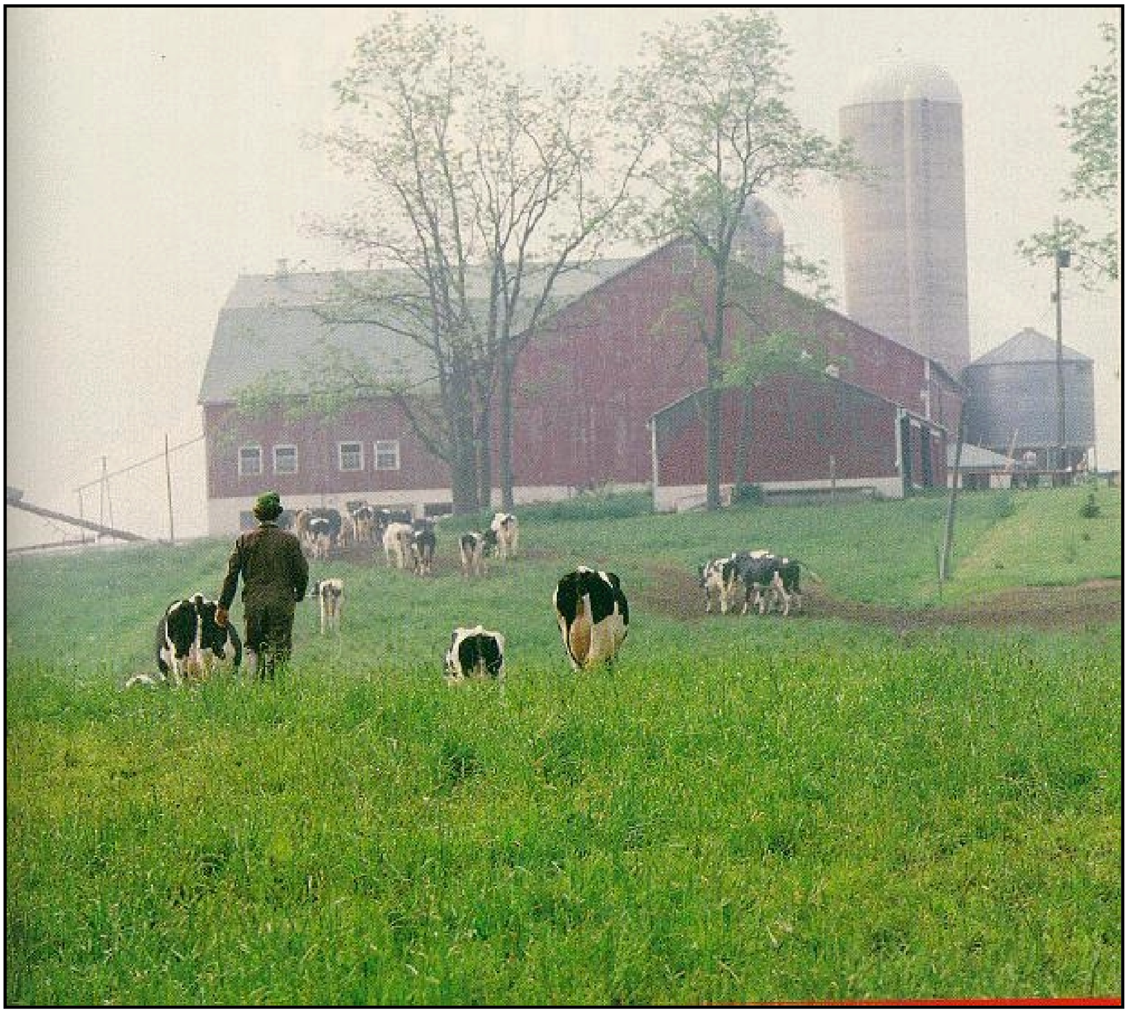
Nutrient Management Plan
for
Example Dairy Farm

October 21, 1998



Nutrient Management Plan Prepared for:

Example Doe (Operator)
Legal Description
Example, ID 83000
(208) 332-8000

Certified Planner: Jenifer Beddoes, ISDA

Facility Information Sheet

Facility	Example Dairy			
Operator Information	Example Doe 111 N. 343 W. Example Way Example, ID 83000		Home Phone Cell Phone Barn Phone	(208) 332-8500 (208) 332-8550 (208) 867-9186
County	Example County		Comments: The best time to reach Example is before 7:00 am in the barn.	
Soil Conservation District				
Watershed Basin	Upper Snake			
Hydrologic Unit Code #	17040212			
Stream Segment	Snake River			
GPS	42 42 780 N.	114 46 208 W.		

