

BUSINESS NARATIVE

This dairy is planned to be a 365-1,000 lb. Jersey animal unit operation. There will be 300 lactating cows, 50 dry cows, 100 heifers, and 50 calves. There will be three phases in reaching the 365-1,000 lb. animal units. Phase 1 will be the initial herd size of 250 lactating cows, 50 dry cows, and 40 calves. Phase 2 will be having 300 lactating cows, 50 dry cows and 50 calves. Phase 3 is the final 365-1,000 lb. Jersey animal units. The lactating cows will be confined for 205 days and on pasture for 214 days, the dry cows and heifers will be confined for 151 days and on pasture for 214 days. The calves will be confined for 365 days. Livestock mortality service is provided by the Tillamook County Creamery Association.

The operation consists of two tracts. Manure is applied to 162.4 acres of pastureland. Tract 81, the milking operation, is owned. Tract 51 will be leased. In Tract 81 there are 104.4 acres that will be used for pasture. All pasture fields are outside the 100-year floodplain. In Tract 51 there are 58.0 acres that will be used for pasture. All fields are outside the 100-year floodplain.

The target yield is 6 tons of dry matter per acre per year. The pastures are currently in fair to good conditions. The primary forage species are rye-grass, orchard-grass, some fescue and white clover. The stocking rate will initially be 1.6 animal per acre with a projected stocking rate of 2.2. A rotational grazing system is being implemented.

The manure from this operation will be applied to all 162.4 acres. Manure during Phase 1 will be handled 80% solids and 20% liquids. In phase 2 and 3, manure will be handled 100% liquids. The solid manure will be transported to the pasture fields with a tractor and manure spreader and applied. The liquid manure will be transported to the fields with a 4,000 gallon tank wagon and applied.

At Tract 81 there is an existing below ground liquid waste store tank. The liquid waste storage tank is 20' x 26' x 8'. In Phase 1, this waste storage tank will be used to store the milk house and parlor wastes. A 12' x 145' x 8' below ground liquid waste storage tank will be constructed. Two waste transfer pipes will be installed to transfer the liquid manure from the animal confinement buildings to the 12' x 145' x 8' below ground liquid waste storage tank. There is an existing 32' x 8' below ground liquid waste storage tank at Tract 51. Liquid wastes from Tract 81 will be transported by a 4,000 gallon tank wagon to this facility and stored when the soil and climatic conditions are not favorable for manure application to the pastures. For the 278-1,000 lb. animal units in Phase 1, the liquid wastes can be stored for 46 days. There are two existing silage bunkers. One at Tracts 81 and one at Tract 51 that will be used to store solid manure when the soils and climatic conditions are not favorable for solid manure application. Plastic will be placed over the silage bunkers when the manure is stored in them. The silage bunker at Tract 81

construction
completed
Spring 2005

RECEIVED 5/19/05

MA# 176184
AWMP # 05057

Received 5/19/05
Due Date 7/2/05

is 78' x 34'. The silage bunker at Tract 51 is 90' x 30'. For the 278-1,000 lb. animal units in Phase 1, the solid manure can be stored for over 160 days.

During Phase 2, a 100' x 16' above ground liquid waste storage tank will be constructed. This liquid waste storage tank in combination with the existing liquid tanks and the planned 12' x 145' x 8' will provide 133 days of storage for the proposed 325-1,000 lb. animal units in Phase 2. A pump and waste transfer pipeline will be used to transfer the liquid wastes from the existing below ground liquid waste tank and the newly constructed 12' x 145' x 8' below ground liquid waste storage tank to the 100' x 16' above ground liquid waste tank. Liquid waste from the below ground liquid waste tank at Tract 51 will be transported to Tract 81 by the 4,000 gallon tank wagon and placed in the above ground liquid waste storage tank when the soil and climatic conditions are not favorable for application. The silage bunkers will no longer be used for solid manure storage as the waste generated will be handled 100% liquids.

During Phase 3 an additional 100 heifers will be added to the operation. All manure will be handled 100% liquids. The 100' x 16' above ground tank in combination with the three below ground liquid waste storage tanks will provide 124 days storage for the 365-1,000 lb. animal unit operation. The liquid manure produced at Tract 51 will be transported and stored in the above ground liquid waste storage tank at Tract 81 when the soil and climatic conditions are not favorable for manure application.

All conservation practices existing and installed will be managed and maintained in accordance with the enclosed "CONSERVATION PRACTICE OPERATION AND MAINTENANCE WORKSHEETS"

Soils where manure will be applied are: Chitwood, Hebo, Knappa, and Quillayute silt loam soils. The Hebo silt loam soil is poorly drained. The Chitwood silt loam soil is somewhat poorly drained. The Knappa and Quillayute silt loam soils are well drained.

Soil Description

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.

HbA - Hebo silt loam is a poorly drained soil formed in alluvium on terraces. Slopes are 0-3%. Permeability is very slow. The runoff rate is slow. Erosion hazard is slight. The surface and subsoil are both dark gray silty clays with an effective rooting depth of less than 20 inches. High water tables influence root depths. Available water holding capacity is 8-11 inches. NRCS capability classification is IVw because of wetness. Hebo soils are primarily used for pastures.

KaB - Knappa silt loam, 0-7% slopes, are very deep, well drained soils. The erosion hazard is slight. Permeability is moderate. NRCS capability classification is IIc because of climate. Effective rooting depth is more than 60 inches. Available water holding capacity is 10 to 12 inches. Soils are well suited for pasturelands. Should they be used for woodland, site indexes are 170 for Douglas Fir. Logging equipment limitations are moderate.

QaB - Quillayute loams, 0-7% slopes, are "well drained" soils. These soils are located on terraces. The erosion hazard is slight to moderate. Permeability is moderate. NRCS capability classification is IIe because of erosion potential on higher slopes. The effective rooting depth is greater than 60 inches. The total available water holding capacity is 12 to 17 inches. These soils are well suited for pasture.

Re - The Riverwash soil series consist of narrow, irregular strips in the bends of stream channels and along drainage ways. The strips are from 40 to 200 yards in width and consist of well-rounded sand, gravel, stones, and boulders. Riverwash slopes are from 0-5 percent. Depth to bedrock is 20 inches to more than 60 inches. Permeability is rapid. Available water holding capacity and water supply capacity are variable. Effective rooting depth is 20 to 60 inches. The water erosion hazard is severe. NRCS capability classification is VIIIs because of the limited potential to produce vegetation on the aggregate.

Butch Katen
03/2005

LAND USE SUMMARY

<u>Tract No.</u>	<u>Field No.</u>	<u>Land Use</u>	<u>Acres</u>
81	1	Pasture	9.8
	2	Pasture	16.9
	3	Pasture	14.9
	4	Pasture	8.3
	5	Pasture	12.2
	6	Pasture	5.9
	7	Pasture	11.3
	8	Pasture	6.8
	9	Pasture	18.3
	10	Wildlife	44.7
	F	Farmstead	5.2
		Subtotal	154.3
51	1	Pasture	2.9
	2	Pasture	6.9
	3	Pasture	2.1
	4	Pasture	7.8
	5	Pasture	6.8
	6	Pasture	7.4
	7	Pasture	7.2

<u>Tract No.</u>	<u>Field No.</u>	<u>Land Use</u>	<u>Acres</u>
51	8	Pasture	13.1
	9	Pasture	3.8
	10	Mined	15.4
	11	Wildlife	6.8
	12	Wildlife	10.2
	F	Farmstead	3.4
		Subtotal	93.8
		TOTAL	248.1

SUMMARY

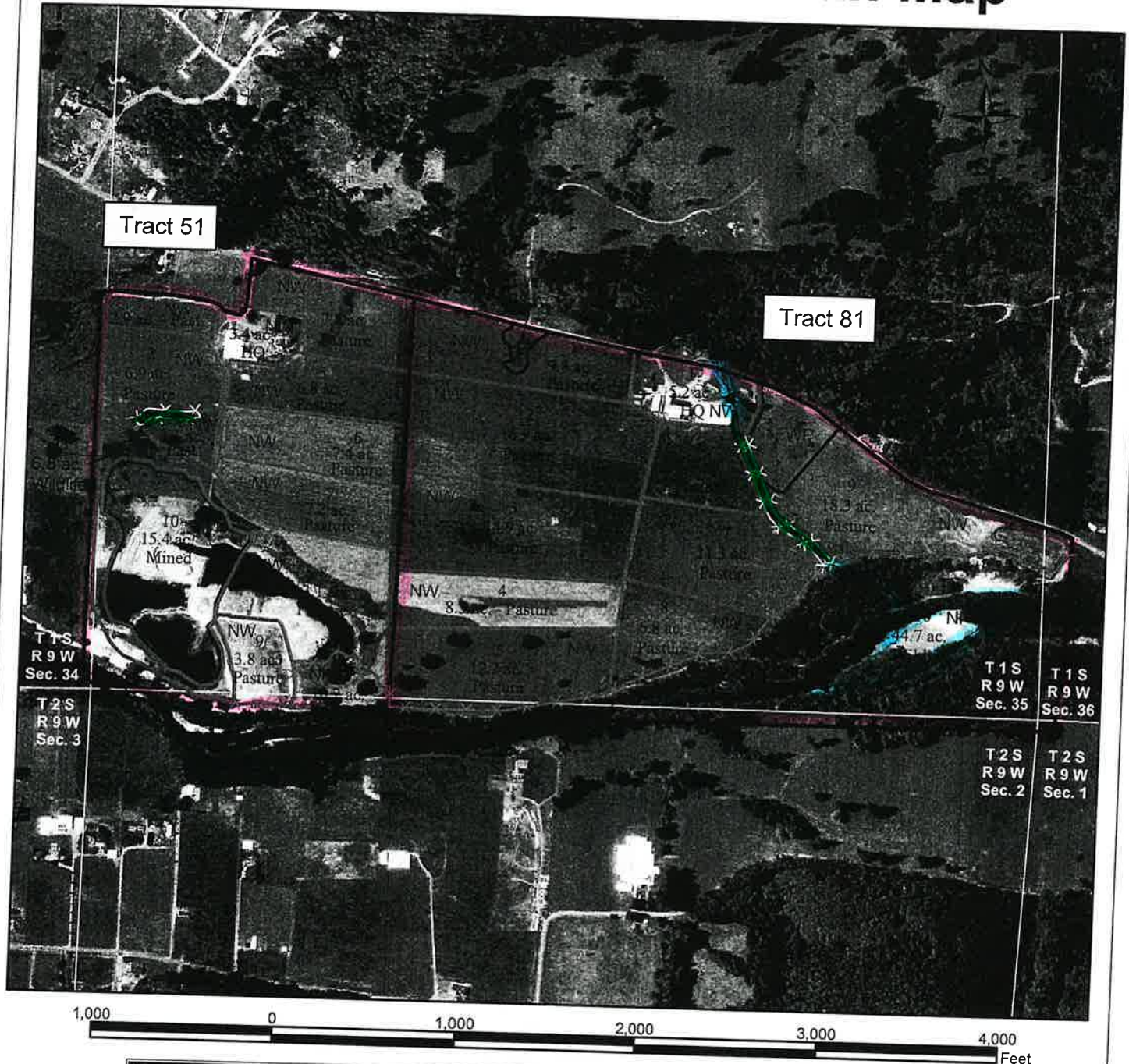
Pasture	162.4
Wildlife	61.7
Mined	15.4
Farmstead	8.6
TOTAL	248.1

BUTCH KATEN
TR059

TILLAMOOK SERVICE CENTER
USDA - NRCS
TILLAMOOK, OREGON

Tillamook County SWCD
Approximate Acres: 248.1
Date: 4/1/2005

Conservation Plan Map



Tract Boundaries

Planned Land Units

Public Land Survey

Legend

Wetland Determination

NW = Non Wetland

NI = Not Inventoried

FWP = Farmed Wetland Pasture

AW = Artificially Induced Wetland

Filter Strip

Existing Fence

Planned Fence

Open Water Course

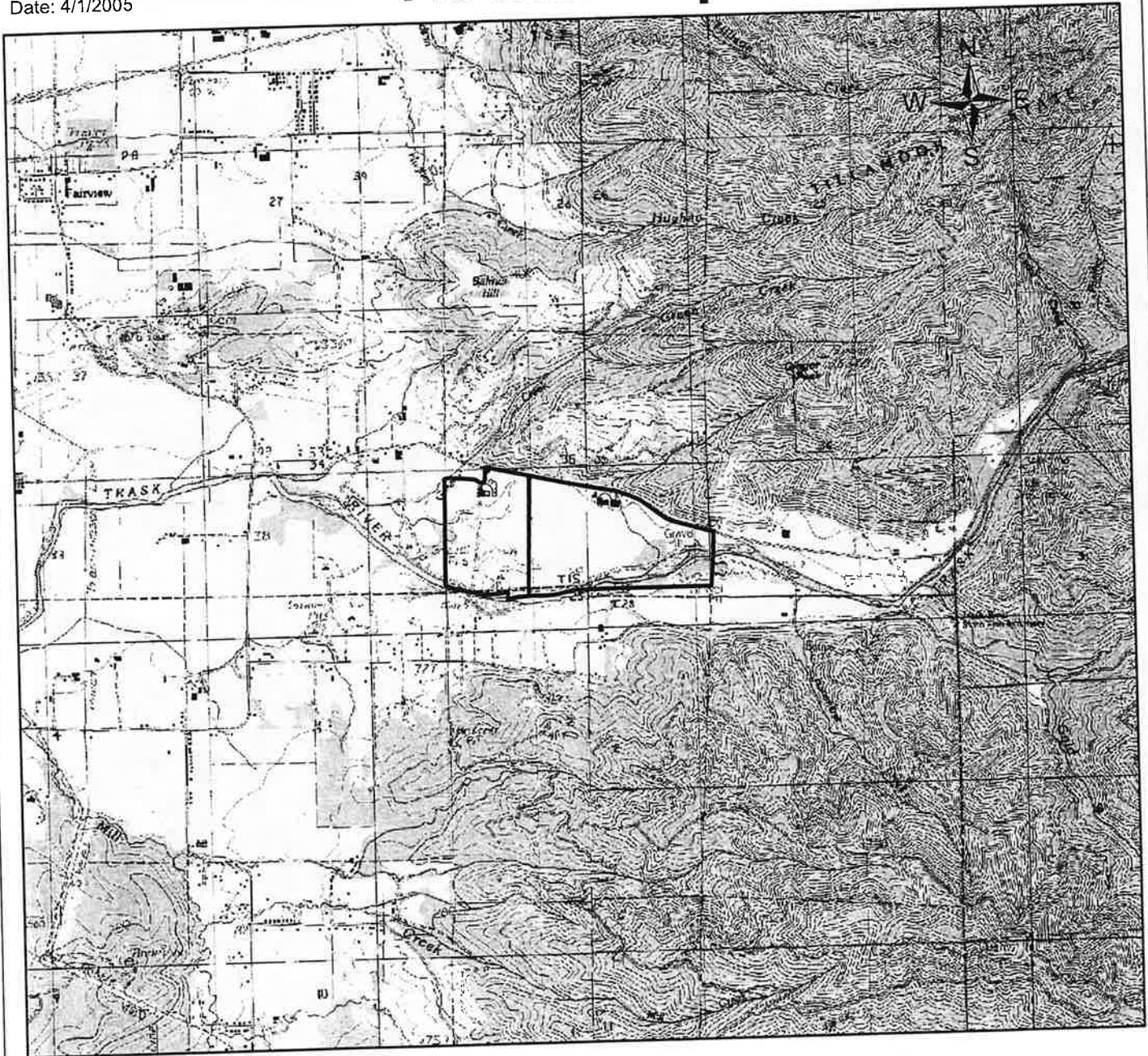


BUTCH KATEN
TR059

TILLAMOOK SERVICE CENTER
USDA - NRCS
TILLAMOOK, OREGON

Tillamook County SWCD
Approximate Acres: 248.1
Date: 4/1/2005

7.5 Min. Topo Map



2,000 0 2,000 4,000 6,000 8,000 Feet



□ Tract Boundaries



Farmstead Lat/Long (NAD83)
45 26' 30.39" N; 123 44' 58.5" W



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

Robert A. Pedersen
Basin Team Leader

Conservation Plan

BUTCH KATEN
11165 TRASK RIVER 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: 51

Comprehensive Nutrient Management Plan

A Comprehensive Nutrient Management Plan consisting of structural and vegetative practices for the handling, transferring, collecting, 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	8	2005		
Total:	1 no				

Waste Storage Facility

A 32' x 8' below ground liquid waste tank was installed. This 6,447 cubic storage facility in combination with the below ground liquid waste storage facility, the planned below ground liquid waste tank, and the planned above ground liquid waste storage tank at Tract 81 will store the liquid waste generated by the 365-1,000 lb. animal units for 124 days.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	4	1980		
Total:	1 no				

Tract: 81

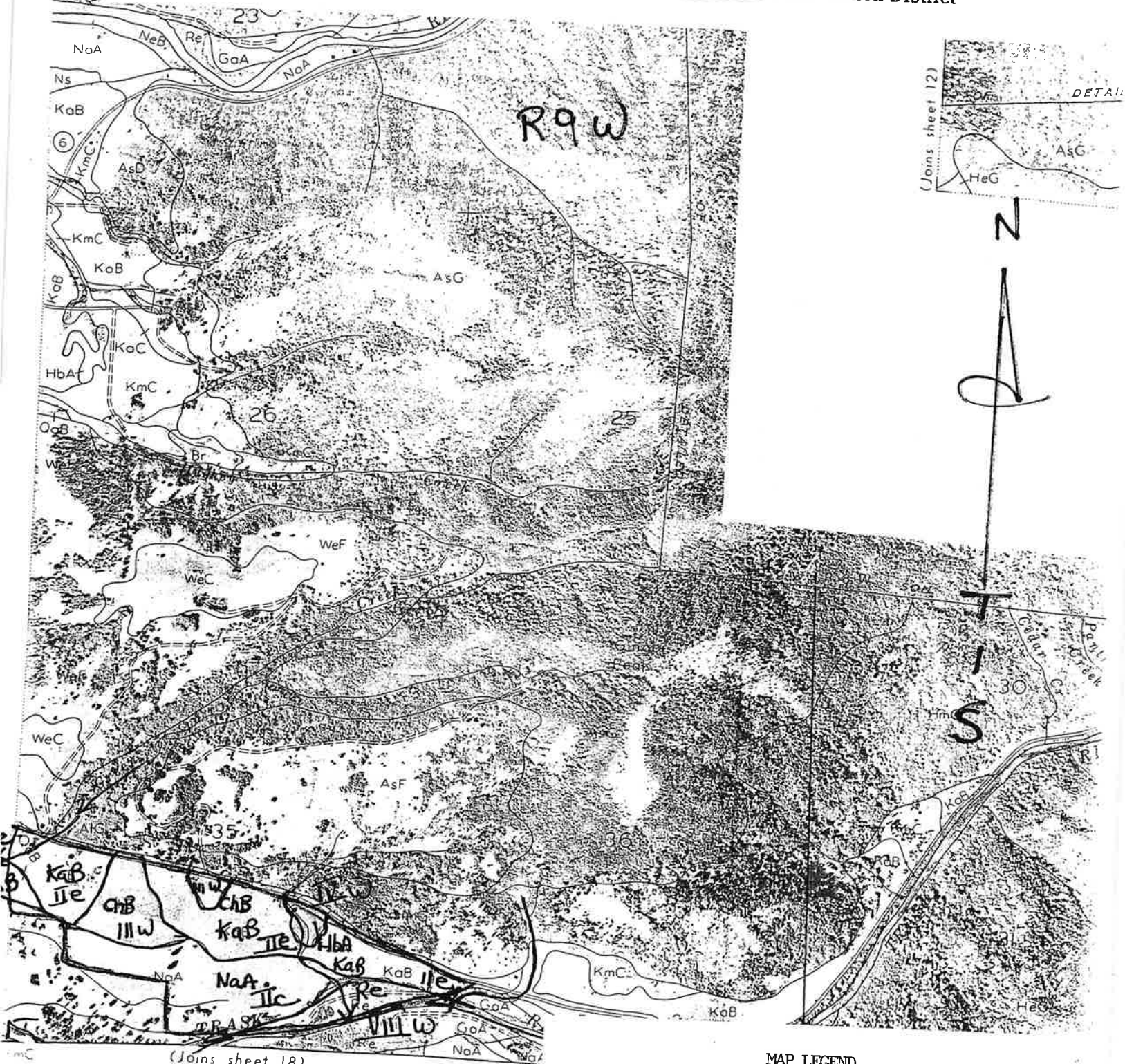
Comprehensive Nutrient Management Plan

A Comprehensive Nutrient Management Plan consisting of structural and vegetative practices for the handling, transferring, collecting, 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	2008		
Total:	1 no				

SOIL MAP

Owner Butch Kater Operator Same
County Tillamook State Oregon
Soil survey sheet(s) or code nos. 15 Approximate scale 1:20000
Prepared by U. S. Department of Agriculture, Soil Conservation Service cooperating
with Tillamook County Soil and Water Conservation District



MAP LEGEND

Farm Boundary
Soil Boundary
Soil Mapping Unit
Soil Capability Unit
Open Water Course



Manure Transfer

160 feet of 5 inch Class Code 125 PVC manure transfer pipe will be installed to transfer manure from the below ground liquid waste storage tank to the planned above ground liquid waste storage tank. NRCS will provide the specifications prior to installation.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	7	2005		
Total:	1 no				

Manure Transfer

A pump/agitator will be installed in the planned below ground liquid waste storage tank to transfer the liquid manure to the planned above ground liquid waste storage tank. The pump/agitator will be installed in accordance with manufacturer's specifications.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	9	2004		
Total:	1 no				

Roof Runoff Structure

Gutters and downspouts will be installed on the animal confinement builds that require roof water management.. NRCS will provide the specifications prior to installation.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	8	2006		
Total:	1 no				

Underground Outlet

A 6 inch underground PVC non-perforated pipe will be installed to outlet the gutter downspouts in an area free of manure. NRCS will provide the specifications prior to installation.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1000 ft	8	2006		
Total:	1000 ft				

Waste Storage Facility

A 100' x 16' above ground liquid manure tank will be constructed to increase the liquid manure storage capacity. This liquid waste storage tank in combination with the planned below ground liquid waste storage tank the existing below ground liquid wastes will store the liquid waste produced by the 365-1,000 lb. animal units for 124 days. The above ground liquid waste storage tank will be installed in accordance with NRCS Specifications and drawing AWM-313060.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	7	2005		
Total:	1 no				

Waste Storage Facility

A 12' x 145' x 8' below ground liquid wastes storage tank will be installed. This 8,700 cubic foot liquid waste storage tank in combination with the existing below ground liquid waste storage tank, the planned above ground liquid waste storage tank and the existing below ground liquid waste storage tank at Tract 51 will store the liquid waste produced by the 365-1,000 lb. animal units for 124 days. NRCS will provide specifications prior to installation.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	9	2004		
Total:	1 no				

Waste Storage Facility

A 20' x 26' x 8' below ground liquid manure tank was installed. This 4,160 liquid waste tank in combination with the existing below ground liquid waste storage tank at Tract 51 and the planned below ground liquid waste storage tank and the above ground liquid waste storage tank will store the liquid waste generated by the 365-1,000 lb. animal units for 124 days.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	6	1975		
Total:	1 no				

Waste Storage Facility

An agitator/pump will be professionally installed in the planned above ground liquid wastes storage tank for proper handling and managing the stored liquid manure. The agitator/pump will be installed in accordance with manufacturer's specifications.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1 no	7	2005		
Total:	1 no				

Mined

Tract: 51

Fence

Trask River has been fenced to exclude livestock from the watercourse and riparian area.

Field	Planned Amount	Month	Year	Applied Amount	Date
10	900 ft	9	1990	900 ft	9/3/1990
Total:	900 ft			900 ft	

Use Exclusion

Livestock have been excluded from the Trask River.

Field	Planned Amount	Month	Year	Applied Amount	Date
10	0.9 ac	9	1990	0.9 ac	9/3/1990
Total:	0.9 ac			0.9 ac	

Pasture

Tract: 51

Fence

Trask River has been fenced to exclude livestock from the watercourse and riparian area.

Field	Planned Amount	Month	Year	Applied Amount	Date
9	300 ft	9	1990	300 ft	9/3/1990
Total:	300 ft			300 ft	

Fence

Water course will be fenced to prevent livestock access to the water course. An NRCS Specification will be provide prior to implementation.

Field	Planned Amount	Month	Year	Applied Amount	Date
2	750 ft	6	2006		
3	750 ft	6	2006		
Total:	1500 ft				

Filter Strip

A grass filter strip adjacent to the open watercourse will be established and maintained as part of the animal confinement operation water quality plan to prevent agricultural waste from entering the open watercourse. The filter strip will be 35 feet wide. The filter strip will be established in accordance with the enclosed NRCS Filter Specification Worksheet Code 393.

Field	Planned Amount	Month	Year	Applied Amount	Date
2	0.6 ac	8	2006		
3	0.6 ac	8	2006		
Total:	1.2 ac				

Nutrient Management

Manure will be used for forage production. Soil tests will be used to determine rates of application. Nutrient management will be implemented in accordance with the enclosed Nutrient Management Specification Sheet Code 590.

Field	Planned Amount	Month	Year	Applied Amount	Date
1	2.9 ac	9	2006R		
2	6.9 ac	9	2006R		
3	2.1 ac	9	2006R		
4	7.8 ac	9	2006R		
5	6.8 ac	9	2006R		
6	7.4 ac	9	2006R		
7	7.2 ac	9	2006R		
8	12.1 ac	9	2006R		
9	3.8 ac	8	2006R		
Total:	57 ac				

Prescribed Grazing

Pastures will be managed in accordance with the enclosed Prescribed Grazing Specification Sheet Code 528A.

Field	Planned Amount	Month	Year	Applied Amount	Date
1	2.9 ac	8	2005R		
2	6.9 ac	8	2005R		
3	2.1 ac	8	2005R		
4	7.8 ac	8	2005R		
5	6.8 ac	8	2005R		
6	7.4 ac	8	2005R		
7	7.2 ac	8	2005R		
8	12.1 ac	8	2005R		
9	3.8 ac	7	2005R		
Total:	57 ac				

Use Exclusion

Livestock have been excluded from the Trask River.

Field	Planned Amount	Month	Year	Applied Amount	Date
2	0.2 ac	7	2006		
3	0.2 ac	7	2006		
9	0.3 ac	9	1990	0.3 ac	9/3/1990
Total:	0.7 ac			0.3 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	2.9 ac	8	2005R		
2	6.9 ac	8	2005R		
3	2.1 ac	8	2005R		
4	7.8 ac	8	2005R		
5	6.8 ac	8	2005R		
6	7.4 ac	8	2005R		
7	7.2 ac	8	2005R		
8	12.1 ac	8	2005R		
9	3.8 ft	7	2005R		
Total:	57 ac				

Tract: 81

Fence

Trask River has been fenced to exclude livestock from the watercourse and riparian area.

Field	Planned Amount	Month	Year	Applied Amount	Date
5	840 ft	7	1990	840 ft	7/20/1990
7	300 ft	7	1990	300 ft	7/20/1990
8	1050 ft	7	1990	1050 ft	7/20/1990
9	1300 ft	7	1990	1300 ft	7/20/1990
Total:	3490 ft			3490 ft	

Fence

Water course will be fenced to prevent livestock access to the water course. An NRCS Specification will be provide prior to implementation.

Field	Planned Amount	Month	Year	Applied Amount	Date
6	500 ft	6	2006		
Total:	500 ft				

Filter Strip

A grass filter strip adjacent to the open watercourse will be established and maintained as part of the animal confinement operation water quality plan to prevent agricultural waste from entering the open watercourse. The filter strip will be 35 feet wide. The filter strip will be established in accordance with the enclosed NRCS Filter Specification Worksheet Code 393.

Field	Planned Amount	Month	Year	Applied Amount	Date
6	0.4 ac	7	2006		
7	0.2 ac	7	2006		
9	0.9 ac	8	2006		
Total:	1.5 ac				

Nutrient Management

Manure will be used for forage production. Soil tests will be used to determine rates of application. Nutrient management will be implemented in accordance with the enclosed Nutrient Management Specification Sheet Code 590.

Field	Planned Amount	Month	Year	Applied Amount	Date
1	9.8 ac	9	2006R		
2	16.9 ac	9	2006R		
3	14.9 ac	9	2006R		
4	8.3 ac	9	2006R		
5	12.2 ac	8	2006R		
5	12.2 ac	9	2007R		
6	5.9 ac	9	2006R		
7	11.3 ac	9	2006R		
8	6.8 ac	9	2006R		
9	18.3 ac	8	2006R		
Total:	104.4 ac				

Prescribed Grazing

Pastures will be managed in accordance with the enclosed Prescribed Grazing Specification Sheet Code 528A.

