sample to check laboratory consistency. The one-time nature of such comparisons, the uncertainty of obtaining a homogeneous sample, and the uncertainty of sample preservation in-transit to the lab limit the interpretation of split-sample data.

Developing a sampling plan

Nutrient management plans can be voluntary, required by regulatory agencies, or a part of an agreement with a conservation planning agency (e.g., Natural Resources Conservation Service or conservation district). If your nutrient management plan is not voluntary, consult the agency that supervises your nutrient management plan to determine whether they have specific requirements for how often fields must/should be sampled.

Suggestions given here for sampling frequency are general in nature and are not intended to serve as policy for any agency.

Representative fields for long-term monitoring

Representative fields are fields that you sample every year to track trends in sample values over time. Select fields that represent typical management practices. Criteria that can be used to choose representative fields include: (1) records or estimates of annual manure application rate, (2) number of years of continuous manure application, (3) soil test values for P and K. On dairies where P and K fertilizers are not routinely applied, soil test values above 75 ppm P (Bray P1 method) and 400 ppm K (ammonium acetate method) usually reflect substantial manure application in the past.

Sample the representative fields every year to assess trends over time. If you grow corn silage and perennial grass forage, plan to sample at least four grass fields and four corn fields each year. At a small dairy (fewer than four fields), sample all fields each year.

Other fields

Periodically, you will need to evaluate the fields not designated as "representative" fields. Consider sampling all fields every 3 years. Compare whole farm soil data to representative field data.

If you have only a few fields with elevated soil test N, then focus management on those fields. If all fields on the farm give similar test data, then focus your N management efforts at the whole farm level. If representative fields consistently have test values of less than 15 ppm (grass) or less than 20 ppm (corn) over a 3-year period, and all other fields sampled have similar test values, consider reducing the number of post-harvest soil nitrate tests.

What other soil tests can be used to provide information to guide N management for corn?

Soil nitrate testing in spring and early summer can assist with N management for silage corn. Test soil ammonium + nitrate-N several weeks after a spring manure application to track early-season N availability. Test soil nitrate when corn is at the four- to six-leaf stage (pre-sidedress nitrate test, PSNT) to determine the need for sidedress N application to corn.

How much variability should I expect in post-harvest nitrate-N test values for the same grass field sampled between August 15 and October 15?

It all depends on weather, soil biology, and crop management. A good stand of actively growing grass can maintain nitrate-N concentrations of less than 15 ppm throughout the post-harvest sampling period. Where soil is dry in late summer, increased N availability may occur for 2 or 3 weeks following the first heavy rain. It may be useful to take several soil nitrate tests from the same field in the fall to document changes in nitrate concentration with time. Soil nitrate values given in the interpretive table in this publication are for typical precipitation and sampling date.

Ammonium-N is plant-available. Why doesn't the post-harvest test include ammonium-N analysis?

Post-harvest ammonium-N analyses cost money, and they do not yield reliable interpretive information. Ammonium-N does not accumulate in soils supplied with an excess of plant-available N. It is rapidly converted to nitrate. Soil samples taken at least 30 days after manure application usually have negligible ammonium-N concentrations unless soil has remained dry.

Drying of soils after sampling releases ammonium-N from microbial biomass. Most dried soils have 2 to 20 ppm ammonium-N

that is caused by the soil drying process. Dry soil ammonium-N concentrations are poorly correlated with other indices of N availability in controlled experiments.

Should post-harvest nitrate tests be used for fields with organic soils?

Other methods should be used to assess the success of nutrient management plans on organic soils. Goals for post-harvest nitrate-N of less than 20 ppm are difficult if not impossible to attain on organic soils, which contain more than 20 percent organic matter. These soils formed as organic matter accumulated under natural poorly drained conditions. Soil organic matter decomposition and N mineralization processes are greatly accelerated under typical farming practices such as artificial drainage and tillage.

Should I measure or estimate soil bulk density to estimate post-harvest nitrate-N in units of pounds per acre?

