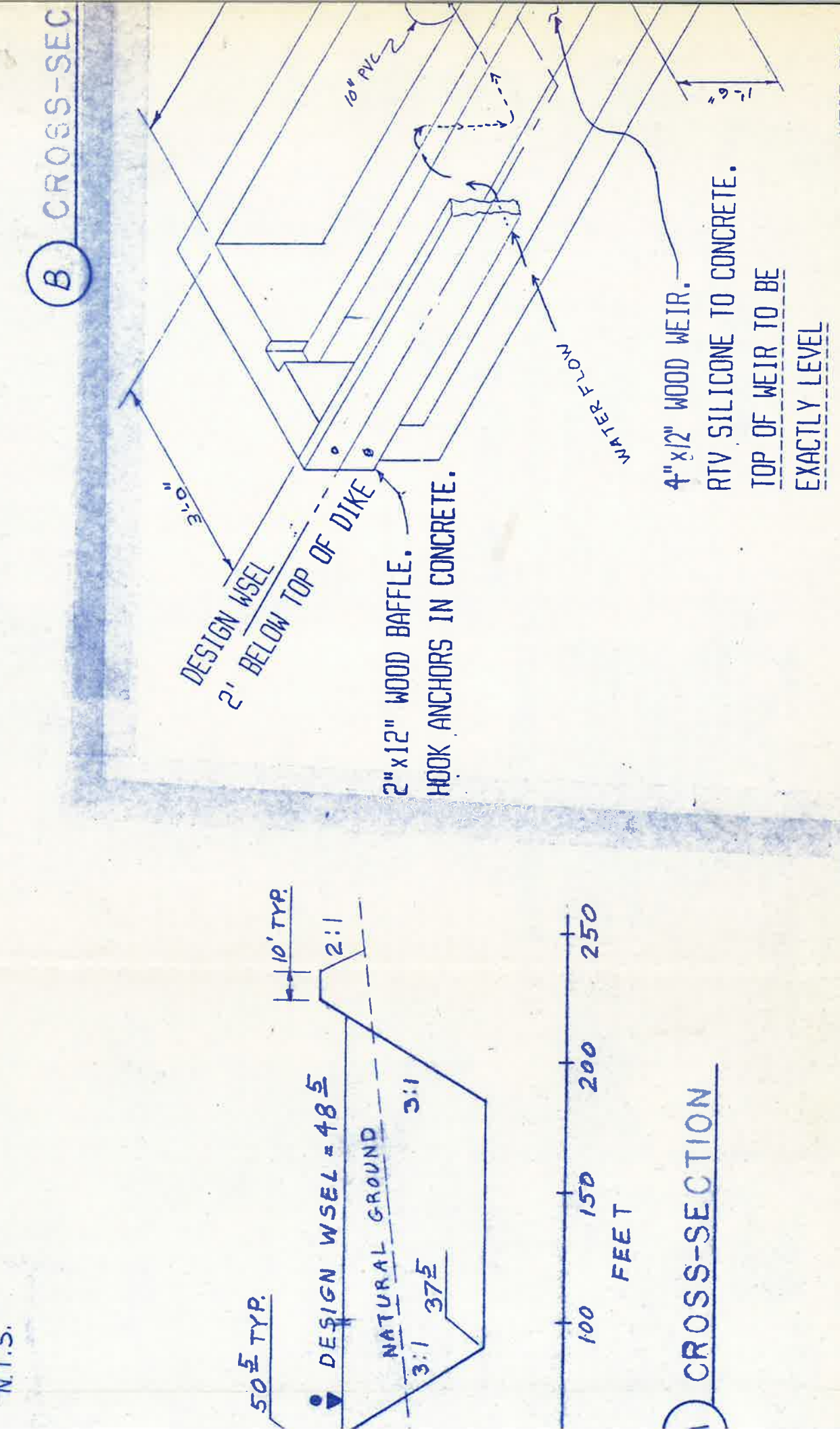
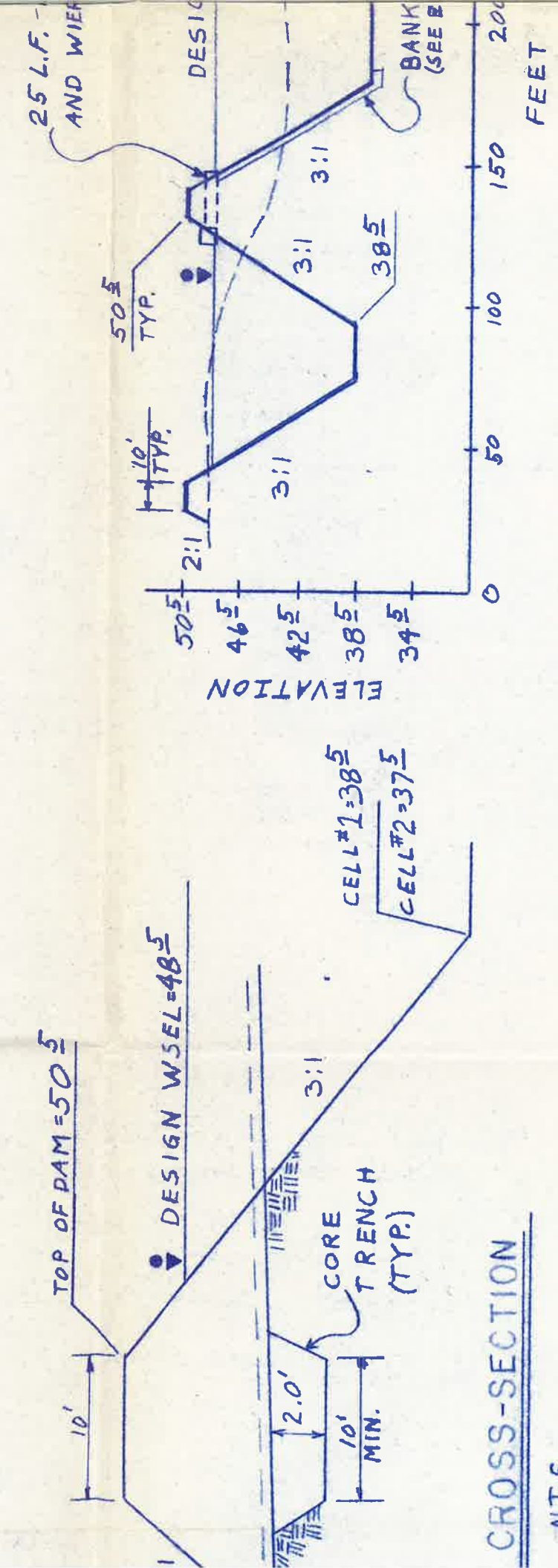
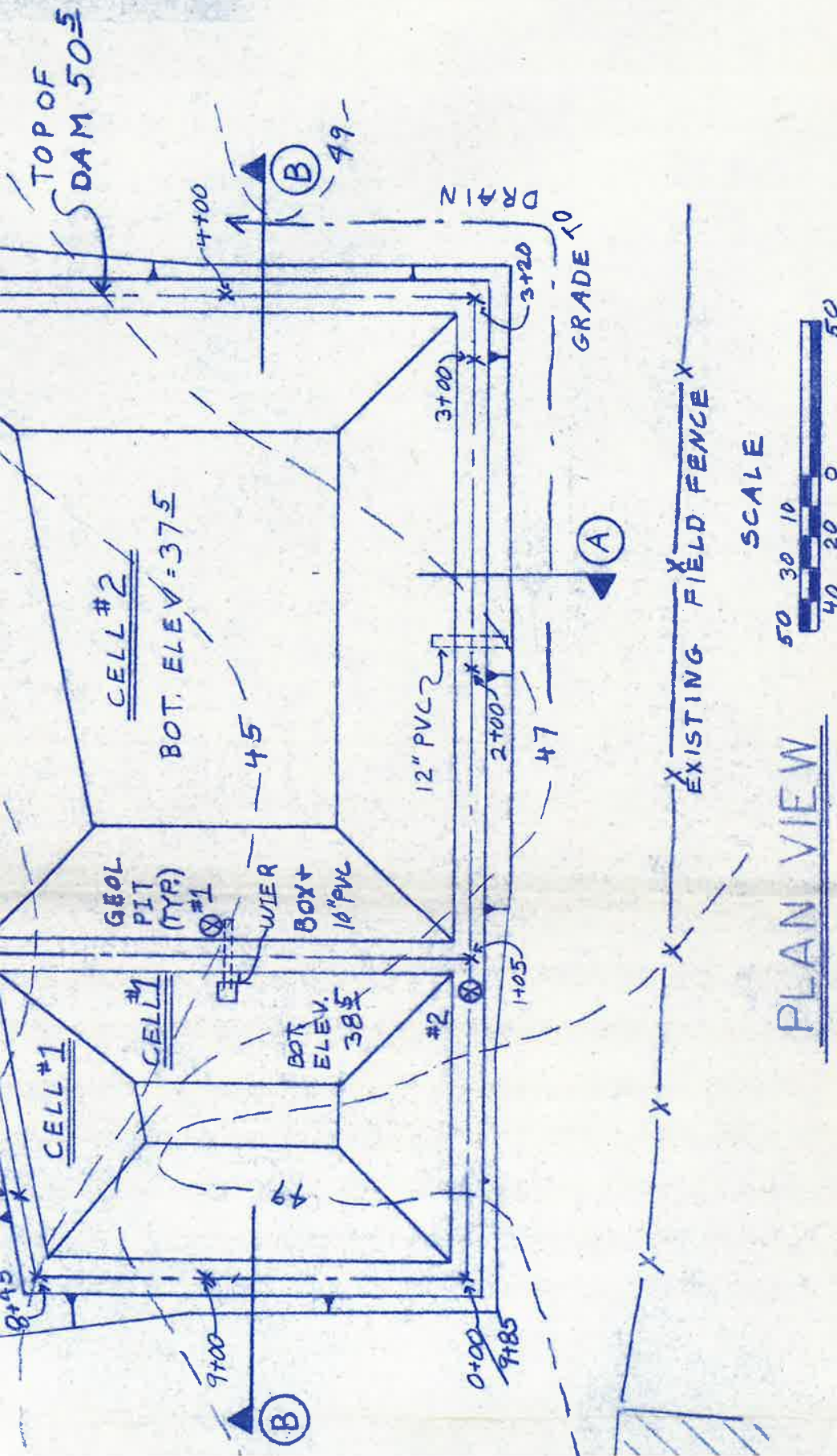
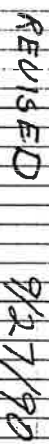


4. ALL ELEVATIONS TO BE SHOWN TO THE NEAREST 0.1 FEET.

5. CUTOFF TOP OF CONCRETE SHALL BE PLACING FORMS.

TOP OF
DAM 505





**Oregon Department of Agriculture
ANIMAL INCREASE REQUEST
National Pollutant Discharge Elimination System
(NPDES PERMIT)**

Statutory Authority

Oregon Revised Statutes (ORS) 468B.050 When permit required
ORS 468B.210 Maximum number of animals based on ability to contain, treat, hold and dispose of
wastes as necessary to comply with all conditions of the permit.

A. General Information

Master Address #

63743

Name or Business Name Dan Boersma

Facility Location Address 12545 SE Finn Road

City Dayton **Zip Code** 97114 **County** Yamhill

B. Livestock Type: Circle the item that best represents your operation.

- | | | | |
|---|----------------------------|-----------------|--------------------|
| 1. Beef Feedlot (Fattening) | 2. Beef Cattle (Cow/calf) | 3. Hogs | 4. Sheep and Goats |
| 5. Dairy Farm, <u>Heifer Replacement Farm</u> | 6. Poultry/Broiler | 7. Poultry/Eggs | |
| 7. Mink/Rabbits | 8. Horses and Other Equine | 9. Other _____ | |

C. Current Permitted Animal Numbers: In the space below please describe your number of animals by herd composition or class.

167 Total Animals: 90 milking, 12 drv. and 65 calves

D. Current Permitted CAFO Designation: Circle one. See reverse side for table.

Large Federal CAFO

Medium Federal CAFO

State CAFO

E. Proposed increase in permitted animal numbers: In the space below please describe your increased animal numbers by herd composition or class.

400 Total Animals: 134 under 500 lbs, and 266 500 to 1,050 lbs.

F. New CAFO Designation based on increased animal numbers. Circle one. See reverse side for table.

Large Federal CAFO

Medium Federal CAFO

State CAFO

G. Certification:

I understand that an approved animal waste management plan is required prior to permit increase. I agree to prepare and implement an animal waste management plan in accordance with the requirements and timelines specified in the permit.

Dan Boersma
Signature (operator or owner)

12/4/05
Date

Dan Boersma
Print Name

Beverly Boersma
Signature (operator or owner)

12/4/05
Date

Beverly Boersma
Print Name

Definition of Legally Authorized Representative:

See 40 CFR 122.22 for more detail. Please also provide the information requested in brackets []

- ◆ **Corporation** — President, secretary, treasurer, vice-president, or any person who performs principal business functions; or a manager of one or more facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million that is authorized in accordance to corporate procedure to sign such documents
- ◆ **Partnership** — General partner *[list of general partners, their addresses, and telephone numbers]*
- ◆ **Sole Proprietorship** — Owner(s) *[each owner must sign the application]*
- ◆ **City, County, State, Federal, or other Public Facility** — Principal executive officer or ranking elected official
- ◆ **Limited Liability Company** — Member *[articles of organization]*
- ◆ **Trusts** — Acting trustee *[list of trustees, their addresses, and telephone numbers]*

SEND THIS FORM TO:

Oregon Department of Agriculture
 Natural Resources Division
 635 Capitol Street NE
 Salem, Oregon 97301-2532

ANIMAL INCREASE REQUEST INSTRUCTIONS**A. GENERAL INFORMATION:**

1. Enter the legal name.
2. Enter the common name of the facility or operation, if different than the legal name.
3. Enter the facility's physical address (physical location), including city, state, zip code and telephone number.

B. CIRCLE THE APPROPRIATE LIVESTOCK TYPE OF YOUR OPERATION.

- C. Self-explanatory
- D. Self-explanatory
- E. Describe your proposed animal increase by herd composition or class
- F. Self-explanatory
- G. Signature

CAFO Designation by Size Threshold (used for items D and F)

Animal sector	Large Federal CAFO	Medium Federal CAFO	State CAFO
Beef feedlot or Cow/calf pairs, heifer replacement facility	1,000 or more	300-999	Less than 300
Mature dairy cattle	700 or more	200-699	Less than 200
Swine (weighing over 55 pounds)	2,500 or more	750-2,499	Less than 750
Swine (weighing less than 55 pounds)	10,000 or more	3,000-9,999	Less than 3,000
Horses or other Equine	500 or more	150-499	Less than 150
Sheep or lambs	10,000 or more	3,000-9,999	Less than 3,000
Poultry laying hens or broilers (liquid manure handling system)	30,000 or more	9,000-29,999	Less than 9,000
Chicken other than laying hens (other than a liquid manure handling system)	125,000 or more	37,000-124,999	Less than 37,000
Laying hens (other than a liquid manure handling system)	82,000 or more	25,000-81,999	Less than 25,000

NATURAL RESOURCES
DIVISION

DEC 01 2005

RECEIVED

Oregon Department of Agriculture
ANIMAL INCREASE REQUEST
National Pollutant Discharge Elimination System
(NPDES PERMIT)

Statutory Authority

Oregon Revised Statutes (ORS) 468B.050 When permit required
ORS 468B.210 Maximum number of animals based on ability to contain, treat, hold and dispose of
wastes as necessary to comply with all conditions of the permit.

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City Dayton **Zip Code** 97114 **County** Yamhill

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1. Beef Feedlot (Fattening) 2. Beef Cattle (Cow/calf) 3. Hogs 4. Sheep and Goats
5. Dairy Farm, Heifer Replacement Farm 6. Poultry/Broiler 7. Poultry/Eggs
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Medium Federal CAFO

State CAFO

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I understand that an approved animal waste management plan is required prior to permit increase. I agree to prepare and implement an animal waste management plan in accordance with the requirements and timelines specified in the permit.

Signature (operator or owner)

Date

Print Name

Signature (operator or owner)

Date

Print Name

Definition of Legally Authorized Representative: See 40 CFR 122.22 for more detail. Please also provide the information requested in brackets [] ◆ Corporation — President, secretary, treasurer, vice-president, or any person who performs principal business functions; or a manager of one or more facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million that is authorized in accordance to corporate procedure to sign such documents ◆ Partnership — General partner <i>[list of general partners, their addresses, and telephone numbers]</i> ◆ Sole Proprietorship — Owner(s) <i>[each owner must sign the application]</i> ◆ City, County, State, Federal, or other Public Facility — Principal executive officer or ranking elected official ◆ Limited Liability Company — Member <i>[articles of organization]</i> ◆ Trusts — Acting trustee <i>[list of trustees, their addresses, and telephone numbers]</i>

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Natural Resources Division
635 Capitol Street NE
Salem, Oregon 97301-2532**

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1. Enter the legal name.
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B. CIRCLE THE APPROPRIATE LIVESTOCK TYPE OF YOUR OPERATION.

- C. Self-explanatory
D. Self-explanatory
E. Describe your proposed animal increase by herd composition or class
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Laying hens (other than a liquid manure handling system)	82,000 or more	25,000-81,999	Less than 25,000



Oregon

Theodore R. Kulongoski, Governor

Department of Agriculture

635 Capitol Street NE
Salem, OR 97301-2532

November 29, 2005



Dan Boersma
Wonderbaar Dairy
12545 SE Finn Lane
Dayton, Oregon 97114

RE: Animal Waste Management Plan (AWMP) review and request for animal increase; MA #63743

Dear Mr. Boersma:

On August 22, 2005, the department received an AWMP for your CAFO facility located at 12545 SE Finn Lane in Dayton, Oregon. You have also submitted a request to increase the number of permitted animals at your facility. We have completed our review of your AWMP and your animal increase request. Our conclusion follows.

AWMP Status: Approved

The AWMP you provided was logged into our files as #05120. The AWMP has been reviewed and is hereby approved. Please find enclosed the AWMP review memo.

Construction Status: None proposed at this time

All construction of substantial manure system structures requires department approval prior to construction. Please apply to the department for construction approval if you plan to build manure storage facilities.

Permit Status: Increase approved

A new CAFO permit has been issued for 400 animals based on a herd composition of 134 calves and heifers (100-500 lbs) and 266 calves and heifers (500-1050 lbs). With the issuance of this new CAFO permit your facility will become a Medium Federal CAFO.

The department appreciates the effort put forth to complete your AWMP. If you have any questions, please contact Sarah Harshberger, the area Livestock Water Quality Specialist, at (503) 986-4780.

Sincerely,

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

Enclosures: AWMP Review Memo
Oregon CAFO General Permit Summary

cc: Sarah Harshberger, Area LWQS
Tom Thomson, Northwest Agricultural Consulting, letter and memo

DG/sh/cd



MEMORANDUM

To: Debbie Gorham

From: Sarah Harshberger

Subject: AWMP approval and request for increase in permitted animals for Wonderbaar Dairy MA #63743

Date: November 29, 2005

Wonderbaar Dairy is owned and operated by Mr. Dan Boersma. This heifer facility is located in Dayton, Oregon, and is currently permitted for 167 animals. On August 22, 2005, Mr. Boersma submitted an AWMP for the facility. The AWMP was logged into our files as AWMP #05120.

Mr. Boersma has also completed an animal increase request form. Currently this facility is permitted for 102 milking and dry cows and 65 calves and heifers. With the approval of the requested increase, the proposed herd size will include 134 heifers and calves under 500 lbs and 266 heifers 500 to 1,050 lbs.

The AWMP was reviewed according to OAR Chapter 340 Division 51 and department policy documents.

AWMP Minimum Required Elements	Notes
1. Summary of CAFO Operation	
a) Contact name, address, phone number	Complete
b) Facility address	Complete
c) Type of operation	
(i) Number and size of animals by species, expansion?	Complete
d) Manure, litter and process waste system – provide a general narrative description of each	
(i) Collection – How is manure, litter and process waste removed from housing, confinement lots? How is clean water diverted from storage?	Complete
(ii) Storage – Types and size of manure, litter and process waste storage tanks, ponds.	Complete
(iii) Transfer – How is manure, litter and process waste moved to storage, application areas?	Complete
(iv) Use – How is manure, litter and process waste treated (composted, separated, anaerobic digestion or storage, aeration)? How is manure, litter and process waste water used on crops? If export is utilized, describe that process.	Complete

2. Specific descriptions and calculations	
a) A description of production area and land application locations	
(i) Aerial photo or topographical map showing numbered field locations, production area facilities, clean water diversions, and surface water features.	Complete
(ii) Soil maps of all application fields, including those not owned, and map unit descriptions. Indicate areas with application limitations.	Complete
b) Manure, litter and process waste volumes	
(i) Manure (feces and urine), litter and process waste output that is collected and stored in this system.	Complete
(ii) Bedding added and collected.	Complete
(iii) Process and wash water collected, include footbath use when appropriate.	Complete
(iv) Silage and feed processing leachate.	Complete
c) Contaminated storm water	
(i) Direct rainfall into storage.	Complete
(ii) Slab or lot runoff collected.	Complete
(iii) Overflow from gutters or other diversions.	Complete
d) Nutrient content of manure, litter and process waste water	
(i) Content and volume of nutrients in manure, litter and process waste generated – can come from NRCS Animal Waste Field Handbook (chapter 4)), land grant university publications, or analyses of manure, litter and process waste. Actual test values are required of large CAFOs.	Complete
e) Farm nutrient balance	
(i) Show amount of nutrients (N, P, K) generated, lost in storage, lost during application, used by crops, and/or exported off the farm on an annual basis.	Complete
(ii) Nutrient application must balance to most limiting nutrient as determined by NRCS Agronomy Technical Note #26 and the NRCS Phosphorus Index.	Complete
(iii) Include all acres required to balance nutrients owned or leased by the operator.	Complete
f) Application schedule and limitations	
(i) Show scheduled applications of solids and liquids. Include date, amount and method of application to identified fields. Describe calibration of equipment used to apply manure, litter and process waste water.	Complete

(ii) Describe limitations to manure, litter and process waste applications. Indicate buffer areas and management to avoid saturated soils. Justify buffer width and management. If application to frozen soil is planned, include field descriptions, specific management/structural practices, monitoring and record keeping.	Complete
(iii) Using agronomic rates, application limitations, and scheduled applications, calculate the minimum storage required for liquids and solids.	Complete
(iv) How is irrigation water managed relative to manure, litter and process waste water application? Include general timing and application rates of irrigation water. Irrigation water management must not allow leaching of soluble nutrients or runoff.	Complete
g) Animal mortality management	
(i) Describe how the farm handles mortalities.	Complete
h) Operation and maintenance	
(i) Include operation and maintenance narrative for structural and mechanical components included in this plan.	Complete
3. Record keeping and reporting requirements	
a) Testing – Monitoring	
(i) Include the protocol for testing manure, litter and process waste.	Complete
(ii) Include the protocol for testing and measuring crop nutrient removals.	Complete
(iii) Include the protocol for soil testing to evaluate nutrient application and crop uptake.	Complete
b) Record keeping. Include the following:	
(i) Date and amount of manure, litter and process waste applied by field. Calculate N and P applied.	Complete
(ii) Manure, litter and process waste volume exported.	Complete
c) Reporting to Oregon Department of Agriculture	
(i) Any discharge within 24 hours.	Complete
(ii) Amount of manure, litter and process waste applied annually.	Complete
(iii) Amount of manure, litter and process waste exported annually.	Complete
4. Additional requirements for Large CAFOs	
a) Inspections	
(i) Check storm water diversions, runoff diversions, waste transport, storage structures, storage structure volume weekly.	N/A
(ii) Check water lines daily.	N/A

AWMP Minimum Required Elements	Notes
(iii) Check for application equipment leaks periodically.	N/A
b) Record keeping	
(i) Results of daily inspections.	N/A
(ii) Results of weekly inspections.	N/A
(iii) Results of periodic inspections.	N/A
(iv) Corrective actions taken, explain those not corrected.	N/A
(v) Expected crop yields if not in the plan.	N/A

Recommendations

The AWMP provided by Mr. Boersma is considered complete. Based on my working knowledge of the CAFO facility and the information provided, I recommend approval of this AWMP.

In addition, I recommend that the department issue a new CAFO permit to Wonderbaar Dairy for 400 animals based on a herd composition of 134 heifers and calves under 500 lbs and 266 heifers 500 to 1,050 lbs.

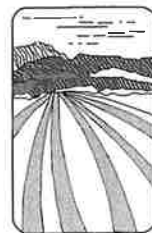


Oregon

Theodore R. Kulongoski, Governor

A/f
Department of Agriculture

635 Capitol Street NE
Salem, OR 97301-2532



August 30, 2005

Dan and Beverly Boersma
12545 SE Finn Road
Dayton, Oregon 97114

Re: Receipt of submitted materials

Dear Dan and Beverly:

On August 22, 2005, the Oregon Department of Agriculture received the Animal Waste Management Plan you provided. We expect to complete our review, and have a written response to you by October 6, 2005.

Should you have any questions, please contact the area Livestock Water Quality Specialist Sarah Harshberger, at (503) 986-4780.

Sincerely,

Cara Walker, Office Specialist
Natural Resources Division

PH: (503) 986-4700

FX: (503) 986-4730

cc: Tom Thomson, Northwest Ag Consulting



COMPREHENSIVE NUTRIENT MANAGEMENT PLAN for BOERSMA HEIFERS

12545 SE FINN ROAD
DAYTON, OR
503-868-7615

DAN & BEVERLY BOERSMA
OWNERS

Received: 8/22/2005
MA# 63743
Plan# 05120
Review By: 10/6/2005

signed

Beverly Boersma

Prepared by :
Northwest Agricultural Consulting
Tom Thomson
1275 Oak Villa Road
Dallas, OR 97338
503-623-0468

signed

Tom Thomson

8-22-05

Original: January 2001
Revised: August 2005



COMPREHENSIVE NUTRIENT MANAGEMENT PLAN for BOERSMA HEIFERS

12545 SE FINN ROAD
DAYTON, OR
503-868-7615

DAN & BEVERLY BOERSMA
OWNERS

Received: 8/22/2005
MA # 63743
Plan # 05120
Review by: 10/6/2005

signed _____

Prepared by :
Northwest Agricultural Consulting
Tom Thomson
1275 Oak Villa Road
Dallas, OR 97338
503-623-0468

signed _____

8-22-05

Original: January 2001
Revised: August 2005



BOERSMA HEIFERS - CNMP

OWNERS/OPERATORS

DAN & BEVERLY BOERSMA
12545 SE FINN ROAD
DAYTON, OR
503-868-76154

LOCATION:

Boersma Heifers is located at the above address approximately 2 miles west of the Willamette River. The dairy facilities are located in Section 19, T5S, R3W, WM in Yamhill County, Oregon. The USDA-FSA identifies the farm as Tract 1884.

Boersma Heifers originally was a milking dairy but has switched to raising replacement heifers organically. Oregon Tilth has certified the facility OR-OTCO-CO-03-01089. The facility is permitted by the ODA for 167 animals consisting of 90 milkers, 12 dry cows and 65 calves and heifers. Currently the dairy has 246 calves and heifers. The owners wish to be permitted at 400 animals. Calves arrive at the facility at about 6 months of age and 400 pounds and return to their dairy at 22 months of age and 1150 pounds. The animals are housed in freestall barns with a flush system to clean the alleys. The manure solids are separated from the manure stream and applied to neighbors fields, and the liquid portion is directed to a two-cell lagoon.

The NRCS-designed manure system for the original milking dairy was designed to provide approximately 180 days of liquid storage in a two-cell pond and 180 days of dry storage in an uncovered concrete slab. The system was planned to preclude discharge from a 25-year 24-hour precipitation event, to minimize groundwater contamination, and to provide controlled recycling of the manure back to crops grown on the farm.

The 21.3 deeded acres are divided between headquarters (3.6 acres) and irrigated pasture (17.9 acres). An additional 17.5 acres across the road is leased for hay. There are another 140.7 acres of ground available for manure application by agreement with the landowners and the custom operator who hays the ground. The animals are fed organic grass and alfalfa hay exclusively.

PURPOSE:

Boersma Heifers has had a CAFO Plan on file with the Oregon Department of Agriculture (ODA) since 2001. The main purpose of this plan revision was to update the current plan information and to provide new information, as necessary, to meet the Minimum Required Elements (MRE) of CAFO plans for the new General CAFO Permit issued by the ODA. Due to the change in operation from a milking dairy to a replacement heifer operation, the Boersma's also seek to increase their permitted animal numbers to 400 head.

OBJECTIVES:

The objectives of the Boersma's are to maintain a heifer replacement facility until such time as the farm and capital improvements have been paid off and they are ready to slow down a bit. Their goal after that time is to convert to a beef cattle operation running about 50 cow-calf pairs. The conversion would allow them more free time for family activities and the ability to leave the farm for extended periods.

PRACTICE LIST

Waste Storage Facility
Manure Transfer
Roof Runoff Structure
Nutrient Management
Waste Utilization
Irrigation Water Management
Mortality Disposal
Operations & Maintenance

Buffers and filter strips

Currently the facility has a pasture which abuts to a tributary of Palmer Creek. The animals are fenced out of the creek but the fence runs right along the edge. No vegetation other than some scattered ash trees, blackberries, and grass occurs in the riparian area. The operator has agreed to develop some sort of vegetated buffer along the length of the stream.

At the present time the specifications for the buffer/filter strip have not been determined.

Waste and Irrigation system

Irrigation System

Boersma Heifers has no water rights to groundwater or surface water from the adjacent branch of Palmer Creek. The domestic well on the property is used for domestic use, animal watering and miscellaneous cleaning.

The current irrigation system at Boersma Heifers consists of a pump near the manure lagoon and a series of handlines and hard hoses to connect the stationary big gun. Liquid manure is applied via a stationary gun with Nelson 150 big gun sprinkler with a 1.2 inch diameter nozzle and a set time of 1.5 hours. Currently, liquid manure is only applied to the pasture.

The operator estimates the application rate to be 1.5 to 2 inch/A. The operator needs to use a rain gauge placed in the field to more accurately determine the application rate.

No runoff is observed to occur during these applications. Liquid manure is only applied in the fall and is managed to avoid surface runoff or leaching and is not applied to frozen soil.

Manure System

The waste management plan was designed to have six main functions – Production, Collection, Transfer, Storage, Treatment, and Utilization of the solid and liquid components of the manure, milking parlor discharge, and surface waters that come in contact with the manure.

The calves and heifers are housed in two large freestall barns. All barns are guttered with the rainwater diverted to a system of sumps and pipes which keeps roofwater out of the lagoons. Manure from the alleys is flushed with recycled pond water at periodic intervals and flows to a reception pit at the south end of the west barn and the north end of the east barn. Manure is pumped from the south reception pit via aboveground PVC pipe to a 18 x 25 x 9 ft (15,147 gal) uncovered sloped-bottom agitated reception pit which feeds the separators. The manure is pumped to a sidehill separator which removes the larger solids and transfers the liquid fraction to the two-cell lagoon. The system extracts approximately 20% of the manure solids. The separated solids are dumped onto a 40 x 40 concrete slab with 5 foot walls on the north and east sides. Leachate from the solids slab flows to a sump which is automatically emptied to the lagoon.

The liquid from the separators is pumped to a two-cell manure pond which contain 40.8 ac-ft. The ponds are agitated in the fall and pumped onto the adjacent 17.7 acre pasture. A sample from 2005 showed the TS concentration to be 1.72%.

Approximately 140.7 acres of hay fields are available to apply liquid manure onto through verbal agreement with the landowners and the custom operator. The fields surround the facility to the south and east with additional acreage at the east end of Finn Road. Access to these fields greatly

3700

improves the ability of the dairy to balance for phosphorus. However, 73% of the liquid manure does not have a place to go. Boersma has purchased a 2000-gallon honey wagon in order to move more liquid manure from the facility to adjacent hay fields. However, as ORAWM was balanced by applying separated solids on the adjacent hayfields, in order to ensure proper agronomic rates of nutrient application, the separated solids may have to be spread elsewhere. The owner must find additional land to which to apply these liquids to.

At the tested nutrient content of the liquid manure 7.58-2.119-24.283 lb/1000 gal of N, P_2O_5 , and K_2O , respectively, 8,000 gal/A of liquid manure from the honey wagon would result in a net nutrient application of 61-17-194 lb/A of the above nutrients. Agronomic rates for N and P but a bit high for K.

Due to the capricious nature of weather in the Willamette Valley, the expected application season is anytime the ground has the capacity to hold additional moisture without runoff and agronomic rates for nutrients are not exceeded. In general, this season occurs between the months of April and October.

