

COMPREHENSIVE NUTRIENT MANAGEMENT PLAN

DECEMBER

For

DIAMOND VALLEY DAIRY

3798 VALLEY CREEK ROAD
SALEM, OR 97304
503-363-3243

RECEIVED

MAY 23 2011

NATURAL RESOURCES
DIVISION

KEVIN DEJAGER and LARRY BOERSMA
OWNERS

signed



5/24/11

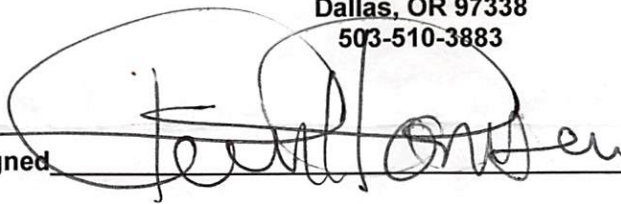
signed



5/24/11

Prepared by:
Northwest Agricultural Consulting
Tom Thomson
1275 Oak Villa Road
Dallas, OR 97338
503-510-3883

signed



5/23/11

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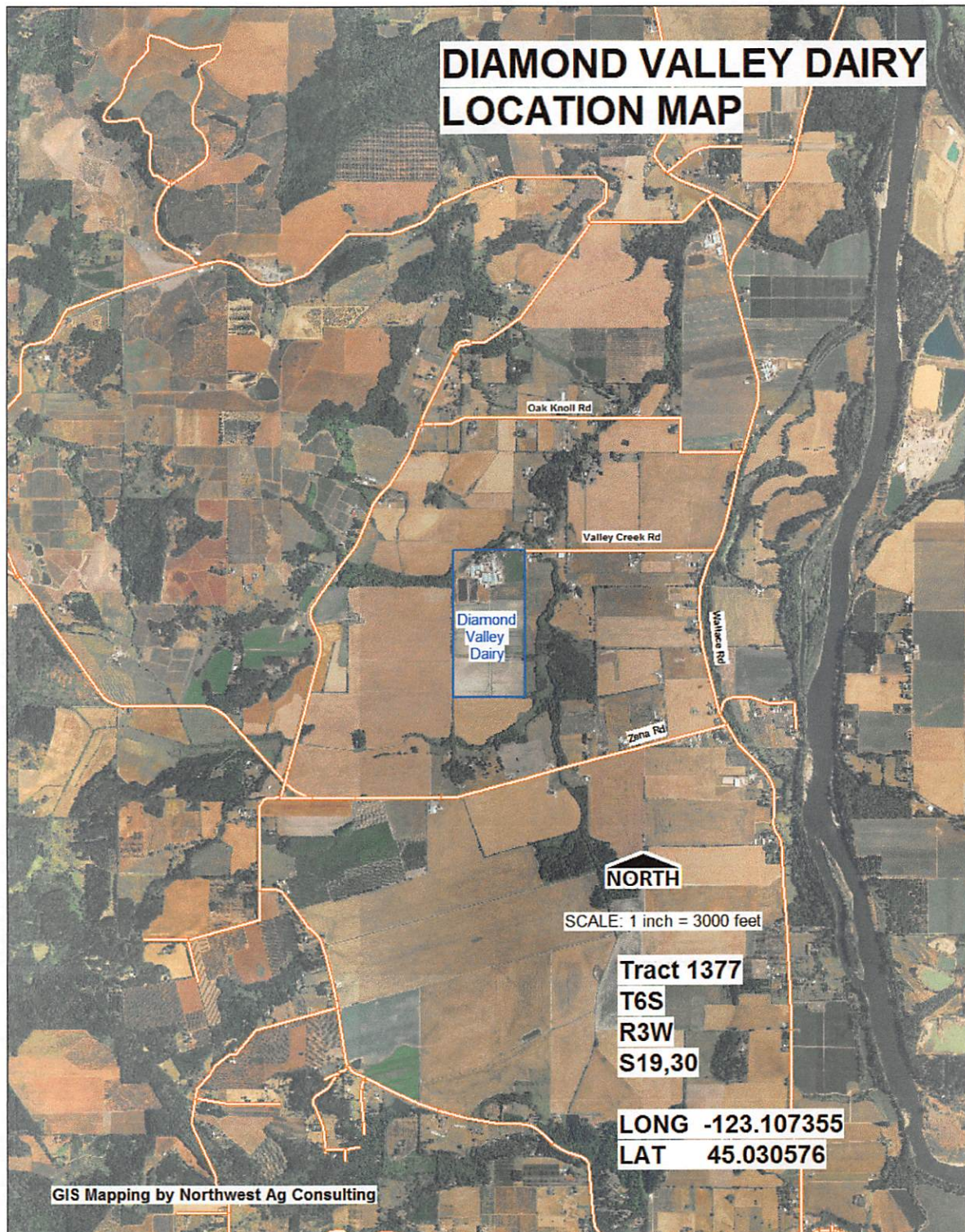
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PLAN SUMMARY

Location Map for Diamond Valley Dairy



PLAN SUMMARY

This Comprehensive Nutrient Management Plan (CNMP) was developed in accordance with the USDA Natural Resources Conservation Service's Field Office Technical Guide and provides guidance for the wise use of the soil, water, air, plants and animal resources in order to minimize degradation of these resources such that public health and safety is protected. The plan provides guidance on what structural and management practices are needed to prevent the discharge of pollutants to surface or ground water by recycling wastes through the soil and plants to the fullest extent possible.

As owner of the Diamond Valley Dairy, Kevin DeJager and Larry Boersma are responsible for the proper application of practices listed in Section 5 of this plan and the Operation and Maintenance (O&M) required to keep them functional. It is also the responsibility of Kevin DeJager and Larry Boersma to comply with all of the provisions and conditions outlined in the Confined Animal Feeding Operation (CAFO) permit administered by the Oregon Department of Agriculture located in Section 9 of this plan. Any modifications to the operation which are not within the provisions and conditions of the CAFO permit must be reviewed and approved by the Oregon Department of Agriculture prior to implementation.

OBJECTIVES

Kevin DeJager and Larry Boersma have the following objectives:

1. Apply liquid and solid manure to obtain maximum nutrient benefit while eliminating runoff and minimizing leaching of nutrients.
2. Operate the farm in a socially and environmentally acceptable manner.

ANIMAL NUMBERS

Diamond Valley Dairy is currently permitted for 1240 animals consisting of 550 lactating cows, 90 dry cows, 350 heifers, and 250 calves. The cows are housed in freestall barns year around.

The barns are flushed with recycled lagoon water. Livestock mortalities are composted on site. Silage is stored in three covered bunkers totaling 36,360 ft². Silage juice from both is piped to the manure ponds. All areas between barns are concrete.

Animal confinement buildings are guttered and down-spouted with outlets to an area free of manure. All conservation practices will be managed and maintained in accordance with the enclosed "Conservation Practice Operation and Maintenance Worksheets."

There are 111.5 acres of owned cropland available for manure application on the dairy. The owned acres are double cropped to a winter cover crop of annual ryegrass and silage corn both of which are ensiled for feed. Additional acres are available for manure application by written lease but are not cropped by the dairy.

The manure separation system consists of a sidehill unit and uncovered concrete slab for storage. Separated solids are removed from the dairy. Liquid manure is stored in a two-cell manure pond and applied to fields with big-gun travelers at agronomic rates via buried mainlines. Manure is applied to adjacent ground via surface mainlines and travelers.

PLAN SUMMARY

The long-term goal of the dairy is to make the operation more efficient by installing a new multi-stage separator system and associated storage to the south of the existing area near the hay barn and Cell #1. This would free up the central portion of the dairy for better barn access and cow movement. The new separator system would also allow a herd increase by removing much of the phosphorus from the liquid portion of the manure. The current separator has an efficiency of approximately 20-25% solids removal while the anticipated efficiency of the new system would be near 70%.

EMERGENCY RESPONSE PLAN

In Case of a Storage Facility Spill, Leak, or Failure

- a. Stop all other activities to address the emergency.
- b. Stop all flow into the storage facility.
- c. If the storage facility is at maximum capacity or overtopping, draw the waste level in the facility down by making an application to the emergency application area shown on the plan map in accordance with the Waste Utilization specifications found in the Section 11 of this plan.
- d. Assess the extent of the emergency and determine how much help is needed to correct the problem.
- e. Call for help & excavator if needed.
- f. If possible, use a skid loader or tractor with blade to contain or divert spill or leak away from environmentally sensitive areas.
- g. If containment material is needed, excavate soil from appropriate areas away from the storage facility.
- h. If possible, begin applying the stored waste to the utilization fields at the prescribed application rates described in Section 6 of this plan.
- i. Complete the clean-up and repair the necessary components.

In Case of a Manure/Waste Discharge

- a. Stop all other activities to deal with the emergency.
- b. Call for help if needed.
- c. Call sheriffs office if spilled on road for traffic control and clean the spill immediately from the road and roadside if needed.
- d. Contain the spill or runoff from entering the stream or waterway using straw bales, saw dust, or soil material.
- e. If flow is coming from a tile, plug the tile with a tile plug immediately.
- f. Assess the extent of the emergency and determine how much help is needed.

Contacts to be made within 24 Hours of a Discharge

(SEE NEXT PAGE FOR REQUIREMENTS FOR FILING A WRITTEN REPORT)

Organization	Phone
Oregon Department of Agriculture	1-503-986-4699
Oregon Emergency Response System (ORES)	1-800-452-0311

Be prepared to provide the following information:

- a. Your Name (See next page)
- b. Farm Identification (See next page)
- c. Description of emergency.
- d. Estimate of the amounts, area covered, and distance traveled.
- e. Has manure reached surface waters or major field drains?
- f. Is there any obvious damage: employee injury, fish kill, or property damage?
- g. What is currently in progress to contain situation?

EMERGENCY RESPONSE PLAN

Emergency Contact Information

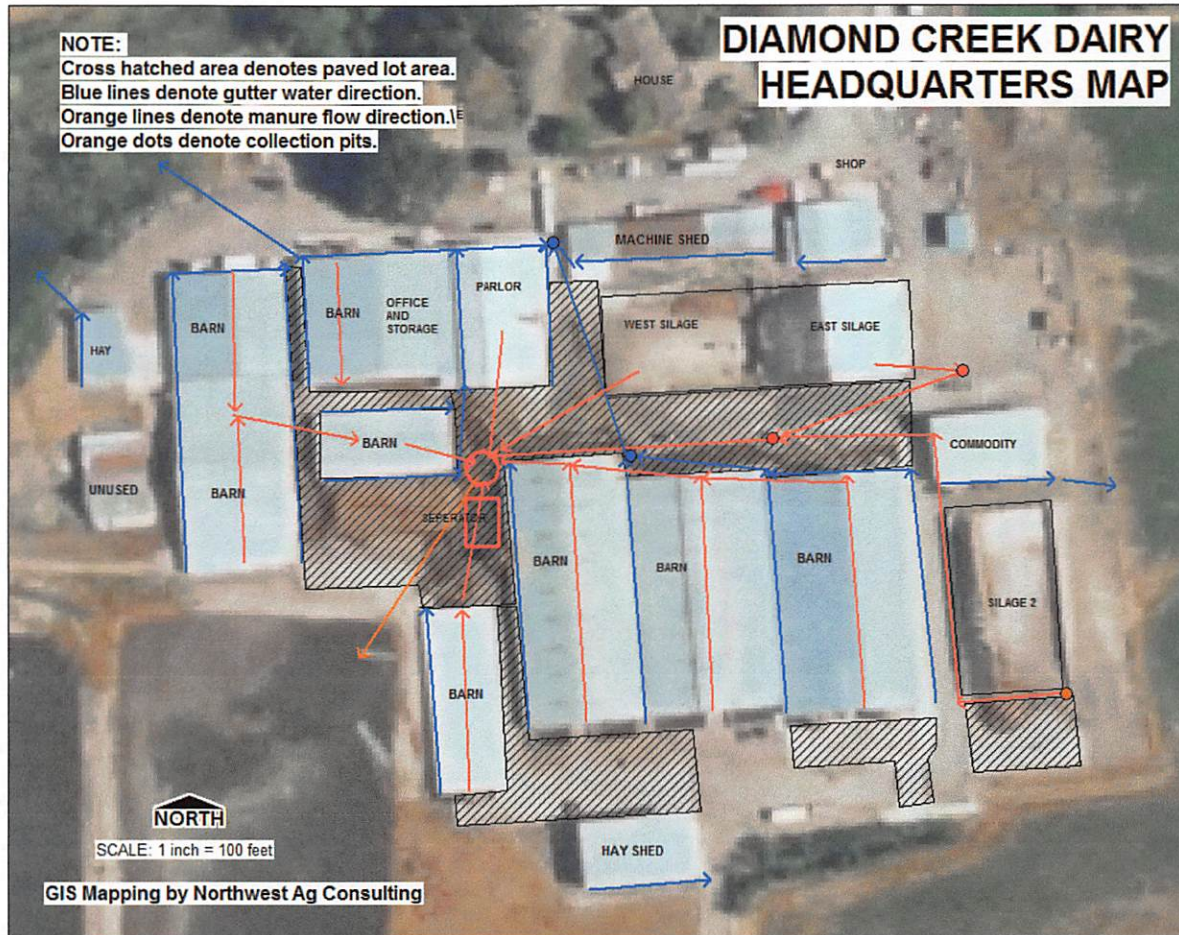
Farm Name	Diamond Valley Dairy
Address	3798 Valley Creek Rd. Salem, OR 97304
Farm Phone	(503) 363-3243
ODA CAFO Permit #	181309
DIRECTIONS TO FARM	FROM WEST SALEM: Go North on Highway 221 (Wallace Road) approximately 8 miles (or about 1.5 miles past Lincoln Store) to Valley Creek Road. Left on Valley Creek Rd, then 1.75 miles to end of road to entrance of dairy
Emergency Phone Numbers:	
Farm Owner	(503) 363-3243
Farm Manager	(503) 363-3243
FIRE or AMBULANCE	911

If a Discharge Occurs a Written Report is to be made by Owner or Operator to Oregon Department of Agriculture within 5 Days that contains the following information:

- a. A description and cause of the discharge.
- b. The period of discharge including exact dates, times and duration of discharge.
- c. An estimate of discharge volume.
- d. Name or location of receiving water.
- e. Corrective steps taken, if appropriate, to reduce, eliminate or prevent reoccurrence of the discharge.

MANURE AND WASTEWATER HANDLING AND STORAGE FACILITIES

Facility Plan Map



***MANURE AND WASTEWATER HANDLING
AND STORAGE FACILITIES***

CLIENT: **DIAMOND VALLEY DAIRY - 1100 Milker**
 ASSISTED BY: Northwest Ag Consulting - Tom Thomson 05-23-11

Worksheet OR10A-7--Waste storage period determination

Basic Storage Period, SPb = **213** Days

Enter average monthly Evapotranspiration(ET) from OSU Extension Publication 8530,
 Oregon Crop Water Use and Irrigation Requirements, and Precipitation(Ppt) Data from

Climatic Station- **SALEM WSO AIRPORT**

Day of Year	MONTH	Crop ET, Inches	Accum ET, Inches	Ppt, Inches
1-31	January	0.39	0.39	6.02
32-59	February	0.63	1.02	5.09
60-90	March	1.46	2.48	4.17
91-120	April	3.31	5.79	2.76
121-151	May	4.53	10.32	2.13
152-181	June	5.24	15.56	1.45
182-212	July	7.13	22.69	0.57
213-243	August	5.91	28.60	0.68
244-273	September	4.02	32.62	1.43
274-304	October	2.48	35.10	3.03
305-334	November	0.43	35.53	6.39
335-365	December	0.35	35.88	6.46

a. Determine last day for the month of the year when 3/4 of Annual ET is exceeded-

$$3/4 \text{ of Annual ET} = 0.75 \times 35.88 = 26.91 \text{ Inches}$$

L = Last Day for Month Accum ET exceeds 3/4 of Annual ET

$$L = 243 \text{ Days}$$

b. Determine first day for the month of the year when ET >= Ppt-

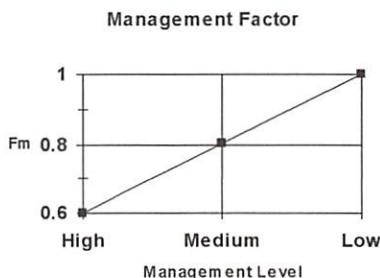
E = First Day of Month ET >= Ppt

$$E = 91 \text{ Days}$$

$$c. SPb = 365 - (L - E) = 365 - (243 - 91) = 213 \text{ Days}$$

Management Factor, Fm =

0.8



Low Level, Fm = 1.0

...The operator does not utilize a waste management plan.
 ...Proper operation and maintenance may not be performed.

Medium Level, Fm = 0.8

...The operator utilizes an up-to-date waste management plan.
 ...Manure application equipment is calibrated for nutrient applications.
 ...Maintains adequate soil moisture for crop growth.
 ...Agronomic treatments which would maximize crop nutrient uptake are not fully utilized.
 ...Proper operation and maintenance is planned.

High Level, Fm = 0.6

...The operator utilizes an up-to-date waste management plan.
 ...Soil fertility testing is performed annually.
 ...Manure in storage is tested for nutrient concentrations.
 ...Records of time, rate and location of manure applications are maintained.
 ...Manure application equipment is calibrated for nutrient applications.
 ...Irrigation water management techniques are practiced.
 ...Crop nutrient uptake is maximized with appropriate agronomic treatments such as residue management, conservation crop rotation, crop variety selection, prescribed grazing, and pest management.
 ...Proper operation and maintenance is planned.

CLIENT: **DIAMOND VALLEY DAIRY - 1100 Milker**
 ASSISTED BY: Northwest Ag Consulting - Tom Thomson 05-23-11

Worksheet OR10A-7--Waste storage period determination

Soils Factor: $F_{s_{LIQ}} = 0.90$ $F_{s_{SOL}} = 0.70$

Soils must meet the following criteria for F_s to be less than 1.0-

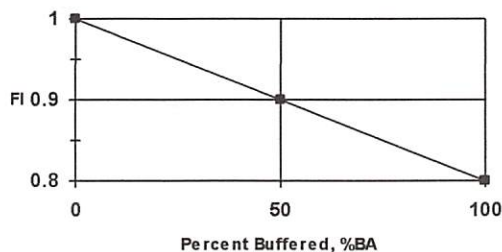
- ... The average water holding capacity for the profile greater than 3.0 inches.
- ... A cation exchange capacity greater than 5 meq/100g of soil.
- ... Depth to a thin layer/cemented pan greater than 20 inches.
- ... Depth to high water table greater than 2 feet.
- ... A permeability greater than 0.06 inches/hr but less than 6 inches/hr.
- ... Cobbles less than 35% by weight in the surface layer.
- ... Stones and boulders less than 15% by weight in the surface layer.

HSG	Soils Factor (F_s)			
	Consistency of Waste			
	Liquid	Slurry	Semi-Solid	Solid
A	1	0.95	0.9	0.8
B	0.8	0.75	0.7	0.6
C	0.9	0.85	0.8	0.7
D	1	1	0.95	0.85

HSG	Area	$F_{s_{LIQ}}$	Wtd $F_{s_{LIQ}}$	$F_{s_{SOL}}$	Wtd $F_{s_{SOL}}$
C	100	0.9	90.00	0.7	70.00
		$F_{s_{LIQ}} = 0.90$		$F_{s_{SOL}} = 0.70$	

Location Factor: $FI = 1.00$

Location Factor



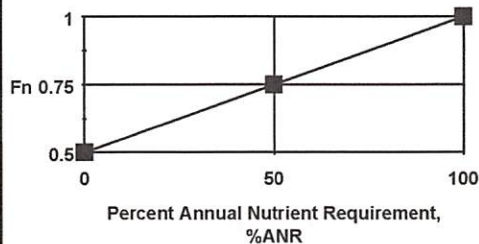
For an application area to be considered buffered there must be a 0 to 5 percent chance of flooding and the area must be at least 50 feet from water bodies, ground water sources(wells), and areas of concentrated flow. The percent buffered area(%BA) is determined by taking the total buffered area(TBA) and dividing it by the total land area(TLA) available for manure application.

$$\%BA = \frac{TBA}{TLA} \times 100\%$$

$$\%BA = \frac{0}{210} \times 100\% = 0\%$$

Nutrient Loading Factor: $F_n = 1.00$

Nutrient Loading Factor



In order for the Nutrient Loading Factor, F_n to be less than 1, the Location Factor, FI must be 0.95 or less.

The percent of annual nutrient requirement(%ANR) is determined by taking the total nutrients applied(TNA) annually and dividing it by the total nutrient requirements(TNR) of all of the crops grown.

$$\%ANR = \frac{TNA}{TNR} \times 100\%$$

$$\%ANR = \frac{1,192}{1,751} \times 100\% = 68\%$$

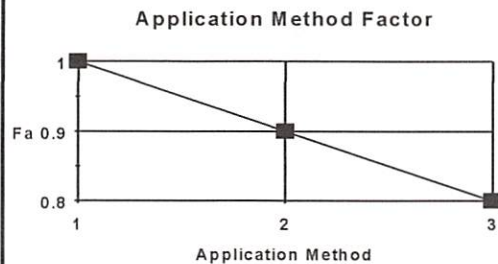
CLIENT: **DIAMOND VALLEY DAIRY - 1100 Milker**
 ASSISTED BY: Northwest Ag Consulting - Tom Thomson 05-23-11

Worksheet OR10A-7--Waste storage period determination

Application Method Factor:

$F_{a\text{LIQUID}} = 0.90$

$F_{a\text{SOLID}} = 1.00$



Method 1 - Surface applied solid manure, no incorporation.

Method 2 - Surface applied liquid manure, no incorporation.

Method 3 - Injection or immediate incorporation.

Adjusted Storage Period: $ASP_{\text{LIQUID}} = 138$ Days $ASP_{\text{SOLID}} = 119$ Days

$ASP = SP_b \times F_m \times F_s \times F_i \times F_n \times F_a$

$ASP_{\text{LIQUID}} = 213 \times 0.8 \times 0.9 \times 1 \times 1 \times 0.9$

$ASP_{\text{SOLID}} = 213 \times 0.8 \times 0.7 \times 1 \times 1 \times 1$

Adjusted earliest Day of Year for application, $E_a = ASP - (365 - L)$

$E_{a\text{LIQUID}} = 16$

$E_{a\text{SOLID}} = -3$

Storage Period: $SP_{\text{LIQUID}} = 154$ Days $SP_{\text{SOLID}} = 154$ Days

The storage period must span the seasonal flooding conditions and must also span frozen ground and snow conditions where the land slope exceeds 5% and a buffer strip of less than 100 feet exists next to open water courses that affect the application area-

a. Enter L from Sheet 1 and determine the Day of Year L_f when seasonal frozen ground, snow or flooding conditions are first anticipated for the application area-

$L = 243$ Days

$L_f = 365$ Days

If L_f comes before L then $L_{sp} = L_f$

If L_f comes after L or there is no seasonal frozen ground, snow or flooding then $L_{sp} = L$

$L_{sp} = 243$ Days

b. Determine the Day of Year E_f when seasonal frozen ground, snow or flooded conditions are no longer anticipated for the application area-

$E_f = 32$ Days

If E_f comes after E_a then $E_{sp} = E_f$

If E_f comes before E_a or there is no seasonal frozen ground, snow or flooding then $E_{sp} = E_a$

$E_{sp\text{LIQUID}} = 32$ Days

$E_{sp\text{SOLID}} = 32$ Days

c. $SP_{\text{LIQUID}} = 365 - (L_{sp} - E_{sp\text{LIQUID}}) = 154$ Days

$SP_{\text{SOLID}} = 365 - (L_{sp} - E_{sp\text{SOLID}}) = 154$ Days

d. Earliest date (E_{sp}) for manure application (month-day):

$E_{sp\text{LIQUID}} = \text{February 4}$

$E_{sp\text{SOLID}} = \text{February 1}$

e. Latest date (L_{sp}) for manure application (month-day) = September 31

CLIENT: DIAMOND VALLEY DAIRY - 1100 Milker
 ASSISTED BY: Northwest Ag Consulting - Tom Thomson 05-23-11

Worksheet OR10A-7--Waste storage period determination

Day of Year Calendar

Day of month	Jan	Feb	Mar	Apr	May	Month Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29		88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

MANURE AND WASTEWATER HANDLING AND STORAGE FACILITIES

Worksheet OR10A-7- Waste storage period determination

Day of Year Calendar

Day of month	Jan	Feb	Mar	Apr	May	Month Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29		88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

MANURE AND WASTEWATER HANDLING AND STORAGE FACILITIES

Livestock Manure Storage Assessment Worksheet					
Ground & Surface Water Contaminants - Nutrients, Organics & Pathogens					
Rating Item	Low Risk 4 Points	Low-Mod Risk 3 Points	Mod-High Risk 2 Points	High Risk 1 Point	Score
1. No on-farm storage facilities	Wastes hauled off farm for proper storage and disposal			Daily spreading of livestock wastes	3
2. On-farm storage Manure stack	Manure stack covered; on impermeable surface; rainfall and runoff diverted; built to NRCS standards.	Manure covered; on low permeable soil; rainfall and runoff diverted.	Manure partially covered; on slightly permeable soils; some runoff collected.	Manure not covered; runoff not collected.	1
and/or					
Liquid/Slurry storage	Concrete, clay lined, or other liquid tight design; designed and built to NRCS standards; properly maintained; no cracks and leaks.	Earthen structure built to NRCS standards and properly maintained.	Not designed to NRCS standards; on slightly permeable soils; poorly maintained, some evidence of cracks and leaks.	Not designed to NRCS standards; on permeable soils; not maintained; leaks and cracks.	4
3. Storage volume	Not full at end of rainy season; if liquid/slurry adequate capacity to hold 25-year, 24-hour storm; solids removed to avoid loss of storage capacity.	Not full at end of rainy season; if liquid/slurry not adequate capacity to hold 25-year, 24-hour storm.	Storage facility requires occasional emptying during the rainy season; if liquid/slurry not adequate capacity to hold 25-year, 24-hour storm.	Storage facility requires regular emptying during the rainy season; if liquid/slurry not adequate capacity to hold 25-year, 24-hour storm.	4
4. Storage location	Manure stack or earthen pond located more than 500 feet from well, stream, pond, or drainageway. Or Liquid/slurry storage located more than 200 feet from well, stream, pond, or drainageway or has emergency containment dike for accidental spills or leaks.	Manure stack or earthen pond located between 250-500 feet from well, stream, pond, or drainageway. Or Liquid/slurry storage located between 100-200 feet from well, stream, pond, or drainageway	Manure stack or earthen pond located less than 250 feet downslope from well, stream, pond, or drainageway. Or Liquid/slurry storage located more than 100 feet downslope from well, stream, pond, or drainageway	Manure stack or earthen pond located less than 250 feet upslope from well, stream, pond, or drainageway. Or Liquid/slurry storage located 100 feet from upslope well, stream, pond, or drainageway	3
Livestock Waste Storage Rating for Ground & Surface Waters		Accumulative Score (sum of above ratings)			15
		Average Score (sum of ratings / number of items rated)			3.8
Overall Risk Rating-		Low			

Ratings: 3.6-4=Low risk, 2.6-3.5=Low to moderate risk, 1.6-2.5=Moderate to high risk, 1-1.5=High Risk

Source: Modification of Oregon Home*A*Syst, EM 8546, Worksheet #7, Livestock Waste Storage

MANURE AND WASTEWATER HANDLING AND STORAGE FACILITIES

Livestock Yard Management Assessment Worksheet					
Ground & Surface Water Contaminants – Nutrients, Organics & Pathogens					
Rating Item	Low Risk 4 Points	Low-Moderate Risk 3 Points	Mod-High Risk 2 Points	High Risk 1 Point	Score
1. Location	More than 200 feet from well and more than 500 feet from stream, pond, or drainageway	Between 100-200 feet of well and between 250-500 feet from stream, pond, or drainageway	Between 50-100 feet of well and between 100-250 feet from stream, pond, or drainageway	Less than 50 feet of well and less than 100 feet from stream, pond, or drainageway	2
2. Livestock water source	Stock water in troughs, with overflow diverted to wastewater system	Stock water in troughs with overflow diverted from lot area. Stock excluded from streams or ditches.	Live water fenced, with stock water provided in water gap.	Stock water provided by live stream or irrigation ditch.	4
3. Surface water diversion	All upslope and roof water diverted. Diversion and gutters well maintained.	Most upslope surface and roof water diverted. Diversions and gutters occasionally maintained.	No surface water diverted. Some roof water collected and redirected. Gutters and diversions not maintained.	All water (surface and roof water) runs through the yard.	4
4. Lot runoff control system	No yard runoff. Fully covered area or runoff from surfaced lot directed to waste storage facility.	All runoff collected from compacted, earthen lot. Solids mounded and collected or stored.	Most of lot runoff diverted to filter strip and collected. Some solids removed.	Lot runoff uncontrolled. Solids rarely collected.	4
5. Yard cleaning and scraping	No yard (animals confined)	Every month or two lot smoothed, leveled, and regularly shaped.	Quarterly. Lot rough and irregular in shape.	Rarely. Lot poorly sited and developed for cleaning and scraping.	4
6. Dairy cow concentration on yard	No yard. Confined to barn, roofed yard or pasture.	75 sf/a or more on fenced, curbed concrete pad and/or 400 sf/a on graded earthen surface. More than 1800 sf/a in exercise area.	50 sf/a or more on concrete pad and/or 200-300 sf/a on earthen surface. More than 1200 sf/a in exercise area.	Some concrete, less than 50 sf/a and less than 200 sf/a on earthen surface.	4
7. Dairy replacements concentration	No yard. Confined to barn, roofed yard, or pasture.	More than 40 sf/a on fenced, curbed concrete pad and/or more than 150 sf/a on earthen yard.	40-20 sf/a on concrete and/or 75-150 sf/a on earthen surface.	Less than 75 sf/a on earth.	4

MANURE AND WASTEWATER HANDLING AND STORAGE FACILITIES

Livestock Yard Management Assessment Worksheet					
Ground & Surface Water Contaminants – Nutrients, Organics & Pathogens					
Rating Item	Low Risk 4 Points	Low-Moderate Risk 3 Points	Mod-High Risk 2 Points	High Risk 1 Point	Score
8. Beef feeder concentrations	No yard. Confined to barn.	Barn and/or paved lot more than 50 sf/a. Earthen lot with mound more than 300 sf/a, or without mound more than 500 sf/a.	No shelter. Paved lot with 30-50 sf/a. Earthen lot with mound 150-300 sf/a or earthen without mound 250-500 sf/a.	Paved less than 30 sf/a. Earthen less than 250 sf/a.	
9. Beef cows/heifers concentrations	Barn, roofed yard, or pasture.	Barn with paved lot more than 60 sf/a. Earthen with mound 400 sf/a or without mound 600 sf/a.	Paved lot more than 30 sf/a. Earthen with mound 200-400 sf/a or without mound 300-600 sf/a.	Paved less than 30 sf/a. Earthen without mound less than 200 sf/a.	
10. Sheep/ewes concentrations	No yard. Confined to barn, roofed yard, or pasture.	Barn and paved lot more than 20 sf/a. Earthen more than 40 sf/a.	Barn and paved lot 15-20 sf/a. Earthen 25-40 sf/a.	Barn and paved lot less than 15 sf/a. Earthen less than 25 sf/a.	
11. Feeder lambs concentrations	No yard. Confined to barn, roofed yard, or pasture.	Barn and paved lot more than 10 sf/a. Earthen more than 25 sf/a.	Barn and paved lot 5-10 sf/a. Earthen 10-25 sf/a.	Barn and paved lot less than 5 sf/a. Earthen less than 10 sf/a.	
12. Hogs/sows Concentrations	No yard. Confined to barn.	Shed and paved lot more than 30 sf/a.	Shed and earthen lot more than 10 sf/a	Shed and earthen lot less than 10 sf/a.	
13. Horses concentrations	No yard. Confined to barn, roofed yard, or pasture.	Earthen exercise lot more than 2,500 sf/a.	Earthen exercise lot 1,000-2,500 sf/a.	Earthen exercise lot less than 1,000 sf/a	
14. Poultry concentrations	No lot. In building.		Earthen lot of more than 4 sf/a.	Earthen lot of less than 4 sf/a.	
Livestock Yard Rating		Accumulative Score (sum of above ratings)			26
		Average Score (sum of ratings / number of items rated)			3.7
Overall Rating-		Low			

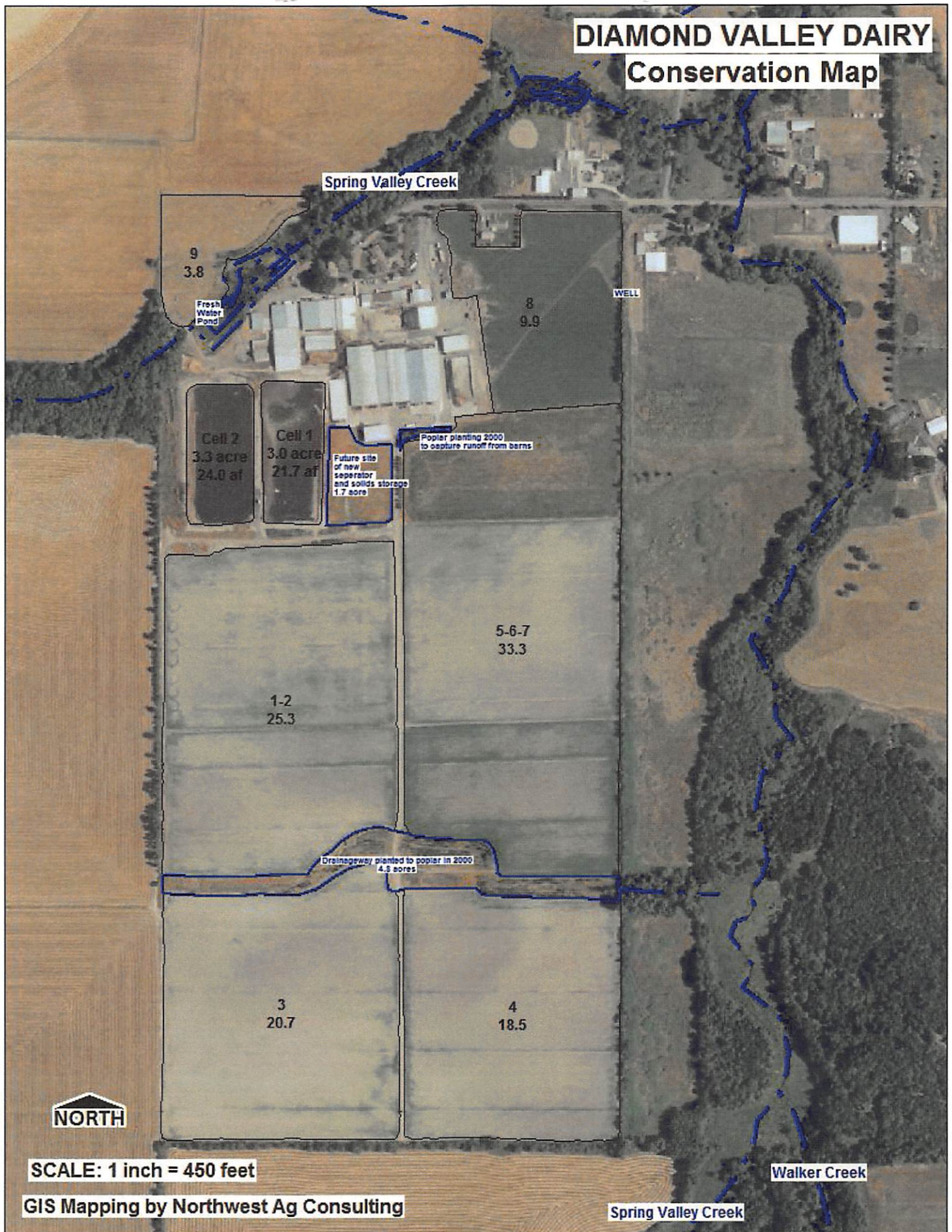
Ratings: 3.6-4=Low risk, 2.6-3.6=Low to moderate risk, 1.6-2.5=Moderate to high risk, 1-1.5=High Risk

Note: sf/a = square feet per animal

Source: Modification of Oregon Home*A*Syst, EM 8546, Worksheet #8, Livestock Yards Management

***MANURE AND WASTEWATER HANDLING
AND STORAGE FACILITIES***

DIAMOND VALLEY DAIRY Conservation Map



DIAMOND VALLEY DAIRY FIELD MAP

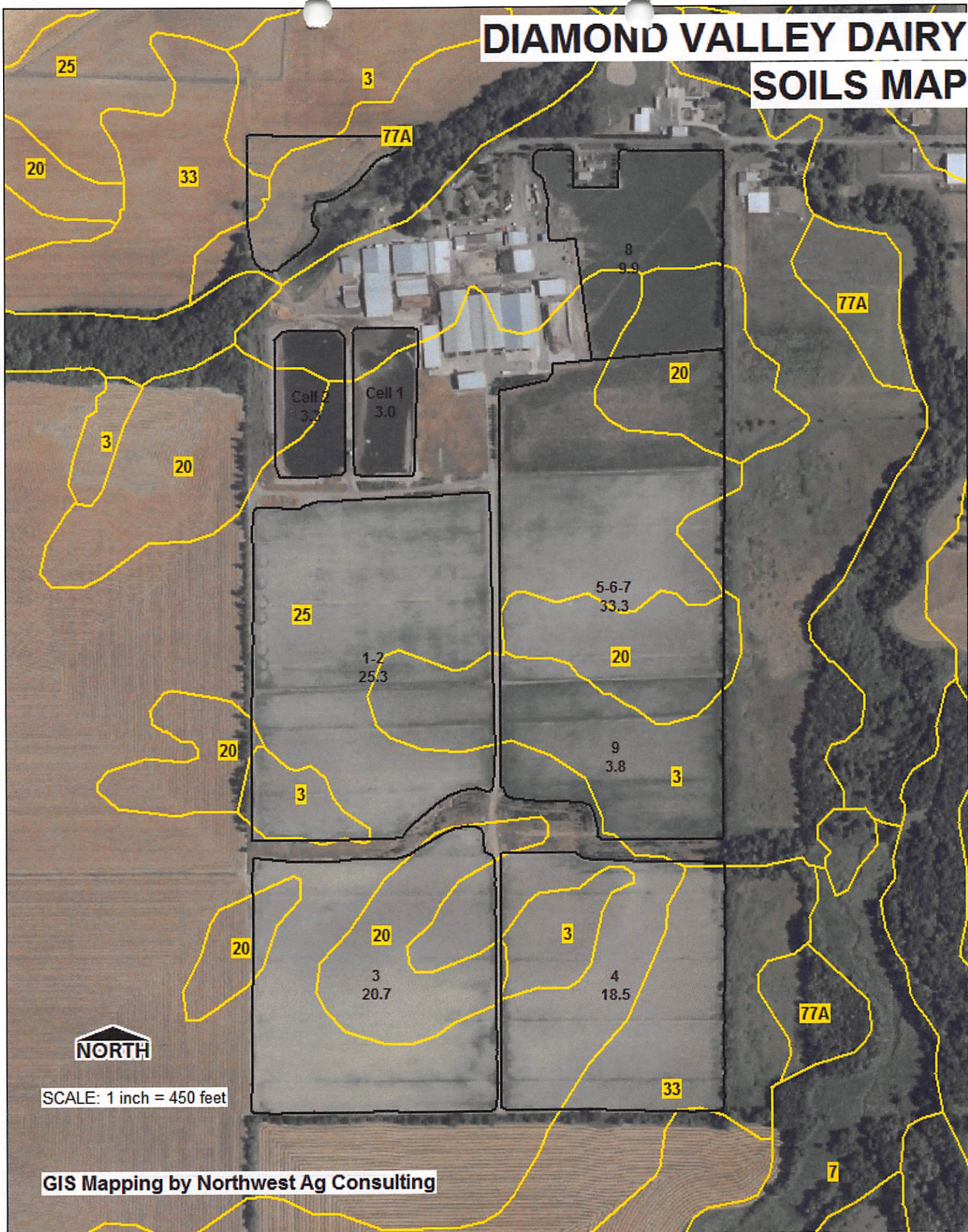



NORTH

SCALE: 1 inch = 450 feet

GIS Mapping by Northwest Ag Consulting

DIAMOND VALLEY DAIRY SOILS MAP



DIAMOND VALLEY DAIRY SOILS MAP

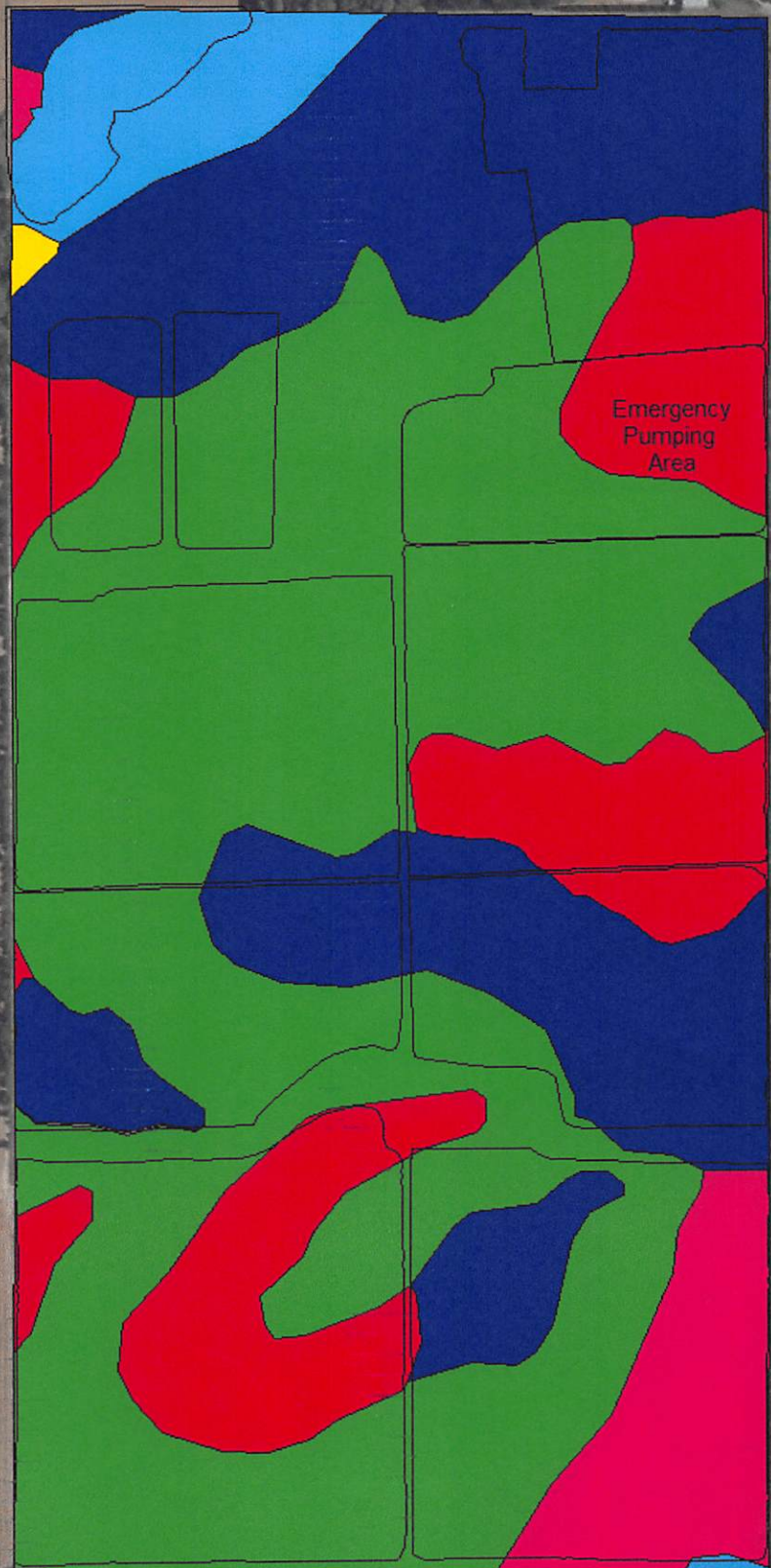
SOIL	SCSSOILNAM	SOIL_CLASS	Area
20	Concord silt loam	IIIW	0.07
25	Dayton silt loam	IVW	73.20
72	Waldo silty clay loam	IIIW	0.26
3	Amity silt loam	IIVW	39.69
20	Concord silt loam	IIIW	23.12
33	Holcomb silt loam	IIIW	7.94
77A	Woodburn silt loam	IIVW	6.34

DeJager Soils

- 20 (2)
- 25 (1)
- 3 (1)
- 33 (1)
- 72 (1)
- 77A (1)

NORTH

SCALE: 1 inch = 450 feet



OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)

4/4/2011

Version 3.7

CLIENT: **Diamond Valley**
 ASSISTED BY: **ODA**

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

ANIMAL INVENTORY

ANIMAL INVENTORY													
Type of Animal		Number of Animals	Average Weight (lbs.)	Animal Units (1,000 lb.)	Milk Production in Pounds/Cow/Day= 72						Manure CF/D/AU	Annual	
					Nutrient Production							Days Confined	Days Grazed
					(lbs./day/1000 lb. Animal Unit)			(lbs./day)					
					N	P	K	N	P	K			
MILKER (Holstein)	▼	1,100	1,300	1,430.0	0.70	0.12	0.32	1006.72	173.49	463.15	1.72	365	
MILKER (DRY)	▼	140	1,400	196.0	0.30	0.04	0.10	58.80	8.23	19.60	0.92	365	
HEIFERS (12-24 Months)	▼	300	1,150	345.0	0.27	0.05	0.12	91.77	15.70	41.40	0.90	365	
CALVES (1-12 Months)	▼	60	200	12.0	0.42	0.05	0.11	5.04	0.65	1.32	1.34	365	
	▼												
	▼												
	▼												
	▼												
	▼												
	▼												
	▼												
Totals/Averages-		1,600	1,013	1,983.0	0.59	0.10	0.26	1,162.3	198.1	525.5	1.5		