Field	Planned Amount	Month	Year	Applied Amount	Date
1	9.8 ac	8	2005R		
2	16.9 ac	8	2005R		
3	14.9 ac	8	2005R		
4	8.3 ac	8	2005R		
5	12.2 ac	8	2005R		
6	5.9 ac	8	2005R		
7	11.3 ac	8	2005R		
8	6.8 ac	8	2005R		
9	18.3 ac	7	2005R		
Total:	104.4 ac				

Use Exclusion

Livestock have been excluded from the Trask River.

Field	Planned Amount	Month	Year	Applied Amount	Date
5	0.5 ac	7	1990	0.5 ac	7/20/1990
6	0.1 ac	7	1990	0.1 ac	7/20/1990
7	0.2 ac	7	1990	0.2 ac	7/20/1990
8	0.8 ac	7	1990	0.8 ac	7/20/1990
9	1 ac	7	1990	1.0 ac	7/20/1990
Total:	2.6 ac			2.6 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	9.8 ac	8	2005R		
2	16.9 ac	8	2005R		
3	14.9 ac	8	2005R		
4	8.3 ac	8	2005R		
5	12.2 ac	8	2005R		
6	5.9 ac	8	2005R		
7	11.3 ac	8	2005R		
8	6.8 ac	8	2005R		
9	18.3 ft	9	2005R		
Total:	104.4 ac				

Wildlife

Tract: 51

Fence

Trask River has been fenced to exclude livestock from the watercourse and riparian area.

Field	Planned Amount	Month	Year	Applied Amount	Date
12	450 ft	9	1990	450 ft	9/3/1990
Total:	450 ft			450 ft	

Use Exclusion

Livestock have been excluded from the Trask River.

Field	Planned Amount	Month	Year	Applied Amount	Date
12	0.5 ac	9	1990	0.5 ac	9/3/1990
Total:	0.5 ac			0.5 ac	

CERTIFICATION OF PARTICIPANTS

Diamond K Jerseys
by Butch Katen 4-15-05
BUTCH KATEN Date

CERTIFICATION OF:

Basin Team Leader

Robert A. Pedersen 4/18/05
Robert A. Pedersen Date

CONSERVATION DISTRICT

Purdy Fleck 4-18-05
TILLAMOOK SOIL & WATER CO Date

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R - Designates Recurring Practices

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

**WASTE STORAGE FACILITY
CODE 313**

For: Landowner/Operator Butch Katen.

Job Location: T 1S; R 9W; Sec 35;

County Tillamook SWCD Tillamook

Farm/Tract No. 03/05

Tract 51

32' x 8' circular below ground liquid waste storage tank

Tract 81

20' x 26' x 8' below ground liquid waste storage tank

12'x 145'x 8' below ground liquid waste storage tank

100' x 16' above 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 EXTEREMELY "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.

NRCS, OR
July 2001

- ⇒ A one foot free board will be maintained to prevent spillage.
- ⇒ The waste storage facility will be inspected weekly to ensure structural integrity.
- ⇒ Perform daily inspections of waterlines, including drinking water or cooling water lines. Repair leaking lines immediately to prevent excess water from entering the waste storage system.
- ⇒ Depth markers are installed in the facility and maintained to assure the maximum volume will be maintained under normal operating conditions allowing for the volume necessary to contain the 25-year, 24-hour rainfall event.
- ⇒ The depth of all liquid manure will be recorded during each week's inspection.
- ⇒ Immediately repair any vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances.
- ⇒ Pump out the facility within the first two years following construction to check for structural damage. If damage is noted, immediately seek a qualified engineer to assess the situation. Thereafter, it should be pumped out at least every four years to check for damages, remove gravel, rocks, sand, wire and other debris to maintain the designed storage capacity.
- ⇒ Immediately remove all foreign debris within the structure that may cause damage to pumps and agitator.
- ⇒ 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.
- ⇒ Dead animals will not be disposed of in the liquid waste storage facility.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

**OPERATION AND MAINTENANCE WORKSHEET
IRRIGATION WATER CONVEYANCE**

**HIGH-PRESSURE UNDERGROUND, PLASTIC PIPELINE
CODE 430-DD**

Landowner/Operator Butch Katen

Job Location: T 1S; R 9W; Sec.35

County Tillamook SWCD Tillamook

Tract No. T-81

Prepared By Pedersen Date 03/05

Waste Transfer Pipe

Operation and Maintenance Items

A properly operated and maintained waste transfer system is an asset to your farm. This waste transfer system was designed and installed for transferring liquid wastes from a below ground liquid storage facility to an above ground liquid waste storage facility. The estimated life span of this installation is at least 20 years. 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:

- ⇒ Check to make sure all valves and air vents are set at the proper operating condition so they may provide protection to the pipeline. Remove foreign materials and vegetation that can interfere with proper valve operation.
- ⇒ Pipeline will be flushed regularly to prevent clogging.
- ⇒ Leaks or broken sections will be replaced and/or repaired.
- ⇒ Maintain the designed depth of cover over the pipeline.
- ⇒ Limit traffic over the pipeline to designated sections that were designed for traffic loads.
- ⇒ Avoid travel over pipelines by tillage equipment when the soil is saturated.
- ⇒ Avoid any sub-soiling operation that may disturb the pipeline.
- ⇒ Maintain a vigorous growth of vegetative covering. This includes reseeding, fertilization and application of herbicides when necessary. Periodic mowing may also be needed to control height of vegetation.

- ⇒ Non-buried pipelines will be inspected weekly to assure there is no leaks that is causing waste spillage. Leaks will be repaired immediately.
- ⇒ Eradicate or otherwise remove all rodents or burrowing animals that can potentially damage or displace the pipe. Immediately repair any damages caused by their activity.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

**MANURE TANK AGITATOR
CODE 634**

Landowner/Operator: Butch Katen

Job Location: T 1S; R 9W; Sec. 35

County Tillamook SWCD Tillamook

Tract No. T-81

Prepared By: Pedersen

Date 03/05

Operation and Maintenance Items

A properly operated and maintained manure tank agitator is an asset to your farm. The manure agitator was designed and installed to stir the liquid waste and keep the solids in suspension so solid manure will not buildup in the bottom of the tank and reduce the designed storage capacity. The estimated life span of this installation is at least 10 years. The life of the manure agitator 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 agitator for proper operation. Clean debris from the propeller, and promptly replace any defective or damaged parts.
- ⇒ Remove the agitator from the manure tank and periodically clean and oil as needed to increase the life expectancy of the agitator.
- ⇒ 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

**MANURE TANK AGITATOR/PUMP
CODE 634**

Landowner/Operator: Butch Katen

Job Location: T 4S; R 10W; Sec. 21

County Tillamook SWCD Tillamook Tract No. T-81

Prepared By: Pedersen Date 03/05

Operation and Maintenance Items

A properly operated and maintained manure tank agitator/pump is an asset to your farm. The manure agitator/pump was designed and installed to stir the liquid waste and keep the solids in suspension so solid manure will not buildup in the bottom of the tank and reduce the designed storage capacity and transfer the manure to a tank wagon or to the fields.. The estimated life span of this installation is at least 10 years. The life of the manure agitator 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 agitator for proper operation. Clean debris from the propeller, and promptly replace any defective or damaged parts.
- ⇒ Remove the agitator from the manure tank and periodically clean and oil as needed to increase the life expectancy of the agitator.
- ⇒ 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
IRRIGATION WATER CONVEYANCE**

**LOW-PRESSURE UNDERGROUND, PLASTIC PIPELINE
CODE 430-EE**

Landowner/Operator Butch Katen

Job Location: T 1S; R 9W; Sec.35

County Tillamook SWCD Tillamook

Tract No. T-81

Prepared By Pedersen Date 03/05

Waste Transfer Pipe

Operation and Maintenance Items

A properly operated and maintained waste transfer system is an asset to your farm. This waste transfer system was designed and installed for transferring liquid wastes from the animal confinement buildings to the a below ground liquid waste storage facility. The estimated life span of this installation is at least 20 years. 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:

- ⇒ Check to make sure all valves and air vents are set at the proper operating condition so they may provide protection to the pipeline. Remove foreign materials that can interfere with proper valve operation and/or pipe flow.
- ⇒ Maintain the designed depth of cover over the pipeline.
- ⇒ Limit traffic over the pipeline to designated sections that were designed for traffic loads
- ⇒ Maintain the concrete cover over the pipeline
- ⇒ Eradicate or otherwise remove all rodents or burrowing animals that can potentially damage or displace the pipe. Immediately repair any damages caused by their activity.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

**NUTRIENT MANAGEMENT
CODE 590**

For: Landowner/Operator Butch Katen

Job Location: T1S; R 9W; Sec 35;

County Tillamook SWCD Tillamook

Farm/Tract No. T-81 & T-51

Prepared By Pedersen 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

**WASTE UTILIZATION
CODE 633**

For: Landowner/Operator Butch Katen

Job Location: T 1S; R 9W; Sec. 35

County Tillamook SWCD Tillamook Farm/Tract No. T-81 & 51

Prepared By Pedersen 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

**PRESCRIBED GRAZING
CODE 528A**

For: Landowner/Operator Butch Katen

Job Location: T 1S; R 9W; Sec.35

County Tillamook SWCD Tillamook Farm/Tract 03/05

Operation and Maintenance Items

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

- ⇒ Pastures are reestablished when forage production falls below planned yield threshold.
- ⇒ A rotational grazing system is used to maintain plant vigor.
- ⇒ Pastures are clipped and dragged during the growing season to maintain plant vigor and spread the livestock droppings to prevent grass from becoming rank.
- ⇒ Manure and commercial fertilizer applied in accordance with soil and forage tests.
- ⇒ Pasture weeds are controlled.
- ⇒ Pasture grasses are not grazed below 2 inches during the growing season
- ⇒ Livestock are removed when the soils become wet in the fall.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

FORAGE HARVEST MANAGEMENT

CODE 511

For: Landowner/Operator: Butch Katen

Job Location: T 1S; R 9W; Sec 35

County Tillamook SWCD Tillamook

Farm/Tract No. T-81 & 51

Prepared By Pedersen

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.

- ⇒ Early excess forage will be cut for ensilage.
- ⇒ 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

FILTER STRIP

CODE 393

For: Landowner/Operator Butch Katen

Job Location: T 1S; R 9W; Section 35

County Tillamook SWCD Tillamook Farm/Tract No. T-81 & 51

Prepared By: Pedersen Date 03/05

Operation and Maintenance Items

A properly operated and maintained vegetated filter strip is an asset to your farm. This vegetative filter strip was designed and installed to remove sediment and pollutants from runoff. 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:

- ⇒ Maintain vigorous growth of vegetative covering. This includes reseeding, commercial fertilization and application of herbicides when necessary. Periodic mowing or grazing may also be needed to control height.
- ⇒ Where the filter strip is used to trap nutrients, periodic grazing or mechanical harvesting and removal of vegetation is needed.
- ⇒ Remove all foreign debris that hinders system operation.
- ⇒ Limit the traffic and do not use as a roadway.
- ⇒ Limit livestock usage to vegetative growth periods when they will not damage vegetative root system or compact the soil.
- ⇒ Immediately repair any vandalism, vehicular, or livestock damage.
- ⇒ Eradicate or remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

CLIENT:	Karen, Butch PHASE 1 (Initial Herd Size)	
ASSISTED BY:	Pedersen	CHECKED BY:

ANIMAL INVENTORY

GRAZING PERIOD

Phase 1 ORAWMTillamookv1.8.xls

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

TILLAMOOK 1 W

WEATHER STATION		TILAMOOK 1 W			
Month	25Yr 24Hr	6.00	Lot Runoff Factors as a Percent of Monthly Precipitation		
	Monthly Average In Inches		Paved	Unpaved	
	Precipitation	Evaporation			
October	7.48	1.42	50%	20%	
November	12.80	0.75	60%	25%	
December	14.25	0.60	60%	25%	
January	13.46	0.48	60%	25%	
February	10.45	0.78	50%	25%	
March	10.35	1.26	45%	15%	
April	6.03	1.90	40%	15%	
May	4.24	3.22	40%	10%	
June	3.16	3.40	35%	10%	
July	1.44	3.91	30%	0%	
August	1.73	3.52	40%	10%	
September	3.69	2.54	45%	15%	
Annual	89.08	23.78			

Description of Runoff Area

[illegible]

10

Type of Water Use	Number of Animals	Number of Wasties per Day	Gallons of Water Used per Wash-Day	Total Water Use per Day, Gallons	Total Water Use per Day, Cubic Feet
Animal Wastewater	230/8	2	6.39	150	20.1
Equipment Wash		2	575.00	1030	137.7
Flushwater		2		0	0.0
Miscellaneous		2	25.00	50	6.7
Total				1230	164.4

Field Number	Acres	Crop	Condition	Yield Units	Tonne Yield	Nutrients Removed in Pounds per Acre		
						Nitrogen N	Phosphorus P ₂ O ₅	Potassium K ₂ O

Field Number	Acres	Crop	Condition	Yield Units	Target Yield	Nutrients Removed in Pounds per Acre		
						Nitrogen N	Phosphorous P ₂ O ₅	Potassium K ₂ O
T81 1,3,6,7,9	77.1	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.08	307	85	235
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.08	307	85	235
T81 1,3	11.9	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.08	307	85	235
4,7	29.2	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.08	307	85	235
8,9	16.9	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.08	307	85	235
Off-Farm								

[illegible]

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	80%	316	79	62	246	41	36	11,362
MILKER (DRY)	Dry Scrape System	80%	53	13	10	40	5	36	1,925
CALVES (1-12 Months)	Dry Scrape System	80%	18	5	2	8	1	36	662
Total Solids			387	97	74	294	46		13,949

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

Month	Runoff in Cubic Feet				Facility Water Use Cubic Feet	Manure		Bedding		Solids Separated		Solids in Liquids		Total	
	Roof Area Square Feet	Paved Slab Area Square Feet	Unpaved Lot Area Square Feet	Silage Pit Surface Area, SF		Solids Cubic Feet	Liquids Cubic Feet	Cubic Feet	Pounds	Cubic Feet	Pounds	Cubic Feet	Pounds	Cubic Feet	Solids
October	0	0	0	0	5,098	1,405	9,992	1,062	7,436	3,016	108,567	754	27,142	3,016	6,393
November	0	0	0	0	4,933	1,360	9,670	3,501	25,510	11,624	418,482	2,906	104,620	11,624	10,119
December	0	0	0	0	5,098	1,405	9,992	3,618	25,327	12,012	432,431	3,003	108,108	12,012	10,380
January	0	0	0	0	5,098	1,405	9,992	3,618	25,327	12,012	432,431	3,003	108,108	12,012	10,380
February	0	0	0	0	4,604	1,269	9,025	3,268	22,876	10,850	390,583	2,712	97,646	10,850	9,596
March	0	0	0	0	5,098	1,405	9,992	3,618	25,327	12,012	432,431	3,003	108,108	12,012	10,380
April	0	0	0	0	4,933	1,360	9,670	1,028	7,196	2,918	105,065	730	26,266	2,918	6,204
May	0	0	0	0	5,098	1,405	9,992	1,062	7,436	3,016	108,567	754	27,142	3,016	6,204
June	0	0	0	0	4,933	1,360	9,670	1,028	7,196	2,918	105,065	730	26,266	2,918	6,204
July	0	0	0	0	5,098	1,405	9,992	1,062	7,436	3,016	108,567	754	27,142	3,016	6,393
August	0	0	0	0	5,098	1,405	9,992	1,062	7,436	3,016	108,567	754	27,142	3,016	6,393
September	0	0	0	0	4,933	1,360	9,670	1,028	7,196	2,918	105,065	730	26,266	2,918	6,204
Annual	0	0	0	0	60,020	16,543	117,646	24,957	168,326	79,328	2,855,820	19,832	713,955	79,328	96,033

DAILY NUTRIENT PRODUCTION

[illegible]

CLIENT: Katen, Butch PHASE 1 (Initial Herd Size)
ASSISTED BY: Pedersen

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	187	74	134	746	295	535	3,071	1,197	2,178	0	0	0	4,004	1,565	2,847
November	775	303	551	3,100	1,212	2,204	0	0	0	0	0	0	3,875	1,514	2,755
December	801	313	569	3,203	1,252	2,277	0	0	0	0	0	0	4,004	1,565	2,847
January	801	313	569	3,203	1,252	2,277	0	0	0	0	0	0	4,004	1,565	2,847
February	723	283	514	2,893	1,131	2,057	0	0	0	0	0	0	3,616	1,414	2,571
March	801	313	569	3,203	1,252	2,277	0	0	0	0	0	0	4,004	1,565	2,847
April	181	71	129	722	285	518	2,972	1,158	2,108	0	0	0	3,875	1,514	2,755
May	187	74	134	746	295	535	3,071	1,197	2,178	0	0	0	4,004	1,565	2,847
June	181	71	129	722	285	518	2,972	1,158	2,108	0	0	0	3,875	1,514	2,755
July	187	74	134	746	295	535	3,071	1,197	2,178	0	0	0	4,004	1,565	2,847
August	187	74	134	746	295	535	3,071	1,197	2,178	0	0	0	4,004	1,565	2,847
September	181	71	129	722	285	518	2,972	1,158	2,108	0	0	0	3,875	1,514	2,755
Annual	5,189	2,033	3,697	20,755	8,133	14,786	21,199	8,261	15,034	0	0	0	47,143	18,426	33,517

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.8

4/19/2005
STATE: OREGON

CLIENT: **Katen, Butch** PHASE 1 (Initial Herd Size)
ASSISTED BY: **Pedersen** CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

TANK

TANK PARAMETERS		MONTHLY INFLOWS INTO TANK					
Parameter	Value	Month	Number of days	Rain-Evap on Tank CF	Rain-Evap on Existing Storage, CF	Normal Runoff CF	Washwater CF
Storage Period, Days=	46	October	31	0	0	0	5,098
Tank Width, Feet=	12	November	30	0	0	0	4,933
Tank Length, Feet=	80	December	31	0	0	0	5,098
Existing Storage, Cubic Feet=	9,281,000	January	31	0	0	0	5,098
Surface Area of Existing Storage, SF=	0	February	28	0	0	0	4,604
25 Year-24 Hour Storm Runoff, CF=	0	March	31	0	0	0	5,098
Volume Needed, Cubic Feet=	15,915	April	30	0	0	0	4,933
Design Volume, Cubic Feet=	6,633	May	31	0	0	0	5,098
Is Tank Covered? yes	▼	June	30	0	0	0	4,933
Tank Dimensions? Rectangular	▼	July	31	0	0	0	5,098
		August	31	0	0	0	5,098
		September	30	0	0	0	4,933
		Annual	365	0	0	0	60,020
							14,841

New BLGT
is 12x8x145
This design says
that it is only
80' long Tank is
not covered.

1.0 Feet

Minimum Freeboard = 1.0 Feet

25Yr-24Hr Storm Precipitation =

6

Inches

25Yr-24Hr Storm Runoff =

0

Cubic Feet

46 Day Precip - Evap =

20.5726666666

Inches

Runoff from Normal Precipitation =

0

Cubic Feet

Washwater =

7816

Cubic Feet

Manure =

3495

Cubic Feet

Depth =

6.91

Feet

Width =

12

Feet

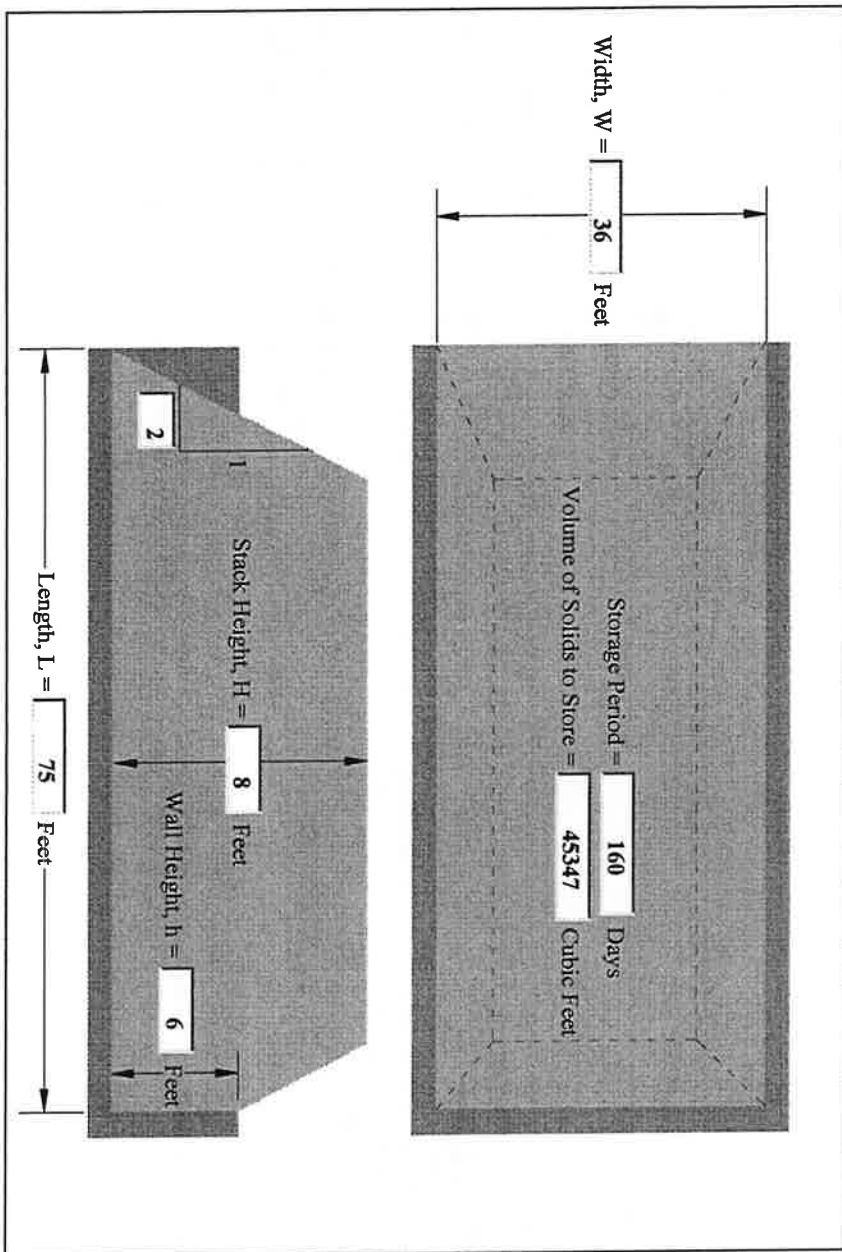
CLIENT: Katen, Butch PHASE 1 (Initial Herd Size)
ASSISTED BY: Pedersen
CHECKED BY:

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=	160	October	31	2166	850	2,180	0
Stacking Width, W in Feet=	36	November	30	8823	2,801	5,812	0
Stacking Height, H in Feet=	8.00	December	31	9117	2,895	6,006	0
Wall Height, h in Feet=	6.00	January	31	9117	2,895	6,006	0
Stack Side Slope (X:1)=	2.00	February	28	8235	2,614	5,425	0
Existing Storage, Cubic Feet=	26,760	March	31	9117	2,895	6,006	0
Surface Area of Existing Storage, SF=	0	April	30	2096	822	1,459	0
25 Year-24 Hour Storm Runoff, CF=	0	May	31	2166	850	1,508	0
Volume Needed, Cubic Feet=	45,347	June	30	2096	822	1,459	0
Design Volume, Cubic Feet=	18,690	July	31	2166	850	1,508	0
Is Facility Covered? YES	▼	August	31	2166	850	1,508	0
		September	30	2096	822	1,459	0
		Annual	365	59,363	19,966	40,336	0



CLIENT: **Katen, Butch** PHASE 1 (Initial Herd Size)
ASSISTED BY: **Pedersen**

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TRACTOR SPREADER APPLICATION OF SOLIDS

10 apply 79,328 cubic feet of solids generated from the operation it will take approximately 399 trips annually. Based on applying NITROGEN, N												
at agronomic rate use the application depths, travel lengths, and loads per acre listed below for each crop.												
Field Number	Acres	Crop	Tractor Spreader Capacity		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 Solids to Apply	Travel Length per Load Needed in Feet	Loads per Acre
			Bushels	CF		PPM	Lbs/100CF					
81 1-3-6-7	77.1	Hay/Pasture Mix 16 % Protein	160	199	15	3,145	19.62	307	1.00	0.8	212	14
4-5-8	27.3	Hay/Pasture Mix 16 % Protein	160	199	15	3,145	19.62	307	1.00	0.8	212	14
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	160	199	15	3,145	19.62	307	1.00	0.8	212	14
4-7	29.2	Hay/Pasture Mix 16 % Protein	160	199	15	3,145	19.62	307	1.00	0.8	212	14
8-9	16.9	Hay/Pasture Mix 16 % Protein	160	199	15	3,145	19.62	307	1.00	0.8	212	14
0												
0												
0												
0												
0												

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS

To apply		710,894 gallons of liquids generated from the operation it will take approximately		39 hours of pumping annually. Based on applying		NITROGEN, N								
at agronomic rate use the application depths, set times, and travel rates listed below for each crop.														
Field Number	Acres	Crop	Sprinkler Flowrate GPM	Wetted Diameter Feet	Portion of Wetted Diameter Receiving Liquids	NITROGEN, N		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Inches of Liquids to Apply	Application Rate in Inches/Hour	Set Time Needed in Hours	Travel Rate Needed in Feet/Minute	
						Concentration in Storage Facility PPM	Lbs/1000Gal							
81 1-3-6-7	77.1	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	▼	700	5.84	307	1.00	3.15	1.45	5.35	0.61
4-5-8	27.3	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	▼	700	5.84	307	1.00	3.15	1.45	5.35	0.61
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	▼	700	5.84	307	1.00	3.15	1.45	5.35	0.61
4-7	29.2	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	▼	700	5.84	307	1.00	3.15	1.45	5.35	0.61
8-9	16.9	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	▼	700	5.84	307	1.00	3.15	1.45	5.35	0.61
0						▼								
0						▼								
0						▼								
0						▼								
0						▼								

CLIENT: Katen, Butch PHASE 1 (Initial Herd Size)

ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

To apply 710,894 gallons of liquids generated from the operation it will take approximately 178 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		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	
					Concentration in Storage Facility PPM	Lbs/1000Gal						
81 1-3,6,7	77.1	Hay/Pasture Mix 16 % Protein	4,000	15	700	5.84	307	1.00	1.19	359	8.1	
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	4,000	15	700	5.84	307	1.00	1.19	359	8.1	
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	4,000	15	700	5.84	307	1.00	1.19	359	8.1	
7	29.2	Hay/Pasture Mix 16 % Protein	4,000	15	700	5.84	307	1.00	1.19	359	8.1	
8-9	16.9	Hay/Pasture Mix 16 % Protein	4,000	15	700	5.84	307	1.00	1.19	359	8.1	
0												
0												
0												
0												

CLIENT: Katen, Butch PHASE 1 (Initial Herd Size)
ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

NUTRIENTS AVAILABLE AFTER STORAGE

Nutrient Source	Type of Operation		Pounds of Nutrients Available			Percent Nutrients Retained After Storage			Pounds of Nutrients Retained After Storage		
	Dairy	Type of Storage Facility	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids		Tank (Covered)	5,189	2,033	3,697	80%	90%	90%	4,151	1,830	3,327
Solids		Solids Storage Facility (Roofed)	20,755	8,133	14,786	75%	90%	90%	15,567	7,319	13,308
Grazing		NONE	21,199	8,261	15,034	100%	100%	100%	21,199	8,261	15,034

NUTRIENTS AVAILABLE AFTER APPLICATION

Nutrient Source	Type of Application System		Pounds of Nutrients Available			Percent Nutrients Retained After Application			Pounds of Nutrients Retained After Application		
			N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids		Sprinkling	4,151	1,830	3,327	75%	100%	100%	3,113	1,830	3,327
Solids		Broadcast (Incorporated 7 or more days after application)	15,567	7,319	13,308	70%	100%	100%	10,897	7,319	13,308
Grazing		Grazing	21,199	8,261	15,034	90%	100%	100%	19,079	8,261	15,034

NUTRIENTS AVAILABLE AFTER DENTRIFICATION

Nutrient Source	Location		Pounds of Nutrients Available			Percent Nutrients Retained After Dentrification			Pounds of Nutrients Retained After Dentrification		
	Coast	Soil Drainage Class	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids		Moderately Well Drained	3,113	1,830	3,327	82%	100%	100%	2,553	1,830	3,327
Solids		Moderately Well Drained	10,897	7,319	13,308	82%	100%	100%	8,935	7,319	13,308
Grazing		Moderately Well Drained	19,079	8,261	15,034	82%	100%	100%	15,645	8,261	15,034

CHECKED BY.

