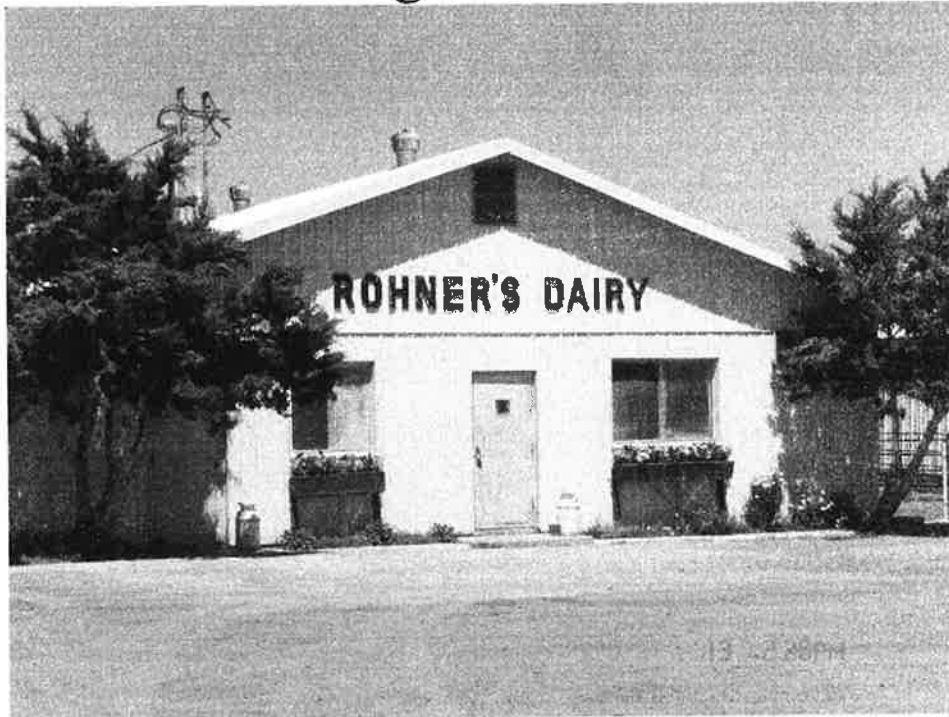


Rohner Dairy

Comprehensive Nutrient Management Plan



Nutrient Management Plan Prepared for:

Jon & Kate Rohner
40535 Pocahontas Road
Baker City, OR 97814

Certified Planner;

Matt Thompson
Engineer, AgTec
(208) 731-8640

As a Certified Conservation Planner, I certify that I have reviewed this plan and have determined that it contains the deliverable items described in the NRCS Statement of Work for a CNMP and appears to be in conformance with NRCS planning policy.

Signature: Matthew W. Thompson Date: 11/2/05

Name: Matthew W. Thompson

Title: Engineer / Certified

RECEIVED
NOV 16 2005
NATURAL RESOURCES
DIVISION

62653
05216
-DUE: 12/31/05

SIGNATURE PAGE

OWNER/OPERATOR: Rohner's Dairy Inc John Rohner Pres.
Address & Phone: 40535 Pocahontas Rd
Farm & Tract No: 113-114-115 - 4364

As the Owner/Operator and Decision-Maker, I certify that I have been involved in the planning process for the development of this CNMP. The certified conservation planner has explained the calculations and recommendations, type of records that will be needed to document compliance with the plan, future changes that will require the CNMP to be updated and the basic steps that I will need to take in order to implement the plan. I understand my responsibilities for applying and updating this CNMP in a timely manner and for keeping all necessary records.

Signature:  Date: 11/2/05

NRCS Approval

Signature: _____ Date: _____

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Site Information

Jon & Kate Rohner
40535 Pocahontas Road
Baker City, OR 97814
(541) 523-3785

Basin: Snake River

Office: Baker City Oregon USDA Service Center

Rohner's Dairy is owned and operated by Jon & Kate Rohner. The dairy operation is located at 40535 Pocahontas Road, in Baker City Oregon. There are 960 acres owned by the facility and 803 acres utilized for waste application at the present time. The manure is applied with a slinger spreader that is stored in a two week dry storage area and a tanker is used to apply the manure that is stored in the 400,000 gallon earthen storage basin located behind the free stall area. Another solids spreader called the beater spreader is utilized to spread the bedded pack from the dry cow and bred heifer pen. The dairy milks twice a day with an every other day pickup. The heifers are on pasture from 8 months of age until calving except for 2 months at 15 months of age for breeding. The dry cows are on pasture for 46 of the 60 day dry period. They are brought to the corrals 2 weeks before calving. All the milking cows are housed in free stalls and the calves are housed in a calf barn and young heifer/maternity barn.

The facility operates as a daily haul system. Fresh manure is hauled weekly to the fields. The facility doesn't have enough storage to prevent winter application of solids or slurry.

Production Information

Rohner dairy is currently running 240 milking and 30 dry Holstein cows with an average weight of 1400 pounds, 110 heifers within 12-24 months of age with an average weight of 800 pounds, and 140 calves/heifers from 1-12 months of age with an average weight of 300 pounds. The facility has a production goal of 360 mature cows and 310 heifers. This equates to a goal of 300 milking cows with 60 dry. An additional 136 heifers from 12-24 months of age and 174 heifers from 0-12 months of age. This CNMP has been developed for the production goals of the facility. All dry cows are grazed on the pastures until 2 weeks before calving or freshing. The dry cows are currently pastured on the west 80 acres of the South east dry pasture. Heifers are pastured at 6-8 months of age until 2 weeks before calving. At 15 months of age the heifers are brought back to the corrals to confirm they are bred. This usually takes 45-60 days on average and they are moved to the dry cow pasture after they are confirmed bred. The milking cows are housed in covered free stalls and bedded with sand during the summer and straw during the winter. The facility uses roughly 20- 20 ton loads of sand for 4 months during the summer and 55 bales of straw per week for the remaining 8 months. The calf barn is bedded with wood chips or straw.

The calculated manure and wastewater production for Rohner dairy is 126,080 cubic feet per year. (*See Appendix E for the ORAWM output*)

Currently the free stall manure is scraped to a ramped pit on the east side of the free stalls. Some of the drier solids can be scraped and stacked next to this pit on the south side. This pit is then scooped out with a loader and loaded into a slinger solids spreader. The dairy has several application scenarios. The facility applies to corn stubble before plow down in the fall. After an application is made the section applied is plowed under. Once the ground is too wet for plowing the field is left alone until spring when the remaining portion of the field receives manure and is plowed under. They also apply to pasture after it has been grazed. The facility

applies to pasture ground as it is used throughout the summer and winter months. Barley stubble ground is reserved for winter applications during the worst conditions. The stubble residue reduces manure movement on the field. These fields are plowed under in the spring. Alfalfa ground receives manure applications after the first cutting. The alfalfa typically doesn't receive any other applications during the year. The tanker and spreaders typically will travel approximately ¼ mile to empty a load for the light applications. Most of the ground only receives 1 application of manure per year.

The parlor wash water flows to the earthen storage lagoon on the north side of the facility. This lagoon has dimensions of 150 ft x 47 ft x 10 ft deep and has capacity of roughly 400,000 gallons or 1.2 acre ft as documented in the previous WMP. The lagoon is agitated and pumped into a 3250 gallon tanker wagon to be applied to pasture ground.

Applicable permits or certifications

The dairy currently has an Oregon Confined Animal Feeding Operation Permit. This permit along with a copy of the most recent inspection is located in Appendix C.

Land Application

The field map is located in Appendix B. The dairy owns 960 acres of which 960 acres are available for manure application. Currently the facility only utilizes 800 acres for manure application. All fields receive slurry or solid manure applications. The fields located east and north of the dairy are reserved and utilized for winter emergency application.

Waste Storage Facility

Rohner dairy is currently running 240 milking and 30 dry with an average weight of 1400 pounds, 110 heifers within 12-24 months of age with an average weight of 800 pounds, and 140 calves within 1-24 months of age with an average weight of 300 pounds. The dairy is only running Holsteins at this time. Currently Rohner Dairy is planning on future herd expansion to 360 mature cows and 310 heifers.

The current storage pit is located on the east side of the free stalls and holds manure liquids and solids and has enough storage capacity for 4840 cubic feet or 10 days - 2 weeks. There is an additional pad area to the south of this pit where solids may be stacked. This area is large enough for 120 days of solid stacking. The parlor waste water flows to an earthen lagoon on the north end of the free stalls. The lagoon has capacity for roughly 400,000 gallons of containment capacity. Typically the facility empties the pond 3 times a year. The calculations from ORAWM show the facility needs 1 acre ft of storage to meet the 180 day storage requirement. This storage meets that requirement for the free stall housing of the milk cows. No other facility runoff is contained within this structure. The bred heifer and dry cow pen on the south east corner of the facility is a bedded pack corral. The corral is self contained and no runoff leaves this corral. The extra straw used for bedding absorbs spring runoff and the pack and liquid are removed in the spring and land applied. The remaining animal housing areas are covered. To meet current waste containment requirements the facility must carefully manage its current containment system. The facility must insure that additional runoff doesn't enter the existing storage facility. The facility is required to manage manure applications so that they do not exceed the capacity of the soil and crops to assimilate nutrients and minimize water pollution.

Currently there is approximately 126,080 cubic feet of waste water and manure produced annually. Currently no manure is exported off of dairy property. Manure volume calculations were estimated using ORAWM located in Appendix E.

The storage facilities should be visually inspected in the spring after emptying for damage.

Manure Transfer

Currently the only transfer facility is the PTO agitator pump and loader. The pump lifts the manure slurry into the honey wagon. Since it is used on almost a monthly basis additional inspection and maintenance hasn't been necessary. The loader cleans out the scrape pit for loading into the solids slinger and beater spreader.

Roof Runoff Structure

The covered housing on the dairy doesn't have functioning gutters and down spouts. The facility has installed gutters on some buildings in the past but they have been damaged by snow and ice during the winter. The facility doesn't plan on installing additional gutters.

Conservation Crop Rotation

The farm has several different cropping systems. There is some irrigated crop ground with an alfalfa, corn silage and barley rotation. There is irrigated pasture and hay fields and some non irrigated pasture. The farmed grass hay yields on average of 6ton/per acre. Around 3 ton is removed with the first cutting in the spring and then the fields are grazed the rest of the year. Fields 1-10 are part of the cropping system. The dairy needs roughly 100 acres of corn silage each year. The dairy rotation is 2 years of corn silage at 24.5 ton yield and 5 year of alfalfa at 6 ton yield and 1 year of barley at 2.5 ton straw and 100 bushel grain yield. There is 320 acres of dry land pasture. This pasture is predominately fescue grass. The dry cows are pastured on the west 40 acres of this pasture. The remaining 280 acres is rented out to other producers for grazing. The dairy still utilizes 200 acres of this remaining area for manure applications. Farmed grass hay and pasture fields are predominately orchard grass.

Nutrient Management

Aerial maps of the land application fields are located in Appendix B. Soil sampling is done on a regular basis as part of the farms general practice. Commercial application of fertilizer is based on soil samples. Manure sampling has also been done on a limited basis up to this point in time. The farm has enough acreage to apply all of the dairy nutrients at less than crop phosphorous uptake rates. Utilizing ORAWM the farm is shown to have more removal than application of phosphorous. Since the farm produces all of its own forage, the system is sustainable meaning the farm is not overloading nutrients to the fields.

Soil Sampling

Soil sampling will be required every year to monitor the application of nutrients. If high levels of any or all nutrients are present over an annual amount of time, management strategies should be reevaluated accordingly to balance for nutrient uptake and cease nutrient loading. The producer should review the Soil Test Interpretation Guide located in appendix H to determine if nutrient levels are excessive. The producer may consult with a crop consultant, nutrient management planner or extension agent to assist in the farm soil evaluation. If levels are determined to be high then the producer should consult with an appropriate professional to modify current practices and application rates.

Manure Testing

Manure sampling will be required every year by the facility. 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. The fertilizer guide for pastures is located in Appendix G. At Rohner Dairy a manure sample and analysis shall be obtained from the storage pit and lagoon during the year to determine the amount of nutrients applied to the crops. The sample should be collected after the lagoon is agitated and mixed. This can be done when slurry is being transferred from the lagoon to the tanker wagon. These samples should be taken in the spring to give the best representation of available nutrients for application. At a minimum the sample will be tested for **Total nitrogen (TKN), phosphorus (P), potassium (K) and moisture content (%)**. The test results will be kept at the facility.

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

Crop Nutrient Removal

Crop yield data is to be obtained from the dairy for all crops grown. This information will be kept in appendix J. Crop yield information for this dairy will be based on the amount of forage and crops removed from the fields. Dry matter yields are calculated by multiplying the mean per acre yield value by the acreage and moisture percentage. 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 is derived from book values for the type of crop grown. It is recommended that a forage quality analysis be tested annually to check for actual nutrient removal and to insure adequate nutrients are being fed to animals to achieve production goals.

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 increase or decrease in application compared to last years review on a pound per pound basis.

Waste Utilization

At this time, manure application will occur on a monthly basis all year long. The dairy will need to manage its existing storage facilities so that application during precipitation events is not necessary. The fields next to the dairy toward the east fields 3,4,9,10 and the meadow pasture are reserved for emergency application. These fields are the low point of the area and no runoff leaves these fields. This will prevent discharge to surface waters.

The expected nutrient uptake from the crops are as follows:

	Uptake		
	N	P2O5	K2O
Pasture	319	118	134
Alfalfa	270	60	270
Barley	128	51	100
Corn Silage	539	281	644
Fescue	88	43	121

These values were calculated in ORAWM located in appendix E.

The tanker holds 3250 gallons and has a spread width of approximately 24 feet. The operator normally travels 1320 feet to empty the tanker. This results in an application rate of 14/23/42 lbs of N, P₂O₅, K₂O respectively calculated from ORAWM and AgTec spreadsheet also located in appendix E. The facility will produce a total of approximately 943,000 gallons of liquid a year.

The slinger wagon holds 280 cubic feet of solids and has a spread width of approximately 30 ft. The operator normally travels 1320 feet to empty the spreader. This results in an application rate of 38/35/67 lbs of N, P₂O₅, and K₂O respectively calculated from ORAWM and AgTec spreadsheet. The facility will produce a total of approximately 265,440 cubic feet of solids a year.

The Beater spreader holds 400 cubic feet of solids and has a spread width of approximately 16 ft. The operator normally travels 1320 feet to empty the spreader. This results in an application rate of 102/95/179 lbs of N, P₂O₅, K₂O respectively calculated from ORAWM and AgTec spreadsheet. This spreader spreads from the same stock pile of solids as the slinger wagon. The beater wagon is typically only used in the spring and it applies typically to barley stubble before plow down. This wagon is used to haul out the bred heifer and dry cow pen bedded pack manure.

This application equipment will need to be calibrated each year. Calibration procedures are outlined in appendix I for this equipment.

Irrigation Water Management

All the fields are irrigated except for the fields to the south across the highway and the dry pasture fields to the south east. Center pivots cover most of the farm with hand lines being used for the remaining corners and field edges. One wheel line is used on the east side of field 8.

The hand lines have 7.5 gpm nozzles and the system is operated at 55 psi and 33 heads at a time can be utilized. This results in a system flow rate of 225 gpm. The head spacing is 40 ft x 60 ft. The set time is 12 hours. The alfalfa fields usually are not irrigated until after first cutting and they then receive 2 irrigations before each of the 2 next cuttings. Each irrigation applies roughly 3.6 inches of water.

The wheel line has 16 gpm heads at 80 x 80 spacing. The set time is also 12 hours and the system pressure is 55 psi. This applies roughly 2.9 inches of water per irrigation. This alfalfa field typically receives irrigation between the 3 cuttings.

The remaining irrigated fields are pivot irrigated. The typical application rate is 1 inch. The facility monitors the soil moisture by hand texture methods to determine when the fields need to be irrigated.

Feed Management

This facility monitors its feeding rations on a regular basis. Every time a new feed source is used a nutritionist balances the feeding ration to cattle requirements to insure optimal production and utilization of feed. The facility raises all of its own forage needs and only imports commodity feeds. The facility exports straw alfalfa and grain on a regular basis so the facility is in a sustainable condition.

Record Keeping

The following items are the required components to be recorded and monitored by the dairy facility. The facility may utilize the record keeping worksheets located in Appendix M but is not required to. The required information must be kept with this Nutrient Management plan but may be kept according to the producer's discretion.

- Soil tests for all fields receiving nutrient applications including commercial fertilizer and animal nutrients. These soil tests shall be taken each year.
- Manure test annually for each manure storage facility that stores manure to be directly applied to the land. This requires this facility to test 1 storage pit and 1 storage lagoon annually for Nitrogen, Phosphorous and Potassium
- Record crop nutrient applications including animal and commercial nutrients. Need to record the Date, field, nutrient source, amount and method applied. The waste application record sheet in appendix M can be utilized to meet this requirement.
- Record crop yields by field.
- Record of on farm inspections of manure handling, storage and application equipment.
- Record of any spill events and measures taken to address such spills.

Mortality Disposal

The facility is currently composting its dead animals. Composting takes place in the north east corner of field 10. This area has slope back toward the field and any runoff is contained within the field. The facility uses straw, dried manure and fresh manure to aid in the composting process. The composting typically takes 3 months to fully decompose the carcass. ODA is currently working on the guidelines for composting of dead animals. The facility is monitoring the piles and turning them with a loader as needed to complete the composting process.

Operation and Maintenance Plan

Waste storage basin -- The lagoon water will be applied to the fields at rates that do not exceed the soils infiltration rate. This will assure no runoff, and proper utilization of the nutrients for the crop during the growing season. The basin should be kept empty as weather permits during the winter to allow storage during in climate weather periods.

Solid waste storage facility -- the solid storage pit is designed to store solid waste for 14 days. Solids are spread throughout the year and incorporated when possible. The facility will be inspected periodically and any structural damage will be repaired.

Manure transport tanker, slinger and spreader -- The manure application equipment shall be inspected periodically for leaks or worn out parts and repairs made as needed. This equipment shall be calibrated annually utilizing the procedures outlined in appendix I.

Portable Pump/agitator -- The basin pump will be operated and maintained according to manufacturer's recommendations. Liquid manure shall be drained from the pump and lines before freezing weather. Pumps will be inspected to prevent debris from wrapping around the impeller. Broken or loose connections will be repaired or replaced as needed.

Waste transfer drain lines- Drain lines will be flushed with clean water as needed to prevent clogging. Lines will be inspected periodically and any leaks or broken sections shall be repaired.

Roofs – Roofs shall be inspected annually. All rusted sections, loose sections, broken trusses, rafters, beams or poles shall be repaired or replaced.

Fences – fences around the waste storage structures shall be inspected periodically. Broken or corroded posts will be replaced. Broken sections will be spliced or replaced. Broken or missing insulators on electric fences will be replaced.

Resources

- *Data Supplied by USDA-NRCS.*
- *Soil information provided by Baker County Natural Resources Conservation Service.*
- *Property Boundary and Acreage Verification – Baker County Natural Resources Conservation Service.*
- *Facility Information – Jon & Kate Rohner (Owner's).*

Any questions regarding nutrient management can be made to your local Natural Resources Conservation Service office (541-523-7121) or to your certified planner (208-731-8640).

Index of Appendices

Appendix A - Location Map

Appendix B – Facility Map

Appendix C – Site Map or Site Plan
Facility ODA Permit and Inspections

Appendix D – Soils Map

Appendix E – Animal Waste Management Worksheet v1.8 Printouts

Appendix F – Phosphorous Index Sheets

Appendix G – Crop Fertilizer Guides

Appendix H – Soil Sampling Guide and Soil Test Interpretation Guide

Appendix I – Record Keeping & NRCS Waste Utilization 633 OR-JS (equipment calibration worksheets and waste application record sheets)

Note: The Appendix page numbers are the page numbers for the beginning of the appendix. Some appendices have many pages within the appendix that are not numbered

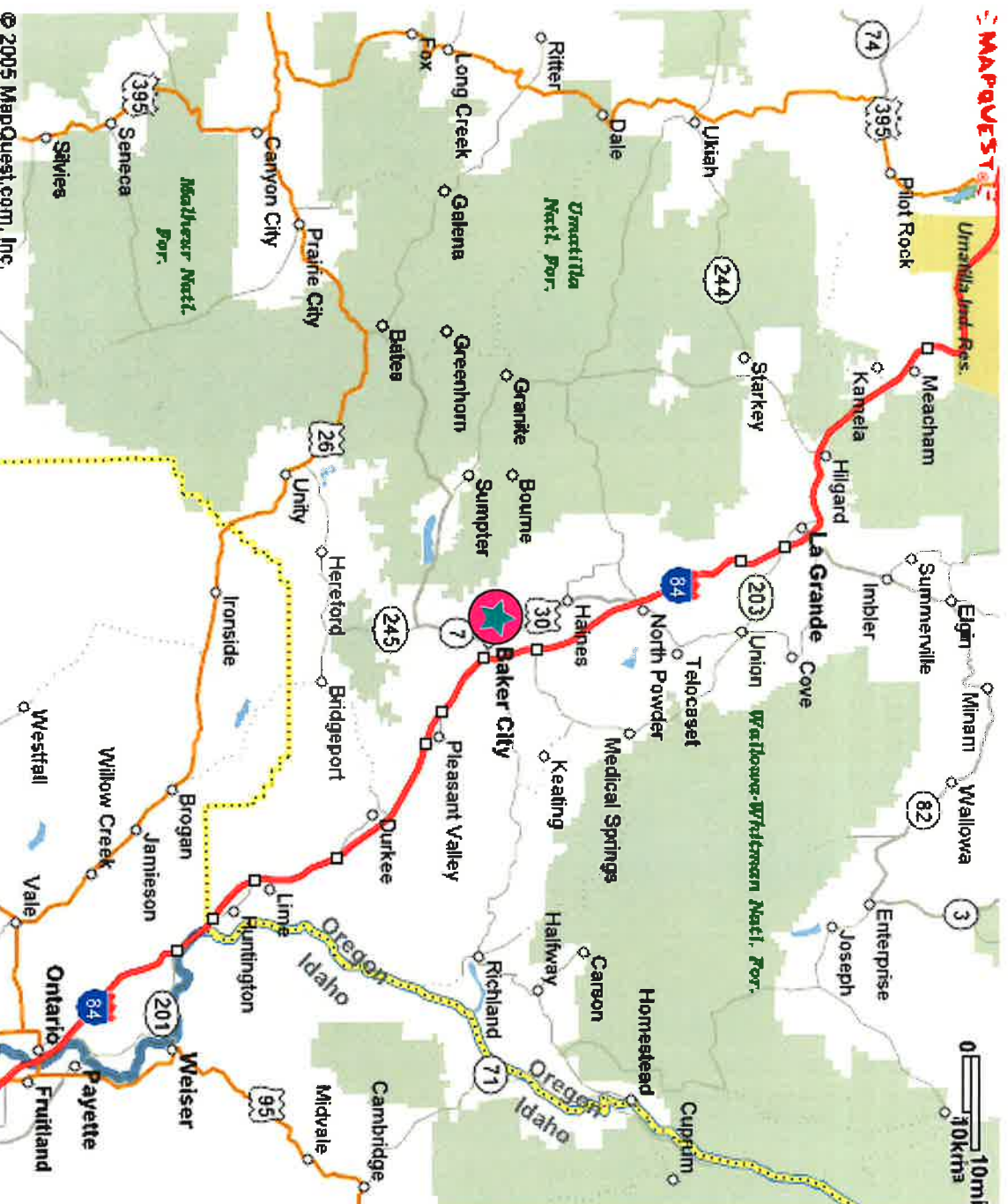
Appendix A -- Location Map

Rohner Dairy

2005

40535 Pocahontas Road

Baker City, OR 97814

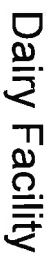


Appendix B -- Facility Map

2005

Tract 113

900 Acres



A = Alfalfa Hay

G = Grain (Barley)

P
=Pasture (Grass)

CS = Corn (Silage)



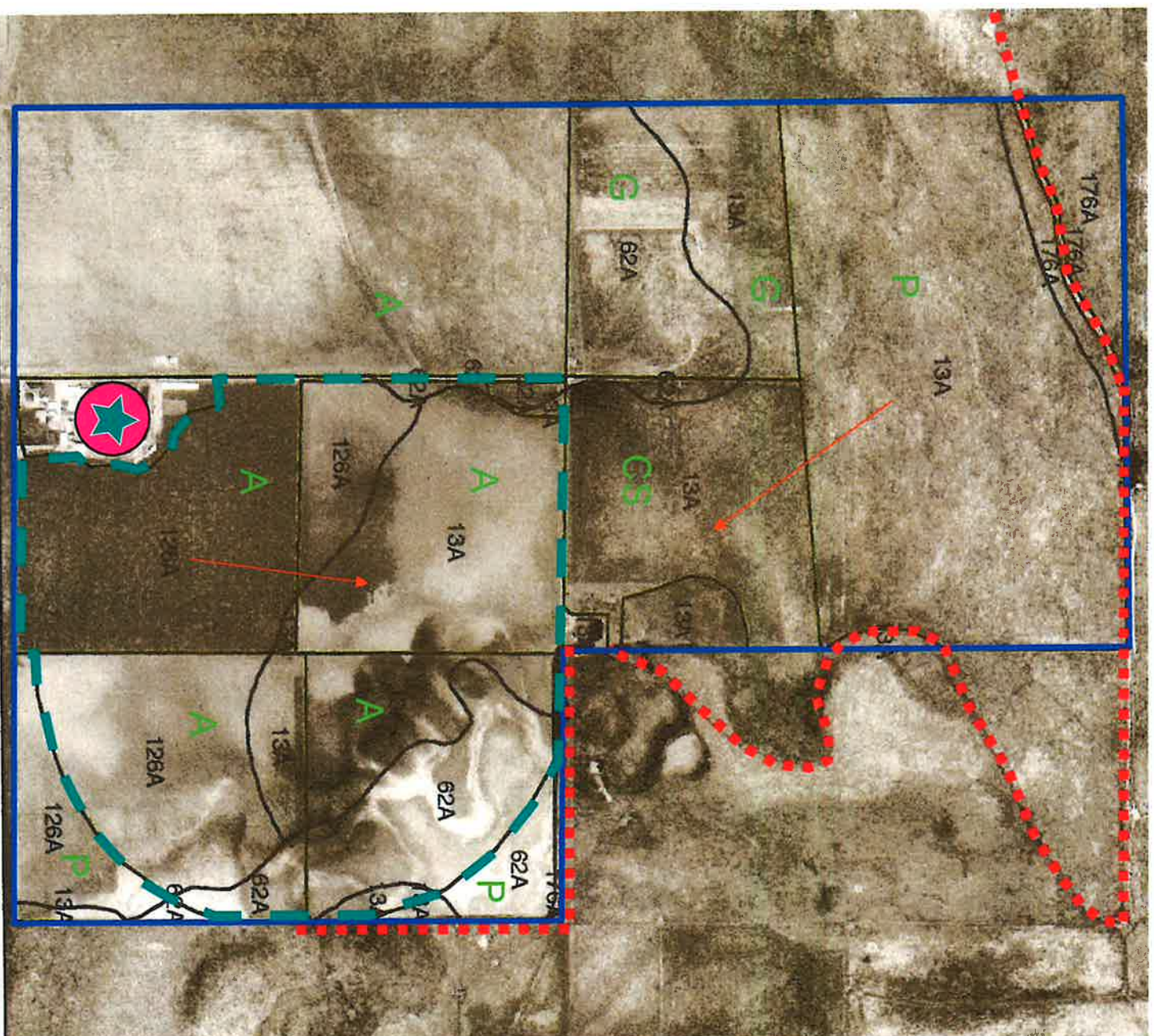
Surface Drainage Ditch



Surface Water Runoff



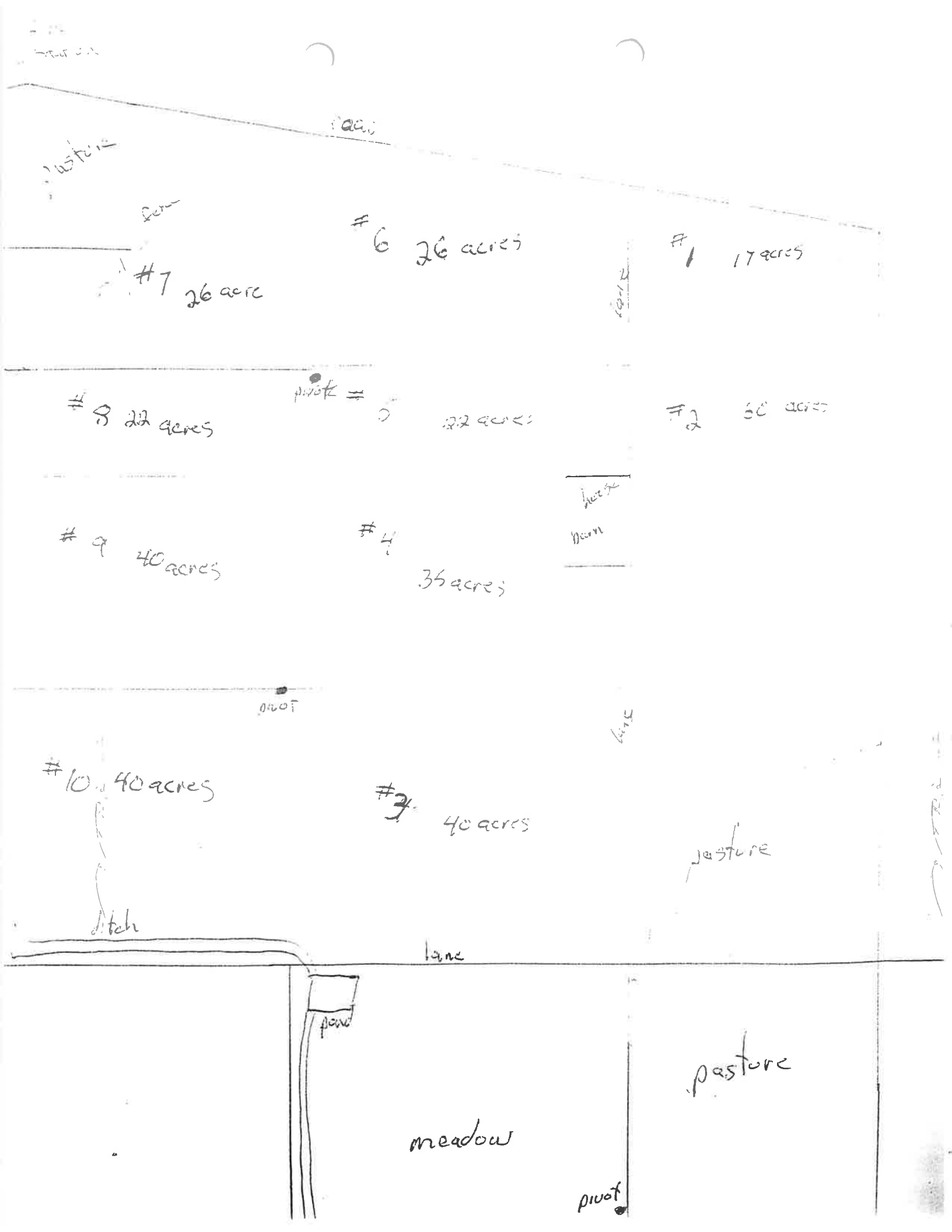
Emergency Winter Application Area





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

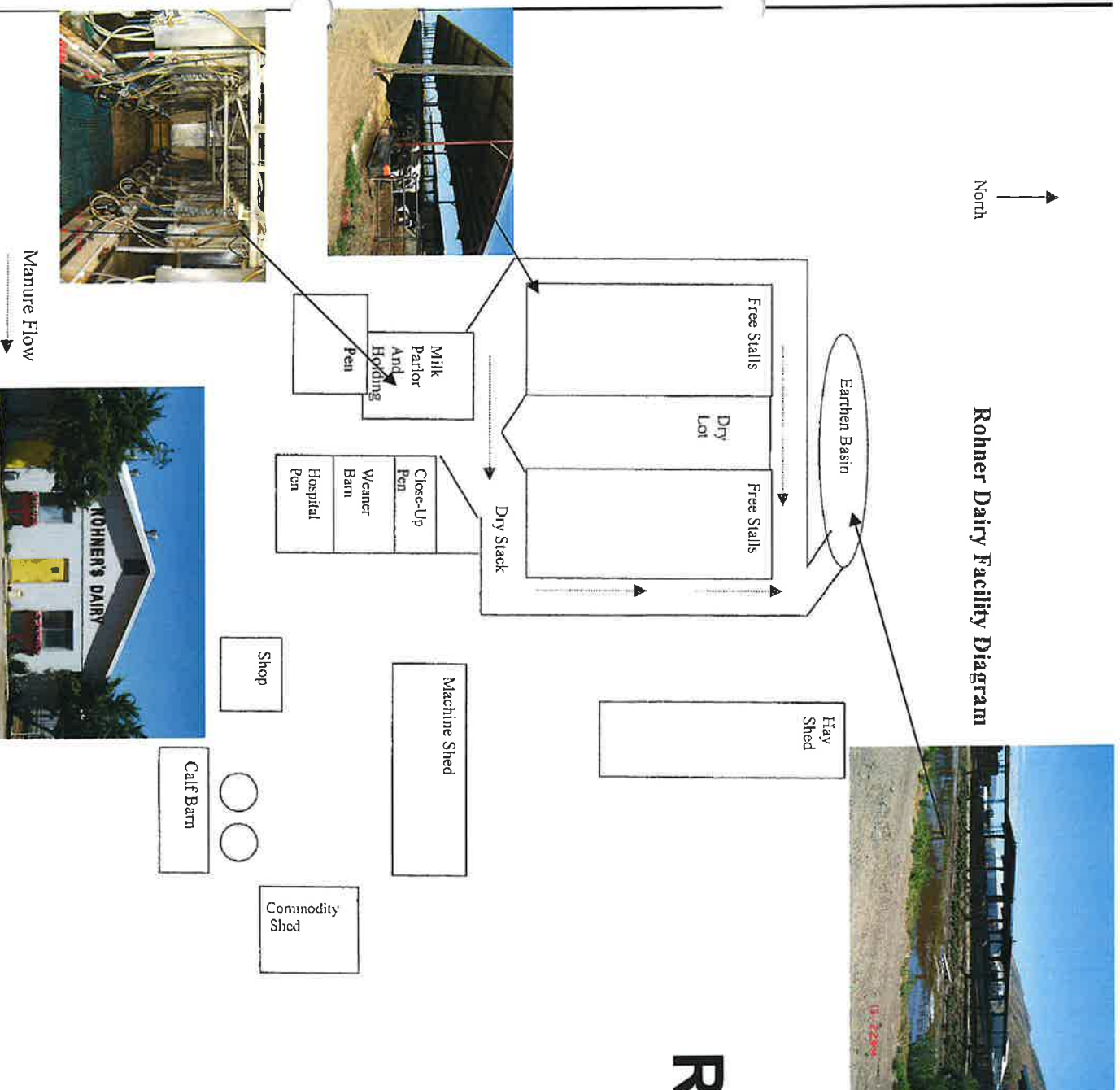




Appendix C – Site Map or Site Plan

North
↑

Rohner Dairy Facility Diagram

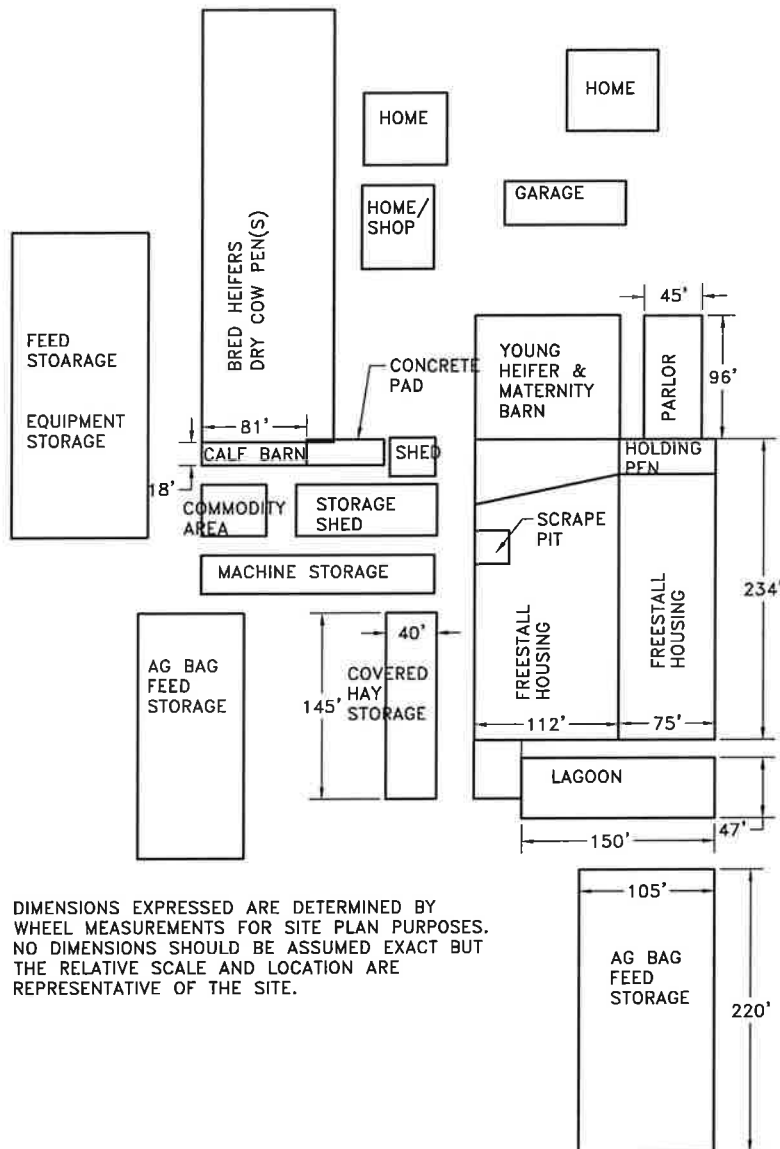


Manure Flow
↓

Rohner Dairy 2005

Site Map

ROHNER DAIRY SITE PLAN



AgTec Engineering & Environmental Associates, LLC

139 River Vista Place #102 -- Twin Falls, ID 83301 -- (208) 731-8640

AG^{TEC}

DESIGNED BY: NA

DRAWN BY: MWT

ROHNER DAIRY SITE PLAN

BAKER CITY -- BAKER

DATE: 10/31/05

FILE NAME: ROHNER JOH.DWG

SCALE: 1" = 150'