GRAZING PERIOD

Type of Animal	Percent of Month and Number of Animals Grazing													AU-YR.
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
MILKER (Holstein)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	0
MILKER (DRY)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	140	140	140	140	140	140	140	140	140	140	140	140	140	0
HEIFERS (12-24 Months)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	300	300	300	300	300	300	300	300	300	300	300	300	300	0
CALVES (1-12 Months)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	60	60	60	60	60	60	60	60	60	60	60	60	60	0
														0
														0
														0
														0
														0
														0
														0
Total AUM's Available>	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total AUM's Needed>>>	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total AUM's>>>>>>>>>>>>	0	0	0	0	0	0	0	0	0	0	0	0	0	0

4/4/2011

Version 3.7

CLIENT: **Diamond Valley**

ASSISTED BY: ODA

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

WEATHER STATION

SALEM WSO AIRPORT

Month	25Yr-24Hr	4.00	Lot Runoff Factors as a Percent of Monthly Precipitation	
	Monthly Average in Inches			
	Precipitation	Evaporation	Paved	Unpaved
October	3.03	1.65	50%	17%
November	6.39	0.73	55%	22%
December	6.46	0.42	55%	20%
January	6.02	0.46	55%	22%
February	5.09	0.78	45%	20%
March	4.17	1.52	44%	15%
April	2.76	2.31	40%	12%
May	2.13	3.61	36%	10%
June	1.45	4.18	30%	10%
July	0.57	5.22	30%	0%
August	0.68	4.76	35%	10%
September	1.43	3.25	45%	15%
Annual	40.18	28.89		

AREAS CONTRIBUTING RUNOFF TO LIQUID STORAGE FACILITY

[illegible]

WATER USE THAT ENTERS LIQUID STORAGE FACILITY

Type of Water Use	Number of Animals	Number of Washes per Day	Gallons of Water Used per Wash-Day	Total Water Use per Day, Gallons	Total Water Use per Day, Cubic Feet
Animal Washwater	1100.0	0	1.00	0	0.0
Equipment Wash		2	200.00	400	53.5
Flushwater		0	0.00	0	0.0
Miscellaneous		2	87.50	175	23.4
Total				575	76.9

CROP DATA

CROP DATA									
Field Number	Acres	Crop		Percent Dry Matter (DM)	Yield Units	Target Yield	Nutrients Removed in Pounds per Acre		
							Nitrogen N	Phosphorous P ₂ O ₅	Potassium K ₂ O
1-6	89.9	Ryegrass Haylage	▼	30%	Ton	6.00	90	33	92
1-6	89.9	Corn, Silage(AH)	▼	30%	Ton	20.00	150	55	145
7	8.0	Orchard Grass Hay/Pasture	▼	85%	Ton	5.00	266	98	112
8	9.9	Orchard Grass Hay/Pasture	▼	85%	Ton	5.00	266	98	112
9	3.9	Orchard Grass Hay/Pasture	▼	85%	Ton	5.00	266	98	112
			▼						
			▼						
			▼						
			▼						
Off Farm			▼						

CLIENT: **Diamond Valley**

ASSISTED BY: ODA

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

BEDDING VOLUME

[illegible]

SOLIDS SEPARATION FACTOR

[illegible]

CLIENT: **Diamond Valley**
 ASSISTED BY: **ODA**

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 Cubic Feet	Total Liquids Cubic Feet
	Roof Area Square Feet 0	Paved Slab Area Square Feet 70,000	Unpaved Lot Area Square Feet 0	Silage Pit Surface Area, SF 36,360		Solids Cubic Feet	Liquids Cubic Feet								
								Cubic Feet	Pounds	Cubic Feet	Pounds				
October	0	8,838	0	4,528	2,383	11,852	80,039	26,652	237,355	6,415	230,926	32,089	1,155,207	6,415	137,907
November	0	20,501	0	7,082	2,306	11,469	77,457	25,792	229,698	6,208	223,477	31,054	1,117,942	6,208	151,013
December	0	20,726	0	6,882	2,383	11,852	80,039	26,652	237,355	6,415	230,926	32,089	1,155,207	6,415	152,149
January	0	19,314	0	6,980	2,383	11,852	80,039	26,652	237,355	6,415	230,926	32,089	1,155,207	6,415	150,836
February	0	13,361	0	5,763	2,152	10,705	72,293	24,073	214,385	5,794	208,579	28,984	1,043,413	5,794	140,329
March	0	10,703	0	4,863	2,383	11,852	80,039	26,652	237,355	6,415	230,926	32,089	1,155,207	6,415	140,107
April	0	6,440	0	3,826	2,306	11,469	77,457	25,792	229,698	6,208	223,477	31,054	1,117,942	6,208	133,695
May	0	4,473	0	645	2,383	11,852	80,039	26,652	237,355	6,415	230,926	32,089	1,155,207	6,415	129,659
June	0	2,538	0	439	2,306	11,469	77,457	25,792	229,698	6,208	223,477	31,054	1,117,942	6,208	126,406
July	0	998	0	0	2,383	11,852	80,039	26,652	237,355	6,415	230,926	32,089	1,155,207	6,415	125,539
August	0	1,388	0	206	2,383	11,852	80,039	26,652	237,355	6,415	230,926	32,089	1,155,207	6,415	126,135
September	0	3,754	0	3,473	2,306	11,469	77,457	25,792	229,698	6,208	223,477	31,054	1,117,942	6,208	130,656
Annual	0	113,033	0	44,689	28,058	139,545	942,392	313,805	2,794,659	75,527	2,718,973	377,823	13,601,634	75,527	1,644,430

DAILY NUTRIENT PRODUCTION

Type of Animal	Pounds/Day of Nutrients from LIQUIDS			Pounds/Day of Nutrients from SOLIDS			Pounds/Day of Nutrients from GRAZING			Grazing Manure	Confined Manure
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	Gallons/Yr	Cubic Feet/Yr
MILKER (Holstein)	855.71	337.84	474.38	151.01	59.62	83.71	0.00	0.00	0.00	0	896,919
MILKER (DRY)	49.98	16.03	20.08	8.82	2.83	3.54	0.00	0.00	0.00	0	65,817
HEIFERS (12-24 Months)	78.00	30.57	42.40	13.77	5.39	7.48	0.00	0.00	0.00	0	113,333
CALVES (1-12 Months)	0.25	0.07	0.08	4.79	1.41	1.51	0.00	0.00	0.00	0	5,869
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Total-	0	0	0	0	0	0	0	0	0	0	1,081,937

CLIENT: **Diamond Valley**
 ASSISTED BY: **ODA**

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	30,502	11,920	16,645	5,530	2,147	2,984	0	0	0	0	0	0	36,032	14,067	19,629
November	29,518	11,535	16,108	5,351	2,078	2,888	0	0	0	0	0	0	34,870	13,613	18,996
December	30,502	11,920	16,645	5,530	2,147	2,984	0	0	0	0	0	0	36,032	14,067	19,629
January	30,502	11,920	16,645	5,530	2,147	2,984	0	0	0	0	0	0	36,032	14,067	19,629
February	27,551	10,766	15,034	4,995	1,939	2,695	0	0	0	0	0	0	32,545	12,705	17,729
March	30,502	11,920	16,645	5,530	2,147	2,984	0	0	0	0	0	0	36,032	14,067	19,629
April	29,518	11,535	16,108	5,351	2,078	2,888	0	0	0	0	0	0	34,870	13,613	18,996
May	30,502	11,920	16,645	5,530	2,147	2,984	0	0	0	0	0	0	36,032	14,067	19,629
June	29,518	11,535	16,108	5,351	2,078	2,888	0	0	0	0	0	0	34,870	13,613	18,996
July	30,502	11,920	16,645	5,530	2,147	2,984	0	0	0	0	0	0	36,032	14,067	19,629
August	30,502	11,920	16,645	5,530	2,147	2,984	0	0	0	0	0	0	36,032	14,067	19,629
September	29,518	11,535	16,108	5,351	2,078	2,888	0	0	0	0	0	0	34,870	13,613	18,996
Annual	359,141	140,348	195,983	65,109	25,277	35,132	0	0	0	0	-1	0	424,250	165,624	231,114

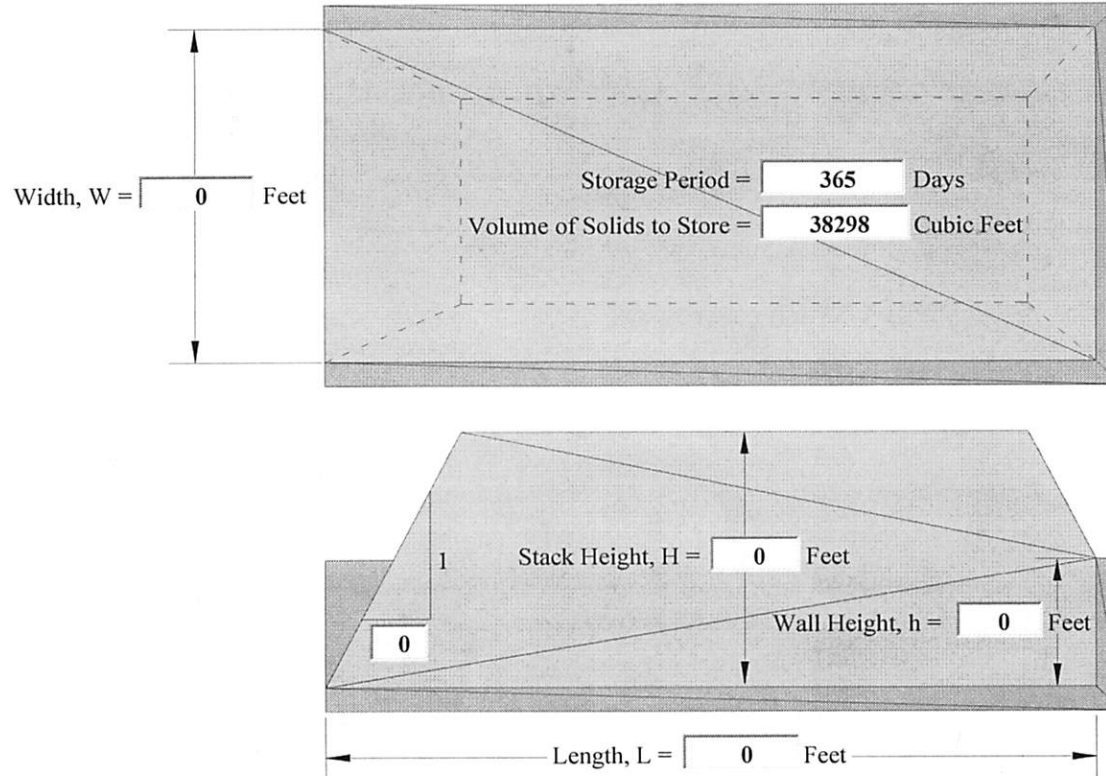
CLIENT: Diamond Valley
ASSISTED BY: ODA

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	Solids to Store Tons	Normal Runoff CF
Storage Period, Days=	365	October	31	1822	4,593	3,207	115	398
Stacking Width, W in Feet=	0	November	30	1763	4,445	3,104	112	1,087
Stacking Height, H in Feet=	0.00	December	31	1822	4,593	3,207	115	999
Wall Height, h in Feet=	0.00	January	31	1822	4,593	3,207	115	1,024
Stack Side Slope (X:1)=	0.00	February	28	1645	4,149	2,897	104	787
Existing Storage, Cubic Feet=	60,320	March	31	1822	4,593	3,207	115	484
Surface Area of Existing Storage, SF=	9,280	April	30	1763	4,445	3,104	112	256
25 Year-24 Hour Storm Runoff, CF=	3,093	May	31	1822	4,593	3,207	115	165
Volume Needed, Cubic Feet=	38,298	June	30	1763	4,445	3,104	112	112
Design Volume, Cubic Feet=	0	July	31	1822	4,593	3,207	115	0
Is Facility Covered?	NO	August	31	1822	4,593	3,207	115	53
		September	30	1763	4,445	3,104	112	166
		Annual	365	21,448	54,079	37,764	1,359	5,531



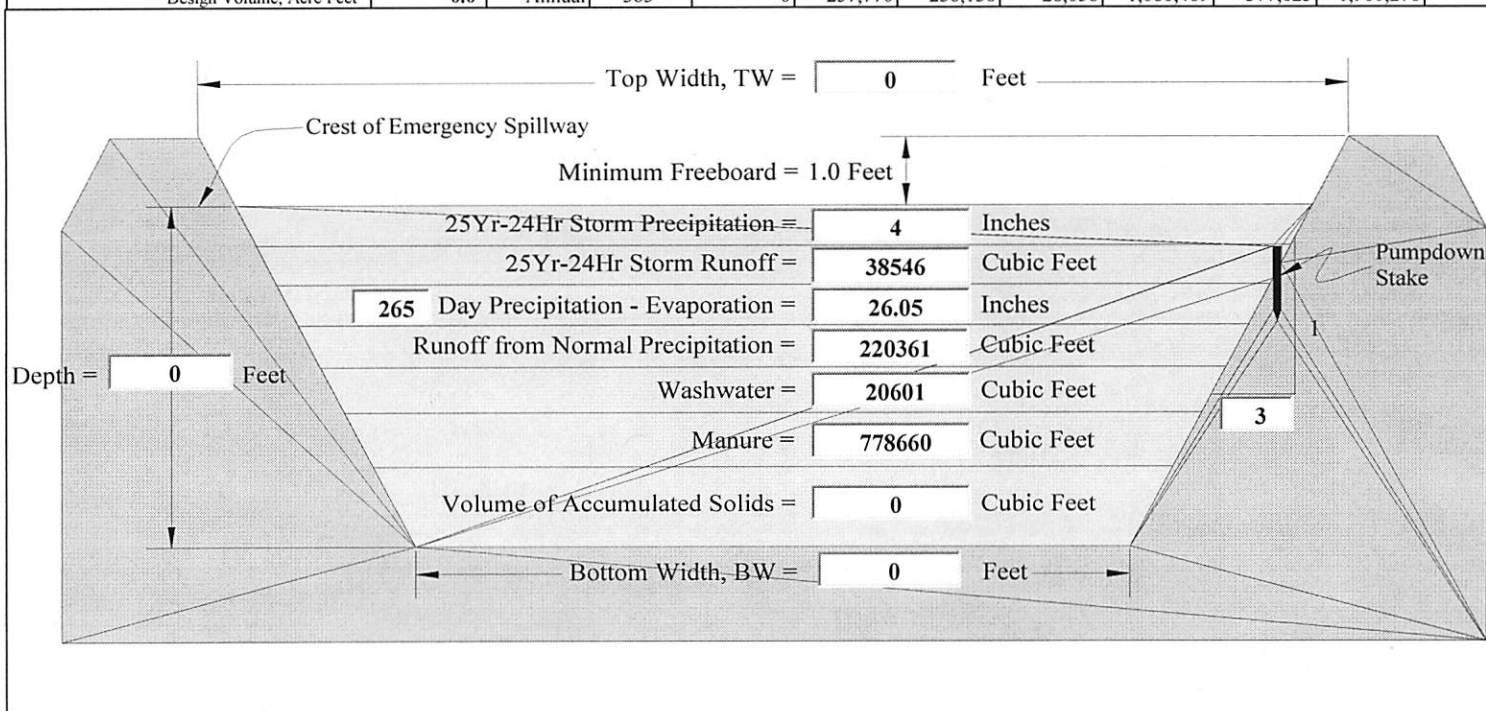
CLIENT: Diamond Valley
ASSISTED BY: ODA

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

WASTE STORAGE POND

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	Solids CF	Waste to Store CF
Storage Period, Days=	265	October	31	0	31,508	18,134	2,383	90,069	32,089	174,183
Side Slope (X:1)=	3.00	November	30	0	129,227	39,975	2,306	87,163	31,054	289,726
Bottom Width, BW, Feet=	0	December	31	0	137,903	40,415	2,383	90,069	32,089	302,859
Bottom Length, BL, Feet=	0	January	31	0	126,944	37,670	2,383	90,069	32,089	289,155
Accumulated Solids Duration, Years=	0	February	28	0	98,404	28,888	2,152	81,353	28,984	239,781
Existing Storage, Acre Feet=	45.60	March	31	0	60,504	23,454	2,383	90,069	32,089	208,499
Surface Area of Existing Storage, SF=	273,980	April	30	0	10,274	14,915	2,306	87,163	31,054	145,712
Minimum Soil Liner Depth, Feet=	1.00	May	31	0	-33,791	11,042	2,383	90,069	32,089	101,793
25 Year-24 Hour Storm Runoff, CF=	38,546	June	30	0	-62,330	7,043	2,306	87,163	31,054	65,236
Top Width, TW, Feet=	0	July	31	0	-106,167	2,840	2,383	90,069	32,089	21,214
Top Length, TL, Feet=	0	August	31	0	-93,153	3,564	2,383	90,069	32,089	34,952
Volume Needed, Acre Feet=	45.1	September	30	0	-41,554	8,198	2,306	87,163	31,054	87,168
Design Volume, Acre Feet=	0.0	Annual	365	0	257,770	236,138	28,058	1,060,489	377,823	1,960,278



CLIENT: Diamond Valley
ASSISTED BY: ODA

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		
	Type of Storage Facility	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids	Storage Pond (<50%) Dilution	359,141	140,348	195,983	59%	90%	90%	213,275	126,313	176,384
Solids	Solids Storage Facility (Unroofed)	65,109	25,277	35,132	65%	80%	80%	42,321	20,222	28,105
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	213,275	126,313	176,384	75%	100%	100%	159,956	126,313	176,384
Solids	Broadcast (Incorporated 7 or more days after application)	42,321	20,222	28,105	70%	100%	100%	29,625	20,222	28,105
Grazing	Grazing	0	0	0	85%	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		
	Between Coastal and Cascade Mountains									
	Soil Drainage Class	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids	Somewhat Poorly Drained	159,956	126,313	176,384	80%	100%	100%	127,965	126,313	176,384
Solids	Somewhat Poorly Drained	29,625	20,222	28,105	80%	100%	100%	23,700	20,222	28,105
Grazing	Somewhat Poorly Drained	0	0	0	80%	100%	100%	0	0	0
TOTAL-								151,665	146,535	204,490

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

NITROGEN, N

Field Number	Acres	Crop	LIQUIDS			SOLIDS			GRAZING		
			Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization 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
1-6	89.9	Ryegrass Haylage	6%	7,678	85	0%	0	0	0%	0	0
1-6	89.9	Corn, Silage(AH)	10%	12,796	85	0%	0	0	0%	0	0
7	8.0	Orchard Grass Hay/Pasture	1%	1,280	5	0%	0	0	0%	0	0
8	9.9	Orchard Grass Hay/Pasture	1%	1,280	5	0%	0	0	0%	0	0
9	3.9	Orchard Grass Hay/Pasture	0%	0	0	0%	0	0	0%	0	0
Off Farm			82%	104,931		100%	23,700		100%	0	
TOTALS-	201.6		100%	127,965	180	100%	23,700	0	100%	0	0

CLIENT: Diamond Valley
ASSISTED BY: ODA

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

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
1-6	89.9	Ryegrass Haylage	85	84	118	90	33	92	-5	51	25
1-6	89.9	Corn, Silage(AH)	142	141	196	150	55	145	-8	86	52
7	8.0	Orchard Grass Hay/Pasture	160	158	220	266	98	112	-106	60	108
8	9.9	Orchard Grass Hay/Pasture	129	128	178	266	98	112	-137	29	66
9	3.9	Orchard Grass Hay/Pasture	0	0	0	266	98	112	-266	-98	-112
Off Farm											

NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer:	Diamond Valley	Tract(s):	503	Field(s):	1-6
Assisted by:	ODA	Date:	April 4, 2011		

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

Table 1. Field Conditions and Recommendations

CROP SEQUENCE/ROTATION (circle current crop)					EXPECTED YIELD
Ryegrass Haylage					6
CURRENT SOIL TEST LEVELS (ppm or lb/ac)					
N	P	K	pH	S.O.M.%	EC
NA	87-120	227-459	6.1-6.4		
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD					
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)	
LIME		Other		Other	
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B
350		0		0	

Table 2. Nutrient Sources

Credits		N		P ₂ O ₅		K ₂ O	
		pounds per acre					
1. Nitrogen credits from previous legume crop							
2. Residual from long-term manure application							
3. Irrigation water							
4. Other (e.g., atmospheric deposition)							
5. Total Credits-		0		0		0	
Plant-Available Nutrients Applied to Field		N		P ₂ O ₅		K ₂ O	
(Circle column that is landuser's decision)		Trial A	Trial B	Trial A	Trial B	Trial A	Trial B
6. Credits (from row 5, above)		0	0	0	0	0	0
7. Fertilizer	Starter						
	Other						
8. Manure / Organic Materials (Source-) Dairy		85	0	84	0	118	0
9. Subtotal (sum of lines 6, 7 and 8)		85	0	84	0	118	0
10. Nutrients Recommended (from Table 1)		350	0	0	0	0	0
11. Nutrient Status (subtract line 10 from line 9)		-265	0	84	0	118	0
If line 11 is a negative number, this is the amount of additional nutrients needed to meet the crop recommendation.							
If line 11 is a positive number, this is the amount by which the available nutrients exceed the crop requirements.							

PLANNED NUTRIENT APPLICATIONS

Amount to be Applied (lb/ac)	N	336	P ₂ O ₅	344	K ₂ O	561
Method, Form, and Timing of Application						
Recommended application rates are based on OSU Extension Recommendations.						
No commercial fertilizer should be applied as all nutrients can be supplied by manure applications except for Sulfur, Magnesium, Zinc and Boron which should be applied in accordance with the fertilizer guide and soil tests.						
Use nutrient concentrations in storage to determine big gun travel rates to apply 100 pounds per acre of nitrogen in March or April and again in May. Use nutrient concentration in storage to determine solids spreader loads per acre to apply 100 pounds per acre of nitrogen in March or April. No more than a total of 350 pounds of nitrogen per acre should be applied.						
Score card soil testing should be done in the fall to insure excessive nitrates are not available for leaching.						
Manure should be reduced or not applied if soil tests show Phosphorous and Potassium concentrations continue to increase over time and approach very high levels as determined by OSU Extension.						

NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer:	Diamond Valley	Tract(s): 503	Field(s): 1-6
Assisted by:	ODA		Date: April 4, 2011

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

Table 1. Field Conditions and Recommendations

CROP SEQUENCE/ROTATION (circle current crop)										EXPECTED YIELD	
Corn, Silage(AH)										20	
CURRENT SOIL TEST LEVELS (ppm or lb/ac)											
N		P		K		pH		S.O.M. %		EC	
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD											
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)		LIME		Other		Other	
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B						

Table 2. Nutrient Sources

Credits		N		P ₂ O ₅		K ₂ O	
		pounds per acre					
1. Nitrogen credits from previous legume crop							
2. Residual from long-term manure application							
3. Irrigation water							
4. Other (e.g., atmospheric deposition)							
5. Total Credits-		0		0		0	
Plant-Available Nutrients Applied to Field		N		P ₂ O ₅		K ₂ O	
(Circle column that is landuser's decision)		Trial A	Trial B	Trial A	Trial B	Trial A	Trial B
6. Credits (from row 5, above)		0	0	0	0	0	0
7. Fertilizer	Starter						
	Other						
8. Manure / Organic Materials (Source-)		142	142	141	141	196	196
9. Subtotal (sum of lines 6, 7 and 8)		142	142	141	141	196	196
10. Nutrients Recommended (from Table 1)		0	0	0	0	0	0
11. Nutrient Status (subtract line 10 from line 9)		142	142	141	141	196	196
If line 11 is a negative number, this is the amount of additional nutrients needed to meet the crop recommendation.							
If line 11 is a positive number, this is the amount by which the available nutrients exceed the crop requirements.							

[illegible]

NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer: Diamond Valley	Tract(s): 503	Field(s): 7
Assisted by: ODA	Date: April 4, 2011	

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

Table 1. Field Conditions and Recommendations

CROP SEQUENCE/ROTATION (circle current crop)						EXPECTED YIELD
Orchard Grass Hay/Pasture						5
CURRENT SOIL TEST LEVELS (ppm or lb/ac)						
N		P		K		pH
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD						
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)		LIME
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B	

Table 2. Nutrient Sources

Credits		N		P ₂ O ₅		K ₂ O	
		pounds per acre					
1. Nitrogen credits from previous legume crop							
2. Residual from long-term manure application							
3. Irrigation water							
4. Other (e.g., atmospheric deposition)							
5. Total Credits-		0		0		0	
Plant-Available Nutrients Applied to Field		N		P ₂ O ₅		K ₂ O	
(Circle column that is landuser's decision)		Trial A	Trial B	Trial A	Trial B	Trial A	Trial B
6. Credits (from row 5, above)		0	0	0	0	0	0
7. Fertilizer	Starter						
	Other						
8. Manure / Organic Materials (Source-)		160	160	158	158	220	220
9. Subtotal (sum of lines 6, 7 and 8)		160	160	158	158	220	220
10. Nutrients Recommended (from Table 1)		0	0	0	0	0	0
11. Nutrient Status (subtract line 10 from line 9)		160	160	158	158	220	220
If line 11 is a negative number, this is the amount of additional nutrients needed to meet the crop recommendation.							
If line 11 is a positive number, this is the amount by which the available nutrients exceed the crop requirements.							

PLANNED NUTRIENT APPLICATIONS

Amount to be Applied (lb/ac)	N	P ₂ O ₅	K ₂ O
Method, Form, and Timing of Application			

NUTRIENT MANAGEMENT DESIGN AND SPECIFICATIONS

Producer: Diamond Valley	Tract(s): 503	Field(s): 8
Assisted by: ODA		Date: April 4, 2011

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

Table 1. Field Conditions and Recommendations

CROP SEQUENCE/ROTATION (circle current crop)						EXPECTED YIELD
Orchard Grass Hay/Pasture						5
CURRENT SOIL TEST LEVELS (ppm or lb/ac)						
N	P	K	pH	S.O.M. %	EC	
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD						
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)		LIME
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B	Other

Table 2. Nutrient Sources

Credits		N		P ₂ O ₅		K ₂ O	
		pounds per acre					
1. Nitrogen credits from previous legume crop							
2. Residual from long-term manure application							
3. Irrigation water							
4. Other (e.g., atmospheric deposition)							
5. Total Credits-		0		0		0	
Plant-Available Nutrients Applied to Field		N		P ₂ O ₅		K ₂ O	
(Circle column that is landuser's decision)		Trial A	Trial B	Trial A	Trial B	Trial A	Trial B
6. Credits (from row 5, above)		0	0	0	0	0	0
7. Fertilizer	Starter						
	Other						
8. Manure / Organic Materials (Source-)		129	129	128	128	178	178
9. Subtotal (sum of lines 6, 7 and 8)		129	129	128	128	178	178
10. Nutrients Recommended (from Table 1)		0	0	0	0	0	0
11. Nutrient Status (subtract line 10 from line 9)		129	129	128	128	178	178
If line 11 is a negative number, this is the amount of additional nutrients needed to meet the crop recommendation.							
If line 11 is a positive number, this is the amount by which the available nutrients exceed the crop requirements.							

PLANNED NUTRIENT APPLICATIONS						
Amount to be Applied (lb/ac)	N		P ₂ O ₅		K ₂ O	
Method, Form, and Timing of Application						

OREGON ANNUAL WASTE MANAGEMENT DESIGN (ORAWM)

4/4/2011

Version 3.7

Producer: Diamond Valley	Tract(s): 503	Field(s): 9
Assisted by: ODA	Date: April 4, 2011	

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

Table 1. Field Conditions and Recommendations

CROP SEQUENCE/ROTATION (circle current crop)					EXPECTED YIELD		
Orchard Grass Hay/Pasture					5		
CURRENT SOIL TEST LEVELS (ppm or lb/ac)							
N	P	K	pH	S.O.M.%	EC		
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD							
N (lbs/ac)		P ₂ O ₅ (lbs/ac)		K ₂ O (lbs/ac)	LIME	Other	Other
Trial A	Trial B	Trial A	Trial B	Trial A	Trial B		

Table 2. Nutrient Sources

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

PLANNED NUTRIENT APPLICATIONS

Amount to be Applied (lb/ac)	N	P ₂ O ₅	K ₂ O
Method, Form, and Timing of Application			

CLIENT: Diamond Valley
ASSISTED BY: ODA

Worksheet OR10A-7--Waste storage period determination

Basic Storage Period, SPb = 243 Days

Enter average monthly Evapotranspiration(ET) from OSU Extension Publication 8530,
Oregon Crop Water Use and Irrigation Requirements, and Precipitation(Ppt) Data from

Climatic Station- SALEM WSO AIRPORT

Day of Year	MONTH	Crop ET, Inches	Accum ET, Inches	Ppt, Inches
1-31	January	0.39	0.39	6.02
32-59	February	0.63	1.02	5.09
60-90	March	1.46	2.48	4.17
91-120	April	3.31	5.79	2.76
121-151	May	4.53	10.32	2.13
152-181	June	5.24	15.56	1.45
182-212	July	6.22	21.78	0.57
213-243	August	5.28	27.06	0.68
244-273	September	4.02	31.08	1.43
274-304	October	2.48	33.56	3.03
305-334	November	0.43	33.99	6.39
335-365	December	0.35	34.34	6.46

a. Determine last day for the month of the year when 3/4 of Annual ET is exceeded-

$$3/4 \text{ of Annual ET} = 0.75 \times 34.34 = 25.76 \text{ Inches}$$

L = Last Day for Month Accum ET exceeds 3/4 of Annual ET

$$L = 243 \text{ Days}$$

b. Determine first day for the month of the year when ET >= Ppt-

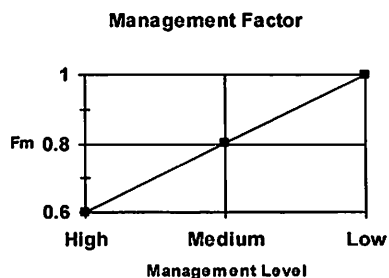
E = First Day of Month ET >= Ppt

$$E = 121 \text{ Days}$$

$$c. SPb = 365 - (L - E) = 365 - (243 - 121) = 243 \text{ Days}$$

Management Factor, Fm =

0.8



Low Level, Fm = 1.0

...The operator does not utilize a waste management plan.
...Proper operation and maintenance may not be performed.

Medium Level, Fm = 0.8

...The operator utilizes an up-to-date waste management plan.
...Manure application equipment is calibrated for nutrient applications.
...Maintains adequate soil moisture for crop growth.
...Agronomic treatments which would maximize crop nutrient uptake are not fully utilized.
...Proper operation and maintenance is planned.

High Level, Fm = 0.6

...The operator utilizes an up-to-date waste management plan.
...Soil fertility testing is performed annually.
...Manure in storage is tested for nutrient concentrations.
...Records of time, rate and location of manure applications are maintained.
...Manure application equipment is calibrated for nutrient applications.
...Irrigation water management techniques are practiced.
...Crop nutrient uptake is maximized with appropriate agronomic treatments such as residue management, conservation crop rotation, crop variety selection, prescribed grazing, and pest management.
...Proper operation and maintenance is planned.

CLIENT: Diamond Valley
ASSISTED BY: ODA

Worksheet OR10A-7--Waste storage period determination

Soils Factor: $F_{s_{LIQ}} = 0.90$ $F_{s_{SOL}} = 0.70$

Soils must meet the following criteria for F_s to be less than 1.0-

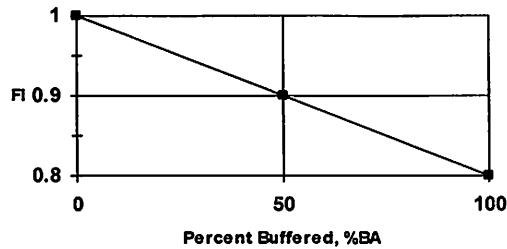
- ... The average water holding capacity for the profile greater than 3.0 inches.
- ... A cation exchange capacity greater than 5 meq/100g of soil.
- ... Depth to a thin layer/cemented pan greater than 20 inches.
- ... Depth to high water table greater than 2 feet.
- ... A permeability greater than 0.06 inches/hr but less than 6 inches/hr.
- ... Cobbles less than 35% by weight in the surface layer.
- ... Stones and boulders less than 15% by weight in the surface

HSG	Soils Factor (F_s)			
	Consistency of Waste			
	Liquid	Slurry	Semi-Solid	Solid
A	1	0.95	0.9	0.8
B	0.8	0.75	0.7	0.6
C	0.9	0.85	0.8	0.7
D	1	1	0.95	0.85

HSG	Area	$F_{s_{LIQ}}$	Wtd $F_{s_{LIQ}}$	$F_{s_{SOL}}$	Wtd $F_{s_{SOL}}$
C	100	0.9	90.00	0.7	70.00
		$F_{s_{LIQ}} = 0.90$		$F_{s_{SOL}} = 0.70$	

Location Factor: $FI = 1.00$

Location Factor



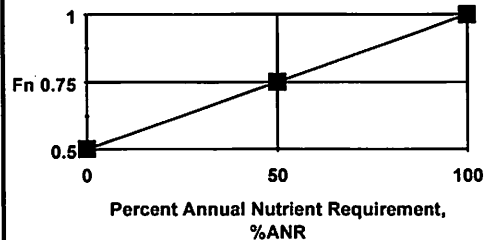
For an application area to be considered buffered there must be a 0 to 5 percent chance of flooding and the area must be at least 50 feet from water bodies, ground water sources(wells), and areas of concentrated flow. The percent buffered area(%BA) is determined by taking the total buffered area(TBA) and dividing it by the total land area(TLA) available for manure application.

$$\%BA = \frac{TBA}{TLA} \times 100\%$$

$$\%BA = \frac{0}{202} \times 100\% = 0\%$$

Nutrient Loading Factor: $F_n = 1.00$

Nutrient Loading Factor



In order for the Nutrient Loading Factor, F_n to be less than 1, the Location Factor, FI must be 0.95 or less.

The percent of annual nutrient requirement(%ANR) is determined by taking the total nutrients applied(TNA) annually and dividing it by the total nutrient requirements(TNR) of all of the crops grown.

$$\%ANR = \frac{TNA}{TNR} \times 100\%$$

$$\%ANR = \frac{1,740}{1,995} \times 100\% = 87\%$$

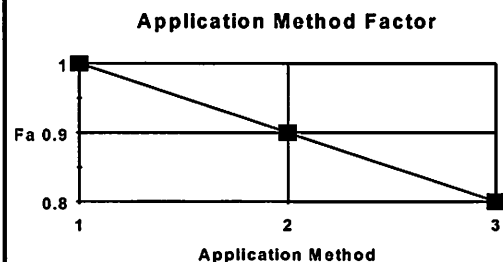
CLIENT: Diamond Valley
ASSISTED BY: ODA

Worksheet OR10A-7--Waste storage period determination

Application Method Factor:

$Fa_{LIQUID} = 0.90$

$Fa_{SOLID} = 1.00$



Adjusted Storage Period: $ASP_{LIQUID} = 157$ Days $ASP_{SOLID} = 136$ Days

$ASP = SPb \times Fm \times Fs \times FI \times Fn \times Fa$

$ASP_{LIQUID} = 243 \times 0.8 \times 0.9 \times 1 \times 1 \times 0.9$

$ASP_{SOLID} = 243 \times 0.8 \times 0.7 \times 1 \times 1 \times 1$

Adjusted earliest Day of Year for application, $E_a = ASP - (365 - L)$

$E_a_{LIQUID} = 35$

$E_a_{SOLID} = 14$

Storage Period: $SP_{LIQUID} = 157$ Days $SP_{SOLID} = 154$ Days

The storage period must span the seasonal flooding conditions and must also span frozen ground and snow conditions where the land slope exceeds 5% and a buffer strip of less than 100 feet exists next to open water courses that affect the application area-

a. Enter L from Sheet 1 and determine the Day of Year L_f when seasonal frozen ground, snow or flooding conditions are first anticipated for the application area-

$L = 243$ Days

$L_f = 365$ Days

If L_f comes before L then $L_{so} = L_f$

If L_f comes after L or there is no seasonal frozen ground, snow or flooding then $L_{so} = L$

$L_{sp} = 243$ Days

b. Determine the Day of Year E_f when seasonal frozen ground, snow or flooded conditions are no longer anticipated for the application area-

$E_f = 32$ Days

If E_f comes after E_a then $E_{so} = E_f$

If E_f comes before E_a or there is no seasonal frozen ground, snow or flooding then $E_{so} = E_a$

$E_{sp_{LIQUID}} = 35$ Days

$E_{sp_{SOLID}} = 32$ Days

c. $SP_{LIQUID} = 365 - (L_{sp} - E_{sp_{LIQUID}}) = 157$ Days

$SP_{SOLID} = 365 - (L_{sp} - E_{sp_{SOLID}}) = 154$ Days

d. Earliest date (E_{sp}) for manure application (month-day):

$E_{sp_{LIQUID}} = \text{February 4}$

$E_{sp_{SOLID}} = \text{February 1}$

e. Latest date (L_{sp}) for manure application (month-day) = September 31

CLIENT: **Diamond Valley**
 ASSISTED BY: **ODA**

Worksheet OR10A-7--Waste storage period determination

Day of Year Calendar

Day of month	Jan	Feb	Mar	Apr	May	Month Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29		88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

LAND TREATMENT PRACTICES

Predicted Soil Loss (Erosion) for Planned System

Farm or Tract	Field Number	Acreage	Soil Survey IDMap Unit	Soil Acreage	T Value Tons/Ac/Yr	Predicted Soil Loss Tons/Ac/Yr
Diamond Valley Dairy	1	14.4	05325	13.68	5	<1
Diamond Valley Dairy	1	14.4	0533	0.71	5	<1
Diamond Valley Dairy	1	14.4	05320	0.01	5	<1
Diamond Valley Dairy	2	10.8	05325	5.95	5	<1
Diamond Valley Dairy	2	10.8	0533	4.53	5	<1
Diamond Valley Dairy	2	10.8	05320	0.32	5	<1
Diamond Valley Dairy	3	20.7	05325	13	5	<1
Diamond Valley Dairy	3	20.7	05320	7.7	5	<1
Diamond Valley Dairy	4	18.4	0533	3.16	5	<1
Diamond Valley Dairy	4	18.4	05325	8.92	5	<1
Diamond Valley Dairy	4	18.4	05333	6.02	5	<1
Diamond Valley Dairy	5	10.4	05325	1.7	5	<1
Diamond Valley Dairy	5	10.4	05320	1.04	5	<1
Diamond Valley Dairy	5	10.4	0533	7.66	5	<1
Diamond Valley Dairy	6	15.1	0533	0.62	5	<1
Diamond Valley Dairy	6	15.1	05320	4.86	5	<1
Diamond Valley Dairy	6	15.1	05325	9.6	5	<1
Diamond Valley Dairy	7	8	05325	5.09	5	<1
Diamond Valley Dairy	7	8	05320	2.91	5	<1
Diamond Valley Dairy	8	9.9	0533	6.7	5	<1
Diamond Valley Dairy	8	9.9	05320	1.73	5	<1
Diamond Valley Dairy	8	9.9	05325	1.47	5	<1
Diamond Valley Dairy	9	3.9	05377A	2.91	5	<1
Diamond Valley Dairy	9	3.9	0533	0.55	5	<1

LAND TREATMENT PRACTICES

[illegible]

LAND TREATMENT PRACTICES

Farm Resource Setting

The landscape is generally stream floodplains, broad terraces and rolling hillsides above the streams in valleys along the Willamette River. The annual precipitation varies from 40-50 inches of which 70% falls within a 5 month period from November through March and less than 7% falls from June through August. Winds are generally moderate in the winter (15-30 mph) from the south to southwest and mild in the summer (5-15 mph) from the north to northwest. Humidity usually varies from 60 to 90 percent throughout the year except when dry east winds occur dropping the humidity to 10 to 15 percent. There is approximately 200-210 frost free days and the average annual temperature is 50 to 55 degrees Fahrenheit. Soils Vary from deep to moderately deep clays, silts and sandy loams that are poor to excessively well drained.

The headquarters facilities contain confined livestock feeding operations and associated structures such as home(s), barns, lots, commodity sheds, shop areas, and feed storage areas. Also included are the components of a waste management system consisting of manure and wastewater production, collection, transfer, treatment and storage facilities.

The irrigated crop land consists mainly of corn and ryegrass ensiled for livestock feed. The cropland fields are also used to utilize nutrients and organics in manure and wastewater from the livestock feeding operation.

Headquarters Land Use Resource Concerns

Resource Concern	Description
Soil Erosion;	Not a concern.
Water Quantity; Ponding & Flooding	Not a concern.
Water Quality, Groundwater; Nutrients & Organics	Of concern if reception pit and solids separation area remains undersized at current location.
Water Quality, Groundwater; Pathogens	Of concern if reception pit and solids separation area remains undersized at current location.
Water Quality, Surface Water; Nutrients & Organics	Of concern if reception pit and solids separation area remains undersized at current location.
Water Quality, Surface Water; Low Dissolved Oxygen	Potential concern.
Water Quality, Surface Water; Pathogens	Of concern if reception pit and solids separation area remains undersized at current location.
Water Quality, Surface Water; Aquatic Habitat Suitability	Not a concern
Water Quality, Surface Water; Suspended Sediments & Turbidity	Not a concern.
Air Quality; Undesirable Odors from Agricultural Sources	Of possible concern.
Plant Management; Establishment, Growth, & Harvest	Not a concern.
Animal Management, Domestic; Animal Health	Not a concern.

LAND TREATMENT PRACTICES

Headquarters Land Use Plan of Operations

Following are practices that Diamond Valley Dairy has implemented or plans to implement that address resource concerns for the Headquarters area

NOTE: Refer to Section 8 for Operation and Maintenance guidelines for existing facilities and Section 11 for drawings and specifications for planned facilities:

Field ID	Conservation or Best Management Practices	Amount	Existing or Planned
T- HQ	Access Road (Ft) (PS560) Existing roadways allow access to farm facilities and fields to perform needed management operations.		Existing
T-HQ	Agrichemical Handling Facility (No.) (PS702) An facility used for safe storage of chemicals (insecticides, herbicides, fungicides, fertilizer, etc.) that is also used to prevent spillage of chemicals during filling of tanks and the mixing operations for agricultural or similar operations in agricultural operations.		Existing
T- HQ	Composting Facility (No) (PS317) A composting and solids storage area is planned that will process manure, bedding and wasted feeds into stable organic matter to be used for recycled bedding and nutrients for crop and hay land fields. The facility will have a capacity of approximately TBD cubic feet that will provide a treatment and storage area for composted solids. The facility will reduce odors of stored separated solids and facilitate off farm removal to non-ag customers.		Planned
T- HQ	Fence (Ft) (PS382) Fences are installed to control the movement and access of animals and humans.	Feet	Existing
T- HQ	Heavy Use Area Protection (Ac) (PS561) Travel and confinement areas shown on the facilities map are stabilized with suitable materials to control soil erosion, improve air and water quality, improve aesthetics and improve animal health.	Acres	Existing
T- HQ	Irr.Pipeline-High-pressure, Underground, Plastic (Ft) (PS430DD) Existing High-pressure Underground Plastic Pipelines at the locations shown on the facilities plan map convey wastewater to collection facilities and waste storage facilities in an efficient manner to prevent contamination of ground and surface water sources.		Existing

LAND TREATMENT PRACTICES

Field ID	Conservation or Best Management Practices	Amount	Existing or Planned
T- HQ	Manure Transfer (No) (PS634) Process water from milking operations is directed to a catch basin that drains by gravity flow to the collection tank using underground PVC waste transfer pipelines. Recycled flush water used to clean barns where livestock are boarded and rainfall runoff is directed to the collection tanks as shown on the facilities map. Wastewater collected in the collection tank is pumped to the solid/liquid separation facility consisting of a sidehill separator, screw press, and flotation tank. Separator estimated to provide 70 percent separation efficiency. Wastewater from the solid/liquid separation facility drains to the waste storage facility. Solids from the solid/liquid separation facility are transferred to the solids storage area before hauling to the crop and hay land fields for utilization. Once the composting facility is constructed the solids will be transferred from the solid/liquid separation facility to the composting facility for treatment. Wastewater stored in waste storage facility is recycled for flushwater and pumped to the crop and hay land fields for utilization using underground PVC waste transfer pipelines as shown on the facilities and plan maps. The current separator and storage pad needs to be moved from its current location due to inadequate size of reception pit, cracked slab at separator, too small storage pad size, and inadequate separator capacity for the increased herd.		Existing Existing Planned Planned Existing
T- HQ	Pipeline (Ft) (PS516) Pipelines are installed to convey water from a source to the place of use to provide water for livestock and domestic use. .		Existing
T- HQ	Pumping Plant (No) (PS533) Pumping Plants shown on the facilities and plan maps are used to transfer fresh water or wastewater at a planned rate and operating pressure.		Existing
T- HQ	Roof Runoff Structure (No) (PS558) Gutters and downspouts are planned for the planned composting facility and some of the animal housing facilities to reduce rainfall runoff near waste storage facilities.		Existing Planned
T- HQ	Solid/Liquid Waste Separation Facility (No) (PS632) The planned solids separation facility shown on the facilities map is used for separating solids from the wastewater generated from the livestock facilities. An overall separation efficiency of 65 percent was used to prepare this plan.		Planned
T- HQ	Underground Outlet (Ft) (PS620) Underground PVC pipelines convey water from downspouts connected to gutters on the barns to unnamed drainageways.		Existing
T- HQ	Use Exclusion (Ac) (PS472) Fences are used to control animal and human access to the dairy facilities.		Existing

LAND TREATMENT PRACTICES

Field ID	Conservation or Best Management Practices	Amount	Existing or Planned
T- HQ	Waste Storage Facility (No) (PS313) TANK: The 15 feet diameter by 8 feet deep underground reinforced concrete collection tank shown on the facilities map has a capacity of 42,411 cubic feet. This facility is considered a collection and temporary storage facilities only and because of it's capacity and was not included in the long term storage calculations. POND: The waste storage facility used for long term storage has a operating capacity of 45.6 acre-feet. Approximately 1,158,150 cubic feet of wastewater is generated and applied to the crop and hay land fields annually. The waste storage facility is estimated to provide 327 days of storage which exceeds the NRCS recommended storage period of 138 days computed using Worksheet 10A-7 located in Section 4. SOLIDS: Approximately 422,488 cubic feet of solids are produced and applied to owned land or off-farm fields annually. The existing solids storage facility provides 101 days of storage for 60,320 cubic feet of material. At this time, the planned solids storage area will have a design capacity of 60,000 cubic feet although the actual design will be based on assessed needs at the time of construction. The planned composting facility is estimated to provide more storage capacity as the existing facility does. The current storage facility almost provides the NRCS recommended storage period of 154 days computed using Worksheet 10A-7 located in Section 4.		Existing Existing Existing Planned
T- HQ	Water Well (No) (PS642) A well supplies water for livestock and other uses.		Existing
T- HQ	Watering Facility (No) (PS614) Watering facilities are installed in the barns to provide livestock access to water.		Existing

Crop Land Use Resource Concerns

Resource Concern	Description
Soil Erosion; Sheet & Rill	Not a concern.
Soil Condition; Tilth, Crusting, Infiltration, Organic Matter	Of possible concern.
Water Quantity, Water Mgt. Irrigated Land	Not a concern.
Water Quantity, Subsurface; Excess Water for Desired Use	Excess subsurface water impedes management activities and cover crop growth in the winter.
Water Quality, Groundwater; Pesticides	Not a concern.
Water Quality, Groundwater; Nutrients & Organics	Of possible concern.
Water Quality, Surface Water; Pesticides	Not a concern.
Water Quality, Surface Water; Nutrients & Organics	Of possible concern.
Water Quality, Surface Water; Suspended Sediments & Turbidity	Of possible concern.