Limitations to Manure Applications

1. The riparian area of Palmer Creek runs along the north edge of the facility. Most all of the riparian area lacks adequate vegetation. The existing vegetation consists primarily of scattered trees with blackberry undergrowth. Relocation of the fence and some riparian buffer may be needed.
2. Written application agreements ought to be obtained from landowners where liquid or solid manure is applied.
3. No manure applications are made in areas of standing water or when soil is frozen.
4. Liquid manure applications are limited by distance from the lagoon. Aboveground pipe is costly, subject to damage, and can leak if not maintained. The recent acquisition of a honey wagon will help alleviate nutrient loading to the pasture but the number of trips needed to move liquid manure to hayfields during the critical agronomic application months may become a management burden due to time constraints.
5. No manure applications will occur between the months of November and March unless soil and weather conditions are conducive for such applications.
6. Emergency pumping is not practical for this facility due to the hydric soils and small field sizes near the creek. As such, every effort should be made to ensure that the lagoon is lowered to an acceptable level prior to the onset of winter precipitation.
7. Currently, excess moisture which leaches from the separated solids storage area moves gravitationally towards a sump at the northwest corner of the slab. The sump is emptied to the lagoon with a sump pump which is automatically activated. The berm to the north of the sump needs to be increased in height in order to prevent an overflow in case the sump pump or electricity fails.

8. The flow box between the two cells of the lagoon often gets plugged when the lagoons are full and is difficult to clean out at that time. Some redesign of the box or a screen mechanism may be appropriate in order to reduce future plugging.

Feed Management

The younger animals receive organic alfalfa hay while the older animals receive organic oat hay. The facility goes through approximately 1 ton/day of alfalfa and 2 ton/day of oat hay. No supplements or other feedstuffs are utilized at this facility.

There has been no testing of the feed by the facility however as can be seen by the calculations below, it is estimated that the P in the feed is approximately 0.22% of the DM fed. Thus the facility is feeding considerably less than the currently recommended $P < 0.37\%$ DM. The feed values were obtained from *Nutrient Requirements of Dairy Cattle 2001* published by the National Academy Press.

At this low level of P it is estimated that 4,174 lbs of P would be excreted as manure after an assumed use of 0.13% for maintenance is deducted. This agrees well with the ORAWM estimate that 4,309 lb P (9,861 lb of P_2O_5). A more exact number could be obtained by testing the feed, however as the P levels are already well below recommendations, that would seem to be a waste of time.

Boersma Feed Calculations

2005

Young animals	CP	TKN	P	K	DM	
Alfalfa Hay (1 ton/day)	19.2	3.07	0.28	2.37	90.3	%
Daily Fed		55.4	5.1	42.8		lb DM/day
Annual Fed		20,237	1,846	15,623		lb DM/year
Older animals						
Oat Hay (2 ton/day)	9.1	1.47	0.22	2.01	91.9	%
Daily Fed		54.0	8.1	73.9		lb DM/day
Annual Fed		19,724	2,952	26,969		lb DM/year
		TOTAL	39,961	4,798	42,592	lb DM/year
		less maintenance	7,992	624	5,111	lb DM/year
		less milk	0	0	0	lb DM/year
		excreted as manure	31,969	4,174	37,481	lb DM/year

P in feed recommendations = < 0.37% DM

Total Daily P fed =	13.1	lbs
Total animal Numbers =	325	animals
	0.04	lb/day/animal

Total tonnage fed =	6000	lbs
Total animal Numbers =	325	animals
	18.5	lb/day/animal

Percent P fed =	0.22	% DM
-----------------	------	------

Grazing

Currently, the animals are allowed in to the pasture on a rotational basis based on pen group. The pasture is not really managed for grazing as much as it is used for an exercise lot. Due to the small size of the facility and the number of animals, the operator has no immediate plans to institute an intensively managed grazing program.

Mortalities

All animal mortalities which occur at the dairy are removed from the facility by the operator to the animal owners dairy where they are disposed of. At times, Denley's Rendering of Sherwood, OR may be utilized. Denley's is licensed by the State of Oregon and other permitting agencies to handle this type of cargo

BOERSMA HEIFER – MANURE TESTING AND MONITORING PROTOCOLS

MANURE TESTING

The main purpose of manure testing is to obtain reasonably accurate values for the nutrients that are contained in the manure which will allow application rates to be determined for various crops. Oregon State University (OSU) has fertilizer guides available for the commonly grown crops in the state. At Boersma Heifers, manure tests are obtained from the irrigation system during application to determine the amount of nutrients applied to the crops. Tests are taken of solid manure applications also.

Liquid manure samples are obtained from the manure pond by throwing a bucket into the pond at a minimum of three sites and consolidating the material to obtain a sample for testing. Samples from the reception pit are obtained by dipping a bucket into the pit while it is being agitated. Other samples may also be obtained from the gun during irrigation. A subsample is placed in screw lid container and frozen prior to shipping unless shipment is to occur that day. At a minimum the samples will be tested for Total nitrogen (TKN), phosphorus (P), potassium (K) and moisture content (%). The test results will be kept at the office.

Solid manure and/or Compost samples will be obtained from a minimum of 10 locations around the solids pile and placed in a suitable, non-leaking and airtight enclosure such as a Ziploc type plastic bag. The samples will be placed in a freezer until shipment or shipped immediately to a laboratory for testing. At a minimum, the samples will be tested for Total nitrogen (TKN), phosphorus (P), potassium (K) and moisture content (%). The test results will be kept at the office.

Annually, after the test results have been obtained, the application sheets will be reviewed to ensure that the gross nutrient application are within suggested guidelines.

All separated solids are spread on the fields at the heifer facility. If any manure is hauled off-farm, records will be kept of customer names and addresses for all manure and/or compost sold. Additionally, the customer will be given a data sheet showing the nutrient content of the manure and appropriate agronomic rates for the crop. The level of responsibility for application at proper agronomic rates rest with the customer.

Manure Nutrient Applications:

Manure application rates are derived from the records maintained at the dairy. Dates and rates are determined for each field from the records and used to determine the application rate for each field. Application rates are determined by the dairy through the use of rain gauges placed in the field during applications. Each traveling gun sprinkler covers an area of approximately its wetted diameter (in feet) times the length of the hose pull divided by 43,560 which equal acres, although actual area is dependent upon the field shape, pump pressure, gun speed, and wind conditions at the time of application. Application volumes are determined by multiplying the number of inches of manure applied by 27,158 gal/acre-inch to get the number of gallons applied per acre. Estimates of annual manure volumes applied to each field are calculated by multiplying the number of acres in the field and the number of application to that field by the application

volume. The actual estimate of nutrients applied on a per acre basis is to be derived from the manure test values for each nutrient times the annual manure volume applied. After calculating for net application losses and denitrification losses, the percent of applied nutrients remaining are estimated at 60, 100, and 100%, for N, P, and K respectively; based upon the poorly drained soil types present on the dairy. These figures are consistent with similar estimates in ORAWM and USDA NRCS guidelines.

SOIL TESTING

The main purpose of soil testing is to determine the current nutrient status of the soil at the depth of the test. As the soil is a dynamic system highly influenced by climatic conditions, cropping, and farming operations, it is important that adequate sites be sampled in the field to represent the true condition of the soil at the time of the test and, for comparison purposes, that the sampling occur at the same time each year. The OSU Bulletins below provide guidance for soil sampling and interpretation.

OSU BULLETINS

EC 628 - Soil Sampling for Home Gardens and Small Acreages outlines approved methods for obtaining soil samples which are representative of the area being tested and proper handling and shipping procedures.

EC 1478 Soil Test Interpretation Guide outlines interpretations and needs for various crops commonly grown in the state.

EM 8677 - A List of Analytical Laboratories Serving Oregon

EM8768 - Calculating Dairy Manure Nutrient Application Rates details protocols for calibrating manure application equipment.

Soils will be tested annually in the fall of each year after harvest. Soils will be sampled on a field basis with a minimum of 20 cores taken per field to a depth of 12 inches. The sample will be homogenized and placed into a suitable container for shipping. If shipping is not to occur the day of sampling, the sample will be frozen until shipment.

At a minimum, the sample will be tested for nitrate-nitrogen ($\text{NO}_3\text{-N}$), ammonium-nitrogen ($\text{NH}_4\text{-N}$), phosphorus (P), and potassium (K). The test results will be kept at the office.

CROP NUTRIENT REMOVAL

Yield Data:

Crop yield data is to be obtained from the dairy for all crops grown. Crop yield information is to be based on scale weights from trucks as they come in from the field. If truck loading is consistent, a few random loads may be selected for weighing rather than weighing all loads. Data will be kept as to the number of loads and test weight for each field. Dry matter yields are calculated by multiplying the mean per acre yield value by the acreage and moisture percentage.

Crop Nutrient Uptake:

Crop nutrient removal rates are derived by multiplying the calculated DM yields by the appropriate nutrient concentration estimate for that crop. Nutrient removal by crops are derived from laboratory test results of the harvested crops. This method allows the nutrient mass balance to be calculated more precisely for the dairy rather than using values derived from national averages.

Nutrient Balance Estimates:

The overall nutrient balance is estimated by dividing the amount of nutrients applied by the amount of nutrients taken up by the crop. An estimate of performance is calculated as the in(de)crease in over application compared to last years status review on a pound per pound basis.

OPERATION AND MAINTANENCE

Above and/or Below Ground Liquid Tank

The underground tank serves as a collection point for scraped manure from the animal housing areas and any other drainage. At least once a year rocks and debris should be removed from the tank and the tank examined for structural damage and leakage. Any damage found shall be corrected before putting the tank back in service.

Continually maintain all pumps, agitators, piping valves and all other electrical and mechanical equipment in good operating condition by following manufacturer's recommendations. Float valves will be maintained in good working order. 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 to assure maximum volume will be maintained and checked weekly. Before entering a tank, for any reason whatever, proper ventilation shall be provided, and self-contained breathing apparatus shall be used, if required, when entering a covered tank. No one shall enter the tank unless safety ropes are used and someone else capable of providing assistance is outside of the tank. Warning: Entering unventilated tanks is extremely dangerous.

Animal Access Lanes or Walkways

Damaged components will be repaired or replaced as needed. Debris and excess manure will be removed from roadway surfaces, road ditch and drainage areas. Maintain drainage area capacities. Maintain good vegetative cover on all slopes and watercourses.

Agitator

Preventative 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 or pond 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 the equipment during operation.

Concrete Gutters

Floor gutters and grates will be inspected periodically. All foreign material restricting flow will be removed. Damage will be repaired as needed.

Curbs

Curbs, gutters and slabs that are used to convey effluent will be inspected periodically. Broken sections will be repaired or replaced. Manure or other solids will be prevented from building up next to curbs or flowing over them. If over flow is a consistent problem the curb height should be increased.

Culverts

Inspect annually or after large rainfall event. All foreign objects restricting water flow will be removed. Damaged sections will be repaired or replaced. Erosion around inlet or outlet will be corrected.

Dry Stack Storage Facility

Solid manure storage facility will be inspected annually. Broken slabs and curbs will be repaired. Repair or replace rusted or damaged areas on roof structure. Broken gutters and/or downspouts will be repaired or replaced. Check for adequacy and function of drain away from downspouts. Check side and back walls for soundness. Manure solids and leachate will not escape through cracks in the facility.

Fencing

Fences will be inspected periodically. Broken or decayed posts will be replaced. Sagging wire will be tightened. Broken wire will be spliced or replaced. Broken or missing insulators for electric fencing will be replaced. Vegetation will be controlled under the fences. Electric fencing will be sufficiently charged to detour animals.

Filter Strips

Maintain vigorous growth of vegetative covering. This includes reseeding, fertilization and application of herbicides when necessary. Periodic mowing, harvesting or grazing may also be needed to control height. Remove all foreign debris that hinders system operation. Limit the traffic from filter strip area. Limit livestock usage to vegetative growth periods when the animals will not damage vegetative root system or compact the soil. Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage.

Gutters and Downspouts

Gutters will be inspected annually to ensure all gutters are free of foreign materials. Broken gutters or downspouts will be replaced or repaired. Gutters will be connected to downspouts. Leaky gutters and downspouts will be repaired. Weeds and sediment will be removed from downspout outlets. All downspouts will be connected to outlets, which are kept free flowing. Outlets will be inspected for rodent guards and repaired or replaced as needed.

Irrigation Water Management

Irrigation water application will be at rates that minimize transport of sediment, nutrients, and chemicals to surface water and ground water. Equipment modifications and/or soil amendments should be considered to reduce erosion if needed.

Manure Application Equipment

All manure application equipment (including but not limited to sprinklers, big gun irrigators, spreaders and/or tank wagons) will be operated and maintained according to the manufacturer's manual. Equipment found to be broken or worn will be replaced. Equipment will be calibrated to ensure recommended rates are applied. Liquids will be drained from sprinklers or big guns prior to freezing weather. When system is flushed, rinse water is used following waste, and liquid and sediment is applied agronomically. Nozzles will be checked periodically and if worn, nozzles will be replaced. Minimize exposure to animal and organic wastes and manure gasses. Wear protective clothing when appropriate. When cleaning equipment after nutrient application, remove and save wastes in an appropriate manner. Avoid applying manure near surface water by establishing buffer strips and set backs, and use extreme care to avoid contaminating ground water.

Manure Effluent and Irrigation Transfer Lines.

Manure, effluent and irrigation lines shall be flushed with clean water periodically to prevent particle buildup and plugging. Manure flushed from the lines will be applied agronomically so that surface and groundwater will be protected. Manure, effluent and irrigation lines shall be inspected periodically for leaks or worn out nozzles, and repairs or replacements made as needed. Special inspection shall be done to pressure relief valves, risers and control valves. Shut off valves will be inspected annually. Avoid unnecessary travel over pipelines that will damage their integrity. Equipment found to be broken or worn will be replaced. Water will be drained during cold weather to prevent frozen or broken lines. These lines can explode if not properly maintained and may cause human injury.

Pumps

Pumps will be maintained in accordance with manufacturer's operation and maintenance manual. Pumps will be inspected periodically to identify and remove debris wrapped around impeller or worn parts. Appropriate action will be taken to repair any worn parts. Liquids will be drained from pump prior to freezing weather to prevent breakage. It is recommended to have a spare pump or back up system in case a pump must be removed for an extended time for repair.

Roofs

Roofs will be inspected annually. Rusted sections will be replaced or repaired if needed. Loose sections will be secured. All broken trusses, beams, poles, gutters and downspouts will be repaired or replaced.

Solid Manure Separator

The separator should be inspected regularly for deterioration of protective coatings and repaired as necessary. All plumbing will be inspected annually and broken lines will be replaced or repaired. Loose connections will be tightened. If applicable, electric motors, pumps and gears should be routinely maintained. Separator will be operated and maintained according to manufacturer's manual.

Trough or Tank

Watering facility will be inspected periodically. Damaged tank/trough will be repaired or replaced. Float valves will be maintained in good working order. Area immediately surrounding the trough/tank will be maintained in a stable condition. Watering facility will be inspected periodically. Damaged tank/trough will be repaired or replaced. Float valves will be maintained in good working order. Area immediately surrounding the trough/tank will be maintained in a stable condition. Watering facilities will not be allowed to overflow if additional liquid will affect waste storage capacities.

Waste Storage Pond

Prior to the storage season, empty the pond to provide storage capacity for the accumulation of wastewater and precipitation during the winter storage period. Sludge and accumulated solids will be removed from the pond periodically when buildup limits storage capacity in the pond. Depth markers are installed to assure maximum volume will be maintained and checked weekly. A 2-foot free board will be maintained to prevent spillage.

Maintain all pumps, agitators, pipeline, valves, and electrical and mechanical equipment in good operating condition following the manufacturer's recommendations. Immediately repair any vandalism, vehicular, or livestock damage to any earth fill. Immediately remove any obstructions or blockage of spillways, trash racks or pipe inlets. Settlement or cracks in earthen sections should be investigated to determine cause and immediately repaired. Maintain vigorous growth of vegetative coverings on the dikes to eliminate soil erosion. Eradicate or otherwise remove all rodents or burrowing animals and repair any damage caused by their activity. Fences and/or warning signs should be maintained as necessary to unauthorized human or livestock entry. Operate systems in a manner that minimizes odor and drift.

ANIMAL WASTE MANAGEMENT PLAN
RECORD KEEPING AND REPORTING TO OREGON DEPARTMENT OF
AGRICULTURE

RECORD KEEPING:

- a) Applications of manure, litter and process waste will be kept, including the date and the amount of N and P applied during each application.
- b) Records of exporting manure, litter and process waste will also be kept.

REPORTING TO OREGON DEPARTMENT OF AGRICULTURE (ODA):

- a) Any discharge will be reported orally to ODA within 24 hours. Within 5 days, a written statement describing this discharge will also be submitted to ODA.
- b) The amount of manure, litter and process waste applied will be reported annually.
- c) The amount of manure, litter and process waste exported will be reported annually.

**ANIMAL WASTE MANAGEMENT PLAN
MINIMUM REQUIRED ELEMENT**

AMENDMENT TO THE ANIMAL WASTE MANAGEMENT PLAN

CONFINED ANIMAL FEEDING OPERATION

CAFO OPERATOR'S NAME

STREET ADDRESS, CITY, STATE, ZIP

PHONE NUMBER

On _____, _____

INSPECTOR'S NAME

of the Oregon Department of Agriculture discussed modifications to Animal Waste Management Plan (AWMP) # _____.

The following modification were made to this AWMP:

- 1) _____

- 2) _____

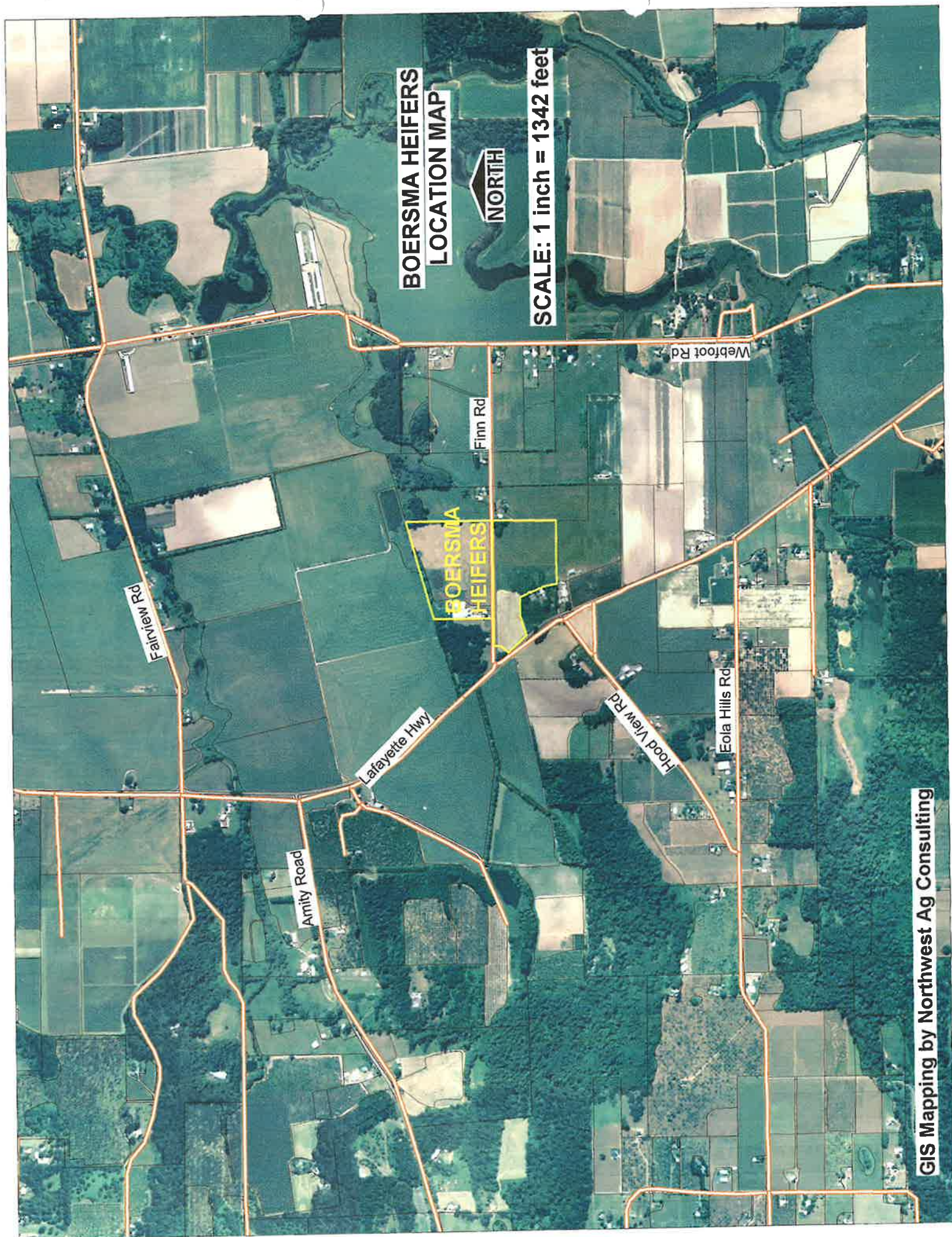
- 3) _____

CONCLUSION:

_____ The above amendments are accepted.

INSPECTOR'S SIGNATURE

OPERATOR'S SIGNATURE



BOERSMA HEIFERS WATER AND TOPO



SCALE: 1 inch = 1587 feet

Palmer Creek

Palmer Creek

Stoller W
79.09

Stoller E
21.27

Knightley
6.51

James W
9.46

James E
9.95

Gibbons
14.4

Hay
17.48

Hay
17.68

Hay
17.04

BOERSMA HEIFERS SOILS



BOERSMA HEIFERS HEADQUARTERS



SEPARATOR

SILAGE

PIT



BARN

PARLOR



SHOP



HOUSE

Headquarters
7.01

Pasture
17.68



SCALE: 1 inch = 120 feet

FINN ROAD

BOERSMA HEIFER FACILITY SOILS

Total Cropped Acres = 35.14

ID/Name	Amity (Am)	Dayton (Da)	Dayton Thick (Dc)
Texture	sil	sil	sil
Slope (%)	0-2	0-2	0-2
Found in:	Pasture, Hay	3	3
Use Class	IIw-2	IIIw-1	IIIw-1
Total Acres			
Pasture yield AUM (NonIrr, Irr)	12, 16	8, 15	8, 15
Drainage	somewhat poor	poor	poor
Irrigation	wetness	wetness, slow infiltration	wetness, slow infiltration
Texture	0-18 sil, 18-60 sicl	0-15 sil, 15-28 clay 28-60 sicl	0-15 sil, 15-28 clay 28-60 sicl
Permeability (in/hr)	0.6-2.0, 0.2- 0.6	0.2-0.63 <0.06 0.2-0.63	0.2-0.63 <0.06 0.2-0.63
Permeability	moderately slow	very slow	very slow
AWC (in/in)	0.19-0.21	0.23-0.25, 0.03-0.05, 0.23-0.25	0.23-0.25, 0.03-0.05, 0.23-0.25
AWC (in/profile)	11-13	3-6	3-6
K	0.32 0.49	0.32 0.43 0.49	0.32 0.43 0.49
T	5	3	3
Hydrologic Group	C	D	D
Flooding	none	none	none
High Water Table (ft)	1.0-1.3 Nov-May	0-2.0 Nov-May	0-2.0 Nov-May
Other		12-24 in to claypan	12-24 in to claypan

USDA-NRCS WESTERN OREGON PHOSPHORUS INDEX WORKSHEET

Farm Operator Dan Boersma Heifers Farm T1884 Date: 11-Mar-05
 Soil Map Units Amity Tract Home Pasture
 Soil Test P Results 128 ppm and depth 12" Field Yamhill
 Tested by & Date Agricheck 3/11/2005 County Yamhill
 Soil Test P Goal 60 ppm and depth 12"

Site Characteristic	None	Low	Medium	High	Very High	WEIGHT	FARM	CURRENT SCORE	FARM	FUTURE SCORE
Weight Factor	0	1	2	4	8					
TRANSPORT FACTORS										
Soil Erosion (T/A/yr)	<1	1-3	4-6	7-15	>15	1.50	0	0	0	0
Soil Erosion from Sprinkler Irrigation	No sprinkler irrigation	Application rate < infiltration rate OR no visible runoff at field borders	Application rate = infiltration rate OR little to no visible runoff at field borders	Application rate > infiltration rate OR visible runoff at field borders	Application rate > infiltration rate OR excessive runoff at field borders. Rills and gullies present	0.75	2	1.5	1	0.75
Runoff Class	Negligible	Very low OR Low	Medium	High	V.High	1.00	2	2	2	2
Flooding Frequency Class	None or very rare	Rare	Occasional	Frequent	Very Frequent	0.75	0	0	0	0
Distance to Perennial Surface Waters OR Buffer Widths Next to Surface Waters	>500 feet OR >30 ft	300-500 feet OR 20-30 ft	200-299 feet OR 10-19 feet	100-199 feet OR <10 feet	<100 feet OR No buffer	0.75	8	6	1	0.75
Subsurface Drainage	None	Tile drains present and Bray P1 < 60ppm	Tile drains present and Bray P1 = 61-140ppm	Tile drains present and Bray P1 = 141-190ppm	Tile drains present and Bray P1 > 190ppm	0.50	2	1	1	0.5
TRANSPORT FACTORS (TFS) SUB-TOTAL								10.5		4

SOURCE FACTORS										
Soil Test P (Bray P1 in ppm)						1.00		8.8		2.0
Comm P Appl Rate						1.00		0.0		0.0
Commercial P Fertilizer Application Method	None applied	Injected or banded deeper than 2 inches OR Incorporated within 5 days of application March-Sept	Incorporated within 5 days of application Oct-Feb OR Surface applied March-August	Incorporated within 5 days of application OR Surface applied Sept-Oct	Surface applied November - February					
Organic P Appl Rate	Current =	170	Goal = 80			1.00	0	0.0	0	0.0
Organic P Source Application Method	None applied	Injected deeper than 2 inches OR Incorporated within 5 days of application March-Sept	Incorporated within 5 days of application Oct-Feb OR Surface applied March-August	Incorporated within 5 days of application OR Surface applied Sept-Oct	Surface applied November - February	1.00		3.4		1.6
SOURCE FACTORS (SFS) SUB-TOTAL								2.0	2	2.0
TOTAL RATING (TFS+SFS)								14.2		5.6
SITE VULNERABILITY CLASS								24.7		9.6

Total of Weighted Rating Values
 <13.0
 13.0-25.0
 25.1-50.0
 >50.0

Site Vulnerability
 Low
 Medium
 High
 Very High

Nutrient to Manage
 N
 N
 P
 No application

SITE VULNERABILITY CLASS
 Medium
 Low

FIELD SUMMARY & P INDEX

Grower:
Application Plan by:
Date:

Boersma Heifers
Northwest Ag Consulting - Tom
March 25, 2005

TOTAL AVAILABLE ACRES: 176

Field Acres	Home	Hay	Knightley	James W	James E	Gibbons	Stoller W	Stoller E
Am, AMITY	17.7	17.5	6.5	9.5	10	14.4	79.1	21.3
Soil								
March 11, 2005		March 11, 2005						
Bray 1 P (ppm)	128	49	49	49	49	49	49	49
Acetate K (ppm)	714	228						
pH	6.1	5.8						
SMP	6.2	6.1						
TRANSPORT FACTORS								
Sheet & rill erosion (tons/ac-yr)	<1	<1	<1	<1	<1	<1	<1	<1
Irrigation erosion (tons/ac-yr)	no irrig. runoff	no irrig. runoff	no irrig. runoff	no irrig. runoff	no irrig. runoff	no irrig. runoff	no irrig. runoff	no irrig. runoff
Runoff Class	medium	medium	medium	medium	medium	medium	medium	medium
Flooding Frequency	none	none	none	none	none	none	none	none
Distance to stream (ft)	<100 ft	>500 ft	<100 ft	>500 ft	>500 ft	100-195 ft	<100 ft	<100 ft
Buffers	none	> 30 ft or NRCS spec.	> 30 ft or NRCS spec.	> 30 ft or NRCS spec.	> 30 ft or NRCS spec.	> 30 ft or NRCS spec.	> 30 ft or NRCS spec.	> 30 ft or NRCS spec.
Drainage	no tiles	no tiles	no tiles	no tiles	no tiles	no tiles	no tiles	no tiles
SOURCE FACTORS								
Commercial P2O5 rate (lbs/ac)	0	0	0	0	0	0	0	0
Commercial P2O5 method	None applied	None applied	None applied	None applied	None applied	None applied	None applied	None applied
Commercial P2O5 timing	None applied	None applied	None applied	None applied	None applied	None applied	None applied	None applied
Organic P2O5 rate (lbs/ac)	170	25	25	25	25	25	25	0
Organic P2O5 method	Not incorp. in 5 days	Not incorp. in 5 days	Not incorp. in 5 days	Not incorp. in 5 days	Not incorp. in 5 days	Not incorp. in 5 days	Not incorp. in 5 days	Not incorp. in 5 days
Organic P2O5 timing	No app. Nov. thru Jan.	No app. Nov. thru Jan.	No app. Nov. thru Jan.	No app. Nov. thru Jan.	No app. Nov. thru Jan.	No app. Nov. thru Jan.	No app. Nov. thru Jan.	None applied
SCORE	25.0	8.2	8.2	8.7	8.2	8.2	8.2	3.7
P RUNOFF RISK RATING	Medium	Low	Low	Low	Low	Low	Low	Low

Total of
Weighted
Rating
Values

Site
Vulnerabil
ity

Nutrient
to
Manage

N
N
P

<13.0
Low
Medium
High
Very High

13.0-25.0
25.1-50.0
>50.0

No application

COMMENTS

BOERSMA HEIFERS**2005****SOLID MANURE APPLICATION RATES**

One ton of solid manure spread evenly over 1 acre would be:
 $(2000 \text{ lb/A})(43560 \text{ ft}^2/\text{A})(36 \text{ lb/ft}^3)(12 \text{ in/ft}) = 0.0153 \text{ inch thick}$
 and, based on test results, provide:

TEST RESULTS =

N	P	K
7.581	1.144	8.104

 lb/ton

Rate (lbs)	Thickness	Lb N/acre	Lb P/acre	Lb K/acre
2000	0.0153	8	1	8
4000	0.031	15	2	16
6000	0.046	23	3	24
8000	0.061	30	5	32
10000	0.077	38	6	41
12000	0.092	45	7	49
14000	0.107	53	8	57
16000	0.122	61	9	65
18000	0.138	68	10	73
20000	0.153	76	11	81
22000	0.168	83	13	89
24000	0.184	91	14	97
26000	0.199	99	15	105
28000	0.214	106	16	113
30000	0.230	114	17	122
32000	0.245	121	18	130
34000	0.260	129	19	138
36000	0.275	136	21	146
38000	0.291	144	22	154
40000	0.306	152	23	162
42000	0.321	159	24	170
44000	0.337	167	25	178
46000	0.352	174	26	186
48000	0.367	182	27	194
50000	0.383	190	29	203
52000	0.398	197	30	211
54000	0.413	205	31	219
56000	0.429	212	32	227
58000	0.444	220	33	235
60000	0.459	227	34	243
62000	0.474	235	35	251
64000	0.490	243	37	259
66000	0.505	250	38	267
68000	0.520	258	39	276
70000	0.536	265	40	284
72000	0.551	273	41	292
74000	0.566	280	42	300
76000	0.582	288	43	308
78000	0.597	296	45	316
80000	0.612	303	46	324

LIQUID MANURE APPLICATION RATES

1000 gallons of liquid manure spread evenly over 1 acre would be:
 $(1000 \text{ gal/A})(43560 \text{ ft}^2/\text{A})(0.1337 \text{ ft}^3/\text{gal})(12 \text{ in}/\text{ft}) = 0.0368 \text{ inch thick}$
 and, based on test results, provide:

TEST RESULTS =

N	P	K
7.58	0.926	20.155

 lb/ton

Rate (gal)	Thickness	Lb N/acre	Lb P/acre	Lb K/acre
1000	0.0368	8	1	20
2000	0.0737	15	2	40
3000	0.1105	23	3	60
4000	0.1473	30	4	81
5000	0.1842	38	5	101
6000	0.2210	45	6	121
7000	0.2578	53	6	141
8000	0.2947	61	7	161
9000	0.3315	68	8	181
10000	0.3683	76	9	202
11000	0.4052	83	10	222
12000	0.4420	91	11	242
13000	0.4788	99	12	262
14000	0.5156	106	13	282
15000	0.5525	114	14	302
16000	0.5893	121	15	322
17000	0.6261	129	16	343
18000	0.6630	136	17	363
19000	0.6998	144	18	383
20000	0.7366	152	19	403
21000	0.7735	159	19	423
22000	0.8103	167	20	443
23000	0.8471	174	21	464
24000	0.8840	182	22	484
25000	0.9208	190	23	504
26000	0.9576	197	24	524
27154	1.0001	206	25	547
28000	1.0313	212	26	564
29000	1.0681	220	27	584
30000	1.1050	227	28	605
31000	1.1418	235	29	625
32000	1.1786	243	30	645
33000	1.2155	250	31	665
34000	1.2523	258	31	685
35000	1.2891	265	32	705
36000	1.3260	273	33	726
37000	1.3628	280	34	746
38000	1.3996	288	35	766
39000	1.4364	296	36	786
40000	1.4733	303	37	806