	Nitrogen (pounds)	Phosphorus (pounds)	Potassium (pounds)
Nutrients Exported:	15750 (78%)	4015 (78%)	15337 (78%)
Animal Nutrients	830	230	800
Commercial Nutrients	0	0	0

Limiting Resource	Groundwater	Vulnerability	High
Plan Designed To	Phosphorus	University of Idaho	Crop Uptake
AU on the Facility	276		
Total Acres Available for Nutrients Owned by the Facility	65		
Animal Equivalent Units per Acre	1.15		

Action Required:	Compliance Date	Completion Date
Containment Upgrade Required		
Irrigation Mechanical Upgrade Required		
Irrigation Management Upgrade Required	5/1/99	
Water Quality Related Practice Required		

Signature of Certified Planner:_______________________________________Date:________
Jenifer Beddoes, ISDA
Certification Number 25

Signature of Operator: _______________________________________Date:________
Example Doe

Producer Summary

Facility Summary

Example Dairy is an existing facility in Example, ID. The dairy is currently at full capacity, milkking 172 Holsteins with 25 dry cows. Cows are housed in open lots and bedded with straw. Calves and heifers are raised off of the facility. Wastewater from the milking barn gravity feeds to the containment system. The facility has 65 farmable acres for liquid application. The crop rotation is two years corn and three years alfalfa and permanent pasture. All solid waste is exported off of the facility onto surrounding cropland when farm land is not in corn silage rotation.

Resource Concerns

Example Dairy is located in the hydrologic unit code 17040212 in the Upper Snake watershed basin within the Snake River stream segment. The facility is found at 42 42 780 N and 114 46 208 W using GPS Coordinates.

The most immediate resource concern on Example Dairy is to groundwater quality. Land application fields have shallow soils and runoff does not leave the facility or fields where waste is applied. Groundwater is located at 10" on the north land application sites corresponding with Fields 1, 2, and 3. The major environmental concern to groundwater on this facility is from nitrogen and phosphorus leaching. This can be a serious problem is sandy soils and must be managed to prevent deep percolation. While phosphorus is normally not a nutrient of concern in groundwater, the shallow depth experienced on this facility indicates that groundwater from the land application fields may "daylight" to surface water. In this case phosphorus would be a nutrient of concern due to the effect it has on eutrophication in surface waters. Although nitrogen and phosphorus are the nutrients of immediate concern, repeated land applications of animal waste will elevate potassium and salt concentrations that may create a nutrient imbalance. This nutrient imbalance will adversely impact agricultural sustainability once a critical level is reached. A boulder field is located on the east end of Field 5.

Land application rates were designed to crop phosphorus uptake on Fields 1,2, and 3 due to the 10" groundwater concern. University of Idaho nitrogen recommendations were utilized on Fields 4 and 5 because there was not a limiting resource < 5'.

Nutrient Management Plan Requirements

- Liquid waste will be applied on Field 2. Lagoon waste will be piped through the culvert under the road into gated pipe for irrigation. Liquid waste application should begin in the spring for six hours of each irrigation set until the lagoon is empty.

- Over application of nitrogen occurs when applying 4 truckloads per acre of manure before corn. Application will be reduced to 2.25 truckloads per acre each year before corn silage. Eighty one percent of the solid waste will be exported off of the facility. The producer will keep load tickets to verify movement of solids off of the facility.
- Nutrient application rates are as follows:

Field	Year	Percent of
		Lagoon
Field 2	Uniform	100%
		Truckloads
Field 1	1999, 2000, 2004, 2005	16
Field 3	1999, 2000, 2004, 2005	23
Field 4	1999, 2004	8
Field 5	1999, 2004	30

Irrigation System Requirements

- Liquid waste from the dairy will be applied to Field 2 at the volumes specified in the above table.
- The ponds should be emptied in the spring and the fall, starting with the first irrigation and ending with the last irrigation with no effluent application through the winter season. If waste ponds are not full in the fall, the irrigation time should be adjusted so that the field receives uniform coverage of the nutrients.
- Liquid waste should be applied to each field as illustrated in the following Table.

Field	Flowrate (gpm)	Time per Set (hrs)	Stage of Irrigation
Field 2	50	6.0	End

Facility Testing Requirements

- Regulatory soil samples will be required from each field every three years. These samples must be taken from the 0-12” zone for Fields 1, 2, and 3 and 18”-24” depths for Fields 4 and 5. The samples will be reviewed for phosphorus level and compared with previous test data. These tests will indicate compliance with the nutrient management plan and the adequacy of the plan. Regulatory soil testing will be conducted every three years starting 2001.

Storage and Handling Plan Recommendations

- A soil scientist from NRCS should evaluate the integrity of the runoff pond. If there is a problem with the groundwater separation, additional soil should be brought in to meet the 2’ separation.
- It is recommended that a sleeve be placed over the piping as it enters and exits the culvert under the road in such a way as to catch and hold any leaks or spills associated with moving liquid waste. Any discharge in or around this area will be grounds to revoke the facility’s permit to sell milk.
- The irrigation tail water return pond should be inspected to meet Idaho Waste Management Guidelines for Confined Feeding Operations lagoon specification. If liquid waste were to be stored in the pond, it would be considered a discharge unless the structure met these construction specifications.
- Continual inspection and maintenance of waste handling facilities and equipment will prevent unwarranted waste discharges into surface water and groundwater.
- Contain manure storage areas to prevent run-off and direct seepage to groundwater from occurring.