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

NUTRIENT BALANCE BASED ON AVAILABLE ACRESPhase 1 ORAWMTTillamookv1.8.xls

CHECKED BY:

Type of Animal	Number of Animals	Average Weight (lbs.)	Animal Units (1,000 lb.)	Milk Production in Pounds/Cow/Day=						Manure CF/D/AU	Annual		
				Nutrient Production							Days Confined	Days Grazed	
				(lbs./day/1000 lb. Animal Unit)			(lbs./day)						
				N	P	K	N	P	K				
MILKER	▼	300	988	270.0	0.49	0.09	0.28	132.57	23.36	76.72	1.37	205	161
MILKER (DRY)	▼	54	988	45.0	0.36	0.05	0.23	16.20	2.25	10.35	1.10	151	214
CALVES (1-12 Months)	▼	56	288	10.0	0.31	0.04	0.24	3.10	0.40	2.40	1.30	365	0
▼													
▼													
▼													
▼													
▼													
▼													
▼													
▼													
▼													
Totals/Averages	400	667	325.0	0.47	0.08	0.28	151.9	26.0	89.5	1.3			

Percent of Month and Number of Animals Grazing													
Type of Animal	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AU-YR.
MILKER	75%	0%	0%	0%	0%	0%	75%	75%	75%	75%	75%	75%	1,418
	300	300	300	300	300	300	300	300	300	300	300	300	
NON-MILKER (DRY)	100%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	315
	50	50	50	50	50	50	50	50	50	50	50	50	
CALVES (1-12 Months)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0
	50	50	50	50	50	50	50	50	50	50	50	50	
													0
													0
													0
													0
													0
Total AUM's Available>	185						333	404	380	357	136	136	1,938
Total AUM's Needed>>	248	0	0	0	0	0	248	248	248	248	248	248	1,733
Total AUM's>>>>>>>>>>>>	-63	0	0	0	0	0	86	157	133	110	-110	-110	203

ASSISTED BY: Pedersen

CHECKED BY

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

TILLAMOOK 1 W

WEATHER STATION		TILLAMOOK 1 W			
Month	25Yr-24Hr Monthly Average in Inches	6.08	Lot Runoff Factors as a Percent of Monthly Precipitation		
	Precipitation	Evaporation	Paved	Unpaved	
October	7.48	1.42	50%	20%	
November	12.80	0.75	60%	25%	
December	14.25	0.60	60%	25%	
January	13.46	0.48	60%	25%	
February	10.45	0.78	50%	25%	
March	10.35	1.26	45%	15%	
April	6.03	1.90	40%	15%	
May	4.34	3.22	40%	10%	
June	5.16	3.40	35%	10%	
July	1.44	3.91	30%	0%	
August	1.73	3.52	40%	10%	
September	3.69	2.54	45%	15%	
Annual	89.08	23.78			

Description of Runoff Area

[illegible]

WATER USE THAT ENTERS LIQUID STORAGE FACILITY

Type of Water Use	Number of Animals	Number of Washes per Day	Gallons of Water Used per Wash-Day	Total Water Use per Day, Gallons	Total Water Use per Day, Cubic Feet
Animal Washwater	388,0	2	0.39	180	24.1
Equipment Wash		2	\$15.00	1030	137.7
Flushwater		2		0	0.0
Miscellaneous		2	25.00	50	6.7
Total				1260	168.4

[illegible]

Field Number	Acres	Crop	Condition	Yield Units	Target Yield	Nutrients Removed in Pounds per Acre		
						Nitrogen N	Phosphorous P ₂ O ₅	Potassium K ₂ O
T 81.1.3.67.9	77.1	Hay/Pasture Mlx 16 % Protein	50% DM	Ton	6.00	307	85	235
4.5.8	27.3	Hay/Pasture Mlx 16 % Protein	50% DM	Ton	6.00	307	85	235
T 81.1.3	11.9	Hay/Pasture Mlx 16 % Protein	50% DM	Ton	6.00	307	85	235
4.7	29.2	Hay/Pasture Mlx 16 % Protein	50% DM	Ton	6.00	307	85	235
8.9	16.9	Hay/Pasture Mlx 16 % Protein	50% DM	Ton	6.00	307	85	235
Off-Farm								

CLIENT:	Karen, B
ASSISTED BY:	Pedersen

DeLorenzo

BEDDING VOLUME

SOLIDS SEPARATION FACTOR

PHASE 2 ORAWMTillamookv1.8.xls

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

Month	Runoff in Cubic Feet				Facility Water Use Cubic Feet	Manure		Bedding		Solids Separated		Solids in Liquids		Total Solids Cubic Feet	Total Liquids Cubic Feet
	Roof Area Square Feet	Paved Slab Area Square Feet	Unpaved Lot Area Square Feet	Sillage Pit Surface Area, SF		Solids		Pounds		Pounds					
						Cubic Feet	Liquids Cubic Feet	Cubic Feet	Pounds	Cubic Feet	Pounds				
October	0	0	0	0	5,222	1,652	11,733	1,294	9,060	0	0	1,695	0	0	18,650
November	0	0	0	0	5,053	1,599	11,335	4,116	28,815	0	0	5,715	0	0	22,124
December	0	0	0	0	5,222	1,652	11,733	4,254	29,776	0	0	5,906	0	0	22,861
January	0	0	0	0	5,222	1,652	11,733	4,254	29,776	0	0	5,906	0	0	22,861
February	0	0	0	0	4,717	1,492	10,598	3,842	26,894	0	0	5,334	0	0	20,649
March	0	0	0	0	5,222	1,652	11,733	4,254	29,776	0	0	5,906	0	0	22,861
April	0	0	0	0	5,053	1,599	11,335	1,253	8,768	0	0	1,640	0	0	18,049
May	0	0	0	0	5,222	1,652	11,733	1,294	1,294	0	0	1,695	0	0	18,650
June	0	0	0	0	5,053	1,599	11,335	1,253	8,768	0	0	1,640	0	0	18,049
July	0	0	0	0	5,222	1,652	11,733	1,294	9,060	0	0	1,695	0	0	18,650
August	0	0	0	0	5,222	1,652	11,733	1,294	9,060	0	0	1,695	0	0	18,650
September	0	0	0	0	5,053	1,599	11,335	1,253	8,768	0	0	1,640	0	0	18,049
Annual	0	0	0	0	61,484	19,452	138,150	29,654	199,812	0	0	40,469	0	0	240,103

DAILY NUTRIENT PRODUCTION

[illegible]

CLIENT: Katen, Butch PHASE 2

ASSISTED BY: Pedersen

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	1,124	443	806	0	0	0	3,585	1,404	2,336	0	0	0	4,708	1,847	3,342
November	4,556	1,788	3,234	0	0	0	0	0	0	0	0	0	4,556	1,788	3,234
December	4,708	1,847	3,342	0	0	0	0	0	0	0	0	0	4,708	1,847	3,342
January	4,708	1,847	3,342	0	0	0	0	0	0	0	0	0	4,708	1,847	3,342
February	4,252	1,668	3,019	0	0	0	0	0	0	0	0	0	4,252	1,668	3,019
March	4,708	1,847	3,342	0	0	0	0	0	0	0	0	0	4,708	1,847	3,342
April	1,087	429	780	0	0	0	3,469	1,359	2,454	0	0	0	4,556	1,788	3,234
May	1,124	443	806	0	0	0	3,585	1,404	2,536	0	0	0	4,708	1,847	3,342
June	1,087	429	780	0	0	0	3,469	1,359	2,454	0	0	0	4,556	1,788	3,234
July	1,124	443	806	0	0	0	3,585	1,404	2,536	0	0	0	4,708	1,847	3,342
August	1,124	443	806	0	0	0	3,585	1,404	2,536	0	0	0	4,708	1,847	3,342
September	1,087	429	780	0	0	0	3,469	1,359	2,454	0	0	0	4,556	1,788	3,234
Annual	30,689	12,056	21,845	0	0	0	24,745	9,692	17,507	0	0	0	55,434	21,749	39,352

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.8

4/19/2005
STATE: OREGON

CLIENT: Katen, Batch PHASE 2
ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

TANK		MONTHLY INFLOWS INTO TANK						
Tank Parameters	Value	Month	Number of days	Rain-Evap on Tank CF	Rain-Evap on Existing Storage, CF	Normal Runoff CF	Washwater CF	Manure CF
Storage Period, Days=	133	October	31	3,964	0	0	5,222	3,265
Tank Diameter, Feet=	100	November	30	7,883	0	0	5,053	12,954
		December	31	8,929	0	0	5,222	13,385
Existing Storage, Cubic Feet=	18,731,00	January	31	8,491	0	0	5,222	13,385
Surface Area of Existing Storage, SF=	0	February	28	6,326	0	0	4,717	12,090
25 Year-24 Hour Storm Runoff, CF=	0	March	31	5,946	0	0	5,222	13,385
Volume Needed, Cubic Feet=	136,530	April	30	2,702	0	0	5,053	3,160
Design Volume, Cubic Feet=	117,750	May	31	667	0	0	5,222	3,265
Is Tank Covered?	NO	June	30	-157	0	0	5,053	3,160
Tank Dimensions?	Circular	July	31	-1,616	0	0	5,222	3,265
		August	31	-1,171	0	0	5,222	3,265
		September	30	752	0	0	5,053	3,160
		Annual	365	42,717	0	0	61,484	87,739

Minimum Freeboard = 1.0 Feet

25Yr-24Hr Storm Precipitation = 6 Inches

25Yr-24Hr Storm Runoff = 0 Cubic Feet

133 Day Precip - Evap = 52.289 Inches

Runoff from Normal Precipitation = 0 Cubic Feet

Washwater = 22476 Cubic Feet

Manure = 57614 Cubic Feet

Depth = 15 Feet

Diameter = 100 Feet

CLIENT: Katen, Butch PHASE 2
ASSISTED BY: Pedersen

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=		34	October	31	0	0	0	0
Stacking Width, W in Feet=		0	November	30	0	0	0	0
Stacking Height, H in Feet=		0.00	December	31	0	0	0	0
Wall Height, h in Feet=		0.00	January	31	0	0	0	0
Stack Side Slope (X:1)=		0.00	February	28	0	0	0	0
Existing Storage, Cubic Feet=		0	March	31	0	0	0	0
Surface Area of Existing Storage, SF=		0	April	30	0	0	0	0
25 Year-24 Hour Storm Runoff, CF=		0	May	31	0	0	0	0
Volume Needed, Cubic Feet=		0	June	30	0	0	0	0
Design Volume, Cubic Feet=		0	July	31	0	0	0	0
Is Facility Covered? YES		▼	August	31	0	0	0	0
			September	30	0	0	0	0
			Annual	365	0	0	0	0

Width, W = 0 Feet

Storage Period = 34 Days

Volume of Solids to Store = 0 Cubic Feet

Stack Height, H = 0 Feet

Wall Height, h = 0 Feet

Length, L = 0 Feet

CLIENT: Katen, Butch PHASE 2
ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TRACTOR SPREADER APPLICATION OF SOLIDS

0 cubic feet of solids generated from the operation it will take approximately at agronomic rate use the application depths, travel lengths, and loads per acre listed below for each crop.													0 trips annually. Based on applying				NITROGEN, N		
d Number	Acres	Crop	Tractor Spreader Capacity		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 Solids to Apply	Travel Length per Load Needed in Feet	Loads per Acre							
			Bushels	CF		PPM	Lbs/100CF												
81 1-3,6,7	77.1	Hay/Pasture Mix 16 % Protein																	
4,5,8	27.3	Hay/Pasture Mix 16 % Protein																	
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein																	
4-7	29.2	Hay/Pasture Mix 16 % Protein																	
8-9	16.9	Hay/Pasture Mix 16 % Protein																	
0																			
0																			
0																			
0																			

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS

100 hours of pumping annually. Based on applying										NITROGEN, N				
1,795,968 gallons of liquids generated from the operation it will take approximately at agronomic rate use the application depths, set times, and travel rates listed below for each crop.														
Field Number	Acres	Crop	Sprinkler Flowrate GPM	Wetted Diameter Feet	Portion of Wetted Diameter Receiving Liquids		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	Application Rate in Inches/Hour	Set Time Needed in Hours	Travel Rate Needed in Feet/Minute
					1/2 Circle	1/4 Circle	PPM	Lbs/1000Gal						
81 1-3,6,7	77.1	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	▼	1,433	11.96	307	1.00	1.54	1.45	2.61	1.25
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	300	250	1/4 Circle	▼	1,433	11.96	307	1.00	1.54	2.91	2.61	1.77
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	▼	1,433	11.96	307	1.00	1.54	1.45	2.61	1.25
4-7	29.2	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	▼	1,433	11.96	307	1.00	1.54	1.45	2.61	1.25
8-9	16.9	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	▼	1,433	11.96	307	1.00	1.54	1.45	2.61	1.25
0						▼								
0						▼								
0						▼								
0						▼								
0						▼								

Natural Resources Conservation Service

CLIENT: Katen, Butch PHASE 2

ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

To apply 1,795,968 gallons of liquids generated from the operation it will take approximately 449 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					
81 1-3,6,7	77.1	Hay/Pasture Mix 16 % Protein	4,000	15	1,433	11.96	307	1.00	0.58	735	3.9
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	4,000	15	1,433	11.96	307	1.00	0.58	735	3.9
TS1 1-3	11.9	Hay/Pasture Mix 16 % Protein	4,000	15	1,433	11.96	307	1.00	0.58	735	3.9
7	29.2	Hay/Pasture Mix 16 % Protein	4,000	15	1,433	11.96	307	1.00	0.58	735	3.9
8-9	16.9	Hay/Pasture Mix 16 % Protein	4,000	15	1,433	11.96	307	1.00	0.58	735	3.9
0											
0											
0											
0											

CLIENT: Katen, Butch PHASE 2
ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

NUTRIENTS AVAILABLE AFTER STORAGE

Nutrient Source	Type of Operation		Pounds of Nutrients Available			Percent Nutrients Retained After Storage			Pounds of Nutrients Retained After Storage		
	Dairy	Type of Storage Facility	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids		Tank (Uncovered)	30,689	12,056	21,845	70%	85%	85%	21,482	10,248	18,568
Solids		Soils Storage Facility (Roofed)	0	0	0	75%	90%	90%	0	0	0
Grazing		NONE	24,745	9,692	17,507	100%	100%	100%	24,745	9,692	17,507

NUTRIENTS AVAILABLE AFTER APPLICATION

Nutrient Source	Type of Application System		Pounds of Nutrients Available			Percent Nutrients Retained After Application			Pounds of Nutrients Retained After Application		
			N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids		Sprinkling	21,482	10,248	18,568	75%	100%	100%	16,112	10,248	18,568
Solids		Broadcast (Incorporated 7 or more days after application)	0	0	0	70%	100%	100%	0	0	0
Grazing		Grazing	24,745	9,692	17,507	90%	100%	100%	22,270	9,692	17,507

NUTRIENTS AVAILABLE AFTER DENTRIFICATION

Nutrient Source	Location		Pounds of Nutrients Available			Percent Nutrients Retained After Dentrification			Pounds of Nutrients Retained After Dentrification		
	Coast	Soil Drainage Class	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids		Moderately Well Drained	16,112	10,248	18,568	82%	100%	100%	13,212	10,248	18,568
Solids		Moderately Well Drained	0	0	0	82%	100%	100%	0	0	0
Grazing		Moderately Well Drained	22,270	9,692	17,507	82%	100%	100%	18,262	9,692	17,507

CLIENT: Katen, Butch PHASE 2
ASSISTED BY: Pedersen

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	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization
T 81 1-3,6,7,9	77.1	Hay/Pasture Mix 16 % Protein	46%	6,077	20	0%	0	0	46%	8,400	27
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	16%	2,114	7	0%	0	0	16%	2,922	10
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	7%	925	3	0%	0	0	7%	1,278	4
4-7	29.2	Hay/Pasture Mix 16 % Protein	17%	2,246	7	0%	0	0	17%	3,104	10
8-9	16.9	Hay/Pasture Mix 16 % Protein	14%	1,850	6	0%	0	0	14%	2,557	8
0											
0											
0											
0											
Off-Farm			0%	0		100%	0		0%	0	
			100%	13,212	43	100%	0	0	100%	18,262	59
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	Potassium, K ₂ O Lbs/Acre
T 81 1-3,6,7,9	77.1	Hay/Pasture Mix 16 % Protein	188	119	215	307	85	235	-119	34	-20	
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	184	117	211	307	85	235	-123	32	-24	
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	185	117	212	307	85	235	-122	32	-23	
4-7	29.2	Hay/Pasture Mix 16 % Protein	183	116	210	307	85	235	-124	31	-25	
8-9	16.9	Hay/Pasture Mix 16 % Protein	261	165	299	307	85	235	-46	80	64	
0												
0												
0												
0												
Off-Farm												

ANIMAL INVENTORY

GRAZING PERIOD

PHASE 3 ORAWMTillamookv1.8.xls

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

[illegible]

Type of Water Use	Number of Animals	Number of Washes per Day	Gallons of Water Used Per Wash-Day	Total Water Use per Day, Gallons	Total Water Use per Day, Cubic Feet
Animal Wastewater	389,0	2	0.36	180	24.1
Equipment Wash		2	515.04	1030	137.7
Flushwater		2		0	0.0
Miscellaneous		2	25.00	50	6.7
Total>>>>>>>>>>>>>>				1260	168.4

Field Number	Acres	Crop	Condition	Yield Units	Target Yield	Nutrients Removed in Pounds per Acre		
						Nitrogen N	Phosphorous P ₂ O ₅	Potassium K ₂ O
T 81 1,3,6,7,9	77.1	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
T 81 1,3	11.9	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
4,7	29.2	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
8,9	16.9	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
Off-Farm								

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

BEDDING VOLUME

SOLIDS SEPARATION FACTOR

PHASE 3 ORAWMTillamookv1.8.xls

CLIENT: Katen, Butch PHASE 3 (Planned Herd Size)

ASSISTED BY: Pedersen

CHECKED BY.

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY VOLUMES

Month	Runoff in Cubic Feet										Total Liquids				
	Roof Area Square Feet	Paved Slab Area Square Feet	Unpaved Lot Area Square Feet	Silage Pit Surface Area, SF	Facility Water Use Cubic Feet	Manure		Bedding		Solids Separated		Solids in Liquids		Total Solids Cubic Feet	
						Solids Cubic Feet	Liquids Cubic Feet	Cubic Feet	Pounds	Cubic Feet		Pounds	Cubic Feet		Pounds
October	0	0	0	0	5,222	1,825	13,173	1,294	9,060	0	0	1,695	0	0	20,090
November	0	0	0	0	5,053	1,766	12,748	4,579	32,055	0	0	6,345	0	0	24,146
December	0	0	0	0	5,222	1,825	13,173	4,732	33,124	0	0	6,557	0	0	24,951
January	0	0	0	0	5,222	1,825	13,173	4,732	33,124	0	0	6,557	0	0	24,951
February	0	0	0	0	4,717	1,648	11,898	4,274	29,918	0	0	5,922	0	0	22,537
March	0	0	0	0	5,222	1,825	13,173	4,732	33,124	0	0	6,557	0	0	24,951
April	0	0	0	0	5,053	1,766	12,748	1,253	8,768	0	0	1,640	0	0	19,442
May	0	0	0	0	5,222	1,825	13,173	1,294	1,294	0	0	1,695	0	0	20,090
June	0	0	0	0	5,053	1,766	12,748	1,253	8,768	0	0	1,640	0	0	19,442
July	0	0	0	0	5,222	1,825	13,173	1,294	9,060	0	0	1,695	0	0	20,090
August	0	0	0	0	5,222	1,825	13,173	1,294	9,060	0	0	1,695	0	0	20,090
September	0	0	0	0	5,053	1,766	12,748	1,253	8,768	0	0	1,640	0	0	19,442
Annual	0	0	0	0	61,484	21,483	185,099	31,984	216,120	0	0	43,638	0	0	260,222

DAILY NUTRIENT PRODUCTION

[illegible]

ANIMAL WASTE MANAGEMENT SYSTEM 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	1,124	443	806	0	0	0	3,969	1,518	2,895	0	0	0	5,092	1,961	3,701
November	4,928	1,898	3,581	0	0	0	0	0	0	0	0	0	4,928	1,898	3,581
December	5,092	1,961	3,701	0	0	0	0	0	0	0	0	0	5,092	1,961	3,701
January	5,092	1,961	3,701	0	0	0	0	0	0	0	0	0	5,092	1,961	3,701
February	4,600	1,771	3,343	0	0	0	0	0	0	0	0	0	4,600	1,771	3,343
March	5,092	1,961	3,701	0	0	0	0	0	0	0	0	0	5,092	1,961	3,701
April	1,087	429	780	0	0	0	3,841	1,469	2,801	0	0	0	5,092	1,961	3,701
May	1,124	443	806	0	0	0	3,969	1,518	2,895	0	0	0	4,928	1,898	3,581
June	1,087	429	780	0	0	0	3,841	1,469	2,801	0	0	0	5,092	1,961	3,701
July	1,124	443	806	0	0	0	3,969	1,518	2,895	0	0	0	4,928	1,898	3,581
August	1,124	443	806	0	0	0	3,969	1,518	2,895	0	0	0	5,092	1,961	3,701
September	1,087	429	780	0	0	0	3,841	1,469	2,801	0	0	0	4,928	1,898	3,581
Annual	32,561	12,610	23,592	0	0	0	27,398	10,477	19,983	0	0	0	59,960	23,087	43,574

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.8

4/19/2005
STATE: OREGON

CLIENT: Katen, Butch PHASE 3 (Planned Herd Size)
ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

TANK

TANK PARAMETERS		Value	MONTHLY INFLOWS INTO TANK					
Storage Period, Days=	124	Month	Number of days	Rain-Evap on Tank CF	Rain-Evap on Existing Storage, CF	Normal Runoff CF	Washwater CF	Manure CF
Tank Diameter, Feet=	100	October	31	3,964	0	0	5,222	3,265
Existing Storage, Cubic Feet=	18,731.00	November	30	7,883	0	0	5,053	14,514
Surface Area of Existing Storage, SF=	0	December	31	8,929	0	0	5,222	14,997
25 Year-24 Hour Storm Runoff, CF=	0	January	31	8,491	0	0	5,222	14,997
Volume Needed, Cubic Feet=	136,258	February	28	6,326	0	0	4,717	13,546
Design Volume, Cubic Feet=	117,514	March	31	5,946	0	0	5,222	14,997
Is Tank Covered? NO	NO	April	30	2,702	0	0	5,053	3,160
Tank Dimensions? Circular	Circular	May	31	667	0	0	5,222	3,265
		June	30	-157	0	0	5,053	3,160
		July	31	-1,616	0	0	5,222	3,265
		August	31	-1,171	0	0	5,222	3,265
		September	30	752	0	0	5,053	3,160
		Annual	365	42,717	0	0	61,484	95,591

1.0 Feet
Depth = 14.97 Feet

Minimum Freeboard = 1.0 Feet	
25Yr-24Hr Storm Precipitation =	6 Inches
25Yr-24Hr Storm Runoff =	0 Cubic Feet
124 Day Precip - Evap =	49,562 Inches
Runoff from Normal Precipitation =	0 Cubic Feet
Washwater =	20910 Cubic Feet
Manure =	60054 Cubic Feet

Diameter = 100 Feet

CLIENT: Katen, Butch PHASE 3 (Planned Herd Size)
ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TRACTOR SPREADER APPLICATION OF SOLIDS

To apply 0 cubic feet of solids generated from the operation it will take approximately 0 trips annually. Based on applying NITROGEN, N at agronomic rate use the application depths, travel lengths, and loads per acre listed below for each crop.												
Field Number	Acres	Crop	Tractor Spreader Capacity		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 Solids to Apply	Travel Length per Load Needed in Feet	Loads per Acre
			Bushels	CF		PPM	Lbs/100CF					
81 1-3-7	77.1	Hay/Pasture Mix 16 % Protein										
4-5	27.3	Hay/Pasture Mix 16 % Protein										
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein										
4-7	29.2	Hay/Pasture Mix 16 % Protein										
8-9	16.9	Hay/Pasture Mix 16 % Protein										
0												
0												
0												
0												

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS

To apply 1,946,458 gallons of liquids generated from the operation it will take approximately 108 hours of pumping annually. Based on applying NITROGEN, N													
at agronomic rate use the application depths, set times, and travel rates listed below for each crop.													
Field Number	Acres	Crop	Sprinkler Flowrate GPM	Wetted Diameter Feet	Portion of Wetted Diameter Receiving Liquids	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	Application Rate in Inches/Hour	Set Time Needed in Hours	Travel Rate Needed in Feet/Minute
						PPM	Lbs/1000Gal						
81 1-3-6,7	77.1	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	1,403	11.71	307	1.00	1.57	1.45	2.67	1.23
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	1,403	11.71	307	1.00	1.57	1.45	2.67	1.23
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	1,403	11.71	307	1.00	1.57	1.45	2.67	1.23
4-7	29.2	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	1,403	11.71	307	1.00	1.57	1.45	2.67	1.23
8-9	16.9	Hay/Pasture Mix 16 % Protein	300	250	1/2 Circle	1,403	11.71	307	1.00	1.57	1.45	2.67	1.23
0													
0													
0													
0													
0													

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.8

CLIENT: Katen, Butch PHASE 3 (Planned Herd Size)
ASSISTED BY: Pedersen

CHECKED BY:

4/19/2005
STATE: OREGON

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

To apply 1,946,458 gallons of liquids generated from the operation it will take approximately 487 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		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
					Concentration in Storage Facility PPM	Lbs/1000Gal					
81 1-3,6,7	77.1	Hay/Pasture Mix 16 % Protein	4,000	15	1,403	11.71	307	1.00	0.59	720	4.0
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	4,000	15	1,403	11.71	307	1.00	0.59	720	4.0
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	4,000	15	1,403	11.71	307	1.00	0.59	720	4.0
4,7	29.2	Hay/Pasture Mix 16 % Protein	4,000	15	1,403	11.71	307	1.00	0.59	720	4.0
8,9	16.9	Hay/Pasture Mix 16 % Protein	4,000	15	1,403	11.71	307	1.00	0.59	720	4.0
0											
0											
0											
0											

CLIENT: Katen, Butch PHASE 3 (Planned Herd Size)
ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

NUTRIENTS AVAILABLE AFTER STORAGE

Nutrient Source	Type of Operation	Pounds of Nutrients Available			Percent Nutrients Retained After Storage			Pounds of Nutrients Retained After Storage		
		N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids	Tank (Uncovered)	32,561	12,610	23,592	70%	85%	85%	22,793	10,718	20,053
Solids	Solids Storage Facility (roofed)	0	0	0	75%	90%	90%	0	0	0
Grazing	NONE	27,398	10,477	19,983	100%	100%	100%	27,398	10,477	19,983

NUTRIENTS AVAILABLE AFTER APPLICATION

Nutrient Source	Type of Application System	Pounds of Nutrients Available			Percent Nutrients Retained After Application			Pounds of Nutrients Retained After Application		
		N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids	Sprinkling	22,793	10,718	20,053	75%	100%	100%	17,095	10,718	20,053
Solids	Broadcast (Incorporated 7 or more days after application)	0	0	0	70%	100%	100%	0	0	0
Grazing	Grazing	27,398	10,477	19,983	90%	100%	100%	24,659	10,477	19,983

NUTRIENTS AVAILABLE AFTER DENTRIFICATION

Nutrient Source	Location	Pounds of Nutrients Available			Percent Nutrients Retained After Denitrification			Pounds of Nutrients Retained After Denitrification		
		N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids	Moderately Well Drained	17,095	10,718	20,053	82%	100%	100%	14,018	10,718	20,053
Solids	Moderately Well Drained	0	0	0	82%	100%	100%	0	0	0
Grazing	Moderately Well Drained	24,659	10,477	19,983	82%	100%	100%	20,220	10,477	19,983

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.8

4/19/2005
STATE: OREGON

CLIENT: Katen, Butch PHASE 3 (Planned Herd Size)
ASSISTED BY: Pedersen

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

PERCENT OF MANURE TO BE APPLIED TO FIELD AND UTILIZATION ACRES NEEDED BASED ON										NITROGEN, N			
Field Number	Acres	Crop	LIQUIDS				SOLIDS				GRAZING		
			Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization		
T 81 1-3,6,7,9	77.1	Hay/Pasture Mix 16 % Protein	46%	6,448	21	0%	0	0	46%	9,301	30		
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	16%	2,243	7	0%	0	0	16%	3,235	11		
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	7%	981	3	0%	0	0	7%	1,415	5		
4-7	29.2	Hay/Pasture Mix 16 % Protein	17%	2,383	8	0%	0	0	17%	3,437	11		
8-9	16.9	Hay/Pasture Mix 16 % Protein	14%	1,962	6	0%	0	0	14%	2,831	9		
0													
0													
0													
0													
Off-Farm													
TOTALS			0%	0	46	100%	0	0	0%	0	66		
			100%	14,018		100%	0		100%	20,220			

NUTRIENT BALANCE BASED ON AVAILABLE ACRES

Field Number	Acres	Crop	NUTRIENTS APPLIED				NUTRIENTS REMOVED				NUTRIENT BALANCE			
			Nitrogen, N Lbs/Acre	Phosphorus, P ₂ O ₅ Lbs/Acre	Potassium, K ₂ O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorus, P ₂ O ₅ Lbs/Acre	Potassium, K ₂ O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorus, P ₂ O ₅ Lbs/Acre	Potassium, K ₂ O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorus, P ₂ O ₅ Lbs/Acre	Potassium, K ₂ O Lbs/Acre
T 81 1-3,6,7,9	77.1	Hay/Pasture Mix 16 % Protein	204	126	239	307	85	235	-103	41	4			
4,5,8	27.3	Hay/Pasture Mix 16 % Protein	201	124	235	307	85	235	-107	39	0			
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	201	125	236	307	85	235	-106	39	1			
4-7	29.2	Hay/Pasture Mix 16 % Protein	199	123	233	307	85	235	-108	38	-2			
8-9	16.9	Hay/Pasture Mix 16 % Protein	284	176	332	307	85	235	-24	90	97			
0														
0														
0														
0														
Off-Farm														

CHECKED BY:

ANIMAL INVENTORY

GRAZING PERIOD

Butch Katen Animal In#5283D.xls

CLIENT: Butch Katen Phase 23

ASSISTED BY:

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

WEATHER STATION		TILLAMOOK 1 W			
Month	25Yr-24Hr	6.00		Lot Runoff Factors as a Percent of Monthly Precipitation	
	Monthly Average in Inches				
	Precipitation	Evaporation			
October	7.48	1.42	50%	20%	
November	12.80	0.75	60%	25%	
December	14.25	0.60	60%	25%	
January	13.46	0.48	60%	25%	
February	10.45	0.78	50%	25%	
March	10.35	1.26	45%	15%	
April	6.03	1.90	40%	15%	
May	4.24	3.22	40%	10%	
June	3.16	3.40	35%	10%	
July	1.44	3.91	30%	0%	
August	1.73	3.52	40%	10%	
September	3.69	2.54	45%	15%	
Annual	89.08	23.78			

[illegible]

WATER USE THAT ENTERS LIQUID STORAGE FACILITY

[illegible]

CROP DATA

Field Number	Acres	Crop	Condition	Yield Units	Target Yield	Nutrients Removed in Pounds per Acre		
						Nitrogen N	Phosphorous P ₂ O ₅	Potassium K ₂ O
T81 1-3-6-7-9	77.1	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
4-5-8	27.3	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
T51 1-3	11.9	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
4-7	29.2	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
8-9	16.9	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
Off-Farm								

CHECKED BY: _____

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

[illegible][illegible]

CLIENT: Butch Katen Phase 3
ASSISTED BY: 0

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

TANK

MONTHLY INFLOWS INTO TANK

Tank Parameters	Value	Month	Number of days	Rain-Evap on Tank CF	Rain-Evap on Existing Storage, CF	Normal Runoff CF	Washwater CF	Manure CF
Storage Period, Days=	116	October	31	3,964	879	0	5,222	3,265
Tank Diameter, Feet=	100	November	30	7,883	1,747	0	5,053	14,514
		December	31	8,929	1,979	0	5,222	14,997
Existing Storage, Cubic Feet=	16,730.00	January	31	8,491	1,882	0	5,222	14,997
Surface Area of Existing Storage, SF=	1,740	February	28	6,326	1,402	0	4,717	13,546
25 Year-24 Hour Storm Runoff, CF=	0	March	31	5,946	1,318	0	5,222	14,997
Volume Needed, Cubic Feet=	135,114	April	30	2,702	599	0	5,053	3,160
Design Volume, Cubic Feet=	118,378	May	31	667	148	0	5,222	3,265
Is Tank Covered?	NO	June	30	-157	-35	0	5,053	3,160
Tank Dimensions? Circular	+	July	31	-1,616	-358	0	5,222	3,265
		August	31	-1,171	-260	0	5,222	3,265
		September	30	752	167	0	5,053	3,160
		Annual	365	42,717	9,469	0	61,484	95,591

Days of storage not including 32' x 8' BGLT on Tract 51.