CHECKED BY:

ANIMAL INVENTORY

GRAZING PERIOD

Boersma ORAWM Permitted.xls

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

WEATHER STATION		MC MINNVILLE		▼
Month	25Yr-24Hr Monthly Average In Inches	Lot Runoff Factors as a Percent of Monthly Precipitation		
	Precipitation	Evaporation	Paved	Unpaved
October	3.19	1.65	50%	17%
November	6.36	0.73	55%	22%
December	7.53	0.42	55%	20%
January	6.56	0.46	55%	22%
February	5.29	0.78	45%	20%
March	4.70	1.52	44%	15%
April	2.52	2.31	40%	12%
May	1.81	3.61	36%	10%
June	1.16	4.18	30%	10%
July	0.41	5.22	30%	0%
August	0.56	4.76	35%	10%
September	1.53	3.25	45%	15%
Annual	41.62	28.89		

AREAS CONTRIBUTING RUNOFF TO LIQUID STORAGE FACILITY

Description of Runoff Area		Area in SF
Paved Lot Area	Is paved lot scraped daily? (Y/N)	1,500
Unpaved Lot Area		500
Roof Area		0
Surface Area of Sludge Storage Facility	Does Sludge Seepage Drain to Storage Facility? (Y/N)	500
Total Runoff Area Contributing to Liquid Storage Facility		2,500

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	0.0	0	0.00	0	0.0
Equipment Wash		0	0.00	0	0.0
Flushwater		0	0.00	0	0.0
Miscellaneous		0	0.00	0	0.0
Total				0	0.0

CROP DATA

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
Pasture	17.7	Grass/Legume Hay/Pasture	DHM	Ton	5.00	170
Hay	17.5	Grass/Legume Hay/Pasture	DHM	Ton	1.25	42
Knightley	6.5	Grass/Legume Hay/Pasture	DHM	Ton	1.25	42
James W	9.5	Grass/Legume Hay/Pasture	DHM	Ton	2.11	72
James E	7.0	Grass/Legume Hay/Pasture	DHM	Ton	2.00	68
Gibbons	14.4	Grass/Legume Hay/Pasture	DHM	Ton	1.57	53
Stoller W	79.1	Grass/Legume Hay/Pasture	DHM	Ton	2.00	68
Stoller E	21.3	Grass/Legume Hay/Pasture	DHM	Ton	2.00	68
Off Farm						

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

[illegible]

SOLIDS SEPARATION FACTOR

SOLIDS SEPARATION FACTOR									
Type of Animal	Type of Separator	Separation Factor %	Volume of Solids Separated CF/Day	Volume of Solids in Liquids CF/Day	Volume of Manure in Liquids CF/Day	Volume of Manure in Solids CF/Day	Accumulated Sludge in Storage CF/Day	Density of Separated Solids Lbs CF	Weight of Separated Solids Lbs Day
MILKER	Static Inclined Screen(Side Hill Separator)	▼ 20%	15	59	200	5	109	36	535
MILKER (DRY)	Static Inclined Screen(Side Hill Separator)	▼ 20%	2	9	23	1	7	36	78
HEIFERS (12-24 Months)	Static Inclined Screen(Side Hill Separator)	▼ 20%	4	18	53	1	14	36	159
CALVES (1-12 Months)	Static Inclined Screen(Side Hill Separator)	▼ 20%	0	2	5	0	1	36	15
		▼							
		▼							
		▼							
		▼							
		▼							
		▼							
		▼							
Total Solids			22	87	281	7	131		786

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

CLIENT: **BOERSMA HEIFERS - Old Milking Permitted (Balanced for P)**
 ASSISTED BY: **Northwest Ag Consulting - Tom Thomson**
 CHECKED BY:

MONTHLY VOLUMES															
	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 0	Paved Slab Area Square Feet 1,500	Unpaved Lot Area Square Feet 500	Slage Pit Surface Area, SF 500		Solids Cubic Feet	Liquids Cubic Feet	Cubic Feet	Pounds	Cubic Feet	Pounds	Cubic Feet	Pounds		
Month	0	1,500	500												
October	0	199	23	311	0	1,076	7,854	2,308	16,154	677	24,366	2,707	97,464	677	11,956
November	0	437	58	333	0	1,042	7,600	2,233	15,633	655	23,580	2,620	94,320	655	12,163
December	0	518	63	352	0	1,076	7,854	2,308	16,154	677	24,366	2,707	97,464	677	12,354
January	0	451	60	349	0	1,076	7,854	2,308	16,154	677	24,366	2,707	97,464	677	12,282
February	0	298	44	305	0	972	7,094	2,084	14,591	611	22,008	2,445	88,032	611	11,807
March	0	259	29	318	0	1,076	7,854	2,308	16,154	677	24,366	2,707	97,464	677	12,028
April	0	126	13	287	0	1,042	7,600	2,233	15,633	655	23,580	2,620	94,320	655	11,761
May	0	81	8	8	0	1,076	7,854	2,308	16,154	677	24,366	2,707	97,464	677	11,519
June	0	44	5	5	0	1,042	7,600	2,233	15,633	655	23,580	2,620	94,320	655	11,388
July	0	15	0	0	0	1,076	7,854	2,308	16,154	677	24,366	2,707	97,464	677	11,438
August	0	25	2	2	0	1,076	7,854	2,308	16,154	677	24,366	2,707	97,464	677	11,451
September	0	86	10	284	0	1,042	7,600	2,233	15,633	655	23,580	2,620	94,320	655	11,715
Annual	0	2,538	314	2,554	0	12,674	92,470	27,472	190,202	7,969	286,891	31,877	1,147,563	7,969	141,861

[illegible]

CLIENT: **BOERSMA HEIFERS - Old Milking Permitted (Balanced for P)**
ASSISTED BY: Northwest Ag Consulting - Tom Thomson
CHECKED BY:

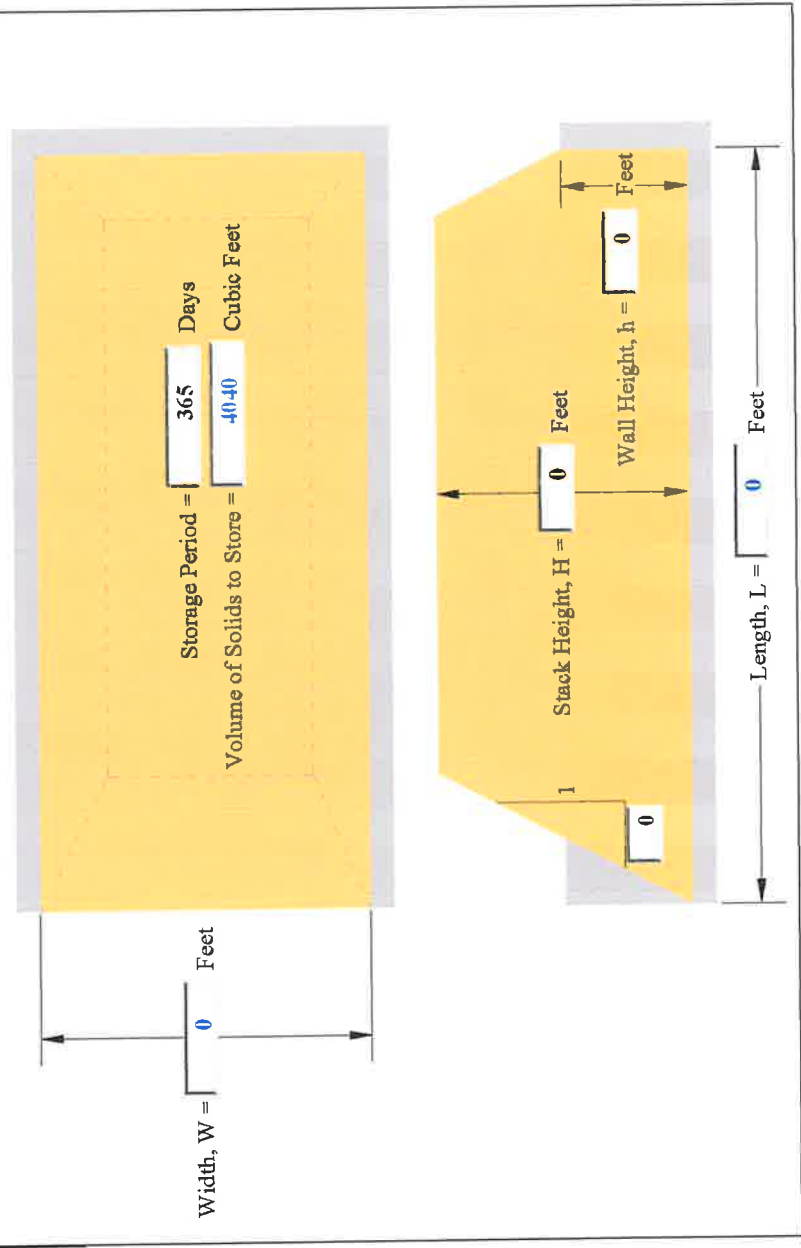
ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

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	2,409	848	1,701	602	212	425	0	0	0	0	0	0	3,011	1,060	2,127
November	2,331	821	1,647	583	205	412	0	0	0	0	0	0	2,914	1,026	2,058
December	2,409	848	1,701	602	212	425	0	0	0	0	0	0	3,011	1,060	2,127
January	2,409	848	1,701	602	212	425	0	0	0	0	0	0	3,011	1,060	2,127
February	2,176	766	1,537	544	191	384	0	0	0	0	0	0	2,720	957	1,921
March	2,409	848	1,701	602	212	425	0	0	0	0	0	0	3,011	1,060	2,127
April	2,331	821	1,647	583	205	412	0	0	0	0	0	0	2,914	1,026	2,058
May	2,409	848	1,701	602	212	425	0	0	0	0	0	0	3,011	1,060	2,127
June	2,331	821	1,647	583	205	412	0	0	0	0	0	0	2,914	1,026	2,058
July	2,409	848	1,701	602	212	425	0	0	0	0	0	0	3,011	1,060	2,127
August	2,409	848	1,701	602	212	425	0	0	0	0	0	0	3,011	1,060	2,127
September	2,331	821	1,647	583	205	412	0	0	0	0	0	0	2,914	1,026	2,058
Annual	28,364	9,983	20,033	7,091	2,496	5,008	0	0	0	0	0	0	35,455	12,479	25,042

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

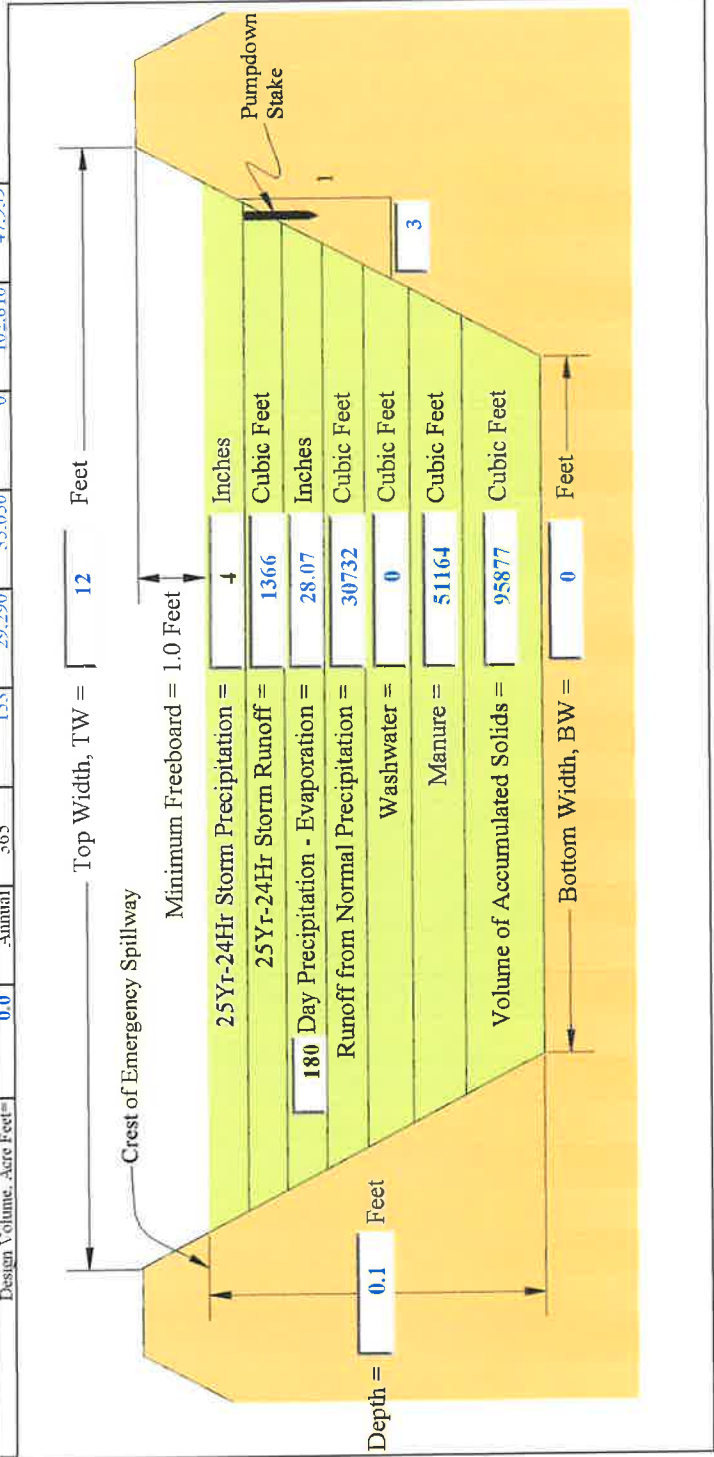
SOLIDS STACKING FACILITY		MONTHLY SOLIDS VOLUME STACKED IN FACILITY						
Solids Storage Facility Parameters	Value	Month	Number of Days	Manure CF	Bedding CF	Solids to Store CF	Normal Runoff CF	
Storage Period, Days=	365	October	31	215	462	338	2,242	
Stacking Width, W in Feet=	0	November	30	208	447	328	5,597	
Stacking Height, H in Feet=	0.00	December	31	215	462	338	6,225	
Wall Height, h in Feet=	0.00	January	31	215	462	338	5,965	
Stack Side Slope (X:1)=	0.00	February	28	194	417	306	3,950	
Existing Storage, Cubic Feet=	8,000	March	31	215	462	338	2,914	
Surface Area of Existing Storage, SF=	1,600	April	30	208	447	328	1,210	
25 Year-24 Hour Storm Runoff, CF=	533	May	31	215	462	338	748	
Volume Needed, Cubic Feet=	4,040	June	30	208	447	328	464	
Design Volume, Cubic Feet=	0	July	31	215	462	338	0	
Is Facility Covered?	NO	August	31	215	462	338	231	
		September	30	208	447	328	918	
		Annual	365	2,535	5,434	3,985	30,463	



CLIENT: BOERSMA HEIFERS - Old Milking Permitted (Balanced for P)
ASSISTED BY: Northwest Ag Consulting - Tom Thomson
CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

MONTHLY INFLOWS INTO WASTE STORAGE POND									
Pond Parameters	Value	Month	Number of Days	Rain-Evap on Pond CF	Rain-Evap on Existing Storage, CF	Normal Runoff CF	Washwater CF	Manure CF	Accum Solids CF
Storage Period, Days=	180	October	31	18	3,543	2,596	0	8,715	4,072
Side Slope (X:1)=	3.00	November	30	68	12,954	6,357	0	8,434	3,940
Bottom Width, BW, Feet=	0	December	31	85	16,359	7,119	0	8,715	4,072
Bottom Length, BL, Feet=	0	January	31	73	14,035	6,750	0	8,715	4,072
Accumulated Solids Duration, Years=	2	February	28	54	10,377	4,512	0	7,871	3,678
Existing Storage, Acre Feet=	8.24	March	31	38	7,317	3,398	0	8,715	4,072
Surface Area of Existing Storage, SF=	27,610	April	30	3	483	1,453	0	8,434	3,940
Minimum Soil Liner Depth, Feet=	1.00	May	31	-22	-4,142	913	0	8,715	4,072
25 Year-24 Hour Storm Runoff, CF=	1,366	June	30	-36	-6,949	561	0	8,434	3,940
Top Width, TW, Feet=	12	July	31	-58	-11,067	32	0	8,715	4,072
Top Length, TL, Feet=	12	August	31	-50	-9,664	282	0	8,715	4,072
Volume Needed, Acre Feet=	6.0	September	30	-21	-3,957	1,077	0	8,434	3,940
Design Volume, Acre Feet=	0.0	Annual	365	153	29,290	35,050	0	102,610	47,939



ANIMAL WASTE MANAGEMENT WORKSHEET

Version 2.0

U.S. Department of Agriculture
Natural Resources Conservation Service

CLIENT: **BOERSMA HEIFERS - Old Milking Permitted (Balanced for P)**
ASSISTED BY: Northwest Ag Consulting - Tom Thomson
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ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TRACTOR SPREADER APPLICATION OF SOLIDS

MANAGEMENT CRITERIA FOR TRACTOR SPREADER											PHOSPHOROUS, P2O5	
To apply 7,969 cubic feet of solids generated from the operation it will take approximately 40 trips annually. Based on applying												
At agronomic rate use the application depths, travel lengths, and loads per acre listed below for each crop.												
Field Number	Acre	Crop	Tractor Spreader Capacity		Spread Width Feet	PHOSPHOROUS, P2O5 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/1000F					
Pasture	17.7	Grass/Legume Hay/Pasture	160	199	10	3,790	23.65	63	1.00	0.1	3254	1
Hay	17.5	Grass/Legume Hay/Pasture	160	199	10	3,790	23.65	16	1.00	0.0	13016	0
Knightley	6.5	Grass/Legume Hay/Pasture	160	199	10	3,790	23.65	16	1.00	0.0	13016	0
James W	9.5	Grass/Legume Hay/Pasture	160	199	10	3,790	23.65	27	1.00	0.0	7711	1
James E	7	Grass/Legume Hay/Pasture	160	199	10	3,790	23.65	25	1.00	0.0	8135	1
Gibbons	14.4	Grass/Legume Hay/Pasture	160	199	10	3,790	23.65	20	1.00	0.0	10363	0
Stoller W	79.1	Grass/Legume Hay/Pasture	160	199	10	3,790	23.65	25	1.00	0.0	8135	1
Stoller E	21.3	Grass/Legume Hay/Pasture	160	199	10	3,790	23.65	25	1.00	0.0	8135	1
0												

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER AT LEONARD, P205														
59 hours of pumping annually. Based on applying														
To apply 1,061,120 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	Acre	Crop	Sprinkler Flowrate GPM	Wetted Diameter Feet	Portion of Wetted Diameter Receiving Liquids	PHOSPHOROUS, P2O5 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							
Pasture	17.7	Grass/Legume Hay/Pasture	300	250	1/2 Circle	▼	254	2.12	63	1.00	1.10	1.45	1.86	1.76
Hay	17.5	Grass/Legume Hay/Pasture	300	250	1/2 Circle	▼	254	2.12	16	1.00	0.27	1.45	0.46	7.03
Knightley	6.5	Grass/Legume Hay/Pasture	300	250	1/2 Circle	▼	254	2.12	16	1.00	0.27	1.45	0.46	7.03
James W	9.5	Grass/Legume Hay/Pasture	300	250	1/2 Circle	▼	254	2.12	27	1.00	0.46	1.45	0.78	4.17
James E	7	Grass/Legume Hay/Pasture	300	250	1/2 Circle	▼	254	2.12	25	1.00	0.44	1.45	0.74	4.40
Gibbons	14.4	Grass/Legume Hay/Pasture	300	250	1/2 Circle	▼	254	2.12	20	1.00	0.34	1.45	0.58	5.60
Stoller W	79.1	Grass/Legume Hay/Pasture	300	250	1/2 Circle	▼	254	2.12	25	1.00	0.44	1.45	0.74	4.40
Stoller E	21.3	Grass/Legume Hay/Pasture	300	250	1/2 Circle	▼	254	2.12	25	1.00	0.44	1.45	0.74	4.40
0						▼								

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 2.0

U.S. Department of Agriculture
Natural Resources Conservation Service

CLIENT: **BOERSMA HEIFERS - Old Milking Permitted (Balanced for P)**
ASSISTED BY: Northwest Ag Consulting - Tom Thomson
CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

To apply		1,061,120 gallons of liquids generated from the operation it will take approximately		265 trips annually: Based on applying		PHOSPHOROUS, P2O5	
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	PHOSPHOROUS, P2O5 Concentration in Storage Facility		Loads per Acre
					PPM	Lbs/1000Gal	
Pasture	17.7	Grass/Legume Hay/Pasture	4,000	15	254	2.12	7.4
Hay	17.5	Grass/Legume Hay/Pasture	4,000	15	254	2.12	1.9
Knightley	6.5	Grass/Legume Hay/Pasture	4,000	15	254	2.12	1.9
James W	9.5	Grass/Legume Hay/Pasture	4,000	15	254	2.12	3.1
James E	7	Grass/Legume Hay/Pasture	4,000	15	254	2.12	3.0
Gibbons	14.4	Grass/Legume Hay/Pasture	4,000	15	254	2.12	2.3
Stoller W	79.1	Grass/Legume Hay/Pasture	4,000	15	254	2.12	3.0
Stoller E	21.3	Grass/Legume Hay/Pasture	4,000	15	254	2.12	3.0
0							

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 2.0

U.S. Department of Agriculture
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CLIENT: BOERSMA HEIFERS - Old Milking Permitted (Balanced for P)
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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
Dairy	Type of Storage Facility	28,364	9,983	20,033	49%	90%	90%	13,986	8,985	18,030
Liquids	Storage Pond (<50%) Dilution	7,091	2,496	5,008	65%	80%	80%	4,609	1,997	4,007
Solids	Solids Storage Facility (Unroofed)	0	0	0	100%	100%	100%	0	0	0
Grazing	NONE									

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	13,986	8,985	18,030	75%	100%	100%	10,490	8,985	18,030
Solids	Broadcast (Incorporated 7 or more days after application)	4,609	1,997	4,007	70%	100%	100%	3,226	1,997	4,007
Grazing	Grazing	0	0	0	90%	100%	100%	0	0	0

NUTRIENTS AVAILABLE AFTER DENITRIFICATION

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	Between Coastal and Cascade Mountains	10,490	8,985	18,030	83%	100%	100%	8,706	8,985	18,030
Solids	Soil Drainage Class	3,226	1,997	4,007	83%	100%	100%	2,678	1,997	4,007
Grazing	Somewhat Poorly Drained	0	0	0	83%	100%	100%	0	0	0

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

PERCENT OF MANURE TO BE APPLIED TO FIELD AND UTILIZATION ACRES NEEDED BASED ON										▼
PHOSPHOROUS, P2O5										
Field Number	Acres	Crop	LIQUIDS			SOLIDS			GRAZING	
			Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied
Pasture	17.7	Grass/Legume Hay/Pasture	13%	1,123	18	0%	0	0	0%	0
Hay	17.5	Grass/Legume Hay/Pasture	3%	270	17	0%	0	0	0%	0
Knighthley	6.5	Grass/Legume Hay/Pasture	1%	112	7	0%	0	0	0%	0
James W	9.5	Grass/Legume Hay/Pasture	3%	270	10	0%	0	0	0%	0
James E	7.0	Grass/Legume Hay/Pasture	2%	180	7	0%	0	0	0%	0
Gibbons	14.4	Grass/Legume Hay/Pasture	0%	0	0	15%	299	15	0%	0
Stoller W	79.1	Grass/Legume Hay/Pasture	0%	0	0	85%	1,697	67	0%	0
Stoller E	21.3	Grass/Legume Hay/Pasture	0%	0	0	0%	0	0	0%	0
0										
Off-Farm			78%	7,030	59	100%	1,997	82	100%	0
TOTALS-			100%	8,985						

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
Pasture	17.7	Grass/Legume Hay/Pasture	61	63	127	170	63	207	-108	0	-80
Hay	17.5	Grass/Legume Hay/Pasture	15	15	31	42	16	52	-27	0	-21
Knighthley	6.5	Grass/Legume Hay/Pasture	17	17	35	42	16	52	-26	2	-17
James W	9.5	Grass/Legume Hay/Pasture	27	28	57	72	27	87	-44	2	-31
James E	7.0	Grass/Legume Hay/Pasture	25	26	52	68	25	83	-43	0	-31
Gibbons	14.4	Grass/Legume Hay/Pasture	28	21	42	53	20	65	-25	1	-23
Stoller W	79.1	Grass/Legume Hay/Pasture	29	21	43	68	25	83	-39	-4	-40
Stoller E	21.3	Grass/Legume Hay/Pasture	0	0	0	68	25	83	-68	-25	-83
0											
Off-Farm											

CLIENT:	BOERSMA HEIFERS - 400 Animals (Balanced for P)	
ASSISTED BY:	Northwest Ag Consulting - Tom Thomson	CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

ANIMAL INVENTORY												
Type of Animal	Number of Animals	Average Weight (lbs.)	Animal Units (1,000 lb.)	Nutrient Production						Manure CF/D/AU	Annual	
				(lbs./day/1000 lb. Animal Unit)			(lbs./day)				Days Confined	Days Grazed
				N	P	K	N	P	K			
CALVES (1-12 Months)	67	350	23.5	0.31	0.04	0.24	7.27	0.94	5.63	1.30	365	0
CALVES (1-12 Months)	67	500	33.5	0.31	0.04	0.24	10.39	1.34	8.04	1.30	365	0
CALVES (1-12 Months)	67	700	46.9	0.31	0.04	0.24	14.54	1.88	11.26	1.30	365	0
HEIFERS (12-24 Months)	67	850	57.0	0.31	0.04	0.24	17.65	2.28	13.67	1.30	365	0
HEIFERS (12-24 Months)	67	950	63.7	0.31	0.04	0.24	19.73	2.55	15.28	1.30	365	0
HEIFERS (12-24 Months)	67	1,050	70.4	0.31	0.04	0.24	21.81	2.81	16.88	1.30	365	0
Totals/Averages	402	733	294.8	0.31	0.04	0.24	91.4	11.8	70.8	1.3		

GRAZING PERIOD

[illegible]

CLIENT: **BOERSMA HEIFERS - 400 Animals (Balanced for P)**
ASSISTED BY: **Northwest Ag Consulting - Tom Thomson**

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

WEATHER STATION		MC MINNVILLE		
Month	25Yr-24Hr	Lot Runoff Factors as a Percent of Monthly Precipitation		
	Monthly Average in Inches	Paved	Unpaved	
	Precipitation	Evaporation		
October	3.19	1.65	50%	17%
November	6.36	0.73	55%	22%
December	7.53	0.42	55%	20%
January	6.56	0.46	55%	22%
February	5.29	0.78	45%	20%
March	4.70	1.52	44%	15%
April	2.52	2.31	40%	12%
May	1.81	3.61	36%	10%
June	1.16	4.18	30%	10%
July	0.41	5.22	30%	0%
August	0.56	4.76	35%	10%
September	1.53	3.25	45%	15%
Annual	41.62	28.89		

AREAS CONTRIBUTING RUNOFF TO LIQUID STORAGE FACILITY		
	Description of Runoff Area	Area in SF
Paved Lot Area	Is paved lot scraped daily? (Y/N) NO	1,500
Unpaved Lot Area		500
Roof Area		0
Surface Area of Slage Storage Facility		500
Does Silage Seepage Drain to Storage Facility? (Y/N) YES		
Total Runoff Area Contributing to Liquid Storage Facility		2,500

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	0.0	0	0.00	0	0.0
Equipment Wash		0	0.00	0	0.0
Flushwater		0	0.00	0	0.0
Miscellaneous		0	0.00	0	0.0
Total				0	0.0

CROP DATA

Field Number	Acres	Crop	Condition	Yield Units	Target Yield	Nutrients Removed in Pounds per Acre		
				Ton		Nitrogen N	Phosphorous P ₂ O ₅	Potassium K ₂ O
Pasture	17.7	Grass/Legume Hay/Pasture	DHM		5.00	170	63	207
Hay	17.5	Grass/Legume Hay/Pasture	DHM		1.25	42	16	52
Knightley	6.5	Grass/Legume Hay/Pasture	DHM		1.25	42	16	52
James W	9.5	Grass/Legume Hay/Pasture	DHM		2.11	72	27	87
James E	7.0	Grass/Legume Hay/Pasture	DHM		2.00	68	25	83
Gibbons	14.4	Grass/Legume Hay/Pasture	DHM		1.57	53	20	65
Stoller W	79.1	Grass/Legume Hay/Pasture	DHM		2.00	68	25	83
Stoller E	21.3	Grass/Legume Hay/Pasture	DHM		2.00	68	25	83
Off-Farm								

CHECKED BY:

CLIENT: **BOERSMA HEIFERS - 400 Animals (Balanced for P)**
ASSISTED BY: Northwest Ag Consulting - Tom Thomson

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY VOLUMES

Month	Runoff in Cubic Feet				Facility Water Use Cubic Feet	Manure		Bedding		Solids Separated		Solids in Liquids		Total Solids	
	Roof Area Square Feet	Paved Slab Area Square Feet	Unpaved Lot Area Square Feet	Surface Area, SF		Solids Cubic Feet	Liquids Cubic Feet	Cubic Feet	Pounds	Cubic Feet	Pounds	Cubic Feet	Pounds	Cubic Feet	Total Liquids Cubic Feet
October	0	199	23	464	0	1,271	10,609	3,525	24,675	959	34,532	3,837	138,130	959	16,149
November	0	437	58	478	0	1,230	10,267	3,411	23,879	928	33,418	3,713	133,674	928	16,313
December	0	518	63	504	0	1,271	10,609	3,525	24,675	959	34,532	3,837	138,130	959	16,547
January	0	451	60	501	0	1,271	10,609	3,525	24,675	959	34,532	3,837	138,130	959	16,476
February	0	298	44	442	0	1,148	9,583	3,184	22,287	866	31,191	3,466	124,762	866	15,876
March	0	259	29	471	0	1,271	10,609	3,525	24,675	959	34,532	3,837	138,130	959	16,222
April	0	126	13	432	0	1,230	10,267	3,411	23,879	928	33,418	3,713	133,674	928	15,910
May	0	81	8	8	0	1,271	10,609	3,525	24,675	959	34,532	3,837	138,130	959	15,560
June	0	44	5	5	0	1,230	10,267	3,411	23,879	928	33,418	3,713	133,674	928	15,393
July	0	15	0	0	0	1,271	10,609	3,525	24,675	959	34,532	3,837	138,130	959	15,479
August	0	25	2	2	0	1,271	10,609	3,525	24,675	959	34,532	3,837	138,130	959	15,492
September	0	86	10	429	0	1,230	10,267	3,411	23,879	928	33,418	3,713	133,674	928	15,864
Annual	0	2,538	314	3,736	0	14,967	124,915	41,504	290,525	11,294	406,592	45,177	1,626,367	11,294	191,279

DAILY NUTRIENT PRODUCTION

Type of Animal	Pounds/Day of Nutrients from LIQUIDS				Pounds/Day of Nutrients from SOLIDS				Pounds/Day of Nutrients from GRAZING			
	N	P ₂ O ₅	K ₂ O		N	P ₂ O ₅	K ₂ O		N	P ₂ O ₅	K ₂ O	
CALVES (1-12 Months)	5.82	1.72	5.43		1.45	0.43	1.36		7.27	2.15	6.78	
CALVES (1-12 Months)	8.31	2.46	7.75		2.08	0.61	1.94		10.39	3.07	9.69	
CALVES (1-12 Months)	11.63	3.44	10.85		2.91	0.86	2.71		14.54	4.30	13.56	
HEIFERS (12-24 Months)	14.12	4.18	13.18		3.53	1.04	3.29		17.65	5.22	16.47	
HEIFERS (12-24 Months)	15.79	4.67	14.73		3.95	1.17	3.68		19.73	5.83	18.41	
HEIFERS (12-24 Months)	17.45	5.16	16.28		4.36	1.29	4.07		21.81	6.45	20.35	
	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	
	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	
	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	
	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	

CLIENT: BOERSMA HEIFERS - 400 Animals (Balanced for P)