Nutrient Management Plan Recommendations

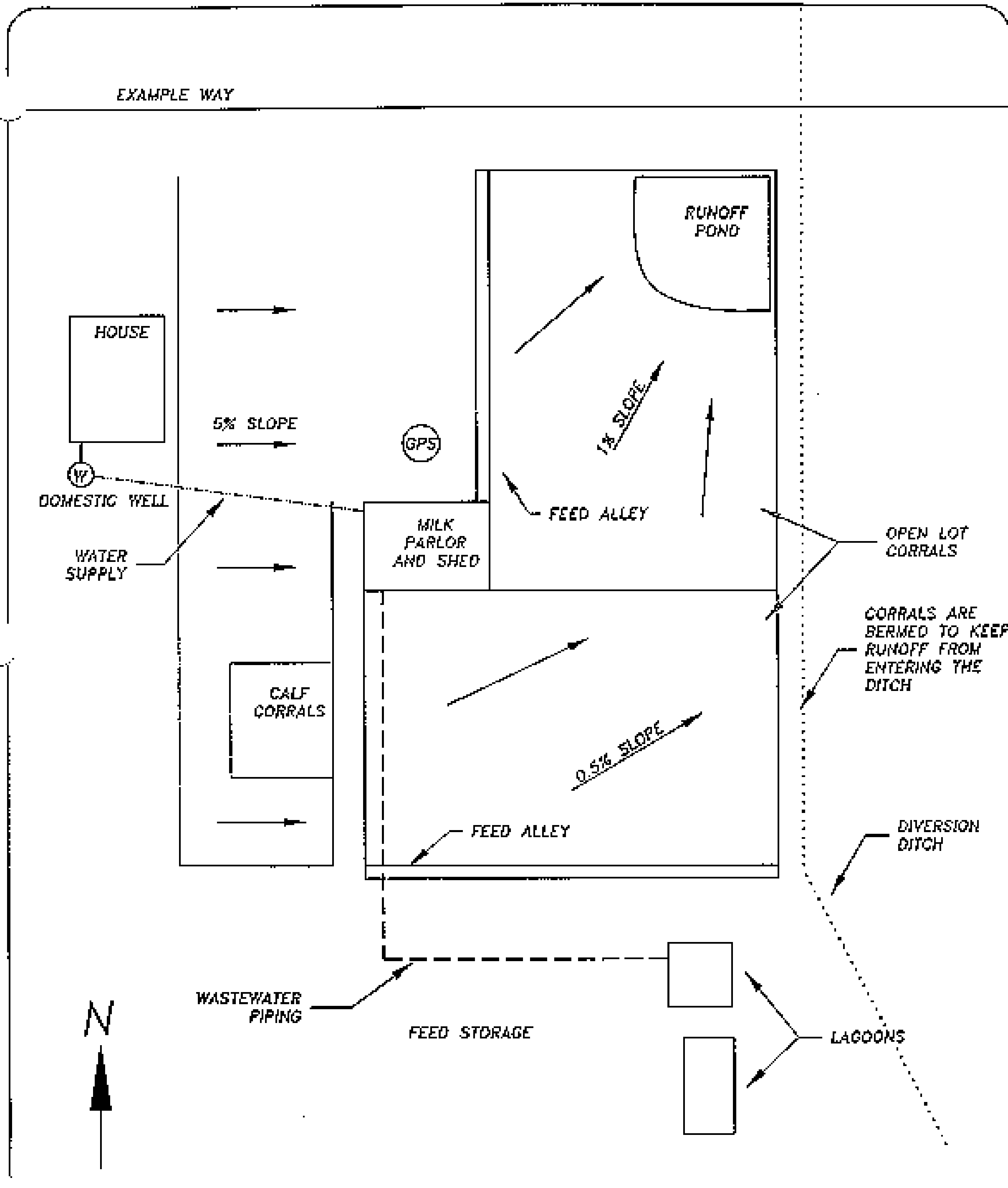
- Set realistic crop yield goals in order to provide an accurate account of the plant nitrogen needs.
- Nitrification inhibitors in liquid-manure injection systems can decrease N losses in coarse-textured soils all year long, in all soils during fall and summer, and in fine or medium textured soils with high water-tables during winter and spring.
- Apply N so that it is available during peak plant demand.
- Apply fertilizer to cool season crop in the spring rather than the previous fall. This will prevent fertilizer leaching through the soil profile and provide the crop with the necessary levels of nutrients.
- Use split or multiple fertilizer applications in order to provide the crop with a preplant treatment and the needed nutrient levels throughout the growing season till the point of major nutrient uptake.
- On each field, keep a record of manure and chemical fertilizer applications, crop information, and soil and manure test results.

Irrigation Management Plan Recommendation

- Irrigate fields efficiently to meet crop needs and the available water holding capacity of the soil. This will prevent the movement of nitrogen through the soil profile to groundwater caused by over irrigation.
- To better manage irrigation water, Field 1 should be irrigated every 7 days for 12 hour sets during peak ET periods. At this scheduling, it will take 4 sets to

irrigate Field 1. Each gate should be open ½" for 66 gates. The system flow rate should be around 410 gpm.