1.0 Feet
Depth = 15.08 Feet

Minimum Freeboard =	1.0 Feet	6	Inches
25Yr-24Hr Storm Precipitation =			
25Yr-24Hr Storm Runoff =		0	Cubic Feet
116 Day Precip - Evap =		47,0606666666	Inches
Runoff from Normal Precipitation =		0	Cubic Feet
Washwater =		19585	Cubic Feet
Manure =		56248	Cubic Feet

Diameter = 100 Feet

DATE: November 10, 2004
 REPORT: S 292
 GROWER: DIAMOND K JERSEYE
 ADDRESS: 11766 TRASK RIVER RD, TILLAMOOK, OR 97141
 SAMPLED: BUTCH KATEM
 FIELD: T81 4+5+8
 CROP:

AGRI-CHECK, INC.

Agricultural Testing Laboratory
 323 Sixth St. - P.O. Box 1380
 Umatilla, OR 97082
 800-537-1128 * 541-922-4884



SOIL ANALYSIS REPORT

Lab No.	Depth Foot	pH	3.5% O.M.	P	K	Ca	Mg	NITROGEN	NO3	NH4	S	B	Zn	Mn	Cu	Fe	CEC	Na	Total Base	Base Sat %	Base SMP	Total	Moisture	Avail.	TKN	Cl
9	1	5.6		8	594	21.7	5.0	88	44													28.2	5.5			

TOTAL BROADCAST FERTILITY NEEDS:

NITROGEN: LBS PER ACRE N
 PHOSPHORUS: LBS PER ACRE P2O5
 POTASSIUM: LBS PER ACRE K2O
 SULFUR: LBS PER ACRE ACTUAL S
 BORON: LBS PER ACRE ACTUAL B
 ZINC: LBS PER ACRE ACTUAL Zn
 MAGNESIUM: LBS PER ACRE ACTUAL Mg
 OTHERS:

COMMENT 9:

SIDEDRESS:

TOTALS: 88 44

YIELD GOAL/ACRE:

ACRES:

PREVIOUS CROP:

GYPSUM REQUIREMENT:

LIME REQUIREMENT:

DOLOMITE REQUIREMENT:

PREPLANT:

TONS PER ACRE 8-INCHES
 TONS PER ACRE 6-INCHES
 TONS PER ACRE 4-INCHES

TOTAL INCHES:

SOIL TEXTURE ANALYSIS:

CLASS:

% SAND:

% SILT:

% CLAY:

PLANT TISSUE ANALYSIS REPORT

Lab No.	FIELD DESCRIPTION	Total N %	Nitrate N ppm	S %	P %	K %	Ca %	Mg %	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	Chloride ppm	Na ppm	Moisture %
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NOTE: East of Cascades Ricarb P & K extraction/SMP=1/4 SMP Buffer pH. West of Cascades Weak Bray P and Acetate K extractions. Fertility recommendations may change after application of gypsum or lime.

PHOSPHORUS INDEX WORKSHEET – WESTERN OREGON

Producer: Butch KatenCounty: TillamookTract No. 81Field No(s) 4,5,8Date: 11/10/2004Soil Map Unit(s): NAA Nehalem Silt LoamSoil Test P 8 ppmLab. Method: Weak BraySample Depth: 1 footCrop Rotation: Permanent PastureNutrient Application Method(s) Tank wagon and manure spreaderPlanner: Pedersen

Notes: _____

TRANSPORT FACTORS	Factor Weight	PHOSPHORUS LOSS RATING					Weighted Rating Value	
		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	1.125
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	1	1
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	1.5	1.5
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)	0.56	0.56
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)	0	0
Transport Factors Subtotal (TFS)							3.06	3.06

Tract 81 Fields 4,5,8		PHOSPHORUS LOSS RATING					Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned
Soil Test P – ppm (Bray P1)	1.00	(Soil Test P – 40) / 10 (8 - 40) x .10 = 0 Assign 0 points if Soil Test P < 40 ppm Soil Test P					0	0
Commercial P Fertilizer Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 x 0.02 = _____ lbs/ac P ₂ O ₅					0	0
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	0	0
Organic P Source Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 $\frac{108}{\text{lbs/ac P}_2\text{O}_5} \times 0.02 = \underline{\hspace{2cm}}$					2.16	2.16
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8.0	2.0

Total Rating Value TFS + SFS		Site Vulnerability Class	
< 13.0		Low	
13.0 – 25.0		Medium	
25.1 – 50.0		High	
> 50.0		Very High	

Current	Planned
Transport Factors Subtotal (TFS)	4.165 ~~3.06~~
Source Factors Subtotal (SFS)	10.16
Total Rating Value (TFS + SFS)	13.22 ~~7.22~~ ~~6.345~~
Site Vulnerability Class	Medium
	Low

DATE: November 10, 2004
 REPORT: S 282
 GROWER: DIAMOND K JENSEY
 ADDRESS: 11165 TRASK RIVER RD, TILLAMOOK, OR 97141
 SAMPLED: BUTCH KATEN
 FIELD: TB1 1-3 + 6+7+9
 CROP:

FAX TO CLIENT: 803.842.3610

AGRI-CHECK, INC.

Agricultural Testing Laboratory
 323 Sixth St. P.O. Box 1350
 Umatilla, OR 97888
 800-837-1122 * 541-888-4894

SOIL ANALYSIS REPORT

Lab No.	Depth Foot	pH	S.Sat O.M. mmhos %	P ppm	K ppm	Ca meq	Mg meq	NITROGEN NO3 N-H4	B ppm	S ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	CEC meq	Na meq	Total Base	Brace SMP	Total Amt pH	MOISTURE Avail. Inches	TKN %	Cl ppm
5358	1	5.4		19	768	16.5	4.4	114	50									22.9	5.3			

TOTAL BROADCAST FERTILITY NEEDS:

NITROGEN: LBS PER ACRE N
 PHOSPHORUS: LBS PER ACRE P2O5
 POTASSIUM: LBS PER ACRE K2O
 SULFUR: LBS PER ACRE ACTUAL S
 BORON: LBS PER ACRE ACTUAL B
 ZINC: LBS PER ACRE ACTUAL Zn
 MAGNESIUM: LBS PER ACRE ACTUAL Mg
 OTHERS:

COMMENTS:

SIDEDRESS:

TOTALS: 114 50

YIELD GOAL/ACRE:

ACRES:
 PREVIOUS CROP:
 GYPSUM REQUIREMENT:
 LIME REQUIREMENT:
 DOLOMITE REQUIREMENT:
 TONS PER ACRE 6-INCHES
 TONS PER ACRE 6-INCHES
 TONS PER ACRE 6-INCHES

PREPLANT:

TOTAL INCHES:

SOIL TEXTURE ANALYSIS:

CLASS:
 % SAND:
 % SILT:
 % CLAY:

PLANT TISSUE ANALYSIS REPORT

Lab No.	FIELD DESCRIPTION:	Total N %	Nitrate N ppm	S %	P %	K %	Ca %	Mg %	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	Chloride ppm	Na ppm	Moisture %

NOTE: East of Cascades Breat P & K extractions SMP=1/4 SMP Buffer pH, West of Cascades Weak Bray P and Acetate K extractions. Fertility recommendations may change after application of gypsum or lime.



Tract 81 Fields 1-3, 6, 7, 9

PHOSPHORUS LOSS RATING							Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned
Soil Test P – ppm (Bray P-1)	1.00	(Soil Test P – 40) / 10 (19 - 40) x .10 = 0 Assign 0 points if Soil Test P < 40 ppm					0	0
Commercial P Fertilizer Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 or x 0.02 = _____ lbs/ac P ₂ O ₅					0	0
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)		
							0	0
Organic P Source Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 $\frac{106}{\text{lbs/ac P}_2\text{O}_5} \times 0.02 = \underline{\hspace{2cm}}$					2.12	2.12
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8.0	2.0

Total Rating Value TFS + SFS	Site Vulnerability Class
< 13.0	Low
13.0 – 25.0	Medium
25.1 – 50.0	High
> 50.0	Very High

	Current	Planned
Transport Factors Subtotal (TFS)	3.25	~~2.12~~ 1.58
Source Factors Subtotal (SFS)	10.12	4.12
Total Rating Value (TFS + SFS)	13.37	~~5.68~~ 0.01
Site Vulnerability Class	Medium	Low

DATE: November 10, 2004 FAX TO CLIENT: 503/842-3610
REPORT: \$ 282
GROWER: DIAMOND K JERSEYS
ADDRESS: 11165 TRASK RIVER RD, TILLAMOOK, OR 97141
SAMPLED: BUTCH KATEN
FIELD: TS1 4-7
CROP:

AGRI-CHECK, INC.
Agricultural Testing Laboratory
3223 Sixth St. - P.O. Box 1380
Umatilla, OR 97882
800-537-1122 * 541-822-4884



SOIL ANALYSIS REPORT

Lab No.	Depth Foot	pH	S.Salt mmbos	O.M. %	P ppm	K ppm	Ca meq	Mg meq	NITROGEN				S ppm	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	CEC meq	Na meq	Total Base	Base Sat. %	SMP Barf. pH	MOISTURE		
									NO ₃ N/H ₄	N/H ₄	N/H ₄	N/H ₄												Total Avail.	TKN	Cl ppm
56	1	5.6			12	255	21.0	4.8	107	39											26.5		5.4			

TOTAL BROADCAST FERTILITY NEEDS:

NITROGEN:	LBS PER ACRE N
PHOSPHORUS:	LBS PER ACRE P2O5
POTASSIUM:	LBS PER ACRE K2O
SULFUR:	LBS PER ACRE ACTUAL S
BORON:	LBS PER ACRE ACTUAL B
ZINC:	LBS PER ACRE ACTUAL Zn
MAGNESIUM:	LBS PER ACRE ACTUAL Mg
OTHERS:	

MINI-MENT

YIELD GOAL/ACRE:
ACRES:
PREVIOUS CROP:
GYPSUM REQUIREMENT:
LIME REQUIREMENT:
DOLOMITE REQUIREMENT:
PREPLANT:
SIDE DRESS:

YIELD GOAL/ACRE:
ACRES:
PREVIOUS CROP:
GYPSUM REQUIREMENT:
LIME REQUIREMENT:
DOLOMITE REQUIREMENT:

TONS PER ACRE 8-INCHES
TONS PER ACRE 8-INCHES
TONS PER ACRE 8-INCHES

PREPLANT:

SIDE DRESS:

PLANT TISSUE ANALYSIS REPORT

Lab No.	FIELD: DESCRIPTION:	Total N %	Nitrate N ppm	S %	P %	K %	Ca %	Mg %	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	Chloride ppm	Na ppm	Moisture %

NOTE: East of Cascades Biscuit P & K extraction/SMP=1/4 SMP Buffer pH; West of Cascades Weak Bray P and Acetate K extractions. Fertility recommendations may change after application of gypsum or lime

Tract 51 Fields 4-7		PHOSPHORUS LOSS RATING						Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned	
Soil Test P – ppm (Bray P1)	1.00	(Soil Test P – 40) / 10 (12 - 40) x .10 = 0 Assign 0 points if Soil Test P < 40 ppm						0	0
Commercial P Fertilizer Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 o x 0.02 = _____ lbs/ac P ₂ O ₅						0	0
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)			
Organic P Source Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 107 _____ x 0.02 = _____ lbs/ac P ₂ O ₅						2.14	2.14
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8.0		2.0

Total Rating Value TFS + SFS	Site Vulnerability Class
< 13.0	Low
13.0 – 25.0	Medium
25.1 – 50.0	High
> 50.0	Very High

	Current	Planned
Transport Factors Subtotal (TFS)	2.56	2.56
Source Factors Subtotal (SFS)	10.14	4.14
Total Rating Value (TFS + SFS)	12.7	6.7
Site Vulnerability Class	Low	Low

DATE: November 10, 2004 FAX TO CLIENT: 503/642-3610
 REPORT: S 292
 GROWER: DIAMOND K JERSEYS
 ADDRESS: 11165 TRASK RIVER RD; TILLAMOOK, OR 97141
 SAMPLED: BUTCH KATEN
 FIELD: T51 & 9
 CROP:

AGRI-CHECK, INC.
 Agricultural Testing Laboratory
 323 Sixth St. - P.O. Box 1350
 Umatilla, OR 97888
 800-837-1188 * 541-888-4884



SOIL ANALYSIS REPORT

Lab No.	Depth Foot	pH	S.Salt mmbhos	O.M. %	P ppm	K ppm	Ca meq	Mg meq	NITROGEN		S ppm	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	CEC meq	Na meq	Total Bases	Bees SMP	9MP Total	Avail. %	TKN %	Cl ppm
657	1	6.4			11	125	24.9	6.2	14	13											31.4	6.1		

+++++
 TOTAL BROADCAST FERTILITY NEEDS:
 TOTALS: 14 13
 YIELD GOAL/ACRE:
 ACRES:
 PREVIOUS CROP:
 GYPSUM REQUIREMENT:
 LIME REQUIREMENT:
 DOLOMITE REQUIREMENT:
 PREPLANT:
 SIDEDRESS:

+++++
 TOTAL BROADCAST FERTILITY NEEDS:
 TOTALS: 14 13
 YIELD GOAL/ACRE:
 ACRES:
 PREVIOUS CROP:
 GYPSUM REQUIREMENT:
 LIME REQUIREMENT:
 DOLOMITE REQUIREMENT:
 PREPLANT:
 SIDEDRESS:

PLANT TISSUE ANALYSIS REPORT

Lab No.	FIELD: DESCRIPTION:	Total N %	Nitrate N ppm	S %	P %	K %	Ca %	Mg %	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	Chloride ppm	Na ppm	Moisture %
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NOTE: East of Cascades Bicarb P & K extractions/SMP=1/4 SMP Buffer pH; West of Cascades Weak Bray P and Acetate K extractions. Fertility recommendations may change after application of gypsum or lime.

Tract 51 Fields 8.9		PHOSPHORUS LOSS RATING						Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned	
Soil Test P – ppm (Bray P-1)	1.00	(Soil Test P – 40) / 10 (11 – 40) x .10 = 0 Assign 0 points if Soil Test P < 40 ppm						0	0
Commercial P Fertilizer Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 or x 0.02 = _____ lbs/ac P ₂ O ₅						0	0
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)			
Organic P Source Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 113 _____ lbs/ac P ₂ O ₅ x 0.02 = _____						2.26	2.26
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8.0		2.0

Total Rating Value TFS + SFS	Site Vulnerability Class
< 13.0	Low
13.0 – 25.0	Medium
25.1 – 50.0	High
> 50.0	Very High

Current	Planned
Transport Factors Subtotal (TFS)	4.75
Source Factors Subtotal (SFS)	10.26
Total Rating Value (TFS + SFS)	15.01
Site Vulnerability Class	Medium
	Low

DATE: November 10, 2004
REPORT: \$ 292
GROWER: DIAMOND K JERSEYS
ADDRESS: 11166 TRASK RIVER RD, TILLAMOOK, OR 97141
SAMPLED: BUTCH KATEN
FIELD: T51 1-3
CROP:

FAX TO CLIENT: 503/842-3610

AGRI-CHECK, INC.

Agricultural Testing Laboratory
3823 Birch St. - P.O. Box 1360
Umealla, OR 97082
800.537.1188 * 541.922.4894



SOIL ANALYSIS REPORT

Lab No.	Depth	pH	S.Salt mmhos	O.M. %	P ppm	K ppm	Ca meq	Mg meq	NITROGEN NO3 #/A	NH4 #/A	S ppm	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	CEC meq	Na meq	Total Bases	Rise SMP	Set %	Buf/pH	MOISTURE Total Avail. inches	TKN %	Cl ppm
5355	1	5.4			20	443	11.6	3.2	125	66										15.9		4.9			

TOTAL BROADCAST FERTILITY NEEDS:

TOTALS: 125 66

TOTAL INCHES:

NITROGEN: LBS PER ACRE N
PHOSPHORUS: LBS PER ACRE P2O5
POTASSIUM: LBS PER ACRE K2O
SULFUR: LBS PER ACRE ACTUAL S
BORON: LBS PER ACRE ACTUAL B
ZINC: LBS PER ACRE ACTUAL Zn
MAGNESIUM: LBS PER ACRE ACTUAL Mg
OTHERS:

YIELD GOAL/ACRE:
ACRES:
PREVIOUS CROP:
GYPSUM REQUIREMENT:
LIME REQUIREMENT:
DOLomite REQUIREMENT:

TONS PER ACRE 4-INCHES
TONS PER ACRE 6-INCHES
TONS PER ACRE 8-INCHES

SOIL TEXTURE ANALYSIS:

CLASS:
% SAND:
% SILT:
% CLAY:

COMMENTS:

SIDEDRESS:

PLANT TISSUE ANALYSIS REPORT

Lab No.	FIELD DESCRIPTION:	Total N %	Nitrate N ppm	S %	P %	K %	Ca %	Mg %	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	Chloride ppm	Na ppm	Moisture %

NOTE: East of Cascades Bicarb P & K extraction/SMP=1/4 SMP Buffer pH; West of Cascades Weak Bray P and Acetate K extractions. Fertility recommendations may change after application of gypsum or lime.

Tract 51

Fields 1-3

PHOSPHORUS LOSS RATING							Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned
Soil Test P – ppm (Bray P1)	1.00	(Soil Test P – 40) / 10					(20 - 40) x .10 = 0	
Commercial P Fertilizer Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 o x 0.02 = _____					Assign 0 points if Soil Test P < 40 ppm	
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	0	0
							0	0
Organic P Source Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02					$\frac{102}{\text{lbs/ac P}_2\text{O}_5} \times 0.02 = \underline{\hspace{2cm}}$	
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	2.04	2.04

Total Rating Value TFS + SFS	Site Vulnerability Class
< 13.0	Low
13.0 – 25.0	Medium
25.1 – 50.0	High
> 50.0	Very High

	Current	Planned
Transport Factors Subtotal (TFS)	3.25	1.56
Source Factors Subtotal (SFS)	10.04	4.04
Total Rating Value (TFS + SFS)	13.29	5.56
Site Vulnerability Class	Medium	Low

NRCS TILLAMOOK COUNTY IRRIGATION RECOMMENDATION

Land Owner, Location, and Field Information	
Landowner:	Butck Katen
Legal Description:	T 1S; R 9W; Sec. 35
Tract #:	81
Field #:	1,2,3,4,5,6,7,8,9
County:	Tillamook

Soils Information	
Soil Map Symbol	NeB
Soil Name	NESTUCCA
Max. Soil Water Deficiency (%):	50%
Maximum Application Rate (in/hr):	0.3
Soil water at Field Capacity (in):	4.8
Average total Soil Depth (in):	60
Soil Surface Slope (%):	0 to 5

SPRINKLER INFORMATION	
Manufacturer:	Rainbird
Model:	SR-150
Nozzle Diameter (in):	0.15625
Operating Pressure (psi):	50
Flow Rate (gpm):	4.98
Wetted Diameter (ft):	90
Lane Spacing (ft):	45
Degrees of Circle Coverage (0-360):	360
Traveler Speed (ft/min):	1
Application Efficiency:	75%

Designer/Assistance Information	
Assisted By:	Pedersen
Date:	5/18/2005

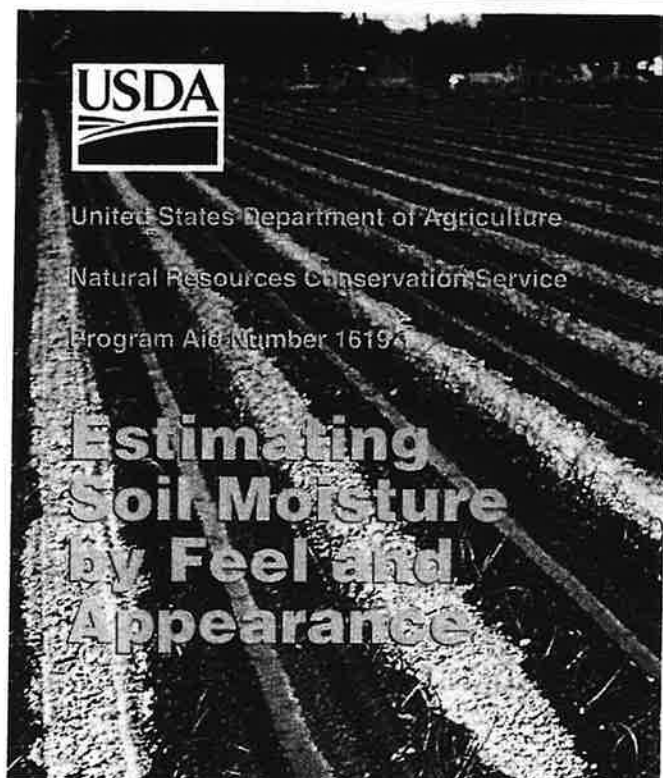
Crop Information	
Crop:	PASTURE (GRASS)
Maximum Rooting Depth (in):	24
Effective rooting depth (in):	24
Soil Profile Managed (in):	18
Maximum Net Application (in):	1.8

SPRINKLER APPLICATION INFORMATION	
Calculated Application Rate (in/hr):	0.09
Calculated Gross Irr Application (in):	0.2
Calculated Net Irr Application (in):	0.1

IRRIGATION SCHEDULING INFORMATION		
Month	Average Net Monthly Irrigation Requirement (in)	Average # of Irrigations
MAR	0	0
APR	0.00	0
MAY	0.00	0
JUN	0.92	6.9
JUL	2.88	21.6
AUG	2.29	17.2
SEP	0.00	0
OCT	0.00	0
TOTAL	6.09	

Estimating Soil Moisture by Feel and Appearance

Irrigation Water Management (IWM) is applying water according to crop needs in an amount that can be stored in the plant root zone of the soil.



The "feel and appearance method" is one of several irrigation scheduling methods used in IWM. It is a way of monitoring soil moisture to determine when to irrigate and how much water to apply. Applying too much water causes excessive runoff and/or deep percolation. As a result, valuable water is lost along with nutrients and chemicals, which may leach into the ground water.

The feel and appearance of soil vary with texture and moisture content. Soil moisture conditions can be estimated, with experience, to an accuracy of about 5 percent. Soil moisture is typically sampled in 1-foot increments to the root depth of the crop at three or more sites per field. It is best to vary the number of sample sites and depths according to crop, field size, soil texture, and soil stratification. For each sample the "feel and appearance method" involves:

1. Obtaining a soil sample at the selected depth using a probe, auger, or shovel;
2. Squeezing the soil sample firmly in your hand several times to form an irregularly shaped "ball";
3. Squeezing the soil sample out of your hand between thumb and forefinger to form a ribbon;
4. Observing soil texture, ability to ribbon, firmness and surface roughness of ball, water glistening, loose soil particles, soil/water staining on fingers, and soil color. [Note: A very weak ball will disintegrate with one bounce of the hand. A weak ball disintegrates with two to three bounces;
5. Comparing observations with photographs and/or charts to estimate percent water available and the inches depleted below field capacity.

Example:

Sample Depth	Zone	USDA Texture	AWC*for Zone	Soil Moisture Depletion**	Percent Depletion
6"	0-12"	sandy loam	1.4"	1.0"	70
18"	12-24"	sandy loam	1.4"	.8"	55
30"	24-36"	loam	2.0"	.8"	40
42"	36-48"	loam	2.0" 6.8"	5" 3.1"	25

Result: A 3.1" net irrigation will refill the root zone.

** Available Water Capacity*

*** Determined by "feel and appearance method"*

Available Water Capacity (AWC) is the portion of water in a soil that can be readily absorbed by plant roots of most crops.

Soil Moisture Deficit (SMD) or Depletion is the amount of water required to raise the soil-water content of the crop root zone to field capacity.

Appearance of sandy clay loam, loam, and silt loam soils at various soil moisture conditions.

Available Water Capacity 1.5-2.1 inches/foot

Percent Available: Currently available soil moisture as a percent of available water capacity.

In/ft. Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

**0-25 percent available
2.1-1.1 in./ft. depleted**

Dry, soil aggregations break away easily, no staining on fingers, clods crumble with applied pressure. (Not pictured)



**25-50 percent available
1.6-0.8 in./ft. depleted**

Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away.



**50-75 percent available
1.1-0.4 in./ft. depleted**

Moist, forms a ball, very light staining on fingers, darkened color, pliable, forms a weak ribbon between the thumb and forefinger.



**75-100 percent available
0.5-0.0 in./ft. depleted**

Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers, ribbons between thumb and forefinger.