ASSISTED BY: Northwest Ag Consulting - Tom Thomson

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY NUTRIENT PRODUCTION

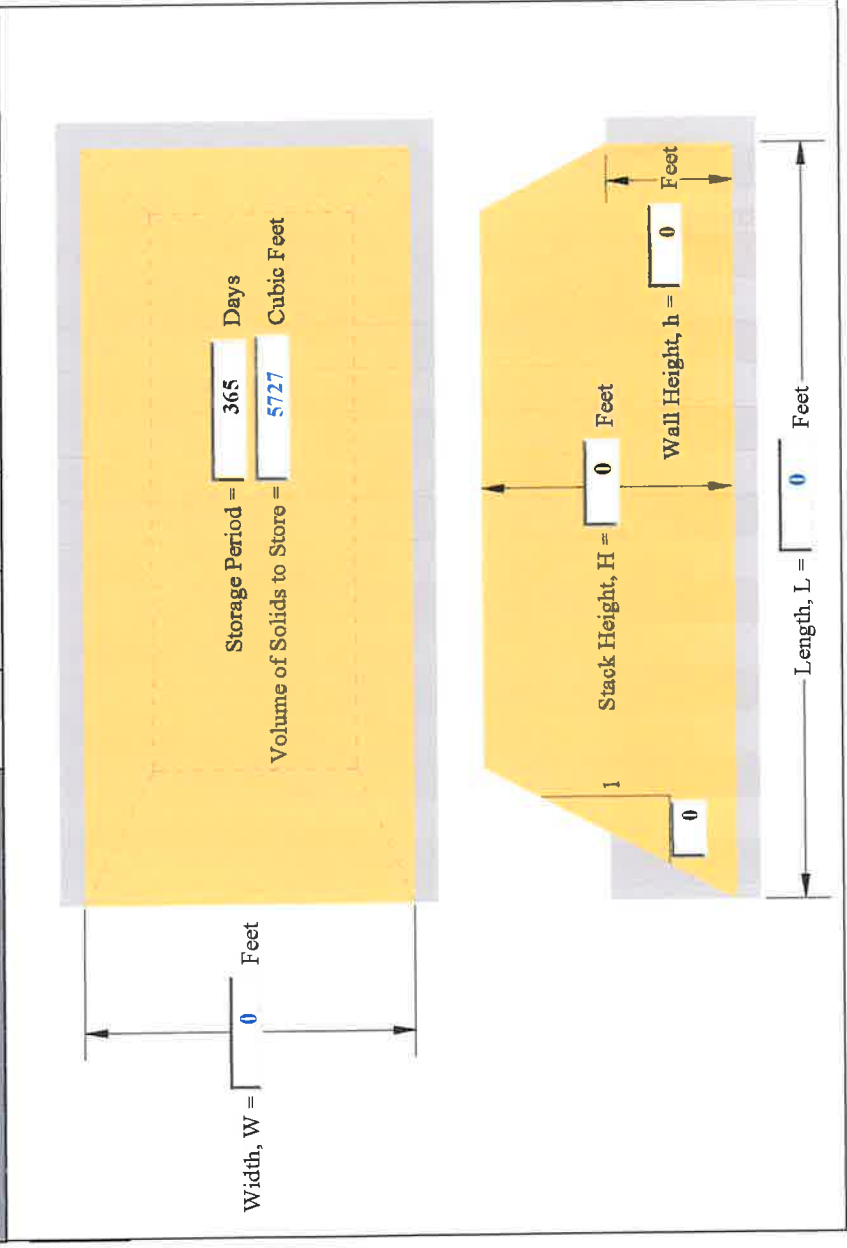
Month	Pounds of Nutrients from LIQUIDS			Pounds of Nutrients from SOLIDS			Pounds of Nutrients from GRAZING			Pounds of Nutrients going OFF-FARM			Total Pounds of Nutrients from ALL SOURCES		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
October	2,266	670	2,114	567	167	529	0	0	0	0	0	0	2,833	837	2,643
November	2,193	648	2,046	548	162	512	0	0	0	0	0	0	2,742	810	2,558
December	2,266	670	2,114	567	167	529	0	0	0	0	0	0	2,833	837	2,643
January	2,266	670	2,114	567	167	529	0	0	0	0	0	0	2,833	837	2,643
February	2,047	605	1,910	512	151	477	0	0	0	0	0	0	2,559	756	2,387
March	2,266	670	2,114	567	167	529	0	0	0	0	0	0	2,833	837	2,643
April	2,193	648	2,046	548	162	512	0	0	0	0	0	0	2,742	810	2,558
May	2,266	670	2,114	567	167	529	0	0	0	0	0	0	2,833	837	2,643
June	2,193	648	2,046	548	162	512	0	0	0	0	0	0	2,742	810	2,558
July	2,266	670	2,114	567	167	529	0	0	0	0	0	0	2,833	837	2,643
August	2,266	670	2,114	567	167	529	0	0	0	0	0	0	2,833	837	2,643
September	2,193	648	2,046	548	162	512	0	0	0	0	0	0	2,742	810	2,558
Annual	26,685	7,889	24,895	6,671	1,972	6,224	0	0	0	0	0	0	33,357	9,861	31,118

CLIENT: BOERSMA HEIFERS - 400 Animals (Balanced for P)

ASSISTED BY: Northwest Ag Consulting - Tom Thomson
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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=	365	October	31	254	705	480	2,242
Stacking Width, W in Feet=	0	November	30	246	682	464	5,597
Stacking Height, H in Feet=	0.00	December	31	254	705	480	6,225
Wall Height, h in Feet=	0.00	January	31	254	705	480	5,965
Stack Side Slope (X:1)=	0.00	February	28	230	637	433	3,950
Existing Storage, Cubic Feet=	8,000	March	31	254	705	480	2,914
Surface Area of Existing Storage, SF=	1,600	April	30	246	682	464	1,210
25 Year-24 Hour Storm Runoff, CF=	533	May	31	254	705	480	748
Volume Needed, Cubic Feet=	5,727	June	30	246	682	464	464
Design Volume, Cubic Feet=	0	July	31	254	705	480	0
Is Facility Covered?	NO	August	31	254	705	480	231
		September	30	246	682	464	918
		Annual	365	2,993	8,301	5,647	30,463



ANIMAL WASTE MANAGEMENT WORKSHEET

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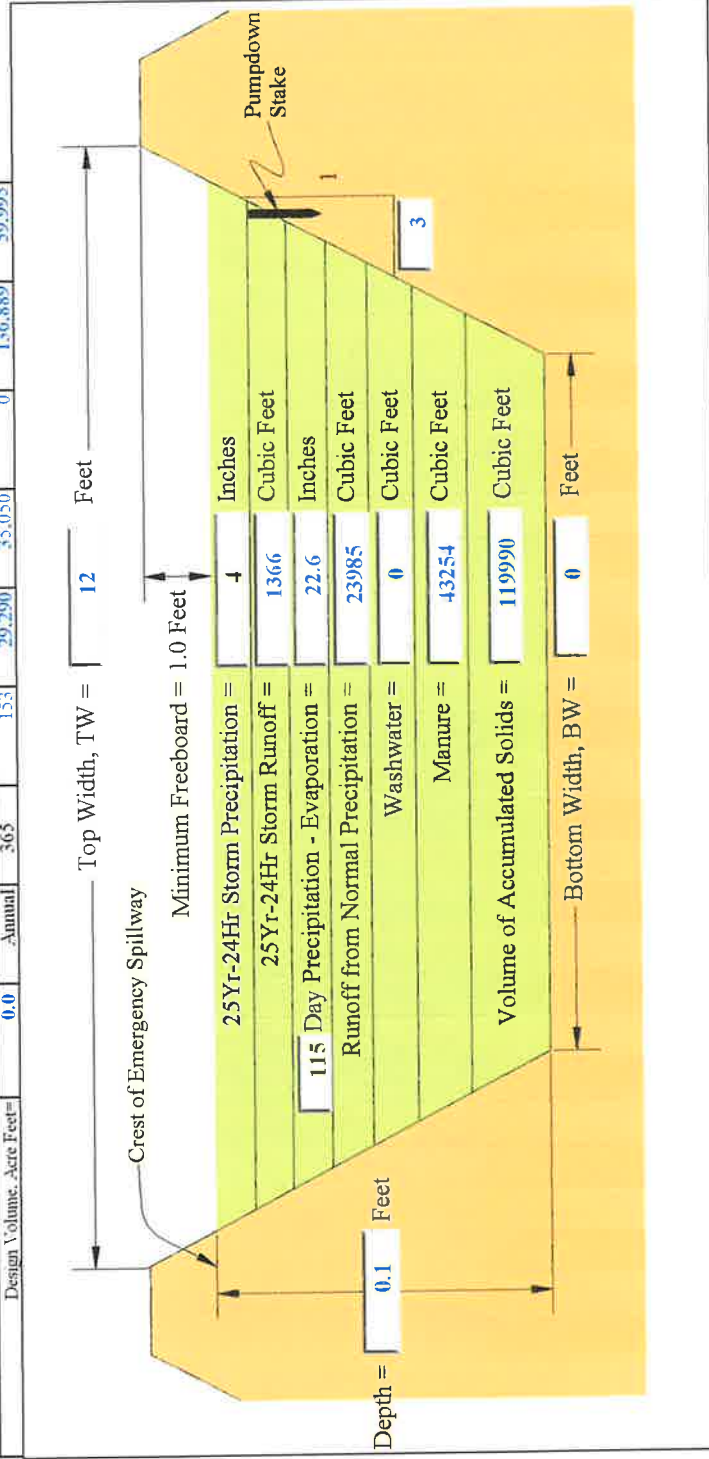
CLIENT: BOERSMA HEIFERS - 400 Animals (Balanced for P)

ASSISTED BY: Northwest Ag Consulting - Tom Thomson

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ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

WASTE STORAGE POND		MONTHLY INFLOWS INTO WASTE STORAGE POND							
Pond Parameters	Value	Month	Number of Days	Rain-Exap on Pond CF	Rain-Exap on Existing Storage CF	Normal Runoff CF	Washwater CF	Mature CF	Accum Solids CF
Storage Period, Days=	115	October	31	18	3,543	2,596	0	11,626	5,095
Side Slope (X:1)=	3.00	November	30	68	12,954	6,357	0	11,251	4,931
Bottom Width, BW, Feet=	0	December	31	85	16,359	7,119	0	11,626	5,095
Bottom Length, BL, Feet=	0	January	31	73	14,035	6,750	0	11,626	5,095
Accumulated Solids Duration, Years=	2	February	28	54	10,377	4,512	0	10,501	4,602
Existing Storage, Acre Feet=	8.24	March	31	38	7,317	3,398	0	11,626	5,095
Surface Area of Existing Storage, SF=	27,610	April	30	33	483	1,453	0	11,251	4,931
Minimum Soil Liner Depth, Feet=	1.00	May	31	-22	-4,142	913	0	11,626	5,095
25 Year-24 Hour Storm Runoff, CF=	1,366	June	30	-36	-6,949	561	0	11,251	4,931
Top Width, TW, Feet=	12	July	31	-58	-11,067	32	0	11,626	5,095
Top Length, TL, Feet=	12	August	31	-50	-9,664	282	0	11,626	5,095
Volume Needed, Acre Feet=	6.0	September	30	-21	-3,957	1,077	0	11,251	4,931
Design Volume, Acre Feet=	0.0	Annual	365	153	29,290	35,050	0	136,889	59,995



CLIENT: BOERSMA HEIFERS - 400 Animals (Balanced for P)
ASSISTED BY: Northwest Ag Consulting - Tom Thomson

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ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TRACTOR SPREADER APPLICATION OF SOLIDS

To apply				11,294 cubic feet of solids generated from the operation it will take approximately			57 trips annually. Based on applying			PHOSPHOROUS, P2O5		▼
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	PHOSPHOROUS, P2O5 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					
Pasture	17.7	Grass/Legume Hay/Pasture	160	199	15	1,310	8.17	63	1.00	0.2	750	4
Hay	17.5	Grass/Legume Hay/Pasture	160	199	15	1,310	8.17	16	1.00	0.1	2999	1
Knightley	6.5	Grass/Legume Hay/Pasture	160	199	15	1,310	8.17	16	1.00	0.1	2999	1
James W	9.5	Grass/Legume Hay/Pasture	160	199	15	1,310	8.17	27	1.00	0.1	1777	2
James E	7	Grass/Legume Hay/Pasture	160	199	15	1,310	8.17	25	1.00	0.1	1875	2
Gibbons	14.4	Grass/Legume Hay/Pasture	160	199	15	1,310	8.17	20	1.00	0.1	2388	1
Stoller W	79.1	Grass/Legume Hay/Pasture	160	199	15	1,310	8.17	25	1.00	0.1	1875	2
Stoller E	21.3	Grass/Legume Hay/Pasture	160	199	15	1,310	8.17	25	1.00	0.1	1875	2
0												

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS														
To apply		79 hours of pumping annually. Based on applying PHOSPHOROUS, P2O5												
1,430,770 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	PHOSPHOROUS, P2O5 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							
Pasture	17.7	Grass/Legume Hay/Pasture	300	250	3/4 Circle	▼	250	2.09	63	1.00	1.11	0.97	1.89	1.73
Hay	17.5	Grass/Legume Hay/Pasture	300	250	3/4 Circle	▼	250	2.09	16	1.00	0.28	0.97	0.47	6.92
Knightley	6.5	Grass/Legume Hay/Pasture	300	250	3/4 Circle	▼	250	2.09	16	1.00	0.28	0.97	0.47	6.92
James W	9.5	Grass/Legume Hay/Pasture	300	250	3/4 Circle	▼	250	2.09	27	1.00	0.47	0.97	0.80	4.10
James E	7	Grass/Legume Hay/Pasture	300	250	3/4 Circle	▼	250	2.09	25	1.00	0.45	0.97	0.75	4.33
Gibbons	14.4	Grass/Legume Hay/Pasture	300	250	3/4 Circle	▼	250	2.09	20	1.00	0.35	0.97	0.59	5.51
Stoller W	79.1	Grass/Legume Hay/Pasture	300	250	3/4 Circle	▼	250	2.09	25	1.00	0.45	0.97	0.75	4.33
Stoller E	21.3	Grass/Legume Hay/Pasture	300	250	3/4 Circle	▼	250	2.09	25	1.00	0.45	0.97	0.75	4.33
0						▼								

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 2.0

U.S. Department of Agriculture
Natural Resources Conservation Service

CLIENT: BOERSMA HEIFERS - 400 Animals (Balanced for P)

CHECKED BY:

ASSISTED BY: Northwest Ag Consulting - Tom Thomson

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

To apply		1,430,770 gallons of liquids generated from the operation it will take approximately		358 trips annually: Based on applying		PHOSPHOROUS, P2O5	
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	PHOSPHOROUS, P2O5 Concentration in Storage Facility		Loads per Acre
					PPM	Lbs/1000Gal	
Pasture	17.7	Grass/Legume Hay/Pasture	4,000	15	1,198	10.00	1.6
Hay	17.5	Grass/Legume Hay/Pasture	4,000	15	1,198	10.00	0.4
Knightley	6.5	Grass/Legume Hay/Pasture	4,000	15	1,198	10.00	0.4
James W	9.5	Grass/Legume Hay/Pasture	4,000	15	1,198	10.00	0.7
James E	7	Grass/Legume Hay/Pasture	4,000	15	1,198	10.00	0.6
Gibbons	14.4	Grass/Legume Hay/Pasture	4,000	15	1,198	10.00	0.5
Stoller W	79.1	Grass/Legume Hay/Pasture	4,000	15	1,198	10.00	0.6
Stoller E	21.3	Grass/Legume Hay/Pasture	4,000	15	1,198	10.00	0.6
0							

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
Dairy	Type of Storage Facility									
Liquids	Storage Pond (<50%) Dilution	26,685	7,889	24,895	52%	90%	90%	13,816	7,100	22,405
Solids	Solids Storage Facility (Unroofed)	6,671	1,972	6,224	65%	80%	80%	4,336	1,578	4,979
Grazing	NONE	0	0	0	100%	100%	100%	0	0	0

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	13,816	7,100	22,405	75%	100%	100%	10,362	7,100	22,405
Solids	Broadcast (Incorporated 7 or more days after application)	4,336	1,578	4,979	70%	100%	100%	3,035	1,578	4,979
Grazing		0	0	0	90%	100%	100%	0	0	0

NUTRIENTS AVAILABLE AFTER DENITRIFICATION

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	Between Coastal and Cascade Mountains Soil Drainage Class	10,362	7,100	22,405	83%	100%	100%	8,600	7,100	22,405
Solids	Somewhat Poorly Drained	3,035	1,578	4,979	83%	100%	100%	2,519	1,578	4,979
Grazing	Somewhat Poorly Drained	0	0	0	83%	100%	100%	0	0	0

CLIENT: BOERSMA HEIFERS - 400 Animals (Balanced for P)
ASSISTED BY: Northwest Ag Consulting - Tom Thomson

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

PERCENT OF MANURE TO BE APPLIED TO FIELD AND UTILIZATION ACRES NEEDED BASED ON													PHOSPHOROUS, P2O5		▼
Field Number	Acres	Crop	LIQUIDS			SOLIDS			GRAZING						
			Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients				
Pasture	17.7	Grass/Legume Hay/Pasture	16%	1,136	18	0%	0	0	0%	0	0	0%	0	0	
Hay	17.5	Grass/Legume Hay/Pasture	4%	284	18	0%	0	0	0%	0	0	0%	0	0	
Knightley	6.5	Grass/Legume Hay/Pasture	2%	106	7	0%	0	0	0%	0	0	0%	0	0	
James W	9.5	Grass/Legume Hay/Pasture	4%	284	11	0%	0	0	0%	0	0	0%	0	0	
James E	7.0	Grass/Legume Hay/Pasture	2%	142	6	0%	0	0	0%	0	0	0%	0	0	
Gibbons	14.4	Grass/Legume Hay/Pasture	0%	0	0	18%	284	14	0%	0	0	0%	0	0	
Stoller W	79.1	Grass/Legume Hay/Pasture	0%	0	0	82%	1,294	51	0%	0	0	0%	0	0	
Stoller E	21.3	Grass/Legume Hay/Pasture	0%	0	0	0%	0	0	0%	0	0	0%	0	0	
0															
Off-Farm			73%	5,147	59	0%	0	0	100%	66	1,578	100%	0	0	
TOTALS-			100%	7,100		100%	1,578								

NUTRIENT BALANCE BASED ON AVAILABLE ACRES

Field Number	Acres	Crop	NUTRIENTS APPLIED			NUTRIENTS REMOVED			NUTRIENT BALANCE		
			Nitrogen, N Lbs/Acre	Phosphorous, P2O5 Lbs/Acre	Potassium, K2O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorous, P2O5 Lbs/Acre	Potassium, K2O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorous, P2O5 Lbs/Acre	Potassium, K2O Lbs/Acre
Pasture	17.7	Grass/Legume Hay/Pasture	78	64	203	170	63	207	-92	1	-5
Hay	17.5	Grass/Legume Hay/Pasture	20	16	51	42	16	52	-23	0	-1
Knightley	6.5	Grass/Legume Hay/Pasture	20	16	52	42	16	52	-23	1	0
James W	9.5	Grass/Legume Hay/Pasture	36	30	94	72	27	87	-35	3	7
James E	7.0	Grass/Legume Hay/Pasture	25	20	64	68	25	83	-43	-5	-19
Gibbons	14.4	Grass/Legume Hay/Pasture	31	20	62	53	20	65	-22	0	-3
Stoller W	79.1	Grass/Legume Hay/Pasture	26	16	52	68	25	83	-42	-9	-31
Stoller E	21.3	Grass/Legume Hay/Pasture	0	0	0	68	25	83	-68	-25	-83
Off-Farm											

Wednesday July 13, 2005

TO: Natural Resources Division Administrator, Debbie Gorham

FROM: Dan and Beverly Boersma (Wonderbaar Dairy)

This is a quick note to let you know we need a second extension on our CAFO permit.

We have Tom Thompson working on it and he is very booked at this time. If possible we will shoot for August 1, 2005.

Thank you for this consideration and sorry if this is a problem-

We appreciate your help in this matter-

Sincerely

Beverly Boersma

FROM :

FAX NO. :5034723054

Jul. 13 2005 08:42AM P1

Fax # 503-986-4730

ATTN: Debbie Gorham

From: Beverly Boersma

From: "Tom Thomson" <tomt@teleport.com>
Subject: **DeHaan and Boersma**
Date: March 17, 2005 8:03:03 AM PST
To: "Sarah Harshberger" <sharshbe@oda.state.or.us>

Hi Sarah

I came in yesterday to turn in Pete DeHaan CAFO for the heifer facility in MAC. It is kind of a botch of things, but all the MRE's are there...i hope!! I spent the minimum time on it as Pete is most likely going to be out of there by this fall and concentrate on the Cherry Hill Dairy for replacements. Hopefully this plan will do.

With regards to Boersma. The glaring flag for his operation is that all of the liquid goes onto the 17 acre pasture. I think he has the capacity to move some across the street to the hay field, but that is probabaly the extent of it. I hope to get a draft plan in shape soon. Since he has signed up for the NRCS money which makes him required to have a CNMP I think it might behoove us to sit down together and discuss his ability to meet a CNMP with the animals he has let alone going to a permitted number of 400. He told me his long term goal is to convert to beef with lower numbers. Maybe that ought to be his short term goal.

Take care...tom

Oh yeah...Pete will be faxing in a signed cover page for the MAC plan.

=====
Tom Thomson Northwest Agricultural Consulting
1275 Oak Villa Road tomt@teleport.com
Dallas, Oregon 97338 Phone/FAX 503-623-0468

"The only difference between a problem and a solution is that everyone understands the solution." Charles Kettering

=====

From: "Tom Thomson" <tomt@teleport.com>
Subject: **RE: Boersma**
Date: November 19, 2005 5:17:40 PM PST
To: "Sarah Harshberger" <sharshbe@oda.state.or.us>

Sarah:

Boersma has the signed application agreements - which I forgot to bring when I saw you. The berm hopefully is done. He also has been using the honey wagon to apply all over creation AND keeping records. Hopefully he has been continuing to do both. He also has the guy who does the haying driving the honey wagon on other properties as well. So I hope its going on at good rates. Additionally he as down to 10 heifers last week as Erhardt used the buyout to reduce his herd but (of course) will be building up again. So that puts some relief in Dans situation,...at least for this winter. So it looks like you could approve his plan with an inspection of the berm, me getting you copies of the lease papers, and the lowered herd size.

tom

-----Original Message-----

From: Sarah Harshberger [mailto:sharshbe@oda.state.or.us]
Sent: Friday, November 18, 2005 10:59 AM
To: Tom Thomson
Subject: Boersma

Hi Tom,

I am hoping to get our updated status on the Boersma AWMP. I keep avoiding it and finally gave them a call today. After talking to Beverly it sounds like they have built up the berm beside the sump and have received lease agreements from each of the operator's that they spread manure with. I am wanting to get this plan off my desk. What can you tell me? The plan I have is approvable I just wanted those two extra items in order to approve it with some confidence.

Thanks,

Sarah Harshberger

Livestock Water Quality Specialist

Natural Resources Division

(503) 986-4780



Oregon

Theodore R. Kulongoski, Governor

Department of Agriculture

635 Capitol Street NE
Salem, OR 97301-2532



November 30, 2005

Dan and Beverly Boersma
Wonderbaar Dairy
12545 SE Finn Road
Dayton, Oregon 97114

Re: Animal Increase Request

Dear Dan and Beverly,

I have completed the review of the Animal Waste Management Plan (AWMP) you provided on August 22, 2005 and the Application to Register (ATR) for a herd increase provided on January 3, 2005. At this time it appears that your AWMP meets the requirements needed to approve it with a herd increase of 400 animals. The ATR you provided only requests an increase to 210 heifers total. I have drafted a new Animal Increase Request form for animal numbers matching your AWMP.

Please sign this new draft of the Animal Increase Request form enclosed and mail it back as soon as possible. I will be moving forward with recommending your AWMP and herd increase approval dependent on receiving this form.

If you have any questions you may contact me at the number below.

Sincerely,

Sarah Harshberger
Livestock Water Quality Specialist
Natural Resources Division
PH: (503) 986-4780
FX: (503) 986-4730



FROM :

FAX NO. : 5034723054

Jul. 13 2005 08:42AM P1

Yamhill

Fax # 503-986-4730

ATTN: Debbie Gorham

From: Beverly Boersma

Wym -

Wednesday July 13, 2005

TO: Natural Resources Division Administrator, Debbie Gorham

FROM: Dan and Beverly Boersma (Wonderbaar Dairy)

This is a quick note to let you know we need a second extension on our CAFO permit.

We have Tom Thompson working on it and he is very booked at this time. If possible we will shoot for August 1, 2005.

Thank you for this consideration and sorry if this is a problem-

We appreciate your help in this matter-

Sincerely

Beverly Boersma

From: "Tom Thomson" <tomt@teleport.com>
Subject: RE: Boersma
Date: August 11, 2005 11:11:01 AM PDT
To: "Sarah Harshberger" <sharshbe@oda.state.or.us>

Sarah:

I am meeting with Dan Tues August 16th for him to review the CNMP. He needs to choose the path and then I will tidy the plan up a bit and turn it into the ODA (you). As the base of the CNMP is all the MRE it should fly on that respect. We probably will have some editing with the NRCS to meet their specs, but that is really separate from the permit requirements of the ODA.

So time wise....I want to give you Boersma's plan on Friday the 19th.

Then I will complete the stuff you asked for on DeHaan Cherry Lane Dairy and get that back to you.

Then I need to get to work and finish Coleman's plans.

Plus.....plus.....]

tom

-----Original Message-----

From: Sarah Harshberger [mailto:sharshbe@oda.state.or.us]
Sent: Wednesday, August 10, 2005 9:08 AM
To: Tom Thomson
Subject: Boersma

Tom,

I got a call earlier this week from Boersma. He said that he isn't sure he will be able to get his AWMP in by the 15th. How is it looking on your end? I will need to work with him on another extension if indeed he can't get it in by then. I am figuring that part of the problem is again, management. Will there be big changes required to make his plan work?

Thanks for you help,
Sarah Harshberger
Livestock Water Quality Specialist
Natural Resources Division
(503) 986-4780



Oregon

Theodore R. Kulongoski, Governor

A/F
Department of Agriculture

635 Capitol Street NE
Salem, OR 97301-2532

March 2, 2005

Dan Boersma
Wonderbaar Dairy
12545 SE Finn Lane
Dayton, Oregon 97114



Re: Request for AWMP extension

Dear Mr. Boersma:

This letter is in response to your request for an extension for the submission of your Animal Waste Management Plan (AWMP). The previous deadline for AWMP submission was March 1, 2005. Your reason for the delay in AWMP completion seems reasonable, thus an extension is approved. The new due date for the submission of your AWMP is July 1, 2005.

If you have questions regarding the submission of your AWMP or the list of minimum required elements, you may contact me at the number listed below. Alternately, you may contact Livestock Water Quality Specialist Sarah Harshberger, at (503) 986-4780.

Sincerely,

Debbie Gorham, Administration
Natural Resources Division
PH: (503) 986-4700
FX: (503) 986-4730

DG/sh/cs



TO: Delila Gorkham

CC Sarah Huchliengen-

ok - pls. prepare
approval ltr.
for my signature.
Delila
2-28

From: Beverly Boasma

For - CMC Extension

To: Debbie Gorham
CC: Sarah Harshberger - CAFO PERMIT Specialist
From: Dan/Beverly Boersma (Wonderbarr Dairy)
Date: 2/18/2005
Re: CAFO Permit UPDATE Extension

I am writing in regards to getting an extension of our CAFO animal waste management plan permit.

We need to have our current plan updated due to an increase in numbers.

We would like to have until 1 July 2005 for the current plan to be revised.

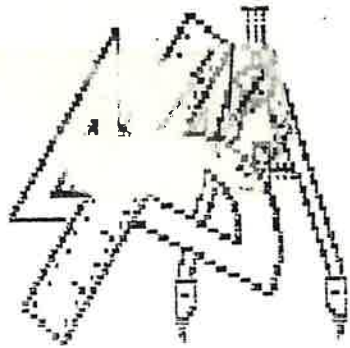
Thank - you for this consideration and we will be waiting to hear from you if this is or is not acceptable.

Sincerely,

Beverly Boersma - 503 818-7615

Beverly Boersma

DESIGN AND SPECIFICATIONS



AGRICULTURE WASTE MANAGEMENT SYSTEM

of

DAN BOERSMA DAIRY

12545 SE Finn Lane

Dayton, Oregon 97114 868-7615

DATE

Revision as of 1/10/91

YAMHILL COUNTY
OREGON

COOPERATING WITH THE
YAMHILL SOIL AND WATER
CONSERVATION DISTRICT



SOIL CONSERVATION SERVICE

INDEX

AGRICULTURAL WASTE MANAGEMENT SYSTEM PLAN DAN BOERSMA DAIRY YAMHILL COUNTY

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7	BUILDING PLAN
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9	SOILS MAPS
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21-31	WASTE STORAGE POND DESIGN Calculations Plan Soils Log
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DAN BOERSMA
AGRICULTURE WASTE MANAGEMENT SYSTEM

YAMHILL COUNTY, OREGON

Owner/ Operator : Dan Boersma

Address : 12545 SE Finn Lane
Dayton, Oregon 97114

Phone Number : 868-7615

Assisted By : Larry Ojua

Date: 1/10/91

GENERAL DESCRIPTION

The Boersma animal waste management system has been designed to manage the waste generated by this 185 dairy cow operation in a manner that prevents or minimizes degradation of the air, soil, and water resources and protects public health and safety. The system has been designed to preclude the discharge of pollutants into the surface water or ground water and to recycle waste through soil and plants to the fullest extent possible.

The system was designed to store the animal waste, bedding, and waste hay and silage of 90 Holstein milking cows, 15 dry milkers, 60 heifers, and 20 calves for a minimum period of 240 days. The system was also designed to contain the waste during scraping operations by the use of curbing and to divert clean roof water away from the animal waste. One of the most severe limitations in the existing operation is the lack of adequate storage and disposal acres. Mr. Boersma has increased his available disposal acres by leasing an additional 21.5 acres adjacent to his property and by obtaining verbal agreements on an additional 70 acres.

A number of components of this system have been completed.
Components of the animal waste management system include:

SCS

Practice

Standard____Description

358	Waste Transfer 1000 gallon tank (Completed) Solid Waste Stacking Facility
362	Diversion (Completed)
425	Waste Storage Pond
510	Pasture and Hayland Management
512	Pasture and Hayland Planting
558	Roof Runoff Management (50% Completed)
587	Structure for Water Control Curbing (Completed) Separator
620	Underground Outlet (50% Completed)
633	Waste Utilization
680	Nutrient Management

Dan Boersma, as owner of the farm, is responsible for the operation and maintenance of the waste management system. Although the system was designed by the Soil Conservation Service based on the best available technical knowledge, it must be recognized that if the system is to operate as planned and designed, it needs to be periodically inspected and properly operated and maintained. Please refer to the attached Operation and Maintenance plan for details.

GENERAL OPERATION

The animal waste storage pond is designed to store the waste in a liquid/slurry form after most of the waste solid have been removed by a solids separator. The proposed 6.24 acre-foot Waste Storage Pond is designed to provide storage for an estimated period of 240 days. Emptying the facility must begin in the spring before it is completely filled and continue through the summer months when weather and soil conditions are favorable. It is imperative that the facility be as empty as possible when the rainy season begins, generally about October 1st.

Solids will be separated from the slurry by a solids separator, and stored in a concrete solid waste stacking facility. The waste stacking facility will drain into the completed silage waste collection tank. The separated solids will be spread on the available land as weather and ground conditions permit.

The liquid waste will be spread on 16 acres of grass pasture located on Dan Boersma's property and on 21.5 acres of leased pasture land adjacent to his property. Mr. Boersma also has verbal agreements to access an additional 70 acres for separated solids disposal if needed. The liquid waste will be applied to the pasture by broadcast with an irrigation gun or honey wagon when weather and ground conditions permit.

The disposal fields contain Amity and Dayton soils. In the spring the liquid waste will be spread on the best drained soils available, giving the wetter soils a chance to dry out. Avoid spreading the waste next to Palmer Creek during the early spring and late fall months when contaminated runoff may enter the creek. Spreading will be done as evenly as possible when weather forecasts predict a minimum of three days without measurable precipitation. Applications should be spaced at three week intervals to maximize the bacterial die off and to minimize soil sealing. Although winter spreading is not anticipated, emergency spreading will be done on the flattest, best drained soils available.

It is estimated that the manure produced in one 365 day period will provide 8345 pounds of nitrogen, 2204 pounds of phosphorus and 10,472 pounds of potassium after all losses have been accounted for. Nutrients will be recycled by applying wastes to crops grown on Mr. Boersma land and leased property. Nutrients will be recycled on 20 acres of grass/alfalfa pasture (Tract - 1884) and (Tract - 1966). Mr. Boersma also leases 16.0 acres of property (Farm C-339) on the south side of Finn Lane that will be used for waste utilization. It will be planted to field corn or be utilized as grass pasture. See waste calculation worksheets for details.