LAND TREATMENT PRACTICES

Resource Concern	Description
Water Quality, Surface Water; Low Dissolved Oxygen	Not a concern.
Water Quality, Surface Water; Temperature	Not a concern.
Water Quality, Surface Water; Pathogens	Of possible concern
Water Quality, Surface Water; Aquatic Habitat Suitability	Not a concern.
Air Quality; Airborne Chemical Drift	Not a concern.
Air Quality; Undesirable Odors from Agricultural Sources	Of possible concern
Plant Management; Nutrient Management	Of possible concern.
Plant Management; Pests	Not a concern
Animal Habitat, Wildlife: Cover &/or Shelter	Not a concern.

Crop Land Use Plan of Operations

Following are practices that Diamond Valley Dairy has implemented or plans to implement that address resource concerns for the Crop Land areas:

NOTE: Refer to Section 8 for Operation and Maintenance guidelines for existing facilities and Section 11 for drawings and specifications for planned facilities:

Field ID	Conservation or Best Management Practices	Amount	Existing or Planned
1-6	Access Road (Ft) (PS560) Existing roadways allow access to farm facilities and fields to perform needed management operations.		Existing
1-6	Conservation Crop Rotation (Ac) (PS328) Crops are rotated as needed to improve soil tilth, and improve water use efficiency. Refer to Section 11 for Conservation Crop Rotations specifications.		Existing
1-6	Cover and Green Manure Crops (Ac) (PS340) A cover crop will be established in fields as shown on the plan map for seasonal cover to control erosion, sequester carbon in plant biomass, improve soil tilth, capture excess nutrients, suppress weeds, provide supplemental forage, improve soil moisture management and reduce particulate emissions.. Refer to Section 11 for specifications for planned Cover and Green Manure Crops.		Existing
1-6	Field Border (Ft) (PS386) A strip of permanent vegetation consisting of grasses, forbs, shrubs and trees exists along the edge of crop land fields or waterways as shown on the plan map to protect water quality, control pests, sequester carbon in biomass and soils, and provide food and shelter for wildlife.		Existing

LAND TREATMENT PRACTICES

Field ID	Conservation or Best Management Practices	Amount	Existing or Planned
1-6	Irr.Pipeline-High-pressure, Underground, Plastic (Ft) (PS430DD) High pressure underground PVC pipe in fields at the locations shown on the plan map are used to convey irrigation water and waste water to irrigation systems in an efficient manner to prevent conveyance losses and soil erosion.		Existing
1-6	Irrigation System-Sprinkler (No-Ac) (PS442) Traveling big gun sprinkler irrigation systems are used to apply irrigation water and wastewater to the crop land fields. The irrigation system applies water and wastewater in an efficient manner to the fields as shown on the plan map to manage soil moisture and apply nutrients and organics to promote plant growth without causing excessive runoff and leaching. The traveling big gun sprinkler irrigation systems have a nozzle diameter of 1.1 inch which can be expected to produce 300-335 gallons per minute at an operating pressure between 80 and 90 pounds per square inch and has an estimated application rate of 0.40 inches per hour.		Existing
1-6	Irrigation Water Management (Ac) (PS449) Irrigation Water Management is applied to the irrigated fields as shown on the plan map to manage soil moisture to promote the desired crop response, optimize the available water supplies, minimize irrigation induced erosion, decrease non-point source pollution of surface and groundwater sources, manage salts in the crop root zone and manage the crop micro climate. Irrigation water is supplied by wells and surface water sources using pumps through an underground pvc pipelines to sprinkler irrigation systems. The average amount of irrigation water to be applied per application and total annual amount needed for irrigated crops with guidance on when and how much irrigation water to apply can be found in the specification for Irrigation Water Management located in Section 11.		Planned

LAND TREATMENT PRACTICES

Field ID	Conservation or Best Management Practices	Amount	Existing or Planned
1-6	Nutrient Management (Ac) (PS590) The site vulnerability rating for phosphorus movement off the listed fields is based on the Western Oregon Phosphorus Index. Fields 8 and 9 have a low vulnerability rating. All of the other fields listed have a medium site vulnerability rating which allows manure, bedding and wastewater from the waste storage facilities to be applied based on the crop uptake of nitrogen which will exceed the crop uptake for phosphorus and potassium. Phosphorus will be monitored on all fields using soil tests and if soil phosphorus concentrations significantly increase, manure applications will be reduced which may result in some of the manure and wastewater to be exported off farm. It is estimated that 1,158,150 of wastewater will be applied annually to the all crop land. All solids go off-farm. The total annual nutrients applied to the crop land (per acre basis) are 545 pounds of nitrogen, 517 pounds of phosphate, and 720 pounds of potash with 1260 pounds of nitrogen, 487 pounds of phosphate and 818 pounds of potash removed in the plant biomass. The protocol for soil and manure testing and fall soil nitrate testing is contained in the specifications for Nutrient Management/Waste Utilization activities located in Section 11.		Planned
1-6	Waste Utilization (Ac) (PS633) The traveling big gun sprinkler systems will be calibrated to apply wastewater from the waste storage pond at the rate needed to meet the requirements of the nutrient management practice for the crops grown. The calculated nutrient concentrations in the waste storage facility used in developing this plan are 3.83 pounds per 1,000 gallons (lbs/th Gal) of Nitrogen, 1.72 lbs/th Gal of Phosphate and 4.7 lbs/th Gal of Potash. The calculated nutrient concentrations for the composted solids are 5.2 lbs/Ton of Nitrogen, 1.58 lbs/Ton of Phosphate and 2.78 lbs/Ton of Potash. No manure applications are to be made to the 35 foot field buffer shown on the plan map. The emergency application area shown on the plan map was selected based on topography, soil type, proximity to open water courses, and risk of flooding. This area will always have a growing crop on it during the fall and winter months in case weather conditions force emergency applications of liquids and solids to draw down storage facilities. Guidance for making emergency applications, protocol and schedule for calibrating application equipment, and the months manure will be applied are contained in the specifications for Nutrient Management/Waste Utilization activities found in Section 11.		Planned

Pasture Land Use Resource Concerns

Resource Concern	Description
Soil Deposition; Onsite Damage	Not a concern.
Water Quantity; Ponding & Flooding	Not a concern.
Water Quantity; Inadequate Outlets	Not a concern.

LAND TREATMENT PRACTICES

Resource Concern	Description
Water Quality, Groundwater; Nutrients & Organics	Slight to Moderate potential leaching of nitrates.
Water Quality, Surface Water; Pesticides	Not a concern.
Water Quality, Surface Water; Pesticides	Not a concern
Water Quality, Surface Water; Low Dissolved Oxygen	Not a concern
Water Quality, Surface Water; Pathogens	Not a concern
Water Quality, Surface Water; Aquatic Habitat Suitability	Not a concern
Air Quality; Undesirable Odors from Agricultural Sources	Of possible concern.
Plant Suitability; To Intended Use	Of possible concern.
Plant Condition; Productivity	Not a concern
Plant Management; Nutrient Management	Not a concern
Plant Management; Pests	Not a concern
Animal Habitat, Wildlife: Cover &/or Shelter	Not a concern
Water Quality, Surface Water; Aquatic Habitat Suitability	Not a concern
Animal Management, Wildlife; Population/Resource Balance	Not a concern

Pasture Land Use Plan of Operations

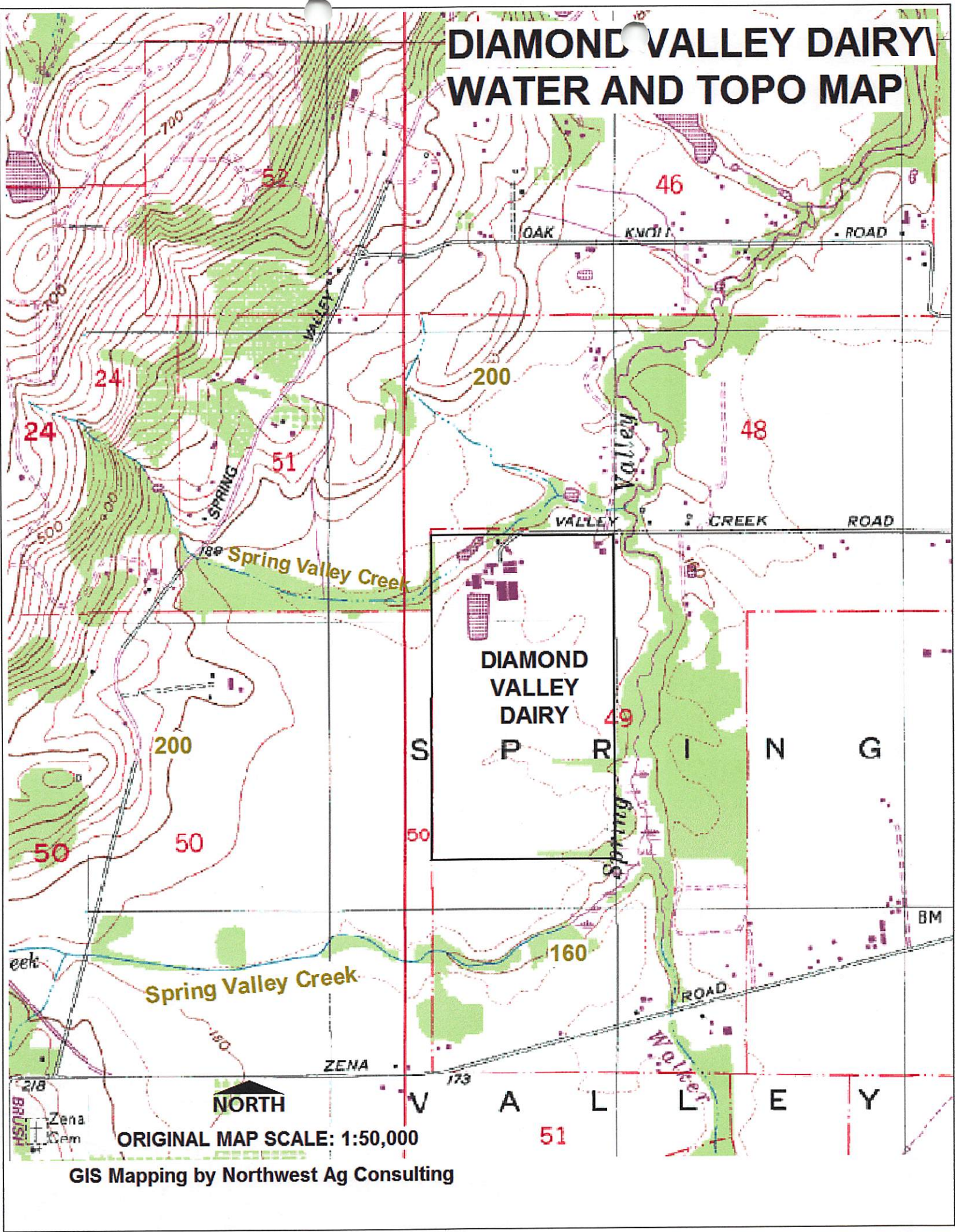
Following are practices that Diamond Valley Dairy has implemented or plans to implement that address resource concerns for the Pasture Land areas:

Field ID	Conservation or Best Management Practices	Amount	Existing or Planned
7-9	Fence (Ft) (PS382) Fencing is installed to control the movement and access of animals and humans to the pasture field and streams shown on the plan map. Refer to Section 11 for drawings and specifications for planned Fences.		Existing
7-9	Field Border (Ft) (PS386) The field border shown on the plan map along the edge of the pasture land field consists of riparian vegetation and grasses planted for pasture to protect water quality, control pests, sequester carbon in biomass and soils, and provide food and shelter for wildlife. The field border extends from both edges of the unnamed sloughs and drainageways 35 feet as shown on the plan map and is not to receive manure applications but can be grazed. Grazing of the field border should be controlled to prevent damage to the riparian area and overgrazing.		Existing

LAND TREATMENT PRACTICES

Field ID	Conservation or Best Management Practices	Amount	Existing or Planned
7-9	Nutrient Management (Ac) (PS590) The site vulnerability rating for phosphorus movement off the listed fields is based on the Western Oregon Phosphorus Index. All of the other fields listed have a medium site vulnerability rating which allows manure, bedding and wastewater from the waste storage facilities to be applied based on the crop uptake of nitrogen which will exceed the crop uptake for phosphorus and potassium. Phosphorus will be monitored on all fields using soil tests and if soil phosphorus concentrations significantly increase, manure applications will be reduced which may result in some of the manure and wastewater to be exported off farm. The protocol for soil and manure testing and fall soil nitrate testing is contained in the specifications for Nutrient Management/Waste Utilization activities found in Section 11.		Planned
7-9	Pasture & Hay Land Planting (Ac) (PS512) As pasture land fields need renovating, adapted and compatible species, varieties, or cultivars will be established in the fields as shown on the plan map to provide forage for livestock. Refer to Section 11 for specifications.		Existing
7-9	Prescribed Grazing (Ac) (PS528A) Fields shown on the plan map are managed to control the harvest of vegetation using grazing animals to improve or maintain the health and vigor of the plant community, reduce non-point source pollution to ground and surface waters, and improve food and shelter for wildlife. Refer to Section 11 for specifications.		Planned
7-9	Use Exclusion (Ac) (PS472) Access to the pastures and field border areas shown on the plan map by livestock will be controlled to maintain or improve the quantity and quality of vegetation and minimize liability and human health concerns.		Existing
7-9	Watering Facility (No) (PS614) Portable watering facilities provide livestock access to water on pastured fields.		Existing

DIAMOND VALLEY DAIRY WATER AND TOPO MAP



ORIGINAL MAP SCALE: 1:50,000

GIS Mapping by Northwest Ag Consulting

LOCATION AMITY
Established Series
Rev. GEO/ DRJ/RWL
12/2002

OR

AMITY SERIES

The Amity series consists of very deep, somewhat poorly drained soils that formed in stratified glacio lacustrine silts. Amity soils are on broad terraces and have slopes of 0 to 3 percent . The average annual precipitation is about 45 inches and the average annual temperature is about 52 degrees F.

TAXONOMIC CLASS: Fine-silty, mixed, superactive, mesic Argiaquic Xeric Argialbolls

TYPICAL PEDON: Amity silt loam, cultivated. (Colors are for moist soil unless otherwise noted.)

Ap--0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many roots; many irregular pores; moderately acid (pH 5.8); clear smooth boundary. (5 to 8 inches thick)

A--7 to 16 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many roots; common irregular pores and few very fine tubular pores; moderately acid (pH 5.8); clear smooth boundary. (5 to 10 inches thick)

E--16 to 22 inches; dark gray (10YR 4/1) silt loam, light gray (5Y 7/1) dry;; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common roots; many irregular pores; common medium brown and black concretions; common fine faint brown and black masses of iron accumulation; moderately acid (pH 5.8); clear wavy boundary. (4 to 12 inches thick)

2Bt1--22 to 28 inches; grayish brown (10YR 5/2) silty clay loam, pale brown (10YR 6/3); weak medium prismatic structure that parts to moderate very coarse subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few roots; common very fine tubular pores; clear silt and sand grains on faces of prisms; common distinct clay films along pores and on faces of peds; common fine faint brown and black masses of iron accumulation; moderately acid (pH 6.0); gradual wavy boundary. (4 to 13 inches thick)

2Bt2--28 to 35 inches; light olive brown (2.5Y 5/4) silty clay loam, very pale brown (10YR 7/4) dry; weak coarse prismatic structure that parts to moderate coarse subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; few fine roots; common very fine tubular pores; common distinct clay films along pores and on faces of peds; common fine

distinct reddish brown, gray and black masses or iron accumulation and depletions; slightly acid (pH 6.2); diffuse boundary. (4 to 14 inches thick)

2C--35 to 72 inches; olive brown (2.5Y 4/4) silt loam, very pale brown (10YR 7/4) dry; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; common fine faint masses of iron accumulation; slightly acid (pH 6.4).

TYPE LOCATION: Linn County, Oregon; 5,000 feet east from Grand Prairie School, 50 feet west of north and south gravel road, located about 200 feet north and 2,600 feet east of SW1/4, section 15, T. 11 S., R. 3 W. Willamette Meridian; Tangent USGS 7.5 minute topographic quadrangle; Latitude 44 degrees, 36 minutes, 26 seconds N.; Longitude 123 degrees, 02 minutes, 15 seconds W. NAD 27.

RANGE IN CHARACTERISTICS: The soils are usually moist but are dry in all parts between a depth of 4 and 12 inches for 45 to 60 consecutive days during the summer. The mean annual soil temperature is 52 to 55 degrees F. The soils are more than 60 inches deep. The mollic epipedon is 10 to 18 inches thick. Depth to aquic conditions with chroma of 2 or less is 10 to 18 inches.

The A horizon has value of 2 or 3 moist, 4 or 5 dry and chroma of 2 or 3 moist and dry. It has weak to moderate granular or subangular blocky structure. Texture is silt loam with 15 to 25 percent clay. Reaction is strongly acid or moderately acid.

The E horizon has value of 3 to 5 moist, 6 or 7 dry and chroma of 0 to 2 moist and dry. Texture is silty clay loam with 20 to 30 percent clay. Reaction is strongly acid to slightly acid. It has few to common, faint to distinct redox concentrations.

The 2Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 moist, 6 or 7 dry and chroma of 2 to 4 moist and dry. It has weak to moderate prismatic or subangular structure. In the lower part it has some brittleness like that of fragipans. Texture is silty clay loam with 27 to 35 percent clay and less than 15 percent sand coarser than very fine sand. Reaction is moderately acid to neutral. It has few to common, faint to distinct redox concentrations.

The 2C horizon has hue of 10YR or 2.5Y, value of 4 or 5 moist, 6 or 7 dry and chroma of 2 to 4 moist and dry. Texture is silt loam or silty clay loam with 15 to 30 percent clay. Reaction is moderately acid to neutral. It has few to common, faint to distinct redox concentrations.

COMPETING SERIES: There are no competing series.

GEOGRAPHIC SETTING: The Amity soils are on broad terraces at elevations of 150 to 400 feet. Slopes range from 0 to 3 percent. The soils formed in indistinctly stratified silty alluvium and lacustrine silts of upper Pleistocene age. Beginning at the surface of the mineral soil, the depositional stratigraphy of the Amity soil profile developed in the following Willamette Formation Members: (1) Greenback Member, and (2) Irish Bend Member. Summers are warm and dry and winters are cool and moist. The average annual precipitation is 40 to 50 inches. The average January temperature is 39 to 40 degrees F. and average July temperature is 65 to 67

degrees F. The average annual temperature is 50 to 54 degrees F. The frost-free season is 165 to 210 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Aloha](#), [Concord](#), [Dayton](#), [Willamette](#), and [Woodburn](#) series. Concord and Dayton soils have aquic conditions and chroma of 2 or less at a depth of 0 to 10 inches. In addition, Concord is fine and Dayton has an abrupt textural change from the E to 2Bt horizon. They occur in depressions on terraces. Willamette soils lack aquic conditions with chroma of 2 or less between 0 and 40 inches and do not have an albic horizon. They are on higher terraces or more sloping positions. Aloha soils do not have a mollic epipedon or an albic horizon and are on higher terraces. Woodburn soils have aquic conditions with chroma of 2 or 13ss and redox concentrations at a depth of 20 to 30 inches, lack an albic horizon, and are on higher terraces or more sloping positions.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow runoff; moderately slow permeability. An apparent water table is at its uppermost limit from December to April.

USE AND VEGETATION: Most of the soil is cropland or in pasture. Small grain, grass seed, and hay are the main crops. Some cannery crops are grown where the soil is artificially drained. A small amount remains in native vegetation of annual and perennial grasses, wild blackberries, wild rose, and widely spaced oak trees.

DISTRIBUTION AND EXTENT: Amity soils are located throughout the Willamette Valley of western Oregon; MLRA 2. They are extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Yamhill County, 1917.

REMARKS: Diagnostic horizons and features include:

Mollic epipedon - the zone from 0 to 16 inches (Ap and A horizons)

Albic horizon - the zone from 16 to 22 inches (E horizon)

Argillic horizon - the zone from 22 to 35 inches (2Bt1 and 2Bt2 horizons)

Argiaquic feature - Does not have an abrupt textural change from the albic to argillic horizon and has a xeric moisture regime.

Argialboll- Has an albic horizon that has chroma of 2 or less and has redox concentrations in the albic or argillic horizon above a depth of 40 inches.

ADDITIONAL DATA: Characterization data for 2 profiles (S59OR-043-004 and S59OR-043-005) in Riverside Soil Survey Laboratory Report for soils from the Willamette Valley by SCS Soil Survey Laboratory, Riverside California, 1959. In addition, characterization data is available for S92OR-053-003 and S92OR-003-003, NSSL, Lincoln, NE.

LOCATION CONCORD
Established Series
Rev. AON/DRJ/RWL
07/2006

OR

CONCORD SERIES

The Concord series consists of very deep, poorly drained soils formed in stratified glacio lacustrine deposits. They are on terraces and have slopes of 0 to 2 percent. The mean annual temperature is about 52 degrees F. and the mean annual precipitation is about 45 inches.

TAXONOMIC CLASS: Fine, smectitic, mesic Typic Endoaqualfs

TYPICAL PEDON: Concord silt loam - pasture. (Colors are for moist soil unless otherwise noted.)

Ap-- 0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure that parts to moderate fine granular structure; hard, friable, moderately sticky and moderately plastic; many very fine roots; many very fine irregular pores and worm holes; common fine brown concretions; moderately acid (pH 6.0); abrupt smooth boundary. (5 to 10 inches thick)

E1--6 to 9 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; moderate medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; many very fine roots; many very fine and few fine tubular pores; common fine and medium very dark brown concretions; common fine prominent brown (7.5YR 4/4) masses of iron accumulation; moderately acid (pH 5.8); clear smooth boundary. (3 to 14 inches thick)

E2--9 to 15 inches; dark gray (10YR 4/1) heavy silt loam, light gray (10YR 7/1) dry; weak medium prismatic structure that parts to moderate medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine roots; many very fine and common fine tubular pores; common fine very dark brown concretions; common fine prominent brown (7.5YR 4/4) masses of iron accumulation; moderately acid (pH 6.0); clear smooth boundary. (0 to 10 inches thick)

2ABg--15 to 19 inches; gray (10YR 5/1) and dark gray (10YR 4/1) light silty clay, light gray (10YR 7/1) and gray (10YR 6/1) dry, darker colors in ped interiors; weak medium prismatic structure that parts to moderate medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine roots; many very fine tubular pores; common medium tubular pores; many fine very dark brown concretions; common fine prominent brown (7.5YR 4/4) masses of iron accumulation; slightly acid (pH 6.2); clear smooth boundary. (2 to 17 inches thick)

2Btg--19 to 24 inches; grayish brown (2.5Y 5/2) silty clay, light brownish gray (2.5Y 6/2) dry; moderate fine prismatic structure that parts to moderate medium and fine angular blocky

structure; extremely hard, firm, very sticky and very plastic; few roots; many very fine tubular pores, and few fine and medium tubular pores; few faint and distinct clay films on surfaces of peds and in pores; many fine very dark brown and few black concretions; common fine prominent yellowish brown (10YR 5/6) masses of iron accumulation; slightly acid (pH 6.4); clear wavy boundary. (4 to 12 inches thick)

2BCtg--24 to 29 inches; dark grayish brown (2.5Y 4/2) silty clay, light brownish gray (2.5Y 6/2) dry; weak coarse prismatic structure; very hard, firm, moderately sticky and moderately plastic; few fine roots; common fine pores; common distinct clay films along horizontal lines of weakness and few in pores; few fine dark brown and black concretions; many fine prominent dark yellowish brown (10YR 4/4) masses of iron accumulation; neutral (pH 6.6); gradual smooth boundary. (0 to 9 inches thick)

3C--29 to 60 inches; dark grayish brown (2.5Y 4/2) silt loam, light gray (2.5Y 7/2) dry; massive; hard, friable, moderately sticky and moderately plastic; common very fine tubular pores; many medium prominent dark yellowish brown (10YR 4/4) masses of iron accumulation; few black stains; neutral (pH 6.6).

TYPE LOCATION: Marion County, Oregon; east edge of Baldock Freeway, 200 feet north from overpass; about 1,500 feet east and 300 feet south of the NW corner of section. 33, T. 5 S., R. 2 W. Willamette Meridian, Gervais, Oregon. USGS 7.5 minute topographic quadrangle. Latitude 45 degrees, 06 minutes, 05 seconds N.; Longitude 122 degrees, 55 minutes, 55 seconds W. NAD 27.

RANGE IN CHARACTERISTICS: The soils are usually moist and are saturated with water during the winter and spring. The mean annual soil temperature is 52 to 55 degrees F. The soils are more than 60 inches deep. The pscs has 40 to 50 percent clay. Depth to aquic conditions with chroma of 2 or less with or without redox concentrations is from the surface to 10 inches.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 moist, 6 or 7 dry, and chroma of 1 or 2 moist and dry. It has weak to moderate subangular blocky or granular structure. Texture is silt loam with 15 to 25 percent clay. It has none to common redox concentrations. Reaction is very strongly acid to moderately acid.

The E horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6 moist, 6 or 7 dry, and chroma of 1 or 2 moist and dry. It has weak to moderate subangular blocky structure, however, tillage can result in platy or prismatic structure or destroy structure. Texture is loam or silt clay loam with 20 to 30 percent clay. It has few to common redox concentrations. Reaction is very strongly acid to moderately acid.

The 2Abg horizon has hue of 10YR or 2.5Y, value of 4 or 5 moist, 6 or 7 dry, and chroma of 1 or 2 moist and dry. It has weak prismatic or moderate subangular blocky structure. Texture is silty clay loam or silty clay with 35 to 45 percent clay. It has few to common redox concentrations. Reaction is strongly acid to slightly acid.

The 2Btg horizon has hue of 10YR, 2.5Y, 5Y, or neutral, value of 4 or 5 moist, 5 to 7 dry, and chroma of 0 to 2 moist and dry. It has weak to moderate prismatic parting to subangular or angular blocky structure. Texture is clay or silty clay with 40 to 50 percent clay. It has few of many redox concentrations. Reaction is strongly acid to slightly acid.

The 2BCtg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 moist, 5 to 7 dry, and chroma of 0 to 2 moist and dry. It has weak to moderate prismatic or subangular blocky structure. It has few to many redox concentrations. It may be massive in the lower part. Texture is clay or silty clay with 40 to 50 percent clay in the upper part and silty clay loam or silt loam with 20 to 35 percent clay in the lower part. Reaction is moderately acid to neutral.

The 3C horizon has hue of 10YR or 2.5Y, value of 4 or 5 moist, 6 or 7 dry, and chroma of 1 to 4 moist and dry. It has weak prismatic structure or is massive. Texture is silt loam or silty clay loam with 15 to 30 percent clay. Reaction is slightly acid or neutral.

COMPETING SERIES: This is the [Elbert](#), [Kampville](#), [Sexton](#), [Traer](#), and [Weir](#) series.

[Elbert](#) soils - 40 to 60 inches to paralithic contact

[Kampville](#) soils - do not have a distinct lithologic discontinuity; have a mean annual soil temperature of more than 55 degrees F.

[Sexton](#) soils - have 2BCt horizons with stratified textures of silty clay loam to fine sandy loam with 10 to 35 percent clay and 10 to 75 percent sand of outwash origin; depth to base of argillic horizon is greater than 40 inches.

[Traer](#) soils - depth to carbonates is 40 to more than 70 inches; pscs has textures of silty clay loam with 36 to 40 percent clay; Wisconsin Age loess origin; the BCg and Cg horizons have slightly alkaline soil reaction.

[Weir](#) soils - have a MAST of 54 to 57 degrees F.; pscs averages 35 to 40 percent clay; loess origin

GEOGRAPHIC SETTING: The Concord soils are on terraces at elevations between 150 and 400 feet. Slopes are dominantly less than 1 percent but may reach 2 percent. The soils formed in stratified silty and clayey glaciolacustrine deposits of mixed mineralogy. The mean annual precipitation is 40 to 50 inches. The average January temperature is 39 to 40 degrees F. and the average July temperature is 65 to 67 degrees F. The mean annual temperature is 50 to 54 degrees F. The frost-free period is 165 to 210 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Aloha](#), [Amity](#), [Dayton](#), [Holcomb](#), [Willamette](#), and [Woodburn](#) soils. Dayton soils have an abrupt textural change between the albic and argillic horizons and occur in depressions on terraces. Aloha soils are fine-silty and have aquic conditions with chroma of 2 or less at a depth of 10 to 20 inches. Amity soils are fine-silty and have a mollic epipedon. Holcomb soils have a mollic epipedon and have aquic

conditions with chroma of 2 or less at a depth of 10 to 20 inches. Willamette and Woodburn soils are fine-silty and are on higher terraces.

DRAINAGE AND PERMEABILITY: Poorly drained; ponded to slow runoff; very slow permeability. An apparent water table is at its uppermost limit from December to April.

USE AND VEGETATION: Used for production of grass seed, cereal grain, hay and pasture. Native vegetation is rushes, sedges, trailing blackberries, hazel brush and scattered ash trees.

DISTRIBUTION AND EXTENT: On broad terraces of the Willamette Valley, Oregon; MLRA 2. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Clackamas County, Oregon, 1921.

REMARKS: Diagnostic horizons and features include:
Ochric epipedon

Albic horizon - from 6 to 15 inches without an abrupt textural change between the albic horizon and the argillic horizon.

Argillic horizon - from 19 to 29 inches (2Btg, 2BCtg horizons).

COLE estimated to 40 inches at 5.0 cm.

Classification changed 7/98 based on 1998 Keys to Soil Taxonomy.

LOCATION DAYTON
Established Series
Rev. WRP/DRJ/RWL
07/2006

OR

DAYTON SERIES

The Dayton series consists of very deep, poorly drained soils that formed in silty and clayey glaciolacustrine deposits. Dayton soils are on terraces. Slopes are 0 to 2 percent. The mean annual precipitation is about 42 inches and the mean annual temperature is about 52 degrees F.

TAXONOMIC CLASS: Fine, smectitic, mesic Vertic Albaqualfs

TYPICAL PEDON: Dayton silt loam, cultivated. (Colors are for moist soil unless otherwise noted.)

Ap--0 to 9 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine irregular pores; many very fine roots; strongly acid (pH 5.1); abrupt smooth boundary. (5 to 10 inches thick)

E1--9 to 12 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine irregular pores; common fine black and dark reddish brown redox masses or fine concretions; strongly acid (pH 5.1); clear smooth boundary. (3 to 9 inches thick)

E2--12 to 15 inches; dark gray (5Y 4/1) silt loam, gray (10YR 6/1) dry; moderate fine subangular blocky structure; slightly hard, firm, moderately sticky and moderately plastic; many very fine tubular pores; common very fine roots; common fine black and dark reddish brown redox masses or fine concretions; strongly acid (pH 5.4); abrupt smooth boundary. (0 to 5 inches thick)

2Bt1--15 to 22 inches; dark gray (5Y 4/1) silty clay, light brownish gray (10YR 6/2) and gray (10YR 6/1) dry; moderate coarse prismatic structure; very hard, very firm, very sticky and very plastic; many fine tubular pores; common very fine roots; few medium black redox masses and gray coatings on faces of peds; strongly acid (pH 5.2); clear smooth boundary. (5 to 21 inches thick)

2Bt2--22 to 29 inches; olive gray (5Y 5/2) silty clay, light olive gray (5Y 6/2) dry; moderate medium and coarse prismatic structure; very hard, very firm, very sticky and very plastic; many very fine tubular pores; clay films not discernible; common black and dark reddish brown redox masses or fine concretions; moderately acid (pH 5.7); clear smooth boundary. (0 to 10 inches thick)

2BCt1--29 to 40 inches; gray (5Y 5/1) silty clay, light gray (5Y 7/2) dry; moderate medium prismatic structure; hard, firm, very sticky and very plastic; many fine tubular pores; many prominent clay films on faces of peds and along pores; few prominent yellowish brown (10YR 5/8) masses of iron accumulation; neutral (pH 6.8); gradual wavy boundary. (0 to 15 inches thick)

2BCt2--40 to 53 inches; dark gray (5Y 4/1) silt loam, light olive gray (5Y 6/2) dry; massive; hard, firm, moderately sticky and moderately plastic; few coarse tubular pores; many faint clay films on fractures and prominent clay films along pores; common prominent brown (10YR 4/3) masses of iron accumulation; neutral (pH 6.8); gradual wavy boundary. (0 to 15 inches thick)

3C1--53 to 64 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/4) dry; massive; slightly hard, friable, moderately sticky and moderately plastic; common fine faint brown (10YR 4/3) masses of iron accumulation; neutral (pH 7.0); gradual wavy boundary. (10 to 32 inches thick)

3C2--64 to 76 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/4) dry; massive; slightly hard, friable, moderately sticky and moderately plastic; neutral (pH 7.2).

TYPE LOCATION: Linn County, Oregon; about 1,500 feet north and 1,300 feet west of the SE corner of section 19, T. 12 S., R. 3 W. Willamette Meridian, Tangent, Oregon, USGS 7.5 minute topographic quadrangle. Latitude 44 degrees, 30 minutes, 33 seconds N.; Longitude 123 degrees, 05 minutes, 35 seconds W. NAD 27.

RANGE IN CHARACTERISTICS: The soils are usually moist and are saturated with water during the winter and spring. The mean annual soil temperature is 52 to 55 degrees F. The soils are more than 60 inches deep. Depth to aquic conditions with chroma of 2 or less, with or without redox concentrations, is from the surface to 10 inches. Depth to the 2Bt and abrupt textural change ranges from 12 to 24 inches. The pscs has 40 to 50 percent clay.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 moist, 6 or 7 dry, and chroma of 1 or 2 moist and dry. It has weak to moderate subangular blocky or granular structure. Texture is silt loam with 15 to 25 percent clay and 0 to 3 percent gravel. It has none to common redox concentrations. Reaction is very strongly acid to moderately acid.

The E horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6 moist, 6 or 7 dry, and chroma of 1 or 2 moist and dry. It has weak to moderate subangular blocky structure, however tillage can result in platy or prismatic structure or destroy structure. Texture is silt loam or silty clay loam with 20 to 30 percent clay. It has few to common redox concentrations. Reaction is very strongly acid to moderately acid.

The 2Bt horizon has hue of 10YR, 2.5Y, 5Y, or neutral, value of 4 or 5 moist, 5 to 7 dry, and chroma of 0 to 2 moist and dry. It has weak to moderate prismatic parting to subangular or angular blocky structure. Texture is clay or silty clay with 40 to 50 percent clay. It has few to many redox concentrations. Reaction is strongly acid to slightly acid.

The 2BCt horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 moist, 5 to 7 dry, and chroma of 0 to 2 moist and dry. It has weak to moderate prismatic or subangular blocky structure and may be massive in the lower part. It has few to many redox concentrations. Texture is clay or silty clay with 40 to 50 percent clay in the upper part and silty clay loam or silt loam with 20 to 35 percent clay in the lower part. Reaction is moderately acid to neutral.

The 3C horizon has hue of 10YR or 2.5Y, value of 4 or 5 moist, 6 or 7 dry, and chroma of 1 to 4 moist and dry. It has weak prismatic structure or is massive. Texture is silt loam, silty clay loam, or silty clay with 15 to 50 percent clay. It has 0 to 15 percent gravel. Reaction is slightly acid or neutral.

COMPETING SERIES: These are the [Adco](#), [Appanoose](#), [Awbrig](#), [Belinda](#), [Chariton](#), [Glensted](#), [Putnam](#), [Rubio](#), and [Wagner](#) series. Adco soils lack a discontinuity and have aquic conditions at a depth of 12 to 30 inches. Appanoose soils lack a discontinuity, have a particle-size control section averaging 48 to 55 percent clay, and a solum depth of greater than 55 inches. Awbrig soils are 5 to 12 inches to a 2Bt argillic horizon, has 50 to 60 percent clay in the particle-size control section, and lacks an albic horizon. Belinda soils lack a discontinuity and a 3C horizon, and depth to the base of the argillic horizon is greater than 40 inches. Chariton soils lack a discontinuity, have 48 to 60 percent clay in the particle-size control section, and have a solum dominated by material of loess origin. Glensted soils have a particle-size control section with 1 to 15 percent chert gravel. [Putnam](#) soils lack a discontinuity, and have 48 to 60 percent clay in the particle-size control section of loess origin over Kansas till. Rubio soils lack a discontinuity and have 35 to 42 percent clay in the particle-size control section of Wisconsin age loess origin. Wagner soils lack a discontinuity and have Btg horizons.

GEOGRAPHIC SETTING: The Dayton soils are on nearly level or somewhat concave, slightly depressed parts of broad valley terraces at elevations of 150 to 400 feet. They formed in silty and clayey glaciolacustrine deposits. Summers are warm and dry and winters are cool and moist. Average January temperature is 39 to 40 degrees F., average July temperature is 65 to 67 degrees F., and mean annual temperature is 50 to 54 degrees F. Mean annual precipitation is 40 to 50 inches. The frost-free period is 165 to 210 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Aloha](#), [Amity](#), [Concord](#), [Holcomb](#), [Willamette](#), and [Woodburn](#) soils. Concord soils do not have an abrupt textural change between the albic and argillic horizons and occur in depressions on terraces. Aloha soils are fine-silty and have aquic conditions with chroma of 2 or less at 10 to 20 inches from the surface. Amity soils are fine-silty and have a mollic epipedon. Holcomb soils have a mollic epipedon and have aquic conditions with chroma of 2 or less at 10 to 20 inches from the surface. Willamette and Woodburn soils are fine-silty and are on higher terraces.

DRAINAGE AND PERMEABILITY: Poorly drained; slow runoff or ponded; very slow permeability. A perched water table is at its uppermost limit from November to April and is ponded from December to April. This soil also has an apparent water table.

USE AND VEGETATION: These soils are used for growing spring grains, grass seed, hay and pasture. Native vegetation is grasses, weeds, rosebushes and widely spaced ash trees.

DISTRIBUTION AND EXTENT: Dayton soils are found throughout the Willamette Valley in western Oregon; MLRA 2. They are extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Yamhill County, Oregon, 1917.

REMARKS: Diagnostic horizons and features include:

Ochric epipedon

Albic horizon - the zone from 9 to 15 inches (E1 and E2 horizons).

Argillic horizon - the zone from 15 to 53 inches (2Bt1, 2Bt2, 2BCt1 and 2BCt2 horizons).

Aqualfs feature - redox features in all layers between 10 and 16 inches, and more than 50 percent redox depletions with chroma of 2 or less and redox concentrations within the upper 5 inches of the 2Bt1 horizon.

Vertic feature - an estimated COLE of 6.8 from 0 to 40 inches.

Classification revised 3/00 from Typic Albaqualfs to Vertic Albaqualfs based on addition of Vertic subgroup to Soil Taxonomy.

ADDITIONAL DATA: Characterization data for pedons (S62Oreg-22-1 and S62Oreg-22-2) from the SCS Laboratory at Riverside, California and for 1 pedon (S59Oreg-22-6) from the OSU Soils Laboratory. The soil survey sample numbers include: S62OR-043-001, S62OR-043-002, S91OR-003-001, S92OR-003-005, S96OR-043-001.

LOCATION HOLCOMB
Established Series
Rev. AON/ DRJ/RWL
08/2006

OR

HOLCOMB SERIES

The Holcomb series consists of very deep, somewhat poorly drained soils that formed in stratified silty and clayey mixed alluvium. Holcomb soils are on broad valley terraces and have slopes of 0 to 3 percent. The mean annual precipitation is about 45 inches and the mean annual temperature is about 52 degrees F.

TAXONOMIC CLASS: Fine, smectitic, mesic Typic Argialbolls

TYPICAL PEDON: Holcomb silt loam, cultivated. (Colors are for moist soil unless otherwise noted.)

Ap--0 to 6 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak coarse subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; moderately acid (pH 5.6); clear smooth boundary. (3 to 9 inches thick)

A--6 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak coarse subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, moderately sticky and slightly plastic; many very fine roots; many very fine pores; few fine and medium black and reddish brown concretions; moderately acid (pH 5.8); clear smooth boundary. (5 to 15 inches thick)

E--18 to 24 inches; very dark grayish brown (10YR 3/2) light silty clay loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine roots; common very fine pores; common clean silt and sand grains on faces of peds; few fine and medium black and reddish brown concretions; common fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; slightly acid (pH 6.2); abrupt smooth boundary. (3 to 15 inches thick)

2Btg--24 to 34 inches; dark grayish brown (10YR 4/2) clay, grayish brown (2.5Y 5/2) dry; weak coarse angular blocky structure parting to strong fine angular blocky; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine pores; common faint clay films on faces of peds; common fine and medium very dark brown (10YR 2/2) concretions; ; common fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; neutral (pH 6.6); clear smooth boundary. (8 to 36 inches thick)

2BCtg--34 to 50 inches; dark grayish brown (10YR 4/2) silty clay, grayish brown (10YR 5/2) dry; weak fine angular blocky structure; very hard, firm, very sticky and very plastic, common

very fine pores; common faint clay films on faces of peds; common medium black concretions; neutral (pH 6.6); clear smooth boundary. (0 to 18 inches thick)

3C--50 to 60 inches; grayish brown (10YR 5/2) dry; silt loam; massive; hard, firm, moderately sticky and slightly plastic; few fine pores; neutral (pH 6.6).

TYPE LOCATION: Marion County, Oregon; about 2,700 feet east and 500 feet north of the SW corner of section 4, T. 9 S., R. 2 W. Willamette Meridian. Turner, Oregon USGS 7.5 topographic quadrangle. Latitude 44 degrees, 48 minutes, 40 seconds N., Longitude 122 degrees, 56 minutes, 15 seconds W. NAD 27.

RANGE IN CHARACTERISTICS: The soils are usually moist and are saturated with water during the winter and early spring. The mean annual soil temperature ranges from 52 to 55 degrees F. Depth to bedrock is 6 feet or more. Redoximorphic features commonly are lacking in the Ap horizon, none to distinct in the A horizons, and distinct or prominent in the E, 2Btg and 3C horizons. Black and reddish brown concretions commonly are in all horizons. Depth to the 2Btg horizon is 15 to 30 inches. Depth to aquic conditions with chroma of 2 or less, with or without redox concentrations is 12 to 20 inches.

The A horizon has value of 2 or 3 moist, 4 or 5 dry and chroma of 2 moist, 2 or 3 dry. It has weak or moderate granular or subangular blocky structure. Texture is silt loam or silty clay loam with 20 to 30 percent clay. It has 0 to 5 percent gravel. Reaction is slightly acid or moderately acid.

The E horizon has value of 3 or 4 moist, 5 to 7 dry and chroma of 2 moist and dry. Texture is silt loam or silty clay loam with 20 to 30 percent clay. It has weak or moderate subangular blocky structure. Reaction is slightly acid or moderately acid. In some pedons the E horizon is replaced in part by a BA horizon.

The 2Btg horizon has hue of 10YR to 5Y, value of 3 to 5 moist, 4 to 6 dry and chroma of 1 or 2 moist and dry. Texture is silty clay or clay with 40 to 50 percent clay. It has weak or strong subangular or angular blocky structure. Reaction is neutral or slightly acid. In some pedons it has weak or moderate prismatic secondary structure.