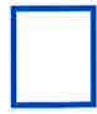
SHEET: 1 OF 1

Appendix D -- Soils Map

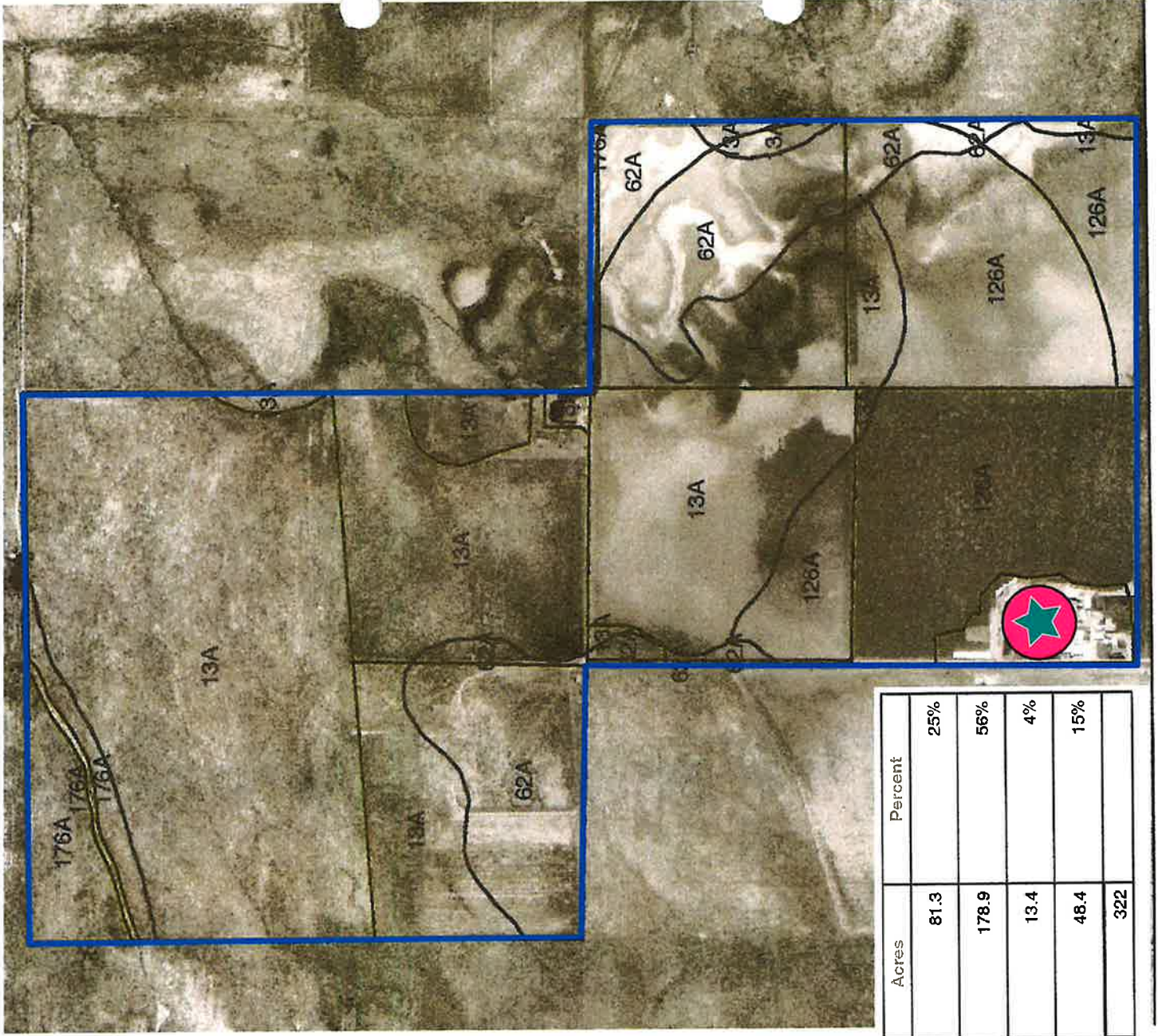
Rohner Dairy

2005

Soils Map

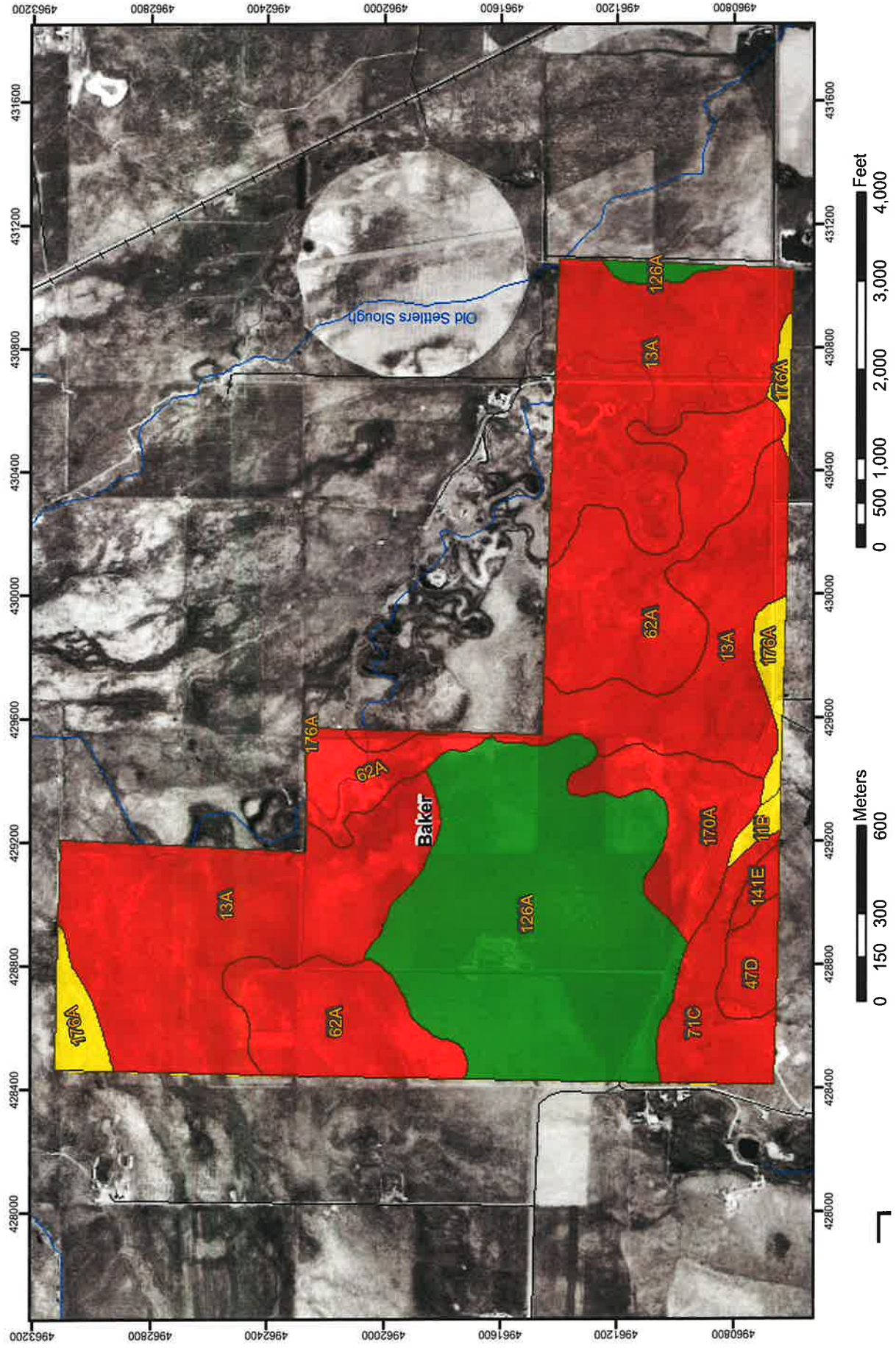
 Rohner Property-
900 Acres

 Dairy Facility



Map Unit Symbol	Map Unit Name	Acres	Percent
126A	POWVAL SILT LOAM, 0 TO 3 PERCENT SLOPES	81.3	25%
13A	BALDOCK SILT LOAM, 0 TO 2 PERCENT SLOPES	178.9	56%
176A	WINGVILLE SILT LOAM, 0 TO 2 PERCENT SLOPES	13.4	4%
62A	HAINES SILT LOAM, 0 TO 2 PERCENT SLOPES	48.4	15%
Total:		322	

MANURE AND FOOD PROCESSING WASTES RATING FOR BAKER COUNTY AREA, OREGON



MANURE AND FOOD PROCESSING WASTES RATING FOR BAKER COUNTY AREA, OREGON

MAP LEGEND

Manure and Food Processing Wastes

{Dominant Condition, >}

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available
- Soil Map Units
- Cities
- Detailed Counties
- Interstate Highways

- Roads
- Rails
- Water
- Hydrography
- Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 11
Soil Survey Area: Baker County Area, Oregon
Spatial Version of Data: 1
Soil Map Compilation Scale: 1:24000

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables - Manure and Food Processing Wastes

Summary by Map Unit - Baker County Area, Oregon

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Total Acres in AOI	Percent of AOI
11B	Baker silt loam, 2 to 7 percent slopes	Somewhat limited	4.3	0.5
13A	Baldock silt loam, 0 to 2 percent slopes	Very limited	403.4	41.8
47D	Durkee gravelly silt loam, 12 to 35 percent south slopes	Very limited	16.1	1.7
62A	Haines silt loam, 0 to 2 percent slopes	Very limited	183.8	19.0
71C	Hibbard silt loam, 7 to 12 percent slopes	Very limited	40.1	4.2
126A	Powval silt loam, 0 to 3 percent slopes	Not limited	233.9	24.2
141E	Roostercomb-Longbranch complex, 35 to 50 percent north slopes	Very limited	5.9	0.6
170A	Umapine silt loam, 0 to 2 percent slopes	Very limited	48.2	5.0
176A	Wingville silt loam, 0 to 2 percent slopes	Somewhat limited	29.4	3.0

Summary by Rating Value

Rating	Total Acres in AOI	Percent of AOI
Very limited	697.4	72.3
Not limited	233.9	24.2
Somewhat limited	33.8	3.5

Description - Manure and Food Processing Wastes

The application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include saturated hydraulic conductivity (Ksat), depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Parameter Summary - Manure and Food Processing Wastes

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

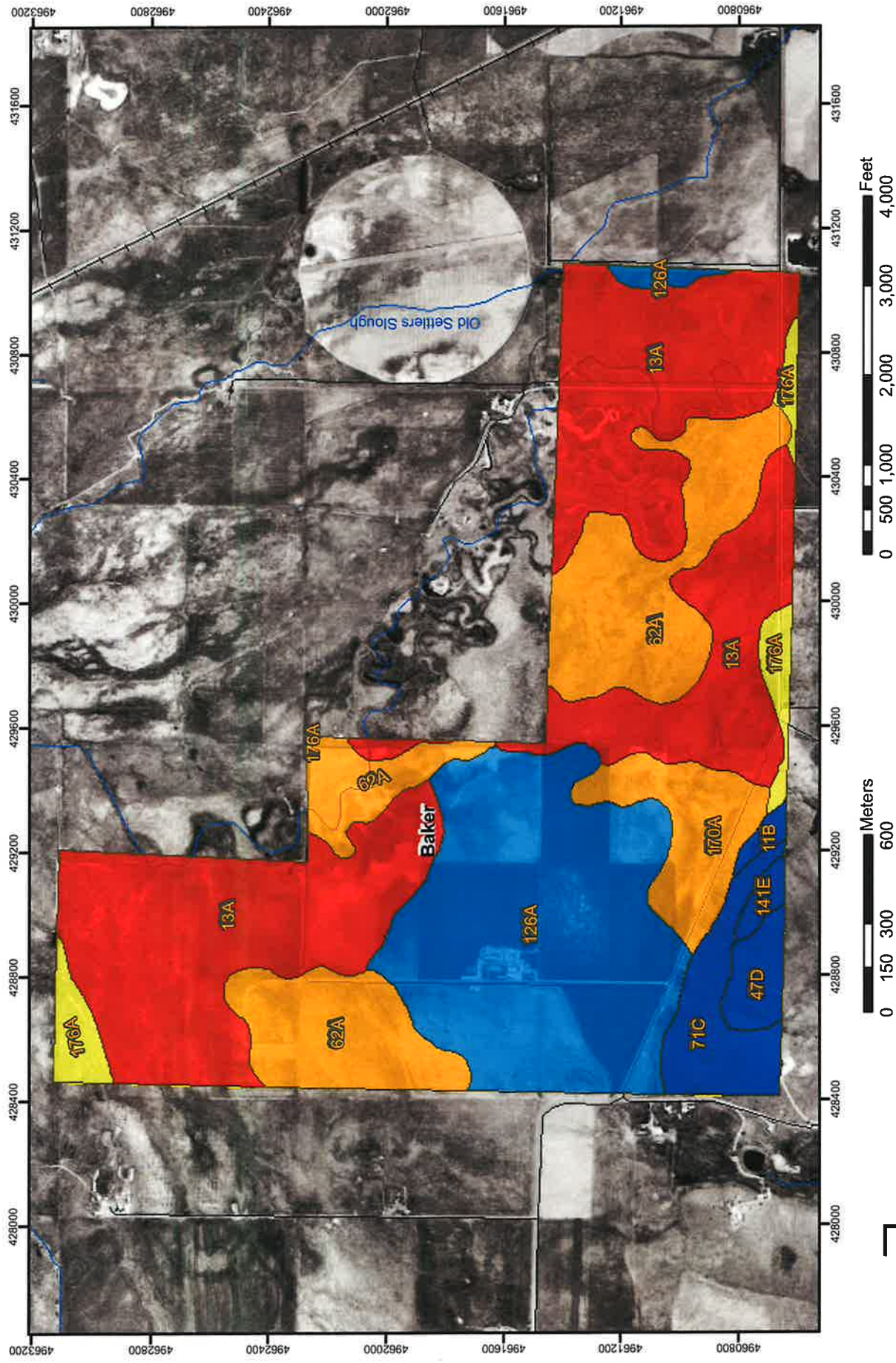
Component Percent Cutoff:

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

DEPTH TO WATER TABLE RATING FOR BAKER COUNTY AREA, OREGON



DEPTH TO WATER TABLE RATING FOR BAKER COUNTY AREA, OREGON

MAP LEGEND

Depth to Water Table

(January to December), {Dominant Condition, <}, [cm]

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200

Soil Map Units

- Cities

Detailed Counties

Interstate Highways

- Roads

- Rails

Water

Hydrography

- Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 11

Soil Survey Area: Baker County Area, Oregon
Spatial Version of Data: 1
Soil Map Compilation Scale: 1:24000

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables - Depth to Water Table

Summary by Map Unit - Baker County Area, Oregon

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating (centimeters)	Total Acres in AOI	Percent of AOI
11B	Baker silt loam, 2 to 7 percent slopes	Null	4.3	0.5
13A	Baldock silt loam, 0 to 2 percent slopes	23	403.4	41.8
47D	Durkee gravelly silt loam, 12 to 35 percent south slopes	Null	16.1	1.7
62A	Haines silt loam, 0 to 2 percent slopes	46	183.8	19.0
71C	Hibbard silt loam, 7 to 12 percent slopes	Null	40.1	4.2
126A	Powval silt loam, 0 to 3 percent slopes	153	233.9	24.2
141E	Roostercomb- Longbranch complex, 35 to 50 percent north slopes	Null	5.9	0.6
170A	Umapine silt loam, 0 to 2 percent slopes	46	48.2	5.0
176A	Wingville silt loam, 0 to 2 percent slopes	69	29.4	3.0

Description - Depth to Water Table

This attribute represents the depth to a water table in the soil during the specified months. Water Table refers to a saturated zone in the soil. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

In the underlying database, this attribute is actually recorded as three separate values. A low value and a high value indicate the range of this attribute for the corresponding component. A "representative" value indicates the expected value of this attribute for the corresponding component. For this soil property, only the representative value is used.

Parameter Summary - Depth to Water Table

Units of Measure: centimeters

Aggregation Method: Dominant Condition

Component Percent Cutoff:

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Depth to Water Table Rating

Beginning Month: January

Ending Month: December

AVAILABLE WATER CAPACITY RATING FOR BAKER COUNTY AREA, OREGON

MAP LEGEND

Available Water Capacity

(0 to 60 in), {Dominant Component, >}, [cm/cm]

- ≤ .070
- > .070 AND ≤ .090
- > .090 AND ≤ .130
- > .130 AND ≤ .180
- > .180 AND ≤ .210
- Not rated or not available
- Soil Map Units
- Cities
- Detailed Counties
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 11

Soil Survey Area: Baker County Area, Oregon

Spatial Version of Data: 1

Soil Map Compilation Scale: 1:24000

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables - Available Water Capacity

Summary by Map Unit - Baker County Area, Oregon

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating (centimeters per centimeter)	Total Acres in AOI	Percent of AOI
11B	Baker silt loam, 2 to 7 percent slopes	0.09	4.3	0.5
13A	Baldock silt loam, 0 to 2 percent slopes	0.18	403.4	41.8
47D	Durkee gravelly silt loam, 12 to 35 percent south slopes	0.13	16.1	1.7
62A	Haines silt loam, 0 to 2 percent slopes	0.17	183.8	19.0
71C	Hibbard silt loam, 7 to 12 percent slopes	0.09	40.1	4.2
126A	Powval silt loam, 0 to 3 percent slopes	0.21	233.9	24.2
141E	Roostercomb-Longbranch complex, 35 to 50 percent north slopes	0.07	5.9	0.6
170A	Umapine silt loam, 0 to 2 percent slopes	0.20	48.2	5.0
176A	Wingville silt loam, 0 to 2 percent slopes	0.20	29.4	3.0

Description - Available Water Capacity

Available water capacity (AWC) refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in centimeters of water per centimeter of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure, with corrections for salinity and fragments. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Available water supply (AWS) is computed as AWC times the thickness of the soil. Example if AWC is 0.15 cm/cm the available water supply for 25 centimeters of soil would be $0.15 * 25 = 3.75$ cm of water.

For each soil horizon or layer in the underlying database, this attribute is actually recorded as three separate values. A low value and a high value indicate the range of this attribute for the corresponding component. A "representative" value indicates the expected value of this attribute for the corresponding component. For this soil property, only the representative value is used.

Parameter Summary - Available Water Capacity

Units of Measure: centimeters per centimeter

Aggregation Method: Dominant Component

Available Water Capacity Rating

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie.

The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Component Percent Cutoff:

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Interpret Nulls as Zero: No

This option indicates if a null value for a component should be converted to zero before aggregation occurs. This will be done only if a map unit has at least one component where this value is not null.

Layer Options: Depth Range

For an attribute of a soil horizon, a depth qualification must be specified. In most cases it is probably most appropriate to specify a fixed depth range, either in centimeters or inches. The Bottom Depth must be greater than the Top Depth, and the Top Depth can be greater than zero. The choice of "inches" or "centimeters" only applies to the depth of soil to be evaluated. It has no influence on the units of measure the data are presented in.

When "Surface Layer" is specified as the depth qualifier, only the surface layer or horizon is considered when deriving a value for a component, but keep in mind that the thickness of the surface layer varies from component to component.

When "All Layers" is specified as the depth qualifier, all layers recorded for a component are considered when deriving the value for that component.

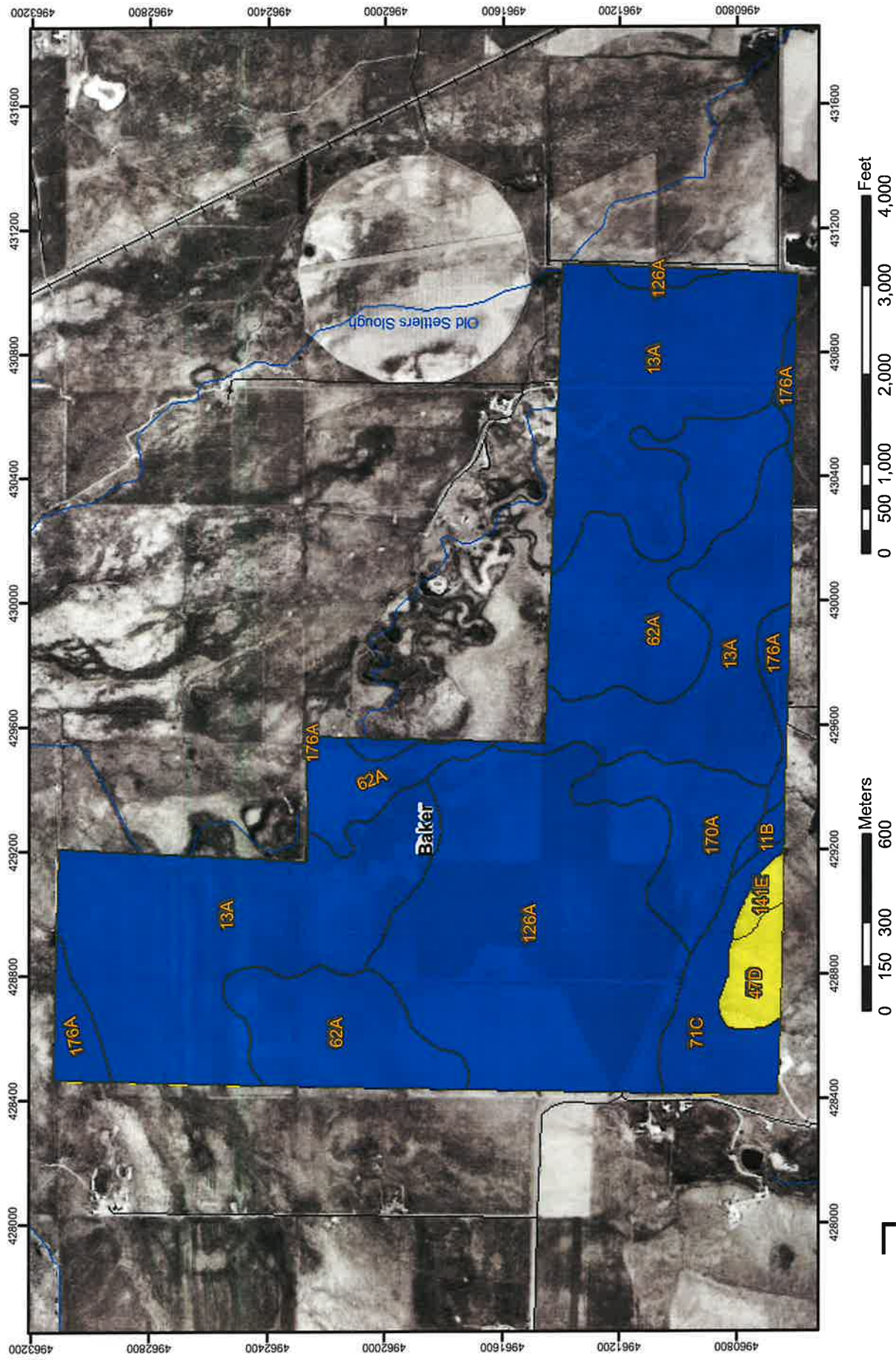
Whenever more than one layer or horizon is considered when deriving a value for a component, and the attribute being aggregated is a numeric attribute, a weighted average value is returned, where the weighting factor is the layer or horizon thickness.

Top Depth: 0

Bottom Depth: 60

Units of Measure: Inches

DEPTH TO SOIL RESTRICTIVE LAYER RATING FOR BAKER COUNTY AREA, OREGON



DEPTH TO SOIL RESTRICTIVE LAYER RATING FOR BAKER COUNTY AREA, OREGON

MAP LEGEND

Depth to Soil Restrictive Layer
(Bedrock (lithic)), {Dominant Condition, <}, [cm]

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Soil Map Units
- Cities
- Detailed Counties
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 11
Soil Survey Area: Baker County Area, Oregon
Spatial Version of Data: 1
Soil Map Compilation Scale: 1:24000

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables - Depth to Soil Restrictive Layer

Summary by Map Unit - Baker County Area, Oregon

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating (centimeters)	Total Acres in AOI	Percent of AOI
11B	Baker silt loam, 2 to 7 percent slopes	Null	4.3	0.5
13A	Baldock silt loam, 0 to 2 percent slopes	Null	403.4	41.8
47D	Durkee gravelly silt loam, 12 to 35 percent south slopes	56	16.1	1.7
62A	Haines silt loam, 0 to 2 percent slopes	Null	183.8	19.0
71C	Hibbard silt loam, 7 to 12 percent slopes	Null	40.1	4.2
126A	Powval silt loam, 0 to 3 percent slopes	Null	233.9	24.2
141E	Roostercomb-Longbranch complex, 35 to 50 percent north slopes	91	5.9	0.6
170A	Umapine silt loam, 0 to 2 percent slopes	Null	48.2	5.0
176A	Wingville silt loam, 0 to 2 percent slopes	Null	29.4	3.0

Description - Depth to Soil Restrictive Layer

A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restricts roots or otherwise provides an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

In the underlying database, this attribute is actually recorded as three separate values. A low value and a high value indicate the range of this attribute for the corresponding component. A "representative" value indicates the expected value of this attribute for the corresponding component. For this soil property, only the representative value is used.

Parameter Summary - Depth to Soil Restrictive Layer

Units of Measure: centimeters

Restriction Kind: Bedrock (lithic)

Aggregation Method: Dominant Condition

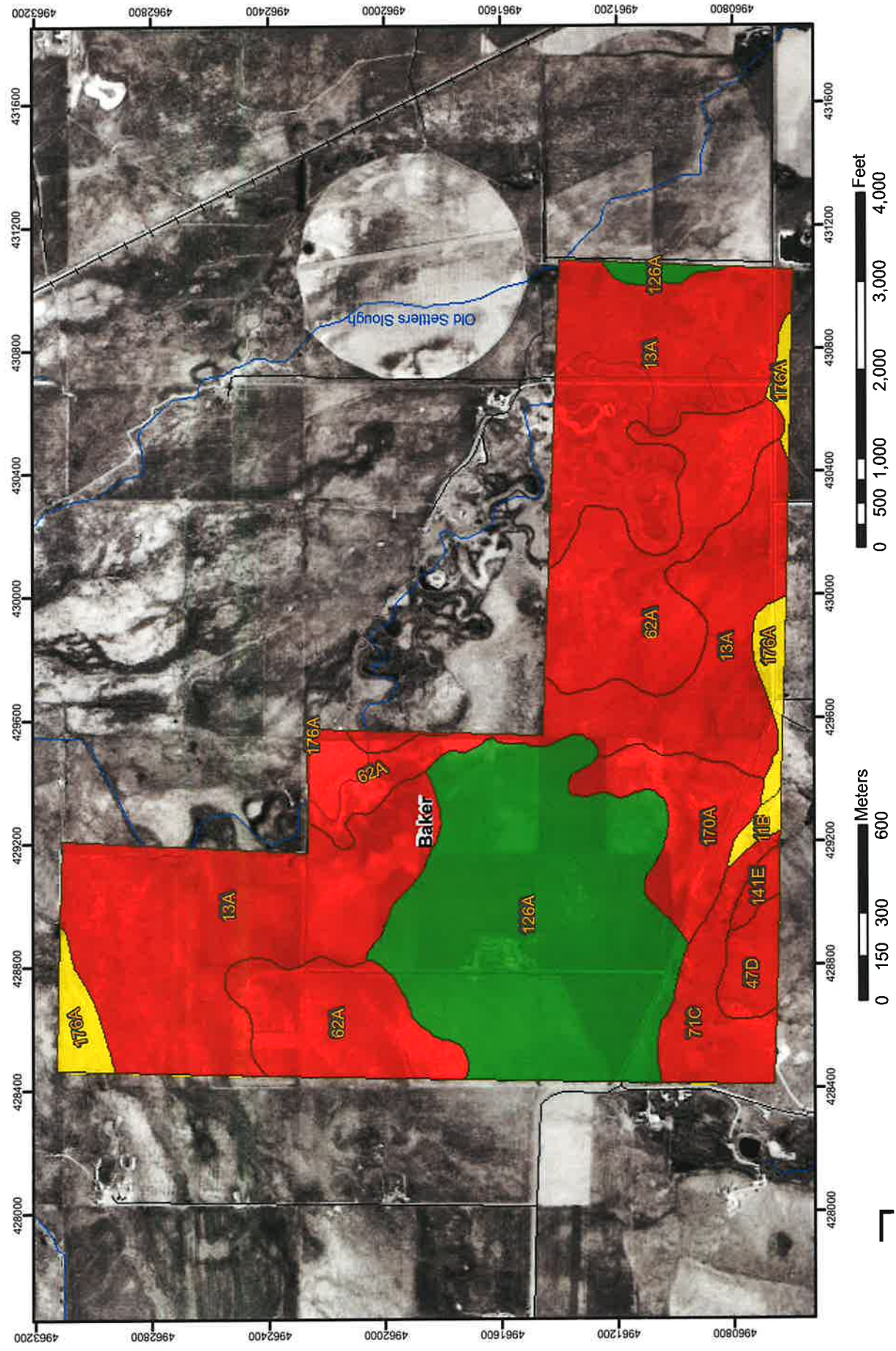
Component Percent Cutoff:

Tie-break Rule: Lower

Depth to Soil Restrictive Layer Ra.