- Field 2 should be irrigated every 4 days for 12 hour sets during peak ET periods. At this scheduling, it will take 4 sets to irrigate Field 2. Each gate should be open ½" for 66 gates. They system flow rate should be around 410 gpm.
- Field 3 should be irrigated every 6 days for 12 hour sets during peak ET periods. Hand line will have to be moved three times before irrigation of Field 3 is complete. Twelve laterals should be run at one time, with 8 birds on a lateral. The system flow rate should be around 375 gpm.
- Fields 4 and 5 are irrigated together. These fields should be irrigated every 4 days for 8 hour sets during peak ET periods. Three laterals should be run at one time with 33 birds on a lateral when irrigating field 5. When Field 4 is irrigated, 6 laterals can be run at one time with 16 birds on each lateral. This compensates for the acreage taken out in the dairy.
- A soil moisture monitoring device should be utilized to help determine irrigation scheduling to meet crop demands.



IDAHO DEPARTMENT OF AGRICULTURE– BUREAU OF DAIRYING – (208) 332–8550.

DESIGNED BY : JENIFER BEDDOES	FACILITY SITE PLAN – LEGAL DESCRIPTION		
DRAWN BY : JENIFER BEDDOES	EXAMPLE DAIRY FARM	EXAMPLE CITY – EXAMPLE COUNTY	
DATE : 10/21/98	FILE NAME : SITE.DWG	SCALE : 1" = 100'	SHEET : 1 OF 1

Analysis of Nutrient Management Practices

Facility Description

The Mavencamp Dairy is an existing facility located at 1019 E 2900 S in Hagerman, ID 83332. This facility is owned by John Mavencamp and operated by .

The purpose of this nutrient management plan is to inform livestock producers and others the value of animal waste and certify that nutrients are utilized in an appropriate way which will not adversely impact surface or groundwater if properly managed.

Mavencamp Dairy has an LCO permit for 276 animal units. At full capacity the dairy has 197 mature Holstein cows. This would correlate to 172 milking cows and 25 dry if 16% of the herd is dry. Calves and heifers are raised off of the facility. The milking parlor consists of a double four herringbone. The milk tank is picked up every day and cleaned with an automatic cleaning device. Cows are milked twice a day. The holding pen is scraped, therefore, only 5% of the solids generated from the milking herd are found in the lagoon.

Mavencamp Dairy has no future plans to expand at this site. Because of the location of the facility, it would be somewhat difficult to increase the herd size.

Resource Concerns

Example Dairy is located in the 17040212 hydrologic unit in the Upper Snake watershed basin by the Snake River stream segment. The facility is found at 42 42 780 N 114 46 208 W using GPS Coordinates.

The most immediate resource concern on Example Dairy is to groundwater quality. Land application fields have shallow soils and runoff does not leave the facility or fields where waste is applied. Groundwater is located at 10” on the north land application sites corresponding with Fields 1, 2, and 3. The major environmental concern to groundwater on this facility is from nitrogen and phosphorus leaching. This can be a serious problem is sandy soils and must be managed to prevent deep percolation. While phosphorus is normally not a nutrient of concern in groundwater, the shallow depth experienced on this facility indicates that groundwater from the land application fields may “daylight” to surface waters. In this case phosphorus would be a nutrient of concern due to the effect it has on eutrophication in surface waters. Although nitrogen and phosphorus are the nutrients of immediate concern, repeated land applications of animal waste will elevate potassium and salt concentrations which may create a nutrient imbalance. This nutrient imbalance will likely adversely impact agricultural sustainability once a critical level is reached. A boulder field is located on the east end of Field 5.

The natural slope on the facility is utilized to contain runoff from the dairy. Runoff is contained in a lagoon in the North corral. Runoff from the north land application fields (Field 1, 2, and 3) enters an irrigation pond where it is contained and used for irrigation.

The south land application fields drain to the West. Runoff from these fields is contained in low spots on the pasture.

The dairy is located in a natural drainage basin. Therefore, all water will run toward the dairy. Run on diversion ditches are in place to divert clean water. If the diversions were to fail, water would pool in the north corral. Free water located in or around the facility cannot leave the area without being pumped.

Land application rates were designed to phosphorus uptake for all fields on the facility. Fields 1, 2, and 3 were designed to phosphorus uptake due to the groundwater concern at 10”. Although Fields 4 and 5 could be designed to University of Idaho nitrogen recommendations, the producer decided to apply animal nutrients to meet crop phosphorus uptake.

Waste Storage and Handling

Solid waste deposited in housing and along the feed alley is stockpiled in the corrals and cleaned out twice a year. It is estimated that 40 tons of straw is used yearly for bedding purposes. Manure is transported from the corrals in a manure spreader and applied to third party cropland within a five-mile radius of the facility. In the past, manure has been spread on cropland going into corn at a rate of 4 trucks/acre. Waste agreements and a list of third party land application sites is found in Appendix G. It is estimated that 5% of the solid waste from the milking herd is deposited in the milking parlor and flushed to the lagoon.

Wastewater from the barn is transported to the lagoon through an 8” PVC pipe by gravity into the first lagoon. When the first lagoon reaches capacity, the second lagoon is filled. The first lagoon is 50’ X 50’ X 4’ deep, holding 6,636 ft^3. The second lagoon will hold 15,822 ft^3 and has dimensions of 75’ X 40’ X 8’ deep. Liquid waste is pumped from the lagoons, down the east side of the corrals, through a culvert under the road and applied through gated pipe onto Field 1 and Field 2.