The 2BCt horizon, when present, has hue of 10YR to 5Y, value of 4 or 5 moist, 5 or 6 dry and chroma of 2 to 4 moist and dry. Texture is silty clay or clay with 40 to 50 percent clay. It has 0 to 15 percent gravel. Reaction is neutral or slightly acid.

The 3C horizon, when present has hue of 10YR to 5Y, value of 4 or 5 moist, 5 or 6 dry chroma of 2 to 4 moist and dry. Texture is silt loam, silty clay loam, or clay loam with 25 to 40 percent clay. It has 0 to 15 percent gravel. Reaction is neutral or slightly acid.

COMPETING SERIES: These are the [Chauncey](#), [Plankinton](#), [Rolfe](#), [Sperry](#), and [Willowfork](#) series. The Chauncey soils lack a discontinuity, have a Bt horizon that is moderately acid to very strongly acid, and a particle-size control section with 35 to 42 percent clay. The Plankinton soils have carbonates at depths of 24 to 50 inches and a mollic epipedon greater than 24 inches thick. The Rolfe soils have carbonates at a depth of 42 to 80 inches, and a 2BCg or 2Cg horizon at a

depth of 24 to 60 inches of glacial drift origin and having 18 to 35 percent clay. The Sperry soils have an A horizon with chroma of 1, have a Btg horizon that is moderately acid or strongly acid, and lack a discontinuity. The Willowfork soils have a Btg horizon that is moderately acid or strongly acid, has 10 percent chert gravel in the lower part of the solum, and has a mean annual soil temperature of more than 55 degrees F.

GEOGRAPHIC SETTING: The Holcomb soils are in nearly level to slightly convex areas on broad valley terraces. Elevations are 125 to 650 feet. The soils formed in silty alluvium over silty and clayey glaciolacustrine deposits. Slope is 0 to 3 percent. Summers are warm and dry and winters are cool and moist. The mean annual precipitation is 40 to 50 inches. The mean January temperature is 39 to 40 degrees F. and the mean July temperature is 65 to 67 degrees F. The mean annual temperature is 50 to 54 degrees F. The frost-free period is 165 to 210 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Amity](#), [Concord](#), [Dayton](#), [Willamette](#), and [Woodburn](#) soils. Amity soils are fine-silty, do not have an abrupt textural change and occur on adjacent terraces. Concord and Dayton soils have an ochric epipedon. In addition, Concord soils do not have an abrupt textural change. Concord and Dayton soils occur on lower terraces. Willamette and Woodburn soils are fine-silty. In addition, Willamette and Woodburn soils lack aquic conditions with chroma of 2 or less above 20 inches from the surface. They occur on broad valley terraces.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow runoff; very slow permeability. A perched water table is at its uppermost limit from November to April. This soil also has an apparent water table.

USE AND VEGETATION: Soils are under cultivation with small grains, hay, pasture, and grass seed as the principal crops. The vegetation is largely annual and perennial grasses, wild blackberry, wild rose, and oak.

DISTRIBUTION AND EXTENT: These soils are distributed on terraces in the Willamette Valley in Oregon; MLRA 2. Holcomb soils are moderately extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Clackamas County, Oregon, 1921.

REMARKS: Diagnostic horizons and features include:

Mollic epipedon - the zone from 0 to 18 inches (Ap and A horizons)

Albic horizon - the zone from 18 to 24 inches (E horizon)

Argillic horizon - the zone from 24 to 50 inches (2Btg and 2BCtg horizons)

Albolls feature - an albic horizon that has concretions or masses of iron accumulation.

Particle-size control section - the zone from 24 to 44 inches.

The Holcomb soils are found on the Senecal geomorphic surface in the Willamette Valley, Oregon.

LOCATION WOODBURN
Established Series
Rev. AON/DRJ/RWL
07/2006

OR

WOODBURN SERIES

The Woodburn series consists of very deep, moderately well drained soils that formed in silty stratified glacio lacustrine deposits. Woodburn soils are on broad valley terraces and have slopes of 0 to 55 percent. The mean annual precipitation is about 45 inches and the mean annual temperature is about 52 degrees F.

TAXONOMIC CLASS: Fine-silty, mixed, superactive, mesic Aquultic Argixerolls

TYPICAL PEDON: Woodburn silt loam, cultivated. (Colors are for moist soil unless otherwise noted.)

Ap--0 to 9 inches; very dark brown (10YR 2/2) silt loam, brown (10YR 5/3) dry; cloddy, with very weak subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many roots; many very fine and fine tubular pores; few fine irregular pores; common medium and fine reddish brown and black concretions; moderately acid (pH 5.9); abrupt smooth boundary. (6 to 10 inches thick)

A--9 to 17 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many roots; many very fine and fine tubular pores; and few medium pores; common silt and sand grains on faces of peds; few thin darker colored very dark brown (10YR 2/2) coatings on faces of peds; few reddish brown and black concretions; slightly acid (pH 6.2); clear smooth boundary. (3 to 18 inches thick)

2Bt1--17 to 25 inches; dark yellowish brown (10YR 3/4) silty clay loam, brown (7.5YR 5/4) dry; moderate coarse and medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common roots; many very fine tubular pores and few fine pores; few faint clay films on faces of peds; few reddish brown and black concretions; few black stains on peds; moderately acid (pH 6.0); clear smooth boundary. (7 to 12 inches thick)

2Bt2--25 to 32 inches; brown (7.5YR 4/4) silty clay loam, brown (10YR 5/3) dry; moderate medium and coarse subangular blocky structure; hard, friable, brittle, moderately sticky and moderately plastic; common roots; many very fine tubular pores and few fine tubular pores; many distinct clay films on faces of peds and along pores; few fine and medium distinct iron depletions, dark gray (10YR 4/1) and light brownish gray (10YR 6/2) dry; few fine black concretions and stains on faces of peds; moderately acid (pH 5.8); abrupt smooth boundary. (6 to 17 inches thick)

2BCt1--32 to 39 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; massive but some planes of weakness that are indistinct, vertical planes are more distinct than horizontal planes; very hard, very firm, brittle, slightly sticky and slightly plastic; few roots; many very fine and fine tubular pores; many distinct clay films on faces of peds and along some root channels and pores; few fine and medium black concretions and few black coatings on faces of peds; faint dark grayish brown (10YR 4/2) iron depletions in a few root channels, faint dark grayish brown (10YR 4/2) coating on plane surfaces, light gray (10YR 7/2) dry; moderately acid (pH 5.7); gradual smooth boundary. (6 to 20 inches thick)

2BCt2--39 to 54 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; massive; with some indistinct vertical planes of weakness; very hard, very firm, brittle, slightly sticky and slightly plastic; many very fine and fine tubular pores; many faint clay films along pores and old root channels; few black concretions and few coatings on faces of peds; moderately acid (pH 5.9); gradual wavy boundary. (0 to 17 inches thick)

2C1--54 to 68 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; massive; very hard, very firm, brittle slightly sticky and slightly plastic; many very fine tubular pores; common distinct clay films along the larger pores and old root or worm channels; few black coatings in pores and channels; moderately acid (pH 5.9); gradual wavy boundary. (14 to 30 inches thick)

2C2--68 to 80 inches; brown (10YR 4/3) very fine sandy loam, pale brown (10YR 6/3) dry; massive very hard, firm, slightly sticky and slightly plastic; many very fine pores; few faint clay films along the larger pores; few small black stains and coatings along pores and channels; moderately acid (pH 6.0); abrupt wavy boundary. (0 to 14 inches thick)

3C3--80 to 92 inches; brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; single grain; loose, friable; many fine irregular pores; moderately acid (pH 6.0).

TYPE LOCATION: Marion County, Oregon; about 200 feet west of paved road to Champoe; SW1/4 SE1/4 section 2, T. 4 S., R. 2 W. Willamette Meridian. St. Paul, Oregon USGS topographic quadrangle. Latitude 45 degrees, 14 minutes, 25 seconds N.; Longitude 122 degrees, 53 minutes, 21 seconds W. NAD 27.

RANGE IN CHARACTERISTICS: The soils are usually moist but are dry in all parts between depths of 4 and 12 inches for 45 to 80 consecutive days during the summer. The mean annual soil temperature is 52 to 55 degrees F. The soils are more than 60 inches deep. The mollic epipedon is 10 to 20 inches thick. Depth to aquic conditions with chroma of 2 or less with or without redox concentrations is 20 to 30 inches. There are few to common, fine reddish brown or black concretions throughout.

The A horizon has value of 2 or 3 moist, 4 or 5 dry and chroma of 2 or 3 moist and dry. It has weak to moderate granular or subangular blocky structure. Texture is silt loam with 15 to 25 percent clay. It has 0 to 3 percent gravel. Reaction is strongly acid to slightly acid.

The AB or BA horizons, when present, have value of 4 or 5 dry and chroma of 2 or 3 moist and dry. They have weak or moderate prismatic or subangular blocky structure. Texture is silt loam

in the upper part and silt loam or silty clay loam in the lower part with 20 to 35 percent clay. Reaction is strongly acid to slightly acid.

The 2Bt horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist, 5 or 6 dry and chroma of 3 or 4 moist and dry. It has weak to moderate prismatic or subangular blocky structure. Texture is loam or silty clay loam with 20 to 35 percent clay. Reaction is moderately acid or slightly acid.

The 2BCt horizon has value of 3 or 4 moist, 5 or 6 dry and chroma of 3 or 4 moist and dry. It has weak prismatic or subangular blocky structure or is massive. Texture is silt loam or silty clay loam with 20 to 35 percent clay. Reaction is moderately acid to neutral.

The 2C horizon has value of 4 or 5 moist, 5 or 7 dry and chroma of 3 or 4 moist and dry. It has weak prismatic or subangular blocky structure or is massive. Texture is silt loam or silty clay loam in the upper part and stratified silt loam, very fine sandy loam, loam, or fine sandy loam in the lower part. It has 10 to 30 percent clay. Reaction is moderately acid to neutral.

COMPETING SERIES: There are no competing series.

GEOGRAPHIC SETTING: The Woodburn soils are on nearly level to gently sloping broad valley terraces formed in indistinctly stratified alluvium or lacustrine Willamette silt of upper Pleistocene age. The soils are at elevations of 150 to 400 feet above sea level. Slopes are 0 to 55 percent. The climate is composed of warm, dry summers, and cool, moist winters. The mean annual precipitation is 40 to 50 inches. The mean annual temperature is 50 to 54 degrees F. The mean January temperature is 39 to 40 degrees F. and the mean July temperature is 65 to 67 degrees F. The frost-free period is 165 to 210 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Amity](#), [Aloha](#), [Concord](#), [Dayton](#) and [Willamette](#) soils. Aloha soils do not have a mollic epipedon or an argillic horizon and are on terraces. Amity soils have an albic horizon, aquic conditions with chroma of 2 or less at a depth of 10 to 20 inches, and occur in depressions or on less sloping position on terraces. Concord and Dayton soils have aquic conditions with chroma of 2 or less at a depth of 0 to 10 inches. In addition, Concord is fine and Dayton has an abrupt textural change from the E to 2Bt horizons. They occur in depressions on terraces. Willamette soils lack aquic conditions and chroma of 2 or less within 40 inches of the surface.

DRAINAGE AND PERMEABILITY: Moderately well drained; slow to medium runoff; moderately slow permeability. An apparent water table is at its uppermost limit from December to March.

USE AND VEGETATION: This series is used for growing berries, orchards, cannery crops, grain, hay and pasture. Native vegetation is Douglas-fir, oak and grass.

DISTRIBUTION AND EXTENT: Woodburn soils occur throughout the Willamette Valley in western Oregon; MLRA 2. The series is extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Benton County (Benton Area), Oregon, 1970.

REMARKS: Diagnostic horizons and features include:

Mollic epipedon - the zone from 0 to 17 inches (Ap and A horizons)

Argillic horizon - the zone from 17 to 54 inches (Bt1, Bt2, BCt1, and BCt2 horizons)

Aquatic feature - has redox depletions with chroma of 2 or less within 30 inches of the surface and also aquic conditions for some time in normal years and a base saturation (sum of cations) of 75 percent or less in one or more horizon between the Ap and 30 inches.

Xeric soil moisture regime.

Particle-size control section - the zone from 17 to 37 inches.

ADDITIONAL DATA: Chemical data from Riverside SCS lab or typifying pedon (S62OR-047-004) in Marion County Area, Oregon Soil Survey Manuscript. Other soil survey sample numbers include: S62OR-047-003, S91OR-047-002, S91OR-067-004, S92OR-003-001, S92OR-053-001, S98OR-071-001, S98OR-071-001A,B,C, and D, S98OR-071-006, S98OR-071-006A,B,C, and D.

National Cooperative Soil Survey
U.S.A.

NUTRIENT MANAGEMENT

Utilization Area Summary

Farm or Tract	Field Number	Acreage	Buffered Acreage	Spreadable Acreage	Soil Test P (ppm)	PI Risk Rating	Controlling Nutrient
Diamond Valley Dairy	1	14.4	0	14.4	81	Low	Nitrogen
Diamond Valley Dairy	2	10.8	0	10.8	81	Low	Nitrogen
Diamond Valley Dairy	3	20.7	0	20.7	120	Medium	Nitrogen
Diamond Valley Dairy	4	18.4	0	18.4	120	Medium	Nitrogen
Diamond Valley Dairy	5	10.4	0	10.4	122	Medium	Nitrogen
Diamond Valley Dairy	6	15.1	0	15.1	122	Medium	Nitrogen
Diamond Valley Dairy	7	8	0	8	122	Medium	Nitrogen
Diamond Valley Dairy	8	9.9	0	9.9	51	Low	Nitrogen
Diamond Valley Dairy	9	3.9	0	3.9	46	Low	Nitrogen

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Crop Type, Yield Goals, and Nutrient Utilization Rates

The timing and frequency of applications of wastewater and solids containing manure for utilization by crops shown in the Planned Crops and Fertilizer Recommendations table on page 119 are based on information provided in Oregon State University Extension publications located in Appendix H.

The following table shows the potential crops that may be grown on this farm. The formulas for determining the total nutrient application rate per unit yield for each crop shown in following table are as follows:

Total N to apply in pounds = N in pounds per ton (lb/t) from the table for the crop grown X percent (%) dry matter (DM)/100 X planned or measured yield in tons

Total P₂O₅ to apply in pounds = P in pounds per ton (lb/t) from the table for the crop grown X 2.291 P₂O₅/P X percent (%) dry matter (DM)/100 X planned or measured yield in tons

Nitrogen, phosphorus and potassium removal of common perennial and annual forage crops.

Crop*	Cuttings (no.)	DM ¹ (%)	CP ¹ (%)	N (lb/t)	P (lb/t)	K (lb/t)	AH ¹ (t/a)
Red clover	1	25	18	58	8	48	16
Alfalfa hay	3	30	20	64	8	42	16
Perennial grass (low intensity)	1-2	30	10	32	6	38	13
Perennial grass (medium to low intensity)	2-3	30	12	38	6	38	15
Perennial grass (medium intensity)	4-5	30	15	48	7	38	17
Perennial grass (medium to high intensity)	5-6	30	18	58	8	40	20
Perennial grass (high intensity)	6-8	30	20	64	8	40	23
Annual ryegrass	1	30	12	38	6	38	13
Annual ryegrass	2	25	15	48	7	40	20
Corn silage	1	25	8	25	4	20	30
Small grains (boot stage)	2	30	12	38	5	32	16
Small grains (soft dough)	1	30	8	25	5	20	13
Sudangrass	1	30	6	40	5	12	16
Triticale	1	30	6	51	7	12	16

*Crop removal information taken from OSU Extension Publications EM 8585-E, PNW 331, and EM 8793.

¹DM = dry matter; CP = crude protein; AH = as harvested

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Farm or Tract	Field Number	Crop Name	Expected Yield/Acre	Nutrient Removal (lb/Acre)		
				N	P2O5	K2O
Off Farm	Off Farm	Ryegrass Hay/Pasture	4 Tons	134	49	137
Off Farm	Off Farm	Ryegrass Seed	15 cwt	24	7	7
Diamond Valley Dairy	1	Corn, silage	20 Tons	154	80	183
Diamond Valley Dairy	1	Ryegrass Haylage	6 Tons	150	55	154
Diamond Valley Dairy	2	Corn, silage	20 Tons	154	80	183
Diamond Valley Dairy	2	Ryegrass Haylage	6 Tons	150	55	154
Diamond Valley Dairy	3	Corn, silage	20 Tons	154	80	183
Diamond Valley Dairy	3	Ryegrass Haylage	6 Tons	150	55	154
Diamond Valley Dairy	4	Corn, silage	20 Tons	154	80	183
Diamond Valley Dairy	4	Ryegrass Haylage	6 Tons	150	55	154
Diamond Valley Dairy	5	Corn, silage	20 Tons	154	80	183
Diamond Valley Dairy	5	Ryegrass Haylage	6 Tons	150	55	154
Diamond Valley Dairy	6	Corn, silage	20 Tons	154	80	183
Diamond Valley Dairy	6	Ryegrass Haylage	6 Tons	150	55	154
Diamond Valley Dairy	7	Orchardgrass Hay/Pasture	5 Tons	266	99	112
Diamond Valley Dairy	8	Orchardgrass Hay/Pasture	5 Tons	266	99	112
Diamond Valley Dairy	9	Orchardgrass Hay/Pasture	5 Tons	266	99	112

Note: Yields for forages and hay are based on plant material as dried in the field, Dry Harvested Material (DHM). Yields for corn silage are based on plant moisture conditions at the time of harvest, As Harvested (AH) moisture conditions.

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Land Base Requirements^{1, 2}

Year	Acreage Available	Acreage Required Based on Nitrogen Removal		Acreage Required Based on Phosphorus Removal	
		Land Required	Excess or (Still Needed)	Land Required	Excess or (Still Needed)
2011	89	283	298	713	(131)

1. Acreage required for Nitrogen utilization is based on estimated losses in manure storage facilities and during application.
2. Land base requirements are based on the cropping system described in this plan.

Manure Nutrient Analysis

Storage Name	Type of Sample	Sample Date	% Moisture	TKN	NH4-N	Org -N	NO3-N	P205	K20	Units
Waste Storage Pond	Mean 2 Samples	Sept 2010	94	17.6	4.7	12.9	0	12.8	7.36	lbs/th gals
Waste Storage Pond	Mean 3 Samples	2003	99.6	3.83	2.83	1.0	0	1.72	4.70	lbs/th gals
Solids Storage Facility	Sample	11/15/10	80	5.7	0.56	5.14	0	1.83	2.72	lbs/Ton

[illegible]

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Estimated Phosphorus Concentrations in Soils after 2, 5 and 10 Years Based on Bray P1 Extraction and Planned Nutrient Management

Farm or Tract	Field Number	P At Start	Units	2 Years	5 Years	10 Years
Diamond Valley Dairy	1	81	ppm	90	70	50
Diamond Valley Dairy	2	81	ppm	90	70	50
Diamond Valley Dairy	3	120	ppm	120	100	80
Diamond Valley Dairy	4	120	ppm	120	100	80
Diamond Valley Dairy	5	122	ppm	120	100	80
Diamond Valley Dairy	6	122	ppm	120	100	80
Diamond Valley Dairy	7	122	ppm	120	100	80
Diamond Valley Dairy	8	51	ppm	50	40	30
Diamond Valley Dairy	9	46	ppm	50	40	30

Note: This plan will have to be revised when phosphorus concentrations in soils and phosphorus applications cause a change in the Phosphorus Index site vulnerability rating.

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Phosphorus Index

The Phosphorus Index for Oregon was developed by a nutrient management advisory group comprised of members from the Natural Resources Conservation Service in Oregon and Washington, Oregon State University, Washington State University, and agricultural industry.

The Phosphorus Index is a field-level assessment tool designed to evaluate the relative potential for off-site movement of phosphorus from the landscape. The purpose of the Phosphorus Index is to provide field personnel, watershed planners, and land managers with a tool to assess various soils, landforms, and management practices for potential risk of phosphorus movement into surface waters. Conservation planners can use the Phosphorus Index to develop alternatives that include management and conservation practices that will reduce the potential for phosphorus transport to surface waters.

Phosphorus Concerns in the Environment

Eutrophication is the process of enrichment of water with nutrients, mainly phosphorus and nitrogen, which results in excessive growth of algae and nuisance aquatic plants. The movement of phosphorus in runoff and eroded sediment from agricultural land to surface water can accelerate eutrophication. Phosphorus is the limiting nutrient in most fresh water systems. The eutrophic condition and excessive aquatic plant growth cause depletion of oxygen in water due to heavy oxygen demand by microorganisms as they decompose organic material. The pH of water also increases as algae and other aquatic plants consume carbon dioxide.

Eutrophication impairs water use for fisheries, wildlife, recreation, agriculture, industry, and drinking due to excessive growth of algae and other aquatic plants. Some blue-green algae can form compounds that are toxic to livestock, humans, and other animals. Accelerated eutrophication is often associated with increases in water pH, causing an increase in ammonia concentrations, which can be harmful to fish and other aquatic animals.

Phosphorus Movement in the Landscape

Phosphorus movement in runoff occurs in sediment-bound and dissolved forms. Sediment P is attached to mineral and organic particles and is transported during erosion events. In general, sediment P contributes about 60 to 90 percent of the P transported in runoff from most cultivated land. Dissolved P makes up the largest portion of the total P in runoff from non-cultivated lands such as pastures, hayland, forests, and cropland using no-till practices. Most sediment P is not readily available for algae and plant uptake because it is chemically bound with mineral (particularly iron, aluminum, and calcium) and organic compounds. Sediment P can however represent a long-term source of P for algae and aquatic plant uptake from the water body. Most dissolved P is immediately available for aquatic plant uptake.

Phosphorus Movement Factors

The main factors influencing P movement can be separated into two main categories: **transport and source factors**. The following factors are considered in the Phosphorus Index for Oregon.

Transport factors:

- Soil erosion (sheet and rill, wind)
- Irrigation-induced erosion
- Runoff class
- Flooding frequency
- Distance to surface waters / buffer width
- Subsurface drainage

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Source Factors:

- Soil test P concentration
- Commercial P fertilizer application rate
- Commercial P fertilizer application method
- Organic P source application rate
- Organic P source application method

Each factor is assigned a **Phosphorus Loss Rating** of *None, Low, Medium, High, or Very High* based on the relative risk of phosphorus transport to surface waters. In addition, each factor is assigned a **Factor Weight** ranging from 0.25 to 1.50, based on the relative contribution of that factor to P transport.

Separate Phosphorus Indices were developed for Western and Eastern Oregon. Differences in cropping systems, tillage practices, irrigation systems, climatic factors, and soil phosphorus testing methods across the state made it necessary to have separate indices.

Descriptions of Phosphorus Index Factors

Transport Factors-

Soil Erosion

Soil Erosion – tons/ac/yr (RUSLE)	tons/ac/yr (Score)	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)
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This factor includes both sheet and rill and wind erosion. Irrigation-induced erosion is addressed in other factors. Sheet and rill erosion is the detachment of soil particles by raindrop impact, surface runoff from rainfall, and snowmelt runoff on frozen or thawing soil. Wind erosion is the detachment and transport of soil particles by wind forces. Sheet and rill erosion rates are estimated with the Revised Universal Soil Loss Equation (RUSLE). Wind erosion rates are estimated using the Wind Erosion Equation (WEQ). These soil loss models predict long-term average erosion rates, over the entire crop rotation, in tons of soil loss per acre per year. They do not predict sediment transport and delivery to a water body. The prediction models are used in the Phosphorus Index to quantify the movement of soil, thus potential for sediment and attached phosphorus transport on a slope or unsheltered distance toward a water body.

Soil Erosion from Sprinkler Irrigation

Soil Erosion from Sprinkler Irrigation	Criteria (Score)	No sprinkler irrigation (0)	Application rate < infiltration rate OR No visible runoff at field borders (0.75)	Application rate = infiltration rate OR Little to no visible runoff at field borders (1.5)	Application rate > infiltration rate OR Visible runoff at field borders (3.0)	Application rate > infiltration rate OR Excessive runoff visible at field borders. Rills and gullies present. (6.0)
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This factor is evaluated by comparing the application rate of the sprinkler irrigation system (inches of water per hour) with the infiltration rate of the soil. A visual assessment of runoff and soil erosion caused by irrigation water is also conducted to assign a *Phosphorus Loss Rating* to this factor.

Runoff Class

Runoff Class	Criteria (Score)	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	(8.0)
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The *runoff class* is determined from the *hydrologic group* assigned to the soil map units in a field, and the average slope gradient. *Hydrologic groups* are group of soils having similar runoff potential under similar

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storm and cover conditions. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonally high water table, intake rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. (National Soil Survey Handbook, Part 618.35).

Flooding Frequency Class

Flooding Frequency Class	Criteria (Score)	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)
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Flooding is the temporary covering of the soil surface by flowing water from any source, such as streams overflowing their banks, runoff from adjacent or surrounding slopes, inflow from high tides, or any combination of sources. Floodwaters can carry both sediment-bound and dissolved P into surface waters. Estimates of flooding frequency are based on the interpretation of soil properties and other evidence gathered during soil survey fieldwork. Flooding frequency is defined as the number of times flooding occurs over a period of time and is expressed as a class.

Distance to Perennial Surface waters / Buffer Widths

Distance to Perennial Surface Waters / Buffer Widths	Criteria (Score)	> 500 feet OR buffer > 30 ft. wide (or meets NRCS standards) next to surface waters (0)	300 – 500 feet OR buffer 20 - 30 ft. wide next to surface waters (0.75)	200 – 299 feet OR buffer 10 -19 ft. wide next to surface waters (1.5)	100 – 199 feet AND buffer < 10 ft. wide next to surface waters (3.0)	< 100 feet AND No buffer next to surface waters (6.0)
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This factor considers the flow distance from the edge of the field to the closest perennial surface water, which may include streams, lakes, and those irrigation and drainage ditches that contain water year around. It also considers the presence and width of a vegetated buffer adjacent to that surface water. The closer the edge of the field is to surface water, the higher the potential risk of P transport to that water.

Vegetated buffers are effective in trapping sediment-bound P in runoff water. They are less effective in reducing dissolved P transport. Dissolved P can flow through a buffer and enter surface water. The wider the vegetated buffer, the more effective it will be in reducing total P transport to surface water. Vegetated buffers that are commonly used adjacent to perennial water include filter strips (NRCS Standard 393) and riparian forest buffers (NRCS Standard 391).

Subsurface Drainage

Subsurface Drainage	Criteria (Score)	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141- 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)
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Recent research has shown that P can leach through the soil profile, and the risk of leaching is directly related to the soil test P concentration in the soil. The higher the P concentration, the greater the potential for leaching. When subsurface drainage is present, such as perforated pipe tile drains, dissolved and sediment-bound P can enter the drains and be directly transported to surface water at the drain outlet. This factor therefore considers whether tile drains are present in the field, and the soil test P concentration.

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Source Factors-

Soil Test P

Soil Test P – ppm (Bray P1)	(Score)	Soil Test P – $40 \times 0.10 = (\rule{1cm}{0.4pt})$ Assign 0 points if Soil Test P < 40 ppm
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A soil sample from the site is necessary to assess the level of "available P" in the surface layer of the soil. Available P is the level customarily reported in a soil test analysis by commercial soil test laboratories. The soil test level for "available P" does not ascertain the total P in the soil. It does however, give an indication of the amount of total P that may be present because of the general relationship between the forms of P (organic, adsorbed, and labile) and the dissolved P available for crop uptake. The higher the soil test P level, the greater the risk of P transport to surface waters.

The depth at which soil samples are collected for available P analysis should be determined from the fertilizer or nutrient management guides for the crops being grown on the site. These guides are available from Oregon State University or Washington State University Cooperative Extension Services. Sampling depth is normally 0 to 6 inches or 0 to 12 inches for cultivated crops, and generally corresponds to typical depth of primary tillage. For established pastures that have not been cultivated for many years, a sample depth of 0 to 3 inches may be appropriate because P tends to be concentrated near the surface when the soil is not cultivated.

In eastern Oregon, soil test P levels should be determined using the Olsen (sodium bicarbonate) extraction method. In western Oregon, the Bray P1 extraction method should be used.

P Fertilizer Application Rate

Commercial P Fertilizer Application Rate	(Score)	lbs/ac $P_2O_5 \times 0.02 = (\rule{1cm}{0.4pt})$
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The P fertilizer application rate is the amount of commercial phosphate fertilizer (P_2O_5), in pounds per acre per year, which is applied to the soil. This factor does not include phosphorus from organic sources. The higher the application rate, the greater the risk of P transport to surface waters.

Commercial P Fertilizer Application Method

Commercial P Fertilizer Application Method	Criteria	None Applied	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September	Incorporated within 5 days of application from October through February OR Surface applied March through August	Incorporated more than 5 days after application OR Surface applied September through October	Surface applied November through February
	(Score)	(0)	(1.0)	(2.0)	(4.0)	(8.0)

The manner in which P fertilizer is applied to the soil, and the length of time that fertilizer remains on the soil surface will affect potential P movement. Banding or incorporating P fertilizer into the soil reduces the risk of P transport. P fertilizer that is surface applied, and not incorporated into the soil, has a higher risk of transport to surface water.

The time of year that P fertilizer is applied also affects the risk of P movement. P fertilizer that is applied during the winter and early spring in Western Oregon, when heavy or prolonged precipitation events are likely to occur, creates a higher risk of P transport than applications made from mid-spring to early fall. In Eastern Oregon, there is a greater risk of P transport when fertilizer is surface applied and not incorporated prior to irrigation or winter precipitation.

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Organic P Source Application Rate

Organic P Source Application Rate	(Score)	lbs/ac P_2O_5 x 0.02 = ()
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The organic P source application rate is the amount of phosphate (P_2O_5) contained in organic material that is applied to the soil, in pounds per acre per year. An analysis of the organic material is desirable to determine the phosphorus content. When an analysis of the organic material is not available, values from the Animal Waste Management Field Handbook can be used. The higher the application rate, the greater the risk of P transport to surface waters.

Organic P Source Application Method

Organic P Source Application Method	Criteria	None Applied	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September	Incorporated within 5 days of application from October through February OR Surface applied March through August	Incorporated more than 5 days after application OR Surface applied September through October	Surface applied November through February
	(Score)	(0)	(1.0)	(2.0)	(4.0)	(8.0)

The manner in which organic P material is applied to the soil, and the length of time it remains on the soil surface will affect potential P movement. Injecting or incorporating organic P sources into the soil reduces the risk of P transport. Organic P material that is surface applied, and not incorporated into the soil, has a higher risk of transport to surface water.

The time of year that organic P is applied also affects the risk of P movement. Organic P that is applied during the winter and early spring in western Oregon, when heavy or prolonged precipitation events are likely to occur, creates a higher risk of P transport than applications made from mid-spring to early fall. In Eastern Oregon, there is a greater risk of P transport when organic material is surface applied and not incorporated prior to irrigation or winter precipitation.

Oregon Phosphorus Index Rating and Interpretation

P Index rating	Interpretation	Recommended Nutrient Limitation
PI Score <13	Low potential for P movement from this site given current management practices and site characteristics. There is a low probability of an adverse impact to surface waters from P losses on this site. Soil test P and P losses are likely to increase in future due to N-based nutrient management from animal manure.	Nitrogen
PI Score 13-25	Medium potential for P movement from this site given current management practices and site characteristics. Practices should be introduced to reduce P losses by surface runoff, subsurface flow, and erosion. Soil test P and P losses are likely to increase in future due to N-based nutrient management from animal manure.	Nitrogen
PI Score 25.1-50	High potential for P movement from this site given current management practices and site characteristics. All practicable management practices to reduce P losses through surface runoff, subsurface flow, or erosion should be implemented.	Phosphorus
PI Score >50	Very high potential for P movement from this site given current management practices and site characteristics. Active remediation techniques should be implemented in an effort to reduce the P loss potential from this site.	No manure

Operation & Maintenance

Proper management is an essential component of every Comprehensive Nutrient Management Plan (CNMP). The following guidelines accompanied with necessary corrective action will help ensure the CNMP is implemented successfully.

SAFETY

Waste collection and management facilities should be kept in a state of good repair and safe operating condition at all times. Warning signs, ladders, ropes, bars, rails, and other safety devices should be provided, as appropriate, to help insure the safety of humans and livestock. Each device should be structurally adequate to support anticipated loads. (A rope may be adequate sight warning, but inappropriate to support a person who accidentally slips on wet concrete.)

At least four noxious gasses are generated when organic waste is subject to anaerobic processes. They are: Methane (CH_4), Hydrogen Sulfide (H_2S), Ammonia (NH_3) and Carbon Dioxide (CO_2). In high enough concentrations, all can be lethal through lack of oxygen or poisoning. (Three gases are heavier than air and will exclude oxygen from depressed areas.) All but carbon dioxide can be explosive. Ventilation and warning signs must be provided for enclosed waste holding structures to help prevent explosions, poisoning or asphyxiation. Pipelines from an enclosed tank(s) in a building should be provided with a water - sealed trap and vent to prevent gas entry into the building. Entry into pits, ponds or tanks should not be allowed but if entry cannot be avoided the following procedures should be adhered to:

- 1) **Ventilate the facility before and during occupancy and use a self-contained breathing apparatus. Do not assume any storage tank, including open top storage tanks, are well ventilated.**
- 2) **Attach a tether or lead capable of supporting the ^{weight} of the person entering the facility and have a person outside the facility at all times tend the tether or lead.**

When inspecting or working on machinery, the following procedures should be adhered to:

- 1) **Disconnect all power connections and provide lockouts whenever possible.**
- 2) **Use blocks in front and behind rolling equipment to prevent movement.**

~~CRG~~
RECORD KEEPING

ACCESS ROADS, LOTS AND WALKWAYS (560, 561, 575)

Maintain road, parking lot and pathway surfaces in good condition, which includes periodic grading and addition of surface material when necessary. Prevent surface ponding by localized grading or addition of surface materials to remove depressions. Road base-course rock may be required to stabilize the road and parking lot foundations. If so, remove unstable materials and rebuild travelway. Limit traffic and animal access with fencing or barriers, where needed.

Remove debris, litter or blockages from roads, parking lots and walkways. Also remove debris and maintain capacity of associated drainage ditches, drop inlets, culverts, bridges, waterways and storm water outlets.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Immediately repair any vandalism, vehicular, or livestock damage to earthfills, side slopes, drainage facilities, water ways and storm water outlets or other appurtenances.

Maintain good vegetative cover, mulches, and other covering installed for erosion protection.

BUILDING ROOFS (313)

Inspect building roofs annually as a minimum. Repair and/or replace all rusted sections and secure loose sections as needed. Immediately replace all broken trusses, rafters, beams, poles as needed. Immediately determining the cause and necessary modification(s) to prevent reoccurring structural failure is essential.

COMPOSTING FACILITY (317)

The composting facility shown on the facility map functions to treat and store compost until it can be applied to the crop land fields. Emptying of the compost facility should begin as soon as possible in the spring after the composting process has been completed and the compost has been allowed to complete the curing process. Emptying should continue throughout the spring and summer months applying the composted solids to the crop land fields in accordance with the guidance given the Nutrient and Waste Utilization Specification located in Section 11. To function properly and have the greatest management flexibility, the compost facility must be as empty as possible in October before the fall and winter rainy season begins.

Periodically inspect concrete and asphalt slabs, walls and curbs and repair or replace broken sections as needed. Cleanup any spillage of composted material from outside of the storage area and place them back in the composting facility.

Maintain all fences, railings, and/or warning signs to provide warning and/or prevent unauthorized human or livestock entry. Immediately repair vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances.

DIKES AND BERMS (356)

Periodically inspect flap gates, control gates, valves and other appurtenances for proper functioning, and their ability to maintain the water level to design elevations. Immediately remove any blockage or debris that could cause malfunction. At approximately 3 month intervals exercise gates and valves to help assure proper function.

Periodically check elevations of earthfills and restore to grade and shape, if necessary. All settlement or cracks in the soil should be investigated to determine the cause and immediately repaired.

Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization, and application of herbicides when necessary. Fertilize the established stand with at least 200 pounds of 21-0-0 per acre or equivalent annually or as needed to maintain a uniform vigorous stand. Avoid excess travel and uncontrolled grazing on any portion of the dike system that will harm or destroy vegetative cover. Periodic mowing or controlled grazing may also be needed to control height.

Maintain installed fences to prevent unauthorized human access or uncontrolled grazing of dike surfaces. Livestock can be used to control vegetation height, providing grazing is controlled to short periods of time when damage to the dike surface and vegetation will not result.

Check all rock riprap and erosion control matting sections for accelerated weathering and displacement of materials. Replace to original shape and grade if necessary.

Immediately repair any vandalism, vehicular, or livestock damage to any earthfills, spillways, outlets or other appurtenance.

Removal of debris that may accumulate on the dike and immediately upstream or downstream from inlet and outlet facilities.

Make sure all structure drains are functional and soil is not being transported through the drainage system. Keep screens and/or rodent guards maintained and in place.

Eradicate or otherwise remove all rodents or burrowing animals and repair any damage caused by their activity.

DIVERSION (362)

Avoid excessive travel on any portion of the system that will harm or destroy the vegetative cover. Periodically check the elevation of fill and restore if necessary.

Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization and application of herbicides when necessary. Periodic mowing may also be needed to control height.

Periodically remove the sediment or soil that is deposited in the channel and restore to the original dimension. Remove all foreign debris that hinders system operation any obstructions or blockage of spillways, trash racks, or pipe inlets. All settlement or cracks in the soil should be investigated to determine the cause and immediately repaired.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Immediately repair any vandalism, vehicular, or livestock damage to any earthfills, spillways, outlets or other apparatuses.

~~RECORD KEEPING~~

DIVERSION DAM (348)

Periodically inspect the spillways and control gates for proper functioning for their ability to maintain the water level to design elevations. Immediately remove any blockage or obstructions in spillways.

Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization, and application of herbicides when necessary. Fertilize the established stand with at least 200 lbs of 21-0-0 per acre or equivalent annually or as needed to maintain a uniform vigorous stand. Periodic mowing may also be needed to control height.

Immediately repair any vandalism, vehicular, or livestock damage to any earthfills, spillways, outlets or other appurtenance.

Remove debris that may accumulate at the Sediment Basin and immediately upstream or downstream from the basin.

Make sure all structure drains are functional and soil is not being transported through the drainage system. The screens and/or rodent guards shall also be kept in place.

Eradicate or otherwise remove all rodents or burrowing animals and repair any damage caused by their activity.

DROP INLETS (CATCH BASINS) (587)

Remove debris and sediment from grates as needed. Annually inspect grates and receiving structures and repair or replace as necessary.

FENCES AND USE EXCLUSION (382, 472)

Do not allow livestock access to open water courses and drainageways. Provide off stream watering facilities where possible and limit access to designated watering areas.

Inspect fences periodically and repair or replace broken or decayed posts and tighten sagging wire as needed. Broken wire can be spliced or replaced. Replace broken or missing insulators on electric fences as needed and repair or replace inoperative electric fence controllers.

Insure gates and other appurtenances are in good working order. Replace or repair components as needed.

FIELD BORDER (VEGETATED BUFFER) (PS386)

Do not apply wastewater or solids to Field Border areas shown on the plan map. Grazing of Field Border areas should be limited to ensure a good stand of vegetation (3 to 4 inches) is present in October before the fall and winter season begins.

Inspect and repair field borders after storms to fill in gullies, remove sediment accumulations, reseed disturbed areas, and perform other maintenance activities as needed to ensure the effectiveness of the border.

SOLIDS STORAGE FACILITY-

The solids storage facility shown on the facility map functions to store manure, bedding and other organic waste.

The solids storage facility will serve as the primary storage facility for manure, bedding and other organic waste produced from the operation. Emptying of the solids storage facility should begin as early as possible in the spring. Emptying should continue through the spring and summer months as weather conditions permit applying solids in accordance with the guidance given the nutrient and waste utilization parts of this section.

The solids storage facility is designed with 6 foot high walls which will allow the solids to be stacked to a height of 10 feet. At no time should the solids be stacked higher than 10 feet or allowed to over top the walls of the structure.

Periodically inspect concrete and asphalt slabs, walls and curbs and repair or replace broken sections as needed. Cleanup any spillage of manure and organics from outside of the solids storage area and place them back in the solids storage facility.

Maintain all fences, railings, and/or warning signs to provide warning and/or prevent unauthorized human or livestock entry. Immediately repair vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances.

WASTE TREATMENT STRIP (635)

Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization and application of herbicides when necessary. Periodic mowing or grazing may also be needed to control height.

Remove all foreign debris that hinders system operation.

Limit the traffic and do not use as a roadway. Also limit livestock usage to vegetative growth periods when they will not damage vegetative root system or compact the soil. Immediately repair any vandalism, vehicular, or livestock damage.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Check all structural sections (i.e. rock riprap) for accelerated weathering and displacement. Replace to original grades if necessary.

WATERING FACILITIES (614)

Check all above ground connections, valves, gates, rodent guards, inlets and outlets to make sure they are functioning properly. Check troughs and tanks for leaks or cracks and repair or replace immediately, if necessary.

Make certain the area adjacent to the trough is well protected with gravel, paving, or good cover. Be sure that the outlet pipe has a free outlet and is not causing any serious erosion problems. Check periodically to see if debris has fallen into the trough or tank which may restrict inflow or planned functions of the outflow system.

Clean the entire system periodically and remove moss, algae growth, and/or sludge. Chemicals such as copper sulfate and chlorine can be used to prevent moss and algae growth. Local rules and regulations are to be followed when using chemicals to make sure they are safe for animals.

Where necessary maintain coverings and insulation to prevent-damage by freezing.

~~RECORD KEEPING~~

WASTE STORAGE FACILITIES (313)

WASTEWATER STORAGE PONDS-

The waste storage pond shown on the facility map has a design capacity of 63 acre-feet to store liquid manure and polluted runoff for a period of 365 days

The waste storage pond will serve as the primary storage facility for wastewater produced from the operation. Emptying of the waste storage pond may begin as early as late February, weather permitting, before the pond is completely filled. Emptying should continue through the spring and summer months as weather conditions permit applying liquids in accordance with the guidance given in the nutrient and waste utilization parts of this section. To function properly and have the greatest management flexibility, the waste storage pond must be as empty as possible in October before the fall and winter rainy season begins. Any annual sludge buildup must be removed to maintain design capacity and applied to utilization areas in accordance with guidance given in the nutrient and waste utilization parts of this section.

Do not permit livestock access to the pond or on pond embankments. Control undesirable vegetation growth by spraying or mowing. Control rodents as necessary. Check elevations of earthfills periodically and restore to grade and shape as necessary. Fill and reseed eroded embankment areas or repair with well graded rock riprap. Repair embankment leaks immediately should they occur. Safety features such as signs and fences should be kept in good repair.

Maintain at least 2 feet of freeboard in the pond to prevent embankment overtopping and subsequent embankment erosion.

WASTEWATER STORAGE TANKS-

The wastewater storage tank shown on the facility map is a temporary holding facility to control flow to the solids separator.

Do not allow equipment that exceeds the design limit of the tanks on or within twenty feet of the structure. Keep pumps, agitators, piping, valves and all other electrical and mechanical equipment in good condition by following the manufacturer's recommendations. Maintain grounding rods and wiring for all electrical equipment in good condition.

Maintain all fences, railings, and/or warning signs to provide warning and/or prevent unauthorized human or livestock entry. Immediately repair vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances. Maintain lids, grates and shields on openings.

Immediately remove all foreign debris within the structure that may cause damage to pumps or agitators.

Pump the wastewater storage tanks completely empty during the summer months and cleanout any debris and other solid materials that may have accumulated in the tanks.

Provide proper ventilation before entering the tank, for any reason what so ever. Provide and use self - contained breathing apparatus (scuba) equipment when entering a tank. No persons should enter the tank unless safety ropes are used and someone else capable of providing rescue assistance is outside the tank.

Do not assume any storage tank, including open top storage tanks, are well ventilated.

Eradicate or otherwise remove all rodents and/or burrowing animals that have or can potentially damage any part of the system. Immediately repair any damage caused by their activity.

Immediately repair any damage due to vandalism, vehicular or livestock.

UNDERGROUND OUTLETS (620)

Annually inspect underground outlets for proper operation. Check fields for signs of positive pressure (blow holes) or negative pressure (sink holes) in underground pipelines. Repair or replace damaged or broken pipelines as needed maintaining designed depth of cover.

Keep outlets free of vegetation and sediment. Correct and prevent erosion at outlets by installing riprap or other measures. Repair or replace damaged or broken rodent guards as needed.

Avoid travel over underground pipelines with heavy equipment when the soil is saturated except at crossings designed for this purpose.

Avoid any subsoiling operation that may disturb the underground outlet.

Eradicate or otherwise remove all rodents and/or burrowing animals that have or can potentially damage any part of the system. Immediately repair any damage caused by their activity.

Immediately repair any damage due to vandalism, vehicular or livestock.

VEGETATIVE SCREENING (380, 612)

Ensure plants are irrigated during the first three years of establishment. If plants cannot be irrigated using a conventional system, use the following rule of thumb:

- During the first year of establishment apply 1 gallon of water per week to each plant between June and September.
- During the second year of establishment apply 2 gallons of water per week to each plant between June and September.
- During the third year of establishment apply 4 gallons of water per week to each plant between June and September.

Provide weed control until plants are well established.

Exclude livestock and other animals from planting area. Control rodents as necessary. Replant damaged or dying plants in accordance with the planting plan.

Control harmful diseases and insects by removing habitat or through the use of approved chemicals.

As the vegetative screen matures some plants may need to be removed to maintain the desired density and variety of plants.