Interpret Nulls as Zero: No

IRRIGATION DISPOSAL OF WASTEWATER RATING FOR BAKER COUNTY AREA, OREGON



IRRIGATION DISPOSAL OF WASTEWATER RATING FOR BAKER COUNTY AREA, OREGON

MAP LEGEND

Irrigation Disposal of Wastewater

{Dominant Condition, >}

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Map Units

- Cities

Detailed Counties

Interstate Highways

- Roads

- Rails

- Water

- Hydrography

- Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 11

Soil Survey Area: Baker County Area, Oregon
Spatial Version of Data: 1
Soil Map Compilation Scale: 1:24000

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables - Irrigation Disposal of Wastewater

Summary by Map Unit - Baker County Area, Oregon

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Total Acres in AOI	Percent of AOI
11B	Baker silt loam, 2 to 7 percent slopes	Somewhat limited	4.3	0.5
13A	Baldock silt loam, 0 to 2 percent slopes	Very limited	403.4	41.8
47D	Durkee gravelly silt loam, 12 to 35 percent south slopes	Very limited	16.1	1.7
62A	Haines silt loam, 0 to 2 percent slopes	Very limited	183.8	19.0
71C	Hibbard silt loam, 7 to 12 percent slopes	Very limited	40.1	4.2
126A	Powval silt loam, 0 to 3 percent slopes	Not limited	233.9	24.2
141E	Roostercomb-Longbranch complex, 35 to 50 percent north slopes	Very limited	5.9	0.6
170A	Umapine silt loam, 0 to 2 percent slopes	Very limited	48.2	5.0
176A	Wingville silt loam, 0 to 2 percent slopes	Somewhat limited	29.4	3.0

Summary by Rating Value

Rating	Total Acres in AOI	Percent of AOI
Very limited	697.4	72.3
Not limited	233.9	24.2
Somewhat limited	33.8	3.5

Description - Irrigation Disposal of Wastewater

Wastewater includes municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. The effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

"Disposal of wastewater by irrigation" not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, Ksat, slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Parameter Summary - Irrigation Disposal of Wastewater

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

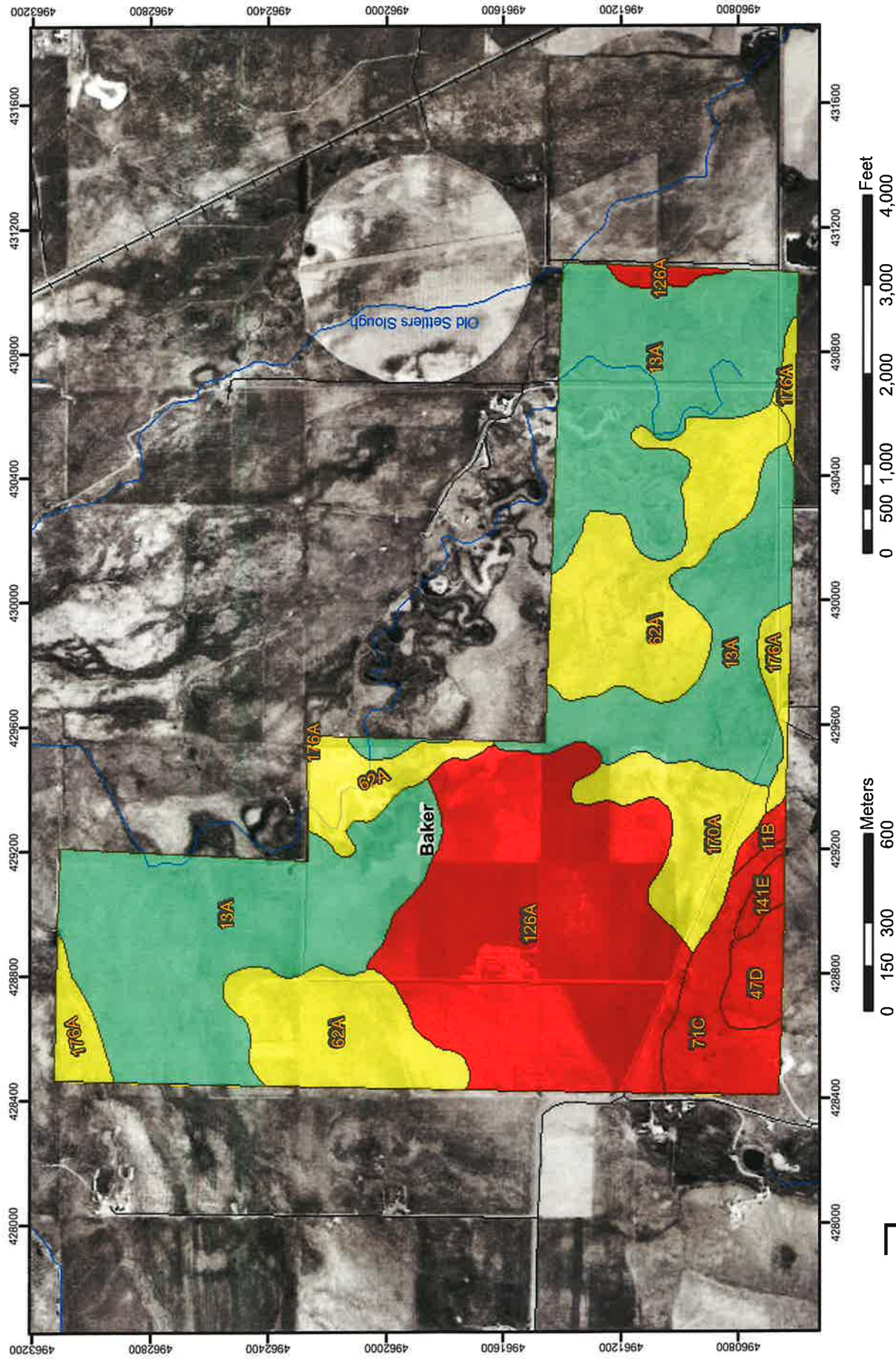
Component Percent Cutoff:

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

FLOODING FREQUENCY CLASS RATING FOR BAKER COUNTY AREA, OREGON



FLOODING FREQUENCY CLASS RATING FOR BAKER COUNTY AREA, OREGON

MAP LEGEND

Flooding Frequency Class

(January to December), {Dominant Condition, >}

- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent
- Soil Map Units
- Cities
- Detailed Counties
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 11

Soil Survey Area: Baker County Area, Oregon
Spatial Version of Data: 1
Soil Map Compilation Scale: 1:24000

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables - Flooding Frequency Class

Summary by Map Unit - Baker County Area, Oregon

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Total Acres in AOI	Percent of AOI
11B	Baker silt loam, 2 to 7 percent slopes	None	4.3	0.5
13A	Baldock silt loam, 0 to 2 percent slopes	Occasional	403.4	41.8
47D	Durkee gravelly silt loam, 12 to 35 percent south slopes	None	16.1	1.7
62A	Haines silt loam, 0 to 2 percent slopes	Rare	183.8	19.0
71C	Hibbard silt loam, 7 to 12 percent slopes	None	40.1	4.2
126A	Powval silt loam, 0 to 3 percent slopes	None	233.9	24.2
141E	Roostercomb-Longbranch complex, 35 to 50 percent north slopes	None	5.9	0.6
170A	Umapine silt loam, 0 to 2 percent slopes	Rare	48.2	5.0
176A	Wingville silt loam, 0 to 2 percent slopes	Rare	29.4	3.0

Description - Flooding Frequency Class

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Flooding frequency class is the number of times flooding occurs over a period of time and is expressed as a class. Flooding Frequency Classes are based on the interpretation of soil properties and other evidence gathered during soil survey field work.

The classes are:

NONE: Flooding is not probable, near 0 percent chance of flooding in any year or less than 1 time in 500 years.

VERY RARE: Flooding is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year).

RARE: Flooding is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year).

OCCASIONAL: Flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year).

FREQUENT: Flooding is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year).

Flooding Frequency Class Rating

percent in any year but is less than 50 percent in all months in any year).

VERY FREQUENT: Flooding is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

Parameter Summary - Flooding Frequency Class

Aggregation Method: Dominant Condition

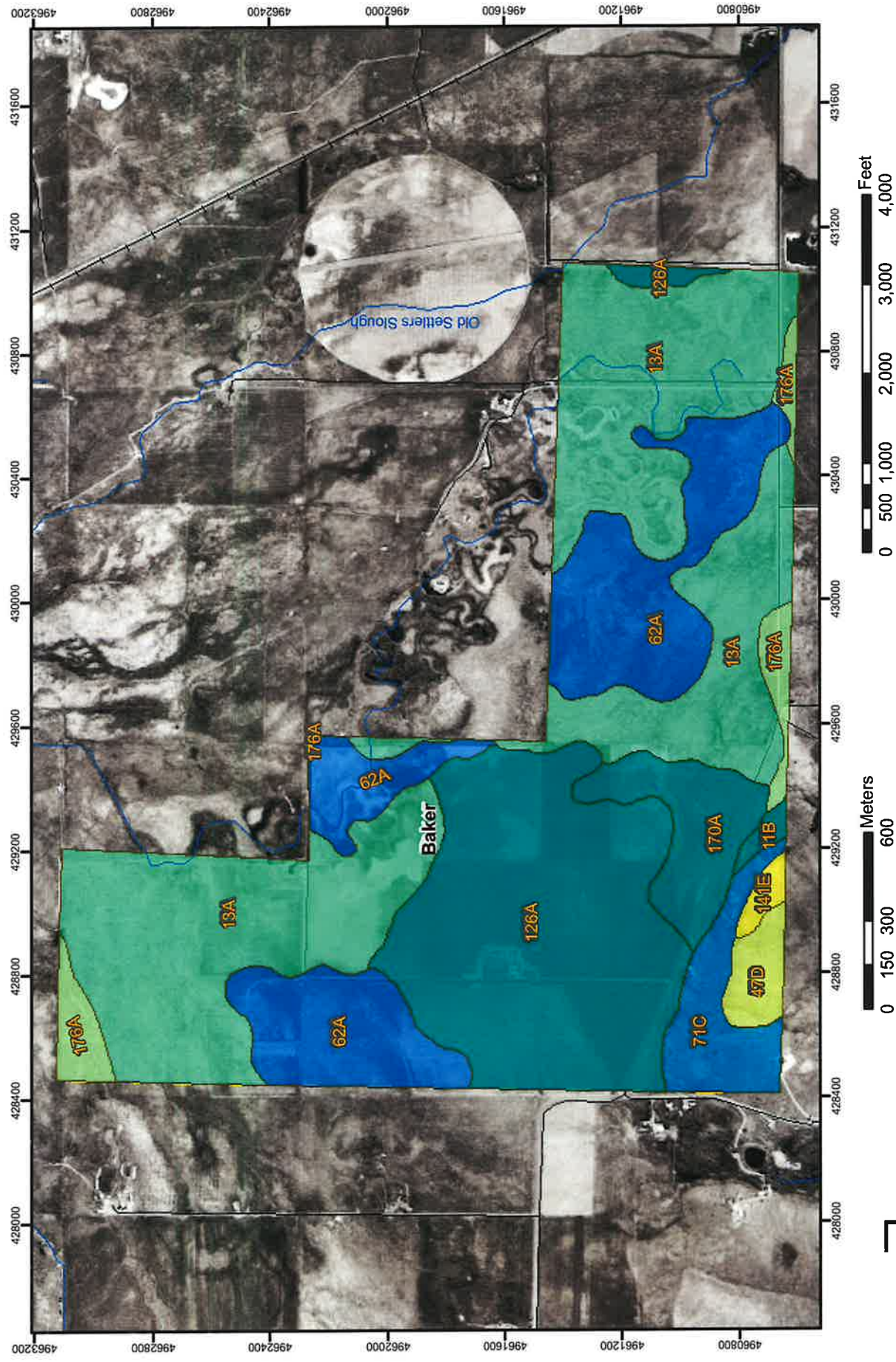
Component Percent Cutoff:

Tie-break Rule: More Frequent

Beginning Month: January

Ending Month: December

K FACTOR - WHOLE SOIL RATING FOR BAKER COUNTY AREA, OREGON



K FACTOR - WHOLE SOIL RATING FOR BAKER COUNTY AREA, OREGON

MAP LEGEND

K Factor - Whole Soil

(Surface Layer), {Dominant Condition, >}



Not rated or not available

Soil Map Units

Cities

Detailed Counties

Interstate Highways

Roads

Rails

Water

Hydrography

Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 11

Soil Survey Area: Baker County Area, Oregon
Spatial Version of Data: 1
Soil Map Compilation Scale: 1:24000

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables - K Factor - Whole Soil

Summary by Map Unit - Baker County Area, Oregon

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Total Acres in AOI	Percent of AOI
11B	Baker silt loam, 2 to 7 percent slopes	.37	4.3	0.5
13A	Baldock silt loam, 0 to 2 percent slopes	.32	403.4	41.8
47D	Durkee gravelly silt loam, 12 to 35 percent south slopes	.24	16.1	1.7
62A	Haines silt loam, 0 to 2 percent slopes	.49	183.8	19.0
71C	Hibbard silt loam, 7 to 12 percent slopes	.43	40.1	4.2
126A	Powval silt loam, 0 to 3 percent slopes	.37	233.9	24.2
141E	Roostercomb-Longbranch complex, 35 to 50 percent north slopes	.20	5.9	0.6
170A	Umapine silt loam, 0 to 2 percent slopes	.37	48.2	5.0
176A	Wingville silt loam, 0 to 2 percent slopes	.28	29.4	3.0

Description - K Factor - Whole Soil

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Parameter Summary - K Factor - Whole Soil

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

K Factor - Whole Soil Rating

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff:

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Layer Options: Surface Layer

For an attribute of a soil horizon, a depth qualification must be specified. In most cases it is probably most appropriate to specify a fixed depth range, either in centimeters or inches. The Bottom Depth must be greater than the Top Depth, and the Top Depth can be greater than zero. The choice of "inches" or "centimeters" only applies to the depth of soil to be evaluated. It has no influence on the units of measure the data are presented in.

When "Surface Layer" is specified as the depth qualifier, only the surface layer or horizon is considered when deriving a value for a component, but keep in mind that the thickness of the surface layer varies from component to component.

When "All Layers" is specified as the depth qualifier, all layers recorded for a component are considered when deriving the value for that component.

Whenever more than one layer or horizon is considered when deriving a value for a component, and the attribute being aggregated is a numeric attribute, a weighted average value is returned, where the weighting factor is the layer or horizon thickness.

12B-Baker silt loam, 2 to 7 percent slopes, warm.

This well drained soil is on low terraces. It is moderately deep to a duripan. It formed in old alluvium influenced by mixed volcanic ash and loess in the surface layer. Areas are long and rectangular and are 40 to 200 acres in size. The native vegetation is mainly bunchgrasses, forbs, and shrubs. Elevation is 2,000 to 2,600 feet. The average annual precipitation is 9 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 125 to 140 days.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The upper part of the subsoil is dark brown and brown silt loam about 8 inches thick. The next part is brown loam about 15 inches thick. The lower part is a duripan about 8 inches thick. The substratum to a depth of 60 inches or more is multicolored extremely gravelly sand. The depth to a duripan generally is 20 to 40 inches. In some areas it is less than 20 inches. In places the soil has a weakly cemented hardpan instead of a duripan.

Included in this unit are small areas of North Powder and Virtue soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability is moderate above the duripan in the Baker soil. Available water capacity is 5 to 8 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight or moderate.

Most areas are used for irrigated hay and pasture. A few areas are used for small grain or homesite development. This unit also provides habitat for many kinds of wildlife.

Hay and pasture.-If this unit is used for hay and pasture, the main limitation is the rooting depth. Ripping and shattering the duripan increase the effective rooting depth and improve internal drainage.

Management that maintains the optimum vigor and quality of forage plants is needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and prevent selective grazing.

In summer irrigation is needed for the maximum production of most crops. Irrigation water can be applied by the sprinkler method. Sprinkler irrigation permits the even, controlled application of water and helps to control runoff. To avoid overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Fertilizer is needed to ensure the optimum growth of grasses, legumes, and other crops. Returning all crop

residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth.

Conducting fieldwork during wet periods results in deterioration of tilth and destroys soil structure. As a result, it increases the runoff rate and the hazard of erosion. Runoff and erosion can be controlled by crop residue management and by rough or minimum tillage. All tillage should be on the contour or across the slope.

Grazing during wet periods results in compaction of the surface layer, poor tilth, and excessive runoff. Compaction limits the movement of air and water in the soil and restricts the growth of roots.

The trees and shrubs grown as windbreaks and environmental plantings should be those that are tolerant of a high content of lime and drought. The free carbonates in the soil tie up minerals and limit their availability. A very low available water capacity may cause severe seedling mortality. Continued cultivation, mulching, or applications of herbicide to control competing vegetation are needed to ensure the establishment and survival of seedlings.

Homesite development.-If this unit is used for homesite development, the main limitations are the moderate depth to a duripan, the sandy substratum, a moderate potential for frost action, and the slope.

On sites for septic tank absorption fields, the moderate depth to a duripan can be overcome by ripping the duripan. Retainer walls should be constructed in shallow excavations to keep cutbanks from caving in. Properly designing foundations, footings, and roads helps to offset the moderate potential for frost action. In the steeper areas the hazard of erosion can be reduced by disturbing only the part of the site that is used for construction.

The Baker soil is in the Loamy 9-12pz range site.

13A-Baldock silt loam, 0 to 2 percent slopes.

This deep, poorly drained soil is on flood plains. It formed in mixed alluvium. Areas are elongated and are 20 to 200 acres in size. The native vegetation is mainly water-tolerant grasses and sedges. Elevation is 2,000 to 3,600 feet. The average annual precipitation is 9 to 12 inches, the average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 110 to 140 days.

Typically, the surface layer is very dark grayish brown and very dark gray silt loam about 6 inches thick. The next layer is dark gray silt loam about 12 inches thick. The upper part of the substratum is dark gray, mottled silt loam. It extends to a depth of about 36 inches. The lower part to a depth of 60 inches or more is gleyed dark grayish brown silt loam.

Included in this unit are small areas of Balm, Haines,

and Boyce soils. Also included are small areas of Wingdale and Wingville soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability is moderate in the Baldock soil. Available water capacity is 9 to 13 inches. The effective rooting depth is limited by a seasonal high water table within a depth of 1.5 feet in winter and spring. This soil is occasionally flooded for brief periods in winter and spring. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for hay and pasture. It also provides habitat for many kinds of wildlife.

Hay and pasture.-If this unit is used for hay and pasture, the main limitation is the seasonal high water table. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill.

Grazing during wet periods results in compaction of the surface layer, poor tilth, and increased runoff. Conducting fieldwork during wet periods results in deterioration of tilth and destroys soil structure. As a result, it increases the runoff rate and the hazard of erosion. Compaction limits the movement of air and water in the soil and restricts the growth of roots.

Fertilizer is needed to ensure the optimum growth of grasses and legumes.

In summer irrigation is needed for the maximum production of hay. Controlled surface irrigation is a suitable method of applying water. Leveling helps to ensure the uniform application of water. To avoid overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and prevent selective grazing.

Because of salt concentrations, the selection of trees and shrubs that can be grown as windbreaks and environmental plantings is limited and seedling mortality is severe. The species selected for planting should be those that can withstand excess moisture. Spring planting may be delayed because of the excess moisture.

The Baldock soil is in the Wet Meadow range site.

14D-Baldrige very gravelly loam, 12 to 35 percent south slopes. This deep, well drained soil is on mountains. It formed in colluvium derived from rhyolite and andesite. Areas are irregular in shape and are 80 to 200 acres in size. The native vegetation is mainly bunchgrasses, shrubs, and forbs. Elevation is

4,000 to 6,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 60 to 90 days.

Typically, the surface layer is very dark brown very gravelly loam about 14 inches thick. The upper part of the subsoil is very dark grayish brown very gravelly loam about 16 inches thick. The lower part is dark grayish brown extremely cobbly loam about 17 inches thick. The substratum to a depth of 60 inches or more is light brownish gray extremely cobbly sandy loam.

Included in this unit are small areas of Segundo soils. Also included are small areas of Anatone and Stavely soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability is moderate in the Baldrige soil. Available water capacity is 3 to 8 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate or high.

This unit is used mainly for livestock grazing. It also provides habitat for many kinds of wildlife.

Livestock grazing.-The potential plant community on this unit is dominated by mountain big sagebrush, buckwheat, bluebunch wheatgrass, and needlegrass.

Bluebunch wheatgrass is the major forage-producing plant. If the site is in excellent condition, the total annual production is estimated at 1,600 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

If the condition of the site deteriorates through overgrazing, bluebunch wheatgrass loses vigor and decreases in extent. Blue wildrye, buckwheat, and mountain big sagebrush increase in extent. If deterioration continues, the extent of needlegrass and blue wildrye decreases and annual grasses and forbs invade the site.

The Baldrige soil is in the High Mountain Loam 18+pz range site.

14E-Baldrige very gravelly loam, 35 to 50 percent south slopes. This deep, well drained soil is on mountains. It formed in colluvium derived from rhyolite and andesite. Areas are irregular in shape and are 80 to 200 acres in size. The native vegetation is mainly bunchgrasses, shrubs, and forbs. Elevation is 4,000 to 6,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 60 to 90 days.

Typically, the surface layer is very dark brown very gravelly loam about 14 inches thick. The upper part of the subsoil is very dark grayish brown very gravelly loam about 16 inches thick. The lower part is dark

acre in favorable years and 1,000 pounds per acre in unfavorable years. Livestock access is limited by the slope and the rock fragments on the surface.

The potential plant community on the Snell soil is dominated by Idaho fescue and common snowberry.

Idaho fescue is the major forage-producing plant. If the site is in excellent condition, the total annual production is estimated at 2,200 pounds per acre in favorable years and 1,200 pounds per acre in unfavorable years. Livestock access is limited by the slope and the rock fragments on the surface.

If the condition of the site deteriorates through overgrazing, bluebunch wheatgrass and Idaho fescue lose vigor and decrease in extent. Sandberg bluegrass increases in extent. If deterioration continues, cheatgrass, soft brome, and other annual plants invade the site.

Mechanical treatment is not practical for brush control and range seeding because of the slope and the very cobbly surface.

The Gwinly soil is in the Shallow South 14+pz range site. The Immig soil is in the South 14-17pz range site. The Snell soil is in the North 14-17pz range site.

61D-Gwinly-Rockly complex, 12 to 35 percent south slopes. This map unit is on hills. Areas are irregular in shape and are 40 to 200 acres in size. The native vegetation is mainly bunchgrasses and forbs. Elevation is 2,500 to 4,000 feet. The average annual precipitation is 14 to 20 inches, the average annual air temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 120 days.

This unit is about 60 percent Gwinly very cobbly silt loam and 25 percent Rockly very cobbly loam. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the selected scale.

Included in this unit are small areas of Immig soils and Rock outcrop. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Gwinly soil is shallow and well drained. It formed in colluvium derived from basalt and influenced by loess and volcanic ash in the surface layer. Typically, the surface layer is very dark brown very cobbly silt loam about 3 inches thick. The upper 5 inches of the subsoil is very dark brown very cobbly silty clay loam. The lower 9 inches is dark brown extremely cobbly clay. The depth to bedrock is 10 to 20 inches.

Permeability is slow in the Gwinly soil. Available water capacity is 1 to 2 inches. The effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate or high.

The Rockly soil is very shallow and well drained. It

formed in loess and in colluvium derived from basalt.

Typically, the surface layer is very dark brown very cobbly loam about 2 inches thick. The subsoil is about 6 inches of dark brown extremely cobbly loam and clay loam. The depth to bedrock is 5 to 10 inches.

Permeability is moderate in the Rockly soil. Available water capacity is 0.5 to 1.0 inch. The effective rooting depth is 5 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate or high.

This unit is used mainly for livestock grazing. It also provides habitat for many kinds of wildlife.

Livestock grazing.-The potential plant community on the Gwinly soil is dominated by bluebunch wheatgrass.

Bluebunch wheatgrass is the major forage-producing plant. If the site is in excellent condition, the production is estimated at 1,200 pounds per acre in favorable years and 400 pounds per acre in unfavorable years. Livestock access is limited by the rock fragments on the surface.

The potential plant community on the Rockly soil is dominated by Sandberg bluegrass, bluebunch wheatgrass, stiff sagebrush, and lomatium.

Sandberg bluegrass and bluebunch wheatgrass are the major forage-producing plants. If the site is in excellent condition, the total annual production is estimated at 600 pounds per acre in favorable years and 200 pounds per acre in unfavorable years. Livestock access is limited by the rock fragments on the surface.

If the condition of the site deteriorates through overgrazing, bluebunch wheatgrass loses vigor and decreases in extent. Sandberg bluegrass increases in extent. If deterioration continues, cheatgrass, soft brome, and other annual plants invade the site.

Mechanical treatment is not practical for brush control and range seeding because of the very cobbly surface.

The Gwinly soil is in the Shallow South 14+pz range site. The Rockly soil is in the Very Shallow 14+pz range site.

62A-Haines silt loam, 0 to 2 percent slopes. This deep, poorly drained soil is on flood plains. It formed in mixed alluvium influenced by volcanic ash in the surface layer. Areas are irregular in shape and are 20 to 200 acres in size. The native vegetation is mainly salt-tolerant grasses and shrubs. Elevation is 2,000 to 3,400 feet. The average annual precipitation is 9 to 12 inches, the average annual air temperature is 45 to 50 degrees F, and the average frost-free period is 110 to 140 days.

Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The next layer is dark grayish brown silt loam about 6 inches thick. The

subsoil is dark grayish brown, mottled silt loam about 21 inches thick. The substratum to a depth of 60 inches or more is grayish brown silt loam and grayish brown, mottled sandy clay loam.

Included in this unit are small areas of Baldock, Burkemont, and Umapine soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability is moderately slow in the Haines soil. Available water capacity is 8 to 10 inches. The effective rooting depth is limited by a seasonal high water table at a depth of 1 to 2 feet in winter and spring. This soil is subject to rare flooding. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture. It also provides habitat for many kinds of wildlife.

Hay and pasture.-If this unit is used for hay and pasture, the main limitations are the seasonal high water table and the high amount of salts in the surface layer.

The concentration of salts and alkali in the surface layer limits the production of plants suitable for hay and pasture. Leaching of the salts from the surface layer is limited by the high water table. A drainage system and good management of irrigation water minimize the concentration of salts. Salt-tolerant species should be selected for planting.

In summer irrigation is needed for the optimum production of hay and pasture. Controlled surface irrigation is a suitable method of applying water. Leveling helps to ensure the uniform application of water. To avoid overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Periodic mowing and clipping help to maintain uniform growth and prevent selective grazing. Proper grazing practices, weed control, and fertilizer are needed to ensure maximum quality of forage.

Conducting fieldwork during wet periods results in deterioration of tilth and destroys soil structure. As a result, it increases the runoff rate. Grazing during wet periods results in compaction of the surface layer. Compaction limits the movement of air in the soil and restricts the growth of roots.

Because of salt concentrations, the selection of trees and shrubs that can be grown as windbreaks and environmental plantings is limited and seedling mortality is severe. The species selected for planting should be those that can withstand excess moisture. Spring planting may be delayed because of the excess moisture.

The Haines soil is in the Sodic Meadow range site.

63A-Halfway clay, 0 to 3 percent slopes. This deep, moderately well drained soil is on alluvial fans and flood plains. It formed in fine-textured mixed alluvium. Areas are irregular in shape and are 20 to 100 acres in size. The native vegetation is mainly bunchgrasses and forbs. Elevation is 2,700 to 3,400 feet. The average annual precipitation is 18 to 22 inches, the average annual air temperature is 45 to 50 degrees F, and the average frost-free period is 110 to 130 days.

Typically, the surface layer is black clay about 22 inches thick. The next layer is very dark brown clay about 8 inches thick. The substratum to a depth of 60 inches or more is dark brown and dark yellowish brown clay loam.

Included in this unit are small areas of Langrell, Hershall, and Catherine soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability is very slow in the Halfway soil. Available water capacity is 7 to 9 inches. The effective rooting depth is limited by a seasonal high water table at a depth of 3 to 5 feet in spring and early summer. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture or small grain. It also is used for homesite development, and it provides habitat for many kinds of wildlife.

Hay and pasture or cropland.-If this unit is used as hayland, pasture, or cropland, the main limitations are the very slow permeability and a high content of clay in the surface layer.

These soils generally are not suitable for deep-rooted perennial crops because adequate drainage usually cannot be maintained in winter and spring. Drainage of this soil is difficult and expensive because the dense clay requires close spacing of the tile drains.

Management that maintains the optimum vigor and quality of forage plants is needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and prevent selective grazing.

Fertilizer is needed to ensure the optimum growth of grasses, legumes, or crops. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain soil fertility and tilth.

In summer irrigation is needed for the maximum production of most crops. The method used generally is governed by the crop grown. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Leveling helps to ensure the uniform application of water. To avoid overirrigation and the

water capacity is 8 to 11 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate or high.

The Xeric Torriorthents are very shallow or shallow and are well drained. They formed in lacustrine sediments. Typically, the surface layer is grayish brown silt loam about 3 inches thick. The substratum is grayish brown silt loam. It extends to a depth of about 7 inches. The depth to consolidated lacustrine sediments is 3 to 20 inches.

Permeability is moderate in the Xeric Torriorthents. Available water capacity is 0.5 inch to 3.0 inches. The effective rooting depth is 3 to 20 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This unit is used mainly for livestock grazing. It also provides habitat for many kinds of wildlife.

Livestock grazing.-The potential plant community on the Poall soil is dominated by bluebunch wheatgrass and Wyoming big sagebrush.

Bluebunch wheatgrass is the major forage-producing plant. If the site is in excellent condition, the total annual production is estimated at 1,200 pounds per acre in favorable years and 400 pounds per acre in unfavorable years.

The potential plant community on the Xeric Torriorthents is dominated by antelope bitterbrush, needleandthread, basin big sagebrush, and rabbitbrush.

Thurber needlegrass and needleandthread are the major forage-producing plants. If the site is in excellent condition, the total annual production is estimated at 1,000 pounds per acre in favorable years and 500 pounds per acre in unfavorable years.

If the condition of the site deteriorates through overgrazing, bluebunch wheatgrass, needlegrass, and antelope bitterbrush lose vigor and decrease in extent. Sandberg bluegrass and Wyoming big sagebrush increase in extent. If deterioration continues, annual grasses and forbs invade the site.

Brush control on the Xeric Torriorthents is not advisable because of the value of antelope bitterbrush for wildlife.

The Poall soil is in the Clayey South 9-12pz range site. The Xeric Torriorthents are in the Terrace Escarpment 9-12pz range site.

126A-Powval silt loam, 0 to 3 percent slopes. This deep, well drained soil is on low terraces. It formed in mixed alluvium influenced by volcanic ash. Areas are irregular in shape and are 20 to 80 acres in size. The vegetation in areas that have not been cultivated is mainly bunchgrasses and forbs. Elevation is 2,600 to 3,500 feet. The average annual precipitation is about 9 to 12 inches, the average annual air temperature is 45

to 47 degrees F, and the average frost-free period is 110 to 125 days.

Typically, the surface layer is very dark grayish brown silt loam about 13 inches thick. The upper part of the subsoil is dark brown silt loam about 19 inches thick. The lower part to a depth of 60 inches or more is very dark grayish brown silt loam.

Included in this unit are small areas of Jett and Wingville soils. Also included are small areas of Baker and Goodrich soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability is moderate in the Powval soil. Available water capacity is 10 to 14 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table fluctuates between depths of 4 and 6 feet during the spring of the year.

This unit is used mainly for irrigated small grain, potatoes, hay, and pasture. It also is used for homesites, and it provides habitat for many kinds of wildlife.

Hay and pasture or cropland.-This unit is well suited to irrigated hay, pasture, and crops. It has few limitations.

Fertilizer is needed to ensure the optimum growth of grasses, legumes, and crops. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain soil fertility and tilth.

In summer irrigation is needed for the maximum production of most crops. Irrigation water can be applied by the controlled surface and sprinkler methods. Sprinkler irrigation permits the even, controlled application of water and helps to control runoff. Leveling helps to ensure the uniform application of water (fig. 9). To avoid overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Management that maintains the optimum vigor and quality of forage plants is needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and prevent selective grazing.

Maintaining crop residue on or near the surface can help to control runoff and soil blowing and maintain tilth and the organic matter content. Conducting fieldwork during wet periods results in deterioration of tilth and destroys soil structure. As a result, it increases the runoff rate and the hazard of erosion. Compaction limits the movement of air and water in the soil and restricts the growth of roots. Excessive cultivation can result in



Figure 9.-Land leveling on Powval silt loam, 0 to 3 percent slopes.

the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

The trees and shrubs grown as windbreaks and environmental plantings should be those that are tolerant of a high content of lime. The free carbonates in the soil tie up minerals and limit their availability. Cultivation or applications of herbicide help to remove competing vegetation.

Homesite development.-If this unit is used for homesite development, the main limitations are the potential for frost action, moderate wetness, and the restricted permeability.

Properly designing foundations, footings, and roads helps to offset the potential for frost action. Local roads and streets may require a special base to prevent the damage caused by frost heaving.

Septic tank absorption fields may function poorly because of wetness late in winter and in spring. If the Powval soil is used for septic tank absorption fields, the

moderate permeability can be overcome by increasing the size of the absorption fields.

In summer irrigation is needed in areas used for lawns, shrubs, vines, or trees.

The Powval soil is in the Loamy Bottom range site.

127A-Powval silt loam, 0 to 3 percent slopes, warm.

This deep, well drained soil is on low terraces. It formed in mixed alluvium high in volcanic ash. Areas are irregular in shape and are 20 to 100 acres in size. The vegetation in areas that have not been cultivated is mainly bunchgrasses, forbs, and shrubs. Elevation is 2,200 to 2,600 feet. The average annual precipitation is 9 to 12 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 125 to 140 days.

Typically, the surface layer is very dark grayish brown silt loam about 13 inches thick. The upper part of the subsoil is dark brown silt loam about 19 inches

the surface layer. Areas are irregular in shape and are 20 to 200 acres in size. The native vegetation is mainly water-tolerant grasses and sedges. Elevation is 2,200 to 3,400 feet. The average annual precipitation is 9 to 12 inches, the average annual air temperature is 45 to 50 degrees F, and the frost-free period is 110 to 140 days.

Typically, the surface layer is black and very dark gray silt loam about 23 inches thick. The next layer is very dark grayish brown, mottled silt loam. It extends to a depth of about 34 inches. The substratum to a depth of 60 inches or more is dark grayish brown and dark gray silty clay loam and gravelly silty clay loam.

Included in this unit are small areas of Wingville and Baldock soils. Also included are small areas of Balm and Haines soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability is moderately slow in the Wingdale soil. Available water capacity is 10 to 12 inches. The effective rooting depth is limited by a seasonal high water table within a depth of 1.5 feet in spring. This soil is occasionally flooded for brief periods in spring. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture. It also provides habitat for many kinds of wildlife.

Hay and pasture.-If this unit is used for hay and pasture, the main limitation is the seasonal high water table. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill. Grazing during wet periods results in compaction of the surface layer, poor tilth, and excessive runoff. Conducting fieldwork during wet periods results in deterioration of tilth and destroys soil structure. As a result, it increases the runoff rate and the hazard of erosion. Compaction limits the movement of air and water in the soil and restricts the growth of roots.

Fertilizer is needed to ensure the optimum growth of grasses and legumes.

In summer irrigation is needed for the maximum production of most hay crops. Controlled surface irrigation is a suitable method of applying water. Leveling helps to ensure the uniform application of water. To avoid overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Management that maintains the optimum vigor and quality of forage plants is needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and prevent selective grazing.

Because of salt concentrations, the selection of trees

and shrubs that can be grown as windbreaks and environmental plantings is limited and seedling mortality is severe. The species selected for planting should be those that can withstand excess moisture. Spring planting may be delayed because of the excess moisture.

The Wingdale soil is in the Wet Meadow range site.

176A-Wingville silt loam, 0 to 2 percent slopes.

This deep, somewhat poorly drained soil is on alluvial fans and broad alluvial terraces. It formed in mixed alluvium influenced by volcanic ash in the surface layer. Areas are irregular in shape and are 20 to 200 acres in size. The native vegetation is mainly grasses and sedges. Elevation is 2,200 to 3,600 feet. The average annual precipitation is 9 to 12 inches, the average annual air temperature is 45 to 50 degrees F, and the average annual frost-free period is 110 to 140 days.

Typically, the surface layer is black and very dark gray silt loam about 23 inches thick. The next layer is very dark grayish brown, mottled silt loam about 10 inches thick. The upper part of the substratum is light brownish gray and olive gray silt loam and silty clay loam. It extends to a depth of about 53 inches. The lower part to a depth of 60 inches or more is gravelly silt loam.

Included in this unit are small areas of Goodrich and Baker soils. Also included are small areas of Baldock and Wingdale soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability is moderate to a depth of about 8 inches in the Wingville soil and moderately slow below that depth. Available water capacity is 11 to 13 inches. The effective rooting depth is limited by a seasonal high water table at a depth of 1.5 to 3.0 feet in spring. This soil is subject to rare flooding. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture. It also provides habitat for many kinds of wildlife.

Hay and pasture.-If this unit is used for hay and pasture, the main limitation is the high water table. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill.

Grazing during wet periods results in compaction of the surface layer, poor tilth, and excessive runoff. Conducting fieldwork during wet periods results in deterioration of tilth and destroys soil structure. Compaction limits the movement of air and water in the soil and restricts the growth of roots.

Fertilizer is needed to ensure the optimum growth of grasses and legumes.

In summer irrigation is needed for the maximum production of most hay crops. Controlled surface

irrigation is a suitable method of applying water. Leveling helps to ensure the uniform application of water. To avoid overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Management that maintains the optimum vigor and quality of forage plants is needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and prevent selective grazing.

Because of salt concentrations, the selection of trees and shrubs that can be grown as windbreaks and environmental plantings is limited and seedling mortality is severe. The species selected for planting should be those that can withstand excess moisture. Spring planting may be delayed because of the excess moisture.

The Wingville soil is in the Meadow range site.

177E-Xeric Torriorthents, 35 to 60 percent south slopes. These very shallow or shallow, well drained soils are on terrace escarpments. They formed in colluvium and residuum derived from silty lacustrine sediments. Areas are irregular in shape and are 10 to 200 acres in size. The native vegetation is mainly bunchgrasses, forbs, and shrubs. Elevation is 2,200 to 3,600 feet. The average annual precipitation is 9 to 12 inches, the average annual air temperature is 45 to 50 degrees F, and the average frost-free period is 110 to 140 days.

Typically, the surface layer is grayish brown silt loam about 3 inches thick. The subsoil is grayish brown silt loam about 4 inches thick. Lacustrine sediments are at a depth of 7 inches. The depth to lacustrine sediments ranges from 3 to 20 inches.