Dean Falk, Extension Dairy Specialist determined 180-day storage for liquid wastes for Example Dairy. The sizing is found in Appendix B. Barn waste generated for 172 milking cows is 22,127 ft^3. Runoff from the facility would encompass 40,341 ft^3 for a 25 year, 24 hour storm and the 1 in 5 year winter. The facility is appropriately sized to contain 180-days liquid storage and runoff.

Table 1 shows the total amount of nutrients produced on the facility.

Table 1. Nutrients Produced

Description	Volume ft^3	N	P lbs	K	Weight (tons)
Solid Waste	139,104	19460	6489	24665	2780
Lagoon Waste	25,020	997	308	1143	
Total Nutrients Produced		20457	6797	25809	
Nutrients Exported	*119,629*	*16736*	*5581*	*21213*	*2391*
Total Nutrients for Land Application		3721	1216	4596	

See Appendix A

Raw data used to calculate the information illustrated in Table 1 is found in Appendix A. As shown in Table 1, 82% of the nitrogen, phosphorus and potassium are exported off of the facility in solids.

Liquid waste will be applied on Field 2 due to its close proximity to the lagoon and ease of irrigation. Lagoon waste will be piped through the culvert under the road to irrigate Field 2. Nutrient application of the lagoon waste should supply the phosphorus demand and part of the nitrogen demand on the pasture on Field 2.

Over application of nitrogen occurs when applying 4 truckloads of manure per acre before corn. By decreasing this application to 2.25 truckloads per acre before corn rotation (1900 ft^3), between 100 and 160 pounds of nitrogen will be applied. Eighty six percent of the solids will be exported off the facility onto third party cropland. The producer will keep load tickets to verify movement of solids off of the facility.

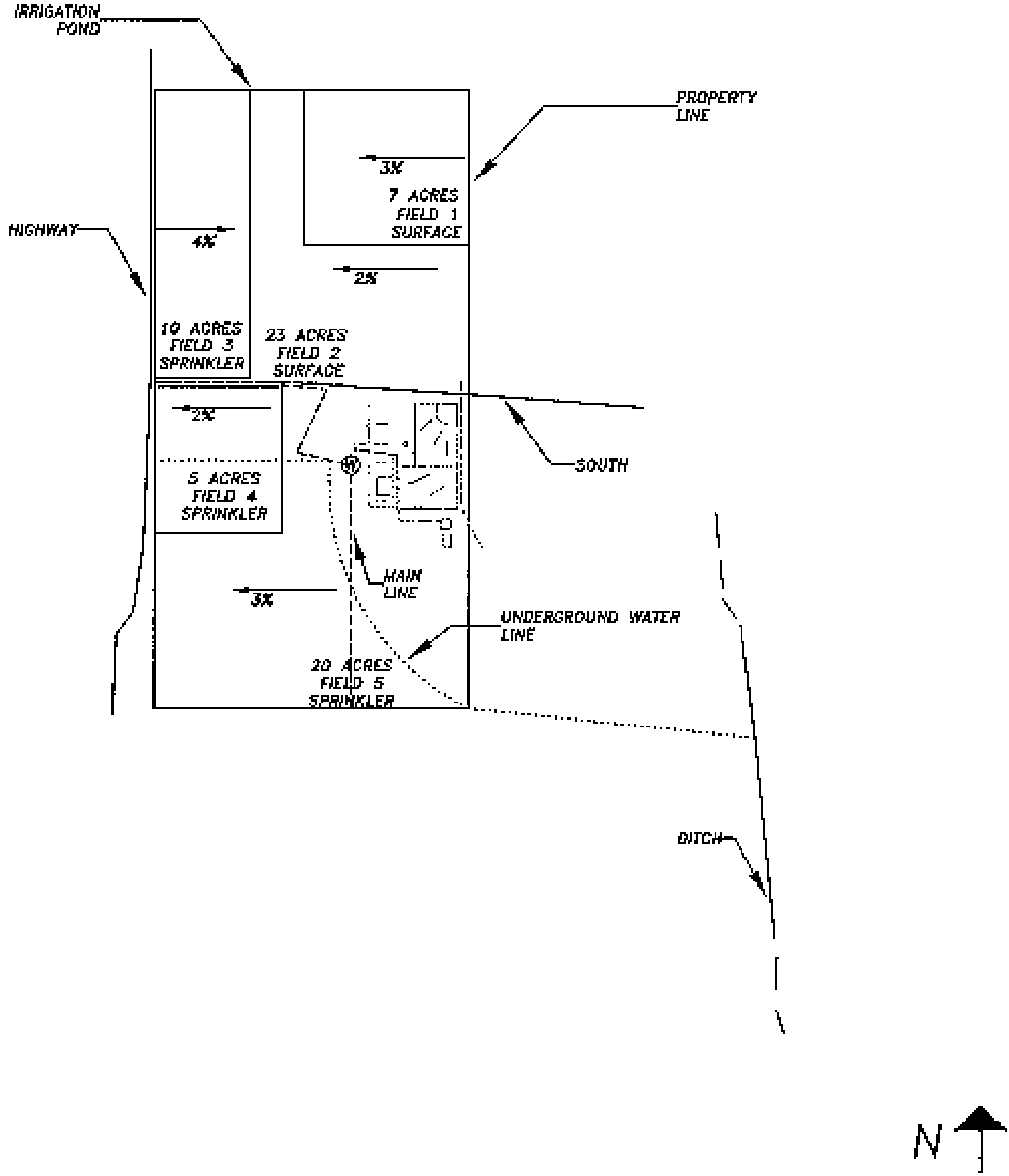
A soil scientist from NRCS should evaluate the integrity of the runoff pond. If there is a problem with the groundwater separation, additional soil should be brought in to meet the 2' separation.