SPRING DEVELOPMENT (574)

Check all above ground connections, cover and seals, valves, insect and rodent guards, inlets and outlets to make sure they are functioning properly. Where necessary, maintain coverings and insulation to prevent damage by freezing.

Maintain all fences in good condition to exclude livestock from collection area. Immediately repair any vandalism, vehicular or livestock damage to any of the facilities.

Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization and application of herbicides when necessary. Periodic mowing may also be needed to control growth. Precaution and care is needed to prevent herbicides, insecticides and other pollutants from contamination of the water source.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

SPRINKLER IRRIGATION SYSTEM (442)

Maintain traveling gun type sprinklers (and hose reel, if used) by oiling and greasing moving parts and the engine in accordance with the manufacturer's recommendations to help ensure trouble free operation. Prevent livestock access to equipment during operation.

Clean plugged nozzles and replace if worn or defective.

Promptly repair all leaks by replacing valves, fittings, gaskets, worn or damaged parts.

STREAM CROSSINGS (578)

The stream crossing, appurtenances, and associated fence should be inspected after each major storm event, with repairs made as needed.

SUBSURFACE DRAINAGE SYSTEMS (606)

Annually inspect subsurface drainage systems for proper operation. Check fields for signs of positive pressure (blow holes) or negative pressure (sink holes) in drainage lines. Repair or replace damaged or broken drain lines as needed maintaining designed depth of cover.

Keep outlets free of vegetation and sediment. Correct and prevent erosion at outlets by installing riprap or other measures. Repair or replace damaged or broken rodent guards as needed.

Monitor subsurface drainage outlets from fields on which animal waste is being applied daily. Stop all animal waste applications if tile outflow contains any indication of animal waste. If waste application must continue, intercept and return drainage water to the waste storage pond.

Avoid travel over drainlines with heavy equipment when the soil is saturated except at crossings designed for this purpose.

Avoid any subsoiling operation that may disturb the subsurface drain or its filter and/or envelope materials.

Do not mow or burn for weed control during the nesting season (normally May through July) to protect ground-nesting wildlife. In place of mowing, consider other vegetative management techniques, such as using "wickbar" herbicide applicators or prescribed burning in areas with adequate moisture.

Lightly disk the field border on a 2 or 3 year cycle to promote the growth of native vegetation.

FILTER STRIPS (393)

Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization and application of herbicides when necessary. Periodic mowing or grazing may also be needed to control height.

Remove all foreign debris that hinders system operation.

Limit the traffic and do not use as a roadway. Also limit livestock usage to vegetative growth periods when they will not damage vegetative root system or compact the soil. Immediately repair any vandalism, vehicular, or livestock damage.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Check all structural sections (i.e. rock riprap) for accelerated weathering and displacement. Replace to original grades if necessary.

GRADE STABILIZATION STRUCTURE (410)

Avoid operating farm equipment too close to the structure. Equipment can transfer vibration and weight to the structure that may be in excess of design and cause damage or failure.

Protect vegetated soil covering and control livestock access to structure. Removal of vegetation will accelerate soil erosion which can result in damage to earthfills or spillways and livestock may be injured, damage protective vegetation and earthfills or accelerate soil erosion.

Removal of debris accumulation at the structure, and immediately upstream or downstream. Debris accumulation can reduce hydraulic capacity and cause structural damage or failure during a runoff event. Make sure all structure drains are functional and soil is not being transported through the drainage system. The screens and/or rodent guards shall also be kept in place.

Repair or replace rock riprap either by machine or by hand to the lines and grades of the original design.

Eradicate or otherwise remove all rodents or burrowing animals. Their burrows may weaken earthen sections and develop flow paths for water and accelerate soil erosion that may cause the structure to fail.

IRRIGATION AND WASTEWATER TRANSFER PIPELINES (430, 634)

Flush pipelines used for liquid waste applications with clean water following waste application, or as needed, to prevent particle buildup.

Cost **RECORD KEEPING**

Drain the pipeline and components in areas that are subject to freezing. If parts of the pipeline cannot be drained, a non-toxic antifreeze solution may be added.

Check to make sure all valves and air vents are set at the proper operating condition so they can provide protection to the pipeline.

Inspect pipelines for signs of failure. Inspect risers and valves periodically for leaks or worn gaskets. Repair or replace pipeline, risers and valves as needed.

Drain the pipeline and components in areas that are subject to freezing. If parts of the pipeline cannot be drained, a non-toxic antifreeze solution may be added.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

PUMPS AND AGITATORS (533, 634)

Operate and maintain pumps in accordance with good judgment and manufacture's manuals and recommendations.

Drain liquid manure from pumps during cold weather to prevent freezing. If parts of the system cannot be drained, a non-toxic antifreeze solution may be added.

Inspect pumps periodically and remove debris wrapped around shafts and impellers. Maintain foot valves and check valves for proper operation.

For proper operation of electric motors and controls, maintain lubrication for all bearings, keep electric panel free from obstructions and debris. Maintain electrical safety devices, assure all electrical contacts are tight, and lock main electrical switch to "OFF" position during non-use season. Maintain adequate shade and ventilation for pump motors.

For proper operation of pumps, maintain lubrication for all bearings and pump shafts, assure belts are adjusted properly, maintain safety covering devices on open shafts and belt drives, check to make sure all safety valves and devices are set at proper operating conditions so they may provide protection to the pump and power unit. For centrifugal pumps, periodically measure tolerance between pump impeller and pump casing (i.e. wearing) and replace wear ring as needed to help restore new pump operating characteristics.

Use portable pressure gauge (preferably a liquid filled gauge) to monitor pump performance.

Operate and maintain agitators in accordance with the manufacture's manual and recommendations. Inspect all plumbing annually as a minimum.

Replace, tighten, or repair broken or loose connections and lines as needed.

RAIN GUTTERS AND DOWNSPOUTS (558)

Annually inspect rain gutters, downspouts, pipelines, trash guards, pumps, structures and appurtenances for proper operation. Keep them free of all foreign material, weeds and sediment. Repair or replace any damaged component as needed.

Keep downspouts and outlets free flowing. Repair or replace broken rodent guards as needed. If the hydraulic capacity is insufficient, replace gutters (and downspouts if needed) or make provisions for the waste management system to handle the extra water.

Protect downspouts from damage by livestock and equipment and repair any damaged components as needed.

SEDIMENT BASIN (350)

Periodically inspect the spillways and control gates for proper functioning for their ability to maintain the water level to design elevations. Immediately remove any blockage or obstructions in spillways.

Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization, and application of herbicides when necessary. Fertilize the established stand with at least 200 lbs of 21-0-0 per acre or equivalent annually or as needed to maintain a uniform vigorous stand. Periodic mowing may also be needed to control height.

Immediately repair any vandalism, vehicular, or livestock damage to any earthfills, spillways, outlets or other appurtenance.

Remove debris that may accumulate at the Sediment Basin and immediately upstream or downstream from the basin.

Make sure all structure drains are functional and soil is not being transported through the drainage system. The screens and/or rodent guards shall also be kept in place.

Eradicate or otherwise remove all rodents or burrowing animals and repair any damage caused by their activity.

SLABS AND CURBS (561, 634)

Periodically inspect concrete and asphalt slabs and curbs and repair or replace broken sections as needed. Prevent manure from building up next to the curbs or over topping them.

SOLID/LIQUID SEPARATION FACILITY (632)

Inspect the solid/liquid separation facility daily to ensure the facility is operating properly and there has been no damage to structural components. Clean screens and outlets if they have become clogged or their capacity is not adequate for proper operation of the facility.

Inspect the capacity of settling basins daily to ensure adequate capacity is available for separated solids.

During daily inspections if it is determined that the maximum capacity of the settling basin has been reached, divert flows to another basin and let excess liquids drain from the basin before removing solids. Once the excess liquids have drained from the basin, remove all accumulated solids from the basin and store them in a designated solids storage area or haul them to the application area for utilization. When removing solids from earthen basins take care not to disturb the earthen liner.

Prevent any spillage or leakage onto roadways when removing solids from the settling basins and hauling solids to utilization areas.

~~RECORD KEEPING~~

Section 10

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Immediately repair any vandalism, vehicular or livestock damage.

WELLS (642)

Protect the area immediately surrounding the well from being damaged by agriculture machinery, vehicles, or livestock.

All fences, railings, and/or warning signs shall be maintained to provide warning and/or prevent unauthorized human or livestock entry.

Do not allow any foreign debris to accumulate and maintain soil and vegetative covering in the immediate vicinity of the well.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Check metal surfaces for rust and other damage especially sections in contact with earthfill and with other materials. Repair or replace damaged section and apply paint as a protective covering.

Keep all surface water from entering or accumulating at the immediate vicinity of the well site.

Immediately repair any vandalism, vehicular, or livestock damage.

ANIMAL MORTALITY MANAGEMENT SPECIFICATION **for Diamond Valley Dairy**

Prepared for: Prepared by:

Kevin DeJager and Larry Boersma
3798 Valley Creek Rd.
Salem, OR 97304
(503) 363-3243

Tom Thomson
Northwest Agricultural Consulting
1275 Oak Villa Road
Dallas, OR 97338
(503) 510-3883

Having dead animals sent to an acceptable disposal site is the best method to deal with animal mortalities. A list of disposal sites can be found on the internet at <http://www.deq.state.or.us/wmc/solwaste/disposal.html>. Under no circumstances are animal mortalities to be disposed of in any type of liquid manure storage facility.

All animal mortalities which occur at the dairy are currently composted on site. However, they may also be removed from the Dairy by Whites Hauling and Farming. Whites is licensed by the State of Oregon and other permitting agencies to handle this type of cargo.

Calves of less than 500 lbs are composted in the manure solids.

As an alternative one of the following methods may be used:

Composting- Rapid composting of dead animals occurs when the carbon to nitrogen (C:N) ratio of the compost mix ranges between 10 and 20 to 1. To achieve the recommended C:N ratio, build the initial compost pile by placing 18 inches of sawdust or other bulking agent on the floor of the composting area. The bulking agent should extend beyond the perimeter of the animal to be composted by at least 2 feet. If using a compost bin the bulking material should extend at least 1 foot beyond the perimeter of the animal being composted. Using a bulking agent such as sawdust will absorb any liquids as the animal decomposes during the composting process.

Once the bulking agent has been placed on the floor of the composting area, place the animal carcass on top. To decrease composting time and prevent bloating the body cavity should be cut open. Cover the carcass with 1 to 3 feet of separated manure solids or other material that has a moisture content between 30 to 60 percent and a C:N ratio of not more than 30 to 1. Use 1 foot of material for small carcasses and 3 feet for large carcasses such as cattle. Be careful not to add material that is too wet as it will hinder the composting process and cause odors. Small animals can be layered in a compost pile by placing 12 inches of the bulking agent between layers as shown in the figure below. Be sure the total height of the compost pile does not exceed 7 feet in height as it may spontaneously combust causing a fire.

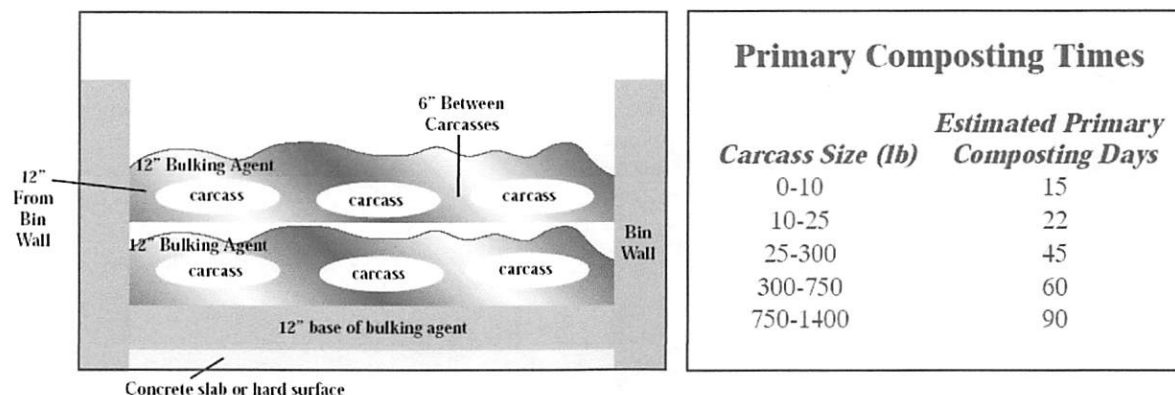
The first heating or primary composting cycle will take approximately 15 to 90 days depending on the size of the animal being composted. Refer to the table below for estimated primary composting times. Check pile temperature using thermometer probe on a daily basis. The pile temperature should be checked at multiple points around the compost pile and at a point approximately 3 feet into the pile. The temperature of the compost pile should reach 130 degrees Fahrenheit (F) within a few days. Temperatures should peak between 130 and 150 degrees F in 3 to 4 days. When the temperature of the compost pile falls below 130 degrees F, the compost needs to be aerated by turning or other means. Be sure carcasses remain covered with the bulking agent after being aerated. It is important to maintain a temperature above 130 degrees F for at

ANIMAL MORTALITY MANAGEMENT SPECIFICATION

for Diamond Valley Dairy

least 7 days during the primary composting cycle as failure to do so may result in the incomplete destruction of pathogens and can cause fly and odor problems. After aerating the compost pile, the secondary composting times will be similar to the first.

After aerating the compost pile by turning or other means, be sure to check the moisture content and add water if necessary being careful not to add too much water. The compost pile should feel moist to the touch but you should not be able to squeeze any water out of it.



Odors given off by the composting operation is a good indicator of how the compost operation is proceeding. Foul odors may mean that the process has turned from aerobic to anaerobic. Anaerobic conditions are the result of insufficient oxygen in the compost. This may be caused by excessive moisture in the compost or the need for turning or aerating of the compost pile.

After the composting process is finished, it may be used as a bulking agent for a new compost pile. A rule of thumb is to use 50 percent of the composted material for a bulking agent but you may want to use more or less depending on how degraded the bulking agent is in the finished compost. Using finished compost in a new compost pile reduces the amount of bulking agent needed for the new pile and provides microbial inoculants to get the composting process started.

Finished compost can also be applied to crop and pasture land fields for utilization of the nutrients and organics in the composted material. The nutrient content of the composted material should be determined and application equipment calibrated to ensure nutrients contained in the composted material are not over applied.

Natural Disposal- To allow nature to take its course the dead animal needs to be transported to a location at least ½ mile from any off-farm dwelling and at least ¼ mile from any water way in accordance with ORS 601.140. Once this criteria is met the carcass can be left to degrade naturally with the help of scavengers.

Landfill- Dead animals may be transported to a permitted landfill that accepts animal carcasses for disposal. Be sure to call the chosen landfill first to insure a landfill will accept your animal carcasses. Refer to the website given previously for permitted landfills to call. Contact the landfill operator and the DEQ at (800) 452-4011 if the landfill you would like to use is not a permitted facility to see if an exception may be granted for the disposal of animal carcasses.

ANIMAL MORTALITY MANAGEMENT SPECIFICATION **for Diamond Valley Dairy**

Incineration- Dead animals may be burned as a method of disposal and as a method to control diseases. Contact your DEQ at (800) 452-4011 for guidance on incineration of animal carcasses.

Burial- Dead animals may be buried as a method of disposal. Large animals such as an adult cow will require a hole approximately 2 feet by 7 feet by 8 feet deep. Be sure to select a site that doesn't have a water table to insure the bottom of the hole will be dry. The animal carcass should be covered with hydrated lime and covered with at least 4 feet of soil mounded 2 feet above the natural ground line to allow for settling as the carcass decomposes. Burial sites should be located at least 500 feet down slope from surface waters or wells.

IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION

for Diamond Valley Dairy

Prepared for:

Kevin DeJager and Larry Boersma
3798 Valley Creek Rd.
Salem, OR 97304
(503) 363-3243

Prepared by:

Tom Thomson
Northwest Agricultural Consulting
1275 Oak Villa Road
Dallas, OR 97338
(503) 510-3883

Fields: 1-9

(See plan map in Section 5)

Acres: 111.6

Location: T1337

Date: May 23, 2011

1.) GENERAL CONSIDERATIONS:

Purpose: Irrigation water management is applied as part of a conservation management system to support one or more of the following:

- Manage soil moisture to promote desired crop response
- Optimize use of available water supplies
- Minimize irrigation induced soil erosion
- Decrease non-point source pollution of surface and groundwater resources
- Manage air, soil, or plant micro-climate

Threatened and Endangered Species: If USDA cost-sharing will be provided, a Biological Evaluation (BE) for this practice demonstrating No Effect on species listed under the Endangered Species Act will be approved by NRCS before this practice begins.

Cultural Resources: This practice will not affect cultural resources; only cropland will be affected and soil will not be disturbed below the plow layer. This practice is not an undertaking as defined under NRCS Cultural Resources policy.

Permits: Under Oregon law all water is publicly owned and anyone planning to store or divert surface or groundwater for the purpose of irrigation must obtain a permit or water right from the Oregon Water Resources Department. These permits or water rights must be obtained prior to the use of the water. It is the responsibility of the Farmer to file for the necessary permits or water rights.

IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION for Diamond Valley Dairy

Irrigation Water Flows, Volumes, and Relationships

$$Q \times T = D \times A$$

where:

Q = flow rate (acre-in/hr or cfs)

T = time (hr)

D = gross depth applied (in)

A = area (acres)

$$Q = \frac{453 \times A \times D}{F \times H}$$

where:

Q = flow rate (gpm)

A = area (acres)

D = gross application depth (in)

F = irrigation period (days)

H = hours of operation per day

Water Flow Rates:

- 1 cubic foot per second (cfs)
= 448.8 gallons per minute
- 1 cfs for 1 hour = 0.99 acre-inch
- 1 cfs for 24 hr = 1.98 acre-ft
- 1,000 gpm = 2.23 cfs
- 1,000 gpm for 24 hr = 4.42 ac-ft
- 1 gpm/acre = 0.053 ac-in/ac/day
- 1 cfs = 40 miner's inches in OR, No CA
- 1 cfs = 50 miner's inches in ID, WA
- 1 miner's inch = 11.22 gpm in OR
- 1 miner's inch = 9 gpm in ID, WA
- 1 cfs = 28.32 liters/sec
- 1 cubic meter/sec = 35.3 cfs
- 1 liter/sec = 15.85 gpm

$Q \times T = D \times A$ where:

Q = cfs, T = hr; D = inches depth; A = acres

Gpm for 5 ft/s velocity in PVC pipe

6"	8"	10"	12"	14"
480	800	1250	1750	2150



Natural Resources
Conservation Service

Water Volumes & Weights:

- 1 cubic foot = 7.48 gallons
= 62.4 lb = 28.3 liters
- 1 acre-foot = 43,560 cubic feet
(1 acre covered 1 ft deep)
- 12 acre-in = 1 acre-ft = 325,829 gal
- 1 million gallons = 3.07 acre-ft
- 1 acre-ft = 1,234 cubic meters
- 1 cu meter = 1,000 liters = 35.3 cu ft

Pressure and Pressure Head:

- 1 psi = 2.31 ft of pressure head
- 1 atmosphere (sea level)
= 14.7 psi = 33.9 ft of head

Lengths and Areas:

- 1 mile = 5,280 ft = 1.61 km
- 1 meter = 3.28 ft = 39.37 inches
- 1 acre = 43,560 square ft
- 1 hectare = 2.47 acres

Pump Power Requirement

$$\text{Horsepower} = \frac{\text{Pump Head in ft} \times \text{gpm}}{39.6 \times \% \text{ Pump Efficiency}}$$

IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION **for Diamond Valley Dairy**

2.) EQUIP INCENTIVE PAYMENT:

This practice may be eligible for USDA cost-sharing. Please see the EQIP contract for details on cost-share rates. The participant must contact USDA-NRCS before beginning this practice if cost-sharing will be provided.

3.) SOILS:

See page **Error! Bookmark not defined.** or page 39 of the Comprehensive Nutrient Management Plan (CNMP) for soils information.

4.) CROPS:

CROP	MATURE ROOT DEPTH (INCHES)	MAXIMUM ALLOWED DEPLETION	CRITICAL PERIOD
Grass Pasture/Hay	30	50%	July
Corn Silage	48	50%	July

Above data are from EM8713, *Western Oregon Irrigation Guides*, June 1998, OSU: Corvallis, OR and NRCS *Irrigation Guide (National Engineering Handbook, Part 652)*.

5.) IRRIGATION WATER SUPPLY:

Description of Oregon Water Right:	
Description of Irrigation Water Supply (Well, Stream, Irrigation District, etc.):	Liquid manure from lagoons and freshwater from wells
Supply Flowrate (gpm or cfs):	
Annual Volume Available (Acre-ft.):	
Water Delivery Schedule:	On Demand
Method(s) of Water Measurement:	

6.) IRRIGATION SYSTEM:

System	System Capacity (gpm)	Nozzle Size (in)	Pressure (psi)	Spacing (ft)	Application Rate (in/hr)	System Efficiency (%)
Traveling Big Gun Sprinkler	335	1.1	80 to 90	180 to 240	0.4 to 0.5	65

IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION for Diamond Valley Dairy

7.) TYPE OF MONITORING SYSTEM:

- ☐ Radio-relayed (remote access) capacitance probes.
- ☐ Gypsum blocks (recorded at least twice per week during irrigation season).
- ☐ Check-book method using daily data from Agri-met.
- ☐ Monitoring of plant appearance. Note: this level of monitoring is not sufficient for USDA cost-sharing.
- ☒ "Feel and Appearance Method" is digging soil in the root zone and then physically squeezing the soil to determine moisture level. Note: this level of monitoring is not sufficient for USDA cost-sharing.

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

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

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

IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION for Diamond Valley Dairy

FEEL AND APPEARANCE METHOD OF DETERMINING SOIL MOISTURE

Clay, Clay Loam, and Silty Clay Loam Soils

Appearance of Clay, Clay Loam, and Silty Clay Loam Soils at Various Soil Moisture Conditions

AVAILABLE WATER CAPACITY = 1.6 TO 2.4 INCHES PER FOOT

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

Inches per Foot Depleted: Inches of water needed to refill a foot of soil to field capacity.

0 TO 25 PERCENT AVAILABLE 2.4 TO 1.2 INCHES PER FOOT DEPLETED

Dry, soil aggregations separate easily, clods are hard to crumble with applied pressure. (Not pictured)

25 TO 50 PERCENT AVAILABLE 1.8 TO 0.8 INCHES PER FOOT DEPLETED

Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure.



50 TO 75 PERCENT AVAILABLE 1.2 TO 0.4 INCHES PER FOOT DEPLETED

Moist, forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.



75 TO 100 PERCENT AVAILABLE 0.6 TO 0.0 INCHES PER FOOT DEPLETED

Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger.



IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION

for Diamond Valley Dairy

8.) SENSOR INSTALLATION:

If soil moisture sensors will be used for soil moisture monitoring, install them according to the following schedule:

FIELD	SOIL	CROP	ACRES	# OF SITES	SENSORS/ SITE	TOTAL SENSORS	DEPTHS
Notes:							

IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION for Diamond Valley Dairy

9.) IRRIGATION WATER MANAGEMENT OPERATIONS:

Irrigation Water Management Worksheet						
Crop Name:	Pasture/Hay Land					
Managed Rooting Depth:	30 inches					
Management Allowed Depletion, MAD:	50 %					
Irrigated Acres:	112					
Soil Name:	Amity, Dayton, Concord, Woodburn					
Soil Depth (inches):	48					
Available Water Capacity (in/in):	0.17					
Soil Intake Rate (in/hr) :	0.5					
IRRIGATION REQUIREMENT HOW MUCH water to apply?	Month					
	April	May	June	July	August	Sept
Total Plant Available Water Capacity (in): Soil or Root Depth * Available Water Capacity	5.10	5.10	5.10	5.10	5.10	5.10
Net Irrigation Application (in): Total Plant Available Water Capacity * MAD	2.55	2.55	2.55	2.55	2.55	2.55
Irrigation System Application Rate (in/hr): Determined based on the type of Irrigation System	0.38	0.38	0.38	0.38	0.38	0.38
IRRIGATION TIMING WHEN to apply water?						
Net Irrigation Water Requirement (in): (From OSU Extension Miscellaneous Pub 8530, 1992)	1.57	3.15	4.57	6.22	5.12	3.46
Average Daily Crop Water Use (in/day):	0.05	0.10	0.15	0.20	0.17	0.12
Irrigation Frequency (days): Net Irrigation Application / Daily Crop Water Use	30	26	17	13	15	21
Irrigation System Set Time (hours):	7.5	7.5	7.5	7.5	7.5	7.5
Actual Net Irrigation Application (in): Gross Application * System Application Efficiency	2.00	2.00	2.00	2.00	2.00	2.00
Actual Irrigation Frequency (days): Actual Net Irrigation Application / Daily Crop Water Use	30	20	13	10	12	17
IRRIGATION SYSTEM CAPACITY						
System Application Efficiency (%): Water Required / Water Applied	70	70	70	70	70	70
Gross Irrigation Application (in): System Application Rate * System Set Time	2.85	2.85	2.85	2.85	2.85	2.85
Volume of Water per Irrigation (acre-in): Gross Irrigation Application * Irrigated Acres	428	428	428	428	428	428
Irrigation System Operation (hours/day):	16	16	16	16	16	16
Required System Flow Rate (gpm): (Equation 2)	403	605	931	1,210	1,009	712
Compare Required system flow rate with Measured flow noted on Irrigation Application Record						

IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION for Diamond Valley Dairy

Name: _____ Date: _____

IRRIGATION SYSTEM WALK-THROUGH INSPECTION EVALUATION

This form may be used to identify and evaluate those components of an irrigation system that directly affect irrigation system operation and water management. Other aspects not directly affecting irrigation water management, such as energy-use efficiency, may also be noted. Make additional copies as needed.

ITEM	OK	Needs attention	Comments
Irrigation water supply			
Adequate water supply for area irrigated	_____	_____	_____
Suitable quality of irrigation water supply	_____	_____	_____
Inflow controlled by valve and/or gate	_____	_____	_____
Inflow is measured easily and accurately	_____	_____	_____
Type of water measuring device: _____			
Source of irrigation water: _____			
Type of delivery schedule if applicable: _____			
Irrigation water conveyance			
Adequate capacity in ditch and/or pipe	_____	_____	_____
Ditch or pipe free of leaks	_____	_____	_____
Adequate water control devices	_____	_____	_____
Irrigation water application			
Adequate water control for uniform application	_____	_____	_____
Uniformity of application throughout field	_____	_____	_____
Wet and/or dry spots	_____	_____	_____
Excessive runoff	_____	_____	_____
Note: There should be no runoff from sprinkler-irrigated areas.			
Overall system condition			
General maintenance			
Other (note):			

IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION for Diamond Valley Dairy

Name: _____ Date: _____

Note: Use of this record keeping form is optional. Make additional copies of this form as needed.

Farmer's Name:	Kevin DeJager and Larry Boersma	Field:	
Nickname:		Crop:	
Managed Soil:		Rooting Depth:	inches
Irrigation system provides:		Inches at speed of:	Feet per minute

	Big gun speed			Irrigation	Rainfall
DATE	Weather	(ft/min)	X	(inches)	(inches)
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IRRIGATION WATER MANAGEMENT (PS449) SPECIFICATION for Diamond Valley Dairy

10.) ACCEPTANCE:

Farmer Acknowledgement Statement:

- a. The Farmer has received a copy of the specification and understands the contents and requirements.
- b. The Farmer agrees to perform the following activities:
 - ☐ Regularly check soil moisture or crop evapotranspiration data and use this information to help decide when and how much to irrigate.
 - ☐ Record irrigation, liquid manure application and rainfall data throughout the irrigation season.
 - ☐ If USDA cost-sharing is provided: Complete irrigation system calibration and irrigation system walk-through. Contact NRCS for more information.
- c. The Farmer will provide to NRCS the following information before this practice can be certified for cost-sharing approval:
 - ☐ Irrigation water application records which include the dates and amounts of water applied.
 - ☐ Documentation showing the irrigation scheduling technique used.
 - ☐ Documentation showing an evaluation of the irrigation system.

Kevin DeJager and Larry Boersma

Date

IRRIGATION WATER MANAGEMENT (449) SPECIFICATION

11.) IMPLEMENTATION CHECKLIST AND APPROVAL:

<i>Year</i>					
Record Keeping					
Water applied at correct agronomic rate					
Water applied at correct time					
Calibration					
System walk-thru completed					
Does the practice meet specifications?	Yes No	Yes No	Yes No	Yes No	Yes No
Check by (Initials)					
Date					

Rating System Used	E = Excellent	G = Good	F = Fair ¹	P = Poor ¹
¹ : Application at this level may not meet NRCS standards.				

This practice is NRCS job class: **X**

CONTROLLING FACTOR	UNITS	JOB CLASS				
		I	II	III	IV	V
AREA	Acres	40	320	640	2000	All

Approved by:

NRCS Representative

Date

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

Prepared for:

**Kevin DeJager and Larry Boersma
3798 Valley Creek Rd.
Salem, OR 97304
(503) 363-3243**

Prepared by:

**Tom Thomson
Northwest Agricultural Consulting
1275 Oak Villa Road
Dallas, OR 97338
(503) 510-3883**

Fields: 1-9

(See plan map in Section 5)

Acres: 111.6

Location:

Date: May 23, 2011

1.) GENERAL CONSIDERATIONS:

Purpose: Nutrient Management and Waste Utilization are applied as part of a conservation management system to:

- Budget and supply nutrients to improve or maintain yields.
- Properly utilize manure or organic by-products as a plant nutrient source to save money on fertilizer bills.
- Protect groundwater from nitrate contamination.
- Protect streams and rivers from phosphorus contamination.
- Help ensure the Farmer complies with local, state and federal laws regulating manure applications.

Threatened and Endangered Species: If USDA cost-sharing will be provided, a Biological Evaluation (BE) for this practice demonstrating No Effect on species listed under the Endangered Species Act will be approved by NRCS before this practice begins.

Cultural Resources: This practice will not affect cultural resources; only cropland will be affected and soil will not be disturbed below the plow layer. This practice is not an undertaking as defined under NRCS Cultural Resources policy.

Permits: In accordance with Oregon law any animal feeding operation where animals are stabled or confined for a total of 45 days or more in any 12 month period and vegetation are not sustained in the stabled or confined area must register under the Oregon CAFO General Permit. This also applies to any confined animal feeding operation where animals are confined to areas that have been prepared to support animals in wet weather and generates wastewater from the production facilities. It is the responsibility of the Farmer to file for the necessary permits with the Oregon Department of Agriculture Confined Animal Feeding Program if there animal feeding operation meets the permitting requirements.

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

Phosphorus: Many rivers in the Willamette Valley are polluted with excessively high phosphorus levels. This phosphorus causes algae blooms, which cause dissolved oxygen levels and pH to fluctuate greatly, thus harming fish and other aquatic organisms. Most crops do not respond to phosphorus fertilizer unless soil test P levels are low (below 50 ppm P).

Phosphorus fertilizer comes from mines. There is a limited supply of high quality phosphorus ores (a consideration for future generations of farmers).

Nitrogen: Nitrogen loss reduces profits. Nitrogen runoff to streams from cropland, however, is usually not a major environmental issue, except where manure is applied at a high rate or ammonium type fertilizers are applied between May 1 to October 31 and excessive irrigation water washes them into the stream. Well and moderately well drained soils (see table on previous page) have a moderate to high risk of nitrate leaching. Poorly and somewhat poorly drained soils have a very low to low risk of nitrate leaching.

Excessive N fertilization can increase de-nitrification, which produces nitrous oxide (a greenhouse gas). Due to the climate in the Willamette Valley, most soil nitrogen in the nitrate form going into winter will be lost from the field and not be available for crop uptake. Nitrogen fertilizer is manufactured by the Haber process, which involves burning natural gas (a non-renewable resource).

2.) EQIP INCENTIVE PAYMENT:

This practice may be eligible for USDA cost-sharing. Please see the EQIP contract for details on cost-share rates. The participant must contact USDA-NRCS before beginning this practice if cost-sharing will be provided.

3.) SOILS:

See page **Error! Bookmark not defined.** of the Comprehensive Nutrient Management Plan (CNMP) for soils information.

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

4.) SAMPLING AND ANALYSIS:

In order to effectively implement nutrient management and waste utilization samples of feed, soils, crops, irrigation water, manure, wastewater, and solids need to be obtained and analyzed in accordance with the schedule on page 73 and the following criteria-

SAMPLE	NUMBER	NOTES
Total ration	1	See Section 7 in the CNMP for guidance on sampling feed rations
Solid manure	1	Sample solids during applications if possible and have each sample analyzed for Total Nitrogen (TKN), Ammonium Nitrogen (NH ₄ -N), Phosphorus (P) and Potassium (K) plus percent moisture. Ask lab to report results in pounds per ton.
Liquid manure (first cell)	3	Sample liquids during applications if possible and have each sample analyzed for Total Nitrogen (TKN), Ammonium Nitrogen (NH ₄ -N), Phosphorus (P) and Potassium (K) plus percent moisture. Ask lab to report results in pounds per thousand gallons.
Liquid manure (main pond)	3	Sample liquids during applications if possible and have each sample analyzed for Total Nitrogen (TKN), Ammonium Nitrogen (NH ₄ -N), Phosphorus (P) and Potassium (K) plus percent moisture. Ask lab to report results in pounds per thousand gallons.
Normal soil tests	All Fields	Collect soil samples from fields and have them analyzed for P, K, pH, SMP (optional: test for B, Ca, Mg and % Organic Mater) in accordance with Oregon State University Extension publication PNW570-E, "Monitoring Soil Nutrients Using a Management Unit Approach" located in Section 13 of the CNMP. This test can be done during any month. Ask lab to report results in parts per million (ppm).
Corn pre-sidedress nitrate soil tests	All Corn Fields	Collect soil samples from fields growing corn at the V5 stage (when corn is approx. 12" tall) and have them analyzed in accordance with Oregon State University Extension publication EM 8650, "The Pre Side Dress Soil Nitrate Test" located in Section 13 of the CNMP.
Fall nitrate soil tests	All Manured Fields	Collect soil samples from the manure application areas every fall (September 15-October 15) in accordance with Oregon State University Extension publication EM8832-E, "Post Harvest Soil Nitrate Testing" located in Section 13 of the CNMP. Have soil samples analyzed for Nitrates (NO ₃ -N), Phosphorus (P) and Potassium (K). Ask lab to report results in parts per million (ppm).

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

5.) NUTRIENT MANAGEMENT OPERATIONS:

Refer to the Waste Utilization Operations part of this section for guidance in applying manure, wastewater, and other organic material to meet nutrient budget requirements for the planned crops. Always perform the following tasks annually before making manure applications:

- Review nutrient management component of this plan annually and make adjustments when needed. Nutrient applications must be based on soil and/or tissue tests and a nutrient budget prepared before application begins.
- N applications must be based on OSU recommendations or N nutrient uptake in harvested portion of crop.
- P applications must be based on OSU recommendations or P uptake in harvested portion of crop if P index is high or very high
- Credit must be taken for N supplied by previous legume crops, manure applications and sludge applications.
- If USDA cost-sharing is provided a Certified Crop Advisor or Certified Professional Agronomist must approve application plans for each field before nutrient application begins.
- Accurate records of rate, analysis and date of nutrient applications must be kept and maintained.
- Maintain records of nutrient application as required by state and local regulations.

The nutrient budget and phosphorus index worksheets on the following pages can be used to prepare annual nutrient budgets and to determine the site vulnerability index for phosphorus movement for fields if nutrient concentrations in the liquid and solid manure samples vary from the values use to prepare the CNMP.

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

Nutrient Budget Worksheet

Tract Number _____ Field number _____

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

Table 1. Field Conditions and Recommendations					
CROP SEQUENCE/ROTATION (circle current crop)					EXPECTED YIELD
CURRENT SOIL TEST LEVELS (ppm or lb/ac)					
N	P	K	pH	S.O.M %	EC
RECOMMENDED NUTRIENTS/AMENDMENTS TO MEET EXPECTED YIELD					
N	P ₂ O ₅	K ₂ O	LIME	Other _____	Other _____

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

1. NUTRIENT MANAGEMENT SPECIFICATIONS

Amount to be Applied(lb./ac)	N		P ₂ O		K ₂ O	
------------------------------	---	--	------------------	--	------------------	--

Method, Form, and Timing of Application:

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

NRCS Agronomy Technical Note 26 – Appendix 1

October 2001

PHOSPHORUS INDEX WORKSHEET – WESTERN OREGON

Diamond Valley Dairy		Tract No.		Field No(s):		Date:	
Soil Map Unit(s):		Soil Test P – Planned:		ppm	Lab. Method: Weak Bray P1		Sample Depth: 12 inches
Planner:		Notes:					
		PHOSPHORUS LOSS RATING					Weighted Rating Value
TRANSPORT FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	
Soil Erosion – tons/ac/yr (RUSLE)	1.50	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)	
Soil Erosion from Sprinkler Irrigation	0.75	No sprinkler irrigation (0)	Application rate < infiltration rate OR No visible runoff at field borders (0.75)	Application rate = infiltration rate OR Little to no visible runoff at field borders (1.5)	Application rate > infiltration rate OR Visible runoff at field borders (3.0)	Application rate > infiltration rate OR Excessive runoff visible at field borders. Rills and gullies present. (6.0)	
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	
Distance to Perennial Surface Waters / Buffer Widths	0.75	> 500 feet OR buffer > 30 ft. wide (or meets NRCS standards) next to surface waters (0)	300 – 500 feet OR buffer 20 - 30 ft. wide next to surface waters (0.75)	200 – 299 feet OR buffer 10 -19 ft. wide next to surface waters (1.5)	100 – 199 feet AND buffer < 10 ft. wide next to surface waters (3.0)	< 100 feet AND No buffer next to surface waters (6.0)	
Subsurface Drainage	0.50	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141- 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)	
Transport Factors Subtotal (TFS)							

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

Tract :	Fields:	PHOSPHORUS LOSS RATING					Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Planned	Current
Soil Test P – ppm (Bray P1)	1.00	(Soil Test P – 40) x 0.10 (_____ - 40) x 0.10 = _____ Assign 0 points if Soil Test P < 40 ppm						
Commercial P Fertilizer Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 _____ x 0.02 = _____ lbs/ac P ₂ O ₅						
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)		
Organic P Source Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 _____ x 0.02 = _____ lbs/ac P ₂ O ₅						
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)		
Total Rating Value TFS + SFS	SITE VULNERABILITY CLASS	Transport Factors Subtotal (TFS)						
< 13.0	Low	Source Factors Subtotal (SFS)						
13.0 – 25.0	Medium	Total Rating Value (TFS + SFS)						
25.1 – 50.0	High	Site Vulnerability Class						
> 50.0	Very High							

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

6.) WASTE UTILIZATION OPERATIONS:

Always perform the following tasks annually to make manure and wastewater applications:

- Review current nutrient budgets to determine how much manure to apply. Refer to the Nutrient Management part of this specification for guidance on developing new nutrient budgets.
- Inspect and repair manure hauling and application equipment to minimize potential of accidental spillage.
- Avoid unnecessary exposure to manure and wastewater and wear protective clothing when necessary.
- Be aware of the location of sensitive areas, concerns of neighbors or concerns of the public, which require special application procedures. To reduce odor problems, apply manure and wastewater in mid morning when temperatures are warming and air is rising rather than in the afternoon or evening when air is cooling and settling. Avoid applications during periods of fog.
- Calibrate application equipment to ensure uniform distribution and accurate application rates in accordance with guidance given in the nutrient budget for the field applying to. Refer to the following pages for calibration worksheets and make copies as necessary to document the calibration of application equipment.
- Apply manure in accordance with the recommendations given on the nitrogen and phosphorus application worksheets located on the following pages. The example application rate calculations on the worksheets are based on the original nutrient budgets and estimated equipment calibrations done to prepare this plan. Use copies of the worksheets or other tools to document calculations made to determine new application rates based on revised nutrient budgets or calibrations of application equipment.
- Apply manure and wastewater in a manner that will cover no more than 25 percent of the leaf surface with solids unless clean water applications are planned immediately after wastes are applied. For pasture/hay land it is best to apply waste 7 days after harvesting forage by haying or grazing.
- When applying manure and wastewater, maintain a **35 foot** setback from down-gradient surface waters, open tile line intake structures, sinkholes, well heads or other sensitive areas to prevent a prohibited discharge of manure and wastewater.
- Record manure and wastewater applications on the appropriate form in section 10 and maintain them for at least 5 years.
- Clean up residual materials from equipment and dispose of properly.

March 15th – August 30th: Apply manure at agronomic rates, using the following guidelines:

- Apply to land being prepared for crops. Till manure into soil within 3 days of application if possible.
- Or, apply to actively growing crops such as grass, clover or alfalfa after cutting.
- Do not apply within **35 feet** of open water courses, seeps, ditches, tile inlets or wetlands.

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

September 1st – October 31st: Apply manure at minimum rates, using the following guidelines:

- Apply to land with actively growing crops such as grass, clover or alfalfa.
- Do not apply within **35 feet** of open water courses, seeps, ditches, tile inlets or wetlands.

November 1 – March 15: Avoid application of manure. If manure application is needed because of an emergency situation during this period, use the following guidelines. **NOTE: THE FOLLOWING GUIDELINES ARE GOOD IDEAS, BUT SPREADING MANURE DURING THIS PERIOD MAY STILL VIOLATE STATE AND FEDERAL LAW:**

- Call the ODA CAFO inspector, Charlene Troost at (503) 986-4780 and report why an emergency application is needed and where the application will be made if different than the field areas identified on the plan map in Section 5 of the CNMP as emergency application areas..
- Apply it only to actively growing crops such as grass, clover or alfalfa.
- Minimize application rates by using the maximum travel rates for the application equipment.
- Do not apply within 35 feet of open water courses, seeps, ditches, tile inlets or wetlands.
- Do not apply during rainfall.
- Do not apply to saturated or flooded soils.
- Do not apply to slopes greater than 7%.
- Maintain records of emergency applications and do not apply manure or commercial fertilizer to fields receiving emergency applications unless soil tests indicate to do so.

Fields that are subsurface (TILE) drained and require additional precautions when manure is applied. Manure applied to these fields can follow soil macropores directly to the tile drains creating a surface water pollution hazard from direct tile discharge. Tillage prior to manure application that can disrupt/close (using horizontal fracturing) the preferential flow paths (worm holes, cracks, root channels) in the soil will reduce the risk of a manure discharge to surface waters. Any pre-application tillage should leave as much residue as possible on the soil surface. Water control structures installed in subsurface drainage systems should be managed to prevent discharge of manure and wastewater during periods of application.

Sampling Liquid Manure

Liquid manure samples submitted for analysis should meet the following requirements:

- Manure samples submitted to a laboratory should represent the average composition of the material that will be applied to the field.
- Place sample in a sealed, clean plastic container with about a 1-pint volume. Glass is not suitable because it is breakable and may contain contaminants.
- Leave at least 1 inch of air space in the plastic container to allow for expansion caused by the release of gas from the manure material.
- Refrigerate or freeze samples that cannot be shipped on the day they are collected, minimizing chemical reactions and pressure buildup from gases.

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

Following are guidelines for obtaining liquid manure samples:

Wastewater. Premixing the surface liquid in the storage structure is not needed, provided it is the only component that is being pumped. Operators with multistage systems should draw samples from the storage structure they intend to pump for application to crops.

Samples should be collected using a clean, plastic container similar to the one shown in figure for liquid manure sampling on the next page. One pint of material should be taken from at least eight sites around the storage structure and then mixed in the larger clean, plastic container. Effluent should be collected at least 6 feet from the storage structure's edge at a depth of about a foot. Shallower samples from storage structure may be less representative than deep samples because oxygen transfer near the surface sometimes alters the chemistry of the solution. Floating debris and scum should be avoided.

One pint of mixed material should be sent to the lab. Galvanized containers should never be used for collection, mixing, or storage due to the risk of contamination from metals like zinc in the container. These recommendations are adequate for making applications that draw the liquid level in the storage structure down a few feet. If an entire storage structure is to be emptied, more frequent sampling with many more sampling points is recommended.

Slurry. Manure materials applied as a slurry from a storage structure should be mixed prior to sampling. A liquid sampling device can be used to obtain a sample from agitated storage structure. If you wish to sample a storage structure without agitation, you must use a composite sampling device as the one shown in the figure on the next page.

Samples should be collected from approximately eight areas around the storage structure and mixed thoroughly in a clean, plastic container. An 8- to 10-foot section of 0.5- to 0.75-inch plastic pipe can also be used: extend the pipe into the pit with ball plug open, pull up the ball plug (or press your thumb over the end to form an air lock), and remove the pipe from the manure, releasing the air lock to deposit the manure in the plastic container.

One pint of mixed material should be sent to the lab. Galvanized containers should never be used for collection, mixing, or storage due to the risk of contamination from metals like zinc in the container.