OPERATION AND MAINTENANCE PLAN

The waste management facilities and appurtenances will be inspected and maintained as follows:

GUTTERS AND DOWNSPOUTS

Maintenance

Gutters and downspouts will be inspected annually. Keep all gutters and downspouts free from foreign material that reduces their ability to function. Maintain all fasteners to securely hold all gutters and downspouts in place. Keep all underground lines free from debris and obstructions. Keep all screens and strainers in place and in good working condition.

WASTE STORAGE POND

Operation

Emptying of the waste storage pond will begin in the spring before the pond is completely filled and will continue through the spring and summer months when weather conditions permit. It is imperative that the pond be as empty as possible before the rainy season begins. This is usually by October 1. Operate the system in a manner that minimizes odors and air drift.

Maintenance

The waste storage pond will be inspected annually. Sludge and accumulated solids will be removed periodically when buildup limits the capacity of the pond. Livestock will not be permitted in the pond or on its banks. If settlement or cracks occur in the dam, determine and eliminate their causes and repair and reseed the damage. Make sure that all drains are functional. Maintain a vigorous growth of desirable vegetation. This includes reseeding, fertilizing, and weed control where necessary. Periodic mowing may be needed to control the vegetation. Unauthorized human or livestock entry will be prevented. Eradicate or otherwise remove all burrowing animals or rodents and repair any damage caused by their activity. Immediately remove any obstructions of spillways, weirs, or pipe inlets. Immediately repair any damage to earthfills or outlets. Repair spalls, cracks, and weathered areas in concrete structures. Immediately remove any foreign debris in or adjacent to the waste storage pond.

SOLIDS STACKING FACILITY

Operation

Operate the stacking facility in a manner to minimize odors and air drift. Control seepage and solids in a manner to prevent runoff.

Maintenance

The stacking facility will be inspected annually. Broken slabs and curb will be repaired. Spalls, cracks, and weathered areas in paved surfaces will be repaired. Repair or replace rusted or damaged metal or paint.

CURBS

Maintenance

Concrete curbs will be inspected periodically and broken curbs will be replaced.

SILAGE COLLECTION TANK

Maintenance

The tank, switches, and pipelines will be inspected annually to insure that all facilities are in working order. Grates will be monitored and kept free of debris. Electrical service, switches, and the area above the tank will be protected from livestock, human, and vehicular traffic. Fencing or other protective measures will be used.

PUMPS AND AGITATORS

Operation

Pumps and agitators will be operated according to the manufacturer's manuals and recommendations.

Maintenance

Pumps and agitators will be maintained according to the manufacturer's manuals and recommendations. Liquid manure will be drained during freezing weather. Pumps and agitators will be inspected periodically to prevent debris from wrapping around the impeller. All plumbing will be inspected annually. Broken lines will be replaced and/or repaired. Loose connections will be tightened.

SOLIDS SEPARATOR

Operation

The solids separator will be operated in accordance with the manufacturer's manuals and recommendations.

Maintenance

The solids separator will be maintained according to the manufacturer's manuals and recommendations.

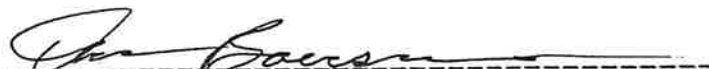
SAFETY

Warning signs, ladders, ropes, bars, rails, and other devices shall be provided as appropriate to insure the safety of humans and livestock. Ventilation and warning signs must be provided as necessary for enclosed waste holding structures to prevent explosions, poisoning, or asphyxiation. All federal, state, and local laws will be met.

SIGNATURE PAGE

An individual Confined Animal Feeding Operation (CAFO) Permit issued by the Oregon Department of Agriculture to the Boersma Dairy will be kept in good standing by complying with all permit provisions. The permit will be based on this plan but may not have the same requirements. This plan provides guidelines for the wise use of the soil, water, air, plant and animal resources for the Boersma Dairy. Changes in the waste management system and/or number of livestock will require a revision of this plan.

I certify that I have read this plan and understand it's contents and requirements:



LANDOWNER/OPERATOR SIGNATURE

1/17/91

DATE

This plan has been prepared by: Larry Ojua, Yamhill SWCD



PREPARERS SIGNATURE

1-10-91

DATE

This Job Class III Waste Management system plan is approved by:



APPROVAL SIGNATURE

1-16-91

DATE

April 3, 1991

DEPARTMENT OF
AGRICULTURE

Dan Boersma Dairy
12545 SE Finn Lane
DAYTON OR 97114

RE: POLLUTION PLAN REVIEW NUMBER: 9103

Regarding OAR 340-52-045(3), the Department of Environmental Quality has, through a Memorandum of Agreement, authorized the Oregon Department of Agriculture (ODA) to review for approval or rejection, plans and specifications for Confined Animal Feeding Operation (CAFO) wastewater pollution control facilities.

We hereby approve these CAFO animal waste disposal facilities and certify they have been designed in accordance with the Oregon Animal Waste Installation Guidebook. Modifications or additions to these facilities must be approved by ODA prior to construction.

PROJECT DESCRIPTION

A 185 cow dairy consisting of 90 milkers, 15 dry milkers, 60 heifers, and 20 calves.

COMPONENT DESCRIPTION

A two-cell, 6.24 acre-foot waste storage pond and a solid separator.

David Wilkinson

David Wilkinson
Project Coordinator
Natural Resources Division
(503) 378-3810

Enclosures

cc: Yamhill Soil and Water Conservation District
Renato Dulay, DEQ

BARBARA ROBERTS
Governor



635 Capitol Street NE
Salem, OR 97310-0110

SOIL INTERPRETATIONS REPORT

Am AMITY SILT LOAM

THE AMITY SERIES CONSISTS OF DEEP SOMEWHAT POORLY DRAINED SOILS FORMED IN OLD ALLUVIUM ON BROAD TERRACES. TYPICALLY, THE SURFACE LAYER IS VERY DARK GRAYISH BROWN SILT LOAM ABOUT 14 INCHES THICK. THE SUBSURFACE LAYER IS DARK GRAY SILT LOAM ABOUT 4 INCHES THICK. THE SUBSOIL IS GRAYISH BROWN AND LIGHT OLIVE BROWN MOTTLED SILTY CLAY LOAM ABOUT 15 INCHES THICK OVER AN OLIVE BROWN SILTY CLAY LOAM TO 60 INCHES. ELEVATIONS ARE 150 TO 400 FEET. MEAN ANNUAL PRECIPITATION IS 40 TO 50 INCHES. MEAN ANNUAL AIR TEMPERATURE IS 50 TO 54 DEGREES F. FROST-FREE PERIOD IS 165 TO 200 DAYS.

ESTIMATED SOIL PROPERTIES

DEPTH: (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT: >3 IN	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO.	LIQUID LIMIT	PLAS- TICITY
				(PCT)	4 10 40 200		INDEX
0-18: SIL 18-60: SILCL		ML CL	A-4 A-7	0 0	100 100	95-100 95-100	30-40 40-45
							5-10 15-20

DEPTH:CLAY		MOIST BULK	PERMEA-	AVAILABLE	SOIL	SALINITY	SHRINK-	EROSION:WIND		ORGANIC:	CORROSIVITY		
(IN.):	(PCT)	DENSITY	BILITY	WATER CAPACITY	REACTION	(MMHOS/CM)	SWELL	FACTORS	EROD.	MATTER			
		(G/CM3)	(IN/HR)	(IN/IN)	(PH)		POTENTIAL	K	T	GROUP	(PCT)	STEEL	CONCRETE
0-18:	15-25	1.20-1.45	0.6-2.0	0.19-0.21	5.6-6.0	-	LOW	.32	5	-	3-5	MODERATE	MODERATE
18-60:	27-35	1.20-1.40	0.2-0.6	0.19-0.21	5.6-6.5	-	MODERATE	.49					

FLOODING			HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD: POTENT'L	
FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS	INIT. (IN)	TOTAL (IN)	GRP	FROST ACTION
NONE			0.5-1.5	APPARENT	NOV-MAY	-		>60		-		D	-

SANITARY FACILITIES

CONSTRUCTION MATERIAL

SEPTIC TANK ABSORPTION FIELDS	SEVERE-WETNESS, PERCS SLOWLY	ROADFILL	POOR-LOW STRENGTH, WETNESS
SEWAGE LAGOON AREAS	SEVERE-WETNESS	SAND	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (TRENCH)	SEVERE-WETNESS	GRAVEL	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (AREA)	SEVERE-WETNESS	TOPSOIL	POOR-WETNESS
DAILY COVER FOR LANDFILL	POOR-WETNESS	WATER MANAGEMENT	
		POND RESERVOIR AREA	MODERATE-SEEPAGE

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-WETNESS	EMBANKMENTS DIKES AND LEVEES	SEVERE-PIPING, WETNESS
DWELLINGS WITHOUT BASEMENTS	SEVERE-WETNESS	EXCAVATED PONDS AQUIFER FED	SEVERE-SLOW REFILL
DWELLINGS WITH BASEMENTS	SEVERE-WETNESS	DRAINAGE	FAVORABLE
SMALL COMMERCIAL BUILDINGS	SEVERE-WETNESS	IRRIGATION	WETNESS
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH, WETNESS	TERRACES AND DIVERSIONS	ERODES EASILY, WETNESS
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-WETNESS	GRASSED WATERWAYS	WETNESS, ERODES EASILY

SEVERE-WETNESS

CAMP AREAS

PLAYGROUNDS

SEVERE-WETNESS

SEVERE-WETNESS

PICNIC AREAS

PATHS AND TRAILS

SEVERE-WETNESS

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

[illegible]

24	24		5		400	1		12	16		9	75		100	
----	----	--	---	--	-----	---	--	----	----	--	---	----	--	-----	--

WOODLAND SUITABILITY

ORDI	MANAGEMENT PROBLEMS					POTENTIAL PRODUCTIVITY		
SYM	EROSION HAZARD	EQUIP- LIMIT	SOIL- MOIST- HAZARD	WINDTH- HAZARD	PLANT COMPET	COMMON TREES	SITE PROD INDEX CLAS	TREES TO PLANT

[illegible]

WINDBREAKS

SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
---------	----	---------	----	---------	----	---------	----

[illegible]

WILDLIFE HABITAT SUITABILITY

POTENTIAL FOR HABITAT ELEMENTS	POTENTIAL AS HABITAT FOR:
1. <u>WATER</u>	1. <u>WATER</u>
2. <u>WETLANDS</u>	2. <u>WETLANDS</u>
3. <u>WATER BODIES</u>	3. <u>WATER BODIES</u>
4. <u>WETLANDS</u>	4. <u>WETLANDS</u>
5. <u>WETLANDS</u>	5. <u>WETLANDS</u>
6. <u>WETLANDS</u>	6. <u>WETLANDS</u>
7. <u>WETLANDS</u>	7. <u>WETLANDS</u>
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15. <u>WETLANDS</u>	15. <u>WETLANDS</u>
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GRAIN & GRASS & WILD SEED LEGUME HERB.	HARDWOOD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLD WILDLF	WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF
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GOOD	GOOD	GOOD	FAIR	FAIR	GOOD	FAIR	FAIR	GOOD	FAIR	FAIR	-
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POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

PLANT	PERCENTAGE COMPOSITION (DRY WEIGHT)
1	100
2	100
3	100
4	100
5	100
6	100
7	100
8	100
9	100
10	100
11	100
12	100
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97	100
98	100
99	100
100	100

ME	SYMBOL (NLSPN)					

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POTENTIAL PRODUCTION (LBS./AC. DRY WT):
FAVORABLE YEARS
NORMAL YEARS
UNFAVORABLE YEARS

FOOTNOTES

SOIL INTERPRETATIONS RECORD

Da DAYTON SILT LOAM

THE DAYTON SERIES CONSISTS OF DEEP, POORLY DRAINED SOILS FORMED IN ALLUVIUM ON TERRACES. TYPICALLY, THE SURFACE LAYER IS GRAYISH BROWN SILT LOAM ABOUT 7 INCHES THICK OVER A BLEACHED LAYER OF DARK GRAY SILT LOAM ABOUT 8 INCHES THICK. THE SUBSOIL IS DARK GRAY DENSE CLAY ABOUT 13 INCHES THICK. THE SUBSTRATUM IS GRAYISH BROWN SILTY CLAY LOAM TO 60 INCHES. ELEVATION IS 100 TO 400 FEET. MEAN ANNUAL PRECIPITATION IS 40 TO 50 INCHES. MEAN ANNUAL AIR TEMPERATURE IS 50 TO 54 DEGREES F. THE FROST-FREE PERIOD IS 165 TO 210 DAYS.

ESTIMATED SOIL PROPERTIES

DEPTH: (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT: PERCENT OF MATERIAL LESS > 3 IN: THAN 3" PASSING SIEVE NO.					LIQUID LIMIT	PLAS- TICITY
				(PCT)	4	10	40	200		
0-7	SIL	ML	A-4	0	100	95-100	90-100	85-100	30-35	5-10
7-15	SIL, SICL	ML	A-4, A-6	0	100	95-100	90-100	90-100	30-40	5-15
15-28	SIC, C	CH	A-7	0	100	95-100	90-100	90-100	55-70	35-45
28-60	SIL, SICL	ML	A-4, A-6	0	100	95-100	90-100	85-95	30-40	5-15

DEPTH: (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEA- BILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK- SWELL POTENTIAL LOW HIGH	EROSION FACTORS K T	WIND GROUP 5	ORGANIC (PCT)	CORROSIVITY STEEL MODERATE	CONCRETE MODERATE
0-7	15-20	1.30-1.40	0.6-2.0	0.18-0.25	5.1-6.0	-	LOW	.43	5	1-4	MODERATE	MODERATE
7-15	15-30	1.25-1.40	0.6-2.0	0.18-0.24	5.1-6.0	-	LOW	.49				
15-28	40-50	1.25-1.40	<0.06	0.03-0.05	5.1-6.5	-	HIGH	.32				
28-60	15-30	1.30-1.40	0.2-2.0	0.15-0.20	6.1-7.3	-	LOW	.49				

FLOODING			HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD: POTENT'L	
FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS	INIT. (IN)	TOTAL (IN)	GRP	FROST ACTION
NONE			+5-1.5	PERCHED	NOV-MAY	-		>60		-		D	-

SANITARY FACILITIES

CONSTRUCTION MATERIAL

SEPTIC TANK ABSORPTION FIELDS	SEVERE-PONDING, PERCS SLOWLY	ROADFILL	POOR-LOW STRENGTH, WETNESS
SEWAGE LAGOON AREAS	SEVERE-PONDING	SAND	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (TRENCH)	SEVERE-PONDING, TOO CLAYEY	GRAVEL	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (AREA)	SEVERE-PONDING	TOPSOIL	POOR-THIN LAYER, WETNESS
DAILY COVER FOR LANDFILL	POOR-TOO CLAYEY, HARD TO PACK, PONDING	POND RESERVOIR AREA	WATER MANAGEMENT MODERATE-SEEPAGE

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-PONDING	EMBANKMENTS DIKES AND LEVEES	SEVERE-HARD TO PACK, PONDING
DWELLINGS WITHOUT BASEMENTS	SEVERE-PONDING, SHRINK-SWELL	EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DWELLINGS WITH BASEMENTS	SEVERE-PONDING, SHRINK-SWELL	DRAINAGE	PONDING, PERCS SLOWLY
SMALL COMMERCIAL BUILDINGS	SEVERE-PONDING, SHRINK-SWELL	IRRIGATION	PONDING, DROUGHTY, PERCS SLOWLY
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH, PONDING, SHRINK-SWELL	TERRACES AND DIVERSIONS	ERODES EASILY, PONDING, PERCS SLOWLY
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-PONDING	GRASSED WATERWAYS	WETNESS, ERODES EASILY, DROUGHTY

RECREATIONAL DEVELOPMENT

CAMP AREAS	SEVERE-PONDING, PERCS SLOWLY	PLAYGROUNDS	SEVERE-PONDING, PERCS SLOWLY
PICNIC AREAS	SEVERE-PONDING, PERCS SLOWLY	PATHS AND TRAILS	SEVERE-PONDING, ERODES EASILY

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

CAPA-BILITY		PASTURE (AUM)		COMMON RYE-GRASS SEED (LBS)		PER. RYE-GRASS SEED (LBS)		GRASS-LEGUME HAY (TONS)		BARLEY (BU)		CORN, SWEET (TONS)		BEANS, SNAP (BU)	
NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.
4W	4W	8	12	1800		1000		3		38		5		260	

WOODLAND SUITABILITY

ORD: MANAGEMENT PROBLEMS						POTENTIAL PRODUCTIVITY					
SYM	EROS	N	EQUIP.	SEEDL.	WINDTH	PLANT	COMMON TREES			SITE PROD	TREES TO PLANT
HAZARD	HAZARD	LIMIT	PORT	Y	HAZARD	COMPET	NONE			INDX	CLAS

WINDBREAKS

SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
NONE							

WILDLIFE HABITAT SUITABILITY

POTENTIAL FOR HABITAT ELEMENTS

POTENTIAL AS HABITAT FOR:

GRAIN SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLD WILDLF	WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF
POOR	FAIR	FAIR	POOR	POOR	FAIR	GOOD	GOOD	FAIR	POOR	GOOD	-

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT	PERCENTAGE COMPOSITION (DRY WEIGHT)									
	SYMBOL (NLSPN)										
OREGON ASH	FRLA										
OREGON WHITE OAK	OUQA4										
HAMTHORN	CRATA										
OTHER SHRUBS	SSSS										
OTHER PERENNIAL GRASSES	PPGG										
OTHER PERENNIAL FORBS	PPFF										
POTENTIAL PRODUCTION (LBS./AC. DRY WT):											
FAVORABLE YEARS											
NORMAL YEARS											
UNFAVORABLE YEARS											

FOOTNOTES

OIL INTERPRETATIONS REPORT

Dc DAYTON SILT LOAM, THICK SURFACE

THE DAYTON SERIES CONSISTS OF DEEP, POORLY DRAINED SOILS FORMED IN ALLUVIUM ON TERRACES. TYPICALLY, THE SURFACE LAYER IS GRAYISH BROWN SILT LOAM ABOUT 7 INCHES THICK OVER A BLEACHED LAYER OF DARK GRAY SILT LOAM ABOUT 13 INCHES THICK. THE SUBSOIL IS DARK GRAY DENSE CLAY ABOUT 8 INCHES THICK. THE SUBSTRATUM IS GRAYISH BROWN SILTY CLAY LOAM TO 60 INCHES. ELEVATION IS 100 TO 400 FEET. MEAN ANNUAL PRECIPITATION IS 40 TO 50 INCHES. MEAN ANNUAL AIR TEMPERATURE IS 50 TO 54 DEGREES F. THE FROST-FREE PERIOD IS 165 TO 210 DAYS.

ESTIMATED SOIL PROPERTIES

DEPTH: (IN.)		USDA TEXTURE		UNIFIED		AASHTO		FRACT: PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO.				LIQUID LIMIT		PLAS- TICITY	
								(PCT):	4	10	40	200			INDEX
0-7	SIL			ML		A-4		0	100	95-100	90-100	85-100	30-35	5-10	
7-20	SIL, SICL			ML		A-4, A-6		0	100	95-100	90-100	90-100	30-40	5-15	
20-28	SIC, C			CH		A-7		0	100	95-100	90-100	90-100	55-70	35-45	
28-60	SIL, SICL			ML		A-4, A-6		0	100	95-100	90-100	85-95	30-40	5-15	

DEPTH: (IN.)		CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEA- BILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION: (PH)	SALINITY (MMHOS/CM)	SHRINK- SWELL POTENTIAL LOW HIGH	EROSION: FACTORS: K T GROUP (PCT)	WIND EROD. MATTER	ORGANIC CORROSIVITY
0-7	15-20	(G/CM3) 1.30-1.40	(IN/HR) 0.6-2.0	(IN/IN) 0.18-0.25	(PH) 5.1-6.0	-	-	LOW HIGH	.43 .32	5	STEEL MODERATE
7-20	15-30	1.25-1.40	0.6-2.0	0.18-0.24	5.1-6.0	-	-	LOW	.49		CONCRETE MODERATE
20-28	40-50	1.25-1.40	<0.06	0.03-0.05	5.1-6.5	-	-	HIGH	.32		
28-60	15-30	1.30-1.40	0.2-2.0	0.15-0.20	6.1-7.3	-	-	LOW	.49		

FLOODING				HIGH WATER TABLE				CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD: POTENT'L	
FREQUENCY	DURATION	MONTHS	(FT)	DEPTH	KIND	MONTHS	(IN)	DEPTH	HARDNESS	DEPTH	HARDNESS	INIT.	TOTAL	GRP	FROST ACTION
NONE			+5-1.5	PERCHED	NOV-MAY	-	-	>60				-		D	-

SANITARY FACILITIES				CONSTRUCTION MATERIAL			
SEPTIC TANK ABSORPTION FIELDS	SEVERE-PONDING, PERCS SLOWLY			ROADFILL	POOR-LOW STRENGTH, WETNESS		
SEWAGE LAGOON AREAS	SEVERE-PONDING			SAND	IMPROBABLE-EXCESS FINES		
SANITARY LANDFILL (TRENCH)	SEVERE-PONDING, TOO CLAYEY			GRAVEL	IMPROBABLE-EXCESS FINES		
SANITARY LANDFILL (AREA)	SEVERE-PONDING			TOPSOIL	POOR-THIN LAYER, WETNESS		
DAILY COVER FOR LANDFILL	POOR-TOO CLAYEY, HARD TO PACK, PONDING			WATER MANAGEMENT			
				POND RESERVOIR AREA	MODERATE-SEEPAGE		

BUILDING SITE DEVELOPMENT				
SHALLOW EXCAVATIONS	SEVERE-PONDING		EMBANKMENTS DIKES AND LEVEES	SEVERE-HARD TO PACK, PONDING
DWELLINGS WITHOUT BASEMENTS	SEVERE-PONDING, SHRINK-SWELL		EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DWELLINGS WITH BASEMENTS	SEVERE-PONDING, SHRINK-SWELL		DRAINAGE	PONDING, PERCS SLOWLY
SMALL COMMERCIAL BUILDINGS	SEVERE-PONDING, SHRINK-SWELL		IRRIGATION	PONDING, DROUGHTY, PERCS SLOWLY
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH, PONDING, SHRINK-SWELL		TERRACES AND DIVERSIONS	ERODES EASILY, PONDING, PERCS SLOWLY
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-PONDING		GRASSED WATERWAYS	WETNESS, ERODES EASILY, DROUGHTY

RECREATIONAL DEVELOPMENT

CAMP AREAS	SEVERE-PONDING, PERCS SLOWLY	PLAYGROUNDS	SEVERE-PONDING, PERCS SLOWLY
PICNIC AREAS	SEVERE-PONDING, PERCS SLOWLY	PATHS AND TRAILS	SEVERE-PONDING, ERODES EASILY

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

CAPABILITY	PASTURE (AUM)	COMMON RYE-GRASS SEED (LBS)	PER. RYE-GRASS SEED (LBS)	GRASS-LEGUME HAY (TONS)	BARLEY (BU)	CORN, SWEET (TONS)	BEANS, SNAP (BU)
NIRR IRR.	NIRR IRR.	NIRR IRR.	NIRR IRR.	NIRR IRR.	NIRR IRR.	NIRR IRR.	NIRR IRR.
3M 3W	8 15	1800	1000	3	42	5	260

WOODLAND SUITABILITY

ORD	MANAGEMENT PROBLEMS	POTENTIAL PRODUCTIVITY
SYM: EROS: N: EQUIP: HAZARD: LIMIT	SEEDL: MORT: Y: WINDTH: PLANT: HAZARD: COMPET	COMMON TREES SITE: PROD: INDX: CLAS
		NONE

WINDBREAKS

SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
NONE							

WILDLIFE HABITAT SUITABILITY

POTENTIAL FOR HABITAT ELEMENTS												POTENTIAL AS HABITAT FOR:	
GRAIN SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLD WILDLF	WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF		
POOR	FAIR	FAIR	POOR	POOR	FAIR	GOOD	GOOD	FAIR	POOR	GOOD	-		

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NLSPN)	PERCENTAGE COMPOSITION (DRY WEIGHT)
OREGON ASH	FRLA	
OREGON WHITE OAK	QUGA4	
HAWTHORN	CRATA	
OTHER SHRUBS	SSSS	
OTHER PERENNIAL GRASSES	PPGG	
OTHER PERENNIAL FORBS	PPFF	

POTENTIAL PRODUCTION (LBS./AC. DRY WT):
FAVORABLE YEARS
NORMAL YEARS
UNFAVORABLE YEARS

FOOTNOTES

STATE <u>OREGON</u>		PROJECT <u>DAN BOERSMA - DAIRY</u>		
BY <u>L. OJHA</u>	DATE <u>7/90</u>	CHECKED BY <u>RJR</u>	DATE <u>9-26-90</u>	JOB NO.
SUBJECT <u>ANIMAL WASTE SYSTEM - CAFO.</u>				SHEET <u>1</u> OF <u>9</u>

JOB CLASS III

MR. BOERSMA, A DAIRYMAN NEAR HOPEWELL, REQUESTED ASSISTANCE IN DEVELOPING AN ANIMAL WASTE PLAN ON HIS PROPERTY. DAN HAS LIMITED STORAGE FACILITIES AND IS FORCED TO SPREAD ANIMAL WASTES DURING WINTER MONTHS. BASED ON DAN'S SOILS, CROPPING SEQUENCE, and AVAILABLE ACREAGE, A WASTE STORAGE and UTILIZATION system will be developed to STORE WASTE for 240 DAYS.

INVENTORY DATAEXISTING HERD

- 1) 90 - 1400# HOLSTEIN MILKERS
- 2) 15 - 1400# DRY HOLSTEIN COWS
- 3) 60 - 700# HOLSTEIN HEIFERS
- 4) 20 - 200# CALVES

FACILITY LAYOUT- SEE ATTACHED DRAWING

OTHER DATA

- A) A SCRAPE SYSTEM IS USED FOR COLLECTING MANURE.
- B) A SOLIDS SEPARATOR WILL BE INSTALLED
- C) STORAGE PERIOD - 240 DAYS (OCT-MAY)
- D) WASTE UTILIZATION AREA

STATE OREGON		PROJECT DAN BOERSMA - DAIRY		
BY L. OSUA	DATE 7/90	CHECKED BY	DATE	JOB NO.
SUBJECT ANIMAL WASTE SYSTEM - LAFO				SHEET 2 OF 9

MR. BOERSMA IS UTILIZING THE L.T.A. PROGRAM THROUGH A.S.C.S. AND HAS REQUESTED OUR ASSISTANCE WITH THE FOLLOWING B.M.P.'s

Pg 199-125
DAWIG

BMP 8
BMP 19
BMP 25
BMP 14 & 16
BMP 20

1. ROOF GUTTERS & DOWNSPOUTS
2. WASTE COLLECTION/STORAGE
3. WASTE UTILIZATION
4. WASTE & LOT COLLECTION/TRANSFER
5. INSTALL A SOLIDS SEPARATOR

OTHER BMP'S MR. BOERSMA WILL INSTALL HIMSELF OR W/ OTHER ASSISTANCE INCLUDE:

BMP 16
BMP 22
BMP 25
BMP 31

1. INSTALL PUMPING EQUIPMENT
2. INSTALL PUMPS & PIPELINES
3. APPLY WASTES TO LAND WHEN RUNOFF IS LEAST
4. APPLY WASTES ACCORDING TO CROP NEED

STATE <u>OREGON</u>		PROJECT <u>DAN BOERSMA - DAIRY</u>		
BY <u>L. OSUA</u>	DATE <u>7/90</u>	CHECKED BY	DATE	JOB NO.
SUBJECT <u>ANIMAL WASTE SYSTEM - CAFO</u>				SHEET <u>3</u> OF <u>9</u>

SOLUTION

WASTE COLLECTION & STORAGE

DETERMINE THE VOLUME OF STORAGE
NEEDED FOR 240 DAYS OF:

1. MANURE
2. WASH WATER
3. Bedding
4. SLAB RUNOFF

VOLUME OF MANURE

$$V = (\text{ft}^3/\text{day}) \left(\frac{\text{wt}}{1000} \right) \text{ No.}$$

$$V_{\text{MILKERS}} = (1.3) \left(\frac{1400}{1000} \right) (90) = 163.8 \text{ ft}^3$$

$$V_{\text{DRY COWS}} = (1.1) \left(\frac{1400}{1000} \right) (15) = 23.1 \text{ ft}^3$$

$$V_{\text{HEIFERS}} = (1.3) \left(\frac{700}{1000} \right) (60) = 54.6 \text{ ft}^3$$

$$V_{\text{CALVES}} = (1.3) \left(\frac{200}{1000} \right) (20) = 5.2 \text{ ft}^3$$

$$(\text{Equivalent of } 193 - 1000\# \text{ units}) \text{ TOTAL} = 246.7 \text{ ft}^3/\text{DAY} \checkmark$$

$$\text{TOTAL } V_{\text{MANURE}} \times 240 \text{ days} = \underline{\underline{59,208 \text{ ft}^3}}$$

VOLUME OF WASH WATER

$$V = 0.53 \text{ ft}^3/\text{milk cow/day} \times \text{No. Cows} \times \text{DAYS}$$

$$(0.53) (90) (240) = \underline{\underline{11,440 \text{ ft}^3}} \checkmark$$

Pg 137
DAW 16

STATE	OREGON		PROJECT	DAN BOERSMA - DAIRY	
BY	L. OSUA	DATE	7/90	CHECKED BY	DATE
SUBJECT	ANIMAL WASTE SYSTEM DESIGN - CAFO				JOB NO.
					SHEET 4 OF 9

RAINFALL CALCULATIONS FOR POND AND SLAB RUNOFF.

from slt - TOTAL RAINFALL FOR 240 DAYS = 39.75"
(OCTOBER - MAY)

P9156
ORWIG AVERAGE MAY to Oct EVAPORATION as
A % OF ANNUAL PRECIPITATION = 75%

∴ 25% OCCURS from NOV. to April.

P9155 AVE. ANNUAL LAKE EVAPORATION = 24"

EVAPORATION DURING STORAGE = 6"
.25 X 24" = 6" for 180 days

NET 240 DAY RAINFALL = 39.75" - 6" = 33.75"

25 YR - 24 hr PRECIPITATION = 4.0"

VOLUME OF UNROOFED SLAB AREA = AREA X NET RAIN FALL

$$20,000 \text{ ft}^2 \times 33.75 \frac{\text{in}}{12} = 56,250 \text{ ft}^3$$

ADD Volume for 25 YR - 24 hr. STORM EVENT.

$$20,000 \text{ ft}^2 \times 4 \frac{\text{in}}{12} = 6667 \text{ ft}^3$$

VOLUME OF BEDDING - (SHAVINGS)

slt.

Volume = 3.1 #/day / 1000 animal X 240 DAYS

slt

$$(3.1 \#) (193 \text{ 1000} \# \text{ units}) (240) = 143,592 \#$$

$$9 \# / \text{cu ft} \therefore 143,592 \# / 9 \# = 15,955 \text{ ft}^3$$

P9144

$$\checkmark \text{ FACTOR by } 50\% \quad 15,955 \times .5 = 7977.5 \text{ ft}^3$$

STATE <u>OREGON</u>		PROJECT <u>DAN BOERSMA - DAIRY</u>		
BY <u>L. OSUA</u>	DATE <u>7/90</u>	CHECKED BY	DATE	JOB NO.
SUBJECT <u>ANIMAL WASTE SYSTEM DESIGN - LAFO</u>				SHEET <u>5</u> OF <u>9</u>

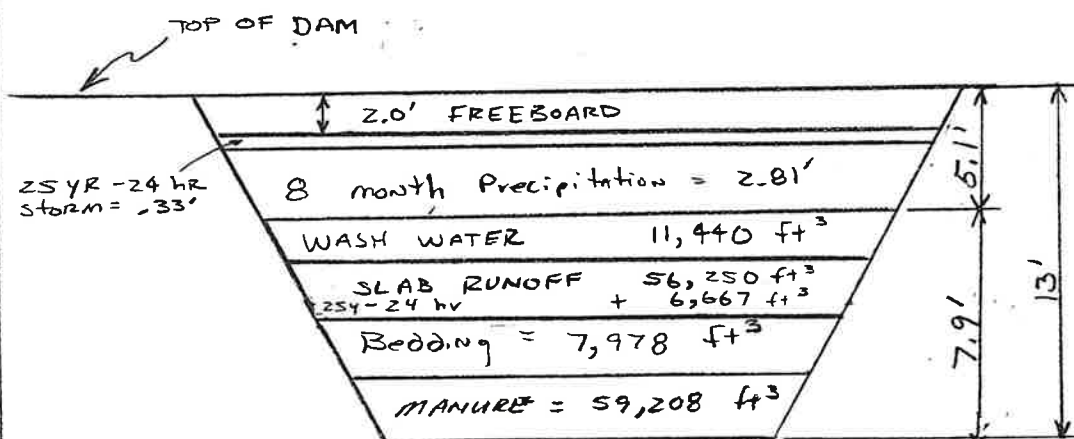
TOTALS for Design Calculations - 240 DAYS

VOLUME OF MANURE	=	59,208 ft ³
VOLUME OF WASH WATER	=	11,440 ft ³
VOLUME from SLAB	=	56,250 ft ³
25 yr-24 hr storm on SLAB	=	6,667 ft ³
VOLUME OF BEDDING	=	7,978 ft ³
		<u>141,543 ft³</u>

ALSO ADDED AS A FUNCTION OF DEPTH ABOVE THE REQUIRED STORAGE VOLUME:

8 mo. PRECIPITATION less EVAPORATION	
33.75" / 12" =	2.81 ft
25 yr-24 hr STORM Precip. =	.33 ft
FREEBOARD (2 ft)	<u>2.00 ft</u>
	<u><u>5.11 ft</u></u>

GRAPHIC SUMMARY



REQUIRED $\Rightarrow$ 141,543 ft³ OR 3.25 AC. ft.