The variation in bulk densities among soils typically is less than the variation associated with soil nitrate sampling and testing. Interpretive information in this publication is based on units of parts per million (ppm; mg per kg dry soil). You can approximate soil nitrate-N in the surface foot of soil by assuming typical bulk density ($\text{ppm} \times 3.5 = \text{lb/acre}$). This conversion factor is based on the weight of 1 acre-foot of soil at a bulk density of 1.3 g cm^3 (1 acre-foot = 3.5 million lb). Organic soils (more than 20 percent organic matter) have lower bulk density ($0.6 \text{ to } 0.8 \text{ g cm}^3$).

What is whole farm nutrient management?

The goals of whole farm management are: (1) to move toward a balance of nutrient imports and exports, and (2) to utilize nutrients on the farm at agronomic rates that minimize nutrient losses to the environment. Managing nutrients at the whole farm level requires knowledge of the major nutrient imports, major nutrient exports, crop

For more information

OSU Extension Service publications

Hart, J. 2002. A List of Analytical Laboratories Serving Oregon, EM 8677.

Marx, E.S., J. Hart, and R.G. Stevens. 1996. Soil Test Interpretation Guide, EC 1478.

Marx, E.S., N.W. Christensen, J. Hart, M. Gangwer, C.G. Cogger, and A.I. Bary. 1996. The Pre-sidedress Soil Nitrate Test (PSNT) for Western Oregon and Western Washington, EM 8650.

Sullivan, D.M., C.G. Cogger, and A.I. Bary. 1997. Which Test Is Best? Customizing Dairy Manure Nutrient Testing, PNW 505.

Sullivan, D.M., C.G. Cogger, and A.I. Bary. 1997. Date, Rate, and Place: The Field Book for Dairy Manure Applicators, PNW 506.

Many OSU Extension Service publications, as well as additional gardening information, may be viewed or downloaded from the Web (<http://eesc.oregonstate.edu>).

Copies of many of our publications and videos also are available from OSU Extension and Experiment Station Communications. For prices and ordering information, visit our online catalog (<http://eesc.oregonstate.edu>) or contact us by fax (541-737-0817), e-mail (puborders@oregonstate.edu), or phone (541-737-2513).

WSU Cooperative Extension publications
Bary, A.I., C.G. Cogger, and D.M. Sullivan. 2000. Fertilizing with Manure, PNW 533.

Daniels, C.H. 2002. Analytical Laboratories and Consultants Serving Agriculture in the Pacific Northwest, EB1578E.

Visit the WSU Cooperative Extension publications Web site at <http://pubs.wsu.edu>

Other resources

Gavlak, R.G., D.A. Horneck, and R.O. Miller. 1994. Plant, Soil and Water Reference Methods for the Western Region, WREP 125 (University of Alaska-Fairbanks).

Johnson, L., J. Harrison, F. Hoisington, and M. Bueler. 2002. Nitrate levels in grass silage. Washington State Dairy News 11(2). Available at: <http://www.puyallup.wsu.edu/dairy/>. Verified 1 August 2002.

Mahler, R.L. and T.A. Tindall. 1994. Soil Sampling, Bulletin 704 (University of Idaho Cooperative Extension System, Moscow, ID).

Midwest Plan Service. Livestock and Poultry Environmental Stewardship (LPES) Curriculum. Available at: <http://www.lpes.org/>. Verified 14 January 2002.

North American Proficiency Testing Program. Standard Reference Soil Samples (Soil Science Society of America, 677 S. Segoe Rd., Madison, WI 53711; phone: 608-273-8080; Web: <http://www.soils.org>).

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Soil Test Interpretation Guide

E.S. Marx, J. Hart, and R.G. Stevens



Regular soil testing is an important element in nutrient management. You can use soil tests as a diagnostic tool or to identify trends through time. To obtain meaningful test results, you must sample soil correctly, at the same time each year, and you must maintain records. For more information, see EC 628, *How to take a soil sample. . .and why* (see "For more information," page 7).

Soil testing laboratories use different test methods, which may influence results and sufficiency ranges. Therefore, the sufficiency ranges in this publication are accurate only for the test methods listed.

Soil tests used to evaluate fertility measure the soil nutrients that are expected to become plant-available. They do not measure total amounts of nutrients in the soil. Measurements of total nutrient content are not useful indicators of sufficiency for plant growth, because only a small portion of the nutrients are plant-available.