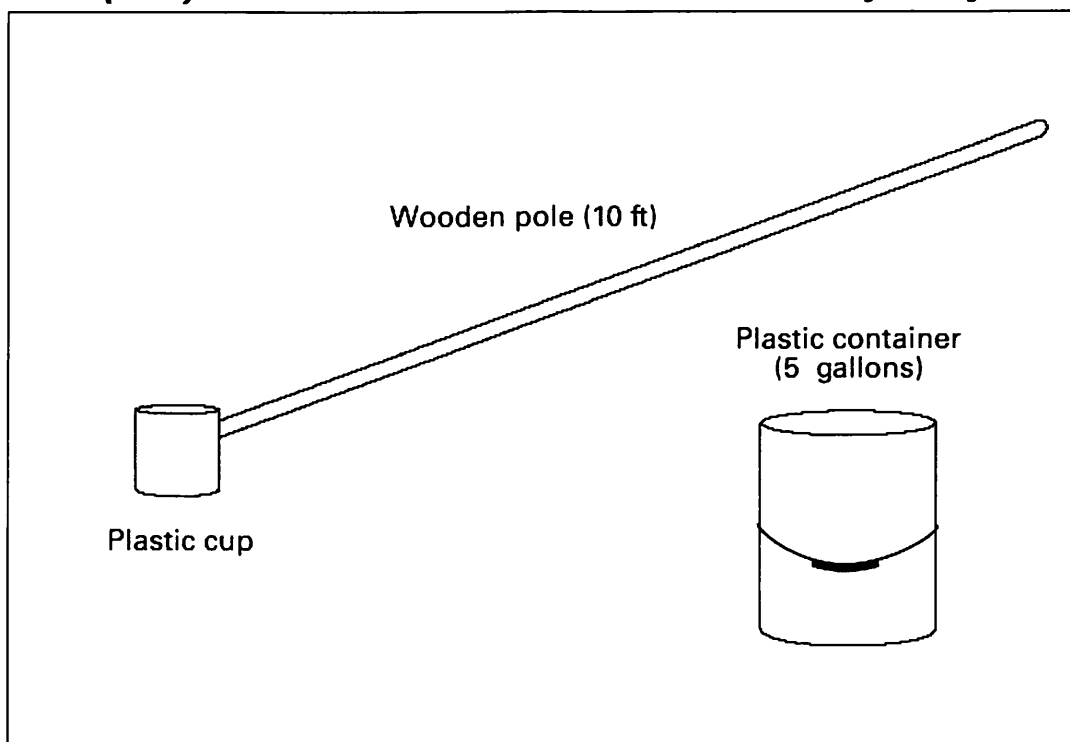
Sludge. Sludge is somewhat more difficult to obtain a representative sample. Two common methods are used.

One method requires pumping the storage structure down to the sludge layers. Then, during sludge agitation, a composite sampling device as shown in the figure on the next page can be used to obtain a sample.

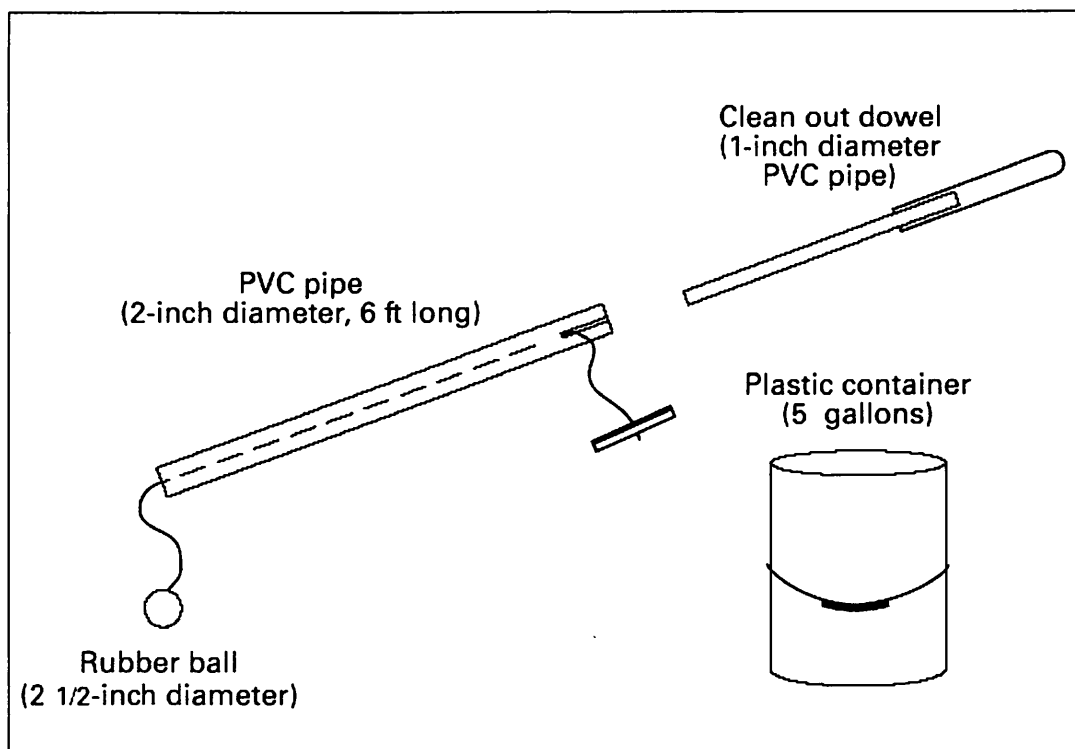
The other method requires insertion of a probe to the bottom of the storage structure to obtain a column of material. The sludge component of this column is then released into a clean plastic bucket, and several (12-20) other sampling points around the storage structure are likewise collected to obtain a composite, representative sample.

For analysis, most labs require at least 1 pint of material in a plastic container. The sample should not be rinsed into the container because doing so dilutes the mixture and distorts nutrient evaluations. However, if water is typically added to the manure prior to land application, a proportionate quantity of water should be added to the sample.

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy



Typical Sampling Equipment for Liquids

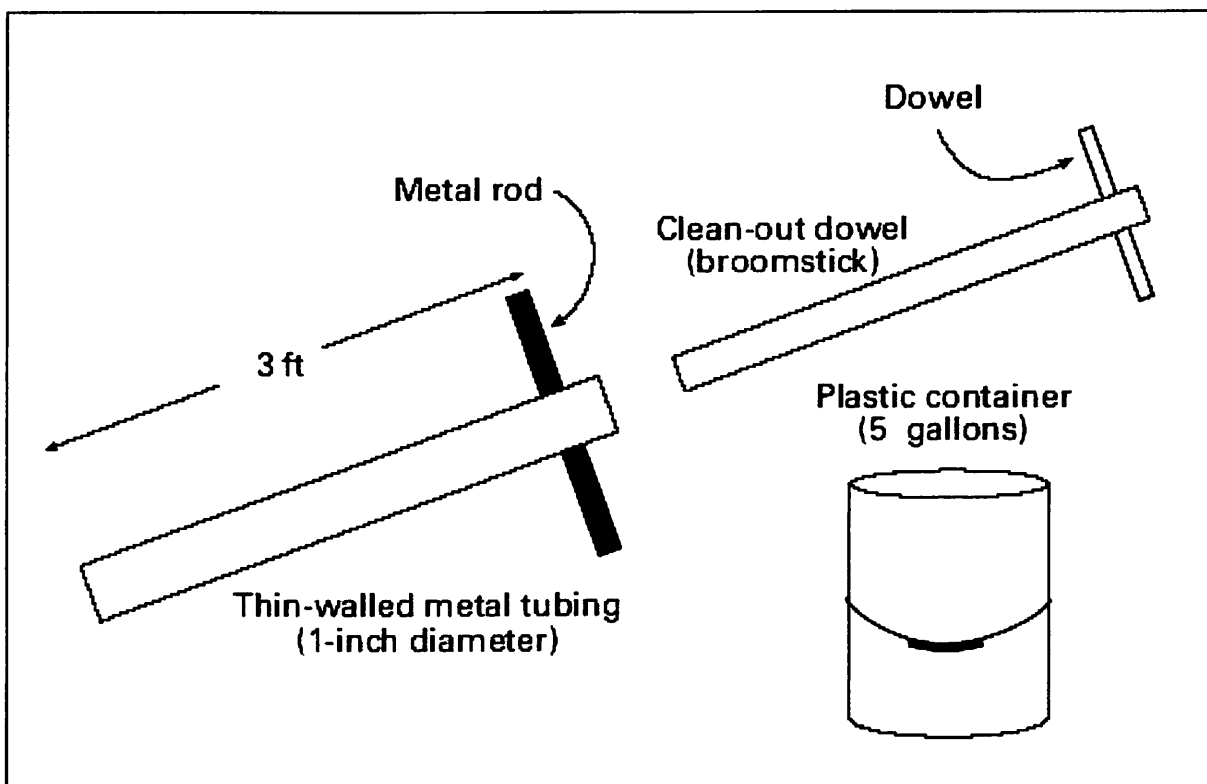


Typical Sampling Equipment for Obtaining Composite Samples

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

Sampling Solid Manure

Solid manure samples should represent the manure's average moisture content. A 1-quart sample is adequate for analysis. Samples should be taken from approximately eight different areas in the manure pile at a depth of 18 inches, placed in a clean plastic container, and thoroughly mixed. Approximately 1 quart of the mixed sample should be placed in a plastic bag, sealed, and shipped directly to the lab. It is recommended to ship the samples early in the week so it doesn't sit in a post office or shipping area of the laboratory for several days. Samples stored for more than two days should be refrigerated. The figure below shows a device that can be constructed and used for sampling solid manure.



Typical Solids Sampling Equipment

Typical Nutrient Availability After Application

Typical nutrient content of animal manure retained after application:			
Application Method	Percent of original nutrient content of manure retained after application		
	N	P ₂ O ₅	K ₂ O
Injection	95%	100%	100%
Sprinkling	75%	100%	100%
Broadcast (Incorporated 1 day after application)	90%	100%	100%
Broadcast (Incorporated 4 days after application)	80%	100%	100%
Broadcast (Incorporated 7 or more days after application)	70%	100%	100%

Name: _____ Date: _____

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**NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION
(633) SPECIFICATION for Diamond Valley Dairy
Tank Equipment Calibration
(Using a Full Tank Load)**

Name: _____ Date: _____

Perform the following operations to calibrate the tank equipment:					
✓ Determine the maximum capacity of the tank equipment from the manufacturer's maintenance manual or the owners manual for the equipment.					
✓ Fill the tank and reduce the volume of the tank by the appropriate amount if the tank is not filled to its maximum capacity. Normally a tank spreader is only filled to about 80 percent of its maximum capacity and therefore the maximum rated capacity of the tank should be multiplied by 0.8 to reflect the volume of the loaded tank during the calibration exercise.					
✓ Spread the loaded tank on the field using consistent speed and settings to cover the field uniformly. Try to spread in a rectangular pattern so the area calculation will be simple. Record engine rpm and gear settings used.					
Data and Calculations:					
Steps	ID of Calibration Test				
	A	B	C	D	E
1. Date of calibration test-					
2. Engine RPM during spreading-					
3. Gear selected during spreading-					
4. Maximum rated capacity of tank (gallons) =					
5. Volume of filled tank (gallons)- Line 4 x _____ % of tank filled ÷ 100% =					
6. Length of spreading area (ft) =					
7. Width of spreading area (ft) =					
8. Area spread (sq ft)- line 6 x line 7 =					
9. Waste applied (gal/sq ft)- line 5 ÷ line 8 =					
10. Convert to gallons per acre - Line 9 x 43,560 =					
11. Average Application Rate (gallons per acre) – Sum of values in cells A10 through F10 divided by the total number of calibrations completed =					
Additional Notes:					

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy Traveling Big Gun Sprinkler Calibration

Name: _____ Date: _____

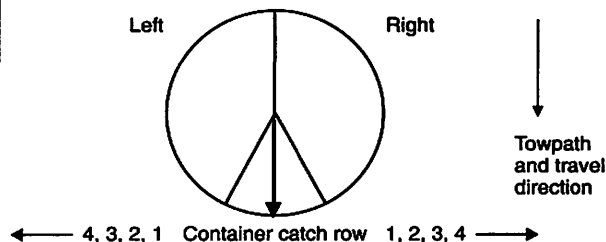
Perform the following operations to calibrate the traveling big gun sprinkler:

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

Catch Can Calibration:

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

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



Travel Rate Setting During Test:

Data and Calculations:

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

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

Planned Manure Exports

Export Date	Exported To	Quantity	Units	TKN	NH4-N	Org-N	NO3-N	P205	K2O
03/13/2011	Carlton, Monrovia and Myers Nurseries	900	Ton	24.6	12	12.6	0	12	16.5
06/11/2011	Carlton, Monrovia and Myers Nurseries	1000	Ton	24.6	12	12.6	0	12	16.5
09/17/2011	Carlton, Monrovia and Myers Nurseries	1000	Ton	24.6	12	12.6	0	12	16.5
12/17/2011	Carlton, Monrovia and Myers Nurseries	1000	Ton	24.6	12	12.6	0	12	16.5

Nutrient Application Plan

Notes and Assumptions:

- Outlets to tile drained fields must be controlled if liquid manure is applied.

Tract Number	Allocation Date	Field Name	Spreadable Acres	Nutrient Source	Application Equipment	Amount Applied per Field	Pounds N Lb/Acre	Pounds P2O5 Lb/Acre	Pounds K2O Lb/Acre
Diamond Valley Dairy	03/17/2011	1	14.4	Waste Storage Pond	Traveling Big Gun	154.8 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	09/15/2011	1	14.4	Waste Storage Pond	Traveling Big Gun	106.416 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 1-							73	135	60

**NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for
Diamond Valley Dairy**

Tract Number	Allocation Date	Field Name	Spreadable Acres	Nutrient Source	Application Equipment	Amount Applied per Field	Pounds N Lb/Acre	Pounds P2O5 Lb/Acre	Pounds K2O Lb/Acre
Diamond Valley Dairy	03/24/2011	2	10.8	Waste Storage Pond	Traveling Big Gun	116.1 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	09/22/2011	2	10.8	Waste Storage Pond	Traveling Big Gun	79.812 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 2-							73	135	60
Diamond Valley Dairy	03/31/2011	3	20.7	Waste Storage Pond	Traveling Big Gun	222.525 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	09/29/2011	3	20.7	Waste Storage Pond	Traveling Big Gun	152.973 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 3-							73	135	60
Diamond Valley Dairy	04/07/2011	4	18.4	Waste Storage Pond	Traveling Big Gun	197.8 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	10/06/2011	4	18.4	Waste Storage Pond	Traveling Big Gun	135.976 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 4-							73	135	60
Diamond Valley Dairy	04/14/2011	5	10.4	Waste Storage Pond	Traveling Big Gun	111.8 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	09/08/2011	5	10.4	Waste Storage Pond	Traveling Big Gun	76.856 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 5-							73	135	60
Diamond Valley Dairy	04/21/2011	6	15.1	Waste Storage Pond	Traveling Big Gun	162.325 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	10/20/2011	6	15.1	Waste Storage Pond	Traveling Big Gun	111.589 th gals or 0.27 inches	30	55	24

**NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for
Diamond Valley Dairy**

Tract Number	Allocation Date	Field Name	Spreadable Acres	Nutrient Source	Application Equipment	Amount Applied per Field	Pounds N Lb/Acre	Pounds P2O5 Lb/Acre	Pounds K2O Lb/Acre
Total Nutrients Applied to Field 6-							73	135	60
Diamond Valley Dairy	04/28/2011	7	8	Waste Storage Pond	Traveling Big Gun	105.28 th gals or 0.48 inches	53	98	44
Total Nutrients Applied to Field 7-							53	98	44
Diamond Valley Dairy	05/05/2011	8	9.9	Waste Storage Pond	Traveling Big Gun	130.284 th gals or 0.48 inches	53	98	44
Total Nutrients Applied to Field 8-							53	98	44
Diamond Valley Dairy	05/12/2011	9	3.9	Waste Storage Pond	Traveling Big Gun	51.324 th gals or 0.48 inches	53	98	44
Total Nutrients Applied to Field 9-							53	98	44
Off Farm	04/30/2011	Off Farm	431.2	Waste Storage Pond	Traveling Big Gun	4286.128 th gals or 0.37 inches	40	74	33
Total Nutrients Applied to Field Off Farm-							40	74	33
Other	04/16/2011	Off Farm	38.8	Waste Storage Pond	Traveling Big Gun	385.672 th gals or 0.37 inches	40	74	33
Total Nutrients Applied to Field Off Farm-							40	74	33

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy Nitrogen Based Waste Application

Name: _____ Date: _____

Planned Application:				
Corn is being grown for silage and the recommended nutrient application from the nutrient management section is 200 pounds of nitrogen (N) per acre. A traveling big gun sprinkler will be used to make 1 application of liquids from a waste storage pond and a tractor pulled box spreader will be used to make 1 application of solids from a dry stacking facility that will not be incorporated into the field.				
Waste application rates and amounts:				
Steps	Planned Application		Current Application	
	Liquid	Solids	Liquid	Solids
1. Crop receiving waste-	Corn Silage			
2. Number of applications to be made-	1	1		
3. Desired nitrogen application rate, lb/acre-	100	100		
4. Nutrient concentrations in storage from laboratory analysis:	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
Nitrogen (N)-	4	9		
Phosphorus (P₂O₅)-	1	4		
Potassium (K₂O)-	6	19		
5. Plant availability of nitrogen-	100 %	100 %	%	%
6. Nitrogen retained, in percent, after application from page 57-	75 %	70 %	%	%
7. Calculate nitrogen availability- N line 4 x line 5 x line 6 ÷ 10,000=	<u>lb/1000 gal</u> 3.00	<u>lb/ton</u> 6.30	<u>lb/1000 gal</u>	<u>lb/ton</u>
8. Determine nitrogen application rate from charts on pages 69 and 70:	<u>inches/acre</u>	<u>tons/acre</u>	<u>inches/acre</u>	<u>tons/acre</u>
Nitrogen (N)-	1.23	16		
9. Determine the amount of phosphorus and potassium applied from nutrient concentration data on line 4 and nutrient application charts:	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>
Phosphorus (P₂O₅)-	33	64		
Potassium (K₂O)-	200	304		
10. Total Nutrients Applied, lb/acre:				
Nitrogen (N)- (Sum of Nitrogen Application Rates from line 3 x Number of Applications on line 2)	200 lb/acre		lb/acre	
Phosphorus (P₂O₅)- (Sum of Phosphorus Application Rates from line 9 x Number of Applications on line 2)	97 lb/acre		lb/acre	
Potassium (K₂O)- (Sum of Potassium Application Rates from line 9 x Number of Applications on line 2)	504 lb/acre		lb/acre	

Nitrogen Based Waste Application

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

Name: _____ Date: _____

Planned Application:				
Pasture grass is being grown for forage and hay and the recommended nutrient application from the nutrient management section is 150 pounds of nitrogen (N) per acre. A traveling big gun sprinkler will be used to make 1 application of liquids from a waste storage pond and a tractor pulled box spreader will be used to make 1 application of solids from a dry stacking facility that will not be incorporated into the field.				
Waste application rates and amounts:				
Steps	Planned Application		Current Application	
	Liquid	Solids	Liquid	Solids
1. Crop receiving waste-	Pasture Grass			
2. Number of applications to be made-	1	1		
3. Desired nitrogen application rate, lb/acre-	100	50		
4. Nutrient concentrations in storage from laboratory analysis:	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
Nitrogen (N)-	4	9		
Phosphorus (P₂O₅)-	1	4		
Potassium (K₂O)-	6	19		
5. Plant availability of nitrogen-	100 %	100 %	%	%
6. Nitrogen retained, in percent, after application from page 57-	75 %	70 %	%	%
7. Calculate nitrogen availability- N line 4 x line 5 x line 6 ÷ 10,000=	<u>lb/1000 gal</u> 3.00	<u>lb/ton</u> 6.3	<u>lb/1000 gal</u>	<u>lb/ton</u>
8. Determine nitrogen application rate from charts on pages 69 and 70: Nitrogen (N)-	<u>inches/acre</u> 1.23	<u>tons/acre</u> 8	<u>inches/acre</u>	<u>tons/acre</u>
9. Determine the amount of phosphorus and potassium applied from nutrient concentration data on line 4 and nutrient application charts:	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>
Phosphorus (P₂O₅)-	33	32		
Potassium (K₂O)-	200	152		
10. Total Nutrients Applied, lb/acre:				
Nitrogen (N)- (Sum of Nitrogen Application Rates from line 3 x Number of Applications on line 2)	150 lb/acre		lb/acre	
Phosphorus (P₂O₅)- (Sum of Phosphorus Application Rates from line 9 x Number of Applications on line 2)	65 lb/acre		lb/acre	
Potassium (K₂O)- (Sum of Potassium Application Rates from line 9 x Number of Applications on line 2)	352 lb/acre		lb/acre	

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy Phosphorus Based Waste Application

Name: _____ Date: _____

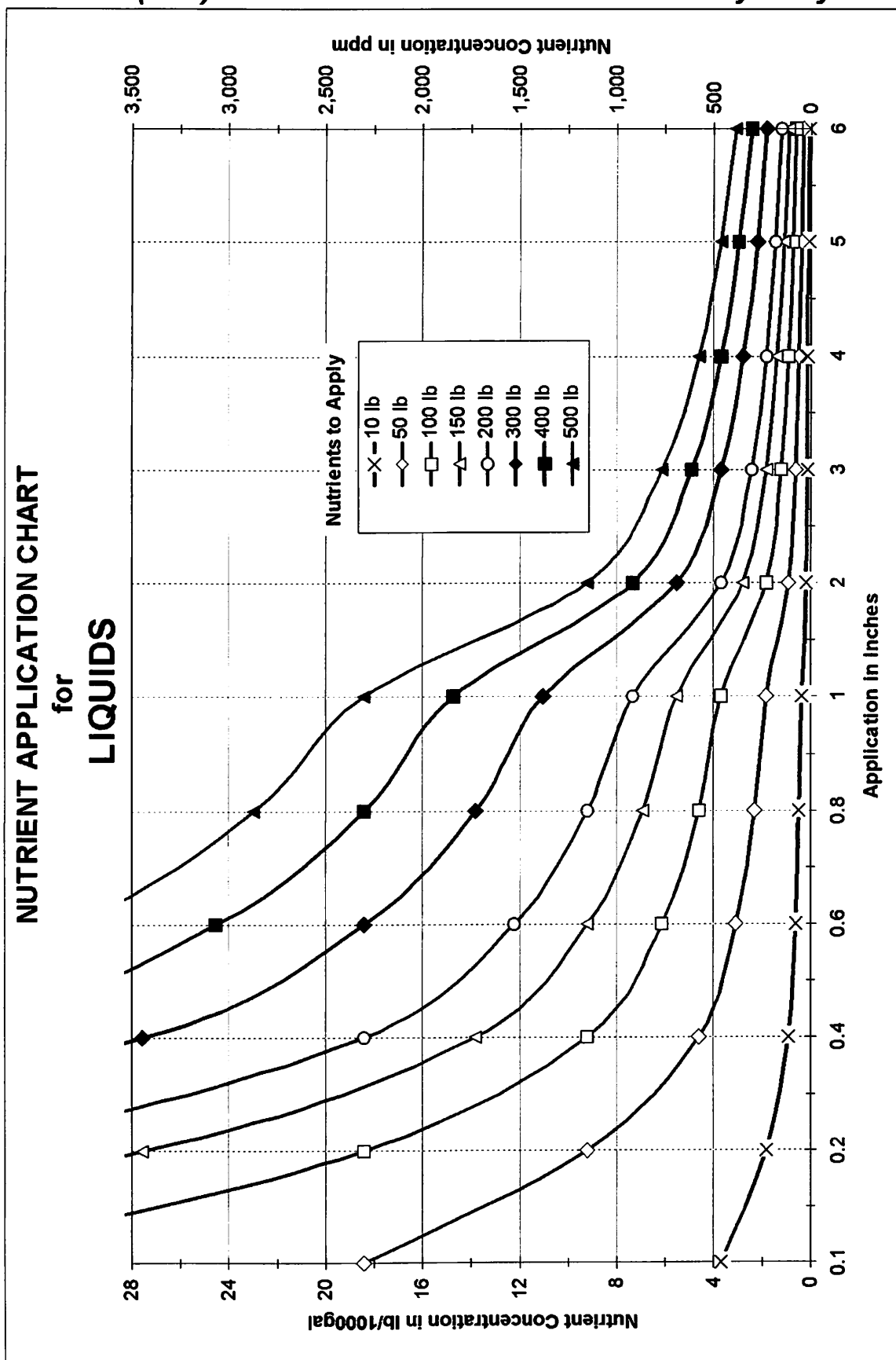
Planned Application:				
Corn is being grown for silage and the recommended nutrient application from the nutrient management section is 100 pounds of phosphorus (P_2O_5) per acre. A traveling big gun sprinkler will be used to make 1 application of liquids from a waste storage pond and a tractor pulled box spreader will be used to make 1 application of solids from a dry stacking facility that will not be incorporated into the field.				
Waste application rates and amounts:				
Steps	Planned Application		Current Application	
	Liquid	Solids	Liquid	Solids
1. Crop receiving waste-	Corn Silage			
2. Number of applications to be made-	1	1		
3. Desired phosphorus application rate, lb/acre-	50	50		
4. Nutrient concentrations in storage from laboratory analysis:	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
Nitrogen (N)-	4	9		
Phosphorus (P_2O_5)-	1	4		
Potassium (K_2O)-	6	19		
5. Determine phosphorus application rate from charts on pages 69 and 70:	<u>inches/acre</u>	<u>tons/acre</u>	<u>inches/acre</u>	<u>tons/acre</u>
Phosphorus (P_2O_5)-	1.84	13		
6. Plant availability of nitrogen in percent-	100 %	100 %	%	%
7. Nitrogen retained, in percent, after application from page 57-	75 %	70 %	%	%
8. Calculate nitrogen availability- N line 4 x line 6 x line 7 $\div$ 10,000=	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
	3.00	6.3		
9. Determine the amount of nitrogen and potassium applied from nutrient concentration data on line 4 and nutrient application charts:	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>
Nitrogen (N)-	150	82		
Potassium (K_2O)-	300	247		
10. Total Nutrients Applied, lb/acre:				
Nitrogen (N)- (Sum of Nitrogen Application Rates from line 9 x Number of Applications on line 2)	232 lb/acre		lb/acre	
Phosphorus (P_2O_5)- (Sum of Phosphorus Application Rates from line 3 x Number of Applications on line 2)	100 lb/acre		lb/acre	
Potassium (K_2O)- (Sum of Potassium Application Rates from line 9 x Number of Applications on line 2)	547 lb/acre		lb/acre	

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy Phosphorus Based Waste Application

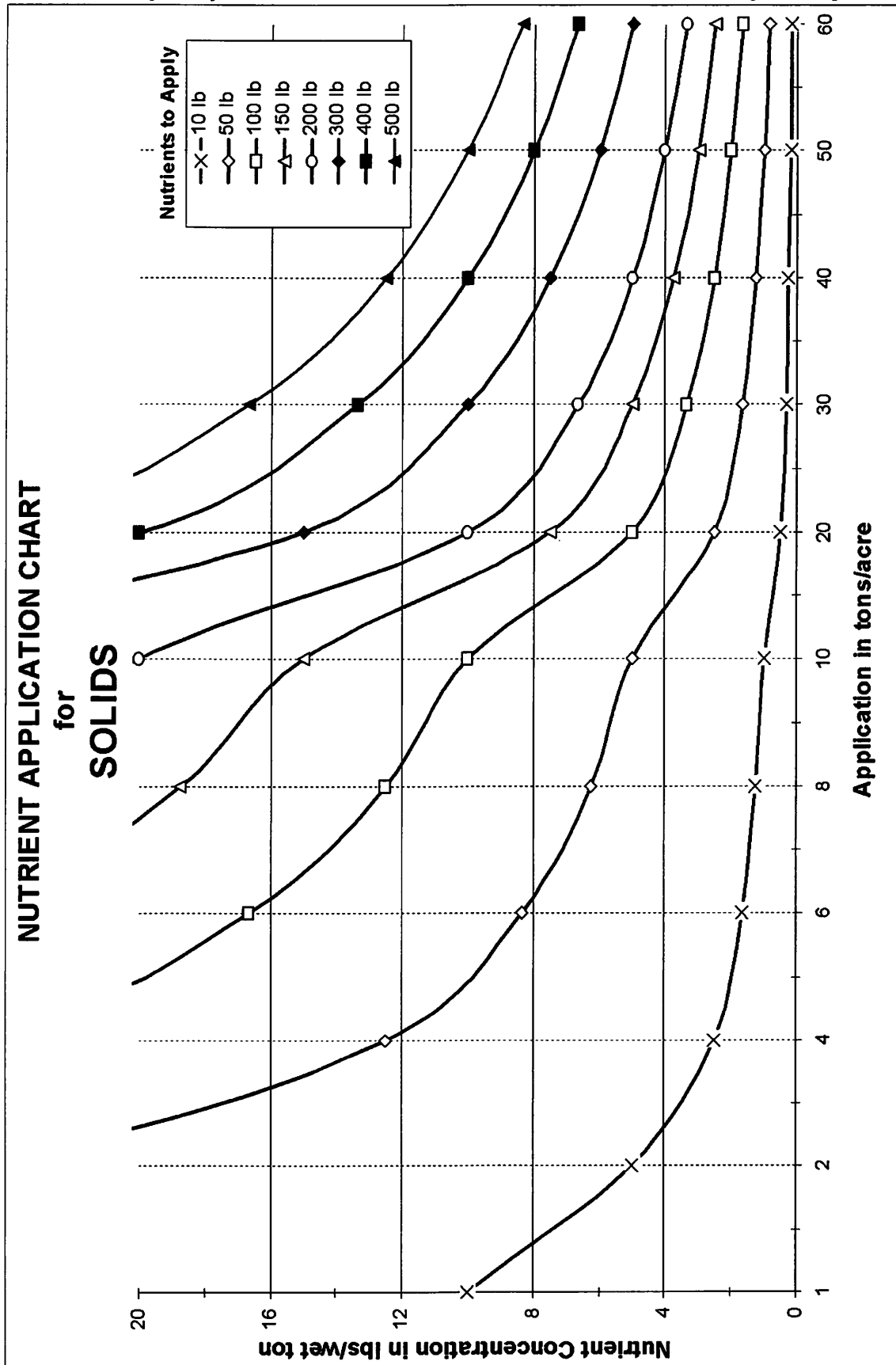
Name: _____ Date: _____

Planned Application:				
Pasture grass is being grown for forage and hay and the recommended nutrient application from the nutrient management section is 50 pounds of phosphorus (P ₂ O ₅) per acre. A traveling big gun sprinkler will be used to make 1 application of liquids from a waste storage pond.				
Waste application rates and amounts:				
Steps	Planned Application		Current Application	
	Liquid	Solids	Liquid	Solids
1. Crop receiving waste-	Pasture/Hayland			
2. Number of applications to be made-	1	0		
3. Desired phosphorus application rate, lb/acre-	50	0		
4. Nutrient concentrations in storage from laboratory analysis:	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
Nitrogen (N)-	4	9		
Phosphorus (P ₂ O ₅)-	1	4		
Potassium (K ₂ O)-	6	19		
5. Determine phosphorus application rate from charts on pages 69 and 70:	<u>inches/acre</u>	<u>tons/acre</u>	<u>inches/acre</u>	<u>tons/acre</u>
Phosphorus (P ₂ O ₅)-	1.84	0		
6. Plant availability of nitrogen in percent-	100 %	100 %	%	%
7. Nitrogen retained, in percent, after application from page 57-	75 %	70 %	%	%
8. Calculate nitrogen availability- N line 4 x line 6 x line 7 ÷ 10,000=	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
	3.00	6.3		
9. Determine the amount of nitrogen and potassium applied from nutrient concentration data on line 4 and nutrient application charts:	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>
Nitrogen (N)-	150	0		
Potassium (K ₂ O)-	300	0		
10. Total Nutrients Applied, lb/acre:				
Nitrogen (N)- (Sum of Nitrogen Application Rates from line 9 x Number of Applications on line 2)	150 lb/acre		lb/acre	
Phosphorus (P ₂ O ₅)- (Sum of Phosphorus Application Rates from line 3 x Number of Applications on line 2)	50 lb/acre		lb/acre	
Potassium (K ₂ O)- (Sum of Potassium Application Rates from line 9 x Number of Applications on line 2)	300 lb/acre		lb/acre	

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy



NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy



NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

7.) IMPLEMENTATION OF NUTRIENT MANAGEMENT AND WASTE UTILIZATION:

(Kevin DeJager and Larry Boersma may choose a Certified Crop Advisor or Certified Professional Agronomist to provide technical assistance in implementing Nutrient Management and Waste Utilization. NRCS does not endorse individual contractors).

Kevin DeJager and Larry Boersma has chosen the following to provide technical assistance in implementing Nutrient Management and Waste Utilization on their farm:

Name: _____

Organization: _____

Phone: _____

If USDA cost-sharing is provided, the implementation of Nutrient Management and Waste Utilization will be approved by the following certified Crop Advisor or Professional Agronomist:

Name: _____

Organization: _____

Phone: _____

8.) ADDITIONAL REQUIRED INFORMATION:

- Record keeping forms in Section 10 of the CNMP may be used document manure and fertilizer applications. If other forms or tools are used to document manure and fertilizer applications, contact NRCS for review and approval if cost sharing will be provided.
- A manure application plan is needed that shows planned applications of manure and commercial fertilizer. The manure application plan developed for the CNMP is located in Section 6. The manure application plan will document that N applications do not exceed harvested N on any field and it will document that P2O5 applications do not exceed harvested P on fields with high or excessively high P indices.

NOTE TO CONSULTANTS: You may use the fillable forms in the NRCS Nutrient Management and Waste Utilization job sheets to develop the manure application plan. If you want to use different forms please contact NRCS in advance.

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

9.) SPECIFICATION CHANGES:

This specification is based on current USDA-NRCS standards and federal, state and local regulations. Any changes in these standards or regulations may necessitate a change in this specification.

10.) ACCEPTANCE:

Farmer Acknowledgement Statement:

- a. The Farmer has received a copy of the specification and understands the contents and requirements.
- a. The Farmer will provide to NRCS the following information before this practice can be certified for cost-sharing approval:
 - ☐ Nutrient and manure application records including soil, water plant and organic by-product test results.
 - ☐ Documentation showing date, crop, amount, rate, form and application method of nutrients applied.
 - ☐ Calibration records for manure application equipment.
 - ☐ Annual review of nutrient management including adjustments made.

Kevin DeJager and Larry Boersma

Date

NUTRIENT MANAGEMENT (590) AND WASTE UTILIZATION (633) SPECIFICATION for Diamond Valley Dairy

11.) IMPLEMENTATION CHECKLIST AND APPROVAL:

<i>Year</i>					
Record Keeping					
Sampling					
N applied at correct agronomic rate					
P applied at correct agronomic rate					
Does the practice meet specifications	Yes No	Yes No	Yes No	Yes No	Yes No
Checked by (initials)					
Date					

Rating System Used	E = Excellent	G = Good	F = Fair ¹	P = Poor ¹
¹ : Application at this level does not meet standards.				

This practice is NRCS job class: **XXX**

CONTROLLING FACTOR	UNITS	JOB CLASS				
		I	II	III	IV	V
AREA	Acres	160	320	640	All	All

Approved by:

NRCS Representative

Date

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. Manure tests are obtained from the irrigation system during application to determine the amount of nutrients applied to the crops. Samples are also taken of solid manure.

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 applications are within suggested guidelines.

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. Applications 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. Fields will be sampled at least once every five years. 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.

**OREGON STATE UNIVERSITY EXTENSION
PUBLICATIONS**

[illegible]

Export Date	Exported To	Quantity	Units	TKN	NH4-N	Org-N	NO3-N	P205	K2O
2011	Carlton, Monrovia and Myers Nurseries	2000	Ton	5.22	0.72	4.50	0	1.58	2.78
2012	Carlton, Monrovia and Myers Nurseries	2500	Ton	5.68	0.56	5.12	0	1.83	2.72
2011	Various Fields	3,500,000	gals	15.91	4.83	11.08	0	10.91	6.66

OREGON STATE UNIVERSITY EXTENSION PUBLICATIONS

Export Date	Exported To	Quantity	Units	TKN	NH4-N	Org-N	NO3-N	P205	K2O
2012	Various Fields	5,000,000	gals	17.62	4.71	12.91	0	12.77	7.36

Nutrient Application Plan

Notes and Assumptions:

- Outlets to tile drained fields must be controlled if liquid manure is applied.

Tract Number	Allocation Date	Field Name	Spreadable Acres	Nutrient Source	Application Equipment	Amount Applied per Field	Pounds N Lb/Acre	Pounds P2O5 Lb/Acre	Pounds K2O Lb/Acre
Diamond Valley Dairy	Spring 2011	1	14.4	Waste Storage Pond	Traveling Big Gun	154.8 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	Summer 2011	1	14.4	Waste Storage Pond	Traveling Big Gun	106.416 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 1-							73	135	60
Diamond Valley Dairy	Spring 2011	2	10.8	Waste Storage Pond	Traveling Big Gun	116.1 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	Summer 2011	2	10.8	Waste Storage Pond	Traveling Big Gun	79.812 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 2-							73	135	60
Diamond Valley Dairy	Spring 2011	3	20.7	Waste Storage Pond	Traveling Big Gun	222.525 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	Summer 2011	3	20.7	Waste Storage Pond	Traveling Big Gun	152.973 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 3-							73	135	60
Diamond Valley Dairy	Spring 2011	4	18.4	Waste Storage Pond	Traveling Big Gun	197.8 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	Summer 2011	4	18.4	Waste Storage Pond	Traveling Big Gun	135.976 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 4-							73	135	60

OREGON STATE UNIVERSITY EXTENSION PUBLICATIONS

Tract Number	Allocation Date	Field Name	Spreadable Acres	Nutrient Source	Application Equipment	Amount Applied per Field	Pounds N Lb/Acre	Pounds P2O5 Lb/Acre	Pounds K2O Lb/Acre
Diamond Valley Dairy	Spring 2011	5	10.4	Waste Storage Pond	Traveling Big Gun	111.8 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	Summer 2011	5	10.4	Waste Storage Pond	Traveling Big Gun	76.856 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 5-							73	135	60
Diamond Valley Dairy	Spring 2011	6	15.1	Waste Storage Pond	Traveling Big Gun	162.325 th gals or 0.4 inches	43	80	36
Diamond Valley Dairy	Summer 2011	6	15.1	Waste Storage Pond	Traveling Big Gun	111.589 th gals or 0.27 inches	30	55	24
Total Nutrients Applied to Field 6-							73	135	60
Diamond Valley Dairy	Summer 2011	7	8	Waste Storage Pond	Traveling Big Gun	105.28 th gals or 0.48 inches	53	98	44
Total Nutrients Applied to Field 7-							53	98	44
Diamond Valley Dairy	Spring 2011	8	9.9	Waste Storage Pond	Traveling Big Gun	130.284 th gals or 0.48 inches	53	98	44
Total Nutrients Applied to Field 8-							53	98	44
Diamond Valley Dairy	Spring 2011	9	3.9	Waste Storage Pond	Traveling Big Gun	51.324 th gals or 0.48 inches	53	98	44
Total Nutrients Applied to Field 9-							53	98	44
Off Farm	2011	Off Farm	431.2	Waste Storage Pond	Traveling Big Gun	4286.128 th gals or 0.37 inches	40	74	33
Total Nutrients Applied to Field Off Farm-							40	74	33
Other	2011	Off Farm	38.8	Waste Storage Pond	Traveling Big Gun	385.672 th gals or 0.37 inches	40	74	33
Total Nutrients Applied to Field Off Farm-							40	74	33

OREGON STATE UNIVERSITY EXTENSION PUBLICATIONS

Field Nutrient Balance

Tract No Field No Acres	Crop Name	Crop Yield	Crop Year	Crop Removal (lb/ac)			Credits (lb/ac)			Manure (lb/ac)		
				N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
Diamond Valley Dairy 1 14.4	Corn, silage	20 Tons	2011	154	80	183	0	0	0	43	80	36
	Ryegrass Haylage	6 Tons	2011	150	55	154	0	0	0	30	55	24
			Totals	304	135	337	0	0	0	73	135	60
Diamond Valley Dairy 2 10.8	Corn, silage	20 Tons	2011	154	80	183	0	0	0	43	80	36
	Ryegrass Haylage	6 Tons	2011	150	55	154	0	0	0	30	55	24
			Totals	304	135	337	0	0	0	73	135	60
Diamond Valley Dairy 3 20.7	Corn, silage	20 Tons	2011	154	80	183	0	0	0	43	80	36
	Ryegrass Haylage	6 Tons	2011	150	55	154	0	0	0	30	55	24
			Totals	304	135	337	0	0	0	73	135	60
Diamond Valley Dairy 4 18.4	Corn, silage	20 Tons	2011	154	80	183	0	0	0	43	80	36
	Ryegrass Haylage	6 Tons	2011	150	55	154	0	0	0	30	55	24
			Totals	304	135	337	0	0	0	73	135	60
Diamond Valley Dairy 5 10.4	Corn, silage	20 Tons	2011	154	80	183	0	0	0	43	80	36
	Ryegrass Haylage	6 Tons	2011	150	55	154	0	0	0	30	55	24
			Totals	304	135	337	0	0	0	73	135	60
Diamond Valley Dairy 6 15.1	Corn, silage	20 Tons	2011	154	80	183	0	0	0	43	80	36
	Ryegrass Haylage	6 Tons	2011	150	55	154	0	0	0	30	55	24
			Totals	304	135	337	0	0	0	73	135	60
Diamond Valley Dairy 7 8	Orchardgrass Hay/Pasture	5 Tons	2011	266	98	112	0	0	0	53	98	44
			Totals	266	98	112	0	0	0	53	98	44
Diamond Valley Dairy 8 9.9	Orchardgrass Hay/Pasture	5 Tons	2011	266	98	112	0	0	0	53	98	44
			Totals	266	98	112	0	0	0	53	98	44
Diamond Valley Dairy 9 3.9	Orchardgrass Hay/Pasture	5 Tons	2011	266	98	112	0	0	0	53	98	44
			Totals	266	98	112	0	0	0	53	98	44
Off Farm	Ryegrass Hay/Pasture	4 Tons	2011	134	49	137	0	0	0	40	74	33

OREGON STATE UNIVERSITY EXTENSION PUBLICATIONS

Tract No Field No Acres	Crop Name	Crop Yield	Crop Year	Crop Removal (lb/ac)			Credits (lb/ac)			Manure (lb/ac)		
				N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
Off Farm 431.2	Ryegrass Seed	15 cwt	2009	24	7	7	0	0	0	0	0	0
			Totals	158	56	144	0	0	0	40	74	33
Other Off Farm 38.8	Ryegrass Hay/Pasture	4 Tons	2011	134	49	137	0	0	0	40	74	33
	Ryegrass Seed	15 cwt	2009	24	7	7	0	0	0	0	0	0
			Totals	158	56	144	0	0	0	40	74	33

Credits are nutrients generated from pasturing animals or other preapplication credits.

PROJECT DESCRIPTION

The manure and freshwater inflow locations for the Diamond Valley Dairy wastewater storage pond #2 has eroded the inside slope of the embankment. Approximately 34 cubic yards of compacted fill will be placed in the eroded areas of the embankment for the Diamond Valley Dairy wastewater storage pond #2 to restore the inside slope of the embankment to its original grade. The material for the compacted fill will be soil with a high clay content imported from an off site source. A 12 inch diameter corrugated HDPE pipe will be cut in half lengthwise and placed on the slope of the embankment below the manure and freshwater inflow locations to protect the embankment from erosion. The HDPE pipe will be anchored in place with steel rebar driven into the ground.

SPECIFICATIONS

The owner is responsible for obtaining and complying with all permits related to the construction and operation of this project.

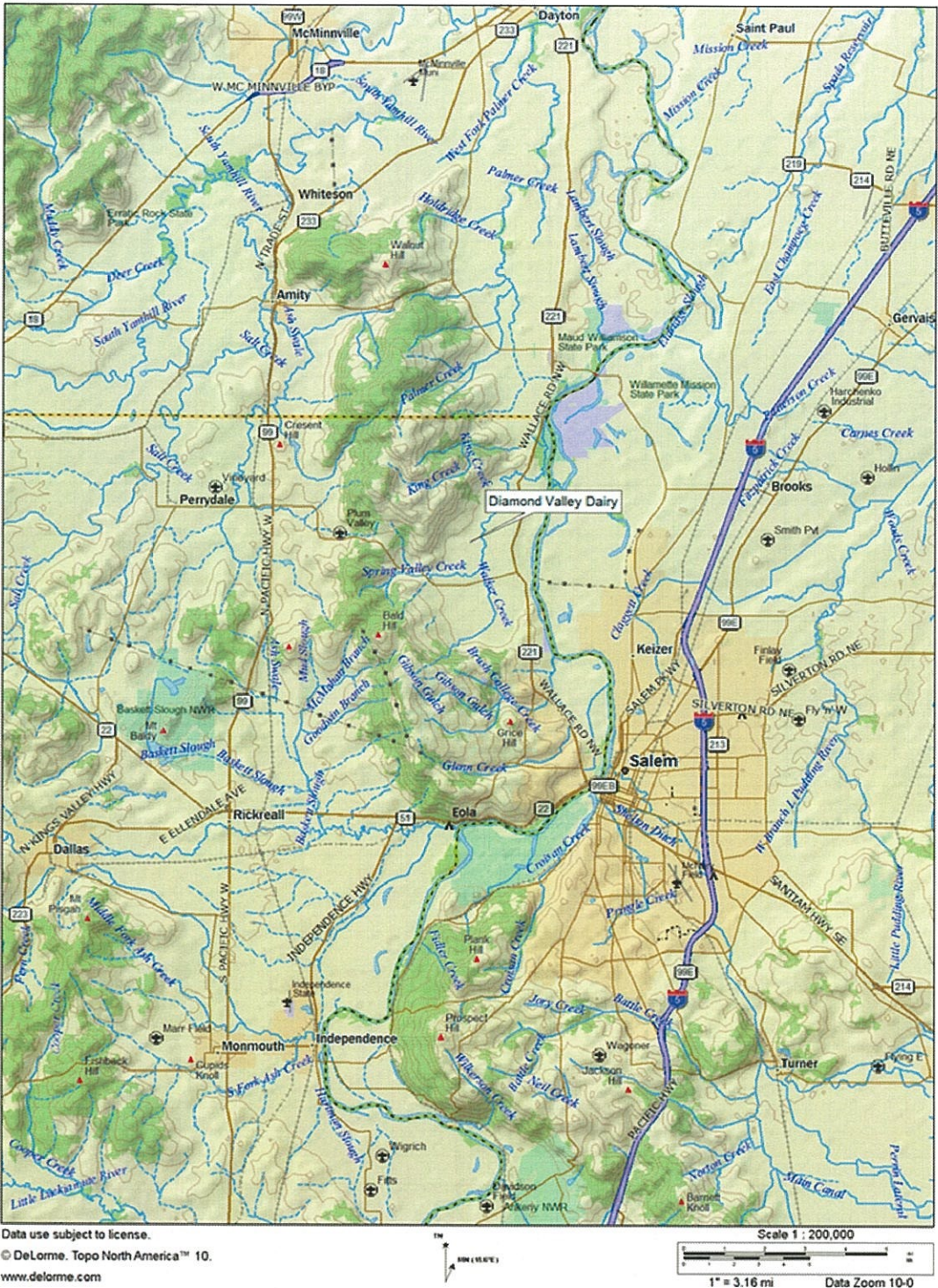
No representation as to existence or non-existence of utilities, public or private is made. It is the responsibility of the contractor to comply with provisions of ORS 757.541 and 757.571 and to determine the location of utilities (1-800-332-2344 or 811). The contractor will be liable for any damage resulting from disruption of service caused by construction activities.