PLUS 5.11 ft. depth

SEE PLANS

Volume Provided @ 7.9 = 3.70 AC-ft. (OK)

STATE <u>OREGON</u>		PROJECT <u>DAN BOERSMA</u>		
BY <u>L. OJUA</u>	DATE <u>7/90</u>	CHECKED BY	DATE	JOB NO.
SUBJECT <u>ANIMAL WASTE SYSTEM DESIGN</u>				SHEET <u>6</u> OF <u>9</u>

WASTE UTILIZATION

DETERMINE NUTRIENTS IN EXCRETED MANURE FOR THE YEAR.

Step 1

$$\text{lbs.} = (N_a) \left(\frac{W+}{1000} \right) (\text{DAILY PRODUCTION}) (\text{DAYS})$$

WILKERS

$$\text{lbs. N} = (90) \left(\frac{1400}{1000} \right) (0.45) (365) = 20,695.5 \checkmark$$

$$\text{lbs. P} = (90) \left(\frac{1400}{1000} \right) (0.07) (365) = 3,219.3$$

$$\text{lbs. K} = (90) \left(\frac{1400}{1000} \right) (0.26) (365) = 11,957.4$$

Pg 137
OAWIG

DRY

$$\text{lbs. N} = (15) \left(\frac{1400}{1000} \right) (0.36) (365) = 2,759.4 \checkmark$$

$$\text{lbs P} = (15) \left(\frac{1400}{1000} \right) (0.05) (365) = 383.3$$

$$\text{lbs K} = (15) \left(\frac{1400}{1000} \right) (0.23) (365) = 1,763.0$$

HEIFERS & CALVES

$$\text{lbs N} = (60) \left(\frac{700}{1400} \right) (0.31) (365) = 3,394.5 \checkmark$$

$$\text{lbs P} = (60) \left(\frac{700}{1400} \right) (0.04) (365) = 438.0$$

$$\text{lbs K} = (60) \left(\frac{700}{1400} \right) (0.24) (365) = 2,628.0$$

$$\text{lbs N} = (20) \left(\frac{200}{1400} \right) (0.31) (365) = 323.3 \checkmark$$

$$\text{lbs P} = (20) \left(\frac{200}{1400} \right) (0.04) (365) = 41.7$$

$$\text{lbs K} = (20) \left(\frac{200}{1400} \right) (0.24) (365) = 250.3$$

TOTALS (for 365 days)

$$N = \underline{27,172.7} \checkmark$$

$$P = \underline{4,082.3}$$

$$K = \underline{16,598.7}$$

STATE OREGON		PROJECT DAN BOERSMA DAIRY	
BY L. OJUA	DATE 7/90	CHECKED BY	DATE
SUBJECT ANIMAL WASTE SYSTEM - DESIGN		JOB NO.	
		SHEET 7 OF 9	

WASTE UTILIZATION - CONT.

STEP 2- ESTIMATE NUTRIENTS REMAINING AFTER EARTHEN STORAGE.

pg 199
CAWIG

$$N - 65\% \quad P - 60\% \quad K - 70\%$$

$$lbs N = (27,172.7)(0.65) = 17,662.3$$

$$lbs P = (4,082.3)(0.60) = 2,449.4$$

$$lbs K = (16,598.7)(0.70) = 11,619.1$$

STEP 3- ESTIMATE NUTRIENTS REMAINING AFTER APPLICATION - USING SPRINKLER -

$$N = 75\% \quad P = 100\% \quad K = 100\%$$

$$lbs N = (17,662.3)(0.75) = 13,246.7$$

$$lbs P = (2,449.4)(1.0) = 2,449.4$$

$$lbs K = (11,619.1)(1.0) = 11,619.1$$

STEP 4- ESTIMATE NITROGEN REMAINING AFTER DENITRIFICATION
SOILS - "AMITY" - SOMEWHAT POORLY DRAINED

pg 200

70% RETAINED

$$\underline{lbs N} = (13,246.7)(70) = \underline{9,272.7}$$

STEP 5- DEDUCT 10% FOR RECALITRANT LOSSES

pg 200

$$lbs N = (9,272.7)(.90) = \underline{8,345.4}$$

$$lbs P = (2,449.4)(.90) = \underline{2,204.5}$$

$$lbs K = (11,619.1)(.90) = \underline{10,457.2}$$

STATE <u>OREGON</u>		PROJECT <u>DAN BOERSMA DAIRY</u>	
BY <u>L. OJUA</u>	DATE <u>7/90</u>	CHECKED BY	DATE
SUBJECT <u>ANIMAL WASTE SYSTEM - DESIGN</u>		JOB NO.	
		SHEET <u>8</u> OF <u>9</u>	

step 6

WASTE UTILIZATION - CONTINUED

pg 201
OAWIG

ESTIMATE AREA Req'd to Recycle NUTRIENTS

MR BOERSMA PLANS TO APPLY WASTES TO

20⁰ ACRES of ALFAIFA/ORCHARD GRASS to be USED for ENSILAGE. ESTIMATED YIELD is 20 TON/ACRE FOR 3 CUTTINGS.

MR. BOERSMA will also grow CORN FOR SilAGE ON 16 ACRES he LEASES ON the SOUTH SIDE OF FINN LANE. ESTIMATED YIELD is 25 TON/ACRE.

WASTE UTILIZATION CALCULATIONS.

pg 201

CROP - ALFAIFA/ORCHARD GRASS for Silage

$$N = 22.1 \#/\text{TON} \quad P = 2.9 \#/\text{TON} \quad K = 19.4 \#/\text{TON}$$

$$\#N = 20 \text{ TON/ACRE} \times 22.1 \#/\text{TON} \times 20 \text{ ACRES} = 8840 \#N$$

$$\#P = 20 \text{ T/AC} \times 2.9 \#/\text{TON} \times 20 \text{ AC} = 1160 \#$$

$$\#K = 20 \text{ T/AC} \times 19.4 \#/\text{TON} \times 20 \text{ AC} = 7760 \#$$

CROP - CORN for SilAGE (WET)

$$N = 7.0 \#/\text{TON} \quad P = 1.3 \#/\text{TON} \quad K = 6.6 \#/\text{TON}$$

$$\#N = 25 \text{ TON/ACRE} \times 7.0 \#/\text{TON} \times 16 \text{ ACRES} = 1050 \#$$

$$\#P = 25 \text{ T/AC} \times 1.3 \#/\text{TON} \times 16 \text{ ACRES} = 520 \#$$

$$\#K = 25 \text{ T/AC} \times 6.6 \#/\text{TON} \times 16 \text{ ACRES} = 2640 \#$$

SUMMARY

from previous
PAGE

OF NUTRIET Avail.

$$N = 8,345.4$$

$$P = 2,204.5$$

$$K = 10,457.2$$

Needed for CROPS

$$N = 8840 + 1050 = 9,890$$

$$P = 1160 + 520 = 1,680$$

$$K = 7760 + 2640 = 10,400$$



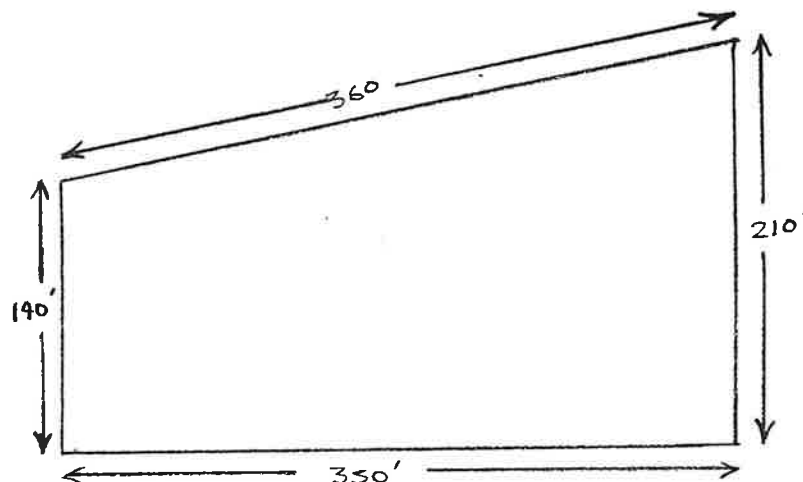
MR BOERSMA HAS ADEQUATE ACRES FOR WASTE UTILIZATION WITH THE PLAN CROP ROTATION.

STATE <u>OREGON</u>		PROJECT <u>DAN BOERSMA DAIRY</u>		
BY <u>L. OSUA</u>	DATE <u>7/90</u>	CHECKED BY	DATE	JOB NO.
SUBJECT <u>ANIMAL WASTE SYSTEM - POND SIZING</u>				SHEET <u>7</u> OF <u>9</u>

GIVEN = 3.25 AC. FT + 5.11 FT Depth Required

FIND = SIZE OF POND NEEDED

TRY A POND W/ FOLLOWING DIMENSIONS -
ft to ft



ANIMAL WASTE POND
CLASS II
for
DAN BOERSMA
9/20/90

Prepared by: Randolph K. Van Hoy

The pond designed for this project is located 70 feet east of the new silage collection tank. It runs parallel to the creek with the toe of the fill slope 50 feet south of the creek.

The pond is trapezoidal in shape, 320 feet long and 140 feet to 200 feet wide. The pond is divided into two cells with a volume ratio of approximately 1:4. The top of the fill is 10 feet wide with an exterior side-slope of 2:1 and an interior side-slope of 3:1. The maximum fill height is 7.5 feet with most of the fill being considerably lower. The depth of the main pond is 13 feet and the depth of the small cell is 12 feet. The main pond is 1 foot deeper to provide needed fill material. There is 2 feet of freeboard. A 2 feet deep, 10 feet wide core trench is located under all pond berms, including the cell divider.

The volume of both cells at a depth of 11 feet in the main pond, at 2 feet of freeboard, is 6.24 acre-feet. This is made up of 1.15 acre-feet in Cell 1 and 5.08 acre-feet in Cell 2. The total surface area at 11 feet is 0.92 acres.

The Animal Waste design requires a storage volume of 3.25 acre-feet at a depth of 7.9 feet. This pond provides 3.70 acre-feet of storage at 7.9 feet.

COST ESTIMATE

RVH 9/24/90 RJB 1-91
ANIMAL WASTE POND

SHEET 1 OF 7

STRIPPING 1366 C.Y. (\$1.30) = \$1776

COMPACTED FILL

Core Trench 1187

Embankment 5129

6316 C.Y. (\$3.00) = \$18,948

ADD'L CUT 897 C.Y. (\$1.00) = \$897

CONCRETE 1 C.Y. (\$150) = \$150

PIPE

25 L.F. - 10" PVC 25 (\$10) = \$250

25 L.F. - 12" PVC 25 (\$13) = \$325

SEEDING 1 acre (\$100) = \$100

SITE PREPARATION \$500

CONTINGENCY 10% = \$2290

\$25,240

2/7

LOCATION	CAFO POND		OWNER	D. BOERSMA	
WATERSHED	TOP 50.5		SUB-WATERSHED	SITE NO.	
FACTOR	BOT 38.5		COMPUTED BY	RKHVH	
ITEM	FILL		CHECKED BY	RJP	
CONTRACT NO.			ESTIMATE	CU. YDS.	ACTUAL CU. YOS.

HEIGHT 3'1/2"

STATION	END AREA SQ. IN.	END AREA SQ. FT.	SUM OF END AREAS SQ. FT.	DISTANCE IN FEET	SECTION PRODUCTS CU. FT.	VOLUME CU. YD.	REMARKS
0+00	6.0	150					
0+60	8.0	240	390	60	23,400		
2+25	8.0	240	480	165	79,200		
3+25	6.6	175	415	100	41,500		
3+75	5.0	112	287	50	14,350		
4+05	4.0	80	192	30	5,760		
4+30	3.0	52	132	25	3,300		
5+25	2.6	43	95	95	9,025		
5+65	3.0	52	95	40	3,800		
6+25	4.0	80	132	60	7,920		
7+20	4.0	80	160	95	15,200		
7+40	2.6	43	123	20	2,460		
7+95	2.0	32	75	55	4,125		
8+45	1.6	22	54	50	2,700		
9+35	3.0	52	74	90	6,660		
9+85	6.0	150	202	50	10,100		
					<u>229,500</u> /54 =	4250 cu.yds.	
1+05A	8.0	240					
1+85A	6.0	150	390	80	31,200		
2+45A	4.0	80	230	60	13,800		
2+65A	2.6	43	123	20	2,460		
					<u>47,460</u> /54 =	879 cu.yds.	
							4250
							879
					FILL	=	5129 cu.yds.

0.5' Striping

EARTHWORK COMPUTATION SHEET

3/7

LOCATION	CAFO POND		OWNER	D. BOERSMA	
WATERSHED	TOP 50.5		SUB-WATERSHED	SITE NO.	
FACTOR	BOT 38.5		COMPUTED BY	RKVH	
ITEM	CUT		CHECKED BY	RJ8	
CONTRACT NO.			ESTIMATE	CU. YDS.	ACTUAL CU. YDS.

DEPTH 3:1/3:1

[illegible]

CUT 1' EXTRA IN MAIN POND (375) = 450 cu. yds. Now Cut Exceeds Fill by 17%

D. BOERSMA

RKUH

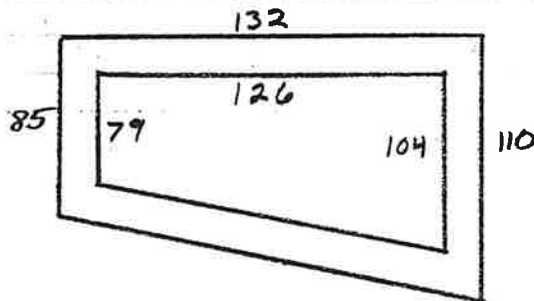
9/17/90

CAFO POND - Earthwork

4

7

CUT MAIN POND 1' ADDITIONAL TO 375



$$A_{IN} = 11,529'2$$

$$A_{OUT} = 12,721$$

$$V = \frac{A_{IN} + A_{OUT}}{2} (1) = 12,200'3$$

$$V = 451 \text{ cu. yds}$$

D, BOERSMA

RTH

9/12/90

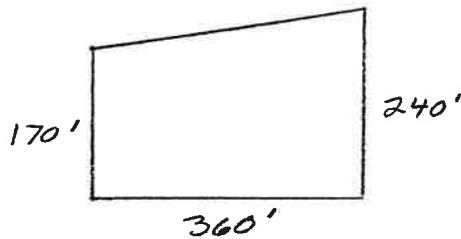
EARTHWORK CALLS.

5

7

STRIPPING

Depth of Stripping = 6"

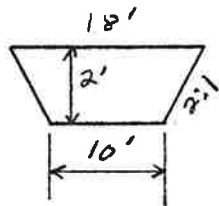


$$AREA = \frac{170+240}{2} (360) = 73,800 \text{ sq. ft.}$$

$$\text{VOLUME STRIPPING} = 73,800 (0.5) = 36,900 \text{ cu. ft.}$$

$$\underline{\underline{1366 \text{ cu. yds.}}}$$

CORE TRENCH



STA 0+00 to STA 9+85 + STA 1+05A to STA 2+65A

$$A = \left(\frac{10+18}{2} \right) 2 = 28 \text{ sq. ft.}$$

$$\text{VOLUME} = (985+160) 28 = 32,060 \text{ ft}^3$$

$$\underline{\underline{1187 \text{ cu. yds.}}}$$

D. BOERSMA

RKVH

9/12/190

POND VOLUME.

CELL 1

STAGE (ft)	ELEV	AREA (ft ²)	AREA (ac)	STOR. (ac-ft)	Σ STOR (ac-ft)
0	38.5	1326	0.030	0	0
3	41.5	3015	0.069	0.149	0.15
5	43.5	4669	0.107	0.176	0.33
7	45.5	6654	0.153	0.260	0.59
10	48.5	9816	0.225	0.567	1.15
12	50.5	12,721	0.292	0.517	1.67

D. BOERSMA

RKVH

9/12/90

POND VOLUME

7

7

CELL 2 MAIN POND

STAGE (ft)	ELEV	AREA (ft ²)	AREA (ac)	STOR. (ac-ft)	Σ STOR. (ac-ft)
0	37.5	11,529	0.265	0	0
1	38.5	12,721	0.292	0.280	0.28
4	41.5	16,985	0.390	1.023	1.30
6	43.5	20,735	0.476	0.866	2.17
8	45.5	24,375	0.560	1.036	3.21
11	48.5	30,147	0.692	1.878	5.08
13	50.5	34,706	0.797	1.489	6.57

BOTH CELLS

MAIN POND STAGE (ft)	ELEV.	AREA (ft ²)	AREA (ac)	STOR. (ac-ft)	Σ STOR. (ac-ft)
0	37.5	11,529	0.27	0	0
1	38.5	14,047	0.32	0.280	0.28
4	41.5	20,000	0.49	1.172	1.45
6	43.5	25,404	0.58	1.042	2.49
8	45.5	31,029	0.71	1.296	3.79
11	48.5	39,963	0.92	2.445	6.24
13	50.5	47,427	1.09	2.006	8.24

1ST ESTIMATE

DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DATE
9/27/90

CHECKED BY

DATE

JOB NO.

SHEET

WASTE STORAGE POND (See Pond Design)

\$25,240

SOLID SEPARATOR (from Supplier)

\$16,500

SOLIDS STORAGE FACILITY

ESTIMATE

40' X 40' - 6' Wall on 2 Sides

900 ft² SLAB X 5" = 375 cft

700 ft² Footing X 10" = 637

480 ft² WALL X 8" = 320 cft

2080 ft²

1332 cft

49 cu.yds (#150/cu.yd) = \$7400

Site Prep = \$500

Gravel = 6" X 1600 ft² = 300 yd
300 yd X \$6 = \$180

\$8080

TOTAL

\$49,820

INSPECTION PLAN
FOR
WASTE STORAGE POND

Name and Address

Dan Boersma

12545 SE Finn Lane

Dayton, Or 97114 868-7615

GENERAL:

Job Class III

This project consists of constructing a two cell Animal Waste Storage Pond. Storage will be provided by a combination of earth excavation and compacted earth fill dam. Pond cell # 1 will receive liquids from a solid manure separator. A concrete weir will be constructed between ponds # 1 and # 2 to allow retention of any residual solids by pond cell # 1 and to provide an over flow into pond cell # 2. The pond excavation and fill for dam will be constructed according to SCS plans and specifications. Both pond cells will be constructed with a minimum of 2 feet of free board above 10" PVC overflow pipes. A permanent grass cover will be seeded on all disturbed areas above water line, upon completion of earth work. The existing subsurface drain tile within the project area will be removed during excavation of pond and cut off trenches or before. The geology investigation determined soils at this site are suitable for pond and embankment construction.

SECTION 1. Items of work to be Inspected

The items to be inspected during construction include; stripping of top 6" of project area, removal of subsurface drain tile, excavation of pond and cut off trenches, installation of compacted fill, construction of concrete weir box and installation of 10" PVC over flow pipes.

SECTION 2. Timing of Inspection

It is anticipated that the project will be constructed in July or August and will take two to four weeks to complete.

SECTION 3. Skills Needed to Perform Required Inspection

A technician with skills in construction lay out, earth excavation, and placement of compacted fill for earth dam is needed. The job will require frequent inspection.

SECTION 4. Staff Hours Needed to Perform Inspection

- | | |
|--|---------|
| 1. LAYOUT - Staking of project parameters prior to stripping | 3 Hrs. |
| Locate and remove drain tile | 3 Hrs. |
| Staking of cut and fill after tile removal & stripping | 8 Hrs. |
| 2. POND & CUT OFF TRENCH EXCAVATION | 16 Hrs. |
| Inspect and approve all foundations before any placement of embankment, inspect cut slopes as constructed. | |
| 3. EMBANKMENT CONSTRUCTION | 45 Hrs. |
| Inspect frequently, earth fill layers for proper compaction, moisture content and suitability of fill materials, including line and grade of embankment, and installation of concrete weir and PVC over flow pipes and cut off collars. Check 25% for compaction, daily. | |
| 4. FINAL INSPECTION | 4 Hrs. |
| Inspect final grade and finish prior to equipment removal | |
| 5. GRASS SEEDING OF DISTURBED AREAS | 1 Hr. |

TOTAL

80 HRS.

Name and Project.

Dan Boersma

12545 SE Finn Lane

Dayton, Or 97114

INSPECTION SCHEDULE

1. Go over construction plans and specifications with landowner and contractor.
2. Preliminary layout of project prior to stripping
3. Inspection of stripping and tile removal
4. Construction staking for cut and fill
5. Inspect core trench and pond excavation
6. Inspect construction of embankment, concrete weir and PVC pipe and cut off collar
7. Inspect finish grade of all earth work and make final measurements
8. Insure grass and fertilizer are properly applied. Document records of inspections and certifications in the cooperator file.

SECTION 5. Testing Equipment and Facilities Needed

Surveying equipment and a compaction testing tool are needed for this job.

SECTION 6. Name and Qualifications of Personnel

Larry Ojua, Dean O'Reilly, & Randy Van Hoy _____ in McMinnville, will be available for this project. _____ They have had some experience with the SCS on pond construction inspection, this project will be used as OJT for them. Assistance will be provided in inspection as needed by the Area Office engineering staff.

SECTION 7. Availability of Personnel

Larry Ojua, Dean O'Reilly, and Randy VanHoy^{are} available to inspect the Animal Waste Storage Pond Construction Project.

SECTION 8. This pond has a dam height of 7.5 feet, and will store 6.24 acre feet at capacity. (H.W.L.) The construction plans will will not (circle one) require approval of the SCS State Conservation Engineer. _{RP}

Robert Tracey

Robert Tracey D.C.
McMinnville, OR

1/10/91

Date

Robert J. Pranger

Robert J. Pranger, C.E.
Hillsboro, OR

1-16-91

Date

INSPECTION PLAN
FOR
WASTE STACKING FACILITY

Dan Boersma

12545 SE Finn Lane

Dayton, Or 97114

GENERAL

This project consists of constructing an uncovered reinforced concrete waste stacking facility for storage of separated animal waste solids. Follow SCS Specification and Standard Plan (OR-E-515

SECTION 1. Items of work to be inspected

The items to be inspected during construction include:

- 1) site preparation 2) excavation for footings and slab and fill as needed 3) Concrete forming 4) placement of reinforced steel 5) concrete placement and finishing 6) form removal. Concrete shall be placed in presence of engineer or engineer representative, contractor to notify SCS engineer before construction is to begin.

SECTION 2. Timing of inspection

It is anticipated that the project will be constructed in August 1990, and will take 2-4 weeks to complete.

SECTION 3. Skills needed to perform inspection

A technician skilled in inspection of concrete and earth work is needed.

SECTION 4. Staff hours needed for inspection

- | | |
|---|---------|
| 1. Layout - staking of project parameters..... | 4 hrs. |
| 2. Site preparation - inspect excavation and fill for foundation
of footings and slab floor..... | 2 hrs. |
| 3. Inspect placement of - forms (2 hrs.), reinforced steel (2 hrs.)
and concrete (6 hours)..... | 10 hrs. |
| 4. Final inspection..... | 2 hrs |
| TOTAL..... | 18 hrs. |

SECTION 5. Testing equipment needed

Concrete slump testing equipment

SECTION 6. Name and qualifications of personnel

Larry Ojua, Dean O'Reilly, and Randy Van Hoy, in McMinnville, will be available for this project. They have had some inspection experience, but some additional co-inspection with area engineer will be required. Assistance will be provided in inspection as needed by the area office engineering staff.

SECTION 7. Availability of personnel

Larry O., Dean O., and Randy V.H. are ~~xx~~ available to inspect the waste storage stacking facility construction project.

Robert Tracey D.C.
McMinnville, OR.

Date

1/70/91

Robert J. Pranger C.E.
Hillsboro, OR

Date

1-16-91

INSPECTION SCHEDULE

1. Go over construction plans and specifications with landowner and contractor.
2. Preliminary layout of project
3. Inspection of foundation excavation and fill placement
4. Inspect placement of forms, reinforcement steel and concrete
5. Inspect finished concrete
6. Insure grass and fertilizer are properly applied to disturbed soil areas. Document records of inspections and certifications in the co-operator file.

Waste Management System (No.)

Definition

A planned system in which all necessary components are installed for managing liquid and solid waste, including runoff from concentrated waste areas, in a manner that does not degrade air, soil, or water resources.

Scope

This standard establishes the minimum acceptable requirements for planning and operating waste management systems. It does not apply to the design and installation of the system components.

Purpose

To manage waste in rural areas in a manner that prevents or minimizes degradation of air, soil, and water resources and protects public health and safety. Such systems are planned to preclude discharge of pollutants to surface or ground water and to recycle waste through soil and plants to the fullest extent practicable.

Conditions where practice applies

This practice applies where: (1) waste is generated by agricultural production or processing; (2) waste from municipal and industrial treatment plants is used in agricultural production; (3) all practice components necessary to make a complete system are specified; and (4) soil, water, and plant resources are adequate to properly manage the waste.

Planning

General. Waste, as used in this standard, includes both liquid and solid waste, waste water used in processing, and polluted runoff such as that from a feedlot.

A waste management system for a given enterprise shall include the components necessary to properly manage waste and prevent degradation of air, water, soil, and plant resources. A system may consist of a single component, such as a diversion, or may consist of several components. Components shall not be installed until an overall waste management system has been planned.

Components. Components of complete waste management systems may include, but are not limited to, the following:

Debris basins	Pond sealings or linings
Dikes	Subsurface drains
Diversions	Surface drains
Fencing	Waste storage ponds
Grassed waterways or outlets	Waste storage structures
Irrigation systems	Waste treatment lagoons
Irrigation water conveyance	Waste utilization

Design criteria for individual components shall be according to standards in the National Handbook of Conservation Practices. The criteria for the design of components not included in this handbook shall be consistent with sound engineering principles.

Planning considerations

1. Waste should be used to the fullest extent possible by recycling it through soil and plants. If very little land is available, such practices as lagoons and oxidation ditches may be needed.
2. Clean water should be excluded from concentrated waste areas to the fullest extent practical.
3. Manure shall be collected and safely spread on land, treated, or stored until it can be safely spread. Adequate storage must be provided to allow spreading during favorable weather and at times compatible with crop management and available labor.
4. Polluted runoff and seepage from concentrated waste areas shall be intercepted and directed to storage or treatment facilities for future disposal or be directly applied to land in an acceptable manner.
5. Waste water from processing shall be collected and directly applied, stored, or treated before using it.
6. Adequate drainage, erosion control, and other soil and water management practices shall be incorporated to prevent system-related problems.

2-2 Waste Management System

7. The overall system shall include sufficient land for proper use or disposal of waste at locations, times, rates and volumes that maintain desirable water, soil, plant, and other environmental conditions. Appropriate waste-handling equipment shall be available for effective operation of the system.

8. The system should be outside major viewsheds to conserve visual resources. Vegetative screens and other methods should be provided, as appropriate, to improve visual conditions.

Sequence of installation. System components shall be planned and installed in a sequence that insures that each will function as intended without being hazardous to others or to the overall system.

Safety. Safety features and devices shall be included in waste management systems, as appropriate, to protect animals and humans from drowning, dangerous gases, and other hazards. Fencing shall be provided, as necessary, to prevent livestock and others from using the facilities for other purposes.

System operation

The owner or operator shall be responsible for operating and maintaining the system. An opera-

tion plan shall be prepared for this use. It should provide specific details concerning the operation of each component and should include:

1. Timing, rates, volumes, and locations for application of waste and, if appropriate, approximate number of trips for hauling equipment and an estimate of the time required.
2. Minimum and maximum operation levels for storage and treatment practices and other operations specific to the practice, such as estimated frequency of solids removal.
3. Safety warnings, particularly where there is danger of drowning or exposure to poisonous or explosive gases.
4. Maintenance requirements for each of the practices.

Plans and specifications

Plans and specifications for waste management systems shall be in keeping with this standard and standards for individual system components.

WASTE TRANSFER

DEFINITION

Structures, conduits, or equipment installed for the movement or transfer of animal waste for storage, treatment, or disposal.

SCOPE

This standard establishes the minimum acceptable requirements for design, construction, and operation of waste transfer system components. It includes mechanical pumping or elevation differential (gravity head) systems. It does not cover waste utilization and waste storage/treatment facilities.

PURPOSE

To convey animal waste through a hopper or reception pit, a pump (if applicable), and a conduit to a waste storage/treatment facility or a loading area, and from storage/treatment to an area for final disposal.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where waste is generated by agricultural production or processing, a conveyance system is necessary to transfer waste from the source location to a storage/treatment facility and/or a loading area, and/or from storage/treatment to an area for final disposal.

This practice will be installed only when the essential components of the overall waste management system have been determined, planned and approved.

PLANNING CONSIDERATIONS

Consideration will be given to the following in planning of waste transfer systems:

1. Utilization of topography to generate head to reduce pumping requirements;
2. Economics, overall waste management plans, and health and safety factors;
3. Possible contamination of domestic water systems and ground water;
4. Loading and unloading equipment;
5. Appropriate federal, state, and local regulations;
6. Subsurface conditions, i.e., depth to bedrock, water table, etc.;
7. When applicable, compatibility to joint use of waste transfer with irrigation system design requirements.

DESIGN CRITERIA

Structures. All structures, including those which provide a work area around pumps, will be designed to withstand the anticipated static and dynamic loadings. The structure must withstand earth and hydrostatic loadings in accordance with Practice Standard 313, Waste Storage Structure. The minimum thickness of component elements of concrete structures will be 5 inches.

Hydraulic design of structures will be in accordance with Practice Standard 587, Structures for Water Control.

The design will consider the safety of humans and animals during construction and operation. Open structures will be provided with covers or barriers such as gates, fences, etc. to insure adequate safety. When needed, covers will be designed to support the anticipated dead and live loads.

When manure is scraped with a front-end loader or an alley scraper system, a grate to provide the necessary opening for manure flow into the structure will be a minimum of 9 square feet with at least one dimension no smaller than 4 feet. The grate will be designed to support the anticipated loads.

When curbs are needed in conjunction with structures, they must be constructed of either concrete or wood. Curbs must be high enough to insure total manure flow into the structure and be adequately anchored.

Pipelines. Design of pipelines will be in accordance with Practice Standard 430, Irrigation Water Conveyance. The minimum capacity of pipelines from collection facilities to storage/treatment facilities will be the maximum flow anticipated on a daily basis. The minimum capacity of pipelines from storage/treatment facilities to an area of final disposal will be such that storage/treatment facilities can be emptied within the time limits of the management plan for the utilization of manure. Gravity pipelines will be designed to have velocities of 2.0 to 6.0 f.p.s. to minimize sedimentation and friction losses. Provisions will be made for flushing pipelines with clean water.

In selection of pipe material consideration will be given to corrosion resistance of pipe materials and water tightness of joints.

Cleanout manholes will be provided for gravity pipelines at a maximum interval of 200 feet for lines carrying non-bedded manure. For bedded manure, the maximum interval will be 150 feet. Gravity pipelines will not have curves or bends except minor deflections (less than 10 degrees) in the pipe joints.

Pipelines from enclosed buildings will be provided water-sealed trap and vent or similar devices to control gas entry into buildings.

Other Conduits. Concrete lined ditches will be designed in accordance with Practice Standard 428A, Irrigation Water Conveyance-Reinforced Concrete Ditch and Canal lining. A minimum design velocity of 1.5 feet per second will be used. Consideration in design will be given to clean out of deposition in the ditch.

Pumps. Pumps will be sized to transfer waste at required system head and volume. Type of pump will be based on the consistency of waste. Design considerations for pump installations will be based on manufacturers' recommendations.

OPERATION AND MAINTENANCE

Operation and maintenance will be in accordance with the requirements specified in the overall waste management plan.

PLANS AND SPECIFICATIONS

Plans and specifications for installing waste transfer systems will be in accordance with this standard and will describe the requirements for applying the practice to achieve its intended purpose.