Adequate soil nutrient levels vary depending on plant species. Similarly, plant tolerance of excessive nutrient levels, nutrient imbalances, or less-than-optimum growing conditions varies. If excessive nutrient levels exist, review management to determine the cause.

Nutrient concentrations vary with soil depth. Depth of sampling, therefore, affects test results. To determine the proper sampling depth, you must consider the purpose of the soil test. To estimate nutrient availability for a crop prior to planting, sample soil to the depth where most root activity will occur. Shallow sampling sometimes is used to evaluate surface conditions in

perennial crops where fertilizers have been applied to the soil surface. Deep sampling may be necessary to diagnose problems in orchards.

Soil test values do not vary greatly from year to year. Drastic changes in test values may indicate an unrepresentative soil sample or a laboratory error. When in doubt, submit a new sample or ask the lab to repeat the analysis.

This publication provides general guidelines for interpreting soil test results. Fertilizer guides for many individual crops are available from your county office of the OSU Extension Service or Washington State University Cooperative Extension, or from Extension and Experiment Station Communications, Oregon State University (see "For more information").

Nitrogen (N)

Plant-available nitrogen (nitrate and ammonium)

Plant-available forms of nitrogen are nitrate (NO_3^- -N) and ammonium (NH_4^+ -N). Soil concentrations of NO_3^- -N and NH_4^+ -N depend on biological activity, and therefore fluctuate with changes in conditions such as temperature and moisture. Nitrate is easily leached from the soil with high rainfall or excessive irrigation. Soil tests can determine NO_3^- -N and NH_4^+ -N concentrations at the time of sampling, but do not reflect future conditions.

When you collect samples for nitrogen testing, keep them cold, or dry them immediately to prevent NO_3^- -N and NH_4^+ -N concentrations from changing.



OREGON STATE UNIVERSITY EXTENSION SERVICE

E.S. Marx, former research assistant in soil science, and John Hart, Extension soil scientist, Oregon State University;
and Bob Stevens, Extension soil scientist, Washington State University.

Cations

Of the three primary cations (potassium, calcium, and magnesium), potassium requires the most management attention. Few crops have responded to calcium and magnesium in the Pacific Northwest.

If extremely high levels of a single cation exist, plant deficiencies of other cations may occur due to competition for plant uptake.

The soil test ranges in Tables 3, 4, and 5 are for the ammonium acetate extraction method. If a sodium bicarbonate (NaHCO_3) extraction is used, test values may be slightly lower.

Potassium (K)

Excessive soil potassium levels can result in elevated K levels in grass forage crops, which may be detrimental to animal health.

Table 3.—Extractable potassium (K).

	K
low	<150 ppm* <0.4 meq/100 g soil
medium	150–250 ppm 0.4–0.6 meq/100 g soil
high	250–800 ppm 0.6–2.0 meq/100 g soil
excessive	>800 ppm >2.0 meq/100 g soil

*See Table 13 (page 7) for conversions from ppm to meq/100 g soil.

Calcium (Ca)

Calcium deficiencies usually are found only on very acid soils. They can be corrected by liming with calcium carbonate (CaCO_3).

Table 4.—Extractable calcium (Ca).

	Ca
low	<1,000 ppm* <5 meq/100 g soil
medium	1,000–2,000 ppm 5–10 meq/100 g soil
high	>2,000 ppm >10 meq/100 g soil

*See Table 13 (page 7) for conversions from ppm to meq/100 g soil.

Magnesium (Mg)

Magnesium deficiencies on acid soils can be corrected by liming with dolomitic lime.

Magnesium toxicity can occur on serpentine soils in southwest Oregon.

Table 5.—Extractable magnesium (Mg).

	Mg
low	<60 ppm* <0.5 meq/100 g soil
medium	60–180 ppm 0.5–1.5 meq/100 g soil
high	>180 ppm > 1.5 meq/100 g soil

*See Table 13 (page 7) for conversions from ppm to meq/100 g soil.

Sulfate-sulfur ($\text{SO}_4^{2-}\text{-S}$)

Plants absorb sulfur in the sulfate ($\text{SO}_4^{2-}\text{-S}$) form. In high rainfall areas west of the Cascades, SO_4^{2-} is readily leached, and soil test data are not well correlated with plant growth. In arid regions east of the Cascades, soil test information may be useful. Also, irrigation water may contain significant amounts of sulfate-sulfur. Plant analysis often is useful for diagnosing sulfur deficiency.