**100 percent available
0.0 in./ft. depleted (field capacity)**

Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. (Not pictured)

Guidelines for Estimating Soil Moisture Conditions

	Coarse Texture- Fine Sand and Loamy Fine Sand	Moderately Coarse Texture Sandy Loam and Fine Sandy Loam	Medium Texture - Sandy Clay Loam, Loam, and Silt Loam	Fine Texture- Clay, Clay Loam, or Silty Clay Loam
Available Water Capacity (Inches/Foot)				
	0.6-1.2	1.3-1.7	1.5-2.1	1.6-2.4
Available Soil Moisture Percent	Soil Moisture Deficit (SMD) in inches per foot when the feel and appearance of the soil are as described.			
0-25	Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure. SMD 1.2-0.5	Dry, forms a very weak ball, aggregated soil grains break away easily from ball. SMD 1.7 -1.0	Dry. Soil aggregations break away easily. no moisture staining on fingers, clods crumble with applied pressure. SMD 2.1-1.1	Dry, soil aggregations easily separate, clods are hard to crumble with applied pressure SMD 2.4-1.2
25-50	Slightly moist, forms a very weak ball with well-defined finger marks, light coating of loose and aggregated sand grains remain on fingers. SMD 0.9-0.3	Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away. SMD 1.3-0.7	Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away. SMD 1.6-0.8	Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure SMD 1.8-0.8
50-75	Moist, forms a weak ball with loose and aggregated sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon. SMD 0.6-0.2	Moist, forms a ball with defined finger marks. very light soil/water staining on fingers. darkened color, will not slick. SMD 0.9-0.3	Moist, forms a ball, very light water staining on fingers, darkened color, pliable, forms a weak ribbon between thumb and forefinger. SMD 1.1- 0.4	Moist. forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger. SMD 1.2-0.4
75-100	Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers, will not ribbon. SMD 0.3-0.0	Wet, forms a ball with wet outline left on hand, light to medium water staining on fingers, makes a weak ribbon between thumb and forefinger. SMD 0.4-0.0	Wet, forms a ball with well defined finger marks, light to heavy soil/water coating on fingers, ribbons between thumb and forefinger. SMD 0.5 -0.0	Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger. SMD 0.6-0.0
Field Capacity (100 %)	Wet, forms a weak ball, moderate to heavy soil/ water coating on fingers, wet outline of soft ball remains on hand. SMD 0.0	Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. SMD 0.0	Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. SMD 0.0	Wet, forms a soft ball, free water appears on soil surface after squeezing or shaking, thick soil/water coating on fingers, slick and sticky. SMD 0.0

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NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer:	Katen, Butch PHASE 1 (Initial Herd)	Tract(s):	81	Field(s):	T 81 1-3,6,7,9
Assisted by:	Pedersen	Date:	April 18, 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	
NA	19	768	5.4			
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD						
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)		LIME
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B	Other
307		85		235		4-6 tons

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		0					
2. Residual from long-term manure application		0					
3. Irrigation water		0		0		0	
4. Other (e.g., atmospheric deposition)		0		0		0	
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 Commercial Fertilizer	142		0		0	
8. Manure / Organic Materials (Source-) Dairy		70	0	45	0	82	0
9. Subtotal (sum of lines 6, 7 and 8)		212	0	45	0	82	0
10. Nutrients Recommended (from Table 1)		307	0	85	0	235	0
11. Nutrient Status (subtract line 10 from line 9)		-95	0	-40	0	-153	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	307	P ₂ O ₅	106	K ₂ O	193
Method, Form, and Timing of Application							
Recommend 142 lbs. of commercial nitrogen fertilizer per acre per year to achieve the 6 tons of dry matter per acre per year. The 768 ppm of potassium is high. High potassium levels may cause health problems in the livestock. See enclosed letter from the Area Dairy Extension Agent. Manure and fertilizer applications should be applied in split applications between late February to mid September. Recommend that 60 lbs. of nitrogen be applied per application per acre. Manure should be applied evenly over the fields during the season. A soil test is recommended in late October every 5 years to evaluate the biosolid application rate matches the nitrogen requirement of the forage. See enclosed Nutrient Management Specification Sheet, the Manure Distribution Sheet Section, for manure application rates per field.							

NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer:	Katen, Butch PHASE 1 (Initial Herd)	Tract(s):	81	Field(s):	4,5,8
Assisted by:	Pedersen	Date:	April 18, 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
NA		8		594		5.6		
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	4-5 tons	Other	
307		85		235				

Table 2. Nutrient Sources

Credits		N		P ₂ O ₅		K ₂ O	
		pounds per acre					
1. Nitrogen credits from previous legume crop		0					
2. Residual from long-term manure application		0					
3. Irrigation water		0		0		0	
4. Other (e.g., atmospheric deposition)		0		0		0	
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 Commercial Fertilizer	138					
8. Manure / Organic Materials (Source-)		199		128		232	
9. Subtotal (sum of lines 6, 7 and 8)		337	0	128	0	232	0
10. Nutrients Recommended (from Table 1)		307	0	85	0	235	0
11. Nutrient Status (subtract line 10 from line 9)		30	0	43	0	-3	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	307	P ₂ O ₅	108	K ₂ O	197
Method, Form, and Timing of Application						
Recommend 138 lbs. of commercial nitrogen fertilizer per acre per year to achieve the 6 tons of dry matter per acre per year. The 594 ppm of potassium is high. High potassium levels may cause health problems in the livestock. See enclosed letter from the Area Dairy Extension Agent. Manure and fertilizer applications should be applied in split applications between late February to mid September. Recommend that 60 lbs. of nitrogen be applied per application per acre. Manure should be applied evenly over the fields during the season. A soil test is recommended in late October every 5 years to evaluate the biosolid application rate matches the nitrogen requirement of the forage. See enclosed Nutrient Management Specification Sheet, the Manure Distribution Sheet Section, for manure application rates per field.						

NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer:	Katen, Butch PHASE 1 (Initial Herd)	Tract(s): 51	Field(s): T51 1-3
Assisted by:	Pedersen	Date:	April 18, 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	
NA	20	443	5.4			
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD						
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)		LIME
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B	Other
307		85		235		6-7 tons

Table 2. Nutrient Sources

Credits		N		P ₂ O ₅		K ₂ O	
		pounds per acre					
1. Nitrogen credits from previous legume crop		0					
2. Residual from long-term manure application		0					
3. Irrigation water		0		0		0	
4. Other (e.g., atmospheric deposition)		0		0		0	
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 Commercial Fertilizer	147					
8. Manure / Organic Materials (Source-)		456		293		532	
9. Subtotal (sum of lines 6, 7 and 8)		603	0	293	0	532	0
10. Nutrients Recommended (from Table 1)		307	0	85	0	235	0
11. Nutrient Status (subtract line 10 from line 9)		296	0	208	0	297	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	307	P ₂ O ₅	102	K ₂ O	186
Method, Form, and Timing of Application							
Recommend 147 lbs. of commercial nitrogen fertilizer per acre per year to achieve the 6 tons of dry matter per acre per year. The 443 ppm of potassium is high. High potassium levels may cause health problems in the livestock. See enclosed letter from the Area Dairy Extension Agent. Manure and fertilizer applications should be applied in split applications between late February to mid September. Recommend that 60 lbs. of nitrogen be applied per application per acre. Manure should be applied evenly over the fields during the season. A soil test is recommended in late October every 5 years to evaluate the biosolid application rate matches the nitrogen requirement of the forage. See enclosed Nutrient Management Specification Sheet, the Manure Distribution Sheet Section, for manure application rates per field.							

NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer: Katen, Butch PHASE 1 (Initial Herd)	Tract(s): 51	Field(s): 4-7
Assisted by: Pedersen	Date: April 18, 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
NA		12		255		5.6
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD						
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)		LIME
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B	Other
307		85		235		4-5 tons

Table 2. Nutrient Sources

Credits		N	P ₂ O ₅	K ₂ O
		pounds per acre		
1. Nitrogen credits from previous legume crop		0		
2. Residual from long-term manure application		0		
3. Irrigation water		0	0	0
4. Other (e.g., atmospheric deposition)		0	0	0
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
6. Credits (from row 5, above)		0	0	0
7. Fertilizer				
	Starter			
	Other Commercial Fertilizer	140	0	0
8. Manure / Organic Materials (Source-)		186	186	119
9. Subtotal (sum of lines 6, 7 and 8)		326	186	119
10. Nutrients Recommended (from Table 1)		307	0	85
11. Nutrient Status (subtract line 10 from line 9)		19	186	34

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	P ₂ O ₅	K ₂ O
	307	107	195
Method, Form, and Timing of Application Recommend 140 lbs. of commercial nitrogen fertilizer per acre per year to achieve the 6 tons of dry matter per acre per year. The 225 ppm of potassium is medium. See enclosed letter from the Area Dairy Extension Agent. Manure and fertilizer applications should be applied in split applications between late February to mid September. Recommend that 60 lbs. of nitrogen be applied per application per acre. Manure should be applied evenly over the fields during the season. A soil test is recommended in late October every 5 years to evaluate the biosolid application rate matches the nitrogen requirement of the forage. See enclosed Nutrient Management Specification Sheet, the Manure Distribution Sheet Section, for manure application rates per field.			

NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer: Katen, Butch PHASE 1 (Initial Herd)	Tract(s): 51	Field(s): 8-9
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Assisted by: Pedersen Date: April 18, 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	
NA	11	125	6.4			
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD						
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)		LIME
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B	Other
307		85		235		1-2 tons

Table 2. Nutrient Sources

Credits		N		P ₂ O ₅		K ₂ O	
		pounds per acre					
1. Nitrogen credits from previous legume crop		0					
2. Residual from long-term manure application		0					
3. Irrigation water		0		0		0	
4. Other (e.g., atmospheric deposition)		0		0		0	
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 Commercial fertilizer	130		0		0	
8. Manure / Organic Materials (Source-)		321	321	206	206	375	375
9. Subtotal (sum of lines 6, 7 and 8)		451	321	206	206	375	375
10. Nutrients Recommended (from Table 1)		307	0	85	0	235	0
11. Nutrient Status (subtract line 10 from line 9)		144	321	121	206	140	375
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	307	P ₂ O ₅	113	K ₂ O	206
Method, Form, and Timing of Application							
Recommend 130 lbs. of commercial nitrogen fertilizer per acre per year to achieve the 6 tons of dry matter per acre per year. The 125 ppm of potassium is low. See enclosed letter from the Area Dairy Extension Agent. Manure and fertilizer applications should be applied in split applications between late February to mid September. Recommend that 60 lbs. of nitrogen be applied per application per acre. Manure should be applied evenly over the fields during the season. A soil test is recommended in late October every 5 years to evaluate the biosolid application rate matches the nitrogen requirement of the forage. See enclosed Nutrient Management Specification Sheet, the Manure Distribution Sheet Section, for manure application rates per field.							

May 28, 2002

Bob Pedersen
Tillamook NRCS Field Office
6415 Signal St.
Tillamook, OR 97141



OREGON
STATE
UNIVERSITY

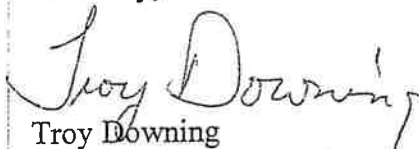
2204 Fourth Street
Tillamook, Oregon
97141

Dear Bob,

Over the past five years, I have had the opportunity to study nutrient cycling dynamics on dairies in the Tillamook area. It has been observed that pastures will vary in productivity based on environment, grazing management and soil fertility. Nitrogen utilization has been a major focus of my work looking specifically at nitrogen up takes by the pasture plant. I have seen pastures remove as little as 200 lbs of N per acre a year to as high as 750. Average pastures on dairies will use between 300 and 400lbs of nitrogen per acre each year.

With this understanding, it makes logical sense to me to use nitrogen utilization numbers in our animal waste management planning of 300 pounds nitrogen per year as a reasonable starting point. I think this is a conservative guess and would not hesitate adjusting this number if the landowner has other data indicating they are using N at higher levels. For example, yield data, grazing rotation records with removal data, and/or soil test data.

Sincerely,


Troy Downing
Area Dairy Extension Agent

Telephone
503-842-3433



Agriculture, Home Economics, 4-H Youth, Forestry, Community Development, Energy, and Extension Sea Grant Programs. Oregon State University, United States Department of Agriculture, and Tillamook County cooperating. The Extension Service offers its programs and materials equally to all people.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

PHASE 1

NUTRIENT MANAGEMENT SPECIFICATION SHEET

CODE 590

Landowner/Operator: Butch Katen

Job Location: T 1S; R 9W; Sec 35

County: Tillamook SWCD Tillamook Farm/Tract No. T-81 & 51

Field No. T-81: Fields 1,2,3,4,5,6,7,8,9 T-51: Fields 1,2,3,4,5,6,7 3/05

⇒ **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 year 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 tests 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, unless soil and forage tests justify higher rates.

Manure Application Equipment to be used:

278-1,000 lb. animal units

4,000 gallon tank wagon

289 bushel manure spreader

NRCS, OR

Manure Nutrient Distribution

Field #	Grazing cycles/yr	# of N supplied by livestock/field	# of N supplied by livestock/ac/yr	Loads of liquids/yr	#of N per field/year liquids	#of N per acre from liquids	Loads of solids/yr	#of N per field/yr solids	#of N per acre from solids	Total # of N per acre/year
T-81										
1.	10	914	93	11	149	15	13	522	53	161
2.	10	1,576	93	18	257	15	22	900	53	161
3.	10	1,389	93	16	227	15	19	793	53	161
4.	10	761	92	9	124	15	10	435	52	159
5.	10	1,119	92	12	182	15	16	639	52	159
6.	10	554	94	6	90	15	8	317	54	163
7.	10	1,058	94	12	173	15	15	604	53	162
8	10	623	92	7	102	15	9	356	52	159
9	10	1,705	93	19	278	15	24	974	53	161
T-51										
1	10	267	92	3	44	15	4	152	52	159
2	10	635	92	8	104	15	9	363	53	160
3	10	193	92	2	31	15	3	110	52	159
4	10	710	91	8	116	15	10	406	52	158
5	10	620	91	7	101	15	9	354	52	158
6	10	673	91	8	110	15	9	384	52	158
7	10	657	91	7	107	15	9	375	52	158
8	10	1,119	92	13	182	15	16	639	53	160
9	10	350	92	4	57	15	5	200	53	160
10	10	721	92	8	118	15	10	412	53	160
Total		15,644		178	2,552		220	8,935		

⇒

⇒ Records are maintained of manure and/or commercial fertilizer applications.

- ⇒ Nutrient management plans are reviewed annually and adjustments are made as needed.
- ⇒ Manure is not applied within 35 feet of an open watercourse.

DESIGN APPROVAL:

Practice Code No.	Practice	Lead 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/ Robert A. Pedersen

Date: 4/15/05

Job Title: Basin Team Leader

CLIENTS ACKNOWLEDGEMENT STATEMENT:

The client acknowledges that:

- They have received a copy of this specification and under-stands the contents and requirements.
- 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.
- 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.
- Maintain records of nutrient application as required by state and local regulations.

Accepted by: /s/ Butch Katen

Date: 4-15-05

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: _____

PHASE 3

NUTRIENT MANAGEMENT SPECIFICATION SHEET

CODE 590

Landowner/Operator: Butch Katen

Job Location: T 1S; R 9W; Sec 35

County: Tillamook SWCD Tillamook Farm/Tract No. T-81 & 51

Field No. T-81: Fields 1,2,3,4,5,6,7,8,9 T-51: Fields 1,2,3,4,5,6,7

Prepared By: Pedersen

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 year 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, unless soil and forage tests justifies higher rates.

Manure Application Equipment to be used:

365--1,000 lb. animal units

4,000 gallon tank wagon

NRCS, OR

Manure Nutrient Distribution

Field #	Grazing cycles/yr	# of N supplied by livestock/field	# of N supplied by livestock/ac/yr	Loads of liquids/yr	#of N per field/year liquids	#of N per acre from liquids	Total # of N per acre/year
T-81							
1.	10	1,182	121	29	819	84	205
2.	10	2,037	121	49	1,412	84	205
3.	10	1,795	120	43	1,245	84	204
4.	10	983	118	24	682	82	200
5.	10	1,446	118	35	1,003	82	200
6.	10	716	121	17	496	84	205
7.	10	1,367	121	33	948	84	205
8	10	806	118	19	558	82	200
9	10	2,204	120	53	1,528	84	204
T-51							
1	10	345	119	8	239	82	201
2	10	821	119	20	569	82	201
3	10	249	119	6	173	82	201
4	10	918	118	22	636	82	200
5	10	801	118	19	555	82	200
6	10	869	117	21	603	82	199
7	10	849	118	21	589	82	200
8	10	1,447	119	35	1,003	83	202
9	10	453	119	11	314	83	202
10	10	931	119	22	645	83	202
Total		20,219		487	14,017		

- ⇒ Records are maintained of manure and/or commercial fertilizer applications.
- ⇒ Nutrient management plans are reviewed annually and adjustments are made as needed.
- ⇒ Manure is not applied within 35 feet of an open watercourse.

DESIGN APPROVAL:

Practice Code No.	Practice	Lead 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/ Robert A. Pedersen

Date: 4/15/05

Job Title: Basin Team Leader

CLIENTS ACKNOWLEDGEMENT STATEMENT:

The client acknowledges that:

- They have received a copy of this specification and under-stands the contents and requirements.
- 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.
- 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.
- Maintain records of nutrient application as required by state and local regulations.

Accepted by: /s/ Butch Katen

Date: 4-15-05

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

PRESCRIBED GRAZING SPECIFICATION SHEET

CODE 528A

Landowner/Operator: Butch Katen

Job Location: T 1S; R 9W; Sec. 35

County: Tillamook SWCD Tillamook County Farm/Tract No. T-81 & 51

Field No.: T-81 Fields 1,2,3,4,5,6,7,8,9 T-51 Fields 1,2,3,4,5,6,7

Prepared By: Pedersen

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 16 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 by clipping.
- ⇒ Pastures are clipped and dragged 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 5 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 ensilage or silage. See Forage Harvest Management Specification Code 511.

NRCS, OR

- ⇒ Excess forage will be cut for ensilage or silage. See Forage Harvest Management Specification Code 511.
- ⇒ Livestock are removed from the pastures in the fall when the ground becomes wet and the grasses have at least 3 inches of growth going into the winter.

DESIGN APPROVAL:

This practice is classified as Job Class V

Design approved by: /s/ Robert A. Pedersen

Date: 4/15/05

Job Title: Basin Team Leader

CLIENTS ACKNOWLEDGEMENT STATEMENT:

The client acknowledges that:

- a. They have received a copy of this specification and understands the contents and requirements.
- b. 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.

Accepted by: /s/ Butch Kater

Date: 4-15-05

CERTIFICATION;

I have completed a review of the prescribed grazing practice 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

FORAGE HARVEST MANAGEMENT SPECIFICATION SHEET

CODE 511

Landowner/Operator: Butch Katen.

Job Location: T 1S R 9W; Sec. 35

County: Tillamook SWCD Tillamook Farm/Tract No. T-81 & 51

Field No.: T-81 Fields 1,2,3,4,5,6,7,8,9 T-51 Fields 1,2,3,4,5,6,7

Prepared By: Pedersen

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 management efficiency to promote economic stability.

Specifications:

- ⇒ Excessive early spring forage will be removed as ensilage.
- ⇒ Hayland fields are managed to assure at least 6 tons of dry matter is produced per acre per year.
- ⇒ Hayland Fields are reestablished when forage yields fall below 4 tons of dry matter per acre per year.
- ⇒ Harvesting newly seeded fields are delayed until the grasses have at least 8 inches of growth and are firmly rooted.
- ⇒ Harvesting established stands are delayed until grasses have at least 6 inches of growth and ground is firm.
- ⇒ Grasses are not cut if the grass height is less than 2 inches.
- ⇒ Harvesting is not done when the fields are saturated or ponded.
- ⇒ Noxious weeds such as Tansy Ragwort and Canada Thistle are controlled in accordance with an Integrated Pesticide Management Plan.
- ⇒ Manure and commercial fertilizer applications are based on soil tests. Soil tests will be taken at least every 5 years. Nitrogen applications will not exceed 307 lbs. of nitrogen per acre per year unless soil tests and forage production justifies higher application rates.
- ⇒ Forage Tissue Tests will be taken at least twice during the growing season.

NRCS, OR

⇒ Field will be grazed when the required amount of forage is harvested. Grazing will be in accordance with the enclosed Prescribed Grazing Specification Sheet Code 528A.

DESIGN APPROVAL:

This practice is classified as Job Class I

Design approved by: /s/

Roberta Pedraza

Date:

04/15/05

Job Title:

Bryson Team Leader

CLIENTS ACKNOWLEDGEMENT STATEMENT:

The client acknowledges that:

- a. They have received a copy of this specification and understand the contents and requirements.
- b. 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.

Accepted by: /s/

Butch Katers

Date:

4-15-05

CERTIFICATION;

I have completed a review of the forage harvest management practice 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: Butch Katen

Job Location: T 1S; R 9W; Sec. 35

County: Tillamook SWCD Tillamook

Farm/Tract No. T-81 & 51

Field No. T-81: Fields 6,7,9 T-51 Field 3

Prepared By: Pedersen 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 by clipping.
- ⇒ 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.

DESIGN APPROVAL

This practice is classified as Job Class II

Design approved by:  Robert A. Pedersen Date: 4/15/05

Job Title: Basin Team Leader

Client Acknowledgement Statement:

The client acknowledges that:

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

Accepted by: /s/  Date: 4-15-05

Certification:

I have completed a review and checked out the filter strip practice specifications and certify that the practice has been applied in accordance with specifications.

Certified by: /s/ _____ Date: _____

Job Title: _____

Natural Resources Conservation Service, Oregon

WASTE UTILIZATION SPECIFICATION SHEETClient Butch KatenLocation: 11165 Trask River Road, Tillamook, Oregon 97141Tillamook SWCD _____ Tract No. 81 & 51Prepared By Pedersen Date 03/22/05**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.
- ☐ 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 identified in the resource management system plan by 50 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-sidedress 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.

WASTE UTILIZATION SPECIFICATION SHEET**DESIGN APPROVAL:**

Practice Code NO.	PRACTICE	LEAD DISCIPLINE	CONTROLLING FACTOR	UNITS	JOB CLASS				
					I	II	III	IV	V
633	Waste Utilization	BCSD-Agron & CED-EE	Area	Acres	20	40	80	180	All

This practice is classified as Job Class IVDesign Approved by:/s/ Robert A. Pedersen

Date:

4/15/05Job title: North Coast Basin Team Leader**CLIENTS ACKNOWLEDGEMENT STATEMENT:**

The Client acknowledges that:

- They have received a copy of the specification and understand the contents and requirements.
- The following information must be provided to NRCS by the client before this practice can be certified as applied:
 - ☐ Waste application records which include the date, crop, type of waste applied, and amount of waste applied.
 - ☐ Calibration records for waste application equipment.
 - ☐ Analysis of nutrient concentrations in solid and liquid wastes.
- 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.

Accepted by:/s/

Butch Kater

Date:

4-15-05**CERTIFICATION:**

I have completed a review of the information provided by the client and certify this practice has been applied.

Certification by:/s/

Date:

Job title:

Tillamook County SWCD
Approximate Acres: 248.1
Date: 4/1/2005

Flood Boundary Map Sensitive Manure Application Area



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

Tract 51

Tract 81

1,000 0 1,000 2,000 3,000 4,000 Feet

 Tract Boundaries

 Planned Land Units

 Public Land Survey

Legend

 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





Waste Utilization

Conservation Practice Jobsheet

Natural Resources Conservation Service, Oregon

633 OR-JS

February 2002

Client Butch Katen

Date 03/22/05



Definition

Waste Utilization is the beneficial use of agricultural wastes such as manure and wastewater or other organic residues.

Purpose

The ultimate purpose of waste utilization is to insure the proper use of agricultural wastes while protecting soil, water, air, plant, and animal resources. Agricultural wastes can be used to provide nutrients for crops, forage, and fiber production and forest products. Agricultural waste also can be used as an amendment to improve or maintain soil structure, provide feedstuff for livestock, or provide a source of energy. The focus of this job sheet will be the use of agricultural wastes to provide fertility for crops, forage, and fiber production and forest products; and to supply organic material to the soil.

Where used

Waste utilization is used where agricultural wastes (primarily animal manure and polluted runoff from livestock and poultry operations) are generated and collected as part of a resource management system. Wastes can be used as a source of fertility on cropland and pastureland, and occasionally on forest land or rangeland. Use of the Soil Condition Index (SCI) can be used to determine the effects of organic material on soil quality.

Conservation Management Systems

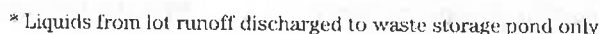
Waste utilization is generally one of several components of a resource management system used to manage manure and polluted water from livestock and poultry operations. Where the wastes are used to supply the fertility needs of crop and pasture, waste utilization is done as part of an overall resource management plan for the enterprise.

Waste Utilization Planning

Waste utilization components of the conservation plan will contain the following information:

- field map and soil map
- crop rotation or sequence
- results of soil, water, plant, and organic material samples analyses
- expected yield
- sources of nutrients to be applied
- nutrient budget, including credits of nutrients available
- recommended nutrient rates, form, timing, and method of application
- location of designated sensitive areas
- guidelines for operation and maintenance

Waste utilization is most effective when used with other conservation practices such as cover crop, residue management, conservation buffers, irrigation water management, nutrient management, pest management, and conservation crop rotation.



Schematic of a Resource Management System for a Dairy

- 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.

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.

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WASTE UTILIZATION WORKSHEET

(Using Bucket, Pan or Tarp)

Operator: _____ Spreader ID: _____

[illegible]

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: _____

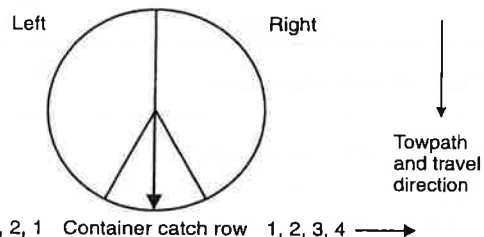
Perform the following operations to calibrate the traveling big gun sprinkler:

- ✓ 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 =								

Natural Resources Conservation Service, Oregon

WASTE UTILIZATION WORKSHEET**Nitrogen Based Waste Application**

Name: _____ Date: _____

Example:

Corn silage is being grown and the recommended nutrient application from the nutrient budget worksheet is 200 pounds of nitrogen(N) 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 Silage	Corn Silage				
3. Desired nitrogen application rate, lb/acre-	100	100				
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 (P₂O₅)-	1	4				
Potassium (K₂O)-	6	19				
5. Plant availability of nitrogen from Table 1-1 in percent-	100 %	100 %	%	%	%	%
6. Nitrogen retained, in percent, after application from Table 1-2-	75 %	70 %	%	%	%	%
7. Calculate nitrogen availability- line 4 N x line 5 x line 6 ÷ 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				
8. Determine nitrogen 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>
Nitrogen (N)-	1.75	17				
9. Determine the amount of phosphorus and potassium applied from nutrient concentration data on line 4 and 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>
Phosphorus (P₂O₅)-	50	70				
Potassium (K₂O)-	250	300				
10. Total Nutrients Applied, lb/acre:						
Nitrogen (N)- (Sum of liquids and solids from line 3)	200 lb/acre		lb/acre		lb/acre	
Phosphorus (P₂O₅)- (Sum of liquids and solids from line 9)	120 lb/acre		lb/acre		lb/acre	
Potassium (K₂O)- (Sum of liquids and solids from line 9)	550 lb/acre		lb/acre		lb/acre	

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	

Natural Resources Conservation Service, Oregon

WASTE UTILIZATION WORKSHEET**Table 1-1****Typical Manure Nutrient Concentrations for Different Handling Systems**

The table below shows typical values of the nutrient content of manure from different animal waste handling systems. You can use them as a rough estimate of the nutrient content of your manure. Because manure nutrient content varies widely among farms and even over time on the same farm, it is recommended to test your manure to get realistic nutrient content numbers for your farm. Refer to Oregon State University Extension Publication PNW 505, "Which test is best?" for more information on manure testing.

Typical nutrient content, solids content, density, and nitrogen availability of animal manure at the time of application:						
Solids from:	Nitrogen N (lb/Ton)₂	Phosphorus P₂O₅ (lb/Ton)₂	Potassium K₂O (lb/Ton)₂	Solids (Percent)	Bulk Density (lb/cubic yard)	Nitrogen Availability (Percent)₁
Broiler with litter	73	64	66	70	900	40-70
Laying Hen	37	57	47	40	1400	40-70
Sheep	18	9	35	28	1400	25-50
Horse	9	6	16	37	1400	0-20
Beef	12	6	17	23	1400	20-40
Dairy:						
Dry Stack	9	4	19	35	1400	20-40
Separated Solids	5	2	3	19	1100	0-20
Liquids from:	Nitrogen N (lb/1,000gal)	Phosphorus P₂O₅ (lb/1,000gal)	Potassium K₂O (lb/1,000gal)	Solids (Percent)	Density (lb/gal)	Nitrogen Availability (Percent)₁
Dairy:						
Holding Tank	21	14	24	8	9.2	75-85
Pond, no agitation	4	1	6	<1	8.4	85-95
Pond, agitated	12	7	18	4	9.0	80-90

¹ Nitrogen available in the first growing season after application. For a field that has received manure annually for 4 years or more, consider 100% of the nitrogen available.