The contractor shall be responsible for on site construction activities and safety of all personnel during construction. These drawings and associated specifications are not intended to provide means or methods of construction.

All earthfill material shall be approved by the engineer of record or their representative prior to placement.

All earthfill shall be placed to the lines and grades as shown on the drawings and compacted to a density equal to or greater than the existing embankment earthfill.

A 20 foot section of 12 inch diameter HDPE corrugated pipe shall be cut in half lengthwise and placed under the manure and freshwater inflow locations as shown on sheet 3 and 4 of the drawings to protect the embankment from erosion. The half pieces of HDPE corrugated pipe shall be anchored in place as shown on sheet 3 and 4 of the drawings.

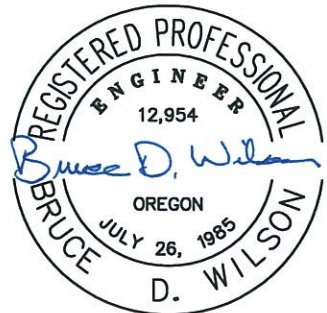


LOCATION MAP

SW 1/4, SW 1/4, Section 19, T6S, R3W from the Willamette Meridian

INDEX OF DRAWINGS

Sheet Number	Subject
1	Project Description, Specifications and Location Map
2	As-Built Plan View, Area/Capacity Curves and Design Data
3	Cross Section A-A of Embankment at the Freshwater Inflow Location
4	Cross Section B-B of Embankment at the Manure Inflow Location



SIGNED: 12/03/2014

EXPIRATION DATE: 6/30/2016

Diamond Valley Dairy Wastewater Storage Pond Repair COVER PAGE

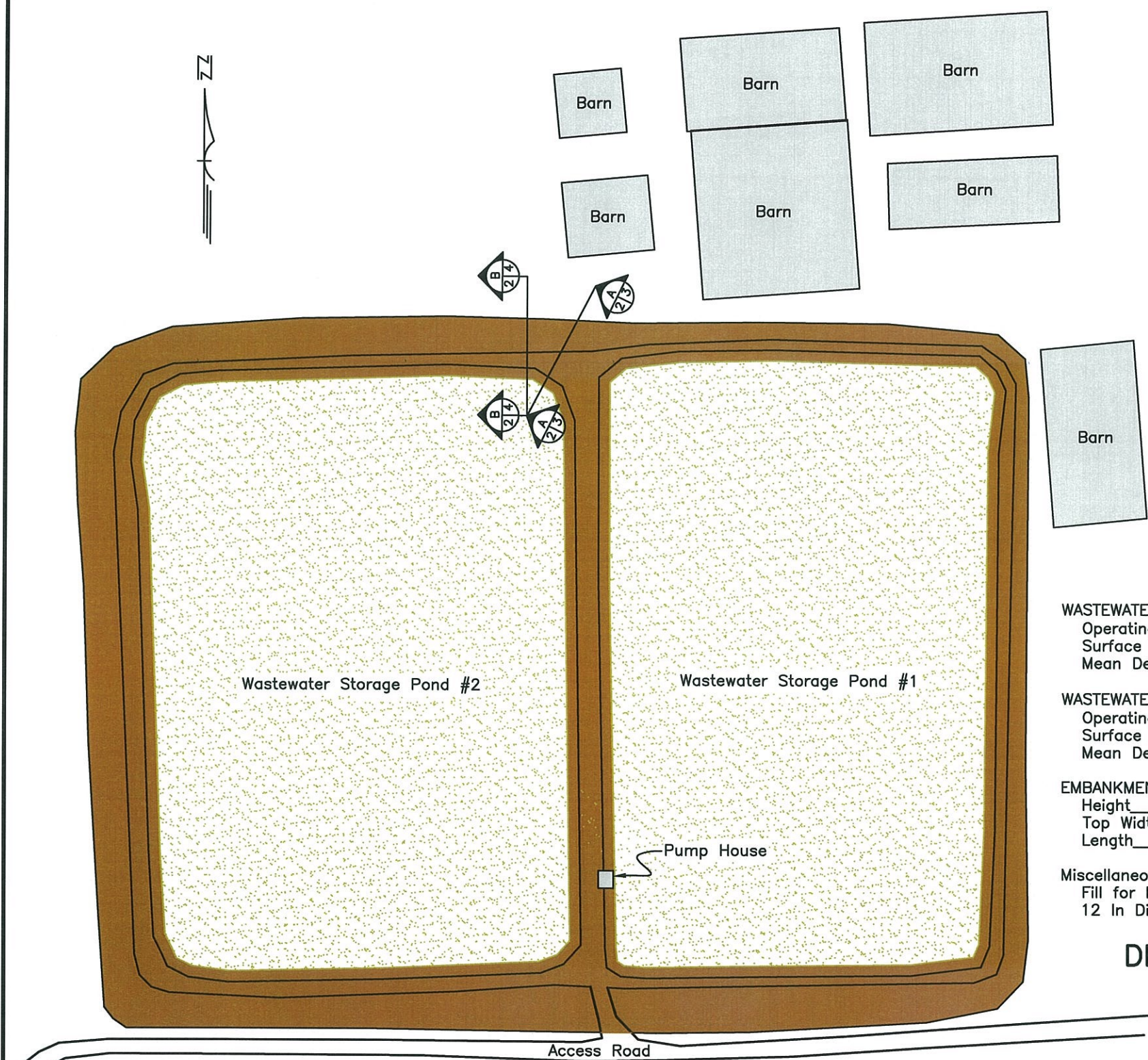
Polk County, Oregon

H & R Engineering LLC
KEIZER, OREGON

DESIGNED BY: B. Wilson
DRAWN BY: B. Wilson

DRAWING NO.: DVD01

December 2014
Sheet 1 of 4



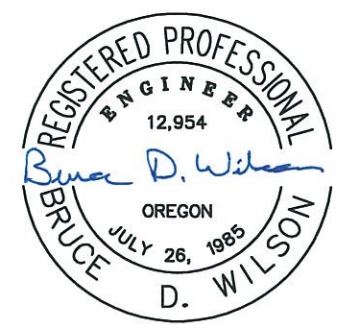
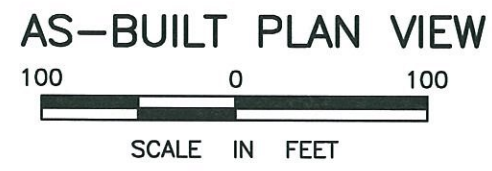
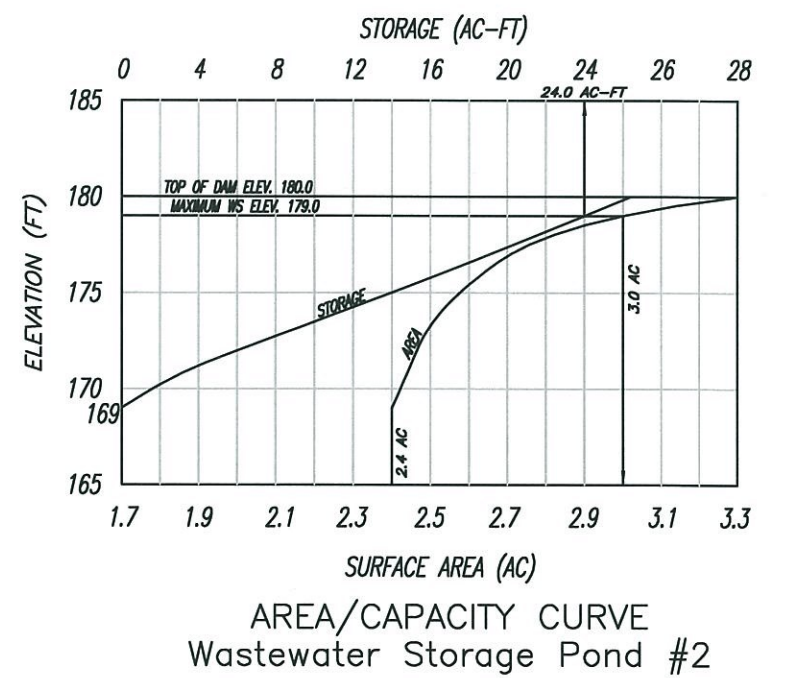
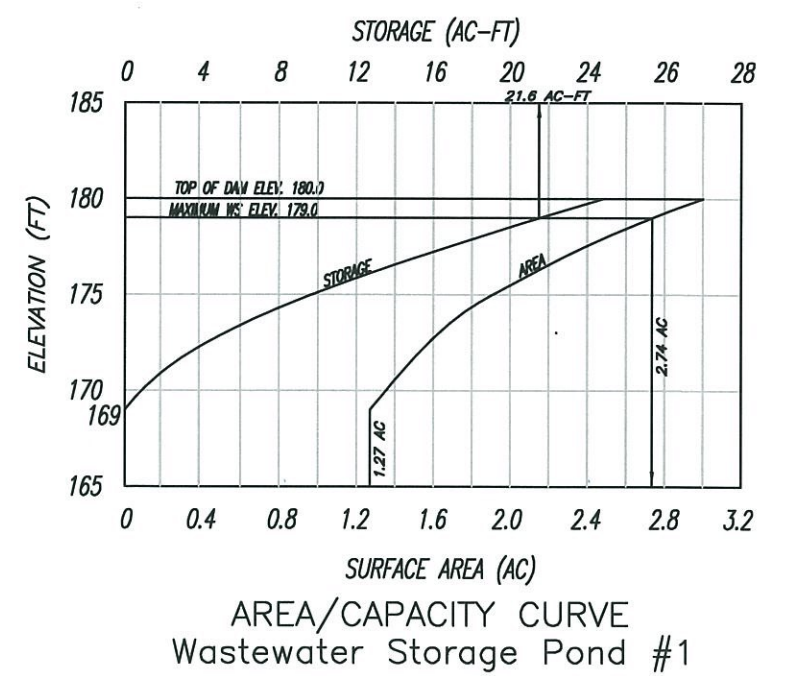
WASTEWATER STORAGE POND #1:
Operating Capacity 21.6 Acre Feet
Surface Area 3.0 Acres
Mean Depth 7.2 Feet

WASTEWATER STORAGE POND #2:
Operating Capacity 24.0 Acre Feet
Surface Area 3.3 Acres
Mean Depth 7.3 Feet

EMBANKMENT:
Height 5-10 Feet
Top Width 10-15 Feet
Length 2,240 Feet

Miscellaneous:
Fill for Eroded Area 34 Cubic Yards
12 In Dia HDPE Pipe 20 Feet

DESIGN DETAILS



EXPIRATION DATE: 6/30/2016

SIGNED: 12/03/2014

Diamond Valley Dairy Wastewater Storage Pond Repair
PLAN VIEW AND DESIGN DETAILS

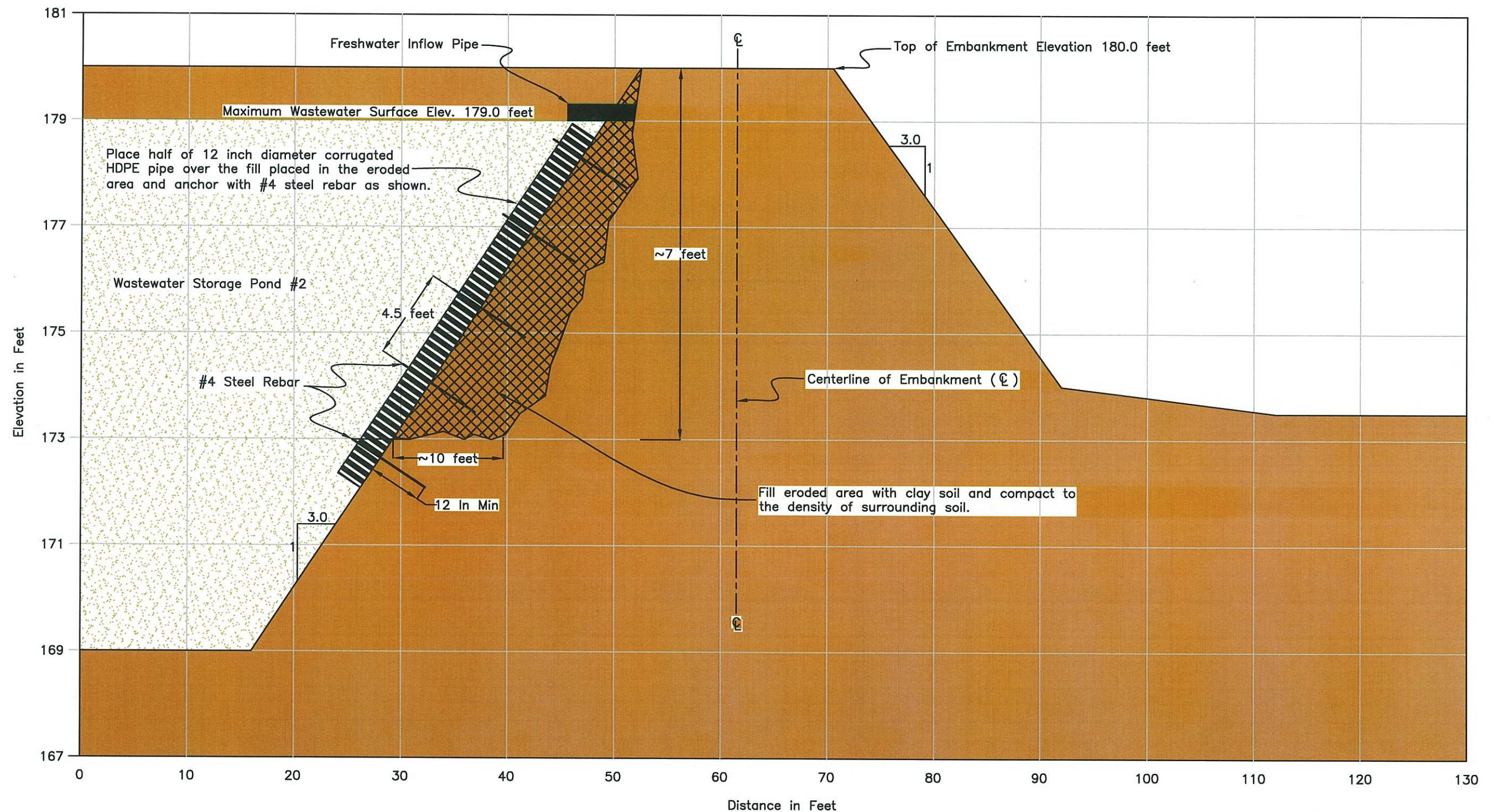
Polk County, Oregon

H & R Engineering LLC
KEIZER, OREGON

DESIGNED BY: B. Wilson
DRAWN BY: B. Wilson

DRAWING NO.: DVD02

December 2014
Sheet 2 of 4



CROSS SECTION OF ERODED EMBANKMENT

REGISTERED PROFESSIONAL
ENGINEER
12,954
Bruce D. Wilson
OREGON
JULY 26, 1985
D. WILSON

SIGNED: 12/03/2014

EXPIRATION DATE: 6/30/2016

Diamond Valley Dairy Wastewater Storage Pond Repair
CROSS SECTION A-A OF EMBANKMENT

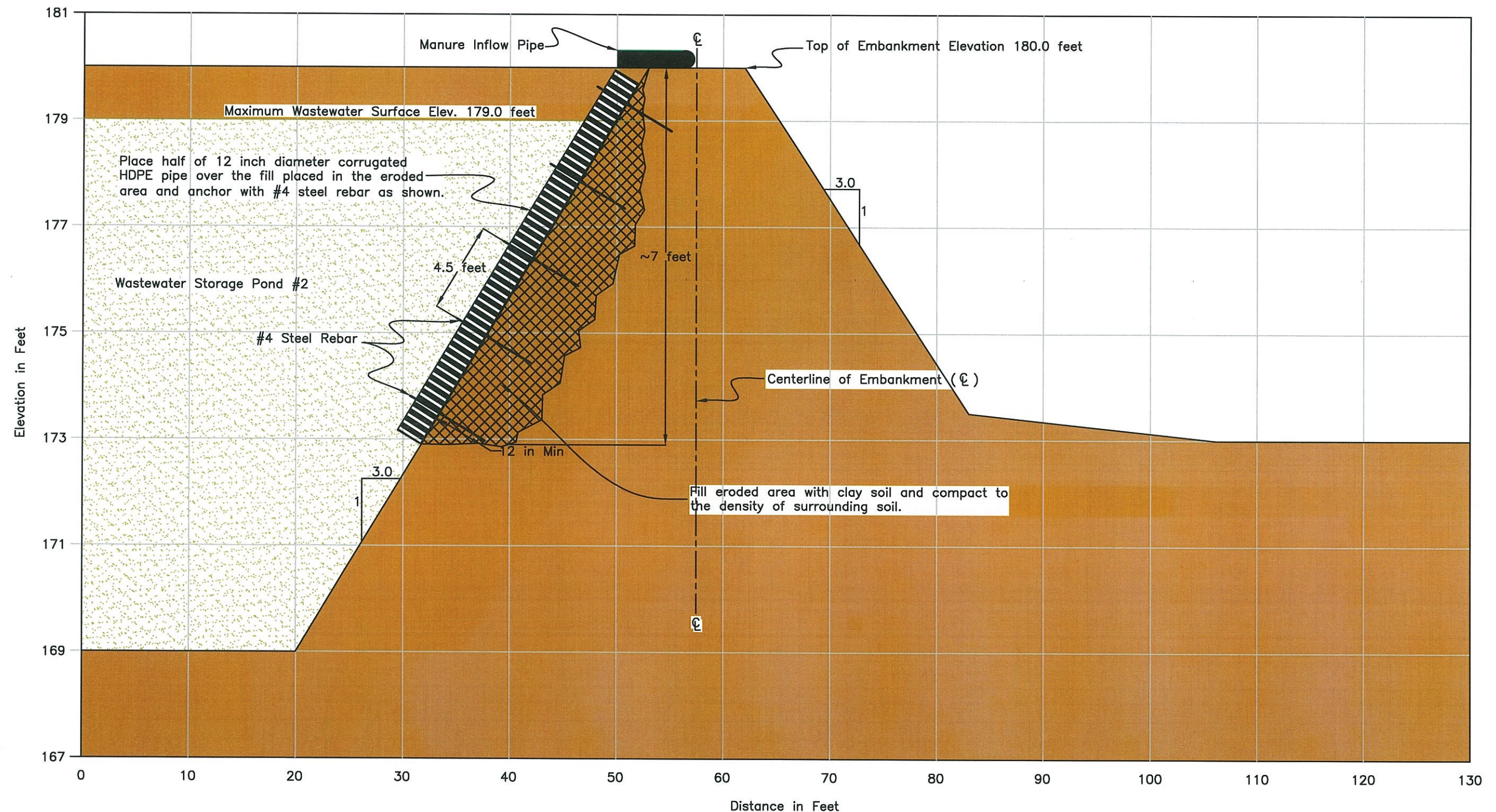
Polk County, Oregon

H & R Engineering LLC
KEIZER, OREGON

DESIGNED BY: B. Wilson
DRAWN BY: B. Wilson

DRAWING NO.: DVD03

December 2014
Sheet 3 of 4



CROSS SECTION OF ERODED EMBANKMENT

REGISTERED PROFESSIONAL
ENGINEER
12,954
Bruce D. Wilson
OREGON
JULY 26, 1985
D. WILSON
EXPIRATION DATE: 6/30/2016

SIGNED: 12/03/2014

Diamond Valley Dairy Wastewater Storage Pond Repair
CROSS SECTION B-B OF EMBANKMENT

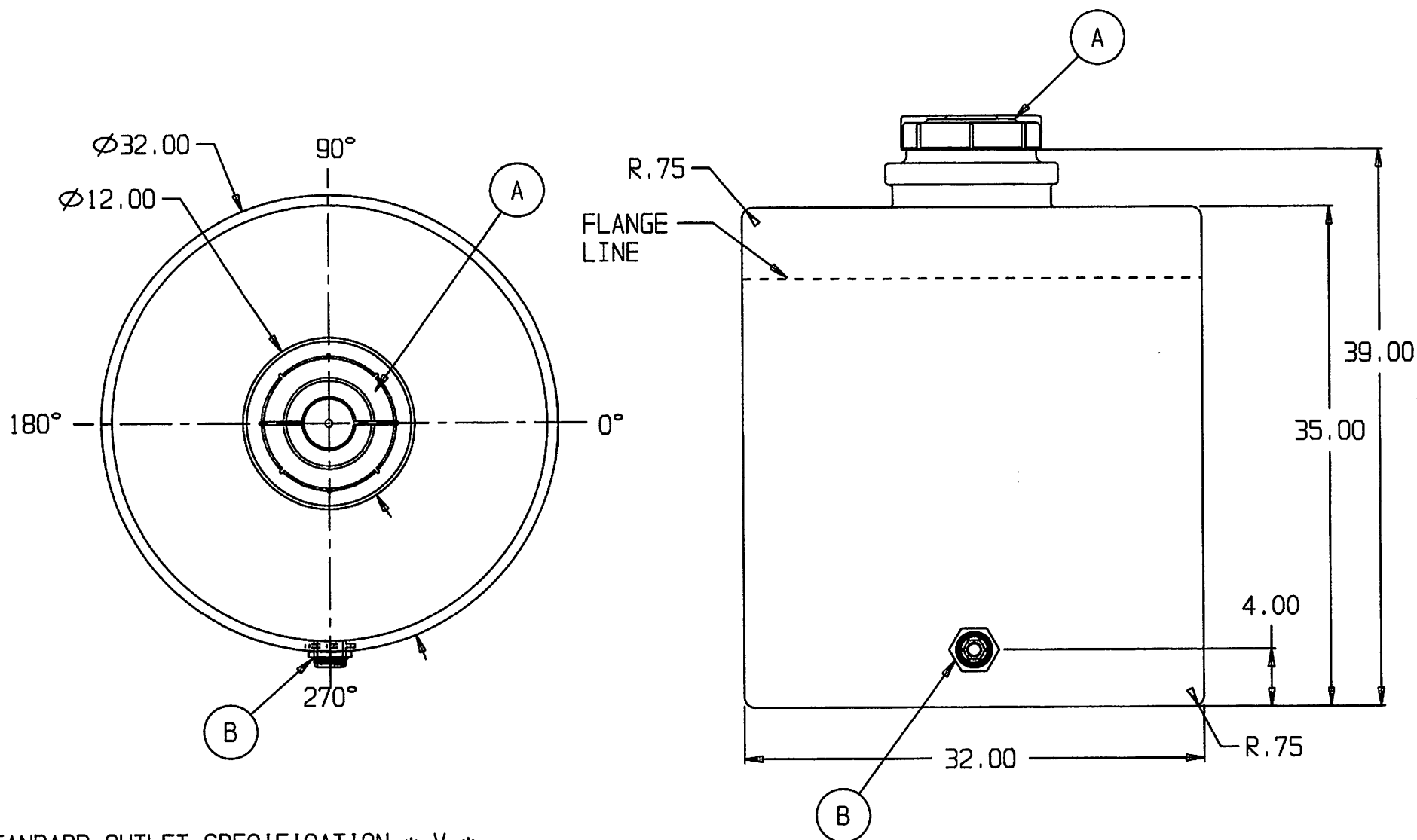
Polk County, Oregon

H & R Engineering LLC
KEIZER, OREGON

DESIGNED BY: B. Wilson
DRAWN BY: B. Wilson

DRAWING NO.: DVD04

December 2014
Sheet 4 of 4



STANDARD OUTLET SPECIFICATION * V *

A. 10" PE THREADED-VENTED FILL CAP W/7" ACCESS [P/N 34700088]

B. 1-1/2" PE STANDARD BH FTG W/EPDM GASKETS [P/N 34300008]

BASE FITTINGS TO BE LEFT INSTALLED AT TIME OF SHIPMENT PER SII PROCEDURE

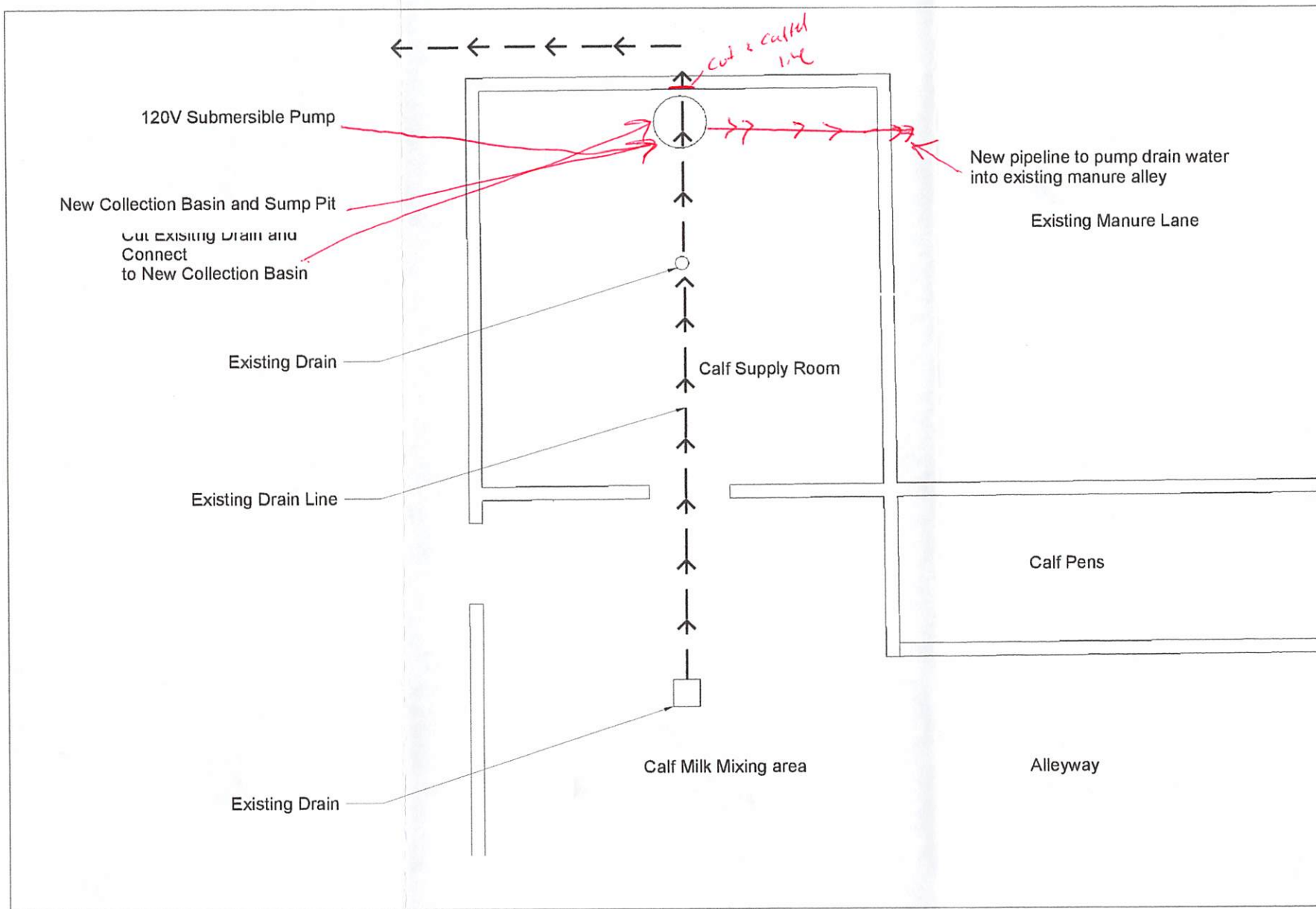
(all dimensions in inches)

PART # TANK: 1540200C--

REF#: 00000

12/05/07

120 GALLON VERTICAL STORAGE TANK



DIAMOND CREEK DAIRY HEADQUARTERS MAP

NOTE:

Cross hatched area denotes paved lot area.

Blue lines denote gutter water direction.

Orange lines denote manure flow direction.

Orange dots denote collection pits.



GIS Mapping by Northwest Ag Consulting

DESIGN REPORT
for
Diamond Valley Dairy
Wastewater Storage Pond #3 (WSP3)

SUMMARY: The project is located north of West Salem on the property of Diamond Valley Dairy located off of Valley Creek Road NW. The project consists of constructing a wastewater storage pond with a compacted soil liner that will store manure and wastewater from a dairy operation.

REFERENCES: 1. USDA Natural Resources Conservation Service (NRCS) Agricultural Waste Management Field Handbook
2. USDA Natural Resources Conservation Service (NRCS) Practice Standards 313-Waste Storage Facility and 520-Pond Sealing or Lining- Compacted Soil Treatment.

LOCATION: The project is located in the SW $\frac{1}{4}$ of the SW $\frac{1}{4}$ of Section 19 Township 6 South, Range 3 West from the Willamette Meridian.

PURPOSE: Provide long term manure storage to prevent degradation of surface and groundwater sources and provide flexibility in application of manure to cropland fields for utilization of nutrients and organics.

PROPOSED WORK: The wastewater storage ponds are designed to store manure and wastewater that is generated from the Diamond Valley Dairy. The wastewater storage ponds consist of wastewater storage pond #1 (WSP1), and wastewater storage pond #2 (WSP2). Wastewater storage pond #3 (WSP3) will be added and connect to the south embankments of wastewater storage pond #1 and wastewater storage pond #2. Wastewater storage pond #3 will be constructed by excavating an average of 4 feet of soil to construct the embankment that will have a 20 foot top width, 3:1 inside side slopes, 3:1 outside side slopes, and a maximum embankment fill height of 6 feet. The maximum storage capacity of the existing wastewater storage ponds is 45.6 acre-feet and the proposed wastewater storage pond #3 (WSP3) will have a maximum storage capacity of 23.24 acre-feet. The bottom and sides of the proposed wastewater storage pond #3 (WSP3) will be over excavated by 1 foot and the excavated area backfilled and compacted with onsite soils mixed with a soil sealant to form a compacted soil liner to prevent leakage. A weir structure will be installed on wastewater storage pond #2 (WSP2) to control the outflow from wastewater storage pond #2 (WSP2) to the proposed wastewater storage pond #3 (WSP3).

LAYOUT: The proposed wastewater storage pond #3 (WSP3) will be located directly to the south of wastewater storage pond #2 (WSP2) so that overflow from wastewater storage pond #2 (WSP2) can be directed to the proposed wastewater storage pond #3 (WSP3). The proposed wastewater storage pond #3 (WSP3) will be laid out at the time of construction by H&R Engineering with assistance from the landowner and contractor. A preconstruction conference will be held with the contractor, landowner and H&R Engineering at the time of layout to ensure the contractor understands the requirements of the drawings and specifications.

DESIGN REPORT
for
Diamond Valley Dairy
Wastewater Storage Pond #3 (WSP3)

DESIGN: Two test pits were excavated in the area of the proposed wastewater storage pond #3 (WSP3) and the soils were found to be uniform with approximately 6 inches of topsoil, 18 inches of silt loam ML soils and 84 inches of silty clay and clay soils. A composite sample of the excavated soils from the 48 inch depth was submitted to geotechnical laboratory for soil mechanics analysis. The soil mechanics analysis requested included permeability in accordance with ASTM D5084-Method C, and density tests in accordance with ASTM D698A.

Based on the soil mechanics report from the soil mechanics laboratory the soils were determined to be suitable for the intended use and a design of the proposed wastewater storage pond #3 (WSP3) was completed using the as-built information from the construction of wastewater storage ponds #1 and #2, and criteria from NRCS practice standards 313-Waste Storage Facility and 520-Pond Sealing or Lining-Compacted Soil Treatment.

Inflow and outflow facilities will consist of gravity pipelines and pump systems. All contaminated runoff from the open slab areas and barn area, all wash water from the milking facilities and manure scraped from the barn areas will be directed to an underground collection tank. The manure and wastewater collected in the underground collection tank will be pumped to a solid/liquid separation facility where solids will be separated from the wastewater and the wastewater will drain to wastewater storage pond #1 (WSP1). Once the capacity of wastewater storage pond #1 (WSP1) is reached, outflow will be controlled using pipe structure and drain to wastewater storage pond #2 (WSP2) for storage. Once the capacity of wastewater storage pond #2 (WSP2) is reached, outflow will be controlled using a pipe structure and drain to the proposed wastewater storage pond #3 (WSP3) for storage. A pumping plant will be used to empty the ponds and is designed to deliver approximately 300 gallons per minute to a traveling "Big Gun" irrigator for application of the wastewater to crops at agronomic rates.

No emergency spillway was designed for the facility since inflow and outflow will be controlled using pumps and there is no drainage area that will contribute rainfall runoff directly to the wastewater storage ponds.

Drawings for the proposed wastewater storage pond #3 (WSP3) were created using computer aided drafting software and the specifications were prepared using the construction requirement worksheet and specifications from NRCS practice standard 313-Waste Storage Facility.

CONSTRUCTION: The embankment will be constructed using the silt and clay soils to elevation 180 feet and compacted with a sheepsfoot roller using a maximum of 9-inch loose lifts during construction. The treated compacted soil liner will be compacted with a sheepsfoot roller and/or rubber tired construction equipment using a maximum of 9-inch loose lifts during construction to form a 1 foot compacted soil liner. Minimum compaction requirements are to reach a minimum of 95% of the maximum dry density as per ASTM D698 keeping the soil moisture content at levels adequate to meet the compaction requirements.

COST: The estimated cost of the project is \$200,000.

DESIGN REPORT
for
Diamond Valley Dairy
Wastewater Storage Pond #3 (WSP3)

ENVIRONMENTAL: Short term effects of the wastewater storage ponds on the environment will be due to soils being exposed to possible wind and water erosion during construction of the proposed wastewater storage pond #3 (WSP3). Once construction is completed and the exposed areas seeded, no wind and water erosion problems are anticipated. Proper management of the facility after construction is completed will prevent any leakage, overtopping and minimize odors effecting the environment.

Design prepared by: Bruce D. Wilson
H&R Engineering LLC
Keizer, Oregon

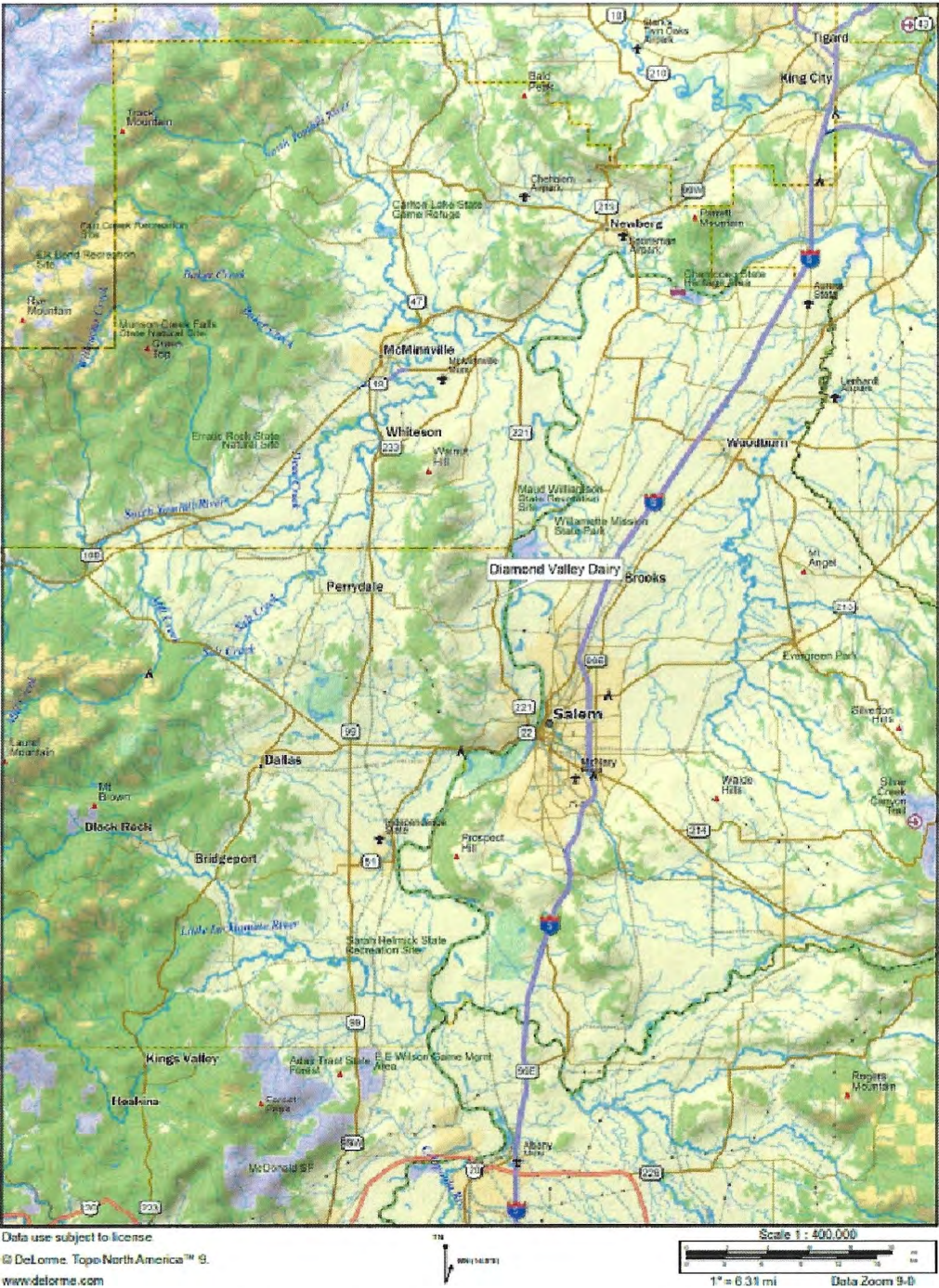


PROJECT DESCRIPTION

The Diamond Valley Dairy Wastewater Storage Pond project will consist of constructing wastewater storage pond #3 (WSP3) that will have an earthen embankment with a maximum height of 6 feet and a length of 1,069 feet. The earthen embankment for WSP3 will have a 20 foot top width with 3 to 1 inside and outside side slopes. The material for constructing WSP3 will come from excavating the inside of the storage area of WSP3. When the project is completed, WSP3 will have a total capacity of 23.24 acre feet. The wastewater storage ponds will be filled by pumping wastewater from a collection tank to a solid/liquid separation facility which drains to an existing wastewater storage pond (WSP1) shown on sheet 2 of the drawings. When WSP1 reaches capacity it overflows through a pipeline structure to wastewater storage pond #2 (WSP2) shown on sheet 2 of the drawings. When WSP2 reaches capacity it will overflow through a pipeline structure to wastewater storage pond #3 (WSP3). The interior bottom and side slopes of waste storage pond #3 (WSP3) will be treated to control seepage.

GENERAL NOTES

- The owner is responsible for obtaining and complying with all permits related to the construction and operation of this project.
- No representation as to existence or non-existence of utilities, public or private is made. It is the responsibility of the contractor to comply with provisions of ORS 757.541 and 757.571 and to determine the location of utilities (1-800-332-2344). The contractor will be liable for any damage resulting from disruption of service caused by construction activities.
- The contractor shall be responsible for on site construction activities and safety of all personnel during construction. These drawings and associated specifications are not intended to provide means or methods of construction.
- The following items must be documented during construction in order to show the waste storage pond meets the requirements of the drawings and specifications and can be approved:
1. Compaction tests showing the embankment and compacted soil liner meets compaction requirements.
 2. Elevation and dimensions of embankments and storage areas.