Table 6.—Sulfate-sulfur, east of the Cascades.

	$\text{SO}_4^{2-}\text{-S}$ (ppm)
low	<2
medium	2–10
sufficient	>10

Micronutrients

Deficiencies of micronutrients other than boron and zinc are uncommon. Availability of most micronutrients is largely pH-dependent; availability decreases as pH increases (except for molybdenum, which becomes more available as pH increases). Deficiencies rarely occur in soils with pH below 6.5.

Soil testing for micronutrients other than boron and zinc is recommended only when a deficiency is suspected. If you suspect a micronutrient deficiency, plant tissue testing may be a better diagnostic tool than soil testing.

pH, lime requirement (LR)

Soil pH is a measure of soil acidity. Most crops grow best if the soil pH is between 6.0 and 7.5.

Table 9.—Soil pH ranges.

	pH
strongly acid	below 5.1
moderately acid	5.2–6.0
slightly acid	6.1–6.5
neutral	6.6–7.3
moderately alkaline	7.4–8.4
strongly alkaline	above 8.5

Soil pH can be increased by liming. The soil pH test indicates *if* lime is needed. The lime requirement test determines *how much* lime is needed. Accurate lime recommendations cannot be made without performing an SMP or similar test.

SMP* lime requirement test

The SMP lime requirement test is used to estimate the amount of lime required to raise the pH of 6 inches of soil. The SMP test is performed by mixing soil with a buffered pH 7.5 solution and determining the pH of the mixture. During the reaction, the soil's reserve acidity lowers the pH of the SMP solution. Soils with low SMP values have high reserve acidity and high lime requirements.

Some soils may have a low pH (<5.3) and a fairly high SMP buffer value (>6.2). This condition can be caused by the application of fertilizer. In this case, the low pH value is temporary, and the pH of the soil will increase as the fertilizer completes its reaction with the soil.

Sandy soils also may have a low pH and high SMP buffer value. This condition occurs because sandy soils have low amounts of reserve acidity due to low cation exchange capacity (CEC). In such cases, a light application of lime (1 to 2 t/a) should suffice to neutralize soil acidity.

Table 10 is used to determine the amount of lime required, based on the SMP test, to raise soil pH to a desired level. The target pH is determined by the crop to be grown and possibly by other factors.

*SMP stands for Shoemaker, MacLean, and Pratt—the people who developed the test.

Without an SMP or similar test, there is no way to know how much lime is required to adjust soil pH to a desired level. Accurate lime recommendations cannot be made solely on the basis of soil pH.

Table 10.—SMP lime requirement—field scale.

SMP buffer	Tons/acre of 100-score lime needed to raise pH of surface 6 inches of soil to the following pH's			
	5.3	5.6	6.0	6.4
6.7	—	—	—	—
6.6	—	—	—	1.1
6.5	—	—	1.0	1.7
6.4	—	—	1.1	2.2
6.3	—	—	1.5	2.7
6.2	—	1.0	2.0	3.2
6.1	—	1.4	2.4	3.7
6.0	1.0	1.7	2.9	4.2
5.9	1.4	2.1	3.3	4.7
5.8	1.7	2.5	3.7	5.3
5.7	2.0	2.8	4.2	5.8
5.6	2.3	3.2	4.6	6.3
5.5	2.6	3.6	5.1	6.8
5.4	2.9	3.9	5.5	7.3
5.3	3.2	4.3	6.0	7.8
5.2	3.6	4.7	6.4	8.3
5.1	3.9	5.0	6.9	8.9
5.0	4.2	5.4	7.3	9.4
4.9	4.5	5.8	7.7	9.9
4.8	4.8	6.2	8.2	10.4

Example: If the "SMP buffer" value is 5.9, the amount of lime needed to raise the pH to 6.0 is 3.3 tons of 100-score lime/acre.

Table 11.—SMP lime requirement—gardens.