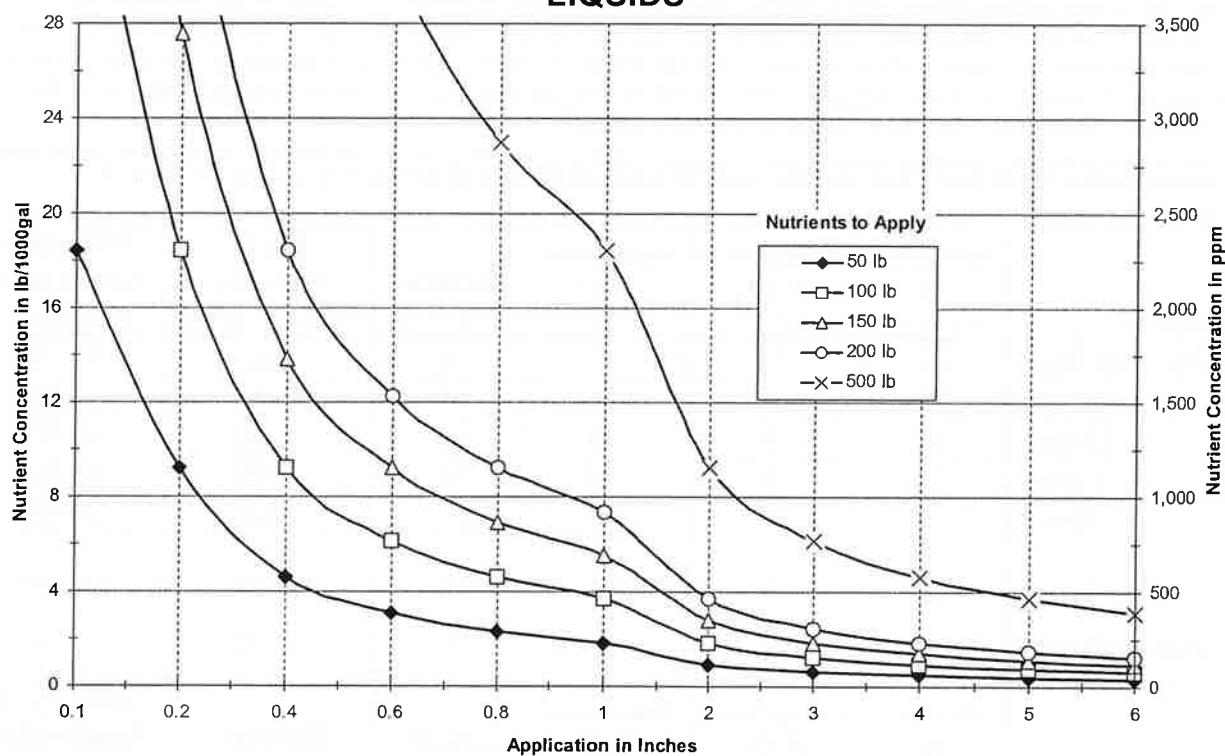
² Manure is at the moisture content typically found in storage.

Table 1-2**Typical Nutrient Availability After Application**

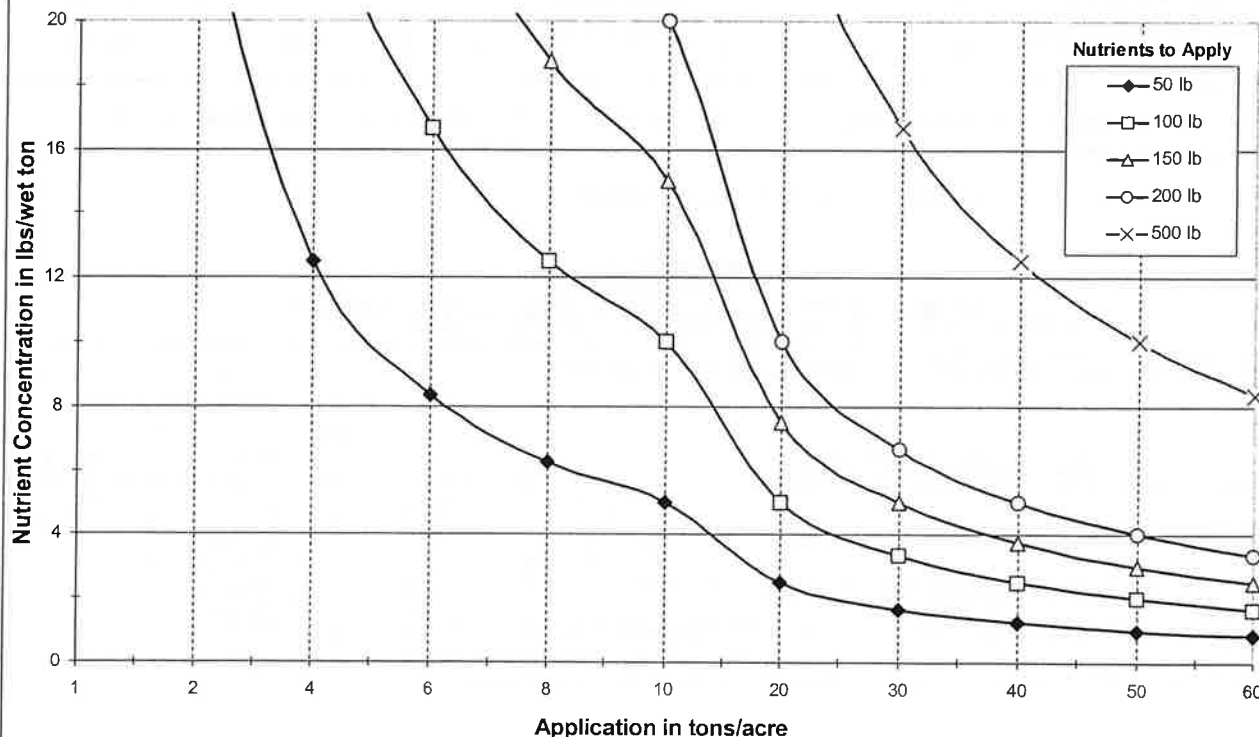
Typical nutrient content of animal manure retained after application:			
Application Method	Percent of original nutrient content of manure retained after application		
	N	P₂O₅	K₂O
Injection	95%	100%	100%
Sprinkling	75%	100%	100%
Broadcast (Incorporated 1 day after application)	90%	100%	100%
Broadcast (Incorporated 4 days after application)	80%	100%	100%
Broadcast (Incorporated 7 or more days after application)	70%	100%	100%

WASTE UTILIZATION WORKSHEET

**NUTRIENT APPLICATION CHART
for
LIQUIDS**



**NUTRIENT APPLICATION CHART
for
SOLIDS**



WASTE UTILIZATION WORKSHEET

Name: _____ Field ID: _____

Crop: _____ Acres: _____ Seeding Date: _____

[illegible]

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 bag 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).

Fall Soil Samples

- Fall soil samples are to be collected during the last 2 weeks in September or the first 2 weeks in October on soils that are not saturated.
- Soil samples are to be collected on fields that have received normal manure applications during the current year.
- Sample soils and ship as outlined in the spring soil sample section above.

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.

MANURE SAMPLES

Solid Manure Samples

- Solid manure samples should be sampled during the first application made in the spring(March-April).
- Lay a piece of tarp or plastic on the pasture and make a pass over or next to it to obtain a representative sample from the spreader.
- Scoop up enough material to fill the sample bag about half full.
- Label the sample with the farm or operator name, date, and solid manure sample.
- Keep the sample cool while in the field. (You can put the sample in a small cooler with some ice.)
- Freeze the sample until ready to ship to the lab.

SHIPPING INSTRUCTIONS

- Nitrogen is heat sensitive. Keeping the samples cool in shipping helps to improve reliability of data.
- Ship frozen soil samples in small cooler.
- If shipping refrigerated soil samples, it is recommended that these be shipped in a small cooler with ice.
- Ship frozen liquid or solid manure samples in a small cooler.
- Ship frozen soil samples or refrigerated soil samples with frozen liquid and/or solid samples in a small cooler. Lab should send cooler back to you if request them to do so.
- Ship any or all samples on Monday, Tuesday, or Wednesday using any parcel post service.
- Include a note with the samples for the analysis needed.

Soils Analysis Needed;

pH
P---Phosphorus (Weak Bray)
K---Potassium
NH₄-N---Ammonium
NO₃-N---Nitrate

Liquid and Solid Manure Analysis Needed;

Total Nitrogen, Phosphorus, & Potassium plus Ammonium and Solids

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

D.M. Sullivan and C.G. Cogger

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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)

The second section of this publication is designed primarily for use by conservation planners and other agricultural professionals working with farmers to implement nutrient management plans. This section is also designed for dairy operators who do their own soil sampling. This section includes detailed suggestions for the following:

- ◆ Collecting, preserving, and analyzing the soil sample
- ◆ Developing a long-term soil sampling plan

The post-harvest test and how to use it

What the post-harvest test measures

The post-harvest soil nitrate test measures the quantity of plant-available nitrogen present in the nitrate form in the surface foot of soil in the late summer or early fall. The test measures nitrate-N not utilized by the recently harvested crop. Because crops differ in their ability to remove nitrate-N from the soil, test interpretation is crop-specific.

The test looks backward in time. It evaluates the balance between N supply and crop uptake for the crops produced during the summer. Nitrate-N accumulates in the soil when more plant-available N is supplied than can be utilized by the summer crop (see “Crop and soil response to excess plant-available N,” page 4).

Use the post-harvest test to:

- ◆ Get a general idea of balance between N supply from manure and other sources and crop N demand
- ◆ Identify imbalances in N supply among fields on a farm
- ◆ Identify fields that may respond to changes in timing or amount of manure application or other agronomic practices

Soil sampling protocols

Sampling depth

Sample the 0- to 12-inch depth for the post-harvest test. This shallow sampling depth is a good predictor of nitrate in the rest of the soil profile when (1) in-season irrigation is not excessive, and (2) samples are taken prior to heavy rains in the fall.

Composite soil sample

Collect a composite soil sample consisting of a mixture of 15 to 30 soil cores from each field or management unit. See “Collecting, preserving, and analyzing the soil sample” (page 9) for detailed sampling instructions and suggestions for special situations.

What fields to sample

In general, it is not necessary to sample every field on a farm every year. Consult with your farm advisor to determine any regulatory requirements for sampling frequency. We recommend that you sample selected fields that represent typical manure and crop management practices each year to track long-term trends in post-harvest soil nitrate values. See “Developing a sampling plan” (page 11) for more information.

When to sample

In general, samples for the post-harvest test should be collected as soon as possible after a crop harvest. Avoid sampling a field that has had manure application within the past 30 days.

Samples must be taken before heavy fall rains move nitrate below the 12-inch depth. Because the timing of fall rainfall is unpredictable, the best strategy is to sample fields before October 1 whenever possible.

Collect samples from medium- to fine-textured soils (loams, clay loams, and clays) prior to 5 inches of cumulative fall rainfall. Sandy soils (sand, loamy sand, or sandy loam soil texture) have lower water-holding capacities and should be sampled prior to

continues on page 5

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.

Crop and soil response to excess plant-available N

Crop response to applied N. Crop N uptake is controlled by the environment, crop N uptake potential, and management. Crops respond to plant-available nitrogen supply (ammonium + nitrate-N) by the law of diminishing returns (Figure 1). Without added N, some crop yield is produced from N supplied by soil organic matter, residual plant-available N, and other non-fertilizer sources (e.g., mineralization of crop residues). Additional N supplied from manure or fertilizer increases crop yield until site yield potential is reached.

The application rate of manure or N fertilizer needed to reach near-maximum yield is termed the *agronomic rate*. Rather than a single agronomic rate, the crop response to N is best described as an *agronomic rate range* (Figure 1). The agronomic rate range concept allows for variability in crop performance among years and for crop uptake of N beyond the yield maximum (increased protein).

Post-harvest soil nitrate test measures nitrate-N not used by the crop. At excessive plant-available N supply levels, crop yield and crop N uptake do not respond to further N additions. The extra soil N not used by the crop accumulates as nitrate-N.

Elevated post-harvest soil nitrate-N concentrations are an indicator of one or more of the following: (1) excess plant-available N, (2) N supplied too late in the season for crop utilization, or (3) poor crop growing conditions due to insect infestation, moisture/heat stress, plant disease, or other cultural problems. If crop yields are acceptable and crop protein is at typical levels, then the most likely explanation is that plant-available N was supplied in excess of crop needs.

Because grass is more efficient than corn at N uptake, target post-harvest soil nitrate levels given in this publication are lower for grass than for corn. There are two key reasons that grass is more efficient than corn in N removal.

- ◆ Grass has a greater capacity to take up N supplied in excess of that needed for maximum yield. After enough N has been supplied

for maximum yield, grass protein content increases in response to increased N supply. With grass, soil nitrate increases only when the available N supply exceeds that required to produce near-maximum protein. Corn does not take up additional N after the maximum yield is reached. Corn silage protein does not increase much in response to excess N supply.

- ◆ Grass utilizes N mineralized late in the growing season more efficiently. Grass managed for silage or hay continues to take up N until harvest. Corn grown for silage completes its N uptake approximately 4 weeks before harvest. Some of the soil nitrate measured after corn harvest is produced by mineralization of soil organic N to available forms during the final weeks of the growing season.

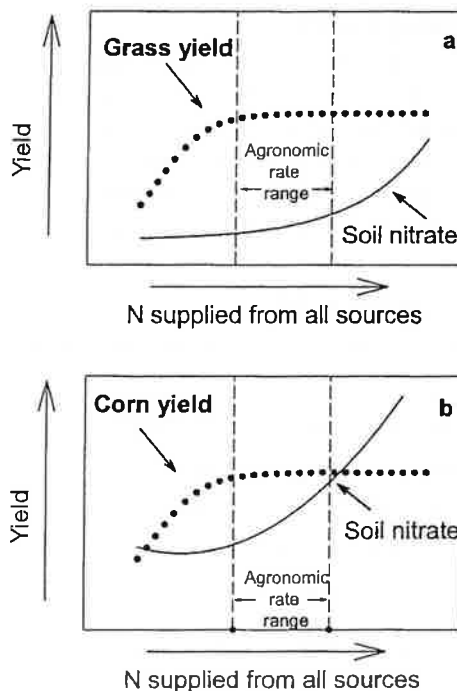


Figure 1.—Crop yield and soil nitrate response to increased N supply. Agronomic rate range = range of N supplied from all sources that results in near-maximum crop yield with acceptable post-harvest nitrate accumulation. Above the agronomic rate range, excess N accumulates as nitrate in soil. More nitrate accumulates in the agronomic rate range with corn (b) than with grass (a).

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.

Response of post-harvest soil test N to changes in management

Success in N management is indicated by long-term trends in post-harvest soil nitrate (at least 3 to 5 years). **Because of the large pool of readily mineralizable N in manured soils, fall soil nitrate values may not decline for 3 to 5 years in response to improved management.** For multiyear comparisons, sampling methods and timing must be consistent.

Some portions of a crop rotation will have higher fall nitrate values because of rapid N mineralization stimulated by tillage or incorporation of crop residues. For example, soil nitrate concentrations typically are high, regardless of overall N management, after a perennial grass sod is plowed down and reseeded.

Reductions in fall soil N are most likely to be measured when (1) commercial N fertilizer amounts are reduced or eliminated, (2) cropping systems that maximize N removal in late summer and fall (August to October) are used, and (3) manure or N application is eliminated after August 1. It is more difficult to attain post-harvest soil nitrate-N values of less than 20 ppm for corn than for grass (see "Crop and soil response to excess plant-available N," page 4).

Interpretation for individual fields

Interpretations of soil test nitrate-N should be made first at the field level. You may be able to discover a probable cause for differences in test values among fields. Questions to ask include:

- ◆ Are relationships present between known management factors (e.g., manure application rate or timing, crop yield and quality, irrigation frequency, distance to the barn) and soil test values?
- ◆ Is a large amount of variation present between fields? Is there a logical explanation for unusual values?
- ◆ Are values for grass and corn fields similar?

Annual averages across grass and corn crops

After looking at test values for individual fields, it may be useful to look at averages across all grass or corn fields. You may want to calculate averages only for fields under similar management.

Average nitrate-N test values are most useful for consideration of changes in whole farm nutrient management. Tables 3 and 4 present interpretive information separately for grass and corn fields.

If a few fields have unusual test values, you may be justified in excluding those fields from an average. Although you may want to exclude unusually high test values from the farm average, you definitely should evaluate those fields further to determine the probable cause of the high soil test values. The unusually high test values may reflect the need for management changes or may reflect a soil sampling or analytical error.

Using the interpretive tables (Tables 3 and 4)

Interpretations and management suggestions given in Tables 3 and 4 (pages 7–8) are general in nature and should serve as only one portion of a nutrient management plan evaluation. Some of the management suggestions can be implemented for individual fields, while others need to be implemented on a whole farm basis.

Remember not to focus solely on post-harvest nitrate-N in evaluating N management. Include other important aspects of N management in your evaluation, such as success in following a plan for manure application, calibration of manure application equipment, maintaining good manure application records, and effective irrigation management.

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.

Table 4.—Grass for hay or silage. Suggested interpretation for post-harvest soil nitrate-N (0- to 12-inch depth).^a

If post-harvest nitrate-N is less than 15 ppm (less than approximately 55 lb N per acre)

- ◆ Continue present N management.

If post-harvest nitrate-N is 15 to 30 ppm (approximately 55 to 105 lb N/acre)

- ◆ Apply manure earlier in the growing season.
- ◆ 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.
- ◆ Check protein levels in forage. Grass crude protein greater than 21 percent is associated with increased potential for nitrate toxicity to cows.
- ◆ Plan to reduce manure-N application by 10 to 25 percent.
- ◆ Improve whole farm nutrient balance.

If post-harvest nitrate-N is greater than 30 ppm N (greater than approximately 105 lb N/acre)

- ◆ Apply manure earlier in the growing season. Reduce manure application after August 1.
- ◆ Keep records to document crop yield, dry matter, and crop N removal. Total manure-N + fertilizer-N should be less than or equal to crop N removal. Even if calculated crop removal exceeds 400 lb N per acre, apply manure-N + fertilizer-N not to exceed 400 lb N per acre per year.
- ◆ Consider reseeding or interseeding if grass yield is limited by poor stand or undesirable species.
- ◆ Check protein levels in forage. Grass crude protein greater than 21 percent is associated with increased potential for nitrate toxicity to cows.
- ◆ Plan to reduce manure-N application by 25 to 40 percent.
- ◆ Consult experts to improve whole farm nutrient balance and reduce danger of nitrate toxicity to cows.

^a The 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

Collect 15 to 30 soil cores from each management unit or representative sampling area with a push probe or similar tool. If you use an auger, 10 holes per management unit or zone is sufficient.

Choose sampling locations in a zigzag pattern across the field. Your general route of travel should be across rows, rather than down one row in the field. Make sure you sample within the part of the field where manure is routinely applied. For grazed pastures, choose sampling locations that have average crop growth and productive forage species.

Scrape away loose crop residues or manure present on the soil surface. Sample only the soil. Including the accumulated organic debris from the soil surface in the soil sample will increase variability in test results.

Once you are satisfied with a sampling strategy, repeat the same procedure each year. This will increase the validity of year-to-year comparisons of results.

Obtaining a representative sample from fields where manure has been injected into soil or placed in bands on the soil surface is difficult. The depth of manure injection, the width of injection zone, and the spacing between bands depend on equipment, soil, and the applicator. Some injection equipment can place manure below the 12-inch sampling depth used for the post-harvest nitrate test. Manure may be injected or banded more than one time per year, with several orientations in a field (e.g., north-south or east-west). Because of the added variability associated with manure injection or banding, plan to collect a larger number of soil cores to obtain a representative composite sample.

Sample handling

Mixing. If it is not too hard to break up the soil cores, break them, mix them all together, and homogenize thoroughly. Take a 1-cup subsample for shipment to the lab. If

the soil cores are too hard to break apart, send the entire sample to the lab, where they can pass the sample through a mechanical grinder. Check with the lab to make sure they will grind and mix the *entire* sample before subsampling.

Preservation. Soils kept moist and warm continue to accumulate nitrate via biological activity after sampling. The simplest way to limit biological activity is to cool the soil after collection. Put the samples in plastic bags and place them in a cooler on ice while still in the field. Refrigerate them when you return from the field. Freeze the samples if they will be held longer than 48 hours before analysis.

Shipment. Keep the samples refrigerated or frozen until you deliver them to the lab. Contact the lab before you sample, so they will be prepared to receive the samples. Use a shipping method that will get the samples to the lab within 48 hours. You may want to freeze the samples before shipping to make sure they remain cool in transit.

Working with an analytical laboratory

Choose a laboratory that has experience with agricultural samples. Ask if they participate in the North American Proficiency Testing Program or a similar quality assurance program for agricultural testing labs. Find out what extraction and analytical procedures they use. Procedures should be consistent with those recommended for the western states (Gavlak et al., 1994).

Labs may use one of several colorimetric (color-based) lab procedures or they may use an electrode method to measure nitrate. Sample comparisons have shown that the colorimetric procedures usually are more precise than the electrode method.

Some testing labs also have sampling and consulting services. This can be convenient for people who have little experience in sampling or need help with sampling.

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.

Sampling priority

Prioritize fields for fall sampling ahead of time so that you get high-priority fields sampled at an appropriate time. Highest priority should be given to representative fields used to track long-term trends. Fields with high manure application rates or elevated soil test N the previous year should also have a high priority.

Corn fields can be sampled for soil nitrate in June (PSNT, pre-sidedress nitrate test) or in the fall (post-harvest test described in this publication). You will get the most management information by sampling your high-priority representative corn fields both in June (PSNT) and after harvest. You also may want to sample fields with PSNT values greater than 45 ppm nitrate-N again in the fall.

For other corn fields where only one soil test per year is planned, we recommend using the PSNT in preference to the post-harvest soil nitrate test. The PSNT is preferred because test results are applicable to in-season N management. Growers can save money and reduce post-harvest nitrate by omitting sidedress N fertilizer application on fields where sufficient soil nitrate-N is present in June.

Sampling corn fields at PSNT time also will reduce the number of post-harvest samples that need to be collected during the short interval between harvest and the end of the fall sampling window (approximately October 15). If you miss a planned fall sampling on a corn field, consider sampling next year using the PSNT.

Grass fields are best sampled in the fall, using the protocols described in this publication. Think carefully about the best way to achieve consistent timing of sample collection for your fields. The timing of manure application and the timing of grass harvest are key variables to consider.

Samples collected shortly after manure application are not a good indicator of the

balance between N supply and crop N demand over the entire growing season. If manure is applied late in the year, postpone soil sampling until after a fall grass harvest. Wait at least 30 days after a late-season manure application before sampling. Sampling need *not* be postponed until after the last manure application or until after the last grass harvest in the fall.

Questions and answers

Why is it difficult to achieve post-harvest nitrate-N less than 15 to 20 ppm with organic sources such as manure?

First, the timing and rate of application for organic sources is less flexible than for fertilizer N. Second, environmental processes that control the quantity and timing of N availability from organic sources are difficult to manage. The biggest factors controlling N availability are soil temperature and moisture. The timing of crop N uptake usually does not match the timing of N supplied from manure and other organic sources. Soil temperature and moisture often support continued release of available N after crop N uptake is complete.

Is there a relationship between soil organic matter content and potential N mineralization?

Research west of the Cascades has demonstrated a lack of correlation between soil organic matter content and N mineralization potential for soils having 3 to 8 percent organic matter. The active fraction of soil organic matter that controls annual N mineralization rates is a small proportion of total organic matter (usually less than 10 percent of total). Recent site management affects soil N mineralization potential; it does not have much effect on soil organic matter content. Because most soil total N is contained in soil organic matter, soil total N is also an unreliable indicator of mineralization potential.

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 to 0.8 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

utilization of nutrients on the farm, and nutrient losses to air and water.

The Livestock and Poultry Environmental Stewardship (LPES) Curriculum, available through the Midwest Plan Service, includes a Web presentation of whole farm nutrient management principles and a worksheet for evaluating whole farm nutrient balance. See "For more information" (page 15) for details.

What is the role of post-harvest nitrate testing in connection with Comprehensive Nutrient Management Plans (CNMPs)?

CNMPs, developed by the Natural Resources Conservation Service (NRCS) or other nutrient management professionals under NRCS supervision, are broader than just nutrient management. Other components of a CNMP are: (1) manure and wastewater handling and storage, (2) land treatment practices, (3) record-keeping, (4) feed management, and (5) other waste utilization options.

Post-harvest nitrate test values may be used as part of a process to develop a new CNMP or to update an existing CNMP. The CNMP typically includes a plan for regular

soil testing. Appropriate timing of the post-harvest nitrate test is critical (see "When to sample," page 2), while soil samples for P and K analysis may be collected any time of the year. Soil samples collected for the post-harvest nitrate test can be analyzed by routine agronomic soil testing procedures and used in developing plans for P and K utilization in a CNMP.

What are the implications of high nitrate concentrations in forages?

Nitrate in ensiled forages can interfere with normal fermentation processes, resulting in poor-quality forage. Forage nitrate affects the distribution of nitrogen compounds in silage. It is difficult to use the silage to formulate rations that meet cow needs for specific protein fractions. Enough nitrate is sometimes present in the silage itself to create a health risk to the animal. Grass silage that is greater than 21 percent crude protein should be tested for the level of nitrate-N. See Johnson et al. (2002) for interpretation of forage nitrate concentrations.

For more information

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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).

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Acknowledgments

This publication is a product of the Western Integrated Nutrient Management Education (WINME) project. Financial support for WINME is provided by the USDA Western Region Sustainable Agriculture Research and Education (SARE) Program.

This publication reflects a collaborative effort among organizations and individuals. Major ideas in the publication were proposed by participants at the Fall Soil Nitrate Workshop facilitated by Washington State University Cooperative Extension on 28 February 2002 in Puyallup, WA.

The authors acknowledge the involvement of the following individuals in development of portions of the publication:

Andy Bary, WSU Cooperative Extension,
Puyallup, WA

Don Horneck, OSU Extension Service,
Hermiston, OR

Joe Harrison, WSU Cooperative Extension,
Puyallup, WA

John Gillies, Washington State NRCS,
Lynden, WA

John Hart, OSU Extension Service,
Corvallis, OR

Mary Staben, OSU Extension Service,
Corvallis, OR

Orlando Schmidt, BC Ministry of Agriculture,
Food and Fisheries, Abbotsford, BC

Robert Dyk, Thurston Conservation District,
Tumwater, WA

Robert Stevens, WSU Cooperative Extension,
Prosser, WA

Steve Campbell, Oregon NRCS, Portland,
OR

Tom Gohlke, Oregon NRCS, Portland, OR

Valerie Oksendahl, Washington State
NRCS, Spokane, WA

Review comments on a draft of the publication were provided by:

Aria Baker, Linn Conservation District,
Tangent, OR

Brad Brown, University of Idaho, Parma, ID

Chris Clark and Chuck Timblin, Whatcom
Conservation District, Lynden, WA

Dean Moberg, Oregon NRCS, Hillsboro, OR

Fred Likkell, David Haggith, and Joy Hawley,
N3 Consulting, Lynden

Glenn Gately, Jefferson Conservation District,
Port Hadlock, WA

Jerry Lemunyon, NRCS, Fort Worth, TX

Lee Ko, Oregon NRCS, Oregon City, OR

Marty Chaney, Washington State NRCS,
Olympia, WA

Mike Gamroth, Animal Science, OSU,
Corvallis, OR

Mike Gangwer, OSU Extension Service,
Salem, OR

Shabtai Bittman, Agriculture and Agri-Food
Canada, Agassiz, BC

Troy Downing, OSU Extension Service,
Tillamook, OR

Wym Matthews, Oregon Department of
Agriculture, Tillamook, OR

This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties.



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Published May 2003.

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.

Ammonium-nitrogen ($\text{NH}_4^+\text{-N}$)

Ammonium-nitrogen does not accumulate in the soil, as soil temperature and moisture conditions suitable for plant growth also are ideal for conversion of $\text{NH}_4^+\text{-N}$ to $\text{NO}_3^-\text{-N}$. Ammonium-nitrogen concentrations of 2–10 ppm are typical. Soil $\text{NH}_4^+\text{-N}$ levels above 10 ppm may occur in cold or extremely wet soils, or if the soil contains fertilizer residue.

Nitrate-nitrogen ($\text{NO}_3^-\text{-N}$)

West of the Cascades. Soil nitrate-nitrogen measurements are most useful as a post-harvest “report card” to evaluate N management. Nitrate remaining in the soil after harvest can leach during winter rains, contaminating surface and groundwater. If residual nitrate levels are consistently high, reduce fertilizer N inputs in future growing seasons.

Table 1.—Residual soil nitrate-nitrogen for evaluating N management.

	$\text{NO}_3^-\text{-N}$ in surface foot (ppm)*	#/Ac
low	<10	< 36.5
medium	10–20	36.5–73.0
high	20–30	73.0–109.5
excessive	>30	>109.5

*See Table 13 (page 7) for conversion of ppm to lb/acre.