It is recommended that a sleeve be placed over the piping as it enters and exits the culvert under the road in such a way as to catch and hold any leaks or spills associated with moving liquid waste. Any discharge in or around this area will be grounds to revoke the facility's permit to sell milk.

Continual inspection and maintenance of waste handling facilities and equipment will prevent unwarranted waste discharges into surface water and groundwater.

Contain manure storage areas to prevent run-off and direct seepage to groundwater from occurring.

Land Application Site Plan



IDAHO DEPARTMENT OF AGRICULTURE---DAIRY BUREAU-(208) 332-8550

DESIGNED BY : JENIFER GEDDGES	LAND APPLICATION SITE PLAN	
DRAWN BY : JENIFER GEDDGES	EXAMPLE DAIRY	EXAMPLE- EXAMPLE COUNTY
DATE : 10/22/03 FILE NAME : LANDAPP.DWG		SCALE : 1" = 600' SHEET : 1 OF 1

Crop Land

Currently Example Dairy owns 65 acres of cropland that waste is applied to. 48 acres are in pasture, while 17 acres are in a silage/alfalfa rotation. Fields 1 and 2 slope to the West while Field 3 slopes to the East. Fields 4 and 5 slope to the West. An inventory of the cropland can be found in Table 2. Fields 2, 4, and 5 will be in pasture; Fields 1 and 3 are in cropland rotation. The crop rotation, yields, and fertilization rates are shown in Table 3.

Table 2. Cropland Inventory

Field	Acres	Crop	Yield	Yr in Rotation	Resource
Field 1	7	Alfalfa	6	3	High Ground Water
Field 2	23	Pasture	3		High Ground Water
Field 3	10	Alfalfa	6	3	High Ground Water
Field 4	5	Watermelon		2	
Field 5	20	Pasture	3		

Table 3. Recommended Crop Rotation, Nutrient Uptake, and Fertilization

Crop	Years	Yield	N	P (uptake) lbs/acre	P (Uofl) lbs/acre	K
Pasture	Perm.	3	150	12	0	140
Silage	2	30	210	53	0	160
Alfalfa	3	6	270	26	0	160
Total Years	5			37	0	

See Appendix C

Phosphorus fertilization rates shown in Table 2 were calculated through crop uptake. Soil test values for nitrogen and potassium were assumed to determine a recommendation for nitrogen and potassium based on the University of Idaho Fertilizer Guides. Soil samples were taken and analyzed for plant available phosphorus. Results are reported in Table 4.

Table 4. Soil Test Values

Field	Test Date	Depth	N	P	K	pH	OM	CEC	Org N.	Salts
Field 1,3	10/8/98	0-12		18						
Field 2	10/8/98	0-12		27						
Field 5	10/8/98	0-12		24						
Field 5	10/8/98	18-24		8						
Field 4	10/8/98	0-12		82						
Field 4	10/8/98	18-24		9						

Although plant available phosphorus test values were relatively low, the University of Idaho Crop Fertilization Guide does not recommend additional phosphorus fertilization at these levels. The pasture will uptake 12 pounds of phosphorus per acre. Cropland in rotation will uptake 37 pounds of phosphorus per acre for the average crop rotation, shown in Table 3.

Table 5 illustrates the nutrients supplied by the liquids and solids when applied to crop uptake rates for the crop rotation and pasture. Due to the resource constraints on Fields 1, 2, and 3, application rates are set at crop phosphorus uptake.

Table 5. Nutrients Applied To Cropland through Waste Application

		N	P	K
Solids	**ft3**		**lb/acre**	
Pasture (yr 1)	1260	70	50	193
Pasture (yr 2)		35	13	34
Crop Rotation (yr 1)	1890	106	76	289
Crop Rotation (yr 2)	1890	159	95	340
Liquids	**Gallons**			
Crop Uptake (Rotation)	27,750	148	37	185
Crop Uptake (Pasture)	9,000	48	12	60

See Appendix C

As shown in Table 5, liquid application to meet crop phosphorus demands will not supply enough nitrogen for the crops. However, liquid application to meet the nitrogen demands of the pasture will over apply phosphorus by 38 pounds/acre. By applying 9,000 gallons/acre of liquid effluent, 48 pounds of nitrogen, 12 pounds of phosphorus and 60 pounds of potassium are supplied to the pasture. This should supply about a quarter of the nitrogen demand of the pasture. However, due to the mobility and variability in the availability of nitrogen, a spring soil test is imperative to determine the nutrient needs of the crop.