If the SMP lime requirement test is	Apply this amount of lime (lb/1,000 ft ²)
5.4 or below	250
5.5–6.0	150–250
6.0–6.5	100–150
above 6.5	0

Some plants, such as blueberries, rhododendrons, azaleas, and cranberries, grow best in acid soils. Fertilizers such as ammonium sulfate can help maintain acidic conditions.

For more information

Hart, J. *Analytical Laboratories Serving Oregon*, FG 74 (Oregon State University, Corvallis, reprinted 1997). No charge

Hart, J. *How to take a soil sample. . .and why*, EC 628 (Oregon State University, Corvallis, revised 1995). No charge

Marx, E.S., N.W. Christensen, J. Hart, M. Gangwer, C.G. Cogger, and A.I. Bary, *The Pre-sidedress Soil Nitrate Test (PSNT) for Western Oregon and Western Washington*, EM 8650 (Oregon State University, Corvallis, reprinted 1997). 75¢

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Table 13.—Conversions.

To convert column 1 into column 2, <i>divide by</i>	Column 1	Column 2	To convert column 2 into column 1, <i>multiply by</i>
390	ppm K	meq K/100 g soil	390
200	ppm Ca	meq Ca/100 g soil	200
121	ppm Mg	meq Mg/100 g soil	121
230	ppm Na	meq Na/100 g soil	230
1	meq/100 g soil	cmol/kg soil	1
2*	lb/acre (7 inch depth)	ppm	2*
3.65*	lb/acre (1 foot depth)	ppm	3.65*
43.56	lb/acre	lb/1,000 sq ft	43.56
43,560	square feet	acres	43,560
2.471	acres	hectares	2.471

*These values vary with soil bulk density.

NUTRIENT MANAGEMENT FOR DAIRY PRODUCTION

Manure application rates for forage production

J. Hart, E.S. Marx, and M. Gangwer

Most dairies can supply all the nitrogen, phosphorus, potassium, and other nutrients needed for forage production by applying manure to forage crops. As a manager, your goal is to match nutrient supply with crop needs by deciding when and how much manure to apply.

This publication explains how to estimate the amount of manure to apply for forage production. To do so, you need:

- A current manure analysis for your dairy (or see EM 8586, *Dairy Manure as a Fertilizer Source*)
- A list of forage crops to be produced
- A soil test from each field where manure will be applied

Too much manure results in excess plant uptake of nutrients such as potassium. High-potassium grass forages can lead to health problems, especially in dry cows. In addition, excess manure contributes to nutrients and microorganisms in runoff water and potential nutrient leaching to groundwater.

John Hart, Extension soil scientist; E.S. Marx, former research assistant in soil science; and Mike Gangwer, Extension agent, Marion County; Oregon State University.

The application rates in this publication are based on soil tests and growing conditions in western Oregon.

Manure analysis

Analyzing your manure is critical to determining the correct application rate. If you don't test your dairy's manure, you can only guess its nutrient value.

Manure testing in western Oregon has shown more variation among dairies than within one dairy. Develop a manure nutrient history for your dairy by testing manure two or three times a year

for 2 or 3 years. These records will help you manage nutrient resources.

Also test manure when you expect a change in nutrient content; for example, when you make a large change in the ration.

Call your county office of the OSU Extension Service or your local Natural Resources Conservation Service office for sampling directions. A *List of Analytical Laboratories Serving Oregon* (FG 74) lists laboratories that test manure.

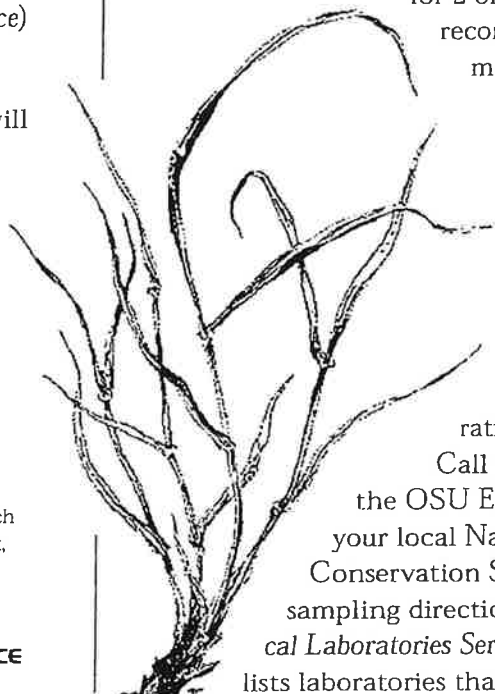


Table 1.—Approximate nitrogen removal by perennial forage crops and suggested nitrogen application rates.