Mid-season measurement of soil nitrate is used for field corn production. See EM 8650, *The Pre-sidedress Soil Nitrate Test (PSNT) for Western Oregon and Western Washington*, for more information.

East of the Cascades. In arid regions, soil nitrate ($\text{NO}_3^-\text{-N}$) is evaluated by measuring $\text{NO}_3^-\text{-N}$ to the expected rooting depth of the crop to be grown. If test results are reported in ppm, convert to lb/acre using Table 13 (page 7). Then subtract the soil nitrate from the crop requirement to determine a fertilizer rate.

Failure to account for $\text{NO}_3^-\text{-N}$ in the soil can lead to over-application of nitrogen fertilizers. Also, irrigation water should be analyzed for $\text{NO}_3^-\text{-N}$ content, and fertilizer rates reduced accordingly. Proper irrigation increases N use efficiency and reduces nitrate leaching.

Total nitrogen

Total nitrogen analysis measures N in all organic and inorganic forms. Total nitrogen does *not* indicate plant-available N, and is not included in standard soil testing programs.

A typical agricultural soil in the Willamette Valley contains about 0.10 to 0.15 percent N, or approximately 5,000 lb N/acre in the surface foot. Only 1 to 4 percent of this total N becomes plant-available during a growing season. East of the Cascades, soils tend to have smaller amounts of total N.

Total N analysis, while not recommended as part of a standard soil testing program, may be better than organic matter analysis for estimating soil N supplying capability.

Phosphorus (P)

The Bray P1 (for acid soils) and the Olsen sodium bicarbonate (NaHCO_3) (for alkaline soils) tests estimate plant-available phosphorus. Soil testing laboratories also use several other extraction methods. For interpretation of results from other extraction methods, contact the laboratory that performed the analysis.

Phosphorus soil tests are an index of P availability. The test values cannot be used to calculate available lb P_2O_5 /acre.

When sampling soil, you must be aware of previous P management. Phosphorus is relatively immobile in soil. If phosphorus has been applied in a fertilizer band, concentrations of P may persist where the band was placed. Avoid fertilizer bands when collecting soil samples.

Table 2.—Phosphorus soil test.

	West of Cascades (Bray P1 test) ppm P	East of Cascades (Olsen test) ppm P
low	<20	<10
medium	20–40	10–20
high	40–100	20–40
excessive	>100	>40

The phosphorus application rate necessary to correct P deficiencies varies depending on soil properties. Phosphorus availability decreases in cool, wet soils. In many situations, banded phosphorus applications are more effective than broadcast applications.

Phosphorus applications generally are not recommended if tests are high or excessive. High soil phosphorus combined with surface runoff can cause excessive growth of plants and algae in surface waters, damaging aquatic ecosystems.

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.

Boron (B)

Crops such as alfalfa, table beets, brassicas, caneberries, and root crops have responded to boron fertilization on B-deficient soils in western Oregon. Tree fruits and alfalfa are examples of crops sensitive to low boron levels east of the Cascades.

While low levels of boron may limit plant growth, high concentrations can be toxic. When applying boron, apply uniformly and mix thoroughly with the soil.

Table 7.—Boron by the hot water extraction method.*

	B (ppm)
low	<0.5
medium	0.5–2
high	>2

*The hot water extraction method for boron may result in incorrectly high values on soils with high organic matter content.

Zinc (Zn)

Zinc values above 1.0 ppm using the DTPA extraction method are sufficient. Zinc deficiencies have been identified in some crops in certain regions. Corn, beans, grapes, hops, onions, and deciduous fruit trees are especially sensitive to low levels of available zinc. Deficiencies sometimes are associated with high soil concentrations, soils high in fine clay and silt, or soils with high pH.

Copper (Cu)

Copper values above 0.6 ppm using the DTPA extraction method are sufficient. Copper deficiencies are uncommon. Deficiencies have been identified on muck soils such as those in the Klamath area in Oregon and the Colville area in Washington.

Manganese (Mn)

Manganese values above 1.5 ppm using the DTPA extraction method are sufficient. Manganese deficiencies generally occur only in soils with pH 7.0 or above. Manganese toxicity may occur on acid soils. On alkaline soils east of the Cascades, Mn availability may increase in acidified microzones where fertilizers have been placed. These acidified microzones can alleviate Mn deficiencies sometimes encountered on high pH soils. In some instances, however, acidic microzones can result in Mn toxicity.

Iron (Fe)

Soil testing for iron is not recommended. Most test methods do not discern between forms of iron, and therefore have little meaning for plant nutrition.

Iron deficiencies are uncommon on acid soils in the Pacific Northwest. Where deficiencies occur, they often are associated with acid soil plants, such as azaleas or rhododendrons, growing on soils with unsuitably high pH. Acidifying fertilizers such as ammonium sulfate will help correct problems.

Iron applications on alkaline soils are inefficient unless a chelated form is used. Lowering soil pH to increase iron availability on a field scale is not economical. However, adding acidifying materials such as elemental sulfur to fertilizer mixes can acidify microzones around the fertilizer material and increase Fe availability.

Foliar applications of Fe sometimes are used to correct deficiencies in fruit, turf, and other high-value crops.

Molybdenum (Mo)

Soil Mo concentrations are too low for most labs to evaluate. Molybdenum deficiencies are rare, and are of concern mostly for leguminous crops. Molybdenum-deficient legumes appear chlorotic. Liming to raise soil pH may alleviate deficiencies. Molybdenum-coated seed also can be used.

Excessive molybdenum in forage can harm animal health. If you suspect excessive molybdenum in your forage, determine Mo content by forage analysis.

Chloride (Cl)

Soil testing for chloride is not a common practice, and little data exists for interpretation of test results. Evidence indicates that wheat sometimes benefits from chloride applications. The values in Table 8 are based on wheat research in Montana and South Dakota. Little information exists on chloride soil testing in Washington and Oregon.

Table 8.—Chloride soil test ranges for wheat in Montana and South Dakota, 2-foot sampling depth.

	ppm	lb/acre
low	0–4	0–32
medium	4–8	32–64
high	>8	>64

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.

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.

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

Sodium (Na)

Sodium is not a plant nutrient and therefore is not necessary for plant growth. High levels of sodium are detrimental to soil tilth and plant growth.

Sodium levels are evaluated based on Exchangeable Sodium Percentage (ESP). The ESP is the percent of the cation exchange capacity (CEC) occupied by Na.

ESP values above 10 percent are of concern. Excessive sodium levels can occur naturally or can result from irrigation with high-sodium water. Reclamation involves establishment of drainage followed by gypsum application and leaching with low-sodium water.

Soluble salts (SS)

Soluble salt problems usually are associated with arid regions such as eastern Oregon and Washington. Soils with high levels of soluble salts are called saline soils. Soils high in sodium are called sodic soils (see "Sodium"). Saline-sodic soils are high in both soluble salts and sodium. Soluble salts are measured by electrical conductivity (EC) of a saturated paste soil extract.

Table 12.—Soluble salts.

	Conductivity (mmhos/cm*)	ppm salt**
low	<1.0	<640
medium	1.0–2.0	640–1,280
high	>2.0	>1,280

*mmhos/cm is equivalent to decisiemen/m.

**Multiply mmhos/cm by 640 to estimate ppm salt.

Because salts move readily with water, salt problems often are transient. Salt toxicity can occur, and salts may leach before soil is tested. Low salt values, therefore, do not always rule out salt toxicity as a cause of problems.

Salt tolerance varies greatly among plant species. Seedlings are especially sensitive to high salt concentrations. Excessive salts may inhibit seed germination. Excessive fertilization and poor irrigation water quality are sources of salts.

Organic matter

Maintenance of soil organic matter is one of the most important goals of soil management. Accurate measurement of soil organic matter is difficult.

Many laboratory methods are used. Most methods are indirect; they measure soil carbon and make an assumption about the percent carbon content of organic matter. The Walkley-Black method is common and gives consistent results. The loss on ignition method can give inconsistent results and tends to overestimate organic matter.

When estimating potential nitrogen release of a soil, total N testing is preferred to organic matter determination. Neither approach provides accurate estimates of soil N availability. If you are monitoring changes in organic matter over time, use the same lab for all analyses.

Cation exchange capacity (CEC)

CEC is a measure of a soil's capacity to retain and release elements such as K, Ca, Mg, and Na. Soils with high clay or organic matter content tend to have a high CEC. Sandy soils have a low CEC. Soil CEC is relatively constant over time, so there is no need for repeated analyses.

CEC often is determined by the ammonium acetate (NH_4OAc) or sodium acetate (NaOAc) methods. While these methods are standard in many regions, there are potential sources of error. Errors are most likely to occur for soils containing appreciable amounts of CaCO_3 or gypsum.

Some labs estimate CEC based on soil texture, organic matter content, cations, and pH. Such estimates often are inaccurate. The "sum of bases" method for calculating CEC of alkaline soils can give inaccurate results, especially if there are significant amounts of free CaCO_3 .

CEC determination can be important for predicting behavior of pesticides and other chemicals in soils.

Base saturation

Base saturation is the percentage of the CEC that is occupied by cations other than hydrogen (H) and aluminum (Al). Soils with low base saturation generally are acidic. Base saturation and pH increase together.

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.

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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, 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.

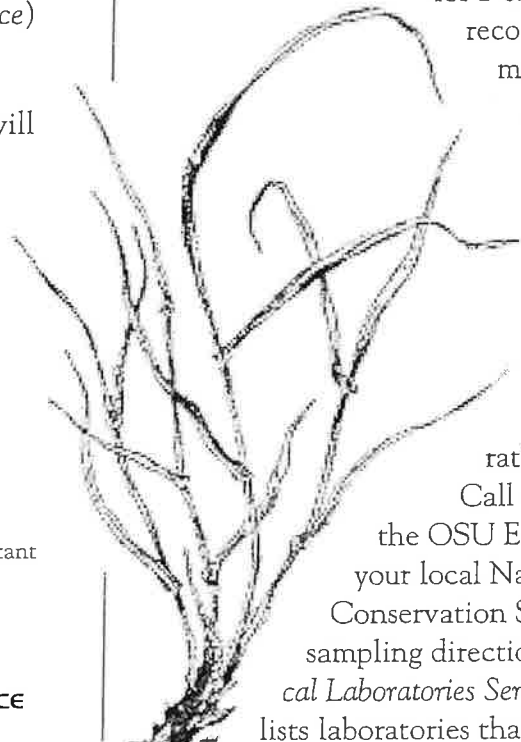
Manure analysis

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 Resource Conservation Service office for sampling directions. A *List of Analytical Laboratories Serving Oregon* (FG 74) lists laboratories that test manure.



Crop nitrogen requirements

Nitrogen (N) is the nutrient needed for crop production on dairies. Tables 1 and 2 show the estimated nitrogen removal rate (or uptake) for average yields of the most common forage crops grown on dairies.

Determining manure application rate

Your goal is to match manure nutrient application rates with crop removal. Table 1 and Figures 1–3 provide the information you need for perennial crops, and Table 2 and Figures 4–6 apply to annual crops. Instructions on how to use them follow. (An example is illustrated on page 3.)

Perennial crops

1. In Table 1, find the crop you will grow and the average yield per cutting. Let's assume you grow perennial ryegrass. Table 1 shows that an average yield per cutting is 1.2 tons per acre of dry matter (about 3 tons of harvested grass).

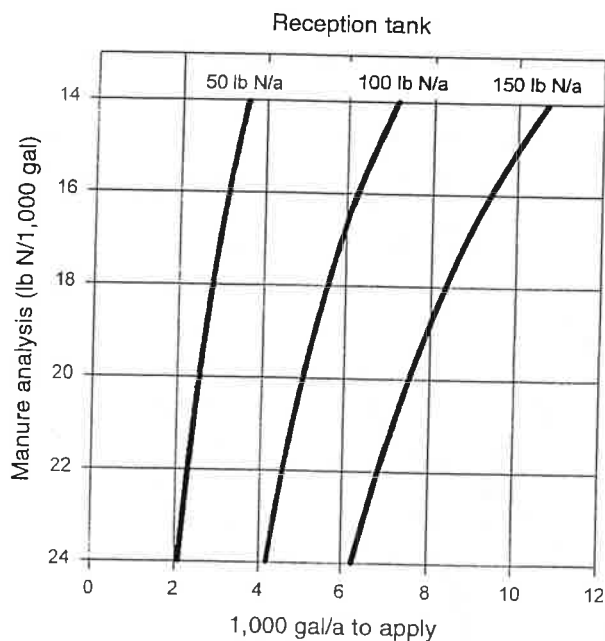


Figure 1.—Determining application rate for reception tank manure.

Note: Recommendations in Figures 1–6 assume that nitrogen applications should not exceed crop removal. We assume that N mineralization will offset any volatile losses that occur during application.

2. Now find the nitrogen removal rate for the average yield. Table 1 shows that perennial ryegrass takes up about 60 pounds of N per acre for each cutting. Thus, you should apply about 60 lb N/a after cutting the ryegrass.
3. Find the figure below (Figures 1–3) that represents the type of manure you want to apply. Let's assume you want to apply lagoon effluent, so you'll use Figure 2.
4. Figure 2 contains three lines representing N application rates of 50, 100, and 150 lb N/a. Find the line that is closest to the rate you need to apply. You'll use the line for 50 lb/a because it is closest to 60 lb/a.
5. Select your manure analysis for nitrogen on the left side of the graph. Let's assume a manure test shows that the effluent contains 6 lb/1,000 gallons or 750 ppm N. Move to the right across the graph until you meet the line for the application rate you have chosen (50 lb N/a).

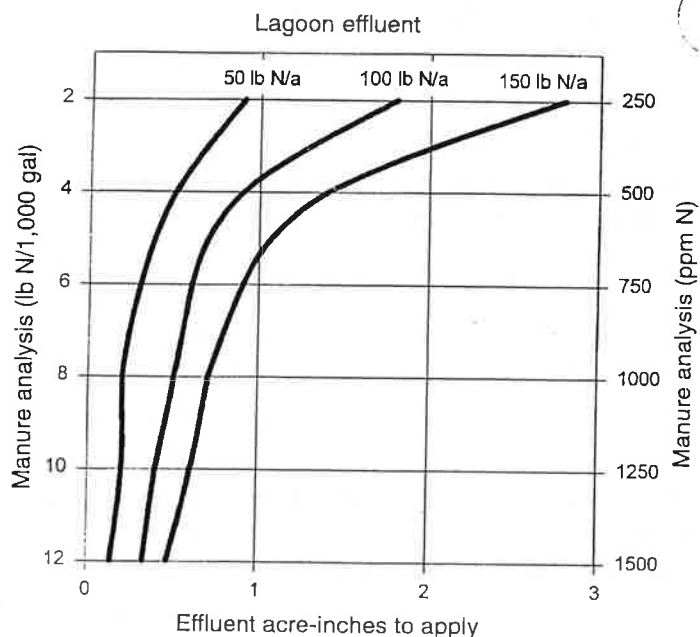


Figure 2.—Determining application rate for lagoon effluent.

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.

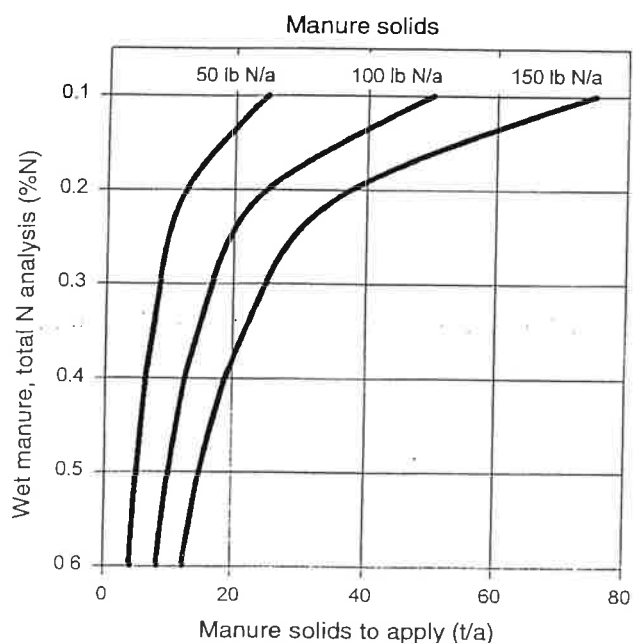


Figure 3.—Determining application rate for manure solids.

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).

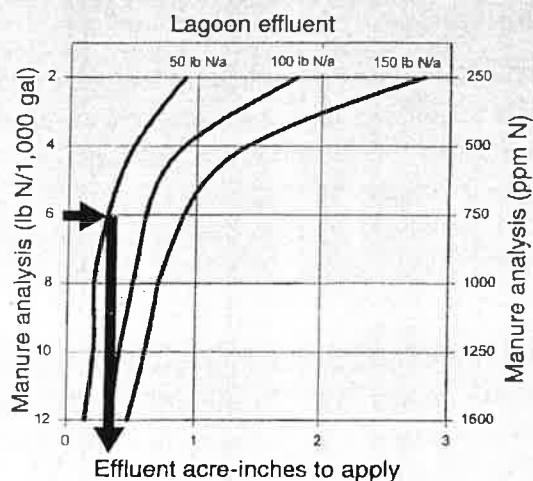


Table 2.—Approximate nitrogen removal by annual forage crops and suggested nitrogen application rates.

Crop	Average total yield (t/a)	N removal rate for average yield (lb N/a)	Suggested N application rate (lb N/t of forage*)
Silage corn			
75% moisture	30	180	5–7
dry matter basis	7	180	20–30
Annual ryegrass	5	100	15–25
Triticale	8	160	15–25
Oats	4	80	15–25
Sudan grass	5	250	50–60

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

Annual crops

You can follow a similar procedure to estimate the amount of manure needed for annual crops. For example:

1. From Table 2, find the total amount of N that is needed by the annual crop you will grow. We will use silage corn as an example. A 30-ton yield of silage corn requires 180 lb N/a.
2. Find the figure (Figures 4–6) that represents the type of manure you want to apply. Let's assume you'll apply separated solids, so use Figure 6.
3. Figure 6 contains three lines representing N application rates of 50, 100, and 150 lb N/a. Find the line that is closest to the rate you need to apply. You'll use the line for 150 lb/a since it is the closest to the rate you need to apply (180 lb/a).
4. Find your manure analysis for nitrogen on the left side of the graph. Let's assume your manure test shows that the solids contain 5 pounds of N/t or 0.25 percent N on a wet basis. Since 0.25 percent N is not on the graph, estimate a point halfway between 0.2 and 0.3. Move to the right until you meet the line for 150 lb N/a.
5. Now move down to the line labeled "manure solids to apply (t/a)." You should find 30 tons. Remember that 20 percent more nitrogen will be needed because no line exists for the 180 lb N/a

required by the silage corn. The total estimated amount of solids required should be 35 t/a.

Note: If you know your own yield, you can figure your nitrogen need more accurately. To do so, multiply your tons per acre by the "suggested N application rate (lb N/t of forage)" in Table 2. The result is your N removal rate. Use the line in the appropriate figure that is closest to that rate.

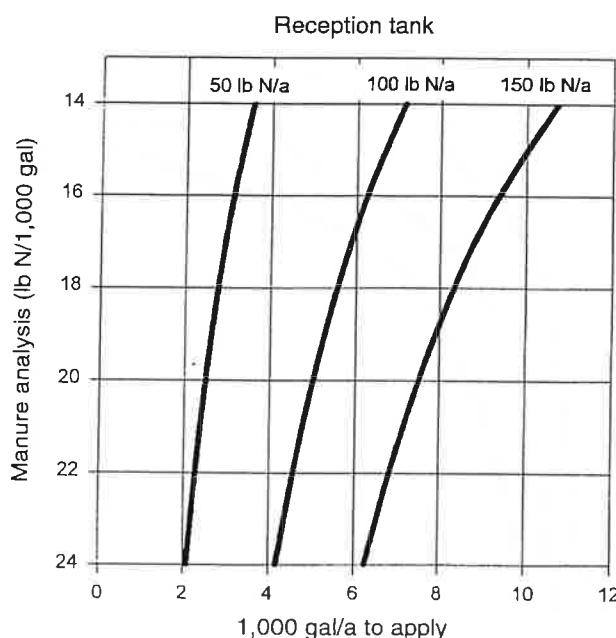


Figure 4.—Determining application rate for reception tank manure.

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.

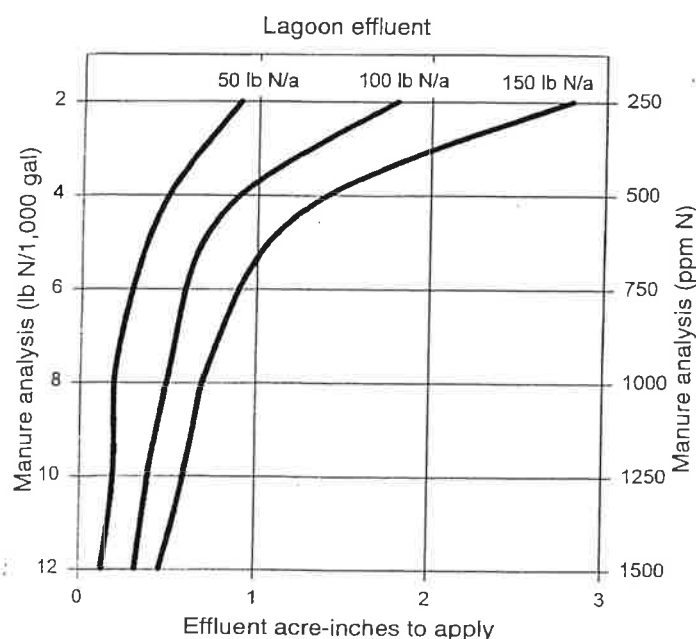


Figure 5.—Determining application rate for lagoon effluent.

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

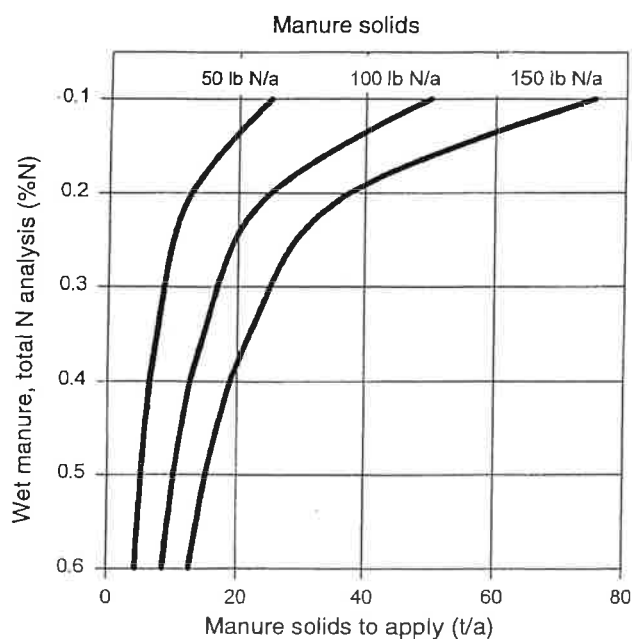


Figure 6.—Determining application rate for manure solids.

Testing your soil for P and K

Test your soil for phosphorus (P) and potassium (K) before applying manure. Table 5 provides interpretations of P and K soil tests.

If you've applied manure for more than 5 years, additions of P and K usually are not needed. For example, potassium usually is not deficient in soils where manure has been applied unless the applications were light and a high yield of grass hay was removed.

A manure application that meets crop nitrogen needs usually supplies sufficient amounts of P and K. Manure contains as much, if not more, K than N. For more information, see EM 8586, *Dairy Manure as a Fertilizer Source*.

In fact, fields that have received manure for a decade or more often have high soil test values for P and K. Fields with soil test K above 1,000 ppm can produce grass forage with a high K concentration. When grass forage with more than 3 percent K is fed to dry cows, serious illness or death may occur.

In some cases, a soil test shows excessive K, but N is needed. In this case, you have two options:

- Apply separated solids, which are lower in K than other forms of manure.
- If another area is available for manure application, apply manure there and buy N fertilizer for the area that has excess K.

Contact your county office of the OSU Extension Service for additional information.

New plantings

Little N is needed by new plantings. After N, phosphorus is the nutrient most likely to limit forage production. For new plantings or annual crops where manure has not been applied, apply 30 lb P_2O_5 /a in a band-placed starter fertilizer. For more information, see FG 63, *Pasture Fertilizer Guide*.

Table 5.—Interpretation of soil tests for P and K.

Soil status	Nutrient	
	Phosphorus (P)	Potassium (K)
	(ppm)	
deficient	below 25	below 150
sufficient	25–50	150–500
high	50–75	500–1,000
excess	above 75	above 1,000

If P is deficient (see Table 5), also apply one of the following :

- 25 tons of separated solids
- 5,000 gallons of reception tank manure
- 5 wet tons of dry stack manure

End-of-season testing

The tables and figures in this publication provide only an estimate of manure application rates. An end-of-season soil test for nitrate nitrogen or stalk nitrate test for silage corn can aid in adjusting next season's manure application rates.

“Report card” soil testing

1. Sample soil to a depth of 12 inches as described for PSNT sampling. Sample from between rows, and avoid fertilizer bands. See EM 8650 for more information.
2. Prepare and handle the sample as described for PSNT sampling.
3. Have the sample analyzed for nitrate nitrogen (NO_3 -N).

If soil NO_3 -N test results are above 15 ppm, nitrogen probably was supplied in excess of crop needs. (To convert ppm to lb/a, multiply by 3.65.)

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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Other publications

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



Oregon

Theodore R. Kulongoski, Governor

Department of Agriculture

635 Capitol Street NE
Salem, OR 97301-2532



May 19, 2005

Butch Katen
Diamond K Jerseys
11165 Trask River Road
Tillamook, Oregon 97141

RE: Receipt of submitted material

Dear Mr. Katen:

On May 19, 2005, the Oregon Department of Agriculture received your Animal Waste Management Plan (AWMP). The AWMP has been logged into our files as AWMP #05057. We expect to complete our review of this AWMP and have a written response to you by July 3, 2005.

Should you have any questions, please contact me at 503-842-6278.

Sincerely,

Kathryn Higgs
Livestock Water Quality Specialist
PH: 503-842-6278
FX: 503-842-5986

Weather Observations Recorded by
KTIL - RADIO TILLAMOOK, OREGON 97141

*Ken Mack's
Records.*

April's Monthly Actuals for 2005 using True Normals

RECEIVED
5/16/05 TFO.
Rec'ds

Day	Low	DN	High	DN	Mean	DN	Prec.	Peak Wind	Comments
1	44	5	54	-1	49	2	0.62		
2	41	4	55	0	48	2	0.20		
3	43	7	54	-2	48	2	0.70		
4	43	5	53	-3	48	1	0.26		
5	40	3	56	-1	48	1	0.00		
6	39	2	65	9	52	5	0.00		
7	45	7	63	7	54	7	0.71		
8	38	-2	53	-3	45	-2	0.18		
9	34	-5	53	-3	43	-4	0.00		
10	37	-2	54	-3	45	-2	0.15		
11	37	-2	54	-3	45	-2	0.95		
12	37	-2	53	-3	45	-3	0.61		
13	37	-2	54	-3	45	-3	0.36		
14	33	-5	54	-3	43	-4	0.12		
15	35	-5	53	-4	44	-4	0.38		
16	46	7	55	-2	50	3	2.00		
17	41	2	56	-1	48	1	0.58		
18	41	3	56	0	48	1	0.41		
19	35	-3	56	0	45	-2	0.00		
20	39	0	54	-2	46	-1	0.00		
21	39	0	56	0	47	0	0.00		
22	44	5	75	19	59	12	0.00		
23	50	11	71	15	60	13	0.18		
24	39	1	62	6	50	3	0.05		
25	42	4	58	1	50	3	0.00		
26	38	-2	64	7	51	2	0.00		
27	44	4	61	4	52	4	0.00		
28	50	10	59	1	54	6	0.04		
29	48	8	54	-4	51	2	0.19		
30	48	9	58	0	53	5	0.20		

PR

SUMMARY of ACTUALS for April 2005

TEMPERATURE :

MONTHLY MEAN:	Low =	40.9	HIGH =	57.4	Mean =	49.2
DEPART NORM :	Low =	2.2	HIGH =	0.8	Mean =	1.6

PRECIPITATION :

Total Month	=	8.89	Normal Month	=	6.66	DN =	2.23	134%Normal
Average daily	=	0.30	Normal daily	=	0.22			
Number of days with measureable precip.	=	20						
Maximum for April	=	14.52	in 1996					
Minimum for April	=	0.00	in 1952					

YEARLY Precip.	Actual through April 30	:	28.32	%Normal =	70 %
	Normal through April 30	:	40.48		
	Departure from Normal	:	-12.16		

Daily Extremes:	Low :	33	on the	14th
	High :	75	on the	22nd
	Prec.:	2.00	on the	16th

RECEIVED
5/16/05 TFO

May-05

Mauure - Export

51,885

Effluent - Returned

68740 gallons

RECEIVED
5/16/05
TFD

Effluent

4-19-05

Tract 277

Field 6-4-5 = 14.6 Ac.