Included in this unit are small areas of Oxman, Encina, and Poall soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability is moderate in the Xeric Torriorthents. Available water capacity is 0.5 inch to 2.0 inches. The effective rooting depth is 3 to 20 inches. Runoff is rapid, and the hazard of water erosion is high or very high.

This unit is used mainly for wildlife habitat. It is not suitable for livestock grazing because of fragile, steep, and unstable slopes.

Livestock grazing.-The potential plant community on this unit is dominated by antelope bitterbrush, needleandthread, and basin big sagebrush.

Antelope bitterbrush and needleandthread are the major forage-producing plants for wildlife. If the site is in

excellent condition, the total annual production is estimated at 1,000 pounds per acre in favorable years and 500 pounds per acre in unfavorable years. Usable production suitable for wildlife is limited by the slope and instability of the soil.

If the condition of the site deteriorates through overgrazing, antelope bitterbrush, needleandthread, Thurber needlegrass, and basin wildrye lose vigor and decrease in extent. Basin big sagebrush and rabbitbrush increase slightly. Cheatgrass and other annual grasses and forbs sparsely invade the site.

Range seeding is not practical because of the slope. Brush control is not advisable because of the value of antelope bitterbrush for wildlife food and cover.

The Xeric Torriorthents are in the Terrace Escarpment 9-12pz range site.

178F-Xeric Torriorthents-Rock outcrop complex, 50 to 80 percent slopes. This map unit is on canyon side slopes. Areas are irregular in shape and are 100 to 400 acres in size. The native vegetation is mainly bunchgrasses, shrubs, and mountain mahogany. Elevation is 2,000 to 4,000 feet. The average annual precipitation is 9 to 12 inches, the average annual air temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 140 days.

This unit is about 60 percent Xeric Torriorthents and 30 percent Rock outcrop. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the selected scale.

Included in this unit are small areas of Rucklick and Ruckles soils. Included areas make up about 10 percent of the total area. The percentage varies from one area to another.

The Xeric Torriorthents are shallow to deep and are excessively drained. They formed in colluvium derived from basalt, andesite, argillite, and gabbro. Typically, the surface layer is grayish brown extremely stony loam about 11 inches thick. The subsoil is light yellowish brown extremely stony loam about 13 inches thick. The depth to hard bedrock is mainly 10 to 60 inches.

Permeability is rapid in the Xeric Torriorthents. Available water capacity is 0.5 inch to 2.0 inches. The effective rooting depth is mainly 10 to 60 inches. Runoff is rapid, and the hazard of water erosion is high or very high.

This unit is used mainly for livestock grazing. It also provides habitat for many kinds of wildlife.

Livestock grazing.-The potential plant community on the Xeric Torriorthents is dominated by curleaf mountainmahogany, bluebunch wheatgrass, antelope bitterbrush, and Nevada greasebush.

Bluebunch wheatgrass is the major forage-producing

Appendix E – Animal Waste Management Worksheets

Rohner Current Manure Application Rate Analysis

Nutrients remaining

	N	P2O5	K2O
Liquids	3,025	4,932	8,787
Solids	33,131	30,617	57,559
Grazing	13,341	6,231	17,724

Volume of Manure

		Concentration			
		N	P2O5	K2O	
Liquids	943,078 Gallons	3.2	5.2	9.3	lbs/1000 gallons
Solids	265,440 cubic feet	12.5	11.5	21.7	lbs/100 cubic feet

Solids Analysis

Rohner Dairy has 2 application rates currently used. They are determined by the travel length of the spreader or Tanker. The heavy rate empties the spreader over 450 ft and the light rate empties over a 1/4 mile or 1320 ft. The application amounts as a result of these rates are as follows.

Solids Slinger	spreader Volume cubic feet	spread width ft	spread length ft	acres covered/load acres	Solid Slinger Application Rate lbs/acre			Loads/ acre
					N	P2O5	K2O	
Light rate	280	30	1320	0.91	38.44	35.53	66.79	1.1
Heavy rate	280	30	450	0.31	112.77	104.21	195.91	3.2

Solids Beater Spreader	spreader Volume cubic feet	spread width ft	spread length ft	acres covered/load acres	Beater Spreader Application Rate lbs/acre			Loads/ acre
					N	P2O5	K2O	
Light rate	400	16	1320	0.48	102.97	95.16	178.90	2.1
Heavy rate	400	16	660	0.24	205.95	190.32	357.79	4.1

Liquids Tanker Wagon	spreader Volume Gallons	spread width ft	spread length ft	acres covered/load acres	Tanker Wagon Application Rate lbs/acre			Loads/ acre
					N	P2O5	K2O	
Light Rate	3250	24	1320	0.73	14.3	23.4	41.6	1.4
Heavy Rate	3250	24	450	0.25	42.1	68.6	122.1	4.0

Loads/acre to meet Crop Demand for Nitrogen									
	Uptake			Solids Slinger		Beater Spreader		Liquids	
	N	P2O5	K2O	Heavy	Light	Heavy	Light	Heavy	Light
Pasture	319	118	134	2.8	8.3	1.5	3.1	7.6	22.3
Alfalfa	270	60	270	2.4	7.0	1.3	2.6	6.4	18.8
Barley	128	51	100	1.1	3.3	0.6	1.2	3.0	8.9
Corn	539	281	644	4.8	14.0	2.6	5.2	12.8	37.6
Fescue	88	43	121	0.8	2.3	0.4	0.9	2.1	6.2

Loads/acre to meet Crop Demand for Phosphorous						
	Solids Slinger		Beater Spreader		Liquids	
	Heavy	Light	Heavy	Light	Heavy	Light
Pasture	1.1	1.1	0.6	1.2	1.7	5.1
Alfalfa	0.6	0.6	0.3	0.6	0.9	2.6
Barley	0.5	0.5	0.3	0.5	0.7	2.2
Corn	2.7	2.7	1.5	2.9	4.1	12.0
Fescue	0.4	0.4	0.2	0.4	0.6	1.8

CLIENT: Jon & Kate Rohner
ASSISTED BY: Matt Thompson-AgTec

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

ANIMAL INVENTORY

Type of Animal	Number of Animals	Average Weight (lbs.)	Animal Units (1,000 lb.)	Milk Production in Pounds/Cow/Day=								70		
				Nutrient Production						(lbs./day)				
				(lbs./day/1000 lb. Animal Unit)			(lbs./day)							
				N	P	K	N	P	K				Manure CF/D/AU	Days Confined
MILKER ▼	300	1,400	420.0	0.57	0.09	0.32	241.37	39.32	133.18	1.57	365	0		
MILKER (DRY) ▼	60	1,400	84.0	0.36	0.05	0.23	30.24	4.20	19.32	1.10	91	274		
HEIFERS (12-24 Months) ▼	136	800	108.8	0.31	0.04	0.24	33.73	4.35	26.11	1.30	62	303		
CALVES (1-12 Months) ▼	174	300	52.2	0.31	0.04	0.24	16.18	2.09	12.53	1.30	245	120		
▼														
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Totals/Averages-	670	975	665.0	0.48	0.08	0.29	321.5	50.0	191.1	1.4				

GRAZING PERIOD

Type of Animal	Percent of Month and Number of Animals Grazing												
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AU-YR.
MILKER	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	300	300	300	300	300	300	300	300	300	300	300	300	0
	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	
MILKER (DRY)	60	60	60	60	60	60	60	60	60	60	60	60	756
	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	
	136	136	136	136	136	136	136	136	136	136	136	136	1,084
CALVES (1-12 Months)	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	
	174	174	174	174	174	174	174	174	174	174	174	174	207
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CLIENT: **Jon & Kate Rohner**
ASSISTED BY: **Matt Thompson-AgTec**

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

Month	25Yr-24Hr	1.80	Lot Runoff Factors as a Percent of Monthly Precipitation	
	Monthly Average in Inches		Paved	Unpaved
	Precipitation	Evaporation		
October	0.71	1.98	30%	0%
November	1.21	0.50	35%	0%
December	1.32	0.71	25%	0%
January	1.26	0.74	25%	0%
February	0.98	1.09	25%	0%
March	0.92	2.06	20%	0%
April	0.70	3.79	25%	0%
May	0.98	5.12	30%	0%
June	0.83	6.08	35%	0%
July	0.19	7.62	30%	0%
August	0.38	6.51	30%	0%
September	0.49	4.03	30%	0%
Annual	9.97	40.23		

[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	300.0	2	0.25	150	20.1
Equipment Wash		2	100.00	200	26.7
Flushwater		2		0	0.0
Miscellaneous		2	250.00	500	66.8
Total				850	113.6

CROP DATA

CROP DATA									
Field Number	Acres	Crop		Condition	Yield Units	Target Yield	Nutrients Removed in Pounds per Acre		
							Nitrogen N	Phosphorous P2O5	Potassium K2O
1362	39.4	Orchard Grass Hay/Pasture	▼	DHM	Ton	6,000	319	118	134
Crop 1&2	77.0	Alfalfa Hay	▼	DHM	Ton	6,000	270	60	270
Crop 3&10	80.0	Barley, Grain Straw Removed	▼	DHM	Ton	2,500	128	51	100
Crop 4&9	75.0	Corn, Silage	▼	35% DM	Ton	24,500	539	281	644
Crop 5&8	44.0	Corn, Silage	▼	35% DM	Ton	24,500	539	281	644
Crop 6&7	52.0	Corn, Silage	▼	35% DM	Ton	24,500	539	281	644
North Meadows	190.7	Orchard Grass Hay/Pasture	▼	DHM	Ton	6,000	319	118	134
Pasture Dry	40.0	Fescue Hay/Pasture	▼	DHM	Ton	3,000	88	43	12
Pasture Rented out	280.0	Fescue Hay/Pasture	▼	DHM	Ton	3,000	88	43	12
Off-Farm			▼						

Jon & Kate Rohner
Matt Thompson-Agilec

BEDDING VOLUME

SOLIDS SEPARATION FACTOR

Rohner Workbook nitrogen.xls

CLIENT: Jon & Kate Rohner
ASSISTED BY: Matt Thompson-AgTec

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY VOLUMES

Month	Runoff in Cubic Feet				Facility Water Use Cubic Feet	Manure		Bedding		Solids Separated		Solids in Liquids		Total Solids		
	Roof Area Square Feet 0	Paved Slab Area Square Feet 43,758	Unpaved Lot Area Square Feet 0	Silage Pit Surface Area, SF 0		Solids		Liquids Cubic Feet	Cubic Feet	Pounds	Cubic Feet	Pounds	Cubic Feet	Pounds	Cubic Feet	Total Liquids Cubic Feet
						Cubic Feet	Cubic Feet									
October	0	777	0	0	3,523	11,912	17,915	2,391	95,473	22,544	811,592	3,192	114,912	22,544	10,563	
November	0	1,544	0	0	3,409	11,528	17,337	2,314	92,393	21,817	785,412	3,089	111,205	21,817	11,113	
December	0	1,203	0	0	3,523	11,912	17,915	2,391	95,473	22,544	811,592	3,192	114,912	22,544	10,989	
January	0	1,149	0	0	3,523	11,912	17,915	2,391	95,473	22,544	811,592	3,192	114,912	22,544	10,934	
February	0	893	0	0	3,182	10,759	16,181	2,160	86,234	20,363	733,051	2,883	103,791	20,363	10,029	
March	0	671	0	0	3,523	11,912	17,915	2,391	95,473	22,544	811,592	3,192	114,912	22,544	10,457	
April	0	638	0	0	3,409	11,528	17,337	2,314	92,393	21,817	785,412	3,089	111,205	21,817	10,207	
May	0	1,072	0	0	3,523	11,912	17,915	2,391	95,473	22,544	811,592	3,192	114,912	22,544	10,858	
June	0	1,059	0	0	3,409	11,528	17,337	2,314	92,393	21,817	785,412	3,089	111,205	21,817	10,629	
July	0	208	0	0	3,523	11,912	17,915	2,391	95,473	22,544	811,592	3,192	114,912	22,544	9,994	
August	0	416	0	0	3,523	11,912	17,915	2,391	95,473	22,544	811,592	3,192	114,912	22,544	10,202	
September	0	536	0	0	3,409	11,528	17,337	2,314	92,393	21,817	785,412	3,089	111,205	21,817	10,105	
Annual	0	10,166	0	0	41,477	140,254	210,931	28,156	1,031,034	265,440	9,555,843	37,583	1,352,992	265,440	126,080	

DAILY NUTRIENT PRODUCTION

Type of Animal	Pounds/Day of Nutrients from				Pounds/Day of Nutrients from				Pounds/Day of Nutrients from			
	LIQUIDS		SOLIDS		GRAZING		GRAZING		GRAZING		GRAZING	
	N	P2O5	K2O		N	P2O5	K2O		N	P2O5	K2O	
MILKER	36.21	13.51	24.07	205.17	76.58	136.41	160.49		241.37	90.09	160.49	
MILKER (DRY)	0.00	0.00	0.00	30.24	9.62	23.28	23.28		30.24	9.62	23.28	
HEIFERS (12-24 Months)	0.00	0.00	0.00	33.73	9.97	31.46	31.46		33.73	9.97	31.46	
CALVES (1-12 Months)	0.00	0.00	0.00	16.18	4.78	15.10	15.10		16.18	4.78	15.10	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	

CLIENT: Jon & Kate Rohner
ASSISTED BY: Matt Thompson-AgTec

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY NUTRIENT PRODUCTION

Month	Pounds of Nutrients from LIQUIDS			Pounds of Nutrients from SOLIDS			Pounds of Nutrients from GRAZING			Pounds of Nutrients going OFF-FARM			Total Pounds of Nutrients from ALL SOURCES		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
October	1,122	419	746	7,108	2,600	4,889	1,736	529	1,505	0	0	0	9,967	3,548	7,140
November	1,086	405	722	6,879	2,516	4,731	1,680	512	1,457	0	0	0	9,646	3,434	6,910
December	1,122	419	746	7,108	2,600	4,889	1,736	529	1,505	0	0	0	9,967	3,548	7,140
January	1,122	419	746	7,108	2,600	4,889	1,736	529	1,505	0	0	0	9,967	3,548	7,140
February	1,014	378	674	6,421	2,349	4,415	1,568	478	1,360	0	0	0	9,003	3,205	6,449
March	1,122	419	746	7,108	2,600	4,889	1,736	529	1,505	0	0	0	9,967	3,548	7,140
April	1,086	405	722	6,879	2,516	4,731	1,680	512	1,457	0	0	0	9,646	3,434	6,910
May	1,122	419	746	7,108	2,600	4,889	1,736	529	1,505	0	0	0	9,967	3,548	7,140
June	1,086	405	722	6,879	2,516	4,731	1,680	512	1,457	0	0	0	9,646	3,434	6,910
July	1,122	419	746	7,108	2,600	4,889	1,736	529	1,505	0	0	0	9,967	3,548	7,140
August	1,122	419	746	7,108	2,600	4,889	1,736	529	1,505	0	0	0	9,967	3,548	7,140
September	1,086	405	722	6,879	2,516	4,731	1,680	512	1,457	0	0	0	9,646	3,434	6,910
Annual	13,215	4,932	8,787	83,696	30,617	57,559	20,445	6,231	17,724	0	0	0	117,357	41,781	84,069

CLIENT: Jon & Kate Rohner
ASSISTED BY: Matt Thompson-AgTec

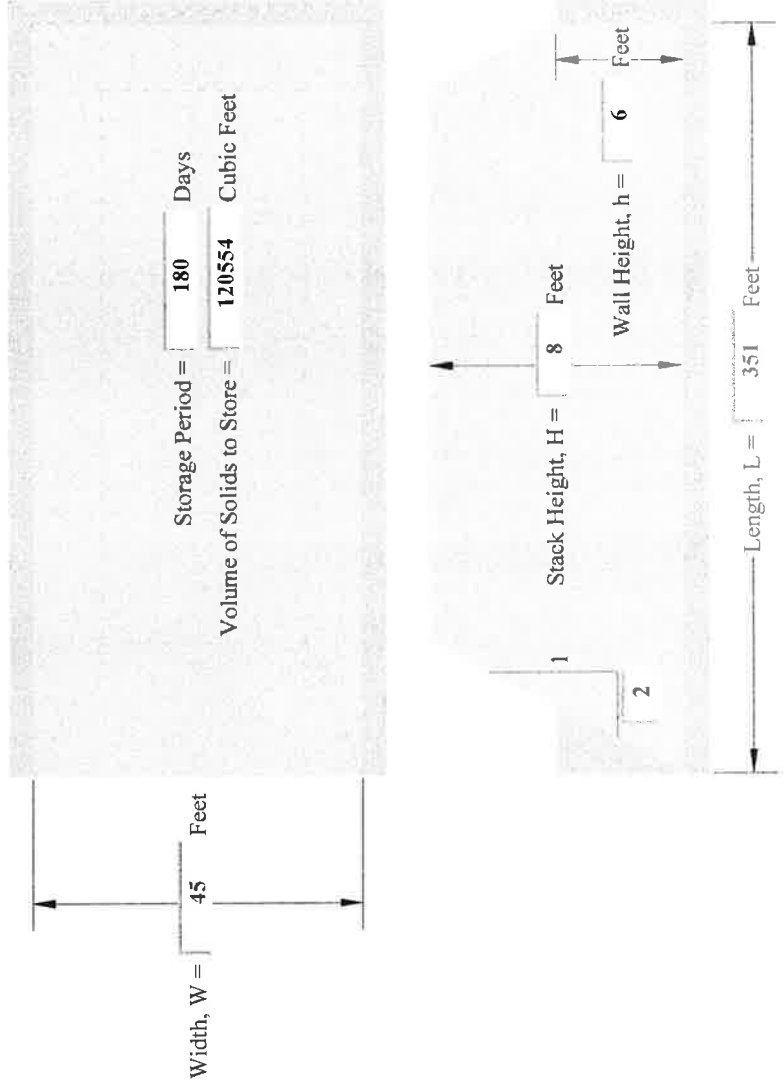
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ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

SOLIDS STACKING FACILITY

MONTHLY SOLIDS VOLUME STACKED IN FACILITY

Solids Storage Facility Parameters	Value	Month	Number of Days	Manure CF	Bedding CF	Solids to Store CF	Normal Runoff CF
Storage Period, Days=	180	October	31	20274	2,270	20,310	0
Stacking Width, W in Feet=	45	November	30	19620	2,197	10,908	0
Stacking Height, H in Feet=	8.00	December	31	20274	2,270	11,272	0
Wall Height, h in Feet=	6.00	January	31	20274	2,270	11,272	0
Stack Side Slope (X:1)=	2.00	February	28	18312	2,051	10,181	0
Existing Storage, Cubic Feet=	0	March	31	20274	2,270	11,272	0
Surface Area of Existing Storage, SF=	0	April	30	19620	2,197	10,908	0
25 Year-24 Hour Storm Runoff, CF=	2,369	May	31	20274	2,270	11,272	0
Volume Needed, Cubic Feet=	120,554	June	30	19620	2,197	10,908	0
Design Volume, Cubic Feet=	120,630	July	31	20274	2,270	11,272	0
Is Facility Covered? NO		August	31	20274	2,270	11,272	0
		September	30	19620	2,197	10,908	0
		Annual	365	238,707	26,733	141,758	0



CLIENT: Jon & Kate Rohner
ASSISTED BY: Matt Thompson-AgTec

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

TANK		MONTHLY INFLOWS INTO TANK							
Tank Parameters		Value	Month	Number of days	Rain-Evap on Tank CF	Rain-Evap on Existing Storage, CF	Normal Runoff CF	Washwater CF	Manure CF
Storage Period, Days=		100	October	31	-332	-301	777	3,523	3,071
Tank Diameter, Feet=		80	November	30	297	168	1,544	3,409	2,972
			December	31	255	145	1,203	3,523	3,071
Existing Storage, Cubic Feet=		44,454.00	January	31	218	123	1,149	3,523	3,071
Surface Area of Existing Storage, SF=		2,847	February	28	-46	-26	893	3,182	2,774
25 Year-24 Hour Storm Runoff, CF=		8,932	March	31	-477	-270	671	3,523	3,071
Volume Needed, Cubic Feet=		47,272	April	30	-1,294	-733	638	3,409	2,972
Design Volume, Cubic Feet=		2,813	May	31	-1,733	-982	1,072	3,523	3,071
Is Tank Covered? NO			June	30	-2,198	-1,246	1,059	3,409	2,972
Tank Dimensions? Circular			July	31	-3,111	-1,763	208	3,523	3,071
			August	31	-2,566	-1,454	416	3,523	3,071
			September	30	-1,482	-840	536	3,409	2,972
			Annual	365	-12,669	-7,179	10,166	41,477	36,160

1.0 Feet

0.56 Feet

Minimum Freeboard = 1.0 Feet

25Yr-24Hr Storm Precipitation = 1.8 Inches

25Yr-24Hr Storm Runoff = 8932 Cubic Feet

100 Day Precip - Evap = 1.84 Inches

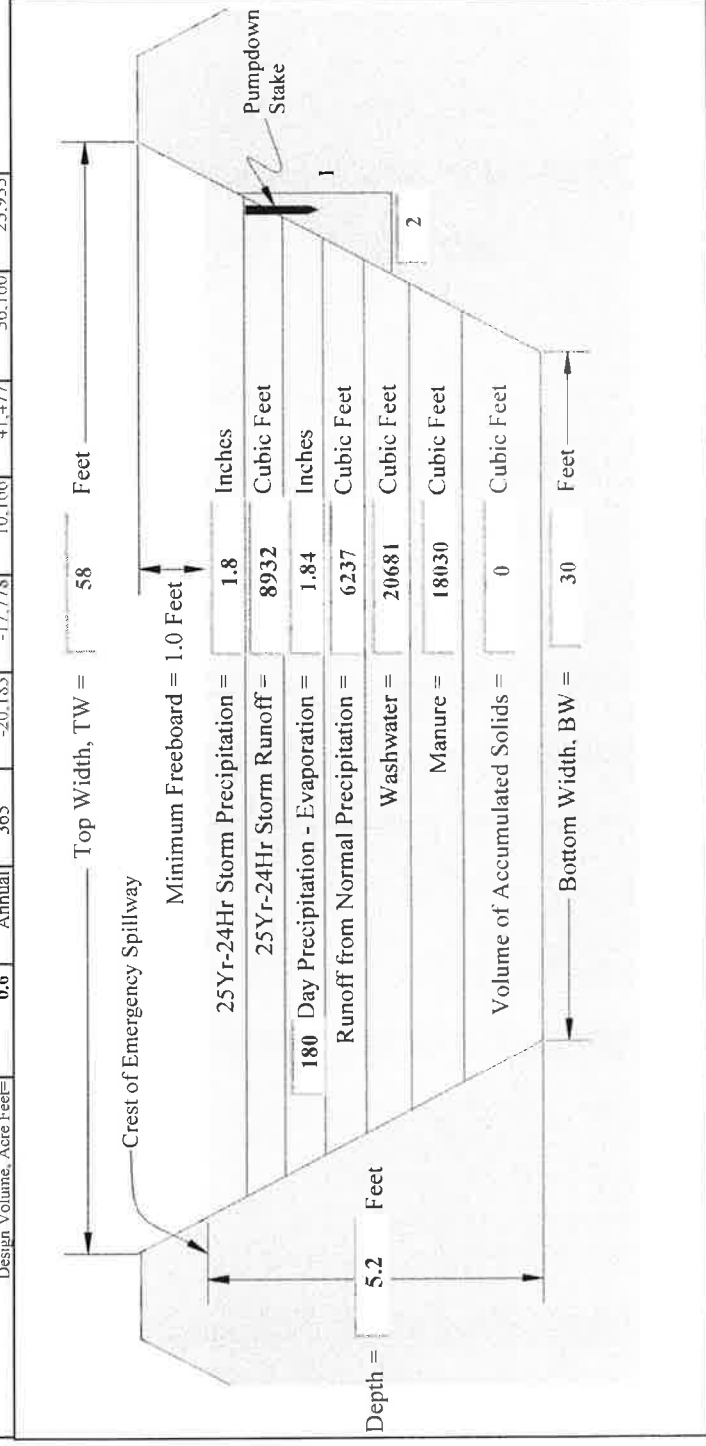
Runoff from Normal Precipitation = 4194 Cubic Feet

Washwater = 11515 Cubic Feet

Manure = 10038 Cubic Feet

Depth = 0.56 Feet

Diameter = 80 Feet



CLIENT: Jon & Kate Rohner
ASSISTED BY: Matt Thompson-AgTec

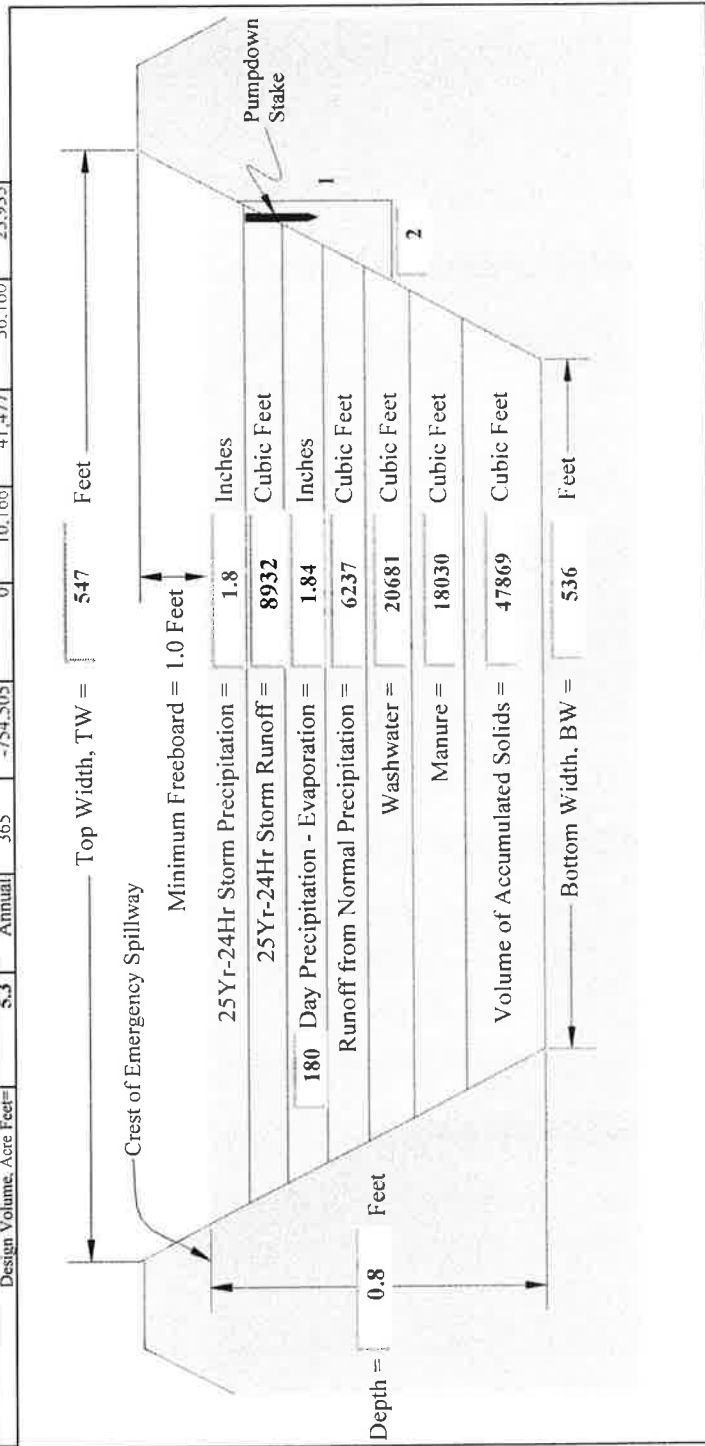
CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

EVAPORATION POND

MONTHLY INFLOWS INTO EVAPORATION POND

Evaporation Pond Parameters	Value	Month	Number of Days	Rain-Evap on Pond CF	Rain-Evap on Existing Storage, CF	Normal Runoff CF	Washwater CF	Manure CF	Accum Solids CF
Storage Period, Days=	180	October	31	-31,666	0	777	3,523	3,071	2,033
Side Slope (X:1)=	2.00	November	30	17,703	0	1,544	3,409	2,972	1,967
Bottom Width, BW, Feet=	536	December	31	15,210	0	1,203	3,523	3,071	2,033
Bottom Length, BL, Feet=	536	January	31	12,966	0	1,149	3,523	3,071	2,033
Accumulated Solids Duration, Years=	2	February	28	-2,743	0	893	3,182	2,774	1,836
Existing Storage, Acre Feet=	0.00	March	31	-28,425	0	671	3,523	3,071	2,033
Surface Area of Existing Storage, SF=	0	April	30	-77,046	0	638	3,409	2,972	1,967
Minimum Soil Liner Depth, Feet=	1.00	May	31	-103,227	0	1,072	3,523	3,071	2,033
25 Year-24 Hour Storm Runoff, CF=	8,932	June	30	-130,904	0	1,059	3,409	2,972	1,967
Top Width, TW, Feet=	547	July	31	-185,260	0	208	3,523	3,071	2,033
Top Length, TL, Feet=	547	August	31	-152,846	0	416	3,523	3,071	2,033
Volume Needed, Acre Feet=	4.0	September	30	-88,267	0	536	3,409	2,972	1,967
Design Volume, Acre Feet=	5.3	Annual	365	-754,305	0	10,166	41,477	36,160	23,935



CLIENT: Jon & Kate Rohner
ASSISTED BY: Matt Thompson-AgTec

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ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TRACTOR SPREADER APPLICATION OF SOLIDS

To apply 265,440 cubic feet of solids generated from the operation it will take approximately 1,106 trips annually. Based on applying NITROGEN, N at agronomic rate use the application depths, travel lengths, and loads per acre listed below for each crop.

Field Number	Acres	Crop	Tractor Spreader Capacity		Spread Width Feet	NITROGEN, N Concentration in Storage Facility		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Inches of Solids to Apply	Travel Length per Load Needed in Feet	Loads per Acre
			Bushels	CF		PPM	Lbs/100CF					
T362	39.4	Orchard Grass Hay/Pasture	193	240	30	2,003	12.50	319	1.00	1.2	83	17
Crop 1&2	77	Alfalfa Hay	193	240	30	2,003	12.50	270	1.00	1.0	98	15
Crop 3&10	80	Barley, Grain Straw Removed	193	240	30	2,003	12.50	128	1.00	0.5	207	7
Crop 4&9	75	Corn, Silage	193	240	30	2,003	12.50	539	1.00	2.0	49	30
Crop 5&8	44	Corn, Silage	193	240	30	2,003	12.50	539	1.00	2.0	49	30
Crop 6&7	52	Corn, Silage	193	240	30	2,003	12.50	539	1.00	2.0	49	30
Orth Meadow	190.7	Orchard Grass Hay/Pasture	193	240	30	2,003	12.50	319	1.00	1.2	83	17
Pasture Dry	40	Fescue Hay/Pasture	193	240	30	2,003	12.50	88	1.00	0.3	301	5
Pasture Rented	280	Fescue Hay/Pasture	193	240	30	2,003	12.50	88	1.00	0.3	301	5

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS

To apply 943,078 gallons of liquids generated from the operation it will take approximately 52 hours of pumping annually. Based on applying NITROGEN, N at agronomic rate use the application depths, set times, and travel rates listed below for each crop.

Field Number	Acres	Crop	Sprinkler Flowrate GPM	Wetted Diameter Feet	Portion of Wetted Diameter Receiving Liquids	NITROGEN, N Concentration in Storage Facility		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Inches of Liquids to Apply	Application Rate in Inches/Hour	Set Time Needed in Hours	Travel Rate Needed in Feet/Minute
						PPM	Lbs/1000Gal						
T362	39.4	Orchard Grass Hay/Pasture	300	250	3/4 Circle	1,106	9.23	319	1.00	1.95	0.97	3.31	0.99
Crop 1&2	77	Alfalfa Hay	300	250	3/4 Circle	1,106	9.23	270	1.00	1.65	0.97	2.80	1.17
Crop 3&10	80	Barley, Grain Straw Removed	300	250	3/4 Circle	1,106	9.23	128	1.00	0.78	0.97	1.33	2.45
Crop 4&9	75	Corn, Silage	300	250	3/4 Circle	1,106	9.23	539	1.00	3.30	0.97	5.60	0.58
Crop 5&8	44	Corn, Silage	300	250	3/4 Circle	1,106	9.23	539	1.00	3.30	0.97	5.60	0.58
Crop 6&7	52	Corn, Silage	300	250	3/4 Circle	1,106	9.23	539	1.00	3.30	0.97	5.60	0.58
Orth Meadow	190.7	Orchard Grass Hay/Pasture	300	250	3/4 Circle	1,106	9.23	319	1.00	1.95	0.97	3.31	0.99
Pasture Dry	40	Fescue Hay/Pasture	300	250	3/4 Circle	1,106	9.23	88	1.00	0.54	0.97	0.92	3.57
Pasture Rented	280	Fescue Hay/Pasture	300	250	3/4 Circle	1,106	9.23	88	1.00	0.54	0.97	0.92	3.57

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ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

at agronomic rates use the application depths, travel lengths, and loads per acre listed below for each crop.