Crop	Average yield per cutting (t/a)	N removal rate for average yield per cutting (lb N/a)	Suggested N application rate (lb N/t of forage*)
Orchard grass	1.4	70	50–60
Perennial ryegrass	1.2	60	50–60
Tall fescue	1.4	70	50–60

*All rates are on dry matter basis unless noted otherwise.

6. Now move down to the line labeled “effluent acre-inches to apply.” Estimate the number of acre-inches of effluent to apply (about 0.3 acre-inch). Remember that you will need about 10 percent more nitrogen because no line exists for the 60 lb N/a required by ryegrass. Your final result will be about 0.4 acre-inch.

Note: If you know your own yield per cutting, you can figure your nitrogen need more accurately. To do so, multiply your tons per acre per cutting by the “suggested N application rate (lb N/t of forage)” in Table 1. The result is your N removal rate. Use the line in the appropriate figure that is closest to that rate.

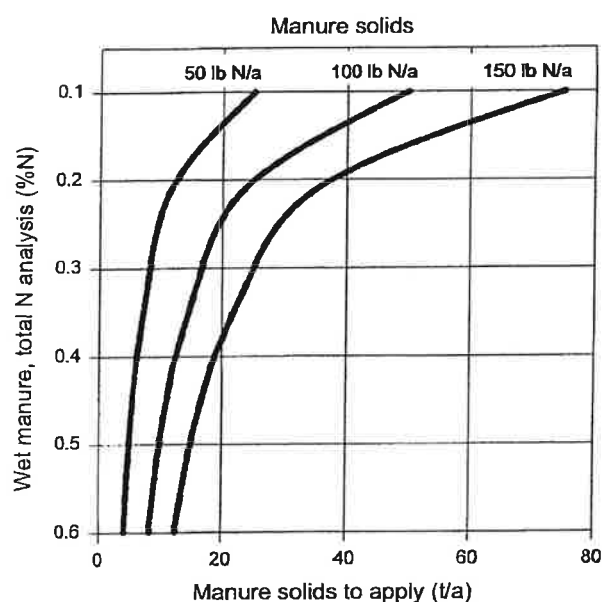


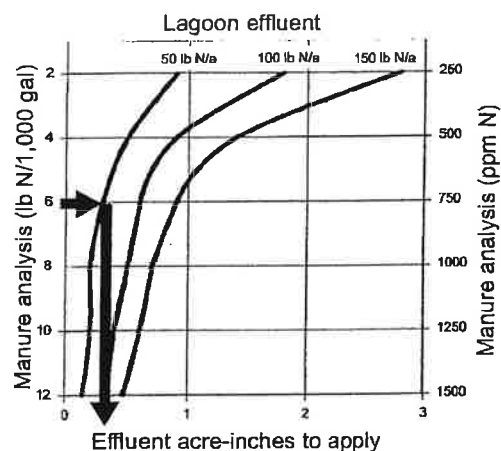
Figure 3.—Determining application rate for manure solids.

Example

Crop: perennial ryegrass

Manure: lagoon effluent

1. Average yield per cutting = 1.2 t/a (Table 1).
2. Nitrogen removal rate = 60 lb N/a per cutting (Table 1).
3. Find the lagoon effluent graph (Figure 2).
4. Use the 50 lb/a line because it is closest to the 60 lb/a you need to apply.
5. Your manure test shows 6 lb/1,000 gal. Find this line on the left of the graph. Move across to the 50 lb/a line.
6. Move down to the bottom line to find the number of acre-inches to apply (0.3 acre-inch).



Special cases

The manure application rates in this publication are based on the assumption that manure already has been applied to fields for at least 4 consecutive years, not including the current year.

If your fields have received manure for less than 4 years, increase rates as shown in Table 3 if you use reception tank, separated solids, or dry stack material. Lagoon effluent provides sufficient available N for any situation when applied during the growing season.