WASTE TRANSFER

SPECIFICATIONS

LUMBER SPECIFICATIONS

1. Structural lumber shall conform to the Western Wood Products Association grading rules. Treated lumber shall be impregnated with pentachlorophenol at a minimum retention rate of 0.5 lbs. per cubic foot or chromated copper arsenate with a minimum retention rate of 0.4 lbs. per cubic foot (AWPA-C2) or equal treatment.
2. Lumber framing shall be true and exact. Lumber shall be accurately cut and assembled to a close fit and shall have even bearing over the entire contact surfaces. No open or shimmed joints shall be accepted. Nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood.
3. Surfacing, cutting, and boring of lumber shall be done before treatment. If cutting and boring of treated lumber is necessary, all cuts and borings shall be carefully trimmed and coated with not less than three brush coats of the same preservative used in the original treatment.

HARDWARE SPECIFICATIONS

1. Steel bolts shall conform to the requirements of ASTM specification A-307, Grade A. Galvanized or zinc coated bolts shall be used.
2. Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood. Cast iron washers shall be used when the bolt will be in contact with earth. Zinc-plated steel standard flat washers shall be used in all other locations.
3. Structural shapes, rods and plates shall be structural steel conforming to the requirements of ASTM specification A-36 and shall be galvanized. All nails shall be galvanized.

CONCRETE SPECIFICATIONS

1. The concrete for all structures except concrete-lined ditches shall have a minimum compressive strength at 28 days of 3000 psi. Minimum cement content shall be 6 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.
2. Forms shall be mortar tight, substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions.

Waste Transfer Interim-2

3. The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into the corners and angles of the forms and around all reinforcement. Immediately after placement, the concrete shall be consolidated by vibrating.
4. Forms shall not be removed before 24 hours have elapsed after placement of concrete.
5. Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. The footings shall be kept continuously moist for the entire period or until curing compound is applied. Moisture shall be maintained by sprinkling, flooding, covering with plastic sheeting, continuously moistened canvas, cloth mats, straw, or other approved material. A curing compound may be applied in lieu of wetting. Curing compound shall meet the requirements of ASTM C 309, Type 2.

PIPE

Pipe shall be installed in accordance with applicable specifications for Practice Standard 430, Irrigation Water Conveyance.

OTHER CONDUITS

Concrete ditches shall be installed in accordance with the specifications for Practice Standard 428-A, Irrigation Water Conveyance--Reinforced Concrete Ditch and Canal Linings.

PUMPS

Pumps and appurtenances shall be installed in accordance with the manufacturer's recommendations.

Diversion Specifications

All ditches or gullies not filled, and undesirable trees and other obstructions not removed before construction begins shall be part of the diversion construction. The diversion shall be constructed to planned alignment, grade, and cross section.

If underground conduits are located under diversion ridges, mechanical compaction or water packing should be required. Installation and backfill of conduit trenches shall be made in advance to allow adequate settlement. The materials used for the inlet

and conduit shall be suitable for the purpose intended and shall meet the requirements for subsurface drains (606). Diversion ridges constructed across gullies or depressions shall be compacted sufficiently to keep settlement within tolerable limits. The surface of the finished diversion shall be reasonably smooth and present a workmanlike appearance.

Topsoil should be stockpiled and spread over excavations and other areas to facilitate revegetation. If vegetation is needed, seedbed preparation, seeding, fertilizing, and mulching shall comply with standards in local technical guides.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CONSTRUCTION SPECIFICATION

No. 378

POND
EMBANKMENT PONDS

I. Clearing and Stripping

The sites of the borrow pits shall be stripped to sufficient depth to remove all vegetation, roots, brush, sod and other objectionable material.

The foundation area shall be cleared of all trees, stumps, roots, brush, boulders, sod and debris. All channel banks and sharp breaks shall be sloped to no steeper than 1:1. All topsoil containing excessive amounts of organic matter shall be removed. Loose earth shall not be left on the foundation area to a depth in excess of 6" above approved undisturbed foundation material. The surface of the foundation area shall be thoroughly scarified before placement of the embankment material.

II. Excavation

A. Cutoff Trench

The cutoff trench shall be excavated to the lines and grades shown on the drawings or as staked by the engineer. Compacted backfill shall not be placed in the trench until the engineer has inspected and approved the trench. The trench shall be kept free of standing water during backfill operations.

B. Spillway

The completed spillway excavation shall conform to the lines, grades, bottom width and side slopes shown on the drawings.

C. Outlet Conduit

Trench excavation for installation of an outlet conduit, where shown on the drawings shall be made in original ground. Excavation in compacted fill may be allowed provided the bottom of the trench is at or near undisturbed foundation. The trench shall conform to lines and grades shown on the drawings.

Compacted Earthfill and Backfill

A. Material

All fill materials shall be obtained from approved borrow pits and from excavations required for other parts of the work. The selection, blending, routing and disposition of materials within the embankment shall be subject to the approval of the Engineer. Fill materials shall contain no sod, brush, roots, or other perishable or unsuitable material. Cobbles and rock fragments having a maximum dimension of more than six inches shall be removed from the materials prior to compaction, and be disposed of or placed in areas designated by the Engineer.

B. Placement

The placing and spreading of the fill material shall be started at the lowest point of the foundation. The fill shall be brought up in approximately horizontal layers parallel to the axis of the dam and of such thickness that the required compaction can be obtained with the equipment used.

Fill placed around structures will be brought up at approximately uniform height on all sides of the structure.

C. Moisture

The moisture content of fill material shall be such that the required degree of compaction can be obtained with the equipment used.

The proper moisture content for compaction by either compaction methods 1, 2 or 3 under item III D below, will be determined by inspection during the placement operation.

As far as practicable the material shall be brought to the proper water content in the borrow pit before excavation. Supplemental water, when required, may be applied by sprinkling the materials on the fill. Uniform distribution of the moisture shall be obtained by discing, blading or other approved method prior to compaction.

Material that is too wet for proper compaction shall either be removed or allowed to dry prior to compaction.

D. Compaction

Compaction shall meet the requirements of the method specified in the Construction Requirements and as described below:

1. Sheepfoot roller - the maximum layer thickness shall be 8 inches before compaction. The roller shall have

staggered, uniformly spaced tamping feet and be equipped with suitable cleaners. The weight of the roller shall be not less than 2500 pounds per foot of width. The maximum speed of the compaction equipment shall be 3 miles per hour. The entire surface, of each layer placed should receive 6 passes of this equipment to attain the necessary compaction. Adjustment in the number of passes may be necessary during construction.

2. Pneumatic tired equipment - The maximum layer thickness before compaction shall be 6 inches. A loaded scraper may be considered a pneumatic roller. The wheels of this equipment must pass over 90 percent of the surface of each lift before a new lift is placed.
3. ~~Track laying equipment (bulldozer) - The maximum layer thickness before compaction shall be 4 inches. The tracks of the equipment must pass over 90 percent of the surface of each lift before a new lift is placed.~~
4. ~~Compaction shall result in densities equal to or greater than 95 percent of the maximum obtained by laboratory compaction at optimum moisture of like soils in accordance with the procedure given in ASTM D-698, Method A.~~
5. ~~Compaction shall result in densities equal to or greater than 90 percent of the maximum obtained by laboratory compaction at optimum moisture of like soils in accordance with the procedure given in ASTM D-1557, Method A.~~

Heavy compaction equipment shall not be operated within 2 feet of any structure. Hand directed tampers or compactors shall be used on areas not accessible to heavy compaction equipment, and within 2 feet of any structure. Fills compacted in this manner shall be placed in layers not greater than 4 inches in thickness before compaction, and shall meet the same density requirement as for adjacent areas.

Compliance with compaction requirements will be determined by the procedure given in ASTM D-1556 or D-2167 for methods 4 and 5 and by observation of performance for methods 1, 2, and 3.

Fill not meeting the specified requirements shall be reworked or removed and replaced with acceptable fill.

The passage of heavy equipment will not be allowed (1) over cast-in-place conduits prior to seven days after placement of the concrete, or (2) over any type of conduit until the compacted back-fill has been placed over the top surface of the structure equal to

one-half the clear span width of the structure or pipe, or two feet whichever is greater.

Compaction of backfill adjacent to structures shall not be started until after the expiration of the following minimum time interval after placement of the concrete:

Walls and counterforts	10 days
Antiseep collars, conduits, and cantilever outlet bents	3 days

IV. Concrete Work

Concrete work under these specifications shall be constructed to the dimensions, lines and grades as shown on the drawings. The subgrade for concrete shall be prepared as shown on the drawings or as directed by the engineer. Concrete strength shall be 3000 psi at 28 days or as specified in the Construction Requirements. Proportioning given in B below will be accepted as meeting this strength requirement.

A. Materials

1. Cement -- Shall be Type II Portland Cement unless otherwise specified, and shall be free of lumps and partially set masses.
2. Water -- Shall be free from acid, alkali, oils or organic matter. The temperature of mixing water shall be not more than 150° F when introduced into the mixer.
3. Aggregate -- Shall be clean, hard, strong and durable, free from dirt and other substances deleterious to concrete. The fine and coarse aggregate shall be a well graded mix approved by the Engineer. The maximum size of aggregate shall be 1-1/2 inches.
4. Entrained Air -- May be used; however, the air content shall not be more than 6 percent.

B. Proportioning

Concrete shall be proportioned to include not more than 7 gallons of water per sack of cement nor less than 5-1/2 sacks of cement per cubic yard of concrete.

C. Mixing

Mixing shall be continued for not less than 1½ minutes after all materials, including water, have been added. Each batch shall be completely discharged before the mixer is recharged.

D. Forms

Forms shall conform to the shapes, lines and dimensions as shown on the drawings. They shall be braced and/or tied together so as to maintain position and shape and be sufficiently tight to prevent leakage of mortar. Forms shall be thoroughly oiled or wetted and cleaned of debris prior to placement of concrete.

Forms shall not be removed without the approval of the engineer.

E. Reinforcing Steel

All reinforcing bars shall be deformed bars conforming to the requirements of the current ASTM Specification A615.

All reinforcement shall be free from rust, oil, grease, paint or other deleterious matter.

Items to be embedded in the concrete shall be positioned accurately and firmly anchored to prevent displacement during placement of concrete.

Welded wire reinforcing, when shown on the drawings, shall conform to the requirements of the current ASTM Specification A185.

F. Placement

No concrete shall be placed until the subgrade, forms, and reinforcing steel have been inspected and approved by the engineer.

The concrete shall be deposited as closely as possible to its final position and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. The depositing of concrete shall be regulated so that the concrete may be consolidated with a minimum of lateral movement.

Consolidation of concrete may be accomplished by means of internal type mechanical vibrators, rodding, spading, or hand tamping.

G. Construction Joints

Construction joints shall be provided as shown in the plans or as approved by the Engineer. Joints shall be thoroughly cleaned and laitance removed before a new pour is made. Each joint shall be wetted immediately before the placing of new concrete.

H. Finishing

After the concrete has been consolidated, the unformed surfaces shall be given a wood float finish.

Immediately after form removal, formed surfaces shall be cleaned of all defective concrete and effectively repaired.

I. Protection and Curing

Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period. Moisture shall be maintained by sprinkling, flooding or fog spraying or by covering with continuously moistened canvas, cloth mats, straw earth or other approved material. For formed surfaces, the protection may be accomplished by leaving the forms in place and keeping them wet for the entire curing period.

In lieu of water curing, the concrete shall be cured by spraying with an approved sealing compound. The sealing compounds shall be applied in an approved manner as soon as practicable after the concrete is finished. All surfaces shall be kept moist until the compound is applied.

J. Concreting in Cold Weather

Before any concrete is placed, all ice, snow, and frost shall be completely removed from all surfaces to be in contact with the new concrete and the temperature of these surfaces shall be raised to as close as may be practical to the temperature of the new concrete that is to be placed thereon. No concrete shall be placed on a frozen subgrade or on one that contains frozen materials.

Concrete shall not be mixed or placed when the daily minimum atmospheric temperature is less than 40° F, unless facilities are provided to insure the adequate protection of the concrete.

The temperature of the concrete at the time of placing shall not be less than 50° F nor more than 90° F. The temperature of all aggregates and mixing water shall be not more than 100° F when introduced into the mixer.

When the daily minimum temperature is less than 40° F, the structures must be insulated or housed and heated for the placement and curing period, and the temperature of the concrete and air within the enclosure shall be maintained at not less than 50° nor more than 90° F.

The use of accelerators or antifreeze compounds will not be allowed.

V. Drainage

Graded sand and gravel filters or filter drains shall be constructed as shown on the drawings or as directed by the Engineer.

Trenches for the filter or filter drains shall be excavated to lines, shapes, and dimensions shown on the drawings. Over-excavation disturbing the compacted foundation will not be permitted, and any disturbed material shall be removed and replaced with compacted earth fill or filter material. The sand and gravel shall be placed and tamped in place to the dimensions shown. When drain pipes are used, they will be installed on line and grade, without displacement due to placement of filter material.

The filter material shall conform to the following gradation unless otherwise specified.

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing</u>
2"	85-90
3/4"	50-90
#16	15-50
Less than #16	0-15

VI. Vegetative Requirements

A protective cover of vegetation shall be established on all exposed surfaces of the embankment spillway, and borrow areas to the extent practicable under prevailing soil and climatic conditions. The embankment and spillway shall be fenced where necessary to protect the vegetation.

Waste Storage Pond (No.)

Definition

An impoundment made by excavation or earthfill for temporary storage of animal or other agricultural waste.

Scope

This standard establishes the minimum acceptable requirements for design, construction, and operation of waste storage ponds. Embankments are limited to an effective height of 35 ft or less and to hazard class (a). This standard does not apply to waste treatment lagoons or to waste storage structures.

Purpose

To store liquid and solid waste, waste water, and polluted runoff to reduce pollution and to protect the environment.

Conditions where practice applies

This practice applies where: (1) an overall waste management system has been planned; (2) waste is generated by agricultural production or processing; (3) storage is necessary to properly manage the waste, and (4) soils and topography are suitable for construction.

Planning considerations

Location. Waste storage ponds should be as close to the source of waste and polluted runoff as practicable. Due consideration should be given to economics, the overall waste management plan, and health and safety factors. The ponds should be located where prevailing winds, vegetative screening, and building arrangement minimize odor and visual resource problems. Nonpolluted runoff should be excluded to the fullest extent possible.

Waste storage ponds shall not be located on flood plains unless they are protected from inundation or damage from a 25-year flood event.

Solids separation. To minimize frequency of solids removal from runoff storage ponds, direct polluted runoff through vegetative filter strips, low-gradient channels, or debris basins to remove readily settleable solids. Settling facilities should have adequate capacity to store settled solids for a reasonable period, based on climate, equipment, and method of disposal. If animal manure, such as from dairy cows, is flushed into a storage pond, a solids separator may be provided for removing fibrous solids to facilitate pumping and irrigation.

Design criteria

Soil and foundation. Locate pond on soils of slow to moderate permeability or on soils that can seal through sedimentation and biological action. Avoid gravelly soils and shallow soils over fractured or cavernous rock. If self-sealing is not probable, the storage pond shall be sealed by mechanical treatment or by the use of an impermeable membrane. Do not construct to an elevation below the seasonal high water table unless considered as a special design.

Storage period. The storage period is the maximum anticipated length of time between emptying, based on climate, crops, equipment, and labor.

Design volume. Waste storage ponds shall store the design volume. Design volume is the minimum volume required to store waste for the storage period. It is the total of the following:

- | With drainage area— | Without drainage area— |
|---|---|
| 1. Manure, waste water, and normal runoff ¹ | 1. Manure and waste water ¹ |
| 2. Normal precipitation less evaporation on pond surface ¹ | 2. Normal precipitation less evaporation on pond surface ¹ |
| 3. 25-year, 24-hour runoff | 3. 25-year, 24-hour precipitation on pond surface |
| 4. Solids accumulation ² | 4. Solids accumulation ² |

¹Accumulated during the storage period.

²For the period between solids removal. This applies mainly to ponds used to store waste water and polluted runoff and refers to the residual solids after the liquids have been removed.

Additional storage can be provided to meet management goals or regulations.

Inlet and outlet. Inlets to storage ponds can be of any permanent type designed to resist erosion, plugging, and, if freezing may be a problem, damage by ice. If slurry and solid waste is stored, the inlet should be designed so that waste will be deposited near the center of the pond.

There shall be no outlet that can automatically release storage from the design volume. An emergency spillway, combination of spillways, or additional storage shall be provided to protect the facility from overtopping during a 25-year, 24-hour storm occurring when the design volume is filled. Spillway requirements, however, do not apply to waste storage ponds without drainage areas.

Earth embankment. The design height of the embankment shall be increased by the amount needed to insure that the design top elevation will be maintained after settlement. This increase shall not be less than 5 percent. The minimum top width shall be 8 ft. The combined side slopes of the settled embankment shall not be less than 5 horizontal to 1 vertical.

For ponds with a drainage area, the minimum elevation of the top of the settled embankment shall be 1 ft above the elevation of the water surface during the 25-year, 24-hour emergency spillway storm occurring when the design volume is filled. For ponds without a drainage area, the minimum elevation of the settled top shall be 1 ft above the design volume.

Disposal facilities. Waste shall be removed from storage and used or disposed of at locations, times, rates, and volumes shown in the overall waste management plan without polluting the surface or ground water. Waste may be liquid, slurry,

or solid, and proper equipment must be available to remove and apply it to the land.

If polluted runoff is stored, liquids shall be removed promptly to insure that sufficient capacity is available to store runoff from subsequent storms. The maximum allowable emptying time shall be based on the chance of overflow from subsequent storms and on the capacity of the disposal area.

Provisions shall be made for removing solids from storage ponds to preserve the storage capacity. The method of removal must be considered in planning, particularly in determining the size and shape of the pond. For ponds built to store runoff and waste water, an entrance ramp having a slope of 4:1 or flatter may be used. For those built to store slurry and solid waste, some type of emptying facility must be provided. It may be a dock, a pumping platform, a retaining wall, or a ramp having a slope of 7:1 or flatter.

Protection. If the waste storage pond creates a safety hazard, it shall be fenced and warning signs posted to prevent children and others from using it for other than the intended purpose. The embankment and surrounding areas shall be vegetated to control erosion. Vegetative screens or other methods should be used to shield the pond from public view and to improve visual conditions.

Plans and specifications

Plans and specifications for waste storage ponds shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Pasture and Hayland Management (acre)

tain or improve the quality and quantity of forage, and to protect the soil and reduce water loss.

Conditions where practice applies

On all pastureland or hayland.

Specifications guide

Definition

Proper treatment and use of pastureland or hayland.

Purpose

To prolong life of desirable forage species, to main-

Frequency and amount of fertilizer and lime applications, stage of growth for harvesting different species or mixtures for hay or grazing, other locally important management practices, and weed and brush control. If necessary, make separate specifications for hay and pasture.

PASTURE AND HAYLAND MANAGEMENT
(Acre)

SUPPLEMENT

Planning Consideration

Keeping the desired percent of legumes in the stand is one of the greatest pasture management problems in western Oregon. Competition from the grass, especially in the spring, is a contributing factor. Periodically reducing the grass to the minimum height and careful consideration of regrowth periods (see item b) is necessary in maintaining the desired percentage of legumes--50%. Sub clover increases under closer grazing*. It is an exception to normal grazing recommendations (may be used nearly 100%).

* means that sub-clover cannot grow through thick mulch. *RJB*

PASTURE AND HAYLAND MANAGEMENT (Acre)

SPECIFICATIONS

Pasture Management

1. Grazing heights of plants

	Av. Height Needed to Begin Grazing		Av. Min. Height to Discontinue Grazing	
	cm	in.	cm.	in.
Bluegrass, Kentucky	10-15	4-6	5-18	2-3
Bromegrass, smooth	20-25	8-10	8-10	3-4
Canarygrass, Reed	30-35	12-14	10	4
Hardinggrass	15-20	6-8	10	4
Orchardgrass	15-20	6-8	5-8	2-3
Meadow foxtail	15-20	6-8	8-10	2-3
Ryegrass, annual	15-20	6-8	5-8	2-3
Ryegrass, perennial	15-20	6-8	5-8	2-3
Tall fescue	18-20	6-8	8-10	4
Tall oatgrass	20-25	8-10	10	4
Timothy	15-20	6-8	10	6
Wheatgrass, intermediate	20-25	8-10	10-15	4-6
Wheatgrass, pubescent	20-25	8-10	10-15	4-6
Wheatgrass, tall	40	16	15	6

	Av. Height Needed to Begin Grazing		Av. Min. Height to Discontinue Grazing	
	cm.	in.	cm.	in.
Alfalfa	25-35	10-14	7-10	3-4
Clover, Ladino	20-25	8-10	8-10	3
Clover, New Zealand	20-25	8-10	5-8	2
Clover, White Dutch	15-20	6-8	5-8	2
Clover, Red	20-25	8-10	5-8	2-3
Clover, Alsike	20-25	8-10	5-8	2-3
Trefoil, Birdsfoot	20-30	8-12	10-15	4-6
Trefoil, big (High rainfall areas)	20-30	8-12	8-10	3-4
Subterraneum, clover (annual)	10-15	4-6	2-5	1-2
Vetch, Lana (annual)	After seed is mature			

Keeping the desired percent of legumes in the stand is one of the greatest pasture management problems in Western Oregon. Competition from the grass, especially in the spring, is a contributing factor. Periodically reducing the grass to the minimum height and careful consideration of regrowth periods (see 2 item b) is necessary in maintaining the desired percentage of legumes--50%. Subclover increases under closer grazing. It is an exception to normal grazing recommendations (maybe used nearly 100%).

2. Rotation grazing: Rotation grazing is applicable to irrigated pasture or in areas where rainfall permits regrowth of forage crops.

- a. Grazing Units - three units are minimum. Two units are considered alternate grazing.
- b. Regrowth Period - Grasses/Ladino or New Zealand White Dutch clover, 21 days in April - May - June, 28 days in remainder of the year. (Longer periods in the spring will cause decline of clover percentage). Trefoil, alfalfa, alfalfa/grass or grasses alone, 26-42 days, except on salt affected or shallow soils, 21 days.
- c. Sub clover may be continuously grazed to a stubble height of 1-2" during the growing season. (Oct.-May). Rotation grazing should begin at an initial height of 4-6".

3. Irrigation

Moisture supply - Maintain moisture above 50% of field capacity in the root zone during the growth cycle. Refer to the irrigation guide or design for more information.

4. Livestock Management

- a. Discontinue grazing when average height is down to Figure shown in A.1.
- b. Avoid grazing when soil is wet and before pasture stand is fully established.
- c. Stocking Rate. Stock by growth periods at a rate to maintain at least minimum height of plants in the stand. Quantity and quality of forage may be sacrificed by the continued over use of grass-legume mixtures except sub clover. Sub clover may be more nearly used to 100% of the available forage at the end of its growing period.
- d. Salt and water. Keep iodized salt and water constantly available to livestock. Provide dry roughage to reduce the bloat hazard when cattle are grazing on pasture with more than 40% alfalfa or clover.
- e. Evaluation of conditions as they relate to (1) protection of resource base, and the operator's goals related to (2) environmental conditions, and (3) income.
- f. Consider design and application of a planned grazing system.

5. Fertilizer

- a. Maintenance. Apply fertilizers to existing stands according to soil tests, Extension Service recommendations or local experiences to maintain quality of stand and acceptable production.

b. General guide:

1. Lime: Apply according to soil tests. This is usually done at seeding time.
2. Nitrogen: Apply on grasses or legume-grass mixtures. Nitrogen may reduce the quantity of legumes in a mixture. It is not needed when the pasture contains a productive stand of legume.

Dryland

14 kg (30 lbs.) early September on grass pasture
14-18 kg (30-40 lbs.) February or early March

Irrigated (grass-legume mixtures)

14-18 Kg (30-40 lbs.) silage cutting stage (on grass stand apply February 15 to March 15)

14 kg (30 lbs.) early summer

14 kg (30 lbs.) August 15 to September 15

3. Phosphorus: On all legumes (irrigated or non-irrigated) 27-40 Kg (60 to 90 lbs.) P_2O_5 annually - fall or early spring. Application needs to be increased 1/3 if needed amounts of lime have not been used.

4. Sulfur: On all legumes (irrigated or non-irrigated) 14 kg (30 lbs) annually is usually essential. Sulfur sources include ammonium sulfate 24% S; normal superphosphate 11% S; 16-20 14% S; gypsum 18% S. Applied in fall or early spring.

5. Potash: On legumes (irrigated or non-irrigated)

Coastal area: Legumes may need 40-55 Kg (90-120 lbs.) if manure is not returned.

Other areas: Potash may be needed. Use soil test, fertilizer guides.

6. Boron: On legumes (irrigated or non-irrigated) 1 Kg (2 lbs) actual boron annually if experience and tests show a need. Usually best applied in a borated fertilizer.

510-4

6. Clipping and Dragging. As often as required to encourage uniform grazing and avoid excessive damage to the stand or reduction in forage production.
 - a. Optimum - after each grazing
 - b. Minimum - twice annually
7. Rodent, insect, and weed control. Current recommended rates and methods will be applied. Not to be specified here - have available at Field Office.
8. Harvest of hay. During periods of peak growth it may not be practical or desirable to harvest all the grazable forage with livestock. Consideration should be given to harvest this excess forage as hay. Follow the specifications in Section B.

Stocking Rate

Expected hay yields (tons/acre) X 2.5 equals AUM's ~~for the~~ ^{season} ~~year~~. To obtain animal units (AU's) per acre for the ~~year~~, divide total AUM's/acre by months to be grazed.

Example: 4 tons hay x 2.5 = 10 AUM's ^{AUM's} / ~~for year~~ ^{season} acre
10 ÷ 5 mo. = 2 AU's per acre for 5 months.
^ AUM's/acre

12/15/80

data from Ed Weber

Natl Handbook of
Cons Practices
Native OR-9 dated 12/18/80

done
LB
1/14/81

Hayland Management

1. Time of Harvest

Species	Period	Growth Stage for Cutting	Minimum Height after Cutting	
			Cm.	In.
<u>Grasses</u>				
Bromegrass, smooth	First cutting	Between 50% head emergence and flowering	8	3
	Second cutting	When basal sprouts appear at soil surface. (At time of 2nd cutting sterile heads will be 15 to 20 in. up the stems.)	8	3
Fescue, tall	First cutting	Boot or head	8	3
Orchardgrass	Same as tall fescue			
Timothy	First cutting	Between heading and flow- ering	8	3
Other grasses	First cutting	Between heading and flow- ering	8	3-5
	Second cutting	After 8-10" recovery growth	8	3
Small grains	--	Milk to soft dough stage	8	3
Grass-legume	--		8	3
Alfalfa-grass	--	Cut when alfalfa is ready		
Clover-crass	--	Cut when grass is ready		

510-6

1. Time of Harvest (continued)

Species	Period	Growth Stage for Cutting	Minimum Height after Cutting	
			Cm.	In.
<u>Legumes</u>				
Alfalfa	First cutting	When in full bud		
	Second cutting	1/10 bloom		
	Last cutting	About 4 to 6 weeks before last killing frost		
Clover, ladino	First cutting	Early bloom to $\frac{1}{2}$ bloom	5	2
	Second cutting	Same as 1st cutting or when 8 to 10" high	5	2
red	First cutting	$\frac{1}{4}$ to $\frac{1}{2}$ bloom	5	2
	Second cutting	Early bloom	5	2
alsike	Same as for red clover			
sweet clover	First cutting	Early bloom	5	2
trefoil, birdsfoot	First cutting	Early bloom	5	2
	Second cutting	After 6 to 8 weeks recovery period	20	8

- Grazing Hay Aftermath - Normally should be avoided for maximum forage production from hayland. Grazing, if any, should be limited to light, timely, short periods.
- Irrigation - Refer to irrigation guide or irrigation plan for irrigation detail. Maintain moisture above 50 percent of field capacity in the entire root zone of the hay crop involved, if water is available.
- Fertilization - Same as for pasture except:
Nitrogen fertilizer is not needed on legumes.

SCS, Oregon, May 1980

Pasture and Hayland Planting (acre)

Purpose

To reduce erosion, to produce high-quality forage, and to adjust land use.

Conditions where practice applies

On existing pasture and hayland or on land that is converted from other uses.

Definition

Establishing and reestablishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants. (Includes pasture and hayland renovation. Does not include grassed waterways or outlets on cropland.)

Specifications guide

Methods of preparing a seedbed, adapted species and mixtures, methods of planting, and fertilization and liming. If applicable, make separate specifications for hay and pastureland.

PASTURE AND HAYLAND PLANTING
(Acre)

SPECIFICATIONS

1. Seedbed preparation--Seed in weed-free grain stubble, fallow, or other seedbed that is firm and weed-free.
2. Fertilize and lime as indicated by soil tests.
3. Seeding methods--Use a drill capable of satisfactorily seeding the seed to be planted.
4. Seeding Dates--Non-irrigated plantings will be made in early spring or in the fall. Irrigated seedings will be made any time in spring, summer, or fall that irrigation water is available. Subclover will be seeded in early fall.
5. Seeding rates and mixtures--According to (with minor local adjustments) "Oregon Interagency Seeding Recommendations for Conservation and Forage" and "Forage Varieties Recommended in Oregon".
6. Depth of Seeding--Planting depth will not exceed an average of one inch.
7. Inoculate all legumes with fresh inoculant immediately prior to seeding.
8. Companion crops will not be used, except (when soils are highly susceptible to erosion) half of regular rate of seeding of small grain may be used, if it is cut before heading and removed.
9. Protection--Protect new seeding from use by livestock. Graze only after plants are well established, usually the fall of first full year after seeding. Clip for weed control as needed. Fall seeded subclover grass can be grazed the following May and later.
10. Plan at seeding time for future protection and good management. See "Pasture and Hayland Management" specifications.

SCS, Oregon, May 1980

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5. Seeding rates and mixtures--According to (with minor local adjustments) "Oregon Interagency Seeding Recommendations for Conservation and Forage" and "Forage Varieties Recommended in Oregon".
6. Depth of Seeding--Planting depth will not exceed an average of one inch.
7. Inoculate all legumes with fresh inoculant immediately prior to seeding. *Pre-inoculated seed with live rhizobia adequate.*
8. Companion crops will not be used, except (when soils are highly susceptible to erosion) half of regular rate of seeding of small grain may be used, if it is cut before heading and removed.
9. Protection--Protect new seeding from use by livestock. Graze only after plants are well established, usually the fall of first full year after seeding. Clip for weed control as needed. Fall seeded subclover grass can be grazed the following May and later.
10. Plan at seeding time for future protection and good management. See "Pasture and Hayland Management" specifications.
- * 11. *Using a drill is the preferred method of seeding. Rocky pastures ~~where~~ that cannot be drilled or small tracts where a drill is not available must be seeded by alternate methods.* SCS, Oregon, May 1980

Seeding by broadcasting on a suitably prepared seedbed at a time when adequate moisture is available is a feasible alternative

*June 2, 1981
W.H. Belding*

ESTABLISHMENT OF INTRODUCED GRASSES AND LEGUMES CP-1 (Acres)

SPECIFICATIONS

SITUATION

LANDOWNER	FIELD(s)	ACRES
SOIL MAPPING UNIT	(T)	CAPABILITY CLASS
		EROSION *1 TONS/ACRE

1. Burning of existing crop residue is discouraged. Temporary cover will be required for erosion control when determined needed by SCS technician.

2. Seedbed Preparation - seedbed will be:

- a. Uniformly firm, and well packed with adequate surface residue to prevent wind and water erosion. (An average-sized person should not leave a foot print penetrating more than $\frac{1}{2}$ inch. No-till seeding of stubble fields, and other crop fields with surfaces meeting the above criteria, are encouraged.)
- b. Capable of retaining moisture near the surface so shallow planted seeds can begin and continue to grow. (Exception would be fall seedings after a crop.)
- c. Free from weeds and competing vegetation.

3. Fertilization -

a. Starter fertilizer will be applied at the following rates:

Nitrogen	maximum	30 lb/acre
Phosphate	maximum	30 lb/acre
Potassium	maximum	20 lb/acre

-- or based upon soil tests.

FIELD	NITROGEN lb/acre	PHOSPHATE lb/acre	POTASSIUM lb/acre
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

b. Fertilization for stand maintenance will be the farmer's responsibility. SCS will review seedings, and determine when fertilization is needed. The amount and kind of fertilizer needed will be determined by soil tests.

c. Phosphate will be incorporated or injected into the soil.

d. If needed, soil amendments will be applied based upon soil tests. Rate of application will be limited to amounts needed for stand establishment.