Field Number	Acres	Crop	Tank Wagon Capacity Gallons	Spread Width Feet	NITROGEN, N Concentration in Storage Facility		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Inches of Liquids to Apply	Travel Length per Load Needed in Feet	Loads per Acre
					PPM	Lbs/1000Gal					
T362	39.4	Orchard Grass Hay/Pasture	3,250	24	383	3.20	319	1.00	2.40	91	20.0
Crop 1&2	77	Alfalfa Hay	3,250	24	383	3.20	270	1.00	2.03	107	16.9
Crop 3&10	80	Barley, Grain Straw Removed	3,250	24	383	3.20	128	1.00	0.96	225	8.0
Crop 4&9	75	Corn, Silage	3,250	24	383	3.20	539	1.00	4.05	54	33.8
Crop 5&8	44	Corn, Silage	3,250	24	383	3.20	539	1.00	4.05	54	33.8
Crop 6&7	52	Corn, Silage	3,250	24	383	3.20	539	1.00	4.05	54	33.8
Orth Meadow	190.7	Orchard Grass Hay/Pasture	3,250	24	383	3.20	319	1.00	2.40	91	20.0
Pasture Dry	40	Fescue Hay/Pasture	3,250	24	383	3.20	88	1.00	0.66	328	5.5
Pasture Rented	280	Fescue Hay/Pasture	3,250	24	383	3.20	88	1.00	0.66	328	5.5

CLIENT: Jon & Kate Rohner
ASSISTED BY: Matt Thompson-AgTec

CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

NUTRIENTS AVAILABLE AFTER STORAGE

Nutrient Source	Type of Operation	Pounds of Nutrients Available			Percent Nutrients Retained After Storage			Pounds of Nutrients Retained After Storage		
		N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids	Dairy									
	Storage Pond (>50%) Dilution	13,215	4,932	8,787	35%	100%	100%	4,636	4,932	8,787
Solids	Solids Storage Facility (Unroofed)	83,696	30,617	57,559	65%	100%	100%	54,402	30,617	57,559
Grazing	NONE	20,445	6,231	17,724	100%	100%	100%	20,445	6,231	17,724

NUTRIENTS AVAILABLE AFTER APPLICATION

Nutrient Source	Type of Application System	Pounds of Nutrients Available			Percent Nutrients Retained After Application			Pounds of Nutrients Retained After Application		
		N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids	Sprinkling	4,636	4,932	8,787	75%	100%	100%	3,477	4,932	8,787
Solids	Broadcast (Incorporated 7 or more days after application)	54,402	30,617	57,559	70%	100%	100%	38,082	30,617	57,559
Grazing	Grazing	20,445	6,231	17,724	75%	100%	100%	15,334	6,231	17,724

NUTRIENTS AVAILABLE AFTER DENITRIFICATION

Nutrient Source	Location	Pounds of Nutrients Available			Percent Nutrients Retained After Denitrification			Pounds of Nutrients Retained After Denitrification		
		N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Liquids	East of Cascade Mountains									
	Soil Drainage Class	3,477	4,932	8,787	87%	100%	100%	3,025	4,932	8,787
Solids	Somewhat Poorly Drained	38,082	30,617	57,559	87%	100%	100%	33,131	30,617	57,559
Grazing	Somewhat Poorly Drained	15,334	6,231	17,724	87%	100%	100%	13,341	6,231	17,724

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ASSISTED BY: Matt Thompson-Ag Tec

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ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

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

Field Number	Acres	Crop	LIQUIDS			SOLIDS			GRAZING		
			Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients
T362	39.4	Orchard Grass Hay/Pasture	11%	341	1	9%	2,979	9	11%	1,505	5
Crop 1&2	77.0	Alfalfa Hay	10%	289	1	10%	3,311	12	10%	1,273	5
Crop 3&10	80.0	Barley, Grain Straw Removed	5%	137	1	5%	1,655	13	5%	605	5
Crop 4&9	75.0	Corn, Silage	19%	576	1	21%	6,952	13	19%	2,541	5
Crop 5&8	44.0	Corn, Silage	19%	576	1	19%	6,246	12	19%	2,541	5
Crop 6&7	52.0	Corn, Silage	19%	576	1	19%	6,246	12	19%	2,541	5
North Meadows	190.7	Orchard Grass Hay/Pasture	11%	341	1	11%	3,699	12	11%	1,505	5
Pasture Dry	40.0	Fescue Hay/Pasture	3%	94	1	3%	1,022	5	3%	416	5
Pasture Rented out	280.0	Fescue Hay/Pasture	3%	94	1	3%	1,022	12	3%	416	5
Off-Farm			0%	0		0%	0		0%	0	
TOTALS-			100%	3,025	10	100%	33,131	105	100%	13,341	42

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
T362	39.4	Orchard Grass Hay/Pasture	122	102	207	319	118	134	-197	-16	73
Crop 1&2	77.0	Alfalfa Hay	63	54	108	270	60	270	-207	-7	-163
Crop 3&10	80.0	Barley, Grain Straw Removed	30	25	51	128	51	100	-98	-25	-49
Crop 4&9	75.0	Corn, Silage	134	114	228	539	281	644	-405	-167	-415
Crop 5&8	44.0	Corn, Silage	213	179	361	539	281	644	-326	-101	-282
Crop 6&7	52.0	Corn, Silage	180	152	306	539	281	644	-359	-129	-338
North Meadows	190.7	Orchard Grass Hay/Pasture	29	25	49	319	118	134	-290	-94	-85
Pasture Dry	40.0	Fescue Hay/Pasture	38	32	65	88	43	121	-50	-10	-56
Pasture Rented out	280.0	Fescue Hay/Pasture	5	5	9	88	43	121	-83	-38	-111
Off-Farm											

Appendix F - Phosphorus Index Worksheet

Producer: Jon & Kate Rohner
 County: Baker
 Tract No. 114
 Field No(s). Cropped
 #1&2
 Date: Sept 20, 2005

Soil Map Unit(s): Silt Loam	Soil Test P: 44 ppm	Lab. Method: Weak Bray	Sample Depth: 1'
Crop Rotation: Corn, Barley, Alfalfa	Nutrient Application Method(s) Slurry Slinger, Tanker or Beater Spreader		
Planner: Matt Thompson - AgTec	Notes:		

PHOSPHORUS LOSS RATING							Weighted Rating Value	
TRANSPORT FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (6)	Current	Planned
Soil Erosion – tons/ac/yr (RUSLE)	1.50	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)	1.5	1.5
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)	.75	.75
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	1	1
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	0	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)	3	3
Subsurface Drainage	0.50	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 – 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141– 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)	0	0
Transport Factors Subtotal (TFS)							6.25	6.25

Tract		Fields 1					PHOSPHORUS LOSS RATING				Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned				
Soil Test P – ppm (Bray P1)	1.00	$(\text{Soil Test P} - 40) / 10$ $(44 - 40) \times .10 = 0$ Assign 0 points if Soil Test P < 40 ppm Soil Test P					0.40	0.40				
Commercial P Fertilizer Application Rate	1.00	$\text{lbs/ac P}_2\text{O}_5 \times 0.02$ $\frac{\text{lbs/ac P}_2\text{O}_5}{\text{lbs/ac P}_2\text{O}_5} \times 0.02 = \underline{\hspace{2cm}}$					0	0				
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	0	0				
Organic P Source Application Rate	1.00	$\text{lbs/ac P}_2\text{O}_5 \times 0.02$ $35 \times 0.02 = 1.08$ $\text{lbs/ac P}_2\text{O}_5$					.7	.7				
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8	8				

Total Rating Value TFS + SFS		Site Vulnerability Class	
< 13.0	Low	Current	Planned
13.0 – 25.0	Medium	6.25	6.25
25.1 – 50.0	High	9.1	9.1
> 50.0	Very High	15.35	15.35
Total Rating Value TFS + SFS		15.35	15.35
Site Vulnerability Class		Medium	Medium

Transport Factors Subtotal (TFS)		Source Factors Subtotal (SFS)		Total Rating Value (TFS + SFS)		Site Vulnerability Class	
Current	Planned	Current	Planned	Current	Planned	Current	Planned
6.25	6.25	9.1	9.1	15.35	15.35	Medium	Medium

PHOSPHORUS INDEX WORKSHEET – WESTERN OREGON

Producer: Jon & Kate Rohner

County: Baker

Tract No. 113

Field No(s). North
Pastures

Date: Sept 20, 2005

Soil Map Unit(s): Silt Loam

Soil Test P: 20 ppm

Lab. Method: Weak Bray

Sample Depth: 1'

Crop Rotation: Permanent Pasture

Nutrient Application Method(s) Slurry Slinger, Tanker or Beater Spreader

Planner: Matt Thompson - AgTec

Notes:

PHOSPHORUS LOSS RATING								Weighted Rating Value	
TRANSPORT FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned	
Soil Erosion – tons/ac/yr (RUSLE)	1.50	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)	0	0	
Soil Erosion from Sprinkler Irrigation	0.75	No sprinkler irrigation	Application rate < infiltration rate OR No visible runoff at field borders	Application rate = infiltration rate OR Little to no visible runoff at field borders	Application rate > infiltration rate OR Visible runoff at field borders	Application rate > infiltration rate OR Excessive runoff visible at field borders. Rills and gullies present.	.75	.75	
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	1	1	
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	1.5	1.5	
Distance to Perennial Surface Waters / Buffer Widths	0.75	> 500 feet OR buffer > 30 ft. wide (or meets NRCS standards) next to surface waters (0)	300 – 500 feet OR buffer 20 - 30 ft. wide next to surface waters (0.75)	200 – 299 feet OR buffer 10 -19 ft. wide next to surface waters (1.5)	100 – 199 feet AND buffer < 10 ft. wide next to surface waters (3.0)	< 100 feet AND No buffer next to surface waters (6.0)	3	3	
Subsurface Drainage	0.50	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141- 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)	0	0	
Transport Factors Subtotal (TFS)							6.25	6.25	

Tract		Fields 1		PHOSPHORUS LOSS RATING					Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned		
Soil Test P – ppm (Bray P1)	1.00	$(\text{Soil Test P} - 40) / 10 \quad (20 - 40) \times .10 = 0 \quad \text{Assign 0 points if Soil Test P} < 40 \text{ ppm}$						0	0	
Commercial P Fertilizer Application Rate	1.00	$\text{lbs/ac P}_2\text{O}_5 \times 0.02 \quad \text{lbs/ac P}_2\text{O}_5 \times 0.02 = \underline{\hspace{2cm}}$						0	0	
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	0	0		
Organic P Source Application Rate	1.00	$\text{lbs/ac P}_2\text{O}_5 \times 0.02 \quad 35 \times 0.02 = 1.08 \quad \text{lbs/ac P}_2\text{O}_5$						.7	.7	
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8	8		

Total Rating Value		Site Vulnerability Class		Transport Factors Subtotal (TFS)		Source Factors Subtotal (SFS)		Total Rating Value (TFS + SFS)		Site Vulnerability Class	
TFS + SFS		Site Vulnerability Class		Transport Factors Subtotal (TFS)		Source Factors Subtotal (SFS)		Total Rating Value (TFS + SFS)		Site Vulnerability Class	
< 13.0		Low		6.25		8.7		14.95		Medium	
13.0 – 25.0		Medium									
25.1 – 50.0		High									
> 50.0		Very High									

PHOSPHORUS INDEX WORKSHEET – WESTERN OREGON

Producer: Jon & Kate Rohner

County: Baker

Tract No. 113

Field No(s). Cropped
#3&10

Date: Sept 20, 2005

Soil Map Unit(s): Silt Loam

Soil Test P: 12 ppm

Lab. Method: Weak Bray

Sample Depth: 1'

Crop Rotation: Corn, Barley, Alfalfa

Nutrient Application Method(s) Slurry Slinger, Tanker or Beater Spreader

Planner: Matt Thompson - AgTec

Notes:

PHOSPHORUS LOSS RATING								Weighted Rating Value	
TRANSPORT FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned	
Soil Erosion – tons/ac/yr (RUSLE)	1.50	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)	1.5	1.5	
Soil Erosion from Sprinkler Irrigation	0.75	No sprinkler irrigation	Application rate < infiltration rate OR No visible runoff at field borders	Application rate = infiltration rate OR Little to no visible runoff at field borders	Application rate > infiltration rate OR Visible runoff at field borders	Application rate > infiltration rate OR Excessive runoff visible at field borders. Rills and gullies present.	.75	.75	
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	1	1	
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	1.50	1.5	
Distance to Perennial Surface Waters / Buffer Widths	0.75	> 500 feet OR buffer > 30 ft. wide (or meets NRCS standards) next to surface waters (0)	300 – 500 feet OR buffer 20 - 30 ft. wide next to surface waters (0.75)	200 – 299 feet OR buffer 10 -19 ft. wide next to surface waters (1.5)	100 – 199 feet AND buffer < 10 ft. wide next to surface waters (3.0)	< 100 feet AND No buffer next to surface waters (6.0)	3	3	
Subsurface Drainage	0.50	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141- 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)	0	0	
Transport Factors Subtotal (TFS)							7.75	7.75	

Tract		Fields 1	PHOSPHORUS LOSS RATING					Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned	
Soil Test P – ppm (Bray P1)	1.00	(Soil Test P – 40) / 10 (12– 40) x .10 = 0 Assign 0 points if Soil Test P < 40 ppm Soil Test P					0	0	
Commercial P Fertilizer Application Rate	1.00	$\frac{\text{lbs/ac P}_2\text{O}_5 \times 0.02}{\text{lbs/ac P}_2\text{O}_5} \times 0.02 = \underline{\hspace{2cm}}$					0	0	
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	0	0	
Organic P Source Application Rate	1.00	$\frac{\text{lbs/ac P}_2\text{O}_5 \times 0.02}{\text{lbs/ac P}_2\text{O}_5} = 1.08$					0.7	0.7	
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8	8	

Total Rating Value		Current		Planned	
TFS + SFS		Transport Factors Subtotal (TFS)		7.75	
		Source Factors Subtotal (SFS)		8.7	
		Total Rating Value (TFS + SFS)		16.45	
		Site Vulnerability Class		Medium	

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

PHOSPHORUS INDEX WORKSHEET – WESTERN OREGON

Producer: Jon & Kate Rohner

County: Baker

Tract No. 113

Field No(s). Cropped
#4&9

Date: Sept 20, 2005

Soil Map Unit(s): Silt Loam

Soil Test P: 38 ppm

Lab. Method: Weak Brav

Sample Depth: 1'

Crop Rotation: Corn, Barley, Alfalfa

Nutrient Application Method(s) Slurry Slinger, Tanker or Beater Spreader

Planner: Matt Thompson - AgTec

Notes:

PHOSPHORUS LOSS RATING							Weighted Rating Value	
TRANSPORT FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned
Soil Erosion – tons/ac/yr (RUSLE)	1.50	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)	1.5	1.5
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)	.75	.75
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	1	1
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	0	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)	3	3
Subsurface Drainage	0.50	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141 - 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)	0	0
Transport Factors Subtotal (TFS)							6.25	6.25

Tract		Fields 1	PHOSPHORUS LOSS RATING					Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned	
Soil Test P – ppm (Bray P1)	1.00	(Soil Test P – 40) / 10 (38– 40) x .10 = 0 Assign 0 points if Soil Test P < 40 ppm Soil Test P						0	0
Commercial P Fertilizer Application Rate	1.00	$\frac{\text{lbs/ac P}_2\text{O}_5 \times 0.02}{\text{lbs/ac P}_2\text{O}_5} \times 0.02 = \underline{\hspace{2cm}}$						0	0
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	0	0	
Organic P Source Application Rate	1.00	$\frac{\text{lbs/ac P}_2\text{O}_5 \times 0.02}{\text{lbs/ac P}_2\text{O}_5} = 1.08$						7	7
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8	8	

Total Rating Value		Site Vulnerability Class		Current		Planned	
TFS + SFS				Transport Factors Subtotal (TFS)		6.25	
< 13.0		Low		Source Factors Subtotal (SFS)		8.7	
13.0 – 25.0		Medium		Total Rating Value (TFS + SFS)		14.95	
25.1 – 50.0		High		Site Vulnerability Class		Medium	
> 50.0		Very High					

PHOSPHORUS INDEX WORKSHEET – WESTERN OREGON

Producer: Jon & Kate Rohner	County: Baker	Tract No. 115	Field No(s): Cropped #5&8	Date: Sept 20, 2005
Soil Map Unit(s): Silt Loam	Soil Test P: 28 ppm	Lab. Method: Weak Bray	Sample Depth: 1'	
Crop Rotation: Corn, Barley, Alfalfa	Nutrient Application Method(s) Slurry Slinger, Tanker or Beater Spreader			
Planner: Matt Thompson - AgTec	Notes:			

PHOSPHORUS LOSS RATING							Weighted Rating Value	
TRANSPORT FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned
Soil Erosion – tons/ac/yr (RUSLE)	1.50	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)	1.5	1.5
Soil Erosion from Sprinkler Irrigation	0.75	No sprinkler irrigation	Application rate < infiltration rate OR No visible runoff at field borders	Application rate = infiltration rate OR Little to no visible runoff at field borders	Application rate > infiltration rate OR Visible runoff at field borders	Application rate > infiltration rate OR Excessive runoff visible at field borders. Rills and gullies present.	.75	.75
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	1	1
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	0	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	300 – 500 feet OR buffer 20 - 30 ft. wide next to surface waters	200 – 299 feet OR buffer 10 -19 ft. wide next to surface waters	100 – 199 feet AND buffer < 10 ft. wide next to surface waters	< 100 feet AND No buffer next to surface waters	3	3
Subsurface Drainage	0.50	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141 - 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)	0	0
Transport Factors Subtotal (TFS)							6.25	6.25

Tract		Fields 1		PHOSPHORUS LOSS RATING					Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned		
Soil Test P – ppm (Bray P1)	1.00	(Soil Test P – 40) / 10 (28– 40) x .10 = 0 Assign 0 points if Soil Test P < 40 ppm Soil Test P					0	0		
Commercial P Fertilizer Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 $\frac{\text{lbs/ac P}_2\text{O}_5}{\text{lbs/ac P}_2\text{O}_5} \times 0.02 = \underline{\hspace{2cm}}$					0	0		
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	$\underline{\hspace{1cm}}0 \underline{\hspace{1cm}} \underline{\hspace{1cm}} \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}}0 \underline{\hspace{1cm}} \underline{\hspace{1cm}} \underline{\hspace{1cm}}$		
Organic P Source Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02 35 x 0.02 = 1.08 lbs/ac P ₂ O ₅					.7	.7		
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8	8		

Current		Planned	
Total Rating Value TFS + SFS		Transport Factors Subtotal (TFS)	6.25
< 13.0		Source Factors Subtotal (SFS)	8.7
13.0 – 25.0		Total Rating Value (TFS + SFS)	14.95
25.1 – 50.0		Site Vulnerability Class	Medium
> 50.0			

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

PHOSPHORUS INDEX WORKSHEET – WESTERN OREGON

Producer: Jon & Kate Rohner

County: Baker

Tract No. 115

Field No(s). Cropped
#6&7

Date: Sept 20, 2005

Soil Map Unit(s): Silt Loam

Soil Test P: 10 ppm

Lab. Method: Weak Bray

Sample Depth: 1'

Crop Rotation: Corn, Barley, Alfalfa

Nutrient Application Method(s) Slurry Slinger, Tanker or Beater Spreader

Planner: Matt Thompson - AgTec

Notes:

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

Tract		Fields 1					PHOSPHORUS LOSS RATING					Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned					
Soil Test P – ppm (Bray P1)	1.00	(Soil Test P – 40) / 10					(10- 40) x .10 = 0					0	0
Commercial P Fertilizer Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02					lbs/ac P ₂ O ₅ x 0.02 = _____					0	0
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September	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	_____0_____	_____0_____					
Organic P Source Application Rate	1.00	lbs/ac P ₂ O ₅ x 0.02					35 x 0.02 = 1.08					.7	.7
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	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	8	8					

Total Rating Value TFS + SFS		Site Vulnerability Class	
< 13.0	Low	Current	Planned
13.0 – 25.0	Medium	7	7
25.1 – 50.0	High	8.7	8.7
> 50.0	Very High	15.7	15.7
Total Rating Value (TFS + SFS)		Medium	Medium
Site Vulnerability Class		Medium	Medium

PHOSPHORUS INDEX WORKSHEET – WESTERN OREGON

Producer: Jon & Kate Rohner	County: Baker	Tract No. 4384	Field No(s).	Dry Pasture	Date: Sept 20, 2005
Soil Map Unit(s): Silt Loam	Soil Test P: 10 ppm	Lab. Method: Weak Bray	Sample Depth: 1'		
Crop Rotation: Permanent Fescue Grass	Nutrient Application Method(s) Slurry Slinger, Tanker or Beater Spreader				
Planner: Matt Thompson - AgTec	Notes:				

PHOSPHORUS LOSS RATING							Weighted Rating Value	
TRANSPORT FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned
Soil Erosion – tons/ac/yr (RUSLE)	1.50	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)	0	0
Soil Erosion from Sprinkler Irrigation	0.75	No sprinkler irrigation	Application rate < infiltration rate OR No visible runoff at field borders	Application rate = infiltration rate OR Little to no visible runoff at field borders	Application rate > infiltration rate OR Visible runoff at field borders	Application rate > infiltration rate OR Excessive runoff visible at field borders. Rills and gullies present.	0	0
Runoff Class	1.00	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	Very High (8.0)	1	1
Flooding Frequency Class	0.75	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)	1.5	1.5
Distance to Perennial Surface Waters / Buffer Widths	0.75	> 500 feet OR buffer > 30 ft. wide (or meets NRCS standards) next to surface waters (0)	300 – 500 feet OR buffer 20 - 30 ft. wide next to surface waters (0.75)	200 – 299 feet OR buffer 10 -19 ft. wide next to surface waters (1.5)	100 – 199 feet AND buffer < 10 ft. wide next to surface waters (3.0)	< 100 feet AND No buffer next to surface waters (6.0)	3	3
Subsurface Drainage	0.50	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141- 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)	0	0
							5.5	5.5
							Transport Factors Subtotal (TFS)	

Tract		Fields 1		PHOSPHORUS LOSS RATING					Weighted Rating Value	
SOURCE FACTORS	Factor Weight	None (0)	Low (1)	Medium (2)	High (4)	Very High (8)	Current	Planned		
Soil Test P – ppm (Bray P1)	1.00	(Soil Test P – 40) / 10 (10– 40) x .10 = 0 Assign 0 points if Soil Test P < 40 ppm Soil Test P					0	0		
Commercial P Fertilizer Application Rate	1.00	$\text{lbs/ac P}_2\text{O}_5 \times 0.02$ $\frac{\text{lbs/ac P}_2\text{O}_5}{\text{lbs/ac P}_2\text{O}_5} \times 0.02 =$					0	0		
Commercial P Fertilizer Application Method	1.00	None Applied (0)	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	0	0		
Organic P Source Application Rate	1.00	$\text{lbs/ac P}_2\text{O}_5 \times 0.02$ $35 \times 0.02 = 1.08$ $\text{lbs/ac P}_2\text{O}_5$					.7	.7		
Organic P Source Application Method	1.00	None Applied (0)	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September (1.0)	Incorporated within 5 days of application from October through February OR Surface applied March through August (2.0)	Incorporated more than 5 days after application OR Surface applied September through October (4.0)	Surface applied November through February (8.0)	8	8		

		Current	Planned
Total Rating Value TFS + SFS	Site Vulnerability Class		
	< 13.0		
	13.0 – 25.0		
Transport Factors Subtotal (TFS)	Source Factors Subtotal (SFS)	5.5	5.5
		8.7	8.7
	Total Rating Value (TFS + SFS)	14.2	14.2
Site Vulnerability Class		Medium	Medium

Appendix G – Crop Fertilizer Guides

Alfalfa

Southwest Oregon (Coos, Curry, Jackson, Josephine counties)

E.H. Gardner, W.S. McGuire, and T.L. Jackson

Alfalfa is capable of producing high yields of forage when grown on deep, well-drained soils. Good management practices are essential if optimum fertilizer responses are to be realized. These practices include use of recommended varieties, selection of adapted soils, weed control, disease and insect control, good seedbed preparation, proper inoculation and seeding methods, and timely harvest.

Alfalfa removes substantial amounts of mineral nutrients. Field experiments have shown that under different conditions in western Oregon, alfalfa has responded to phosphorus, potassium, sulfur, boron, and lime. The need for nutrients other than sulfur can be determined with a soil test. With borderline test values, retest every year.

Follow recommended soil sampling procedures to estimate fertilizer needs. The Oregon State University Extension Service agent in your county can provide you with soil sampling instructions, soil sample bags, and information sheets.

Inoculation

All alfalfa seed should be inoculated immediately before seeding to ensure an adequate supply of nitrogen-fixing bacteria. Use a fresh, effective, live culture of the correct strain of *Rhizobia*.

Nitrogen (N)

If alfalfa responds to applied N, the alfalfa has not been nodulated effectively.

Phosphorus (P)

The need for P fertilization can be determined by a soil test (Table 1).

P can be applied to alfalfa fields most effectively by banding 1/2–1 inch to the side or below the seed when seeding. Some soil should separate the seed from fertilizer.

Do **not** include boron in band applications.

Broadcasting and working P into the surface 2 inches of soil during seedbed preparation is more effective than broadcasting following seeding.

P recommendations assume the soil pH is above 6.0

On established stands, apply P in the fall.

Table 1.—P fertilization rates for alfalfa.

If the soil test for P is (ppm)	Apply this amount of phosphate (P ₂ O ₅) (lb/a)*
0–5	80–100
5–10	60–80
10–20	40–60
over 20	0

*For nonband applications to new seedlings, increase the P rate by 50 percent.

Potassium (K)

Alfalfa requires large amounts of K. Available soil K may decline rapidly under established stands. Check soil tests every year on soils with borderline values.

Table 2.—K fertilization rates for alfalfa.

If the soil test for K is (ppm)	Apply this amount of potash (K ₂ O) (lb/a)
0–75	80–100
75–100	60–80
over 100	0

On new seedlings

Broadcast K and work it into the seedbed prior to seeding.

On established stands

On nonirrigated alfalfa, broadcast K in the fall or early spring. On irrigated alfalfa, apply half the K in fall or early spring and the other half after the first cutting.

A K deficiency is indicated by light-colored spots around the margins of the leaves. If K deficiency symptoms become apparent on alfalfa leaves, apply at least 80 lb K₂O to provide the needs of the following crop.

Responses to K fertilizer often are obtained before leaf deficiency symptoms are apparent.



OREGON STATE UNIVERSITY
EXTENSION SERVICE

E. Hugh Gardner, Extension soil scientist emeritus; W.S. McGuire, professor emeritus of agronomy; and T.L. Jackson, Extension soil scientist emeritus; Oregon State University. Reviewed by a committee of southwest Oregon county Extension agents.

Sulfur (S)

Include 20–40 lb S/a in the annual fertilizer program. Apply S in the fall or early spring. An early spring application is suggested for valley floor soils.

One ton of alfalfa hay removes about 5 lb S.

S is contained in several fertilizer materials used to supply other nutrients. Plants absorb S in the form of sulfate. Fertilizer materials supply S in the form of sulfate and elemental S. Elemental S must be converted to sulfate in the soil before the S becomes available to plants. The conversion of elemental S to sulfate usually is rapid for fine-ground (less than 40-mesh) material in warm, moist soil.

The S requirements of alfalfa can be provided by:

1. Annually applying 20–40 lb S/a in the form of sulfate or fine-ground (finer than 40-mesh) elemental S. Elemental S will not be available to plants until the soil warms up.
2. Applying 40–60 lb S/a as sulfate or fine-ground elemental S every second year.
3. Applying coarser ground elemental S at higher rates and less frequently.

Magnesium (Mg)

Responses to Mg applications have not been measured in alfalfa fertility experiments to date. Trial applications are suggested when soil test values are below 0.8 meq Mg/100 g or when the amount of calcium is more than 10 times the amount of Mg.

Mg can be applied in the form of dolomite lime, which is equal to ground limestone in reducing soil acidity.

Boron (B)

On established stands, apply 3 lb B/a if the soil test is 1 ppm B or less. The application of B is not recommended for new seedings.

Apply B uniformly to the soil. B and other materials should be thoroughly mixed when B application is combined with other fertilizers. Apply B in fall or early spring.

B can be toxic to plants if applied at rates higher than recommended.

Response to B is most apparent on the second or third cutting

Lime

Alfalfa is sensitive to soil acidity and is responsive to liming of acid soils. Apply lime if the soil pH is below 6.4 or the soil test for calcium is below 5 meq Ca/100 g of soil.

Table 3.—Lime application rates for alfalfa.

If the SMP buffer test for lime is	Apply this amount of lime (t/a)
under 5.2	5–7
5.2–5.5	4–5
5.5–6.0	3–4
6.0–6.4	2–3
6.4–6.6	1–2
over 6.6	0

These liming rates are based on dry 100-score lime. Check liming materials for moisture content and score.

Apply lime preferably a season ahead, or at least several weeks before seeding, and thoroughly mix it with the surface 5–6 inches of soil. A lime application is effective for several years. Broadcasting lime on established alfalfa fields is not effective.

Dolomite lime, which can be used as a source of Mg, is equal to ground limestone in reducing soil acidity.

For More Information

How to Take a Soil Sample ... and Why, EC 628, by E.H. Gardner (revised 1997). No charge.

A List of Analytical Laboratories Serving Oregon, EM 8677, by J. Hart (revised 1997). No charge.

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World Wide Web

Fertilizer and Lime Materials, FG 52, by J. Hart (reprinted 1997). No charge.

You can access the above publications, as well as FG 60, *Alfalfa: Southwest Oregon (Coos, Curry, Jackson, Josephine counties)*, our Publications and Videos catalog, and many other publications via our Web site at eesc.orst.edu

Fertilizer recommendations are based on experiments conducted by T.L. Jackson, E.H. Gardner, and H. Hickerson, Oregon State University.

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Pastures

Western Oregon and Western Washington

J. Hart, G. Pirelli, L. Cannon, and S. Fransen

In western Oregon and Washington, forage shortages typically occur in late fall and early spring. In contrast, an excess supply may exist in late spring. By fertilizing in early fall and late winter, you can increase forage supply in deficient times. To reduce production in times of excess, reduce or eliminate late spring fertilization.

A single fertilization program will not fit all pastures. Determine which combination of grazing management, fertilization, and irrigation fits your resources and environment. Use a soil test and an assessment of forage supply and forage species to determine fertilizer need.

If suitable species are not present, fertilization will not compensate. In this case, consider renovating the pasture.

New Seedings

Match the pasture species to site conditions and livestock needs when renovating a pasture. Cows prefer grasses over legumes and graze perennial ryegrass before tall fescue. Sheep graze selectively, preferring clover and grass mixtures with short, lush feed to tall, coarse plants.

Horses are selective grazers, eating a wide range of plants. The horse digestive system cannot handle large amounts of legumes. Small and frequent amounts of forage are best. Horses avoid grazing near their own manure and urine; therefore, managing grazing on horse pastures is difficult.

Cool season forages such as tall fescue, perennial ryegrass, orchardgrass, subclover, and white clover are suited for our climate.

After choosing the appropriate forage species and planting method, use a soil test as the basis for fertilization. EC 628, *How to Take a Soil Sample . . . and Why*, contains instructions for obtaining a soil sample.

For a preplant soil test, obtain samples from the tillage depth, generally the surface to 6 inches. If you use a minimum tillage method of planting, you may wish to divide the sample into two parts: the top 2 inches and the lower 4 inches.

Analyze the soil sample for the following:

- pH
- Lime requirement (SMP or LR)
- Phosphorus (P)
- Potassium (K)
- Calcium (Ca)
- Magnesium (Mg)

Soil pH indicates whether lime is needed, and the SMP buffer or lime requirement (LR) test estimates the amount of lime needed. Estimate the rate of lime application from the following SMP buffer table.

Table 1.—Lime application rates for grass or white clover-grass pastures.

If the SMP buffer test for lime is:	Apply this amount of lime (t/a):
under 5.5	4–5
5.5–5.8	3–4
5.8–6.1	2–3
6.1–6.5	1–2
over 6.5	0–1

If soil pH is below 5.5, incorporate lime for stand establishment and longevity. Mix lime into the seedbed before seeding to allow time for lime to neutralize soil acidity.

Exceptions to Table 1 are subclover seedings and pastures on coastal county bottomland soils. For new subclover seedings where the pH of the top 2 to 3 inches of soil is 5.5 or lower, mix 1 to 2 t lime/a into the surface 2 inches of soil before seeding. Using lime-pelleted seed also can improve seedling establishment on acidic soils.

If your pasture is on coastal county bottomland soils, apply a maximum of 2 t lime/a if the soil pH is below 5.5.

Additional information about lime requirement and the SMP buffer is in FG 52, *Fertilizer and Lime Materials*.

Nitrogen fertilization usually is necessary to establish grass forages in western Oregon and Washington. Broadcast 20 to 40 lb N/a at planting, or band this amount 1 to 2 inches below the seed. When P or K is needed, N can be banded with these nutrients. The total N plus K₂O in the band should not exceed 100 lb/a. *Do not include B in band applications because this concentration of B can be toxic to seedlings.*

Working P into the top 2 inches of the soil during seedbed preparation is more effective than broadcasting after seeding. The most effective P application method is banding.

If you band P, place the band 1 to 2 inches to the side or below the seed. Some soil should separate seed from fertilizer. Phosphorus fertilization rates are given in Table 2.

In new clover or clover and grass seedings, broadcast K and work it into the seedbed anytime before seeding. See Table 3 for fertilization rates based on a soil test.



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John Hart, Extension soil scientist; Gene Pirelli, Extension agent, Polk County; Lynn Cannon, Extension agent emeritus, Coos County; Oregon State University; and Steve Fransen, Washington State University. Reviewed by western Oregon county Extension agents.

If soil test K is below 125 ppm, band an additional 20 lb K_2O/a at the time of planting. At least 1 inch of soil should separate the seed and fertilizer. Potassium can be banded with N and P. Potassium fertilization at planting will not meet the need for K in subsequent years.

Inoculate legume seed immediately before planting to ensure an adequate supply of nitrogen-fixing bacteria. Use fresh, effective live culture of the correct rhizobial strain.

Established Pastures

Manage fertilization and grazing jointly in established pastures. Although growth rates are influenced by temperature, moisture, solar radiation, and soil fertility, grazing management has a profound impact on pasture production.

New Zealand sheep producers use plant growth phases in ryegrass pastures to manage pasture growth, grazing, and fertilizer applications. Phase I (lag phase), Phase II (vegetative phase), and Phase III (maturity) describe the stages of growth and the impact on grazing and dry matter production.

Grass-clover pastures in Phase II provide high-quality feed. The goal is to graze before excess forage is produced (Phase III) and to supply fertilizer for rapid regrowth after grazing.

Figure 1 is an example of how this works with a perennial ryegrass pasture grazed by sheep or cattle. In Phase I ($3/4$ inch, 550 lb of dry matter), the plants grow very slowly because they lack sufficient leaf area for photosynthesis.

Phase II ($3/4$ to $4 1/4$ inches high, 550 to 1,900 lb of dry matter/a) growth is desired in pastures. Plants grow most rapidly and efficiently in this stage. Their leaf area is great enough for efficient use of sunlight.

Growth slows in Phase III (greater than $4 1/4$ inches), as lower leaves become shaded and die, and the plant moves toward maturity and seed production.

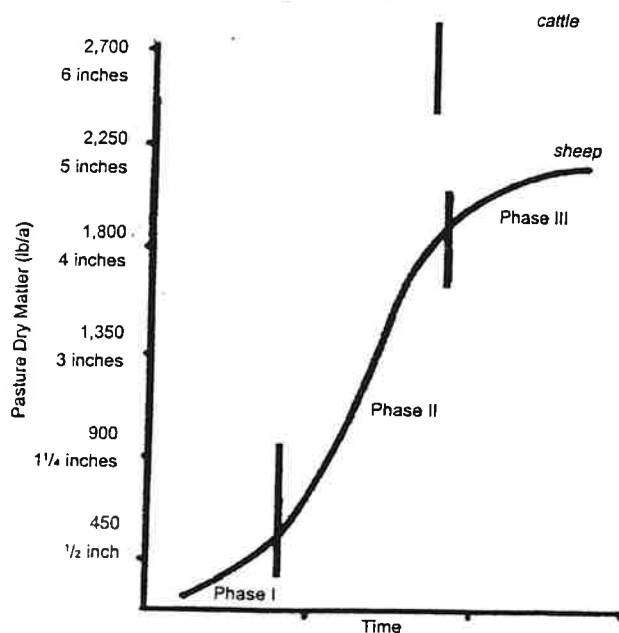


Figure 1.—Rate of perennial ryegrass pasture regrowth following grazing. For other grasses, multiply height by 2.

The grey line represents Phases I, II, and III if the pasture were managed for cattle. Cattle do not graze as closely as sheep, so the growth curve is based on higher initial and residual dry matter amounts. Other grass species such as orchardgrass and tall fescue have similar growth phases, but the grass heights listed for perennial ryegrass should be multiplied by two.

Fertilization of established pastures should be based on a soil test and the amount of forage needed. Obtain soil samples the year after establishment and every 2 to 3 years thereafter. Obtain samples from the top 3 inches of established pastures.

Nitrogen (N)

N fertilization should be based on moisture and temperature, which control pasture growth. Time N applications to crop and forage production needs. Avoid the following:

- *N applications in November and December.* N applied to cold, wet soils in winter can be leached beyond the root zone before slow-growing plants can use the fertilizer.
- *Late winter or early spring N application to saturated soils.* Soils that are too wet to drive on with a tractor may be too wet for plant growth. The plants may be yellow due to lack of oxygen from wet conditions and not lack of fertilizer. Wait for conditions conducive to plant growth before applying fertilizer.

See Figure 2 for an application schedule.

Fall

Assume the growing season begins with the fall rains. If sufficient rain falls in September to initiate growth, apply 40 to 60 lb N/a for the fall growing season (September and October). Do not apply N if adequate rain does not fall until late October or if the air temperature drops to or below freezing in October.