Checking your application rate for silage corn

With silage corn, you can confirm that you applied sufficient manure by using the pre-side-dress soil nitrate test (PSNT). When the corn is 12 inches tall or at the five-leaf development stage, sample soil between rows to a depth of 12 inches. Have the sample analyzed for nitrate nitrogen ($\text{NO}_3\text{-N}$).

Compare the soil test results to Table 4. Apply the appropriate amount of lagoon effluent or fertilizer N to the growing crop based on the PSNT and Table 4.

It is important to handle samples properly. For more information, see *The Pre-sidedress Soil Nitrate Test (PSNT)*, EM 8650.

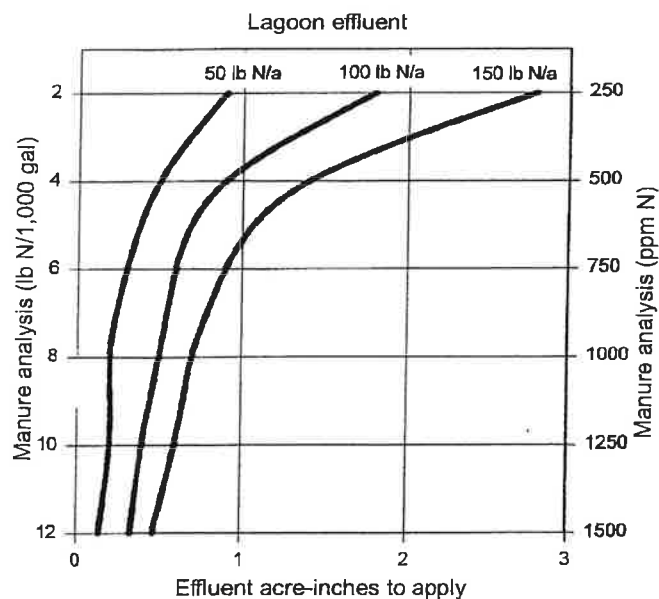


Figure 5.—Determining application rate for lagoon effluent.

Table 3.—Manure application rates based on number of years field has received manure.

If your field has received manure this many years:	Multiply suggested application rate by:
0	3.0
1	2.5
2	2.0
3	1.5
4 or more	Use suggested rates

Table 4.—Amount of nitrogen to apply for silage corn production based on the PSNT.

PSNT (ppm)	Nitrogen (lb/a)
0–10	100–150
10–20	50–100
20–25	0–50
above 25	0

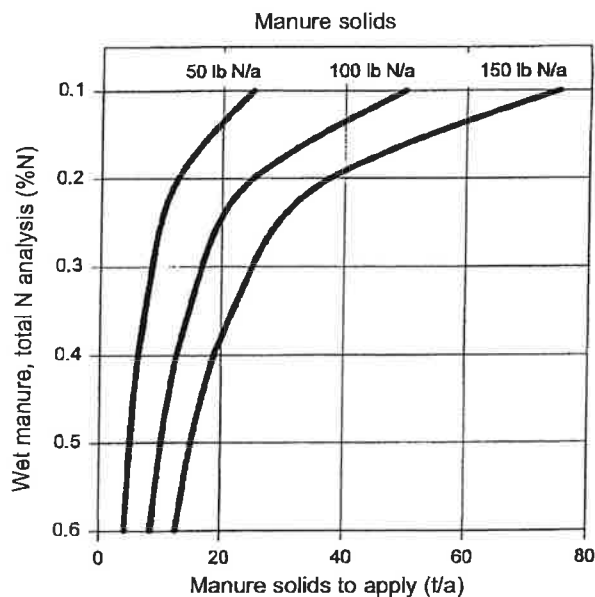


Figure 6.—Determining application rate for manure solids.

Corn stalk nitrate testing at harvest

1. Collect 10 mature corn plants by cutting the stalks just above the brace roots. Select representative plants away from edges of the field.
2. Cut an 8-inch section of stalk from the bottom of each harvested plant.
3. Remove the dried outer leaves from each 8-inch section.
4. Split each section of stalk lengthwise to aid in drying.
5. Place the split stalks together in a bag and send to a lab for nitrate nitrogen ($\text{NO}_3\text{-N}$) analysis.
6. Use Table 6 to interpret results.