Solid waste will be applied to the pasture once every five years at a rate of 1.5 truckloads/acre. This will supply enough phosphorus to the pasture for five years, while supplying around half of the nitrogen the first year and a quarter of the nitrogen the second year. Solid waste will be applied to the cropland at a rate of 2.25 truckloads/acre each year before corn rotation. Taking into account legume crediting the first year and adjusting for stover degradation the second year, it is defendable that solid manure application would supply the nitrogen needs for corn silage and the phosphorus demands for the crop rotation.

However, mineralization plays an important role in the availability of nitrogen. Mineralization is dependent upon temperature, precipitation, nitrogen content of the manure, as well as other controlling factors. Because these factors cannot be managed, mineralization can and will vary considerably from one year to the next. Therefore, spring soil testing is critical, especially when using a nutrient budget approach to optimize nutrient applications.

Table 6 shows the total acres that should be utilized to land apply the liquid and solid waste from 276 AU onto a cropland rotation of silage/alfalfa.

Table 6. Acres Needed for Land Application

Uptake	Crop Rotation	Pasture
Liquids	8	26
Solids	176	541

Example Dairy has 17 acres in cropland rotation, and another 48 in pasture. All of the nutrients available in the liquid waste can be applied to Field 2 at 12 lb P/acre.

The following crop information was taken from the University of Idaho Crop Fertilization Guides.

Crop Information

Corn Silage-

Table 8. Recommended Fertilizer Nitrogen Rates (lb/acre) for Field Corn Harvested for Silage as Affected by Yield Level and Soil Test Nitrogen

	Silage Yield (tons/acre)				
Soil Test N	20	25	30	35	40
(ppm)			lb N/acre		
0	210	230	250	270	295
10	170	190	210	230	255
20	130	150	170	190	215
30	90	110	130	150	175
40	50	70	90	110	135
50	10	30	50	70	95
60	0	0	10	30	55
70	0	0	0	0	15

The recommended fertilizer nitrogen rates do not account for nitrogen cycling as influenced by previous crops. Add 20 pounds nitrogen per acre for each ton of straw or stover plowed under to a maximum of 50 pounds per acre. Straw yields are normally 3 or 4 tons per acre and are not always related to grain yields. Winter wheat generally produces more straw than spring wheat or barley. Fertilizer nitrogen rates should be reduced 60 pounds per acre where corn follows alfalfa.

Coarse textured soils, including sandy loams, loamy soils and sands, may lose nitrogen from leaching. For these soils, sidedress a portion of the nitrogen at the time of the last cultivation.

High nitrogen rates (approaching 300 pounds per acre) broadcast and incorporated before planting may reduce early season corn growth.

Table 9. Fertilizer Phosphorus Rates (lb/acre) Based on Soil Test Phosphorus and Soil Lime Content

		Lime Content	
Soil Test P	5	10	15+
(ppm)		P2O5 lb/acre	
0	180	240	300
5	100	160	220
10	20	80	140
15	0	0	60
20	0	0	0

Other micronutrients have not been shown to limit corn production. “Shot gun” applications of micronutrient mixtures containing boron (B), copper (Cu), iron (Fe) and manganese (Mn) “for insurance” have not been shown to be economical and are not recommended.

Alfalfa-

Soils containing 20 to 30 pounds (4 to 7.5 ppm) of nitrate-nitrogen in the top 12 inches have sufficient nitrogen to establish a stand of alfalfa seeded alone. Adding fertilizer nitrogen at establishment reduces nodule number and nodule activity.

Table 10. Phosphorus Fertilizer Rates Based on a Soil Test

Soil Test (0 to 12 inch)	Apply P205
(ppm)	(lb/acre)
0	160
3	120
7	60
over 10	0

Alfalfa has a high potassium (K) requirement.

Table 11. Potassium Fertilizer Needs Based on a Soil Test

Soil Test (0 to 12 inch)	Apply K20
(ppm)	(lb/acre)
0	240
56	160
112	80
150	0

Alfalfa and other legumes require more sulfur than grasses. Plant tissue testing is an excellent tool for detecting sulfur-deficient alfalfa. Samples should be analyzed for total nitrogen and total sulfur. These values are used to calculate the nitrogen/sulfur ratio, which should be less than 15.

Zinc (Zn) deficiencies on alfalfa have not been observed in Idaho.

Alfalfa quality is enhanced by cutting at the early bud stage and more frequently during the growing season. This practice will reduce stand life, however.

Pasture –

Grass pastures have responded well to nitrogen (N) fertilizer applications up to 150 pounds nitrogen per acre. The nitrogen rate depends upon the length of frost-free growing season and the number of cuttings or grazing periods. Split applications of nitrogen fertilizer maintain a more uniform level of forage production through summer and fall. Broadcast 30 to 50 pounds nitrogen per acre per application after each cutting or grazing cycle, and irrigate to move nitrogen into the plant root zone.

Nitrogen and phosphorus are the elements needed most on Idaho irrigated pastures. Potassium, sulfur, zinc and boron may be needed. Their need is best determined by soil and plant tissue tests. Legume population in a grass-legume mixture is reduced by nitrogen fertilization and increased by phosphorus and potassium addition when these nutrients are low in the soil.