Many growers apply fertilizer to dry soil and note that the granules disappear before any rain. They fear volatile N loss. Nitrogen fertilizers, especially ammonium nitrate, often disappear overnight. Usually, this N has dissolved in dew and has moved onto the surface soil.

Winter

In cold conditions, pastures will not grow enough to use fertilizer. Forages in southwest coastal sites generally grow throughout winter, while conditions in the northern Willamette Valley allow only occasional winter growth.

For warm winters in the south coastal counties, apply 50 to 60 lb N/a in January or February (in addition to fall N application). Apply 50 to 60 lb N/a in the Willamette Valley or other cooler areas when a temperature of 40 to 45°F is maintained in the surface 2 inches.

Another method to estimate nitrogen demand is to monitor air temperature, then change the air temperature into heat units. A heat unit is the average of the high and low temperature for the day (in centigrade) and is a way to measure heat accumulation over time.

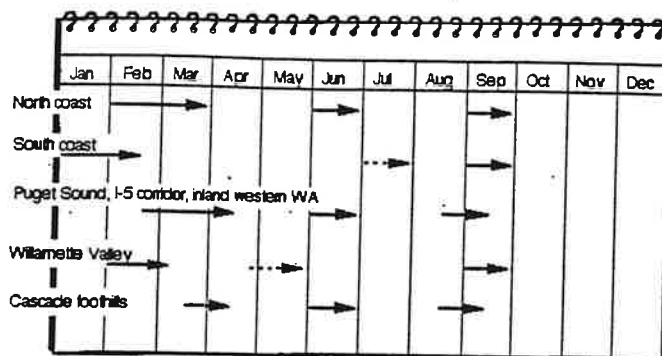


Figure 2.—Pasture nitrogen application calendar. Apply 50 to 60 lb N/a each time a solid arrow appears for your region. Additional applications for irrigated pastures are indicated by dotted lines. See nitrogen section in text for an explanation.

Table 4 shows a sample calculation of heat units. The process is as follows:

1. Beginning January 1, add together each day's maximum temperature and minimum temperature, and divide this total by 2. The result is the day's average temperature (column 4).
2. If this average temperature is in Fahrenheit, convert it to centigrade (column 5). To convert to centigrade, subtract 32 from the Fahrenheit temperature and then multiply by 0.556.

For example:

$$42^{\circ}\text{F} - 32 = 10$$

$$10 \times 0.556 = 5.6^{\circ}\text{C}$$

The centigrade average temperature is the number of heat units accumulated for that day. (If the average temperature is below freezing, give it a heat unit value of zero.)

3. To find the number of heat units that have accumulated since January 1, add together the heat units for each day (column 6).

Apply nitrogen when 200 heat units are accumulated or soon thereafter. The 30-year average for accumulation of 200 heat units is January 30 to February 14 in the Willamette Valley. Foothill temperatures and pasture growth typically lag 2 to 3 weeks behind the Willamette Valley.

Spring

Intensively grazed pastures that are expected to produce a high level of forage through June should receive a second application of nitrogen. Apply nitrogen only if moisture is sufficient for additional growth after mid-May. Apply summer N in July on irrigated coastal pastures.

Phosphorus (P)

Adequate P fertilization is particularly important for clover. Estimate the need for P fertilization with a soil test.

Table 2.—Phosphorus application rates for pastures.

If the Bray soil test for P is (ppm)	Apply this amount of phosphate (P_2O_5) (lb/a)
0–15	60–100
15–30	0–60
over 30	0

Apply P on established pastures in the fall or spring before growth begins. When using ammonium phosphate materials, do not over-apply N to supply adequate P.

Moderate rates of N and P (40 to 60 lb/a) applied together sometimes have a synergistic effect on plant growth. Fall applications of N and P from ammonium phosphate materials on south coastal Oregon pastures produced more forage than individual applications of either N or P.

Potassium (K)

An adequate level of available K is essential for optimal growth of clover-grass pastures. Potassium is particularly important for clover. Grass competes vigorously with clover for K. High-producing pastures can rapidly deplete soil test K. Test soil every 2 years to determine available K levels.

Potassium deficiency is indicated by light-colored spots around the margins of clover leaves and yellow to brown coloring of grass leaf tips. Growth responses to K fertilizer often can be obtained before deficiency symptoms are seen.

Table 3.—Potassium application rates for pastures.

If the soil test for K is (ppm)	Apply this amount of potash (K_2O) (lb/a)
0–125	100–150
125–200	70–100
over 200	None—Watch soil tests for K depletion

We suggest split applications of K for established, high-yielding irrigated pastures, with the first application in late

Table 4.—Sample heat unit calculation.

Day	Max Temp. ($^{\circ}\text{F}$)	Min Temp. ($^{\circ}\text{F}$)	Average Temp ($^{\circ}\text{F}$) (Max T + Min T)/2	Average Temp. ($^{\circ}\text{C}$) = Daily Heat Units	Cumulative Heat Units
Jan 1	47	37	42	5.6	5.6
Jan 2	46	32	39	3.9	9.5
Jan 3	45	36	40	4.7	14.2

heat unit = (Max T + Min T)/2. Convert temperatures to centigrade to determine heat units. The equation to convert Fahrenheit to centigrade is: $(^{\circ}\text{F} - 32) \times 0.556$.

spring to avoid tetany and the second in midsummer. For other pasture types, apply K in the fall or spring.

Sulfur (S)

Plants absorb S as sulfate. Most fertilizer materials (ammonium sulfate, gypsum, sulpomag) supply S as sulfate.

Soil sulfate, which increases in the fall, is decreased by leaching in November and December and use by microorganisms in the spring. Thus, we recommend late winter or spring applications unless there is a severe deficiency, which may require additional fall or spring applications.

You can meet pasture S requirements by applying 20 to 30 lb S/a annually as sulfate or by applying 30 to 40 lb S/a as sulfate every other year.

Boron (B)

Clover-grass pastures need adequate B. Clovers have a higher B requirement than grasses. Too much B can be highly toxic to plants; therefore, do not exceed suggested rates of B application. Distribute B evenly over the field. *Never band B-containing fertilizer materials.*

If the soil test for B is below 0.7 ppm, we suggest an application of 2 to 3 lb B/a. Mix thoroughly when applying B with other fertilizers. Spring applications are preferred. Apply B in the fall only when B is critically low.

Lime, Calcium (Ca), and Magnesium (Mg)

Soils west of the Cascades are naturally acidic. Lime applications overcome soil acidity, allowing for increased

grass and legume growth. Determine the need for lime by soil pH or a calcium (Ca) soil test. The amount of lime required to raise soil pH is determined by the SMP buffer or lime requirement (LR) test. Additional information is available in FG 52, *Fertilizer and Lime Materials*.

Grass pastures have a moderate tolerance to soil acidity. We suggest a lime application if the soil pH is below 5.4 or the Ca soil test is below 5 meq Ca/100 g of soil. For acidic soils low in Mg (less than 0.8 meq Mg/100 g of soil), use 1 t/a of dolomitic lime as an Mg source. Dolomitic lime and ground limestone have about the same ability to neutralize soil acidity. Liming rate is based on 100-score lime.

Subclover is an annual, reseeding itself each year. We recommend lime on subclover pastures where soil pH in the surface 2 to 3 inches of soil is below 5.5. Broadcast 1 t lime/a on established stands.

Clovers other than subclover are more responsive to liming than grasses. We recommend a 1–2 t/a lime application when soil pH is below 5.8. Broadcasting lime on established pastures is not as effective as mixing lime with the soil at planting, but is the only alternative on established pastures.

Pasture yield responses to Mg have not been observed in western Oregon and Washington. We suggest trial applications of a soluble Mg fertilizer where soil test levels are below 0.8 meq/100 g soil.

Incidence of grass tetany, however, may make Mg applications desirable. If tetany is a problem, do not apply K fertilizer until after the tetany period, since K reduces plant Mg and can induce tetany.

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Gardner, E.H., and J. Hart. *How to take a soil sample... and why*, EC 628 (Revised 1995). No charge

Hart, J. *Fertilizer and lime materials*, FG 52, (Reprinted 1998). No charge

Hart, J. *A List of Analytical Laboratories Serving Oregon*, EM 8677 (reprinted 1999). No charge

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Controlled Grazing Systems, Farm Production and Practice 681, New Zealand Ministry of Agriculture and Fisheries, P.O. Box 2526 (Wellington, New Zealand, 1983).

Dawson, M.D., and W.S. McGuire. *Recycling nitrogen and sulfur in grass-clover pastures*, Agricultural Experiment Station Bulletin 610 (Oregon State University, Corvallis, 1972).

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phosphorus on the yield and phosphorus content of legumes in western Oregon, Agricultural Experiment Station Technical Bulletin 83 (Oregon State University, Corvallis, 1964).

Kilgour, R., and C. Dalton. *Livestock behavior, a practical guide*, Mathuen Publications (New Zealand, 1942).

McCarthy, M.J. *Some effects of sulfur fertilization on the nutrient value of subclover-grass forage*, M.S. thesis (Oregon State University, Corvallis, 1976).

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Suggested P, K, Mg, B, and lime applications are based on soil test methods used in the Central Analytical Laboratory, OSU, Corvallis, OR. This fertilizer guide is based on experiments and field trials conducted by Lynn Cannon, M.D. Dawson, E. Hugh Gardner, John Hart, T.L. Jackson, W.S. McGuire, and Gene Pirelli, Agricultural Experiment Station and Extension Service, Oregon State University. This guide replaces FG 1, *Irrigated Clover-Grass Pastures (W. Ore.)*; FG 4, *Subclover-Grass Pasture (W. Ore.)*; FG 16, *Perennial Grass Pasture (W. Ore.)*; FG 58, *Irrigated Clover-Grass Pastures (SW Ore.)*; and FG 63, *Subclover-Grass Pastures (W. Ore.)*.

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NUTRIENT MANAGEMENT FOR DAIRY PRODUCTION

The pre-sidedress soil nitrate test (PSNT)

for Western Oregon and Western Washington

E.S. Marx, N.W. Christensen, J. Hart, M. Gangwer, C.G. Cogger, and A.I. Bary

What is the Pre-sidedress Soil Nitrate Test (PSNT)?

The Pre-sidedress Soil Nitrate Test (PSNT) evaluates nitrogen fertilizer needs for field corn. The PSNT can help ensure maximum yields without excessive nitrogen fertilizer applications. The benefits are reduced fertilizer purchases and reduced risk of environmental contamination.

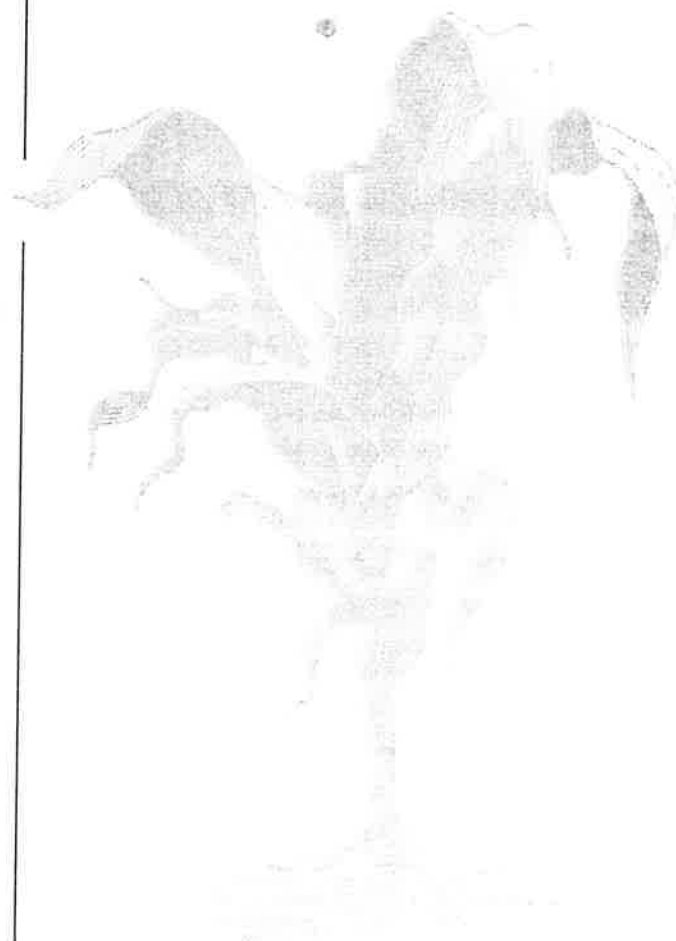
Who can benefit from the PSNT?

Anyone producing corn for feed can potentially benefit from the PSNT. Growers who apply manure to their fields are especially likely to benefit. The organic matter in manure contributes nitrogen that is not well accounted for by other soil test methods.

Why does the PSNT tell more about nitrogen availability than early spring soil tests?

Soil tests performed in early spring do not tell how much nitrogen might be available later in the growing season. Most soil nitrogen is held in organic matter and is unavailable to growing plants. As the soil warms up, increased biological activity converts organic nitrogen into

plant-available inorganic forms (Figure 1). An early spring soil test does not take this nitrogen into account. Thus, if you base fertilization on an early spring test, you might apply too much fertilizer.



E.S. Marx, former research assistant in soil science; Neil W. Christensen, professor of crop and soil science; John Hart, Extension soil science specialist; Mike Gangwer, Extension agent, Marion County; Oregon State University; C.G. Cogger, Extension soil scientist; and A.I. Bary, scientific assistant; Washington State University.



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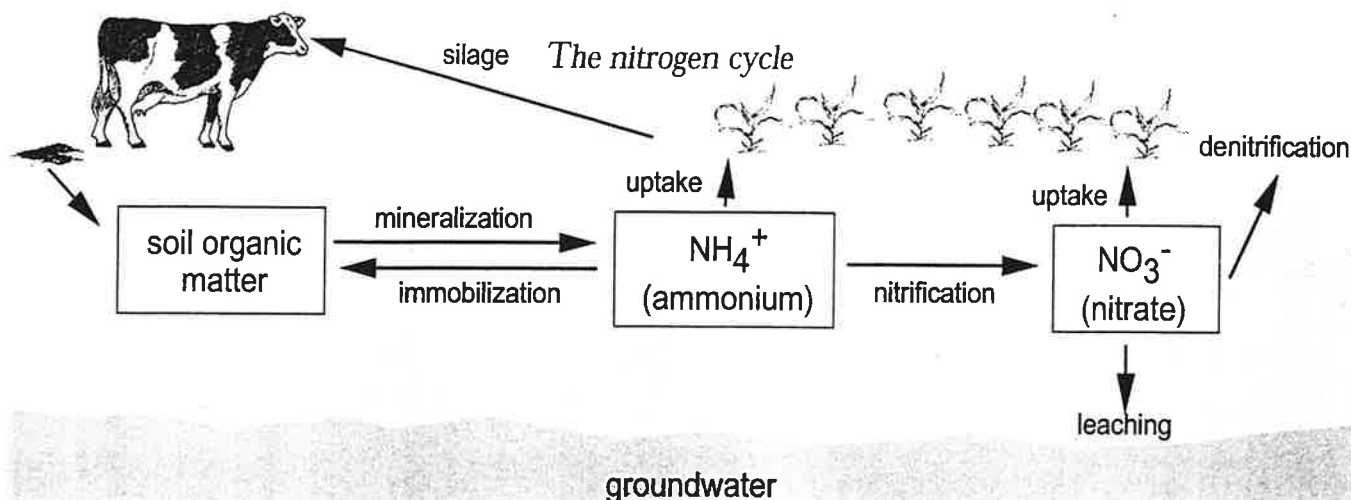


Figure 1.—Organic nitrogen in soil is converted through mineralization to plant-available inorganic forms (NH₄⁺ and NO₃⁻), which are taken up by growing plants.

The PSNT measures soil nitrate (NO₃⁻-N) during the growing season, after some nitrogen has become plant-available and just prior to the crop's period of greatest need.

How much N should I apply before planting?

If needed, apply no more than 40 lb N/acre as a starter in spring. Most fields with a history of manure applications require no starter N fertilizer. If starter N is needed, it can be supplied by manure or commercial fertilizers.

Delay as much N fertilization as possible until midseason. If the midseason PSNT shows low N levels, make a sidedress fertilizer application.

When is the best time to measure soil nitrate?

Corn plants begin their greatest uptake of nitrogen around the 5-leaf stage, or when the plants are

about 12 inches tall at the center of the whorl. The best time to evaluate soil nitrogen is just prior to this period of rapid uptake (Figure 2).

How much N is enough?

A PSNT value of 25 ppm or greater is sufficient for maximum silage corn yields. If the PSNT value is below 25 ppm, apply nitrogen at the rates shown in Table 1.

Nitrogen can be supplied by manure or commercial fertilizer. Most dairies produce enough manure to supply needed N, making fertilizer purchases unnecessary. See EM 8585, *Manure Application Rates for Forage Production*, for more information.

What if I apply more N than the crop needs?

Excess nitrogen will not be used by the crop and will remain in the soil after harvest. During winter, rain may wash nitrate from the soil into surface and ground waters. This poses a threat to human and environmental health and wastes fertilizer dollars.

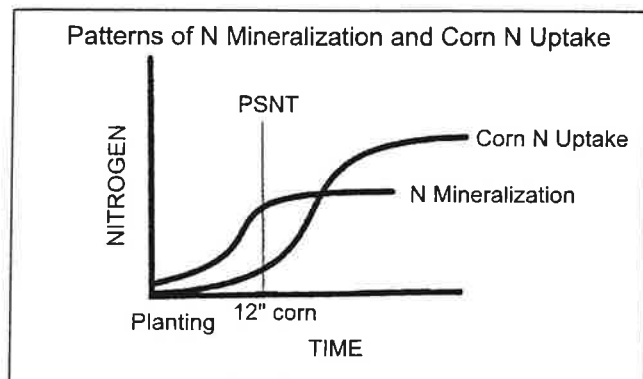


Figure 2.—Perform the PSNT when corn is 12 inches tall (before rapid nitrogen uptake by corn and after some nitrogen mineralization has occurred).

Table 1.—Suggested N fertilization rates based on PSNT values.

PSNT value (ppm NO ₃ ⁻ -N)	Estimated N to apply (lb N/acre)
0-10	100-175
10-20	50-100
20-25	0-50
over 25	0

Soil sampling and handling procedures

- 1** **When to sample.** Sample soil when the corn has 5 collared leaves, or at least a week before planned sidedressing. This usually coincides with a plant height of about 12 inches at the center of the whorl.



- 2** **Where to sample.** Sample between rows, away from fertilizer bands. Avoid irregularities in the field, such as low areas or places where manure has accumulated.
- Collect a composite sample of 15–20 cores. The more cores you collect, the better your chance of getting an accurate measurement.



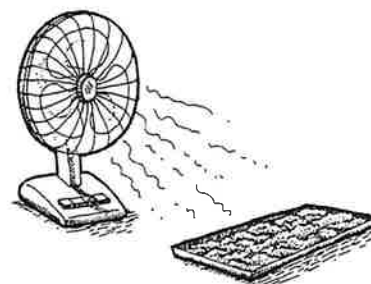
- 3** **How to sample.** Sample soil to a depth of 12 inches.



- 4** **Preparing the sample.** Mix the sample thoroughly in a clean container. Save a subsample sufficient to fill a soil sample bag.

Dry this sample immediately. Drying is important to stop biological activity, which could alter soil nitrate content. Dry the sample by spreading it on a clean piece of paper in a warm, well-ventilated area. A fan can increase air flow. Do not use a microwave oven to dry the sample.

If you cannot dry the sample immediately, refrigerate it in a cooler and dry it later the same day. If you cannot dry or deliver the sample to a lab the day it is collected, freeze it.



- 5** **Soil analysis.** Send the sample to a soil testing lab to be analyzed for nitrate-nitrogen (NO_3^- -N). See FG 74, *A List of Analytical Laboratories Serving Oregon*, for a list of labs.



- 6** **Interpreting results.** If soil nitrate levels are above 25 ppm, no additional nitrogen fertilizer is needed. If soil nitrate levels are below 25 ppm, apply fertilizer at the rates shown in Table 1.

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Hart, J. *A List of Analytical Laboratories Serving Oregon*, FG 74 (Oregon State University, Corvallis, revised 1996). No charge

Hart, J., M. Gangwer, M. Graham, and E.S. Marx. *Manure Application Rates for Forage Production*, EM 8585 (Oregon State University, Corvallis, 1996). \$1.00

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

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

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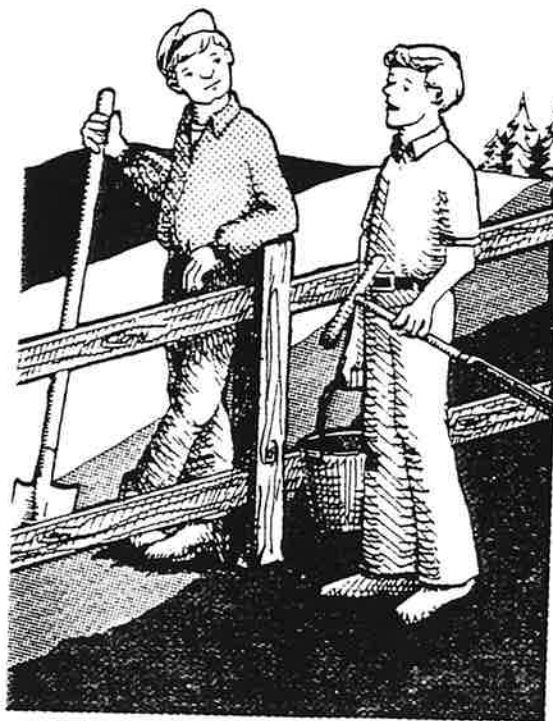
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EC 628 • Reprinted April 2003

Soil Sampling

for Home Gardens
and Small Acreages



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Laboratory soil tests will help you develop and maintain more productive soil and increase crop production by providing information on the available nutrient content of your soil. Soil testing helps you select the correct kind and amount of fertilizer and liming material. Recommendations are based on the results of fertilizer experiments, soil surveys, and results obtained by farmers.

A soil sample weighing about 0.5 pound represents from 2 to 40 million pounds of soil in the field. Thus, care in sampling is essential.

When should I test my soil?

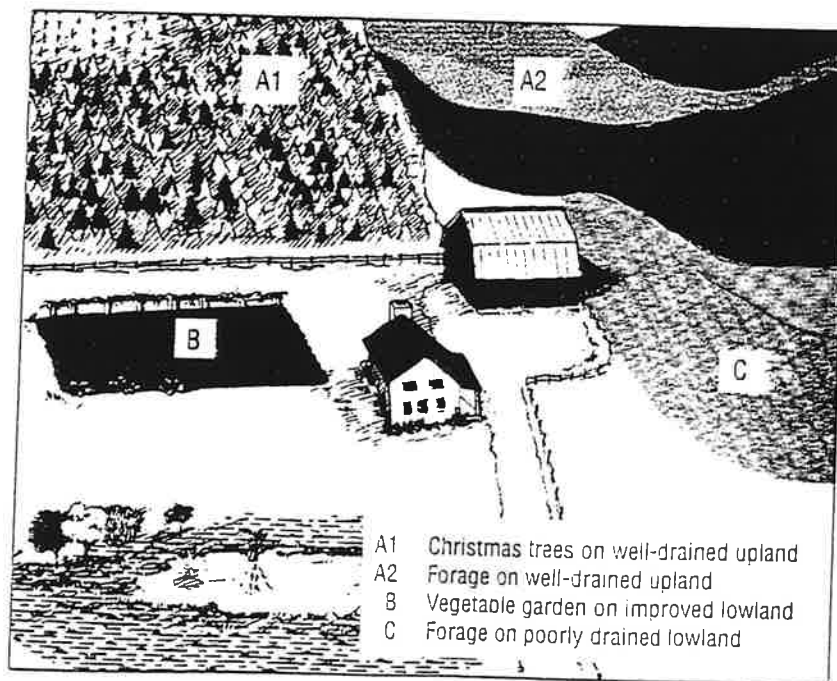
- *For perennial crops* such as orchards, Christmas trees, alfalfa, grass seed, and permanent pasture, the most important time to test the soil is before planting so that necessary nutrients can be mixed into the soil. This test is especially important in acidic soils where liming is likely to be needed. Apply lime and mix it with the soil several months before planting (for example, in the fall for spring planting), since it reacts slowly with the soil. Then:
 - For perennial grass seed, legumes, and pastures, test soil every 3 years after planting.
 - Soil testing usually is not used for established fruit trees, berries, or grapes. Use foliar nutrient analysis instead.
 - Testing soil in timber or Christmas tree plantings usually is not necessary until replanting, unless tree growth is unsatisfactory.

- *For annual crops*, especially vegetables, test soil each year before planting. If you plant successive crops in a single season, you don't need to test before each planting.
- *Additional information* on nutrient testing methods and requirements for various crops is available in OSU Extension publications.

Each soil sample should represent only one soil type or soil condition

The farm in the illustration below has three soil types: A (upland), B (improved lowland), and C (poorly drained lowland). On the upland soil, two areas have different management histories: A1 (Christmas trees) and A2 (pasture).

Sample each soil type (A, B, and C) separately. Areas with different management histories (A1 and A2) also should be sampled separately. In this example, a separate soil sample should be taken from each of the four areas.



How to sample

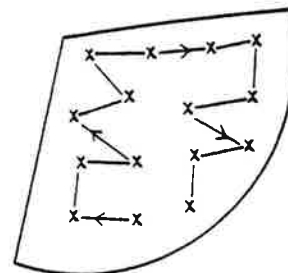
Sample where the crop will be planted

If you are using raised beds, such as for vegetable crops, take your samples in the beds, not in the areas between them.



Take 15 to 20 subsamples

Each sample should consist of subsamples (X) taken from 15 to 20 locations within the sampling area.



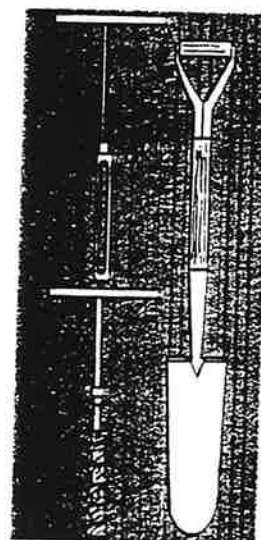
Avoid unusual areas

Avoid sampling in small areas where you know that conditions are different than the rest of the field (for example, former manure piles or fertilizer bands). You often can spot these areas by looking for plants growing very well or very poorly.



Avoid contaminating the sample

- Use clean sampling tools and avoid contaminating the sample during mixing or packaging. A small amount of fertilizer residue on tools or hands, for instance, can cause serious contamination of the soil sample.
- Do not use galvanized, brass, or bronze sampling tools to collect samples that will be tested for micronutrients such as zinc.



Note: This publication is not intended to be used as guidance for obtaining soil samples for environmental testing.

Take the soil sample to the correct depth

- Sample the part of the soil where the plant roots will grow. For most annual and perennial crops, sample from the surface down to about 6 to 9 inches.



Carefully mix the soil sample

Place all of the soil subsamples from a single sampling area in a clean container and mix thoroughly.



Forwarding the soil sample

- A list of laboratories that perform soil tests is available on the Web (<http://eesc.oregonstate.edu>) or from your county office of the OSU Extension Service.
- Call one or more labs to determine the cost of the soil test you need.
- After choosing a lab, request any necessary paperwork (such as an information sheet), find out how you should prepare and submit the sample, and obtain the address where you should send the sample.
- Prepare and submit the sample according to the instructions. Plastic zipper bags work best; do not use a paper bag. Most laboratories ask you to label the sample bag with identifying information and to fill out and include an information sheet with the sample. Don't forget to include payment.
- Number each sample and keep a record of the fields and areas sampled.



What analysis should I request?

The standard soil test from most laboratories measures organic matter, phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sodium (Na), and soil pH (acidity). For acidic soils, the SMP buffer test is the best way to determine how much lime is needed. Certain crops might have higher requirements for specific nutrients. Consult OSU Extension publications to determine whether you should test for nutrients such as sulfur (S), boron (B), or zinc (Zn).

Special soil-sampling techniques sometimes are required

- Nitrate nitrogen soil tests are recommended only for a few crops in eastern Oregon.
- For orchards, leaf sampling is more useful than soil sampling.

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~~orientation, national origin, age, marital status, disability~~

This publication, originally prepared by E. Hugh Gardner, former Extension soil science specialist, was revised by Michael Robotham, Extension small farms faculty, Clackamas County, and John Hart, Extension soil science specialist; Oregon State University.

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Soil Test Interpretation Guide

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



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

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

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

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

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

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

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

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

Nitrogen (N)

Plant-available nitrogen (nitrate and ammonium)

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

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

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

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

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

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

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

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

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

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

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

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

Total nitrogen

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

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

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

Phosphorus (P)

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

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

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

Table 2.—Phosphorus soil test.

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

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

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

Cations

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

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

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

Potassium (K)

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

Table 3.—Extractable potassium (K).

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

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

Calcium (Ca)

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

Table 4.—Extractable calcium (Ca).

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

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

Magnesium (Mg)

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

Magnesium toxicity can occur on serpentine soils in southwest Oregon.

Table 5.—Extractable magnesium (Mg).

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

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

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

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

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

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

Micronutrients

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

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

Boron (B)

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

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

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

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

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

Zinc (Zn)

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

Copper (Cu)

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

Manganese (Mn)

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

Iron (Fe)

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

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

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

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

Molybdenum (Mo)

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

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

Chloride (Cl)

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

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

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

pH, lime requirement (LR)

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

Table 9.—Soil pH ranges.

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

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

SMP* lime requirement test

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

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

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

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

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

Table 10.—SMP lime requirement—field scale.

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

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

Table 11.—SMP lime requirement—gardens.

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

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

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

Sodium (Na)

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

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

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

Soluble salts (SS)

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

Table 12.—Soluble salts.

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

*mmhos/cm is equivalent to decisiemen/m.

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

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

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

Organic matter

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

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

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

Cation exchange capacity (CEC)

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

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

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

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

Base saturation

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

For more information

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

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

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

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Table 13.—Conversions.

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

*These values vary with soil bulk density.

Appendix H - Soil Sampling Guide & Soil Test Interpretation Guide

***Appendix I - Record Keeping & NRCS Waste Utilization 633 OR-JS
(equipment calibration worksheets and waste application record sheets)***



Waste Utilization

Conservation Practice Jobsheet

Natural Resources Conservation Service, Oregon

633 OR-JS

February 2002

Client: Jon & Kate Rohner

Date: October 2005



Definition

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

Purpose

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

Where used

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

Conservation Management Systems

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

Waste Utilization Planning

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

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

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

Schematic of a Resource Management System for a Dairy

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

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

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

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WASTE UTILIZATION WORKSHEET**Tank Equipment Calibration**

(Using a Full Tank Load)

Name: _____ Date: _____

Operator: _____ Spreader ID: _____

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	F
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:						

WASTE UTILIZATION WORKSHEET**Nitrogen Based Waste Application**

Name: _____ Date: _____

Example:

Corn silage is being grown and the recommended nutrient application from the nutrient budget worksheet is 200 pounds of nitrogen(N) per acre. A traveling big gun sprinkler will be used to make 1 application of liquids from a non-agitated waste storage pond and a tractor spreader will be used to make 1 application of solids from a dry stacking facility that will not be incorporated into the field.