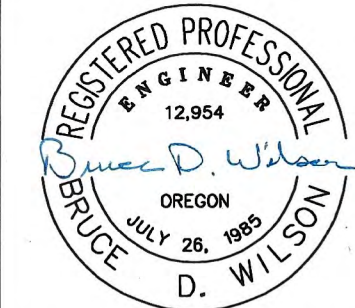


LOCATION MAP

SW¼ of the SW¼, Section 19, T6S, R3W from the Willamette Meridian

INDEX OF DRAWINGS

Sheet Number	Subject
1	Project Description, General Notes and Location Map
2	Site Plan, Area-Capacity Curve and Design Data
3	Profile on Centerline of Embankment
4	Cross Section A-A of Embankment and Storage Area
5	Cross Section B-B of Embankment and Storage Area



EXPIRATION DATE: 6/30/2022

SIGNED: 01/03/2022

Diamond Valley Dairy Waste Storage Pond #3
COVER PAGE

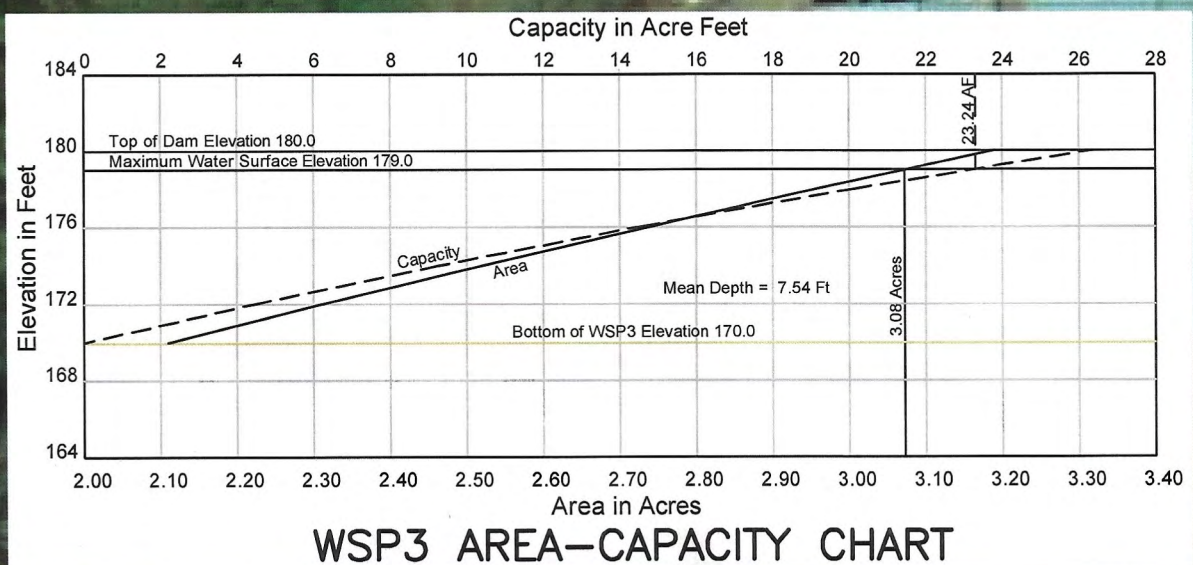
Yamhill County, Oregon

H & R Engineering, LLC
KEIZER, OREGON

DESIGNED BY: B Wilson
DRAWN BY: B Wilson

DRAWING NO.: DWSP3-01

January 2022
Sheet 1 of 5



WSP2
Storage Capacity—
24.0 AF/7,819,891 Gallons

WSP1
Storage Capacity—
21.6 AF/7,037,902 Gallons

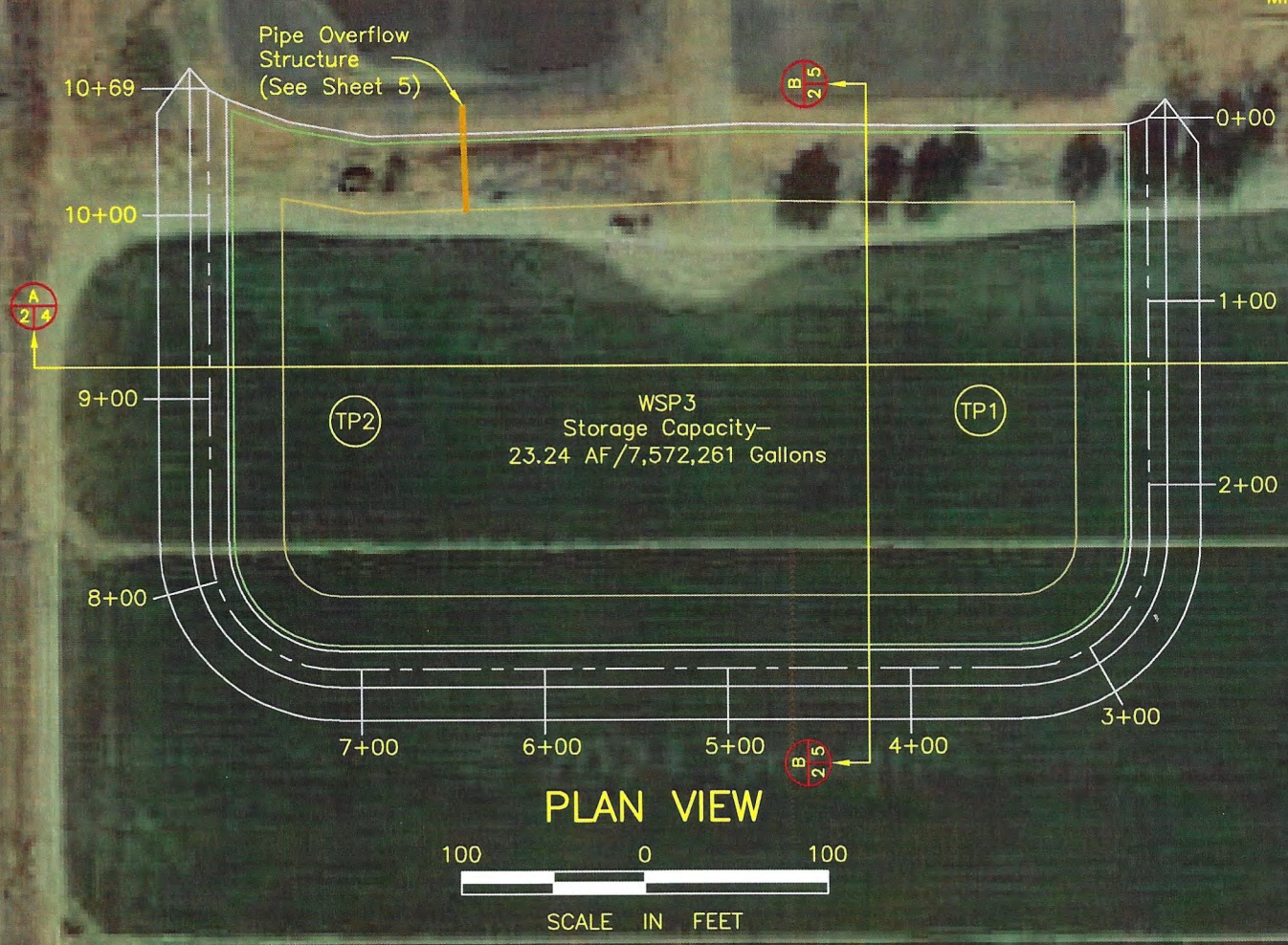
WSP3:
Operating Capacity—23.24 Acre Feet
Surface Area—3.19 Acres
Mean Depth—7.54 Feet

EMBANKMENT:
Height—6 Feet
Top Width—20.0 Feet
Length—1,069 Feet
Compacted Fill—8,748 Cubic Yards
Excavation—15,533 Cubic Yards

CORE TRENCH:
Depth—5.0 Feet
Bottom Width—12.0 Feet
Length—1,069 Feet
Side Slopes— $\frac{1}{2}$ to 1
Excavation—2,870 Cubic Yards

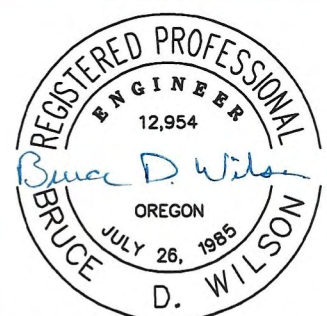
MISCELLANEOUS VOLUMES:
Foundation Stripping—7,778 Cubic Yards

WSP3 DESIGN DATA



LEGEND

- = BENCHMARK
- = TEST PIT LOCATION



EXPIRATION DATE: 6/30/2022

SIGNED: 01/03/2022

Diamond Valley Dairy Wastewater Storage Pond #3 SITE PLAN AND DESIGN DETAILS

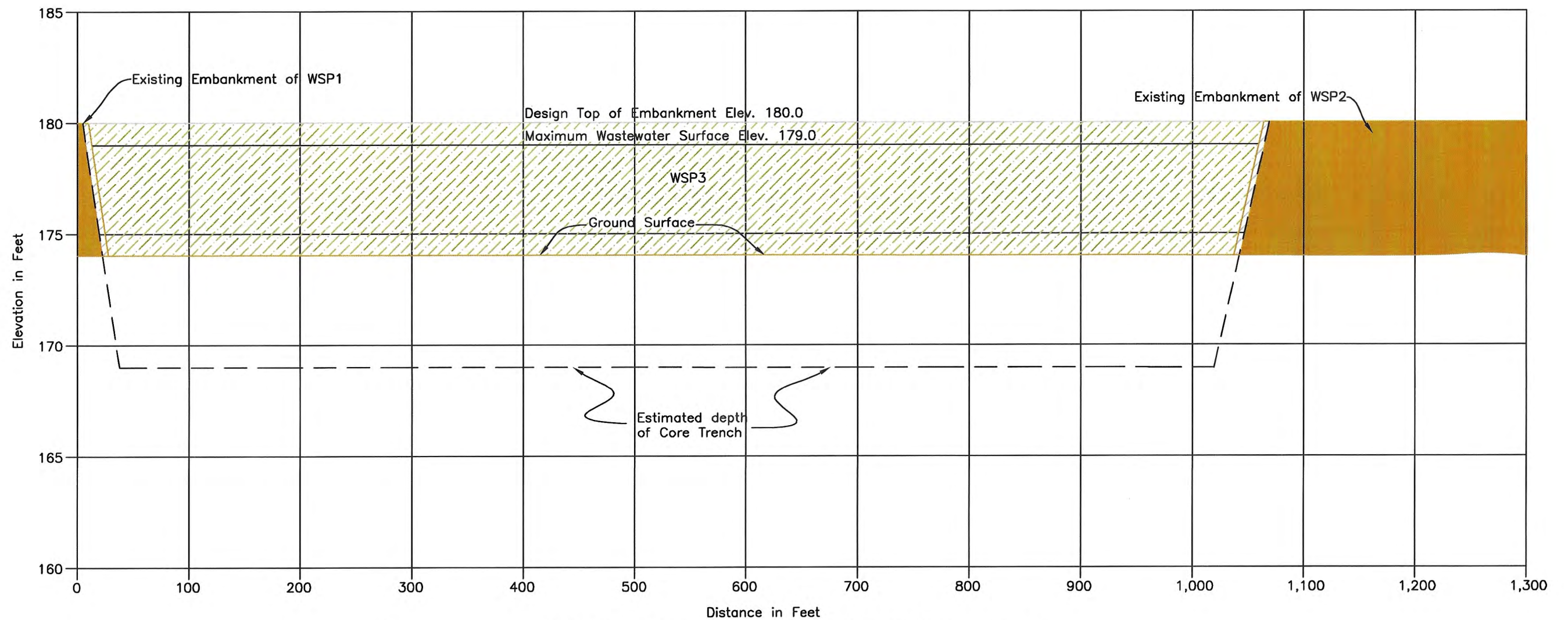
Yamhill County, Oregon

H & R Engineering LLC
KEIZER, OREGON

DESIGNED BY: B Wilson
DRAWN BY: B Wilson

DRAWING NO.: DVWSP3-2

January 2022
Sheet 2 of 5



PROFILE ON CENTERLINE OF EMBANKMENT



0-24" brn sil ML

24-72" drk brn sil CH

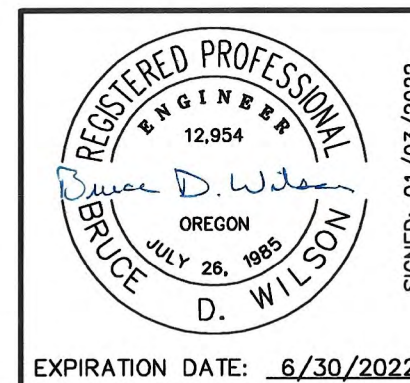
Test Pit #1



0-24" brn sil ML

24-108" drk brn sil CH

Test Pit #2



Diamond Valley Dairy Wastewater Storage Pond #3
PROFILE ON CENTERLINE OF EMBANKMENT

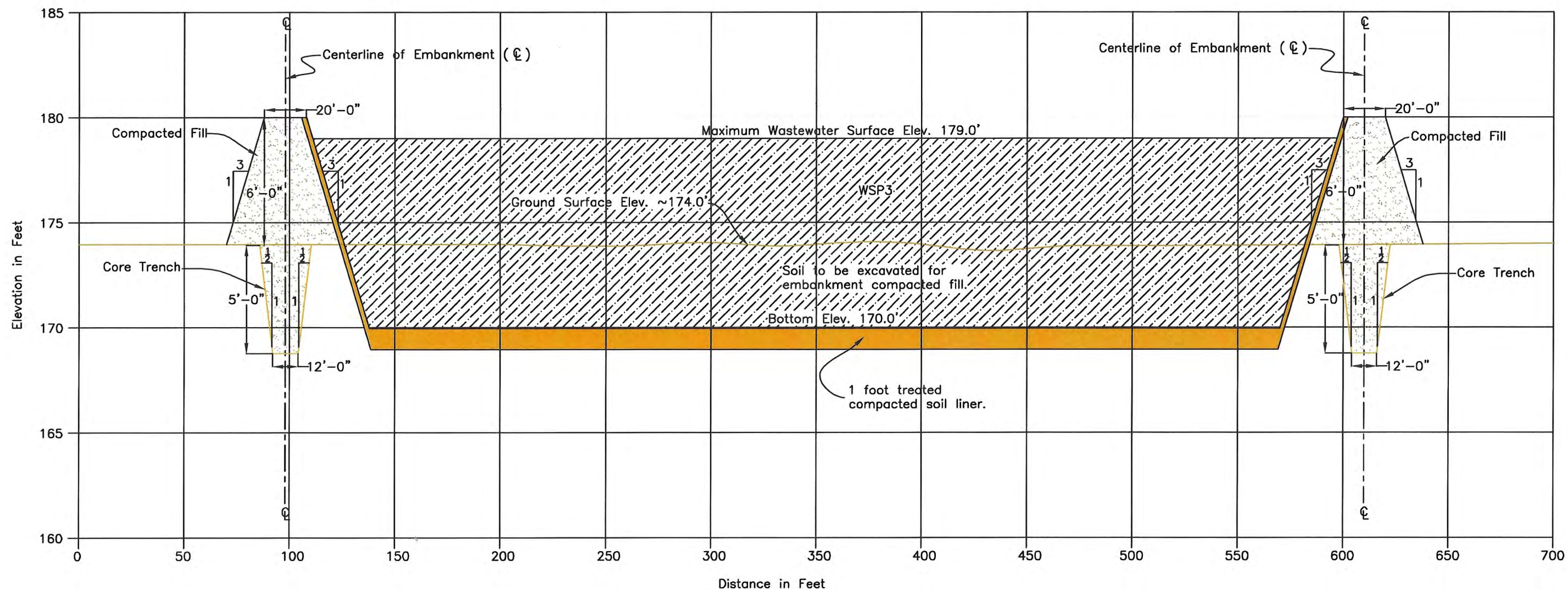
Yamhill County, Oregon

H & R Engineering LLC
 KEIZER, OREGON

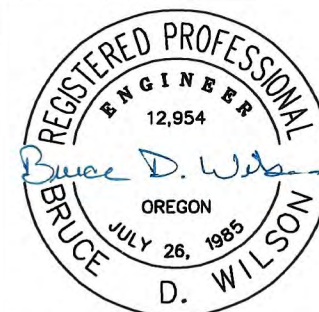
DESIGNED BY: B. Wilson
 DRAWN BY: B. Wilson

DRAWING NO.: DVWSP3-03

January 2022
 Sheet 3 of 5



CROSS SECTION OF EMBANKMENT



EXPIRATION DATE: 6/30/2022

SIGNED: 01/03/2022

Diamond Valley Dairy Wastewater Storage Pond #3
CROSS SECTION A-A OF EMBANKMENT

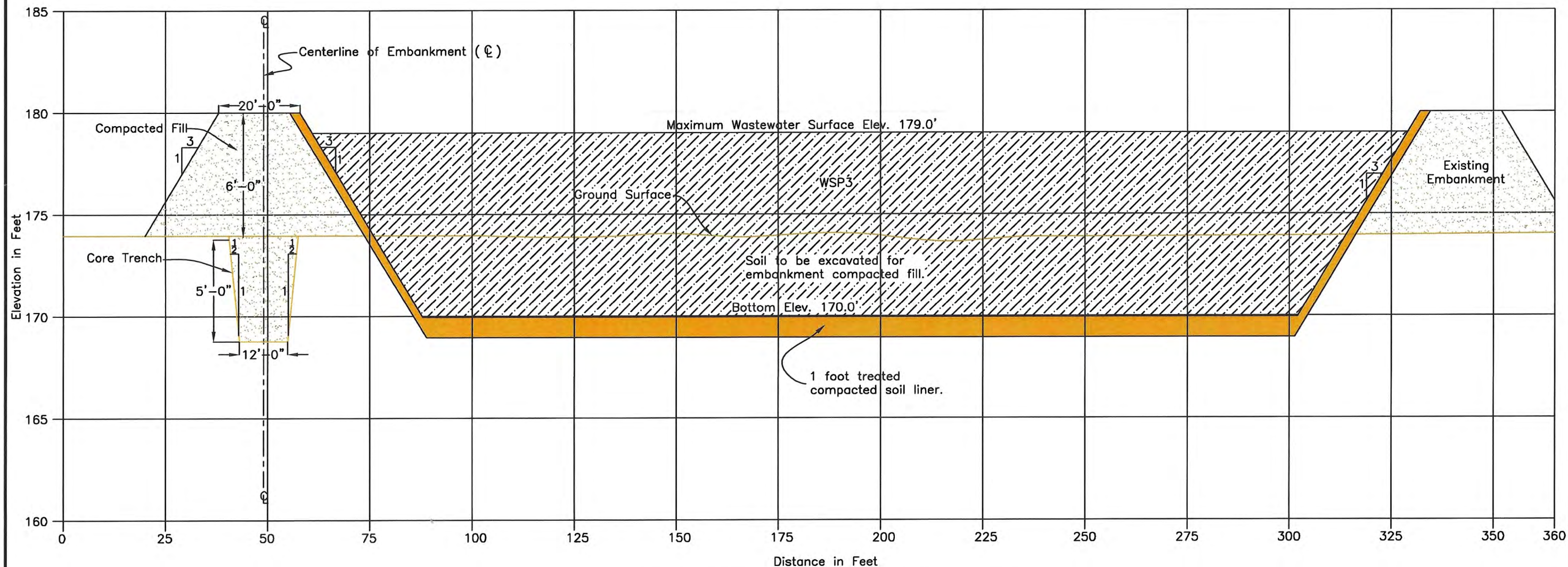
Yamhill County, Oregon

H & R Engineering LLC
 KEIZER, OREGON

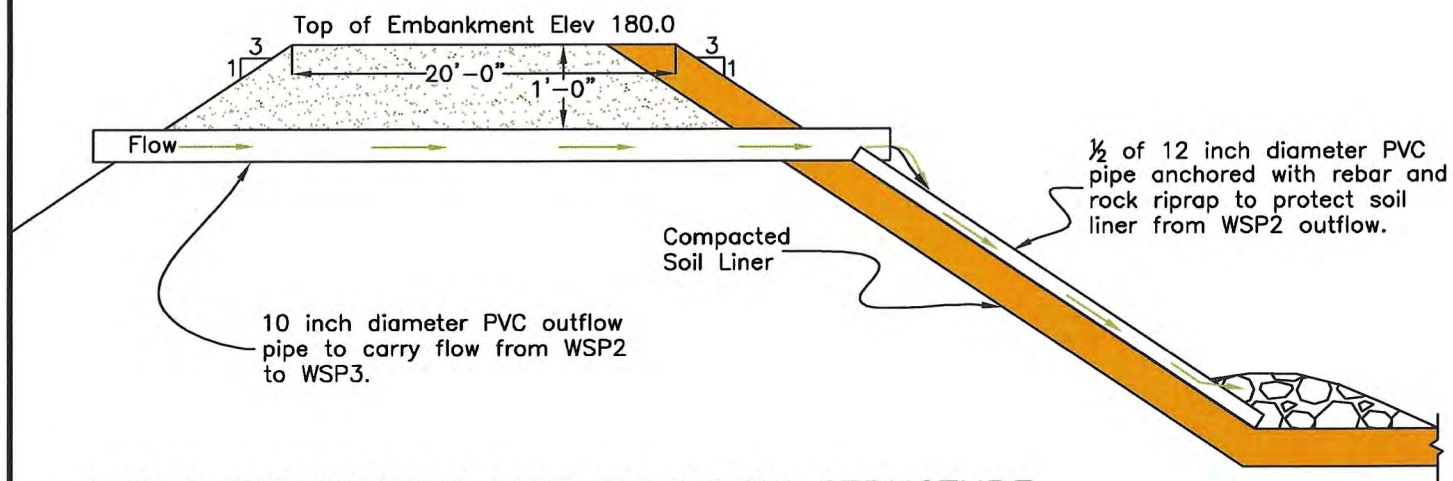
DESIGNED BY: B. Wilson
 DRAWN BY: B. Wilson

DRAWING NO.: DWSP3-04

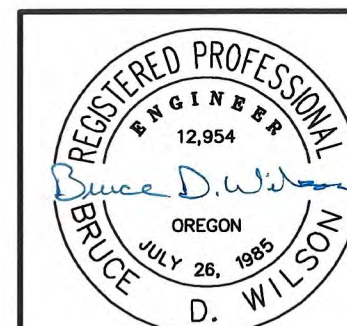
January 2022
 Sheet 4 of 5



CROSS SECTION OF EMBANKMENT



CROSS SECTION OF PIPE OVERFLOW STRUCTURE
(Not to Scale)



EXPIRATION DATE: 6/30/2022

SIGNED: 01/03/2022

Diamond Valley Dairy Wastewater Storage Pond #3
CROSS SECTION B-B OF EMBANKMENT

Yamhill County, Oregon

H & R Engineering LLC
KEIZER, OREGON

DESIGNED BY: B. Wilson
DRAWN BY: B. Wilson

DRAWING NO.: DVWSP3-05

January 2022
Sheet 5 of 5

CONSTRUCTION REQUIREMENTS

DIAMOND VALLEY DAIRY WASTEWATER STORAGE POND #3 (WSP3)

The attached drawings and specifications set forth the requirements for the construction of wastewater storage pond #3 (WSP3) project for Diamond Valley Dairy located in Yamhill County approximately 8.4 miles northwest of Salem, Oregon near Valley Creek Road NW, more specifically described as being within the SW ¼ of the SW ¼ of Section 19 Township 6 South, Range 3 West of the Willamette Meridian. The project shall be constructed at the location and to the lines and grades as shown on the drawings in accordance with the construction and material specifications.

The owner is the official spokesperson for this project. The owner is the person who reviewed the construction plan, made all contractual agreements, ensures construction is in accordance with the requirements as set forth in the plans, obtains all permits and is financially responsible. The owner or their representatives are the only people who can authorize any changes during construction that incur financial obligations.

H&R Engineering is the engineer of record and has the authority to review the project during construction and make necessary tests to ensure that all work is in compliance with the drawings and specifications. H&R Engineering will perform all work in accordance with the Engineering Services Agreement entered into with the owner.

The contractor has a contractual agreement with the owner for construction of the project in accordance with the drawings and specifications. The contractor shall not make changes to the drawings or specifications without prior approval of H&R Engineering and the owner. The contractor shall comply with all applicable permits and conduct the work in a safe manner.

DESIGN APPROVAL:

The drawings and specifications were prepared by Bruce D. Wilson, H&R Engineering LLC.



OWNER'S ACKNOWLEDGEMENT:

The owner acknowledges that:

- a. They have received a copy of the construction drawings and specification, and that they understand the contents and requirements.
- b. They understand that they are responsible for obtaining all permits relating to the construction and operation of this project.
- c. They understand that H&R Engineering makes no representation as to the existence or non-existence of utilities. It is the responsibility of the owner and contractor to comply with the provisions of ORS 757.541 to 757.571. The owner and contractor will be liable for any damage resulting from disruption of service caused by construction activities. The phone number for the utility location service in Oregon is 811.
- d. Proper operation and maintenance of the installed work is necessary for proper performance during the service life of the project.

Accepted by:

/s/ _____ Date: _____

CHECKOUT:

I have made an onsite inspection of the project installation and have determined that project was installed according to the drawings and specifications. I have also documented the required items have be inspected in accordance with the basis of acceptance section in the construction specifications.

Installation certified by:

/s/ _____ Date _____

Job title: _____

CONSTRUCTION SPECIFICATIONS FOR DIAMOND VALLEY DAIRY WASTEWATER STORAGE POND #3 (WSP3)

SCOPE

The work shall consist of the following:

1. Excavating and placing compacted soil to an elevation of 180.0 to create embankments with a 20 foot top width and 3 horizontal to 1 vertical slopes on the inside and outside.
2. Constructing a one foot thick treated compacted soil liner for seepage control.
3. Constructing a weir box structure to control outflow from the existing wastewater storage pond #2 (WSP2) to wastewater storage pond #3 (WSP3).

All work shall be done to the neat lines, grades, elevations and dimensions shown on the drawings or as staked in the field.

DEFINITIONS AND RELATIONSHIPS OF PARTIES CONCERNED

The term "Owner" shall refer to the authorized representative of Diamond Valley Dairy who's signature appears on the Construction Requirements worksheet which is part of these specifications. The Owner is responsible for all expenditures for construction. All items of work to be paid by the Owner must have the Owner's approval.

It is understood that the Owner or their representative will execute the drawings and specifications to the best of their ability. Any changes made as construction progresses will be made with the advice and concurrence of H&R Engineering.

The term "Engineer" shall refer to the authorized representative of H&R Engineering.

The Engineer acting as a technical advisor for the Owner has compiled these drawings and specifications. The Engineer will provide surveys, tests, and technical direction of work so that the project may be constructed as planned. He or she cannot authorize changes without the Owner's approval.

The term "Contractor" shall refer to the authorized representative of Owner that is under a contractual agreement to complete the project according to the drawings and specifications.

The Contractor will provide the necessary equipment and manpower so that the project may be constructed as planned. He or she cannot

make changes to the project without the Engineer's and Owner's approval.

The official drawings prepared by H&R Engineering and approved by the Oregon Department of Agriculture Confined Animal Feeding Operations (CAFO) program are part of these specifications.

The directions, provisions, and requirements contained herein pertain to the method and manner of performing the work and to the quality of materials to be used.

CONSTRUCTION OPERATIONS

Construction operations shall be performed in such a manner that soil erosion, air and water pollution are minimized. See the section on "CONTROL OF SOIL EROSION, WATER AND AIR POLLUTION" for more guidance.

All environmentally sensitive areas, as shown on the drawings or as flagged at the construction site, shall be avoided. If human remains are discovered, **stop construction** immediately, secure the site and contact the County Sheriff. If cultural materials are discovered, **stop construction** immediately and contact the County Environmental office for guidance. The Contractor shall be responsible for mitigating any damages to sensitive areas that are a result of construction activities not approved by H&R Engineering and the Owner.

All pollution control measures shall be adequately maintained in a functional condition as long as needed during the construction operation. All temporary measures shall be removed and the site restored to the original conditions as practicable.

The Owner, Contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regard to safety of all persons and property.

The completed project shall be workmanlike and present a good appearance.

CLEARING AND STRIPPING

All fill and excavation areas shall be cleared of trees, logs, stumps, roots, brush, boulders, sod, rubbish and unstable soil.

The limits of the area to be cleared or stripped shall be marked by a suitable method.

All materials cleared from the designated areas shall be placed at locations and in a manner approved by the Owner or otherwise removed from the site.

EXCAVATION

Core Trench

A core trench for the embankment shall be excavated at the location shown on the drawings or as staked in the field. The core trench shall be excavated to the neat lines and grades shown on the drawings or as staked in the field.

Material excavated from the core trench may be used for compacted fill in the core trench if it is determined to be suitable by the Engineer.

Structure Excavation

Excavation for the weir structures shall be to the neat lines and grades shown on the drawings and/or as staked in the field. No concrete shall be placed for the weir structures until the Engineer has inspected and approved the excavation.

EARTHFILL PLACEMENT

Foundation Preparation

After stripping, the foundation shall be loosened thoroughly by scarifying or discing to a minimum depth of 2 inches. The foundation area shall be bonded with the first layer of earth fill and compacted to the density and moisture specified for the earth fill. All foundation and abutment surfaces shall not be steeper than 1:1 unless otherwise specified on the drawings.

Material

The earth fill placed to construct the embankment shall consist of soil materials excavated from the borrow area that are approved by the Engineer. Fill materials shall contain no sod, brush, roots, or other perishable or compressible debris. No stones having maximum dimension of more than six inches shall be placed in the compacted earth fill. Any such stones, roots or other unsuitable material hauled into the embankment shall be removed prior to compaction, and be disposed of as directed by the Engineer.

Placement

The approved earth fill materials shall be placed on the embankment in a thin layer such that the combined thickness of this layer and the scarified

surface of the foundation shall not exceed 9 inches before compaction. The thickness of spread layers shall not exceed 9 inches and shall be such that the required compaction can be obtained with the equipment used. The earth fill shall be constructed in continuous layers not be steeper than 3 horizontal to 1 vertical. The bonding surface shall be treated the same as that specified for the previous layer so as to insure a good bond with the new fill. If the surface of any lift becomes too smooth for proper bond, it shall be adequately scarified before placement of the next lift.

The distribution of materials shall be such that the earth fill material will be free from lenses, pockets, streaks, or layers differing appreciably in texture from the surrounding material.

Selected earth fill material shall be placed around structures and pipe conduits at the same rate on all sides to prevent damage from unequal loading. Earth fill placed around structures will be brought up at approximately uniform height on all sides of the structure.

Moisture Control

The surface of the earth fill and the soil being placed shall be maintained at the proper moisture content during the placement operations. The moisture content of the earth fill shall be adequate for obtaining the required compaction. The application of water to the soil for the earth fill shall be accomplished by irrigation of the borrow area.

During construction the moisture content of the soil for the earth fill shall be determined from laboratory reports or from tests performed by the Engineer in the field. No soil shall be placed that does not have the moisture content as approved by the Engineer. Soil that is too wet shall be dried to meet this requirement, or removed, and soil that is too dry shall have water added and mixed until the requirement is met. Uniform distribution of the moisture shall be obtained by discing, blading or other approved method prior to compaction.

Compaction control

The earth fill shall be compacted by means of a tamping roller of such size and weight that the materials will be compacted to a minimum dry density of 95% of the maximum dry density as determined by onsite compaction tests. Density of in-place earth fill shall be determined from

laboratory reports or density tests performed in the field by the Engineer or their representative.

Heavy compaction equipment shall not be operated within 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure. Hand directed tampers or compactors shall be used to compact earth fill adjacent to structures, and pipe conduits. Earth fill compacted in this manner shall be placed in layers not greater than 6 inches in thickness before compaction, and shall meet the same density requirement as for the surrounding earth fill.

Earth 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 any conduits prior to 14 days after placement of the concrete except as approved by the Engineer, or
- (2) over any type of structure until the compacted earth 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 earth fill 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
Conduits, and cantilever outlet, bents	3 days

Testing

Field Water Content-Density testing of the compacted earth fill will be conducted verifying the test results are within the moisture content and densities described herein. The Contractor is responsible for quality control of the compacted earth fill and shall coordinate with Engineer. Field tests to determine the water content and density of compacted earth fill shall be conducted during the course of the work using test procedures ASTM D-1556, "Density of Soil in Place by the Sand-Cone Method", ASTM D-2167, "Density of Soil in Place by the Rubber Balloon Method", ASTM D-2937, "Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method", ASTM D-2923, and "Density of Soil and Soil Aggregate in Place by Nuclear Methods at

Shallow Depths". Records of test procedures and results shall be maintained and provided to the Engineer.

TREATED COMPACTED SOIL SOIL LINER

Foundation Preparation

After excavating for the compacted soil liner the foundation shall be loosened thoroughly by scarifying or discing to a minimum depth of 2 inches. The foundation area shall be bonded with the first layer of the compacted soil liner and compacted to the density and moisture specified for the liner. All foundation and abutment surfaces shall not be steeper than 3:1 unless otherwise specified on the drawings.

Material

The material used as an soil sealant shall be approved by the Engineer prior to placement.

The earth fill placed to construct the compacted soil liner shall consist of soil materials excavated from the sides and bottom of the storage area that are approved by the Engineer. Earth fill materials shall contain no stones, sod, brush, roots, or other perishable or compressible debris. Any such stones, roots or other unsuitable material excavated for the compacted soil liner shall be removed prior to compaction, and be disposed of as directed by the Engineer.

Placement

The material used as a treatment for the soil liner shall be applied at rates designated by the soil mechanics laboratory to meet seepage requirements. The combined thickness of soil liner material and the scarified surface of the foundation shall not exceed 9 inches before compaction. The thickness of spread layers shall not exceed 9 inches and shall be such that the required compaction can be obtained with the equipment used. The compacted soil liner shall be constructed in continuous layers not be steeper than 3 horizontal to 1 vertical. The bonding surface shall be treated the same as that specified for the previous layer so as to insure a good bond with the new fill. If the surface of any lift becomes too smooth for proper bond, it shall be adequately scarified before placement of the next lift.

The distribution of materials shall be such that the earth fill will be free from lenses, pockets, streaks, or layers differing appreciably in texture from the surrounding material.

The compacted soil liner placed around structures will be brought up at approximately uniform height on all sides of the structure to prevent damage from unequal loading.

Moisture Control

The soil liner material shall be brought to the specified moisture range before compaction. The treated soil liner material that is too wet for compaction shall be allowed to dry before compaction or be removed.

If the top surface of a preceding layer or foundation becomes too dry or over compacted, it shall be scarified by diskings, or as approved by the Engineer, and moistened to the proper moisture content prior to placement of the next layer of treated soil liner material.

The constructed density and water content of the compacted soil liner shall be as specified by the Engineer.

Compaction control

The treated soil shall be compacted by means of a tamping roller or rubber tired equipment of such size and weight that the materials will be compacted to a dry density as specified by the Engineer as construction progresses. Density of in-place compacted soil materials shall be determined from laboratory reports or density tests performed in the field by the Engineer or their representative.

Heavy compaction equipment shall not be operated within 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure. Hand directed tampers or compactors shall be used to compact the treated soil liner material adjacent to structures and pipe conduits. Soil liner material compacted in this manner shall be placed in layers not greater than 6 inches in thickness before compaction, and shall meet the same density requirement as for the surrounding soil material.

Soil liner material not meeting the specified requirements shall be reworked or removed and replaced with acceptable treated soil liner material.

The passage of heavy equipment will not be allowed:

- (3) over any conduits prior to 14 days after placement of the concrete except as approved by the Engineer, or

- (4) over any type of conduit until the compacted earth 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 treated soil liner material 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
Conduits, and cantilever outlet, bents	3 days

Testing

The Contractor is responsible for quality control of the compacted treated soil liner and shall coordinate with the Engineer to ensure the density and water content of the treated soil material meet the requirements of the laboratory reports. Field tests to determine the water content-density of the compacted treated soil liner shall be conducted during the course of the work using test procedures ASTM D-1556, "Density of Soil in Place by the Sand-Cone Method", ASTM D-2167, "Density of Soil in Place by the Rubber Balloon Method", ASTM D-2937, "Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method", ASTM D-2923, and "Density of Soil and Soil Aggregate in Place by Nuclear Methods at Shallow Depths". Records of test procedures and results shall be maintained and provided to the Engineer.

WEIR STRUCTURES

The weir structures shall be constructed with approved materials to the neat lines and dimensions shown on the drawings.

Pipe

Pipe used for the outlet conduit of the weir structure shall conform to specifications and be suitable for the intended purpose.

All pipe installed under this specification shall be pressure rated for water and meet the requirements of the following ASTM's:

D-1785 Polyvinyl chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.

D-2241 Polyvinyl chloride (PVC) Pressure Rated Pipe (SDR Series).

D-2672 Joints for IPS PVC Pipe Using Solvent Cement

- D-1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80.
- D-2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR).
- D-2104 Polyethylene (PE) Plastic Pipe, Schedule 40.
- D-2239 Polyethylene (PE) Plastic Pipe, (SIDR-PR) Based on Controlled Inside Diameter
- D-2447 Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, based on outside diameter.
- D-2737 Polyethylene (PE) Plastic Tubing.
- D-3035 Polyethylene (PE) Plastic Pipe (SDR-PR), based on controlled outside diameter.
- F-771 Polyethylene (PE) Thermoplastic High Pressure Irrigation Pipeline Systems

The pipe shall be installed in accordance with these specifications and the manufacturer's instructions. The pipe shall be firmly and uniformly bedded throughout its length and shall be installed to the neat lines and grades shown on the drawings.

Plastic pipe shall conform to the requirements as specified on the drawings.

Concrete

Concrete, unless otherwise specified by the Engineer, shall be a redi mix that will achieve 3,000 psi at 28 days, or concrete shall be mixed and placed as specified below.

Cement. To be Type II Portland Cement of a standard commercial brand, free of lumps and partially set masses. In no case shall less than 6 sacks of cement be used in each cubic yard of concrete.

Water. To be free of acid, alkali, oils and organic matter. Generally, the quality of water should be suitable for drinking. The temperature of the water shall not be more than 150 degrees Fahrenheit when added to the mixer.

Aggregate. This may be of non-commercial sources, provided it has adequately graded, clean, hard, strong, durable particles, and is sufficiently free of deleterious substances. The aggregate shall be considered adequately graded and sufficiently free of deleterious substance when it meets the following limitations.

1. When separated on the number 4 standard screen, the weight passing the sieve shall not

be less than 30 percent nor more than 50 percent of the total. The maximum size of aggregate shall be 1-1/2 inches.

2. Clay lumps do not exceed 1.5 percent.
3. All other deleterious substances do not exceed 5 percent.
4. The aggregates shall be proportional so that the concrete contains approximately 2,000 lbs of 1-1/2 inch to number 4 aggregates, and 1,200 lbs of sand per cubic yard.

Mixing. Mixing shall be continued for at least 1-1/2 minutes after all materials, including water are in the mixer. Each batch shall be completely discharged before the mixer is recharged. Not more than 6-1/2 gallons of water per sack of cement shall be used. This includes surface water in the aggregates. Entrained air may be used; however, the air content shall not be more than 6 percent. Excessive overmixing requiring the addition of water to preserve the required concrete consistency shall not be permitted.

Truck mixing will be allowed provided that the use of this method does not violate any applicable provisions of these specifications for concrete.

Measurement and Materials. Equipment used for measuring quantities shall be calibrated so the correct quantity of material measured is known.

Forms. Forms shall conform to the shape, lines and dimensions of the members as called for on the drawings, and shall be substantially and sufficiently tight to prevent leakage of mortar. They shall be properly braced and tied together so as to maintain position and shape.

Placing Concrete. Forms shall be wetted or oiled and thoroughly cleaned of debris and ice. Depositing concrete continuously at one point and letting it flow to distant points shall not be allowed. Mechanical vibrators shall be used as directed by the Engineer. The concrete shall be spaded next to the forms to help prevent honey combing. Excess water shall be worked to a low point without causing flow of the concrete, and be removed.

Reinforcing Steel. Steel shall be furnished, fabricated and placed as shown on the drawings. All reinforcing bars shall be deformed bars of structural steel grade conforming to the requirements of the current ASTM Specification A615. Welded wire reinforcing, when shown on the drawings, shall conform to the requirements of the current ASTM Specification A185. Before the

reinforcing steel is placed it shall be thoroughly cleaned of loose mill and rust scale, oil, dirt, or other coatings that would prevent proper bonding.

Construction Joints. Joints not indicated on the drawings shall be so made and located as to least impair the strength of the structure. Where a joint is to be made, the surface of the concrete shall be thoroughly cleaned, and all laitance removed. In addition to the foregoing, vertical joints shall be thoroughly wetted, but not saturated, and flushed with a coat of neat cement grout immediately before the placing of new concrete.

Curing. All concrete shall be kept moist for at least seven (7) days by one of the approved methods of curing. Moisture or a membrane seal shall be applied within thirty (30) minutes after placing. All concrete shall be protected against freezing for a period of at least (10) days. This may be reduced to seven (7) days for high-early-strength concrete.

Metal Work

All metal parts shall conform to the requirements noted on the drawings. Assembled metal components shall be carefully handled to prevent damage to protective coatings applied at the manufacturing plant.

Installation. Frames or bracing shall be installed at locations shown on the drawings. Frames shall be carried up true and plumb as required. Temporary bracing shall be placed wherever necessary to resist outside forces. Such bracing shall be left in place as long as necessary for safety. No welding shall be done until as much of the structure as will be stiffened thereby has been properly aligned. All field welding shall be done in conformance to the requirements for shop fabrication.

Painting. Before paint or primer is applied, solvent shall be used to clean metal work of grease and oil. All surface rust, dirt and loose scale shall be removed with a wire brush, steel wool or abrading tool.

Cleaned metal work shall be painted immediately with a non lead based primer. Final coatings shall consist of one or more coats of alkyd gloss enamel or asphalt base paint.

Timber Work

All timber or lumber parts shall conform to the requirements noted on the drawings. All hardware used in timber or lumber construction shall be

made from wrought iron or steel and shall be galvanized.

Installation. All framing shall be true and exact. Timber 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.

Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood.

Painting. Lumber or timber may be treated with any acceptable preservative by pressure or dip method.

Untreated lumber or timber shall be protected with one coat of primer and at least two coats of finish paint. Primer coat shall be non lead based primer. Finish coat shall be a linseed oil based paint. All surfaces to be painted shall be thoroughly cleaned prior to painting. Surfaces shall be clean and dry when paint is applied.

RIPRAP AND SLOPE PROTECTION

Materials

Riprap material shall consist of well graded, dense and durable rock. Table 1 shows gradation for rock riprap.

Table 1. –Rock Riprap Gradation

Opening Size, Inches	Percent Passing
18	100
12	60-100
8	30-60
4	5-30
Fines	<5

Subgrade Preparation. Subgrade surfaces for the riprap and/or filter material shall be shaped to the neat lines and grade shown on the drawings or as staked in the field.

Placement. Riprap shall be placed to the depths specified on the drawings. Rock riprap shall be constructed to the full thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. Rock shall be delivered and placed in a manner that will insure larger rocks are uniformly distributed and firmly in contact with one another, with smaller rock and spalls filling the voids between larger rocks. Riprap shall be placed in a manner that will prevent damage to structures.

CONTROL OF SOIL EROSION, WATER AND AIR POLLUTION

Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. Construction activities shall not be carried out during extended periods of wet weather unless measures are taken to control soil erosion and water pollution. Hauling of all materials, personnel, or equipment to, from or within the project shall be limited to those roads or work areas actually needed. Erosion or pollution control or abatement work shall be carried out concurrently with regular construction activities to ensure that adequate control be in effect when adverse climatic conditions could create pollution or erosion problems. All items listed under this general heading shall be discussed with or approved by the Engineer.

Water Pollution

Soil erosion on construction sites or pollution of live streams, lakes, ponds, irrigation or drainage channels, or other water courses, will be prevented, controlled or reduced to acceptable limits.

Work within channel or banks of creeks, ponds or lakes shall be prohibited or limited to the work actually needed to be done. Turn areas, roads parking areas, temporary building sites, etc. shall not be constructed within the channel or banks but shall be placed at a distance so removed as to prevent any contamination of water or destruction of game or fish habitat. Where roads cross permanent streams, culverts of adequate size shall be installed before the road is used.

Open fully exposed cut slopes, embankment slopes, or borrow areas shall be protected with permanent vegetation as soon as practical after slopes are finished or borrow areas are exhausted. Vegetation used shall be as specified in these specifications. Fully exposed means that the surface will not be covered by impounded waters at any time.

When overwinter shutdowns occur, exposed areas will be adequately protected with temporary vegetation or organic mulch. Vegetation or mulching operations will be made as directed in these specifications.

Permanent Vegetation

Unless otherwise specified, a protective cover of vegetation shall be established on all disturbed areas.

Seedbed Preparation. A good seedbed shall be prepared on all areas to be protected by vegetation. Where low fertility soils are exposed, topsoil shall be used as needed and a seedbed prepared.

Seeding Mixtures. Approved grasses or grains as shown in Table 2 or as specified by the Engineer should be seeded as soon as possible after construction is completed to assure the development of good protective growth before storm runoff begins.

Method of Seeding. A good seedbed should be prepared. Seeding shall be made by hand or machine broadcasting; and hand raked or harrowed to insure that the seeding is mixed or has contact with surface soil. Seeding shall be made at right angles to the centerline of the spillway section for the bottom and interior slopes of the spillway section. On all other areas, seeding shall be made approximately on the contour.

Table 2. Permanent Vegetation

Minimum Seeding, Drill Rates 1/

Plant Variety	Lbs per Acre
Creeping Red Fescue	30
Meadow Foxtail	15
Tall Fescue	40
Nordan Crested Wheatgrass	16
Siberian Wheatgrass	16
Pubescent Wheatgrass	16
Intermediate Wheatgrass	16

1/ Broadcast seeding rates should be twice the recommended drill rates.

Seeding should be made soon after construction is completed. Seed in early spring - March 10 to April 15, or when soil temperatures reach 50 °F and soils are dry enough to be friable, or early fall - September 1 to October 1, when soil moisture is adequate.

Fertilizer. Apply 500 lbs. per acre of 16-20-0 commercial fertilizer or its equivalent at seeding time.

Mulching. Mulches needed to protect vegetative seedings during establishment shall be applied at the rate of 2 to 2-1/2 tons of grain straw or equivalent crop or plant residues per surface acre.

Straw or other residues shall be spread uniformly to cover the entire area to be protected. Where specified, the mulches shall be incorporated into the surface soil by discing or by punching with a cultipacking type device.

Mulches may be held in place with wire or cloth meshes such as jute mesh, chicken or hog wire.

Irrigation. Irrigation shall be used for plant establishment as needed.

Temporary Vegetation

Where intermittent or temporary vegetation is needed and can be established until permanent vegetation can be installed. Table 3 shows seeding rates for temporary vegetation.

Table 3. Minimum Seeding Rates

Plant Variety	Lbs per Acre
Winter or Annual Rye	60
Winter Wheat or Barley	100

Method of Seeding. A good seedbed should be prepared. Seeding shall be made by hand or machine broadcasting; and hand raked or harrowed to ensure that the seeding is mixed or has contact with surface soil. Seeding shall be made at right angles to the flow direction. On all other areas, seeding shall be made approximately on the contour.

Seeding should be made soon after construction. Fall seeding should be made August 20 - September 30. Spring seeding may be made from April 1 to May 15 if there is ample moisture near the soil surface and seedbed is firm.

Fertilizer. Apply 300 pounds of 16-20-0 commercial fertilizer or its equivalent at seeding time.

Mulching. Mulching may not be needed. If needed, use mulch as indicated under permanent seeding.

Irrigation. Irrigation shall be used for plant establishment as needed.

Other Erosion Control Measures

Mulches can be used for temporary protection instead of temporary vegetation. Two to three tons per acre of hay, straw, wood chips, sawdust or barkdust should be applied evenly. Gravel or small rock shall be used on small steep, highly erodible soils to provide temporary protection when designated by the Engineer. Plastic sheeting securely anchored in place may be used in areas of high water concentrations and erosion potential.

Vegetative slopes of earth fills shall be protected from grazing and trampling of livestock by fencing. Plant residues from these areas can be used for dry forage production, green crop or mulches.

Temporary structures for interim control of diverted water shall be made of approved materials and shall be constructed at the locations and to the lines and grades established in the field.

Diversion ditches shall be placed at the top of exposed cut slopes or in other locations as shown on the drawings and/or staked in the field. Ditch cross sections shall be constructed to the neat lines and grades shown on the drawings and/or staked in the field.

Where needed, debris basins to retain sediment produced on the project construction site by storm runoff will be built at locations shown on the drawings and/or as staked in the field.

Chemical pollutants produced as a by-product of project work such as drained lubricating oils, transmission oils, greases, soaps, asphalt, etc. shall be contained and removed from the site for proper disposal or recycling. Construction equipment shall be staged in a location and manner to minimize air, soil and water pollution. All fuel and lubricants shall be stored in containers and areas that are in conformance with the Oregon State Department of Environmental Quality and local regulations. If a spill of chemical pollutants such as fuel or hydraulic fluid should occur, immediately attempt to contain the spilled material. The following procedures shall be followed:

(a) For spillage on land, construct earthen berms or use other suitable barricade material of sufficient size to contain the spill and keep it from spreading.

(b) For spillage on water, attempt to isolate and contain the spilled material. Commercial booms or other suitable materials shall be kept on site during construction to contain fuel and oil spills on water.

(c) Call the Oregon Emergency Response System (ORES) at (800) 452-0311.

Sanitary facilities such as chemical toilets shall be located at least 100 feet from water bodies to prevent contamination of surface or subsurface water.

Air Pollution

Local and state regulations concerning brush slash burning shall be adhered to. In lieu of burning, chipping of all the larger wood residues is encouraged. Wood chips can be utilized for mulching.

Fire prevention measures shall be taken to prevent the start of fires or the spread of fires started because of project work. Fire breaks or guards shall be constructed at suitable locations.

All Permanent, access, or haul roads used during construction shall be sprinkled as needed to fully suppress dust, which may be produced by such use.

BASIS OF ACCEPTANCE

The acceptability of the project shall be determined by field inspections to check compliance with all provisions of this specification with respect to the drawings and minimum installation requirements.

In order to certify the project meets the requirements of the drawings and specifications, the following items will be inspected and documented during construction:

1. Compaction tests showing the embankment and compacted treated soil liner meets compaction requirements.
2. Elevations and dimensions of embankment and storage area.
3. Elevations and dimensions of the weir overflow structures.