4. Seeding -

a. Seeding will be with a conventional or no-till drill, with some method of packing or firming soil over the seed. Broadcasting seed will be allowed if the seedbed is tilled and seeding is followed by a cultipacking.

b. Seeding dates - Non-irrigated plantings will be made in early spring (as a rule of thumb, 45 days before the normal extended dry season). Fall seedings should be made at least 60 days before average first killing frost, or late enough so no germination will take place until spring. (Residue or temporary cover needed to control erosion will be required in the latter situation.)

c. Seeding mixtures including grass legumes, grass legume-forbes, or grass legume-shrubs are desirable. In some instances single grass or single legume species may be more suitable. Seeding mixtures will be determined onsite by technician and land operator to attain the conservation objective. A maximum of 10 lbs/acre pure live seed (PLS)*2 will be used.

A sod-forming grass should generally be included in all mixtures. For wildlife benefits, a tall grass and a short grass in the mixture are desirable. The "Oregon Interagency Seeding Guide for Conservation Forage", and "Forage Varieties Recommended in Oregon", may be used for locally adapted species.

d. Inoculate all legumes with fresh inoculant for the variety used, immediately prior to seeding.

SEEDING MIXTURE:

SPECIES	VARIETY	LB/ACRE PLS *2
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

5. Seeding depth will be 5 times seed diameter or not more than $\frac{1}{2}$ inch deep.
6. Primary noxious weeds, as determined by State Department of Agriculture, or in accordance with county weed control laws will be controlled. Noxious weeds will not be allowed to go to seed. Weed control methods will be agreed upon with the local Extension or SCS technician.
7. Irrigation will be carried out as needed (irrigated land).

8. Plantings will be protected from livestock grazing.
9. Firebreaks are permitted where desirable.

SIGNATURES:

FARMER _____ DATE _____

SCS DISTRICT CONSERVATIONIST _____ DATE _____

CHAIRMAN SWCD _____ DATE _____

ASCS _____ DATE _____

*1. Residue and erosion calculations will be determined for the next erosion period.

*2. PLS considers both purity and germination. It is the real indicator of seed quality and is determined by:

$$\frac{\text{purity} \times \text{germination}}{100} \text{ equals percent pure live seed.}$$

REVIEW OF SEEDING ESTABLISHMENT

Date _____ BY _____ SCS

STAND DENSITY _____ VIGOR _____ EROSION CONTROL _____

ESTABLISHMENT ADEQUATE _____ (more than 70 percent cover of desired species)

NOT ADEQUATE _____

RECOMMENDATIONS FOR ACTION TO BE TAKEN _____

SIGNATURE _____ DATE _____

Roof Runoff Management (No.)

Definition

A facility for collecting, controlling, and disposing of runoff water from roofs.

Scope

This standard establishes the minimally acceptable requirements for design, construction, and operation of roof management facilities. Such facilities include but are not limited to erosion-resistant channels or subsurface drains with rock-filled trenches along building foundations below eaves, roof gutters, downspouts, and appurtenances.

Purpose

To prevent roof runoff water from flowing across concentrated waste areas, barnyards, roads and alleys, and to reduce pollution and erosion, improve water quality, prevent flooding, improve drainage, and protect the environment.

Conditions where practice applies

This practice applies where: (1) a roof runoff management facility is included in an overall plan for a waste management system; (2) roof runoff water may come in contact with wastes or cause soil erosion; and (3) barnyard flood protection or improved drainage is needed.

Design criteria

Capacity. Design of roof runoff management facilities shall be based on the runoff from a 10-year frequency, 5-minute rainfall except that a 25-year fre-

quency, 5-minute rainfall shall be used to design such facilities for exclusion of roof runoff from waste treatment lagoons, waste storage ponds, or similar practices. Rainfall from figures 1 and 2 or reliable local records may be used for design.

Materials. Roof gutters and downspouts may be made of aluminum, galvanized steel, wood, or plastic. Aluminum gutters and downspouts shall have a nominal thickness of at least 0.07 and 0.05 cm, (0.027 and 0.020 in), respectively. Galvanized steel gutters and downspouts shall be at least 28 gage. Wood shall be clear and free of knots. A water-repellent preservative shall be applied to the flow area of wood other than redwood, cedar, or cypress. Plastics shall contain ultraviolet stabilizers. Dissimilar metals shall not be in contact with each other.

Supports. Gutter supports shall have sufficient strength to withstand anticipated water, snow, and ice loads. They shall have a maximum spacing of 120 cm (48 in) for galvanized steel and 81 cm (32 in) for aluminum or plastic. Wood gutters shall be mounted on fascia boards using furring blocks that are a maximum of 61 cm (24 in) apart. Downspouts shall be securely fastened at the top and bottom with intermediate supports that are a maximum of 3 m (10 ft) apart.

Outlets. The water from roof runoff management facilities may empty into surface drains or underground outlets, or onto the ground surface. When downspouts empty onto the ground surface, there shall be an elbow to direct water away from the building and splash blocks or other protection shall be provided to prevent erosion.

Protection. Roof runoff management facilities and outlets shall be protected from damage by livestock and equipment. Where appropriate, snow and ice guards may be installed on roofs to protect gutters and reduce the hazard to humans and animals below. Gutters may be installed below the projection of the roof line to further reduce gutter damage from snow and ice.

Plans and specifications

Plans and specifications for installing roof runoff management facilities shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

ROOF RUNOFF MANAGEMENTSUPPLEMENT

The minimum acceptable quality for design and construction of facilities for roof runoff management shall be in accordance with the national standard as supplemented or modified by the following:

The following tables allow design of roof water management facilities using 24-hour precipitation values in lieu of 5-minute rainfall values.

Table 1. Sizing of semicircular gutters for varying
roof areas and rainfall volumes:*
n = 0.015, s = 1/16 inch per foot

Gutter Dia. Inches	Type IA Storm 24-Hour Precip (Inch)							Downspout Cross-sec.
	2.0	2.5	3.0	3.5	4.0	4.5	5.0	Area
	Horizontal Projected Surface Area Sq. Ft.							Sq. In.
3	940	750	630	540	470	420	380	3
4	2554	2047	1708	1457	1277	1136	1023	6
5	4628	3710	3100	2641	2314	2059	1855	9
6	7524	6031	5032	4293	3762	3348	3015	14
7	11160	8950	7470	6370	5580	4970	4470	19
8	16206	12991	10840	9248	8103	7211	6495	24
10	29385	23554	19655	16767	14692	13074	11777	39

Gutter Diam. Inches	Type II Storm 24-Hour Precip (Inch)					Downspout Cross-sec.
	1.0	1.5	2.0	2.5	3.0	Area
	Horiz.	Projected	Surface	Area	Sq. Ft.	Sq. In.
3	330	200	160	130	110	3
4	880	590	440	350	290	6
5	1612	1075	806	645	537	9
6	2620	1747	1310	1048	873	14
7	3890	2590	1940	1560	1300	19
8	5644	3763	2822	2258	1881	24
10	10234	6823	5117	4094	3441	39

* Roof area is that area served by an individual downspout.

Table 2. Sizing of rectangular gutters for varying roof areas* and rainfall; $n = 0.015$, $s = 1/16$ inch/foot

Rectangular Gutter		Type IA Storm 24-Hour Precip (Inches)							Downspout
		2.0	2.5	3.0	3.5	4.0	4.5	5.0	Cross-sec.
		Horizontal Projected Roof Areas Sq. Ft.							Area
Width	Depth								Sq. In.
5"	2"	4260	3410	2850	2430	2130	1890	1710	9
	4"	10610	8500	7100	6050	5300	4720	4250	16
	6"	17490	14020	11700	9980	8750	7780	7010	22
	8"	24460	19610	16360	13960	12230	10900	9800	27
6"	2"	4390	4320	3600	3080	2690	2400	2160	12
	4"	13690	10970	9150	7810	6840	6090	5480	22
	6"	22750	18240	15220	12980	11380	10120	9120	29
	8"	32160	25780	21510	18350	16080	14310	12890	36
8"	2"	7740	6210	5180	4420	3870	3440	3100	17
	4"	20230	16220	13532	11540	10120	9000	8110	32
	6"	34260	27460	22920	19550	17130	15240	13730	44
	8"	49060	39320	32810	27990	24530	21830	19660	54

Rectangular Gutter		Type II Storm 24-Hour Precip (Inches)					Downspout
		1.0	1.5	2.0	2.5	3.0	Cross-sec.
		Horizontal Projected Roof Areas Sq.Ft.					Area
Width	Depth						Sq. In.
5"	2"	1480	990	740	590	490	9
	4"	3690	2460	1850	1480	1230	16
	6"	6090	4060	3050	2440	2030	22
	8"	8520	5680	4260	3410	2840	27
6"	2"	1880	1250	940	750	620	12
	4"	4770	3180	2380	1910	1590	22
	6"	7920	5280	3960	3170	2640	29
	8"	11200	7470	5600	4480	3730	36
8"	2"	2700	1800	1350	1080	900	17
	4"	7050	4700	3520	2780	2350	32
	6"	11930	7950	5970	4770	3980	44
	8"	17090	11390	8540	6740	5700	54

*Roof area is that area served by an individual downspout.

Structure for Water Control (No.)

Definition

A structure in an irrigation, drainage, or other water management systems that conveys water, controls the direction or rate of flow, or maintains a desired water surface elevation.

Scope

This standard applies to the structures normally installed in a well-planned irrigation or drainage system, wildlife facility or other water management systems for the conveyance, flow control, or level regulation of water. It covers the planning and functional design of such water-control structures but not the detailed design criteria or construction specifications for specific structures. It does not apply to structural components of irrigation pipelines or to subsurface drains or grade-stabilization structures (410).

Purpose

To control the stage, discharge, distribution, delivery, or direction of flow of water in open channels or water use areas. Also used for water quality control, such as sediment reduction or temperature regulation. These structures are also used to protect fish and wildlife and other natural resources.

Conditions where practice applies

This practice applies wherever a permanent structure is needed as an integral part of an irrigation, drainage, or other water-control systems to serve one or more of the following functions:

1. To conduct water from one elevation to a lower

elevation within, to, or, from a ditch, channel, or canal. Typical structures: drops, chutes, turnouts, surface water inlets, head gates, pump boxes, and stilling basins.

2. To control the elevation of water in drainage or irrigation ditches. Typical structure: checks.

3. To control the division or measurement of irrigation water. Typical structures: division boxes and water measurement devices.

4. To keep trash, debris, or weed seeds from entering pipelines. Typical structure: debris screens.

5. To control the direction of channel flow resulting from tides and high water or backflow from flooding. Typical structure: tide and drainage gates.

6. To control the level of a water table or to remove surface or subsurface water from adjoining land, to flood land for frost protection or to manage water levels for wildlife or recreation. Typical structures: water level control structures, pipe drop inlets, and box inlets.

7. To provide water control for recreation or similar purposes.

8. To convey water over, under, or along a ditch, canal, road, railroad, or other barriers. Typical structures: bridges, culverts, flumes, inverted siphons.

9. To modify water flow to provide habitat for fish, wildlife, and other aquatic animals. Typical structures: deflectors, chutes, cold water release, or structures to make pools and riffles.

Design criteria

Structures shall be designed on an individual job basis, or applicable SCS standard drawings shall be adapted, to meet site conditions and functional requirements. They shall be part of an approved and overall engineering plan for irrigation, drainage, wildlife, recreation, channel improvement, or similar purposes.

The plan shall specify the location, grades, dimensions, materials, and hydraulic and structural requirements for the individual structure. Provisions must be made for necessary maintenance. Care must be used to insure that the area's visual resources are not damaged. If watercourse fisheries are important, special precautions or design features may be needed to insure continuation of fish migrations.

If soil and climatic conditions permit, a protective cover of vegetation shall be established on all disturbed earth surfaces. If soil or climatic conditions preclude the use of vegetation and protection is needed, nonvegetative means, such as mulches or

gravel, may be used. In some places, temporary vegetation may be used until permanent vegetation can be established. The structure can be fenced, if necessary, to protect the vegetation. Seedbed preparation, weeding, fertilizing, and mulching shall comply with the instructions in technical guides.

Plans and specifications

Plans and specifications for installing structures for water control shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Underground Outlet Specifications

Conduits and appurtenances shall be installed to the line and grade shown in the plans or as staked in the field and according to the recommendations of the manufacturers. Conduits shall be bedded and backfilled as shown in the plans or as described in the specifications for the job. Mechanical compaction, water packing, or other means of compaction shall be specified in the plans or in the specifications for the job.

Materials shall meet the requirements of this standard and those in the plans or in the specifications for the job. The ends of the conduits shall be protected during installation. All appurtenant structures, including trash and animal guards, shall be installed promptly, and provisions shall be made for protecting them during installation.

Work areas shall be restored to their former condition or as required in the plans and in the specifications for the job. Vegetation or other protective cover shall be established promptly.

manner. If system is flushed, use rinse water in the following batch of nutrient mixture, where possible, or dispose of according to state and local regulations, always avoiding high runoff areas, ponds, lakes, streams, and other water bodies. Extreme care must be exercised to avoid contaminating wells.

universities to evaluate groundwater pollution potential in conjunction with the water budget for the location.

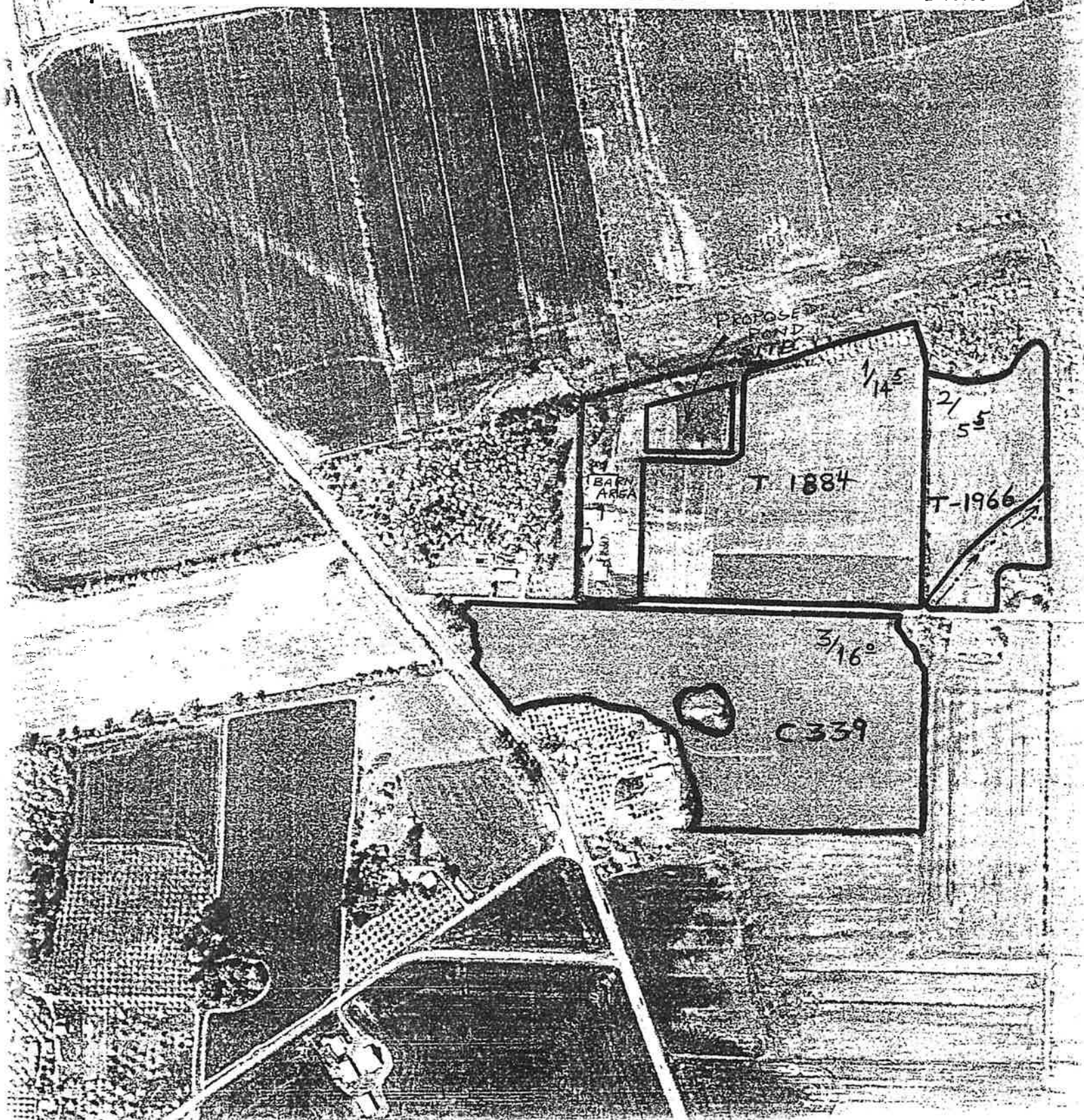
9. All specifications will be consistent with state and local regulations.

Specification Guide

1. Nutrient rates applied to agricultural land shall be based on soil test results, where applicable. Frequency of soil tests and/or plant tissue tests will be specified.
2. Establish realistic yield goals based on soil map unit, available moisture, historical yield data, climatic conditions, and level of management to minimize potential nutrient loading of surface water and groundwater.
3. Develop a nutrient management plan for the crops to be grown. Account for the residual amount of nutrients in the soil and crop residue, add estimated nutrients from anticipated organic waste applications, and then determine the amount of chemical fertilizer needed to meet the nutrient needs of the proposed crop and target yield. Specify the crop, crop rotation, and kind, source, and amount of plant nutrients that will be used to meet the crop fertility needs.
4. If non-farm organic waste is to be used, it shall be analyzed for content and applied as prescribed by federal, state, or local regulations. Appropriate documentation of amounts applied will be maintained.
5. Livestock waste shall be analyzed prior to land application to establish nutrient credits and application rates.
6. Credit for nitrogen contributions from legume crops in rotation shall be consistent with current land grant university recommendations.
7. Develop a water budget that will describe the seasonal distribution of water resources under the appropriate soil-crop-management system.
8. Use the "Leaching Index for Soluble Nutrients" procedure or other detailed guidelines from land grant

CONSERVATION PLAN MAP

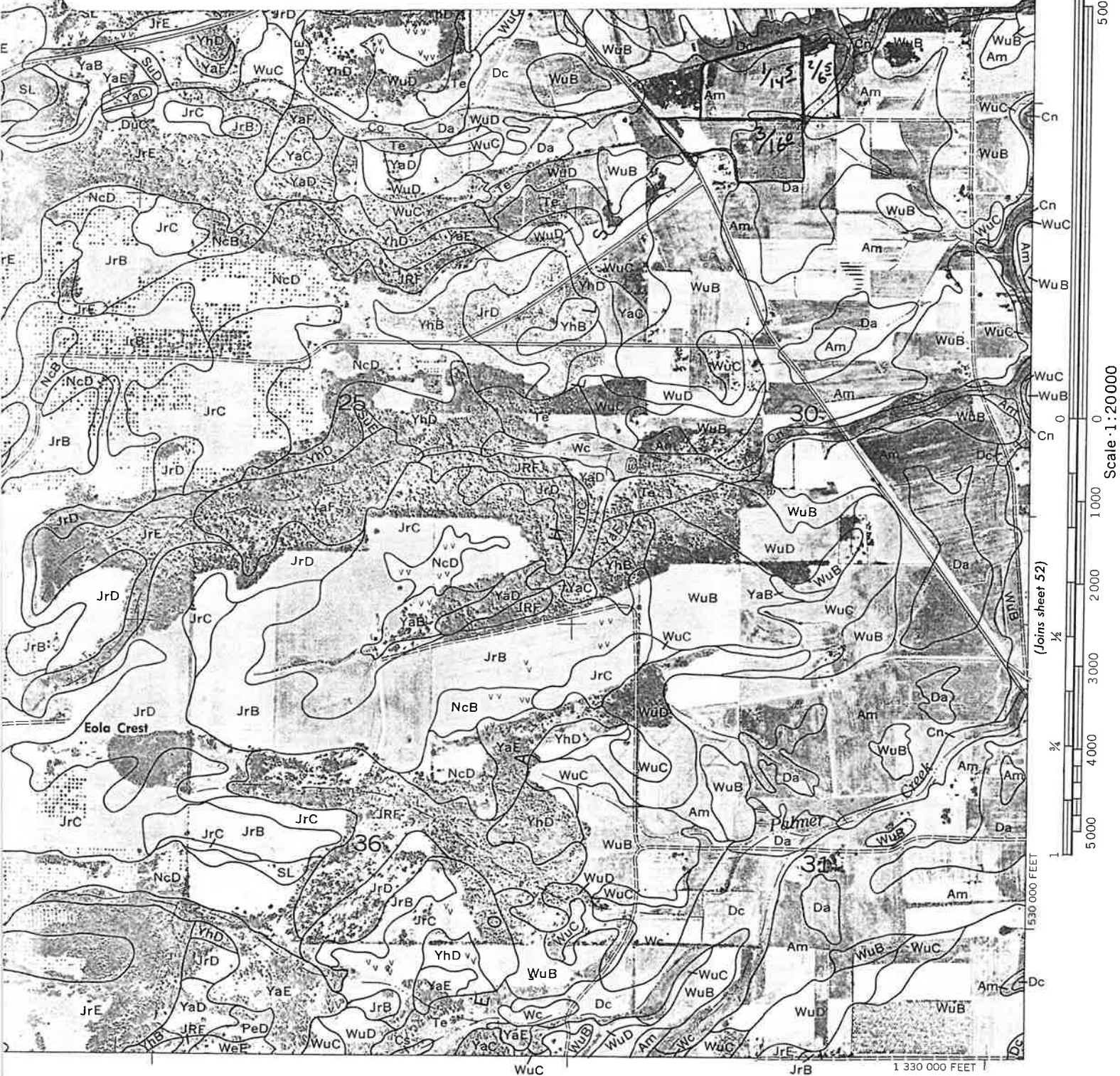
Owner DAN BOERSMA (FIELD #1) Operator DAN BOERSMA (Field #24#3)
County YAMHILL State OR Date 9-90
Approximate acres 36 (DISPOSAL) Approximate scale 1" = 425'
Cooperating with YAMHILL SOIL & WATER Conservation District
Plan identification CAFO PLAN Photo number P12
Assisted by McMINNVILL FIELD OFFICE USDA Soil Conservation Service



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Owner DAN BOERSMA Operator DAN BOERSMA
County YAM HILL State OREGON
Soil survey sheet (s) or code nos. 51 Aproximate scale 1" = 66'

Prepared by U. S. Department of Agriculture, Soil Conservation Service cooperating
with YAMHILL Conservation District



OPERATION AND MAINTENANCE PLAN
FOR THE
BOERSMA ANIMAL WASTE MANAGEMENT SYSTEM

YAMHILL COUNTY

GENERAL

7/12/89

The Boersma animal waste management system has been designed to manage the waste generated by a dairy cow operation in a manner that prevents or minimizes degradation of air, soil, and water resources and protects public health and safety. The system has been designed to reduce discharge of pollutants into surface water and to recycle waste through soil and plants to the fullest extent possible.

The system was designed to store the animal waste, bedding, and waste hay and silage of 85 milking cows for a minimum period of 120 days. The system was also designed to contain the waste during scraping operations by the use of curbing, and to divert clean roof water away from the animal waste. One of the most severe limitations in the existing operation is lack of adequate storage and disposal acres. In addition to the components listed below, Mr. Boersma must find at least 50 acres of suitable land for manure utilization. Components of the system include: an above ground 50 ft. dia. concrete waste storage structure (SCS plan OR-E-507); a 1000 gallon below ground concrete tank and accessories for collection of silage liquor runoff; machinery and livestock passable curbing; land shaping for manure and silage diversion; pasture and hayland planting; pasture and hayland management; roof water outlets for all barns; and manure utilization.

Dan Boersma, as owner of the farm, is responsible for the operation and maintenance of the waste management system. Although the system was designed by the Soil Conservation Service based on the best available technical knowledge, it must be recognized that if the system is to operate as planned and designed, it needs to be periodically inspected and properly operated and maintained.

OPERATION

The waste storage structure is designed to store the waste in an above ground circular concrete tank in a liquid/slurry form, after mixing with grass seed screenings for bedding, waste feed, waste hay, and milkhouse waste water. This will provide a minimum storage period of 120 days, with an estimated storage volume of 31,400 cubic feet. Emptying the facility must begin in the spring before it is completely filled and continue through the summer months when weather, soil, and crop conditions are favorable. It is imperative that the facility be as empty as possible when the rainy season begins, generally about November 1st.

Waste from dry cows, heifers, and calves will be stored as solid material under cover and be applied to fields when ground and weather conditions permit. In 1992-93, Mr. Boersma plans to roof a storage area 24' X 36' to provide a minimum of 60 days storage for these wastes. In the interim, wastes must be contained under existing cover, hauled to a suitable disposal or storage area, or be stored in such a manner that no manure runoff escapes the designed disposal system.

The manure will be spread on 17 acres of grass pasture located on Dan Boersma's property, and 5 acres of grass pasture located on neighbor Chuck Keightly's property. Dan also has access to 8 additional acres of grass pasture on his father property near Lafayette for waste utilization. Manure will be applied to the pasture by broadcast with a honey wagon, or by application with a irrigation gun when weather and ground conditions permit. The additional 20+ acres required for manure disposal is currently being sought and an agreement will be made prior to dispersal of any cost share funds. When these acres have been contracted, Mr. Boersma will contact our office with the agreements, and they will subsequently be incorporated into the management plan.

The disposal fields contain Amity, and Dayton soils. In the spring the manure will be spread on the best drained soils available, giving the wetter Amity and Dayton soils a chance to dry out. Avoid spreading the waste next to Palmer Creek during the early spring and late fall months when contaminated runoff could enter the stream. Spreading will be done as evenly as possible over the fields when weather forecasts predict a minimum of 3 days without measurable precipitation. Applications should be spaced at 3 week intervals to maximize bacterial die off and minimize soil sealing. Although winter spreading is not anticipated, emergency spreading will be on the flattest best drained soils available.

It is estimated that the manure produced in one 365 days will provide 13,988 lbs of nitrogen, 3,474.9 lbs of phosphorus, and 10,172.0 lbs of potash. At an application rate of 135# of N/acre; 65# of P/acre; and 185# of K/acre, for Tall Fescue Pasture, the manure will supply adequate Nitrogen for 103 acres; Phosphorus and Potash would need to be supplemented. Requirements for Orchardgrass pasture are 300# of N/acre; 100# of P/acre; 375# of K/acre. If Orchardgrass pastures are established, the amount of disposal acres could be reduced to 47 acres.

*With the limited acreage available for waste utilization, it is recommended that all new pastures be planted to Orchardgrass, or Orchardgrass/Tall Fescue mix.

MAINTENANCE

The waste management facilities and appurtenances will be inspected and maintained as follows:

Waste Storage Structure - Above Ground Concrete Tank

Silage Collection Tank

Gutter Outlets

Weeds and sediment will be removed from outlets and they will be kept free flowing. Broken rodent guards will be repaired or replaced

Curbs

Concrete curbs will be inspected periodically and broken curbs will be repaired.

STATE <u>OREGON</u>		PROJECT <u>ANIMAL WASTE FACILITY - GUTTERING</u>		
BY <u>LARRY OJUA</u>	DATE <u>10-15-87</u>	CHECKED BY	DATE	JOB NO.
SUBJECT <u>DAN BOERSMA - DAIRY INVENTORY DATA</u>				SHEET <u>1</u> OF <u>3</u>

NUMBER OF LIVESTOCK TOTAL 92 COWS
 MILKING 85 COWS
 DRY COWS 7 COWS

TYPE: HOLSTEINS

YEARLING AND OLDER HEIFERS 30
 YEARLING AND YOUNGER HEIFERS 30
 BABY CALVES 20

} Design

AVAILABLE DISPOSAL ACRES

SOILS - AMITY, DAYTON

HOME PLACE 15 ACRES
 NEIGHBOR PLACE 8 ACRES
 FATHER'S PROPERTY 8 ACRES
31

1. NO PRESENT CROPPING PLAN
2. NO IRRIGATION
3. PUMPS SLURRING ON FIELDS & SPREADS WITH TRACTOR & BLADE.
4. CAN HAUL WET OR DRY MATERIAL TO DISPOSAL AREAS

BEDDING

1. STRAW > TO DRY STORAGE AREA
2. SANDUST >
3. PAPER PULP > TO LIQUID STORAGE TANK

WATER & WASTE MANAGEMENT

WATER SUPPLY - $\approx$ 20 GAL/MIN.

1. $\approx$ 80 COWS WASTE SCRAP TO MANURE TANK.

A) $\approx$ 5241 cu.ft. STORAGE IN MANURE TANK.

APPROXIMATELY 20 DAYS STORAGE IN SUMMER

" 10-12 DAYS STORAGE IN WINTER

2. DRY COWS, HEIFERS, AND CALVES
 MAT'L IS HAULED AWAY ON A REGULAR BASIS
 AFTER PENS ARE CLEARED.

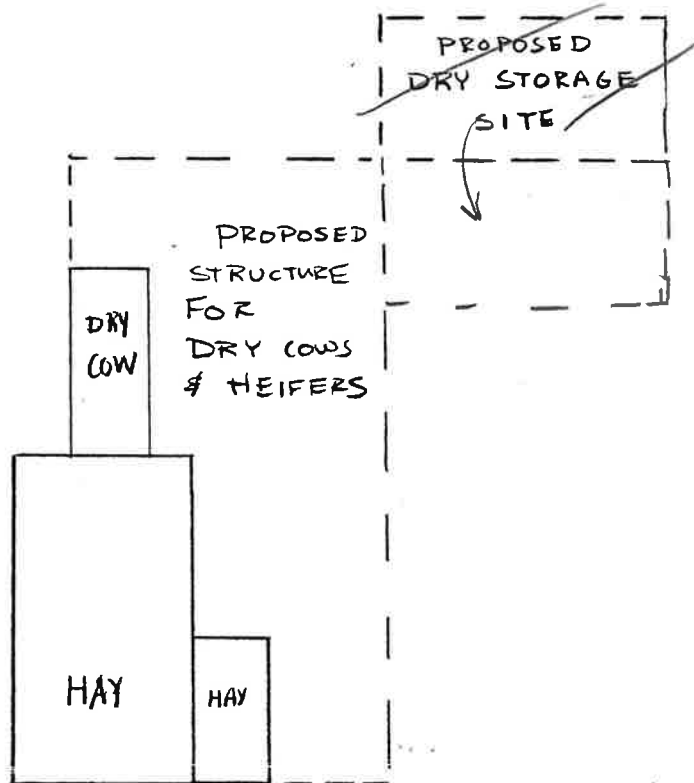
* WANTS TO DEVELOP A STORAGE AREA FOR DRY MAT'L.

1. PREVENT RUN OFF
2. DECREASE HAULING PART LOADS
3. WON'T HAVE TO SPREAD MAT'L DURING WET PERIODS
4. WILL SCRAP WASTE FEED, BEDDING, ECT INTO STORAGE PIT.

STATE <u>OREGON</u>		PROJECT <u>ANIMAL WASTE FACILITY - GUTTERING</u>		
BY <u>LARRY OJHA</u>	DATE <u>10-19-87</u>	CHECKED BY	DATE	JOB NO.
SUBJECT <u>DAN BOERSMA-ALTERNATIVES; RECOMMENDATION</u>		SHEET <u>2</u> OF <u>3</u>		

DRY STORAGE AREA:

1. DAN PLANS TO EXTEND HIS HAY STORAGE BUILDING EAST AND NORTH AND INSTALL PENS FOR DRY COWS AND HEIFERS.
2. HE WOULD LIKE TO CONSTRUCT HIS DRY STORAGE AREA ON THE NORTHEAST CORNER OF THIS BUILDING. HE WOULD LIKE AT LEAST 60 DAYS OF STORAGE



3. GUTTERING SHOULD BE INSTALLED TO PREVENT RUNOFF ONTO THE SLAB AND SURROUNDING AREAS.
A) WATER COULD BE DIVERTED TO
1) STREAM
2) INTO SYSTEM.
4. BENEFITS OF CURBING CAN BE RECOGNIZED.
5. DAN ALSO IS INTERESTED IN SOME TYPE OF SEPARATING SYSTEM, IF FEASIBLE & NEEDED.

STATE <u>OREGON</u>		PROJECT <u>ANIMAL WASTE FACILITY</u>		
BY <u>LARRY OJHA</u>	DATE <u>10-19-87</u>	CHECKED BY	DATE	JOB NO.
SUBJECT <u>DAN BOERSMA - ALTERNATIVES, REC'D.</u>				SHEET <u>3</u> OF <u>3</u>

CONT'D.

6. DISPOSAL ACRES COULD BE UTILIZED WITH CROPS PLANTED ANNUALLY OR PERENNIAL.
7. SOME LEVELING AND FILLING ALONG THE CREEK AREA, AND NEAR THE SILAGE BUNKER COULD IMPROVE DRAINAGE AND REDUCE THE FLOW TO THE CREEK.
8. TO COLLECT RUNOFF FROM THE SILAGE PIT, A SUMP COULD BE INSTALLED TO COLLECT MATERIAL.