Waste application rates and amounts:

Steps	Example		Your Calculations			
	Liquid	Solids	Liquid	Solids	Liquid	Solids
1. Type of waste-	Dairy	Dairy				
2. Crop receiving waste-	Corn Silage	Corn Silage				
3. Desired nitrogen application rate, lb/acre-	100	100				
4. Nutrient concentrations in storage from laboratory analysis or from Table 1-1:	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
Nitrogen (N)-	4	9				
Phosphorus (P₂O₅)-	1	4				
Potassium (K₂O)-	6	19				
5. Plant availability of nitrogen from Table 1-1 in percent-	100 %	100 %	%	%	%	%
6. Nitrogen retained, in percent, after application from Table 1-2-	75 %	70 %	%	%	%	%
7. Calculate nitrogen availability- line 4 N x line 5 x line 6 ÷ 10,000=	<u>lb/1000 gal</u> 3	<u>lb/ton</u> 6.3	<u>lb/1000 gal</u>	<u>lb/ton</u>	<u>lb/1000 gal</u>	<u>lb/ton</u>
8. Determine nitrogen application rate from the nutrient application charts:	<u>inches/acre</u>	<u>tons/acre</u>	<u>inches/acre</u>	<u>tons/acre</u>	<u>inches/acre</u>	<u>tons/acre</u>
Nitrogen (N)-	1.75	17				
9. Determine the amount of phosphorus and potassium applied from nutrient concentration data on line 4 and nutrient application charts:	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>	<u>lb/acre</u>
Phosphorus (P₂O₅)-	50	70				
Potassium (K₂O)-	250	300				
10. Total Nutrients Applied, lb/acre:						
Nitrogen (N)- (Sum of liquids and solids from line 3)	200 lb/acre		lb/acre		lb/acre	
Phosphorus (P₂O₅)- (Sum of liquids and solids from line 9)	120 lb/acre		lb/acre		lb/acre	
Potassium (K₂O)- (Sum of liquids and solids from line 9)	550 lb/acre		lb/acre		lb/acre	

Natural Resources Conservation Service, Oregon

WASTE UTILIZATION WORKSHEET**Phosphorus Based Waste Application**

Name: _____ Date: _____

Example:

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

Waste application rates and amounts:

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

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

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

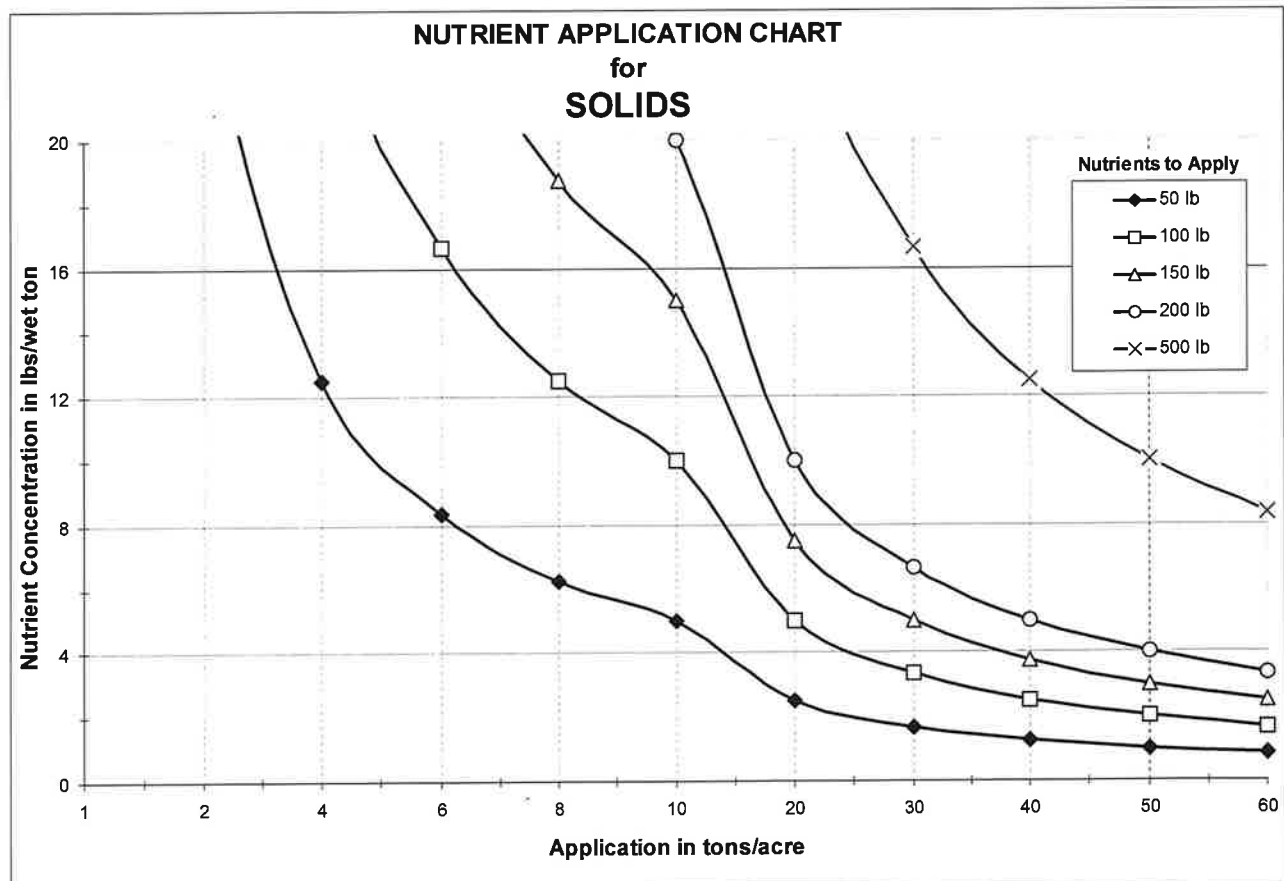
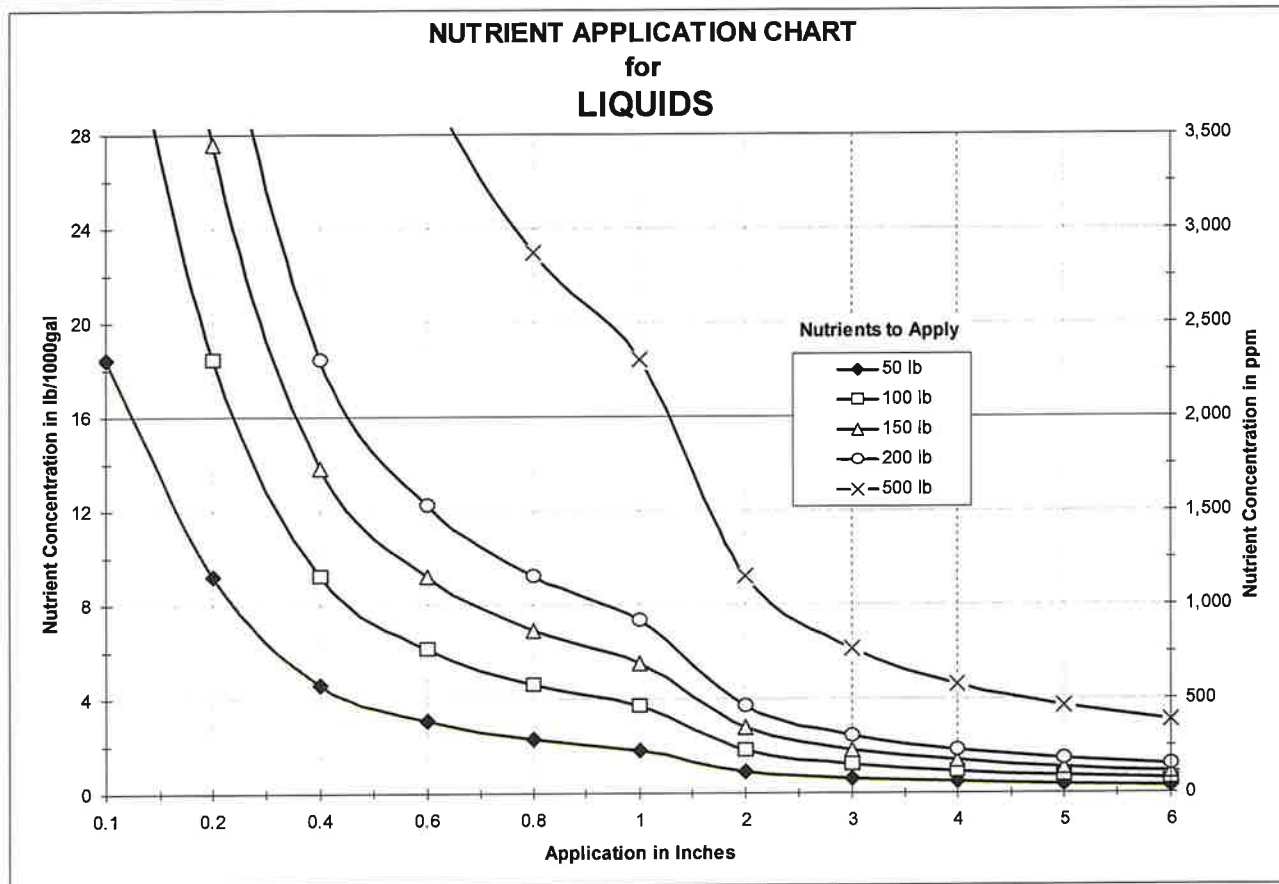
Typical nutrient content, solids content, density, and nitrogen availability of animal manure at the time of application:						
Solids from:	Nitrogen N (lb/Ton) ₂	Phosphorus P₂O₅ (lb/Ton) ₂	Potassium K₂O (lb/Ton) ₂	Solids (Percent)	Bulk Density (lb/cubic yard)	Nitrogen Availability (Percent) ₁
Broiler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

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

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

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

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

WASTE UTILIZATION WORKSHEET

[illegible]

[illegible]

DATE: OCTOBER 9, 1998
 REPORT: M3200
 CLIENT: OREGON DAIRY FARMERS ASSN.
 GROWER: JOHN ROHNER DAIRY
 SAMPLER: TODD LEONNIG
 COPY TO:
 TYPE: LIQUID MANURE

AGRICULTURAL
 CHEMICALS

LAB NO.	SAMPLE I.D.	(As Rec'd) UNIT	Total N	P	P2O5	K	K2O	Sol. Salts	Moisture	Solids
5825	MANURE	%	0.118	0.018	0.041	0.079	0.095	0.26	95.74	4.26
		#/1000 gal.	9.829	1.499	3.432	6.581	7.930	21.66		

DATE: OCTOBER 9, 1998

REPORT: M3199

CLIENT: OREGON DAIRY FARMERS ASSN.

GROWER: JOHN ROHNER DAIRY

SAMPLED: TODD LEONNIG

COPY TO:

TYPE: SOLID MANURE

LAB NO.	SAMPLE I.D.	UNIT	Total N	P	P2O5	K	K2O	Sol. Salts	Moisture	Total Solids
5824	MANURE	Dry Wt. %	1.422	0.756	1.732	2.620	3.156	0.69		21.95
		Dry Wt. #/T	28.440	15.120	34.646	52.400	63.122	13.80		439.00
		As Rec'd %	0.312	0.166	0.380	0.575	0.693	0.15	78.05	
		As Rec'd #/T	6.242	3.318	7.604	11.502	13.856	3.00	1561.00	

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 8006583858 • 702226550
 p: 702226550

Dealer: 7-20

Joe Hill

Reported: 3

Test #: 1

Grower: John Rohner

50 3

Lab #:

3

3

ELEMENT	ANSWER	INTERP	Should Be	ELEMENT	ANSWER	INTERP	Should Be
pH Soil	7.4	Slightly Basic		Potassium-ppm	279	Low	300 +
pH-SMP				Sulfate-ppm	20	Adequate	20 +
Soluble Salts	0.27	Normal	< 1.5	Calcium-ppm	4046	High	1,800
% Lime	2.5	Potential Sealing		Magnesium-ppm	478	High	250 +
% Organic Matter	2.3	Low		Sodium-ppm	169	OK	< 225
Nitrates-ppm	22	Adequate	10 - 35	Zinc-ppm	0.6	Low	1.0 - 3.0
Ammonium-ppm	3	Low	5 +	Copper-ppm	0.4	Low	0.8 - 2.5
Phosphorus-ppm	16	Low	25 - 40	Manganese-ppm	1	Very Low	6 - 30
Phos-ppm-Bray			50 - 100	Iron-ppm	4	Very Low	7 +
				Boron-ppm	0.6	Low	0.7 - 1.5
Texture	Silt Loam			NO3 ppm		NH4 ppm	
Cation Exchange Capacity - CEC	19			1st Foot	22		
	13			2nd Foot			
BASES	IDEAL	YOURS		3rd Foot			
Calcium-%CE	65-80%	106		4th Foot			
Magnesium-%CE	10-20%	21					
Potassium-%CE	2-6%	3.8					
Sodium-% of EC	< 5%	3.9					
Hydrogen-% of EC	< 15%						
Ratio	Ideal	Yours	Evaluation	Recommendations			
N:S	12:1	1:1	OK				
Ca:Mg	3-20:1	3:1	OK				
Ca:K pH > 7	15:1	15:1	OK				
Ca:K pH < 7	10:1	1:1					
Ca:P pH > 7	100:1	256:1	High	Watch P			
Ca:P pH < 7	40:1	1:1					
P:Zn	15:1	26:1	High	Watch Zn			
P:Mn	4:1	16:1	High	Watch Mn			
P:Cu	25:1	40:1	High	Watch Cu			
Zn:Cu	2:1	2:1	OK				
Mn:Zn	3:1	2:1	OK				
Mn:Cu	5:1	3:1	OK				
K:B	200:1	465:1	High	Watch B			
Mg:K	2:1	2:1	OK				
				Nutrient Suggestions: Pounds per Acre			
				Crop	Corn		
				Field Gal	Silage	30	
				Past Crop		3	
				Ares		3	
				Nitrogen		3	
				Phosphate		3	
				Potash		3	
				Sulfates		5	
				Elemental Sulfur		3	
				Sum			
				Lime			
				Dolomite			
				Magnesium			
				Zinc		7	
				Iron			
				Manganese		8	
				Copper			
				Boron		1	

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Se 720 #

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Sve John Rohner

ED #8 & 9

Lab #:

4683

SV #:

BLUOL BOR

ELEMENT	ANSWER	INTERP	Should Be	ELEMENT	ANSWER	INTERP	Should Be
pH-Soil	7.5		Slightly Basic	Potassium-ppm	215	Low	300 +
pH-SMP				Sulfate-ppm	18	Low	20 +
Soluble Salts	0.29	Normal	< 1.5	Calcium-ppm	3371	date	1,800
% Lime	2	Potential Sealing		Magnesium-ppm	399	date	250 +
% Organic Matter	2.19	Low		Sodium-ppm	140	OK	< 225
Nitrates-ppm	27	date	10 - 35	Zinc-ppm	0.3	Low	1.0 - 3.0
Ammonium-ppm	2	LOW	5 -	Copper-ppm	0.5	LOW	0.8 - 2.5
Phosphorus-ppm	20	Low	25 - 40	Manganese-ppm	2	LOW	5 - 30
Phos-ppm-Bray			50 - 100	Iron-ppm	5	LOW	7 +
				Boron-ppm	0.6	Low	0.7 - 1.5
Texture	Loam			Nutrient Suggestions			
Cation Exchange Capacity - CEC	20			Con			
Percent Base Saturation	107			Yield Goal	30		
	IDEAL YOUNG			Past Crop	Corn Silage		
Calcium-% of CEC	65-80%	84		Acres	52		
Magnesium-% of CEC	10-20%			Nitrogen	136		
Potassium-% of CEC	2-8%	29		Phosphate	48		
Sodium-% of CEC	< 5%			Potash	115		
Phosphorus-% of CEC	< 15%			Sulfates	9		
Ratio	Ideal	Yours	Evaluation	Recommendations			
N:P	10:1	2:1	OK	Elemental Sulfur	112		
P:K	10:1	8:1	OK	Gypsum			
C:N	15:1	16:1	Low	Lime			
C:P	10:1	1:1		Dolomite			
C:K	10:1	167:1	High	Magnesium			
C:Ca	10:1	1:1		Zinc	6		
Ca:Mg	15:1	25:1	High	Watch Zn			
Mg:K	4:1	10:1	High	Watch Mn			
Ca:Cu	3:1	40:1	High	Watch Cu			
C:Cu	2:1	2:1	OK				
C:Mn	5:1	3:1	OK				
Mg:Cu	5:1	4:1	OK				
C:B	358:1	358:1	High	Watch B			
C:N	2:1	2:1	OK				

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Lab #:

4684

SV #:

3ve John Rohner
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SUMMARY

ELEMENT	ANSWER	INTERP.	Should Be	ELEMENT	ANSWER	INTERP.	Should Be
pH-Soil	8.1	Moderate	Basic	Potassium-ppm	549	High	300 +
pH-SMP				Sulfate-ppm	29	date	20 +
Soluble Salts	0.35	date	< 1.5	Calcium-ppm	3589	High	1,800
% Lime	3.5	date	5-10	Magnesium-ppm	659	High	250 +
% Organic Matter	2.88	date	Medium	Sodium-ppm	287	High	< 225
Nitrates-ppm	16	date	10 - 35	Zinc-ppm	1.4	date	1.0 - 3.0
Ammonium-ppm	2	Low	5 +	Copper-ppm	0.5	Low	0.3 - 2.5
Phosphorus-ppm	38	date	25 - 40	Manganese-ppm	2	Low	5 - 30
Phos-ppm-Bray			50 - 100	Iron-ppm	6	Low	7 +
				Boron-ppm	0.8	date	0.7 - 1.5

Texture	3 Loam	NO3	NH4	Nutrient Suggestions	
		ppm	ppm	Pounds per Acre	
Cation Exchange Capacity - CEC	20	1st Foot	6	Crop	3B
Percent Base Saturation	130	2nd Foot	2	Yield Goal	6
Calcium-% of CEC	65-80%	3rd Foot		Past Crop	Barley
Magnesium-% of CEC	10-20%	4th Foot		Acres	40
Potassium-% of CEC	2-8%			Nitrogen	10
Sodium-% of CEC	< 5%			Phosphate	
Sulfate-% of CEC	< 15%			Potash	
				Sulfates	
Ratio	1st	2nd	3rd	Elemental Sulfur	245
N:S	10:1	1:1	OK	Gypsum	
S:Cl	5-20:1	5:1	Low	Lime	
S:Mg	15:1	7:1	OK	Dolomite	
S:Ca	10:1	1:1		Magnesium	
S:K	100:1	95:1	OK	Zinc	3
S:Fe	40:1	1:1		Iron	
S:Mn	15:1	27:1	High	Manganese	6
S:Cu	4:1	19:1	High	Copper	1
S:Zn	25:1	76:1	High	Boron	1
S:B	2:1	3:1	High		
M:Ca	3:1	1:1	OK		
M:Mg	5:1	4:1	OK		
M:Fe	200:1	610:1	High		
M:Mn	2:1	1:1	Low		

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4689

SV #:

John Rohner

LABOR

ELEMENT	ANSWER	INTERP	Should Be	ELEMENT	ANSWER	INTERP	Should Be	
pH-Soil	7.6	Opt, Bas		Potassium-ppm	267	W	300 +	
pH-SMP				Sulfate-ppm	8	W	20 +	
Soluble Salts	0.11	W	< 1.5	Calcium-ppm	2056	Rate	1,800	
% Lime	0.5	Potential		Magnesium-ppm	208	W	250 +	
% Organic Matter	2.25	W		Sodium-ppm	37	OK	< 225	
Nitrates-ppm	5	W	10 - 35	Zinc-ppm	1.7	Rate	1.0 - 3.0	
Ammonium-ppm	2	W	5 +	Copper-ppm	0.4	W	0.8 - 2.5	
Phosphorus-ppm	19	W	25 - 40	Manganese-ppm	2	W	6 - 30	
Phos-ppm-Bray			50 - 100	Iron-ppm	9	Rate	7 +	
				Boron-ppm	0.5	W	0.7 - 1.5	
Texture	S&M			NO3 ppm	NH4 ppm			
Cation Exchange Capacity - CEC	W			1st Foot	5	2	Nutrient Suggestions Pounds per Acre	
Percent Base Saturation	64			2nd Foot				
BASES	IDEAL	YOURS		3rd Foot				
Calcium-% of CEC	65-80%	51		4th Foot				
Magnesium-% of CEC	10-20%	9						
Potassium-% of CEC	2-6%	34					Crop	W
Sodium-% of CEC	< 5%	8					Yield Goal	3
Hydrogen-% of CEC	< 15%	36					Past Crop	Alfalfa
							Acres	17
Ratio	Ideal	Yours	Evaluation	Recommendations			Nitrogen	59
N:S	10:1	1:1	OK				Phosphate	85
S:M	W	10:1	OK				Potash	123
C:P	15:1	8:1	OK				Sulfates	32
C:K	10:1	1:1					Elemental Sulfur	
C:Mg	10:1	106:1	High	Watch P			Gypsum	
C:Zn	W	1:1					Lime	
H:Fe	15:1	11:1	OK				Dolomite	
Mn	W	10:1	High	Watch Mn			Magnesium	
Fe	W	49:1	High	Watch Cu			Zinc	2
B:Cu	2:1	4:1	High	Watch Cu			Iron	
M:Z	3:1	1:1	OK				Manganese	6
M:O	5:1	5:1	OK				Copper	2
B	W	534:1	High	Watch B			Boron	1
W	2:1	1:1	W	W	g			

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36 720 #
10272005
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Lab #:

4690

SV #:

John Rohner

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3000R

ELEMENT	ANSWER	INTERP	Should Be	ELEMENT	ANSWER	INTERP	Should Be
pH-Soil	7.4	ght	Basic	Potassium-ppm	505	High	300 +
pH-SMP				Sulfate-ppm	11	w	20 +
Soluble Salts	0.20	sl	< 1.5	Calcium-ppm	2085	date	1,800
% Lime	0	G		Magnesium-ppm	348	date	250 +
% Organic Matter	3.29	Med		Sodium-ppm	91	OK	< 225
Nitrates-ppm	19	date	10 - 35	Zinc-ppm	1.3	date	1.0 - 3.0
Ammonium-ppm	2	w	5 +	Copper-ppm	0.4	w	0.8 - 2.5
Phosphorus-ppm	44	High	25 - 40	Manganese-ppm	2	w	6 - 30
Phos-ppm-Bray			50 - 100	Iron-ppm	9	date	7 +
				Boron-ppm	0.6	w	0.7 - 1.5
Texture	Bam			NO3 ppm	NH4 ppm		
Cation Exchange Capacity - CEC	21			1st Foot	19	2	
Percent Base Saturation	72			2nd Foot			
BASES		IDEAL	YOURS	3rd Foot			
Calcium-% of CEC	65-80%	50		4th Foot			
Magnesium-% of CEC	10-20%	14					
Potassium-% of CEC	2-6%	62					
Sodium-% of CEC	< 5%	19					
Hydrogen-% of CEC	< 15%	28					
Ratio	Ideal	Yours	Evaluation	Recommendations	Nutrient Suggestions Pounds per Acre		
N:S	10:1	2:1	OK		Crop	Ab	
S:P	10:1	6:1	OK		Yield Goal	6	
P:K	10:1	4:1	OK		Past Crop	Alfalfa	
K:Ca	10:1	1:1			Acres	60	
Ca:Mg	10:1	47:1	OK		Nitrogen	3	
Mg:P	10:1	1:1			Phosphate		
P:K	10:1	34:1	High	Watch Zn	Potash		
K:Mn	10:1	22:1	High	Watch Mn	Sulfates	25	
K:Fe	10:1	110:1	High	Watch Cu	Elemental Sulfur		
S:Cu	10:1	3:1	High	Watch Cu	Gypsum		
Ca:Mg	10:1	2:1	OK		Lime		
Mg:P	10:1	5:1	OK		Dolomite		
P:K	10:1	842:1	High	Watch B	Magnesium		
K:Mn	10:1	1:1	w		Zinc	4	
					Iron		
					Manganese	6	
					Copper	2	
					Boron	1	

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220 720
10272005

Lab #:

4691

SV #:

John Ronner

#4 & 5

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ELEMENT	ANSWER	INTERP	Should Be	ELEMENT	ANSWER	INTERP	Should Be
pH-Soil	7.8	Med	Basic	Potassium-ppm	306	date	300 +
pH-SMP				Sulfate-ppm	14	W	20 +
Soluble Salts	0.12	W	< 1.5	Calcium-ppm	2870	date	1,800
% Lime	1	Potential	Strong	Magnesium-ppm	362	date	250 +
% Organic Matter	1.53	W		Sodium-ppm	71	OK	< 225
Nitrates-ppm	4	W	10 - 35	Zinc-ppm	0.9	W	1.0 - 3.0
Ammonium-ppm	2	W	5 +	Copper-ppm	0.5	W	0.8 - 2.5
Phosphorus-ppm	28	date	25 - 40	Manganese-ppm	1	W	5 - 30
Phos-ppm-Bray			50 - 100	Iron-ppm	10	date	7 +
				Boron-ppm	0.7	W	0.7 - 1.5

Feature	Sam	NO3 ppm	NH4 ppm	Nutrient Suggestions Pounds per Acre		
Exchange Capacity - CEC	19			Crop	Bar	Bar
Water Saturation	87			Yield Goal	5	5
Caesium-% of CEC	35-80%	73	Foot	Past Crop		
Ammonium-% of CEC	10-20%	10	Foot	Acres		
Phosphorus-% of CEC	0-3%	47	Foot	Nitrogen	145	208
Hydrogen-% of CEC	< 15%	8	Foot	Phosphate		
				Boron		10
				Potassium		
				Sulfur		
				Excess		
				Lime		
				Dolomite		
				Magnesium		
				Zinc		4
				Iron		
				Manganese		
				Copper		1
				Boron		1
				"Always practice the laws of Agronomy."		
				John P. Taberna, Soil Scientist		

Western Laboratories, Inc.

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30 720

10272005

3#

John Rohner

#6

Lab #:

4692

SV #:

BBIBOR

ELEMENT	ANSWER	INTERP.	Should Be	ELEMENT	ANSWER	INTERP.	Should Be
pH-Soil	8.0	Mildly Basic		Potassium-ppm	321	date	300 +
pH-SMP				Sulfate-ppm	17	W	20 +
Soluble Salts	0.14	W	< 1.5	Calcium-ppm	3436	High	1,800
% Lime	1.3	Potential	ing	Magnesium-ppm	402	date	250 +
% Organic Matter	1.72	W		Sodium-ppm	106	OK	< 225
Nitrates-ppm	1	W	10 - 35	Zinc-ppm	0.3	W	1.0 - 3.0
Ammonium-ppm	2	W	5 +	Copper-ppm	0.3	W	0.3 - 2.5
Phosphorus-ppm	10	W	25 - 40	Manganese-ppm	2	W	3 - 30
Phos-ppm-Bray			50 - 100	Iron-ppm	5	W	7 +
				Boron-ppm	0.9	date	0.7 - 1.5

Texture	am	NO3	NO4	Nutrient Suggestions
Carbon Exchange Capacity - CEC	17			
Cation Sat. Saturation	100			
Calcium-% of CEC	10			
Magnesium-% of CEC	10-20%			
Potassium-% of CEC	2-5%			
Phosphorus-% of CEC	4-5%			
Iron-% of CEC	1%			
Zinc-% of CEC	OK			
Copper-% of CEC	OK			
Boron-% of CEC	OK			
Calcium	10	High	Watch	
Magnesium	10	High	Watch	
Potassium	10	High	Watch	
Phosphorus	10	High	Watch	
Iron	10	High	Watch	
Zinc	10	High	Watch	
Copper	10	High	Watch	
Boron	10	High	Watch	
Calcium	10	High	Watch	
Magnesium	10	High	Watch	
Potassium	10	High	Watch	
Phosphorus	10	High	Watch	
Iron	10	High	Watch	
Zinc	10	High	Watch	
Copper	10	High	Watch	
Boron	10	High	Watch	

"Always practice the laws of Agronomy."
John P. Taberna, Soil Scientist

Submitted By:
 10-06-2003

Submitted For:
 10-06-2003

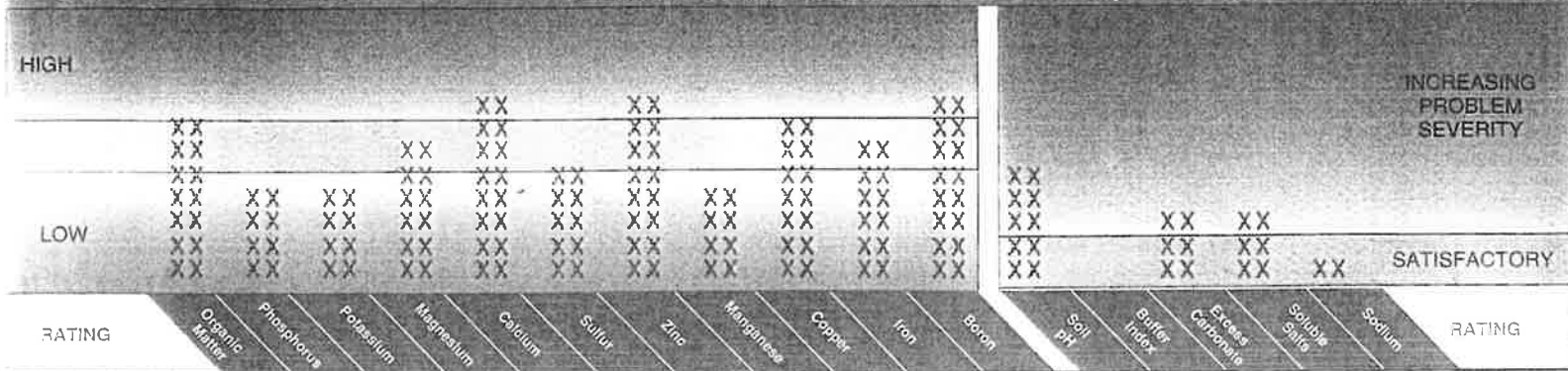
Laboratory Sample #
 00027314
Field Identification
Acres Sampled
1

Date Reported 10-06-2003

Laboratory Turnaround 10 DAYS

Samples Will Be Stored Until 00-XXX-0000

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS YOUR SAMPLE NUMBER	
F-103	
Soil pH	7.3
Buffer Index	---
Excess Carbonate	---
Soluble Salts (mmhos/cm)	0.26
Sodium ppm	70
% Organic Matter	1.0
ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)	
Nitrate N	10
Phosphorus Bray 1 Olsen	25
Potassium	345
Magnesium	490
Calcium	3954
Sulfate Sulfur	9
Zinc	1.9
Manganese	2.4
Copper	1.7
Iron	9.7
Boron	1.0

FERTILIZER GUIDELINES IN LBS PER ACRE											
1st Option Intended Crop				2nd Option Intended Crop				3rd Option Intended Crop			
ALFALFA				ALFALFA				ALFALFA			
Yield Goal				Yield Goal				Yield Goal			
5.0 TONS/AC				5.0 TONS/AC				5.0 TONS/AC			
Preceding Crop				Preceding Crop				Preceding Crop			
ALFALFA				ALFALFA				ALFALFA			
PLANT FOOD GUIDELINE RANGES			CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES			CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES			CROP REMOVAL RATES
N	0	60	60	N	0	72	72	N	0	84	84
P ₂ O ₅	30	50	53	P ₂ O ₅	40	60	63	P ₂ O ₅	30	60	74
K ₂ O	0	30	175	K ₂ O	0	60	210	K ₂ O	0	30	245
MgO	0	0	0	MgO	0	0	0	MgO	0	0	0
S	0	0	0	S	0	0	0	S	0	0	0
Zn	0	0	0	Zn	0	0	0	Zn	0	0	0
Mn	0	3.5	0	Mn	0	4.0	0	Mn	0	5.0	0
Cu	0	0	0	Cu	0	0	0	Cu	0	0	0
Fe	0	0	0	Fe	0	0	0	Fe	0	0	0
B	0	0	0	B	0	0	0	B	0	0	0

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)										ESTIMATED
Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	3.5	3.2-7	16.2	15-20	78.6	65-75	1.7	0-5	25.2

SPECIAL COMMENTS

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.1. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.7.

7 Ton

$\frac{N}{11}$	$\frac{P}{52}$	$\frac{K}{34}$
----------------	----------------	----------------

100 # 11-52

\$14.10

40 # 0-0-60

3.74

140 #

\$17.84

11-52
0-0-60
140 #

view of an analysis is controlled by many factors in addition to method. While these guidelines are based on laboratory research and experience, they DO NOT GUARANTEE the achievement of the stated objectives. Analytical results pertain only to the sample tested. Laboratory reports are not to be reproduced without the written approval of laboratory staff. For questions relating to analytical methods, please call Marianne C. Gierke at 313-487-1111.

Submitted By: **DAVID L. HARRIS**
Address: **1000 10th St, Lincoln, NE 68502**
Phone: **402-476-7508**

Submitted For: **DAVID L. HARRIS**
Address: **1000 10th St, Lincoln, NE 68502**
Phone: **402-476-7508**

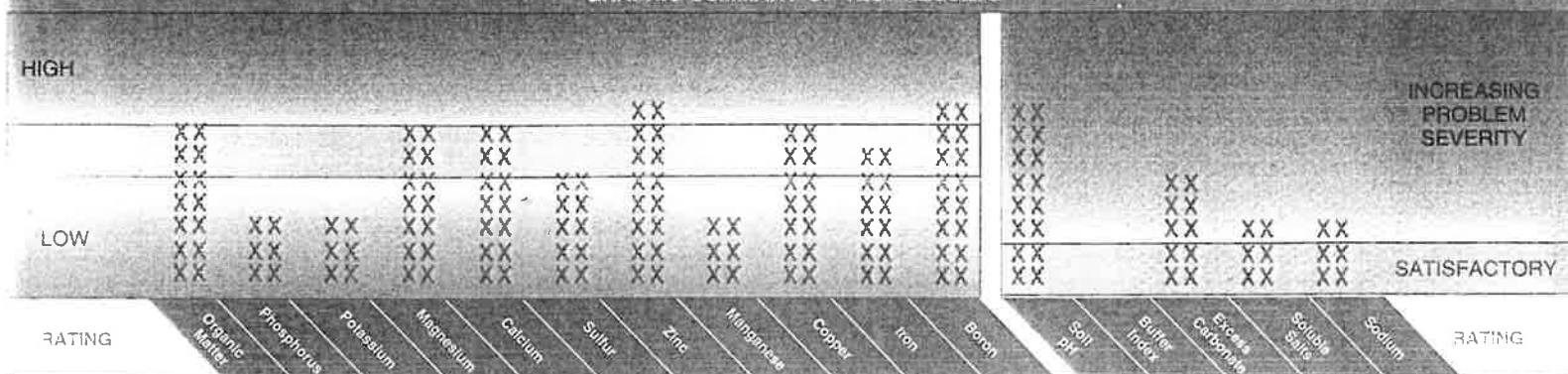
Laboratory Sample # **00027319**
Field Identification
Acres Sampled **1**

Date Reported **10-03-2003**

Laboratory Turnaround **10 DAYS**

Samples Will Be Stored Until **00-XXX-0000**

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS		FERTILIZER GUIDELINES IN LBS PER ACRE											
YOUR SAMPLE NUMBER		1st Option Intended Crop				2nd Option Intended Crop				3rd Option Intended Crop			
74-08		ALFALFA				ALFALFA				ALFALFA			
Soil pH		Yield Goal				Yield Goal				Yield Goal			
Buffer Index		5.0 TONS/AC				5.0 TONS/AC				5.0 TONS/AC			
Excess Carbonate		Preceding Crop				Preceding Crop				Preceding Crop			
Soluble Salts (mmhos/cm)		ALFALFA				ALFALFA				ALFALFA			
Sodium ppm		PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES		PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES		PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES	
% Organic Matter		N	0	60		N	0	72		N	0	84	
ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)		P ₂ O ₅	35	45	53	P ₂ O ₅	50	70	80	P ₂ O ₅	60	70	74
Nitrate N		K ₂ O	40	50	175	K ₂ O	45	50	210	K ₂ O	45	50	245
Phosphorus Bray I Olsen		MgO	0			MgO	0			MgO	0		
Potassium		S	0			S	0			S	0		
Magnesium		Zn	0			Zn	0			Zn	0		
Calcium		Mn	0	50	4.5	Mn	0	50	5.5	Mn	0	50	5.5
Sulfate Sulfur		Cu	0			Cu	0			Cu	0		
Zinc		Fe	0			Fe	0	50	4.0	Fe	0	50	4.0
Manganese		B	0			B	0			B	0		
Copper													
Iron													
Boron													

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)										ESTIMATED
Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	2.6	3.0-7	19.6	15-20	73.6	65-75	4.2	0-5	29.0

SPECIAL COMMENTS

IF DESIRED APPLY 0 POUNDS OF P2O5/ACRE AND 125 POUNDS OF K2O/ACRE TO RAISE THE SOIL P AND K TO A HIGHER FERTILITY LEVEL. THIS BUILD APPLICATION MAY NOT BE CRITICAL FOR ROUTINE CROP PRODUCTION PRACTICES. IF APPLIED, APPLICATION SHOULD BE DIVIDED OVER A NUMBER OF YEARS.

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.1. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.6.

6 Ton

N	P	K	MN	Fe
11	52	48	5.5	4

100 #	11-52	14.10
50 #	5-26-60	7.48
5 #	3% Mn	5.85
5 #	10% Feor	3.25
194 #		30.68

Ammonium Nitrate
DIP method
Technical Support

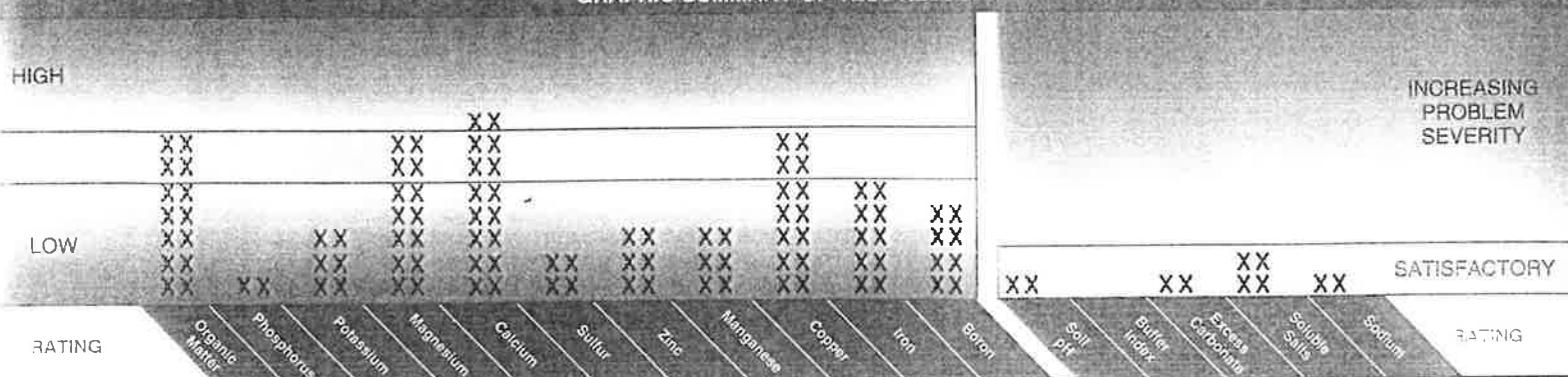
Submitted By
Coop Fertilizer Plant
2331 11th Street
Baker City OR 97814

Submitted For
ROHNER DAIRIES

Laboratory Sample #
04234975
DATE OF ANALYSIS
10-25-2003

Date Reported 30-Dec-2003 Laboratory Turnaround < 3 DAYS Samples Will Be Stored Until 00-XXX-0000

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS YOUR SAMPLE NUMBER	
F-GR	
Soil pH	7.2
Buffer Index	
Excess Carbonate	VL
Soluble Salts (mmhos/cm)	0.35
Sodium ppm	51
% Organic Matter	14.4
ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)	
Nitrate N	21
Phosphorus Bray I Olsen	5
Potassium	244
Magnesium	404
Calcium	2769
Sulfate Sulfur	3
Zinc	0.7
Manganese	0.7
Copper	1.0
Iron	5.4
Boron	0.8

FERTILIZER GUIDELINES IN LBS PER ACRE				
1st Option Intended Crop		2nd Option Intended Crop		3rd Option Intended Crop
ALFALFA		ALFALFA		ALFALFA
Yield Goal		Yield Goal		Yield Goal
5.0 TONS/AC		6.0 TONS/AC		7.0 TONS/AC
Preceding Crop		Preceding Crop		Preceding Crop
ALFALFA		ALFALFA		ALFALFA
PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES		
N	0	60		N 0 84
P ₂ O ₅	70 to 85	53		P ₂ O ₅ 95 to 110 74
K ₂ O	40 to 50	175		K ₂ O 45 to 55 245
MgO	0			MgO 0
S	0 to 20			S 0 to 20
Zn	0 to 4.5			Zn 0 to 6.0
Mn	0 to 5.5			Mn 0 to 7.0
Cu	0			Cu 0
Fe	0 to 4.0			Fe 0 to 4.8
B	0 to 1.0			B 0 to 1.0

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)										ESTIMATED
Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	3.5	3.8-7	18.6	15-20	76.7	65-75	1.2	0-5	18.1

SPECIAL COMMENTS

IF DESIRED APPLY 88 POUNDS OF P2O5/ACRE AND 65 POUNDS OF K2O/ACRE TO RAISE THE SOIL P AND K TO A HIGHER FERTILITY LEVEL. THIS BUILD APPLICATION MAY NOT BE CRITICAL FOR ROUTINE CROP PRODUCTION PRACTICES. IF APPLIED, APPLICATION SHOULD BE DIVIDED OVER A NUMBER OF YEARS.