Table 6.—Interpretation of corn stalk nitrate tests.

Stalk $\text{NO}_3\text{-N}$ concentration at harvest	Interpretation
<3,500 ppm	N may have limited yield
3,500–5,500 ppm	N sufficient for optimum yield
>5,500 ppm	N supplied in excess of crop demand

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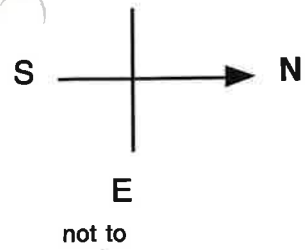
Hart, J., G. Pirelli, L. Cannon, and S. Fransen. *Pastures Fertilizer Guide*, FG 63 (Oregon State University, Corvallis, 1993). No charge

Hart, J., M. Gangwer, M. Graham, and E.S. Marx. *Dairy Manure as a Fertilizer Source*, EM 8586 (Oregon State University, Corvallis, reprinted 1996). \$1.00

Marx, E.S., N.W. Christensen, J. Hart, M. Gangwer, C.G. Cogger, and A.I. Bary. *The Pre-sidedress Soil Nitrate Test*, EM 8650 (Oregon State University, Corvallis, 1996). \$1.00

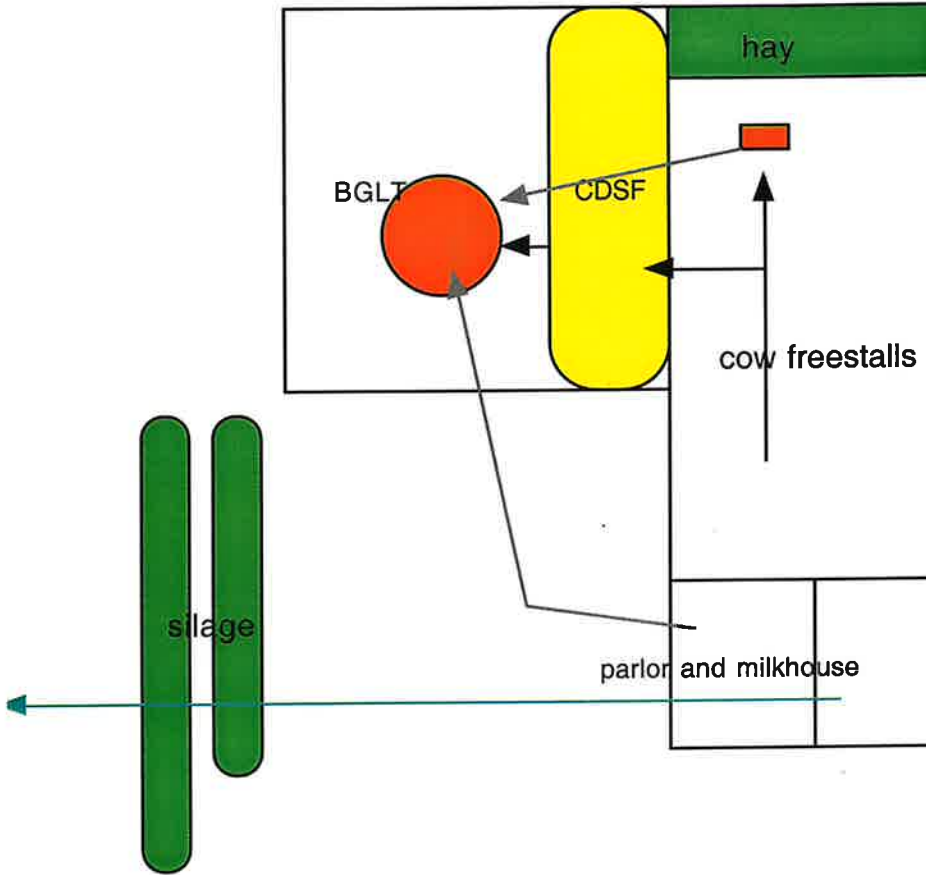
Other publications

Marx, E. *Evaluation of Soil and Plant Analyses as Components of a Nitrogen Monitoring Program for Silage Corn* (Master's thesis, Oregon State University, 1995).

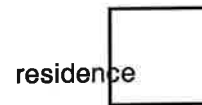


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