24000 - gallons

657 lb/N

87.1b/p

All day

Effluent

4-20-05

Tract 277

Field 3

9.6 Ac.

16000 gallons

438.1b/N

58 lb/p

All day

Effluent

4-21-05

Tract 277

Field 1-2

12.5 Ac

24000 gal

657 lb/N

87 lb/p

All Day

LARRY
FERREIRA
RECORDS

RECEIVED
5/13/05 TFO



DARITECH

8540 Benson Road
Lynden, WA 98264
www.daritech.com

Phone (360) 354-8900
Toll Free (800) 701-3632
Fax (360) 354-7522

Big

Little

Big

Little

4-13 - 1-0
4-14 - 0-6
4-15
4-16
4-17
4-18
4-19
4-20
4-21
4-22
4-23
4-24
4-25
4-26
4-27
4-28
4-29
4-30
5-1
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5-9

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3-10
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2-4
2-0
4-0
3-7
3-5
3-1
2-9
2-6
2-3
2-0
1-8

5-10 - 0-6

1-4

Construction Approval Request

I would like to request approval for the following construction plans.

I plan on building a NRCS DESIGNED & APPROVED at my
BELOW GROUND TANK & ABOVE GROUND TANK
facility located at 811165 TRASK RIVER RD. TILLAMOOK, OR 97141
(Address / City / State / Zip)

NRCS is responsible for
(Organization / company)
the planning and/or construction of this structure.

Additional information and/or comments: _____

145' x 12' x 8' BELOW GROUND TANK
100' x 16' IS THE STANDARD DESIGN
DRAWING # AWM-313060

Attached are the completed documents required for construction approval.

Signature Butch Katen Date 1-26-05
Phone: (503) 801-5800 E-mail: _____

- ☒ Site map including the location of the proposed structure(s)
- ☒ Engineer-stamped drawing of the proposed manure storage structure(s)
- ☒ Operation and maintenance for the proposed manure storage structure(s)

FOR ODA USE ONLY:

MA#: 176184
LOG#: 05010
COUNTY: TILLAMOOK
STATUS: APPROVED
DATE: 1/28/05
REVIEWED BY: KH.
(initials)

RECEIVED

1/26/05 TFO

OREGON

KMP 9-16-04

FARMSTEAD

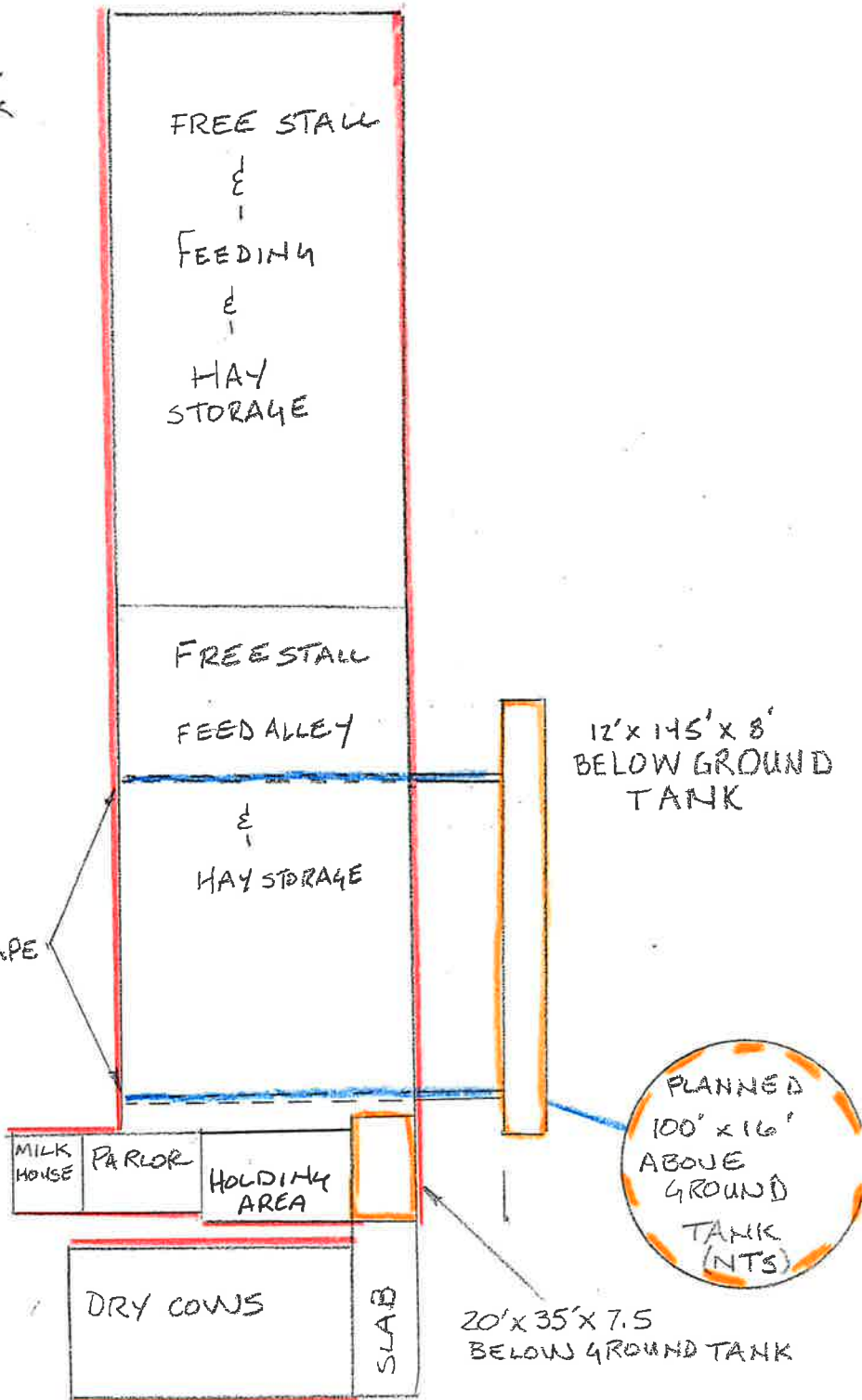
BUTCH KATEN

LEGEND

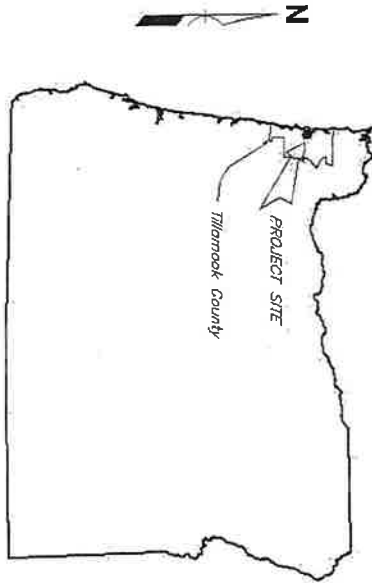
- PLANNED ABOVE GROUND TANK
- PLANNED BELOW GROUND TANK
- BELOW GROUND TANK
- 30" PVC MANURE GUTTER
- GUTTERS & DOWNSPOUTS
- WASTE TRANSFER

SILAGE
BUNKER

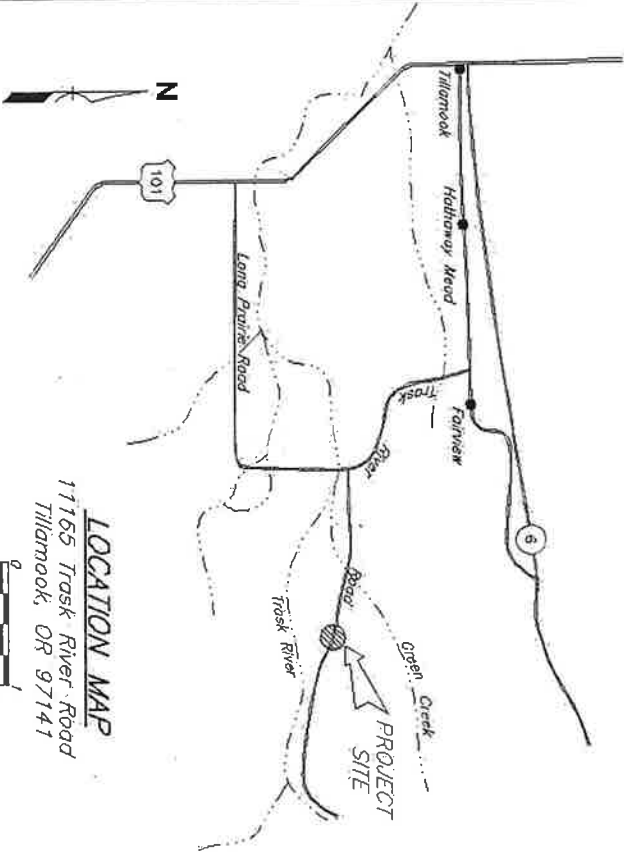
30" PVC SCRAPE
GUTTER



SCALE 1" = 60'



OREGON



LOCATION MAP
17165 Trask River Road
Tillamook, OR 97141

Approx. scale in miles

BUTCH KATEN

ANIMAL WASTE STORAGE TANK

PREPARED BY:
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

INDEX OF DRAWINGS

SHT. NO.	TITLE
1.	Index of Drawings
2.	Plan View
3.	Steel Details
4.	Steel Details

GENERAL NOTES:

1. All construction shall be in accordance with these drawings and attached specifications.
2. Landowner shall be responsible for obtaining any needed permits, easements, and/or right-of-ways, and meeting all requirements.
3. Landowner will be responsible for locating and protecting all utilities. Special safety precautions to be taken when working in the vicinity of gas, oil, and electrical lines.
4. OR-OSHA safety requirements shall be in effect during all construction.
5. All lines and grades shown on these drawings are approximate. The proposed structure's location, excavation limits, and fill limits will be stated in the field by the engineer.
7. Contact the Natural Resources Conservation Service prior to construction. Ph. (503) 397-4555 ext. 106.

Practice Code: 313

Job Class: V

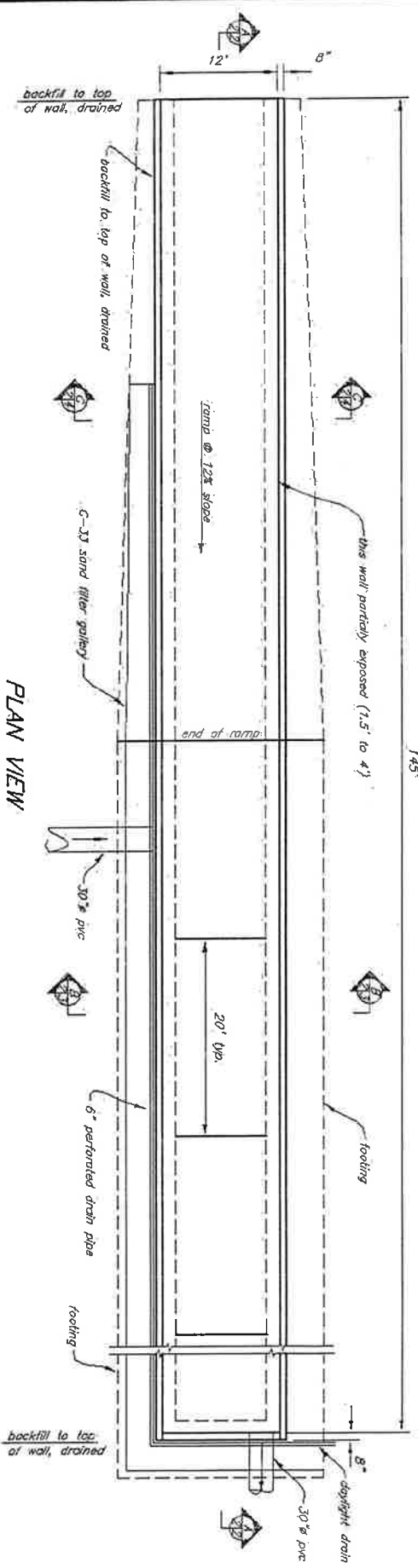


Natural Resources Conservation Service
United States Department of Agriculture

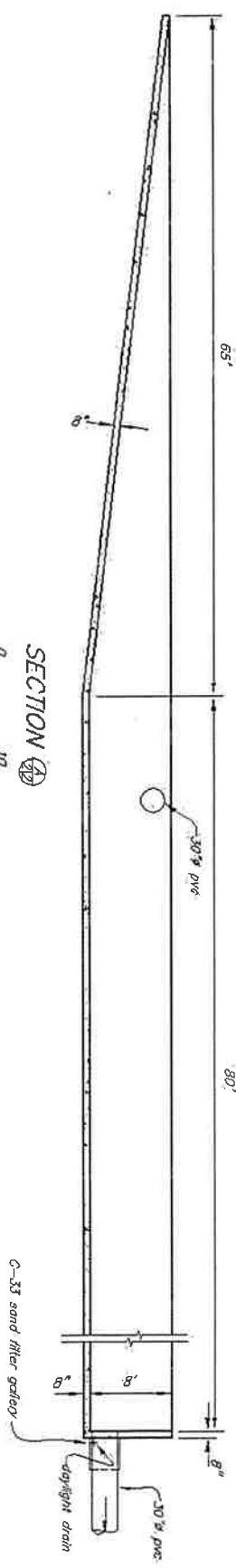
INDEX OF DRAWINGS
BUTCH KATEN EQIP
ANIMAL WASTE STORAGE TANK
TILLAMOOK, OREGON

Designed	GR/RY	Date	1/05
Drawn	KIT	Date	1/05
Checked			
Approved			
Title			

File Name
Lower, Janki, 057
Drawing No.
Sheet 1 of 4



PLAN VIEW



SECTION A-A

Scale in feet

CONCRETE SPECIFICATIONS

- The concrete shall have a minimum compressive strength at 28 days of 4000 psi. Minimum cement content shall be 6.5 bags/cy and maximum net water content shall be 5.2 gal/bag. The slump shall be 2 to 4 inches and the air content shall be 5 to 8% of the volume of concrete.
- Forms shall be mortar tight, substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions. Metal ties within the forms shall be equipped with a device that permits their removal to a depth of at least 1 inch without injury to the concrete.
- The concrete shall be deposited as closely as possible to its final position in the forms and around all reinforcement. Immediately after placement the concrete shall be consolidated by vibrating.
- Woodstrips shall be held firmly in correct position as the concrete is placed.
- Unless otherwise shown, the concrete cover over reinforcement shall be 3" for concrete cast against earth or gravel and 2" for concrete cast against forms.
- Adjustments to the reinforcing steel around embedded fittings shall be approved in advance by the Engineer.
- Forms shall not be removed before 24 hours after placement of concrete.
- Hydr. produced by the removal of form ties, cone bolts, etc., shall be cleaned, wetted, and filled with dry pack mortar.
- Construction joints shall be left rough and shall be thoroughly cleaned and wetted prior to placing the subsequent lift of concrete. Construction joints shall be moist cured without curing compound, or curing compound shall be removed by sand blasting or high pressure washing.
- Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. The slab and footings shall be kept continuously moist for the entire period or until curing compound is applied. Abrasive materials shall not be applied to the surface or covering with plastic. The ends shall be thoroughly wetted immediately after forms are removed and shall be kept wet until patching and repairs are made. After patching and repairs are made, curing compound may be applied in lieu of wetting. Curing compound shall meet the requirements of ASTM C 309, Type 2.
- Concrete shall not be dropped more than 5 feet vertically unless suitable equipment is used to prevent segregation.
- Concrete shall be protected from freezing for the first 72 hours after placement.

Practice Code: 313 Job Class: V



PLAN VIEW
BUTCH KATEN EQUIP
ANIMAL WASTE STORAGE TANK
TILLAMOOK, OREGON

Designed	GT/PV	Date	1/05
Drawn	RLV	Date	1/05
Checked			
Approved			
Title			

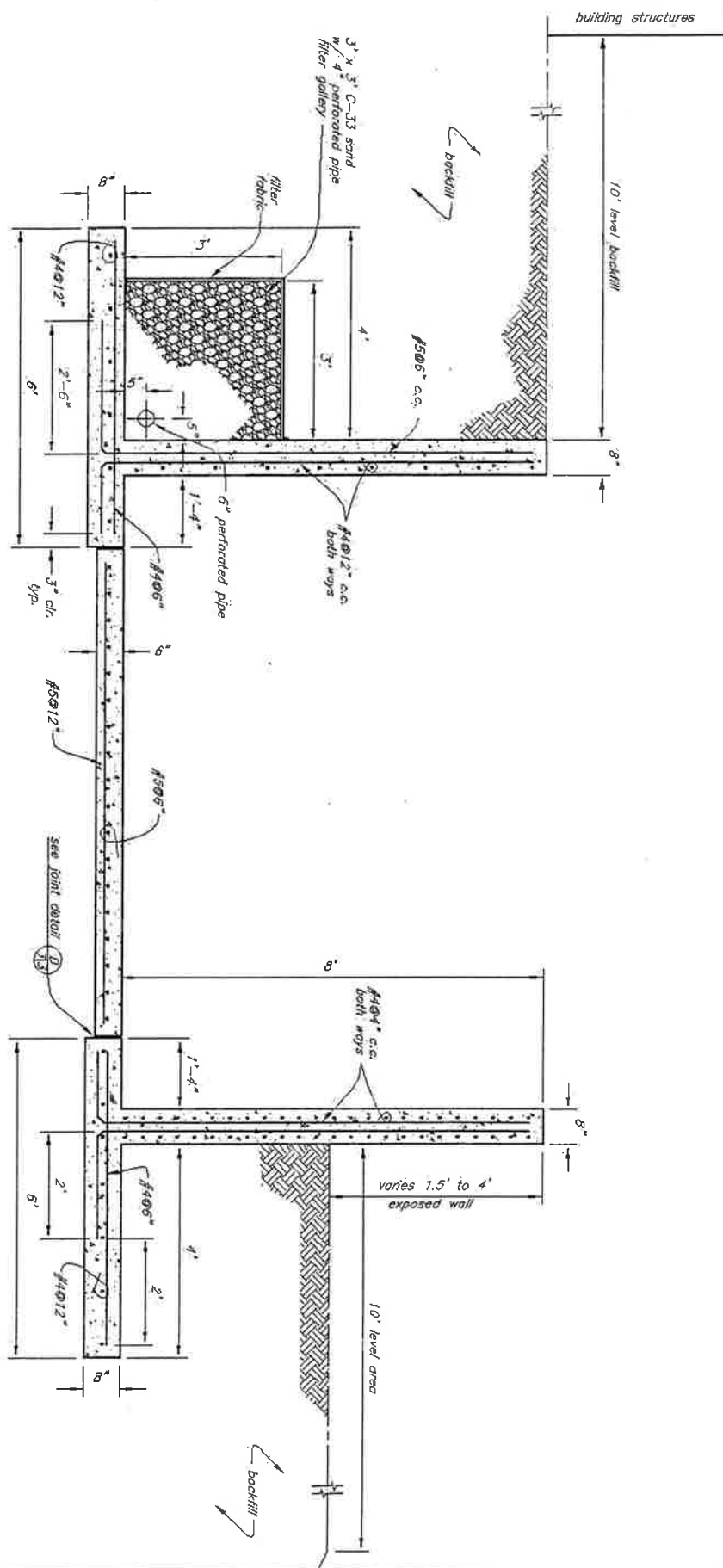
Sheet 2 of 4
The Name
Address
Drawing No.

JOINT DETAIL (NOT TO SCALE)



Joint sealer
1/2" x 6" preformed bituminous
expansion joint filler
floor
locking

SECTION



1
0
2
Scale in feet

Practice Code: 313 Job Class: V

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name
Author/Consulting
Drawing No.

Sheet 3 of 4

STEEL DETAILS
BUTCH KATEN EQIP
ANIMAL WASTE STORAGE TANK
TILLAMOOK, OREGON

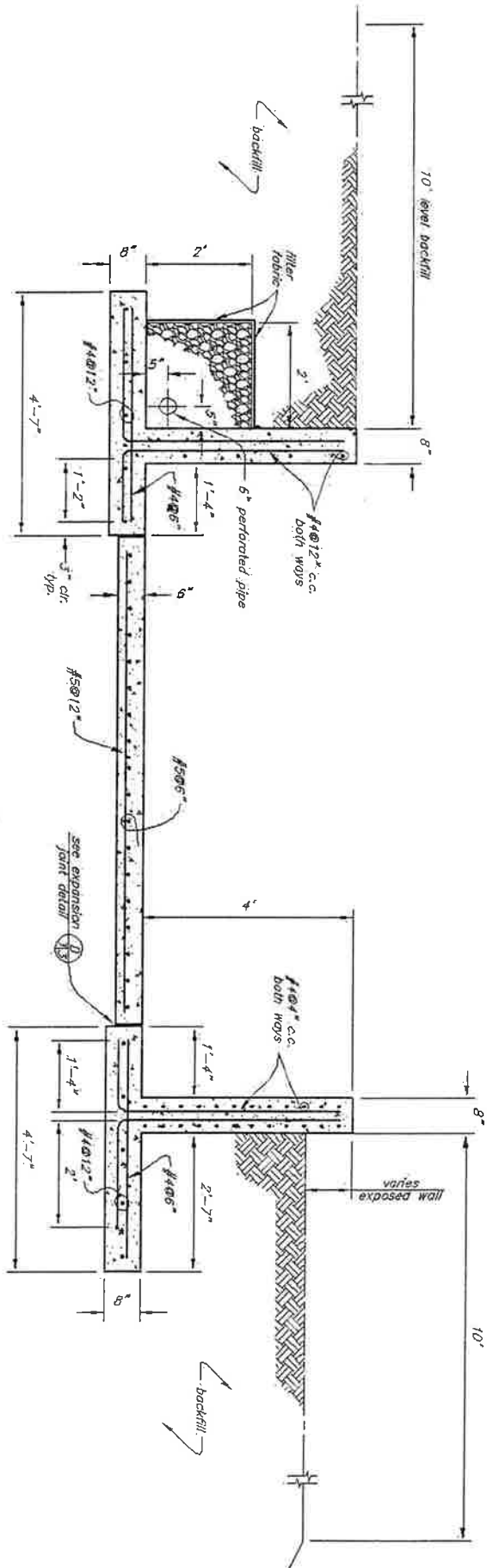
Designed	CF/PV	Date	1/05
Drawn	KLY	Date	1/05
Checked			
Approved			
Title			

CONSTRUCTION NOTES:

1. The backfill shall be material free of roots, organics, and other unsuitable materials obtained from the structure excavation or other off site sources, as approved by the Engineer.
2. The moisture content of the backfill shall be maintained within the limits required to: (1) prevent bulking of the material under the action of the hauling or compaction equipment, (2) prevent adherence of the fill materials to the treads and tracks, and (3) insure the blending of the soil and rock into a reasonably homogeneous mass.
3. The minimum size of rock fragments incorporated into the fill shall be 6 inches, except hand compacted backfill shall have no rock fragments larger than 3 inches.
4. The backfill shall be placed and compacted uniformly around perimeter of the tank in level lifts not exceeding 9 inches in thickness prior to compaction.
5. The backfill shall be compacted to the density of the surrounding in place soil. Hand directed mechanical tampers shall be used within 2 feet of the concrete structures or pipes.
6. The excavation shall be dewatered so that all work can be performed "in the dry". Fill may not be placed in standing or flowing water.
7. Backfill may not be placed until 14 days after placement of the concrete walls.
8. The drain pipe shall be 4 inch diameter heavy duty corrugated plastic drain tubing and fittings meeting the requirements of ASTM F405 (PE Pipe).
9. The geotextile filter fabric shall be non-woven, geotextile recommended by the manufacturer for subsurface drainage applications, such as LINO 120EX, as manufactured by LINO Industrial Fabrics, Inc., or approved equal.
10. The drainfill shall be ASTM C-33 sand for concrete mixture or equivalent.
11. The drain pipe shall have a free outlet. The exposed portion of the drain at the outlet shall be of galvanized corrugated steel pipe, 0.064 inches thick, and shall be equipped with a commercially manufactured rodent guard. The plastic drain tubing shall be inserted into the corrugated steel pipe a minimum of 2 feet.
12. A base course of 6" compacted 5/8" minus crushed rock will be placed below the tank at all locations.

1
0
2
Scale in feet

SECTION



Practice Code: 313

Job Class: V

The Name Drawing No.	 Natural Resources Conservation Service United States Department of Agriculture

STEEL DETAILS
BUTCH KATEN EQIP
ANIMAL WASTE STORAGE TANK
TILLAMOOK, OREGON

Designed	CF/PV	Date	1/05
Drawn	KLY	Date	1/05
Checked			
Approved			
Title			

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

**WASTE STORAGE FACILITY
CODE 313**

For: Landowner/Operator Butch Katen

Job Location: T 1S; R 9W; Sec 35;

County Tillamook SWCD Tillamook

Farm/Tract No. T-81 & 51

Prepared By Pedersen Date 09/04

Tract 51

32' x 8' circular below ground liquid waste storage tank

Tract 81

20' x 26' x 8' below ground liquid waste storage tank

12'x 145'x 8' below ground liquid waste storage tank

100' x 16' above 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 EXTEREMELY "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.
- ⇒ Perform daily inspections of waterlines, including drinking water or cooling water lines. Repair leaking lines immediately to prevent excess water from entering the waste storage system.
- ⇒ Depth markers are installed in the facility and maintained to assure the maximum volume will be maintained under normal operating conditions allowing for the volume necessary to contain the 25-year, 24-hour rainfall event.
- ⇒ The depth of all liquid manure will be recorded during each week's inspection.
- ⇒ Immediately repair any vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances.
- ⇒ Pump out the facility within the first two years following construction to check for structural damage. If damage is noted, immediately seek a qualified engineer to assess the situation. Thereafter, it should be pumped out at least every four years to check for damages, remove gravel, rocks, sand, wire and other debris to maintain the designed storage capacity.
- ⇒ Immediately remove all foreign debris within the structure that may cause damage to pumps and agitator.
- ⇒ 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.
- ⇒ Dead animals will not be disposed of in the liquid waste storage facility.



Oregon

Theodore R. Kulongoski, Governor

A/F
Department of Agriculture

635 Capitol Street NE
Salem, OR 97301-2532

January 31, 2005

Butch Katen
11165 Trask River Road
Tillamook, Oregon 97141



RE: Construction approval for a 145-ft by 12-ft by 8-ft Below Ground Liquid Manure Tank (BGLMT) and 100-ft by 16-ft diameter Above Ground Liquid Manure Tank (AGLMT)

Dear Mr. Katen:

On January 26, 2005, the Oregon Department of Agriculture received documents, to obtain construction approval for both a BGLMT and AGLMT. We have completed our review of this information and our conclusions follow.

Construction Status: Approved

You are approved to construct both liquid manure storage facilities (145-ft by 12-ft by 8-ft BGLMT and the 100-ft by 16-ft diameter AGLMT), according to the design and operation materials on file with the department.

If you have questions about this matter, please contact Livestock Water Quality Specialist Kathryn Higgs, at (503) 842-6278. Thank you for doing your part to help improve Oregon's water quality.

Sincerely,

Debbie Gorham, Administrator
Natural Resources Division
PH: 503-986-4700
FX: 503-986-4730

DG/kh/cs





Oregon

Theodore R. Kulongoski, Governor

Celebrating 75 years!
Department of Agriculture
635 Capitol Street NE
Salem, OR 97301-2532



Memo

To: Ray Jaendl
From: Kathryn Higgs
Subject: Butch Katen (dba Diamond K Jerseys) – Completion of Phase II
Date: May 23, 2006

On May 9, 2005, the Oregon Department of Agriculture received an AWMP from Butch Katen (MA# 176184). This AWMP proposed several improvements to be implemented over a period of time. Each time an improvement was completed, the CAFO permit was to be increased. There were two phases to be completed.

PHASE ONE: Completed on May 24, 2005.

Phase One included the construction of the 12' x 125' x 8' below ground liquid manure tank. With the completion of this tank, the CAFO was increased from 210 animals, based on a herd composition of 175 cows (900 lbs) and 35 calves (200 lbs), to 340 animals, based on a herd composition of 300 cows (900 lbs) and 40 calves (200 lbs). This increase was issued on March 24, 2005.

PHASE TWO:

Phase Two included the construction of the 100' x 16' above ground liquid manure tank. With the completion of this tank, the AWMP proposed increasing the CAFO permit from 340 total animals to 500 total animals based on herd composition 350 cows (900 lbs) and 150 calves and heifers (100-800 lbs).

On March 21, 2006, a routine inspection was conducted at Diamond K Jerseys. During this inspection, I viewed the completed and operational 100' x 16' above ground liquid manure tank.

Since the aboveground liquid manure tank is complete and operational, the AWMP was approved and an animal increase request for 500 total animals has been completed. I recommend that the department issue a new CAFO permit to Diamond K Jerseys for 500 animals based on a herd composition of 350 cows (900 lbs) and 150 calves and heifers (150 lbs).