Table 1. Phosphorus Fertilizer Rates Based on Soil Test

Soil Test (0 to 12 inch)	Apply P205
(ppm)	(lb/acre)
0-3	160
3-7	120
7-10	60
over 10	0

Table 2. Potassium Fertilizer Rates Based on Soil Test

Soil Test (0 to 12 inch)	Apply K20
(ppm)	(lb/acre)
0-40	200
40-75	140
75-110	80
over 110	0

Nutrient Budgeting

The following section will be utilized in conjunction with the Nutrient Budget worksheets, which are available in Appendix D to help determine fertilization rates.

Line 1- Crop nutrient requirements can be determined from spring soil testing and the University of Idaho Crop Fertilization Guides. For additional information on how to soil test, see University of Idaho Bulletin 704 – Soil Sampling.

Line 2 – Using the U of I Fertilizer Guide, credit nitrogen from previous legume crop.

Line 4 – Solid waste will be applied at the following rates:

Application Rate (ft^3/acre)	Year	N Lb/acre	P Lb/acre	K Lb/acre
2500	1	145	74	300
2500	2	236	92	353
Mineralization	3	91	18	53
1680	1	94	48	195
Mineralization	2	59	12	34

Line 5 - As illustrated in Table 5, if 12 pounds of phosphorus are applied through liquid waste application, 40 pounds of nitrogen and 45 pounds of potassium will be applied to the cropland.

This budgeting approach will help the producer to determine the amount of commercial fertilizer that should be applied to the cropland.

Irrigation System

Fields 1 and 2 are surface irrigated through gated pipe for 12 hour sets. Fields 3, 4, and 5 are sprinkler irrigated through hand line for 8 and 12 hour sets. The fields for Example Dairy are characterized for irrigation purposes in Table 7 and 8. The soil information has been collected from the NRCS Soil Survey for Gooding County. Crop evapotranspiration (ET) rates are from the Idaho Department of Water Resources.

Table 7. Field Irrigation Information

Field Identification	Soil Texture	AWHC in/in	Soil Depth ft	Irrig System	Runoff?	Drained?	WT?
Field 1	Fine Sandy Lm	0.13	>5	Gated Pipe	N	N	Y
Field 2	Fine Sandy Lm	0.13	>5	Gated Pipe	N	N	Y
Field 3	Fine Sandy Lm	0.13	>5	Hand Line	N	N	Y
Field 4	Fine Sandy Lm	0.1	>5	Hand Line	N	N	N
Field 5	Fine Sandy Lm	0.1	>5	Hand Line	N	N	N

Table 8. Crop Irrigation Information

Crop	Table ET mm/day	Yield Adj %	Peak ET in/day	Root Depth Ft	M.A.D. %
Alfalfa	8.128	80%	0.26	4	55
Corn Silage	7.62	90%	0.27	3	50
Pasture	7.29	100%	0.29	2	50

Fields 1 and 2 are gravity irrigated with significant field slope. Ideally, these fields should also be sprinkler irrigated. A relatively low system efficiency was assumed for this system based on the design and management. Runoff from these fields is captured and reused on other fields.

To better manage irrigation water, Field 1 should be irrigated every 7 days for 12 hour sets during peak ET periods. At this scheduling, it will take 4 sets to irrigate Field 1. Each gate should be open ½" for 66 gates. The system flow rate should be around 410 gpm. The irrigation frequency and scheduling does not change whether corn or alfalfa is being grown. The tailwater from this field is used to irrigate a portion of the pasture included in Field 2. This is a very inefficient use of the tailwater, since the pasture ET rate does not match the crops grown on Field 1.

Field 2 should be irrigated every 4 days for 12 hour sets during peak ET periods. At this scheduling, it will take 4 sets to irrigate Field 2. Each gate should be open ½" for 66 gates. They system flow rate should be around 410 gpm.

Twelve hour sets on Fields 1 & 2 may not be sufficient to properly wet the corrugates/furrows. This set time may need to be changed to 24 hours, with decreased flowrate. Ideally, the field should be irrigated in response to moisture sensors placed in the field.

Field 3 should be irrigated every 6 days for 12 hour sets during peak ET periods. Hand line will have to be moved three times before irrigation of Field 3 is complete. Twelve laterals should be run at one time, with 8 birds on a lateral. The system flow rate should be around 375 gpm.

Fields 4 and 5 are irrigated together. These fields should be irrigated every 4 days for 8 hour sets during peak ET periods. Three laterals should be run at one time with 33 birds on a lateral when irrigating field 5. When Field 4 is irrigated, 6 laterals can be run at one time with 16 birds on each lateral. This compensates for the acreage taken out in the dairy.

Liquid waste from the dairy will be applied to Field 2 at the volumes specified previously. The ponds should be emptied in the spring and fall, during the first and last irrigations with no effluent applied through the remainder of the season. Liquid waste should be applied as illustrated in Table 9.

Table 9. Application Rates for Irrigated Liquid Waste

Field	Flowrate (gpm)	Time per Set (hrs)	Stage of Irrigation
Field 2	50	6.0	End

A soil moisture monitoring device should be utilized to help determine irrigation scheduling to meet crop needs.