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 0.9. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.4.

CERTAIN SOIL CONDITIONS MAY MAKE IRON UNAVAILABLE FOR PLANT GROWTH EVEN THOUGH THE DETECTABLE IRON CONTENT OF THIS SOIL IS HIGH.

N P K S Z Mn Fe B
18.04 85.2 49.8 14.8 5 5 4 .9

6 Ton

7 #	10% Zinc	\$ 4.55
164 #	11-52	\$ 24.19
83 #	0-0-60	\$ 7.76
22 #	0-0-0-90	\$ 2.47
8 #	8% Mn	\$ 5.20
5 #	10% Fe	\$ 3.25
6 #	15% Boron	\$ 2.58
<u>295 #</u>		<u>\$ 50.00</u>

Laboratory Methods Used: Soil pH and Soluble Salt, 1:1 water to soil ratio; Buffer pH; SMP buffer solution; Cations (Ca, Mg, K, Na), extracted by a modified Ammonium Acetate Method; Traces (Zn, Mn, Cu, Fe), extracted by a modified DTPA method; Organic Matter, Loss-on-Ignition; Phosphorus, extracted by either Bray 1 or Olsen method; Sulfur, determined by ICP; Boron, determined by ICP; Nitrate, cadmium reduction method.

Analytical Data Supported by: Steve Frack, Technical Support

Submitted By...

Submitted For...

Laboratory Sample #

Field Identification

Acres Sampled

Date Reported

10-Oct-2003

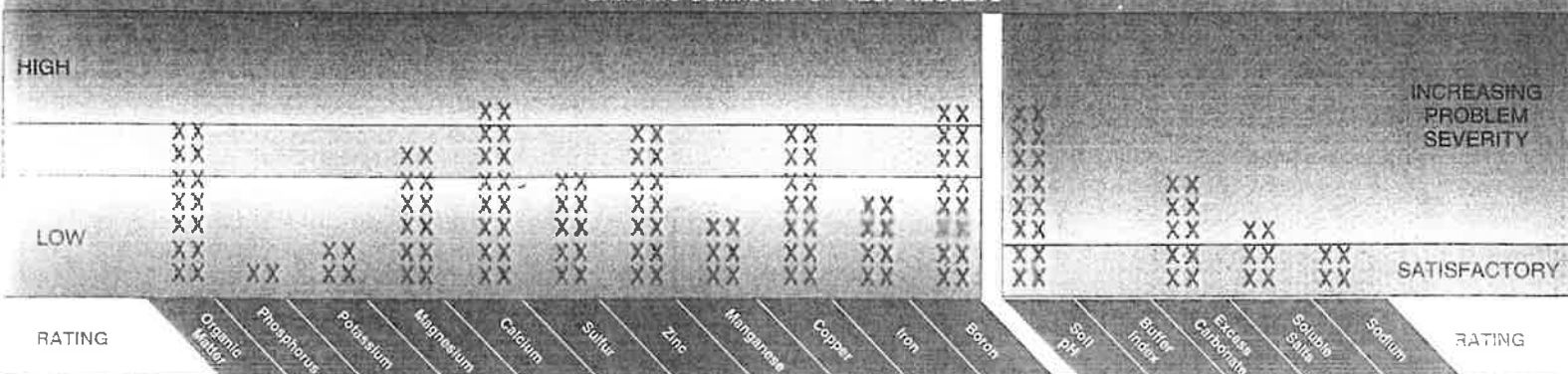
Laboratory Turnaround

10 DAYS

Samples Will Be Stored Until

00-XXX-0000

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS YOUR SAMPLE NUMBER	
F7-00	
Soil pH	6.4
Buffer Index	---
Excess Carbonate	M
Soluble Salts (mmhos/cm)	0.56
Sodium ppm	220
% Organic Matter	3.5
ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)	
Nitrate N	17
Phosphorus Bray I Olsen	9
Potassium	186
Magnesium	536
Calcium	4234
Sulfate Sulfur	10
Zinc	1.3
Manganese	1.1
Copper	1.3
Iron	4.0
Boron	1.1

FERTILIZER GUIDELINES IN										LBS PER ACRE				
1st Option Intended Crop				2nd Option Intended Crop				3rd Option Intended Crop						
ALFALFA				ALFALFA				ALFALFA						
Yield Goal				Yield Goal				Yield Goal						
5.0 TONS/AC				5.0 TONS/AC				7.0 TONS/AC						
Preceding Crop				Preceding Crop				Preceding Crop						
ALFALFA				ALFALFA				ALFALFA						
PLANT FOOD GUIDELINE RANGES			CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES			CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES			CROP REMOVAL RATES			
N	0		60	N	0		72	N	0		84			
P ₂ O ₅	65	to	75	53	P ₂ O ₅	70	to	85	63	P ₂ O ₅	85	to	100	74
K ₂ O	55	to	65	175	K ₂ O	100	to	120	210	K ₂ O	135	to	180	245
MgO	0			MgO	0			MgO	0					
S	0			S	0			S	0					
Zn	0			Zn	0			Zn	0	to	2.0			
Mn	0	to	5.0	Mn	0	to	5.0	Mn	0	to	7.0			
Cu	0			Cu	0			Cu	0					
Fe	0	to	5.5	Fe	0	to	5.5	Fe	0	to	7.5			
B	0			B	0			B	0					

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)										ESTIMATED
Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	1.8	3.1-7	16.5	15-20	78.1	65-75	3.6	0-5	27.1

SPECIAL COMMENTS

IF DESIRED APPLY 75 POUNDS OF P2O5/ACRE AND 350 POUNDS OF K2O/ACRE TO RAISE THE SOIL P AND K TO A HIGHER FERTILITY LEVEL. THIS BUILD APPLICATION MAY NOT BE CRITICAL FOR ROUTINE CROP PRODUCTION PRACTICES. IF APPLIED, APPLICATION SHOULD BE DIVIDED OVER A NUMBER OF YEARS.

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.0, THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.5.

CERTAIN SOIL CONDITIONS MAY MAKE IRON UNAVAILABLE FOR PLANT GROWTH EVEN
THOUGH THE DETECTABLE IRON CONTENT OF THIS SOIL IS HIGH.

6 Ton

<u>N</u>	<u>P</u>	<u>K</u>	<u>MN</u>	<u>Fe</u>
15.95	75.4	102	6	6

145 #	11-52	50.44
170 #	0-0-60	15.89
10 #	5% Iron	6.52
5 #	10% Iron	5.20
332 #		\$ 78.03

[illegible]

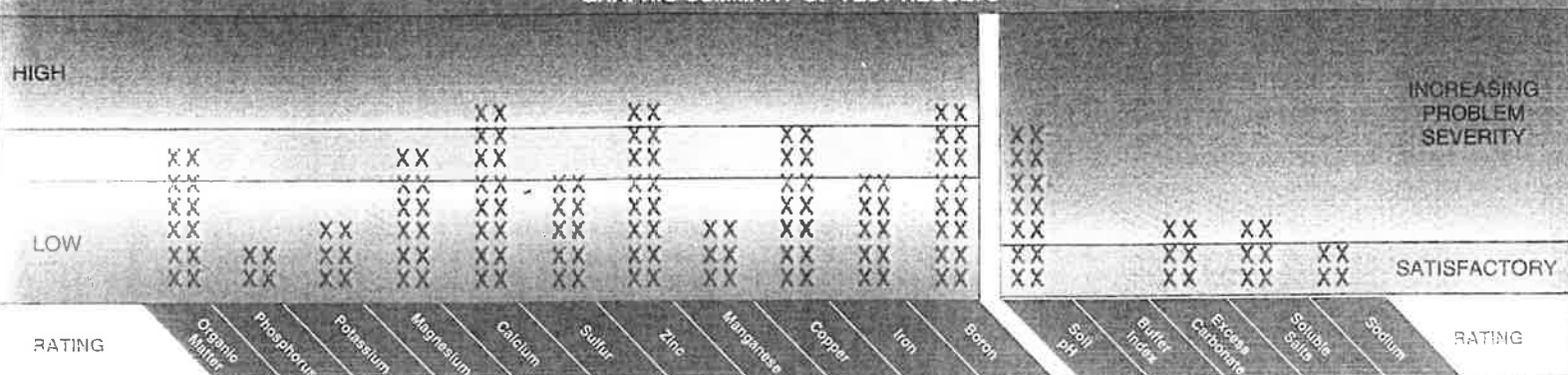
Submitted By: **ALAN J. HARRIS**
Address: **1000 S. 10th St. Lincoln, NE 68502**
Phone: **402-476-2811**

Submitted For: **ALFALFA**
Address: **1000 S. 10th St. Lincoln, NE 68502**
Phone: **402-476-2811**

Laboratory Sample # **00027315**
Field Identification
Acres Sampled **1**

Date Reported **10-Oct-2003** Laboratory Turnaround **13 DAYS** Samples Will Be Stored Until **00-XXX-0000**

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS YOUR SAMPLE NUMBER

F3&6-03

FERTILIZER GUIDELINES IN LBS PER ACRE

Soil pH	8.2
Buffer Index	---
Excess Carbonate	---
Soluble Salts (mmhos/cm)	0.45
Sodium ppm	149
% Organic Matter	3.2
ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)	
Nitrate N	15
Phosphorus Bray I Olsen	15
Potassium	229
Magnesium	458
Calcium	3496
Sulfate Sulfur	10
Zinc	1.8
Manganese	1.2
Copper	1.2
Iron	5.6
Boron	0.9

1st Option Intended Crop				2nd Option Intended Crop				3rd Option Intended Crop			
ALFALFA				ALFALFA				ALFALFA			
Yield Goal				Yield Goal				Yield Goal			
8.0 TONS/AC				8.0 TONS/AC				7.0 TONS/AC			
Preceding Crop				Preceding Crop				Preceding Crop			
ALFALFA				ALFALFA				ALFALFA			
PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES		PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES		PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES	
N	0 to 60	60		N	0 to 72	72		N	0 to 84	84	
P ₂ O ₅	50 to 60	53		P ₂ O ₅	130 to 70	63		P ₂ O ₅	70 to 85	74	
K ₂ O	40 to 30	175		K ₂ O	45 to 55	210		K ₂ O	60 to 70	245	
MgO	0 to 0			MgO	0 to 0			MgO	0 to 0		
S	0 to 0			S	0 to 0			S	0 to 0		
Zn	0 to 0			Zn	0 to 0			Zn	0 to 0		
Mn	0 to 3.0			Mn	0 to 3.0			Mn	0 to 7.0		
Cu	0 to 0			Cu	0 to 0			Cu	0 to 0		
Fe	0 to 4.0			Fe	0 to 4.0			Fe	0 to 3.0		
B	0 to 0			B	0 to 0			B	0 to 0		

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)

Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	2.6	3.4-7	17.2	15-20	77.3	65-75	2.9	0-5	22.6

SPECIAL COMMENTS

IF DESIRED APPLY 35 POUNDS OF P2O5/ACRE AND 165 POUNDS OF K2O/ACRE TO RAISE THE SOIL P AND K TO A HIGHER FERTILITY LEVEL. THIS BUILD APPLICATION MAY NOT BE CRITICAL FOR ROUTINE CROP PRODUCTION PRACTICES. IF APPLIED, APPLICATION SHOULD BE DIVIDED OVER A NUMBER OF YEARS.

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.1. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.6.

CERTAIN SOIL CONDITIONS MAY MAKE IRON UNAVAILABLE FOR PLANT GROWTH EVEN
THOUGH THE DETECTABLE IRON CONTENT OF THIS SOIL IS HIGH.

<u>N</u>	<u>P</u>	<u>K</u>	<u>MN</u>	<u>Fe</u>	<u>G Ton</u>
13.75	25	48	6	4	

90 #	1-0-60	\$ 7.48
25 #	11-52	17.62
10 #	9% MN	6.50
5 #	10% IRON	3.25
230 #		\$ 34.85

[illegible]

Submitted By

Submitted For

Laboratory Sample #

BAKER CITY BR 97814

ROHNER 040808

00000000
Field Identification

BAKER CITY BR 97814

Acres Sampled

Date Reported

Laboratory Turnaround

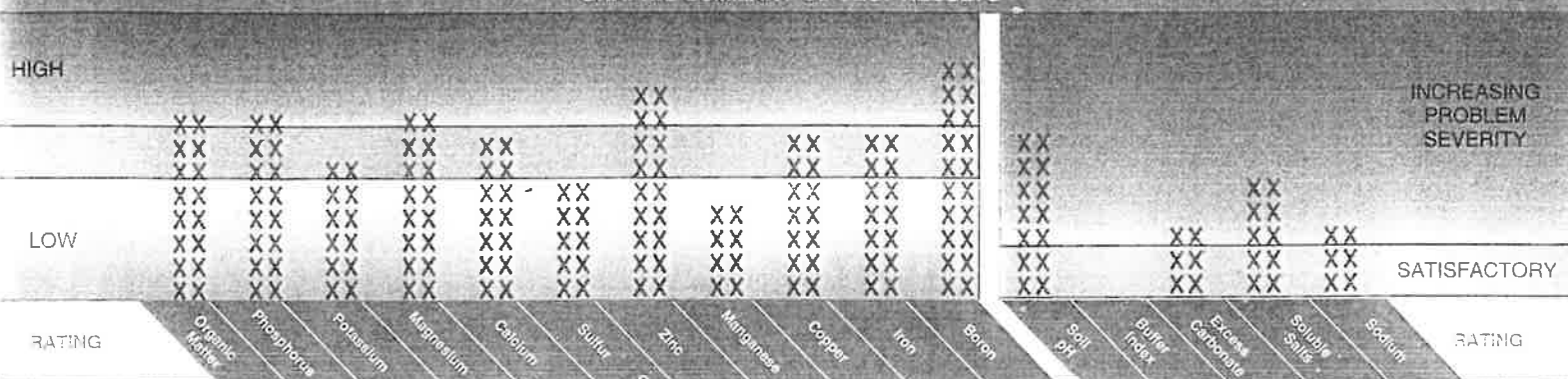
Samples Will Be Stored Until

08-Jul-2003

3 DAYS

00-XXX-0000

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS YOUR SAMPLE NUMBER

FE

FERTILIZER GUIDELINES IN LBS PER ACRE

1st Option Intended Crop

2nd Option Intended Crop

3rd Option Intended Crop

CORN SILAGE

CORN SILAGE

CORN SILAGE

Yield Goal

Yield Goal

Yield Goal

20.0 TONS/AC

25.0 TONS/AC

30.0 TONS/AC

Preceding Crop

Preceding Crop

Preceding Crop

CORN SILAGE

CORN SILAGE

CORN SILAGE

PLANT FOOD
GUIDELINE RANGES

CROP
REMOVAL
RATES

PLANT FOOD
GUIDELINE RANGES

CROP
REMOVAL
RATES

PLANT FOOD
GUIDELINE RANGES

CROP
REMOVAL
RATES

ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)

Nitrate N

83

Phosphorus
Bray I
Olsen

37

Potassium

732

Magnesium

957

Calcium

5385

Sulfate
Sulfur

24

Zinc

4.8

Manganese

3.5

Copper

2.2

Iron

13.5

Boron

2.0

P₂O₅

48

K₂O

150

MgO

0

S

0

Zn

0

Mn

0 to 4.0

Cu

0

Fe

0

B

0

N

35 to 65

P₂O₅

0

K₂O

0

MgO

0

S

0

Zn

0

Mn

0 to 6.0

Cu

0

Fe

0

B

0

N

65 to 75

P₂O₅

0

K₂O

0

MgO

0

S

0

Zn

0

Mn

0 to 8.0

Cu

0

Fe

0

B

0

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)

ESTIMATED

Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	4.9	0.0-7	20.7	15-20	70.0	65-75	4.4	0-5	38.5

SPECIAL COMMENTS

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.1. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.6.

ALL APPLICATIONS

CONSIDERING PH. BAND APPLICATION OF ZINC, MANGANESE AND/OR COPPER (IF RECOMMENDED) MAY BE MORE EFFICIENT THAN BROADCAST APPLICATION.

N
64.96

203[#]-32-00

²³ 23.34 Acres

30 Ton

234 #

32-0-0

[#] 26.9 / Acre

[illegible]

Downloaded from <http://www.ashg.org/> by guest on September 11, 2012

Submitted By

Submitted For

Laboratory Sample #

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

BOOKS RECEIVED

Field Identification

30X-1 146 00 07914

RECEIVED

Acres Sampled

Date Reported

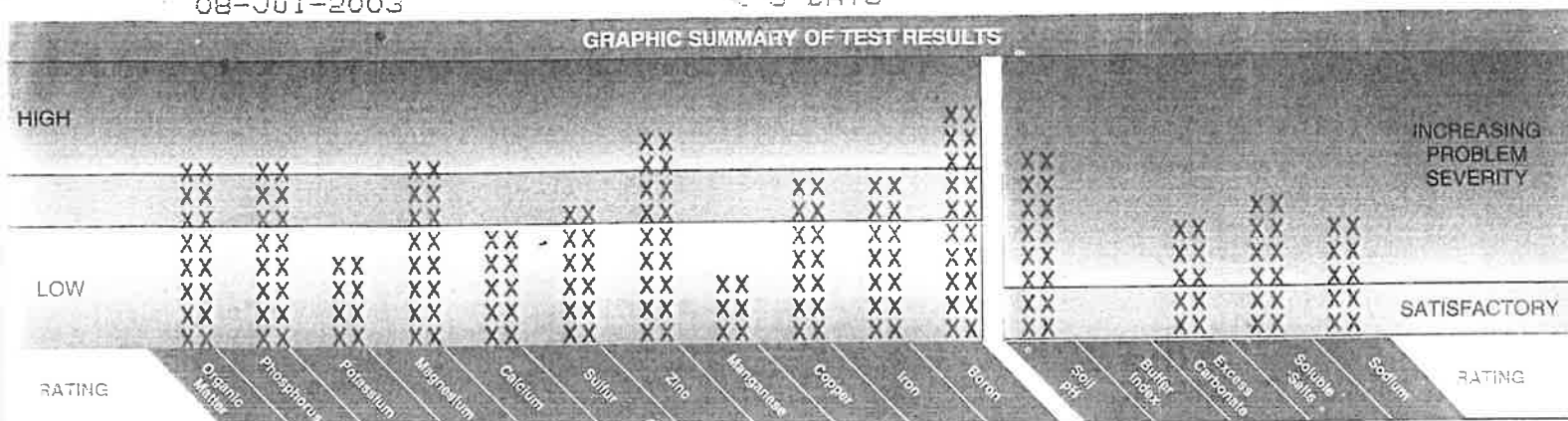
Laboratory Turnaround

Samples Will Be Stored Until

08-Jul-2003

C 3 DAYS

00-XXX-0000



REPORT OF ANALYSIS YOUR SAMPLE NUMBER		FERTILIZER GUIDELINES IN 1 LB PER ACRE					
FC		1st Option Intended Crop		2nd Option Intended Crop		3rd Option Intended Crop	
Soil pH		CORN SILAGE		CORN SILAGE		CORN SILAGE	
Buffer Index		Yield Goal		Yield Goal		Yield Goal	
Excess Carbonate		20.0 TONS/AC		25.0 TONS/AC		30.0 TONS/AC	
Soluble Salts (mmhos/cm)		Preceding Crop		Preceding Crop		Preceding Crop	
Sodium ppm		CORN SILAGE		CORN SILAGE		CORN SILAGE	
% Organic Matter		PLANT FOOD GUIDELINE RANGES		PLANT FOOD GUIDELINE RANGES		PLANT FOOD GUIDELINE RANGES	
ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)		CROP REMOVAL RATES		CROP REMOVAL RATES		CROP REMOVAL RATES	
Nitrate N	122	N	40 to 50	152	N	55 to 65	228
Phosphorus Bray 1 Olsen	38	P ₂ O ₅	0	48	P ₂ O ₅	0	72
Potassium	570	K ₂ O	0 to 30	150	K ₂ O	0 to 30	225
Magnesium	1194	MgO	0		MgO	0	
Calcium	5218	S	0		S	0	
Sulfate Sulfur	44	Zn	0		Zn	0	
Zinc	5.5	Mn	0 to 7.0		Mn	0 to 11.5	
Manganese	2.4	Cu	0		Cu	0	
		Fe	0		Fe	0	
		B	0		B	0	
		Sulfur 250LB			Sulfur 250LB		

These Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

Iron	23.1	ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)										ESTIMATED
Boron	1.9	Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
		0.0	0-5	3.6	2.0-7	24.7	15-20	64.8	65-75	6.8	0-5	40.3

SPECIAL COMMENTS

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.0. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.5.

ABOVE SUGGESTED NITROGEN RATES ARE BASED ON CONVENTIONAL APPLICATIONS, PROPER MANAGEMENT AND CULTURAL PRACTICES CAN INCREASE OVERALL NITROGEN USE EFFICIENCY.

CONSIDERING PH, BAND APPLICATION OF ZINC, MANGANESE AND/OR COPPER (IF RECOMMENDED) MAY BE MORE EFFICIENT THAN BROADCAST APPLICATION.

Methods Used: Soil pH and Soluble Salt, 1:1 water to soil ratio.
Cations (Ca, Mg, Na) extracted by a
Ammonium Acetate Method, traces (Zn, Mn, Cu, Fe) extracted by a
DTPA method; Organic Matter, Loss-on-Ignition; Phosphorus, extracted
by a Bray 1 and Olsen method; Sulfur, determined by ICP; Boron, determined
by a Inductively Coupled Plasma method.

Analytical Data Supported by: Steve Frack, Technical Support

CORN SILAGE



RATE PLOT RESULTS REPORT

Harrell Herford	Planting Date: May 14, 2003	Fertilizer	Kernel Processor: Yes
Baker City Oregon	Harvest Date:	N: 50	Insect Pressure
Irrigation: Pivot	Planting Rate: 35,000	P: 50	Spider Mites Pressure: Low
Soil Type: Silty Loam	Herbicide: Banvel	K: 25	Pea Apids Pressure: Low
Prev. Crop: Corn	638	S: -	Smut Pressure: Med
Row Width: 30"	Insecticide:		Ratings: Low Med High

C	K	BRAND	HYBRID	Harv. Pop	% Milk Line	% Moist	Harv. Yield ₁	Adj. Yield ₂	+/- Plot Ave. 3	Forage Quality Info										Milk Ton	Milk Ac	R
										CP	ADF	%	HDF	%	NDFD	%	Starch	%				
Pioneer	3921			33666	50%	67.6	23.0	24.9	-0.2	7.4	27.1	51.4	73.6	49.2	16.7	2686	20122	3				
NK Brand	N3030Bt			31666	0%	72.2	29.4	27.2	2.1	7.3	28.7	63.0	80.2	50.6	11.6	2448	19993	4				
CROPLAN	303081			32666	40%	66.7	20.6	22.9	-2.2	7.7	25.1	47.7	79.0	47.5	22.3	2916	18666	5				
CROPLAN	314Bt			36333	15%	72.5	27.8	25.5	0.4	6.9	26.9	61.2	78.4	47.6	15.0	2462	18824	7				
CROPLAN	184RR			34000	15%	71.3	25.4	24.4	-0.7	7.2	26.2	49.8	77.6	48.6	16.7	2695	19048	6				
CROPLAN	DS86RR			30000	0%	74.2	33.3	28.7	3.6	7.3	28.0	63.3	88.2	51.0	11.4	2463	21175	1				
CROPLAN	DS94RR			36333	0%	78.2	33.0	24.0	-1.1	7.0	32.2	59.5	79.2	61.1	5.6	2226	16041	10				
CROPLAN	294			36333	15%	72.3	25.6	23.7	-1.4	7.1	28.2	62.2	77.5	46.2	14.2	2386	16943	8				
NK Brand	N2555Bt			36666	40%	72.6	28.1	25.7	0.6	7.2	28.1	59.6	73.7	44.9	12.6	2171	16713	9				
NK Brand	N17-J4			35000		68.9	23.4	24.3	-0.8	7.0	24.4	46.7	77.3	44.6	24.8	2853	20794	2				
Plot Avg:										7.2	27.6	61.4	78.2	48.1	15.1	2523	18964					

Harv. Yield 1 = Tons per acre at harvest with no adjustment for moisture.
 Adj. Yield 2 = Tons per acre adjusted to a 70moisture basis.
 +/- Plot AV. 3 = Tons above or below plot average (checks not included)
 %CP 4 = Percent Crude Protein
 %ADE 5 = Percent Acid Detergent Fiber
 %NDF 6 = Percent Neutral Detergent Fiber
 %AVD 7 = Percent In vitro digestibility within 48 hours as predicted by NIRS. Also known as Wholeplant Digestibility
 %NDFD 8 = Estimates the percent of the NDF portion digested within 48 hours as predicted by NIRS
 %Starch 9 = % starch in whole plant sample
 Milk/Ton 10 = Estimated Milk/Ton (DM) using the University of WI MILK 2000 formula.
 Milk/Ac 11 = Milk/Ton multiplied by the adjusted yield per acre converted to a Dry matter basis.

PRECISION GENETIC PLACEMENT STARTS HERE

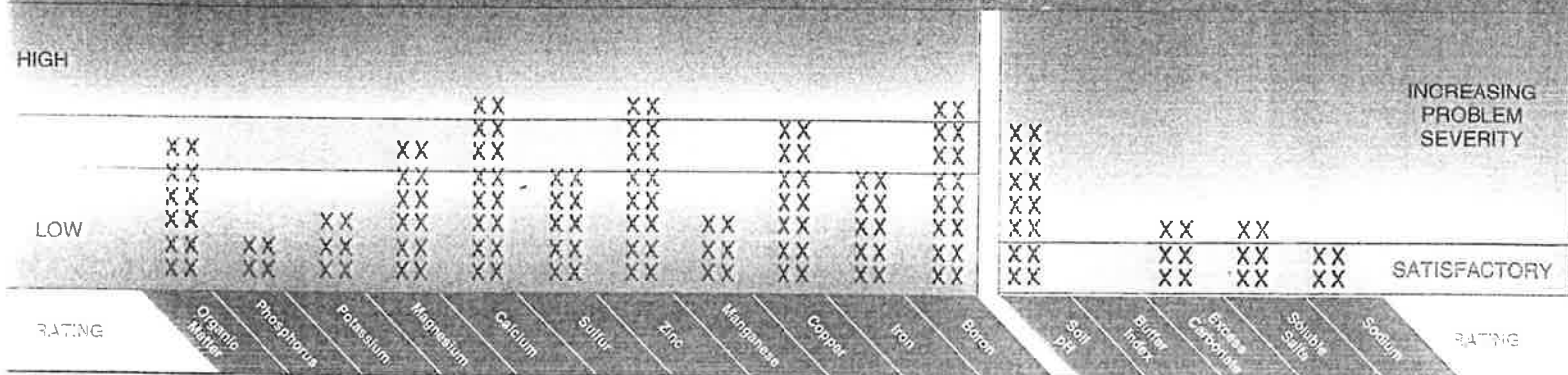
Submitted By:
1001 1001 1001
1001 1001 1001

Submitted For:
FARMER JACKSON
BANKER WITH US FARMER

Laboratory Sample #
1002713
Field Certification
Acres Sampled
1

Date Reported 10-Oct-2000 Laboratory Turnaround 3 DAYS Samples Will Be Stored Until 00-XXX-0000

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS YOUR SAMPLE NUMBER	
F546-00	
Soil pH	8.2
Buffer Index	---
Excess Carbonate	---
Soluble Salts (mmhos/cm)	0.46
Sodium ppm	1.19
% Organic Matter	0.3
ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)	
Nitrate N	16
Phosphorus Bray I Olsen	16
Potassium	229
Magnesium	468
Calcium	3496
Sulfate Sulfur	10
Zinc	1.8
Manganese	1.2
Copper	1.2
Iron	5.6
Boron	0.9

FERTILIZER GUIDELINES IN LBS PER ACRE				
1st Option Intended Crop		2nd Option Intended Crop		3rd Option Intended Crop
ALFALFA		ALFALFA		ALFALFA
Yield Goal		Yield Goal		Yield Goal
5.0 TONS/AC		6.0 TONS/AC		7.0 TONS/AC
Preceding Crop		Preceding Crop		Preceding Crop
ALFALFA		ALFALFA		ALFALFA
PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES		
N	0 to 60	N	0 to 72	N 0 to 84
P ₂ O ₅	50 to 60 53	P ₂ O ₅	60 to 70 63	P ₂ O ₅ 70 to 35 74
K ₂ O	40 to 50 175	K ₂ O	145 to 55 210	K ₂ O 60 to 70 245
MgO	0	MgO	0	MgO 0
S	0	S	0	S 0
Zn	0	Zn	0	Zn 0
Mn	0 to 5.0	Mn	0 to 6.0	Mn 0 to 7.0
Cu	0	Cu	0	Cu 0
Fe	0 to 4.0	Fe	0 to 4.0	Fe 0 to 5.0
B	0	B	0	B 0

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)										ESTIMATED
Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	2.6	3.4-7	17.2	15-20	77.3	65-75	2.9	0-5	22.6

SPECIAL COMMENTS

IF DESIRED APPLY 35 POUNDS OF P2O5/ACRE AND 165 POUNDS OF K2O/ACRE TO RAISE THE SOIL P AND K TO A HIGHER FERTILITY LEVEL. THIS BUILD APPLICATION MAY NOT BE CRITICAL FOR ROUTINE CROP PRODUCTION PRACTICES. IF APPLIED, APPLICATION SHOULD BE DIVIDED OVER A NUMBER OF YEARS.

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.1. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.6.

CERTAIN SOIL CONDITIONS MAY MAKE IRON UNAVAILABLE FOR PLANT GROWTH EVEN THOUGH THE DETECTABLE IRON CONTENT OF THIS SOIL IS HIGH.

$\frac{N}{13.75} \quad \frac{P}{25} \quad \frac{K}{48} \quad \frac{Mn}{6} \quad \frac{Fe}{670} \quad 7$

80 # 2-0-60
125 # 11-52
10 # 8% MN
5 # 16% IRON
3.25
\$34.85

IF DESIRED APPLY 35 POUNDS OF P2O5/ACRE AND 165 POUNDS OF K2O/ACRE TO RAISE THE SOIL P AND K TO A HIGHER FERTILITY LEVEL. THIS BUILD APPLICATION MAY NOT BE CRITICAL FOR ROUTINE CROP PRODUCTION PRACTICES. IF APPLIED, APPLICATION SHOULD BE DIVIDED OVER A NUMBER OF YEARS.

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.1. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.6.

CERTAIN SOIL CONDITIONS MAY MAKE IRON UNAVAILABLE FOR PLANT GROWTH EVEN THOUGH THE DETECTABLE IRON CONTENT OF THIS SOIL IS HIGH.

MDS Harris

124 Peach Street
Lincoln, NE 68502

Phone: 402-478-2811
Fax: 402-478-1548
www.mds-harris.com



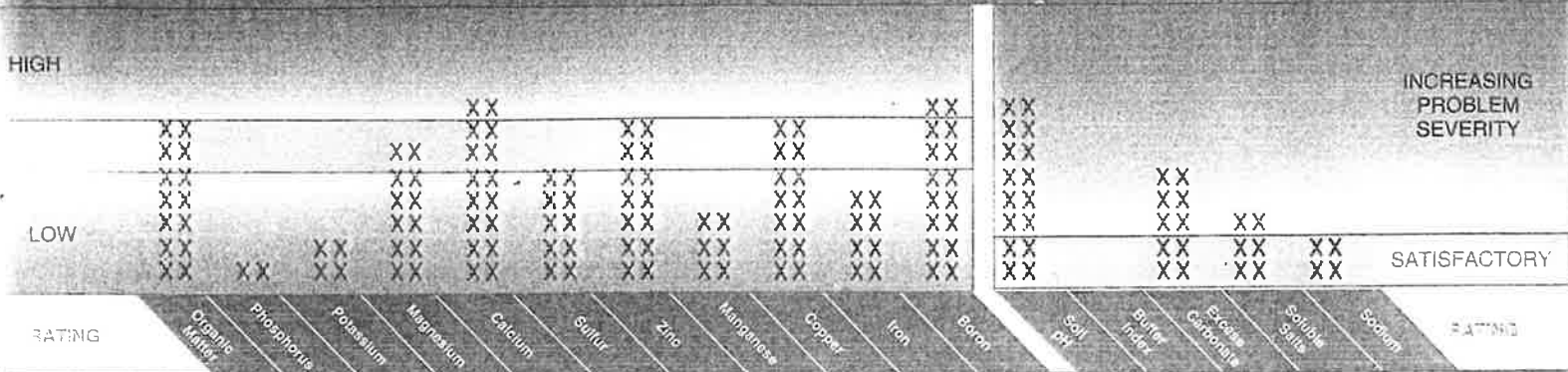
Submitted By
1001 1001 1001 1001
1001 1001 1001 1001
1001 1001 1001 1001

Submitted For
ROHMER DAIRIES
BAKER 2175 15 87814

Laboratory Sample #
00027817
Field Identification
Acres Sampled
1

Date Reported 10-Oct-2003 Laboratory Turnaround 3 DAYS Samples Will Be Stored Until 00-XXX-0000

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS YOUR SAMPLE NUMBER	
77-03	
Soil pH	8.4
Buffer Index	100
Excess Carbonate	1M
Soluble Salts (mmhos/cm)	0.58
Sodium ppm	220
% Organic Matter	3.0
ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)	
Nitrate N	17
Phosphorus Bray I Olsen	2
Potassium	186
Magnesium	536
Calcium	4234
Sulfate Sulfur	10
Zinc	1.3
Manganese	1.1
Copper	1.3
Iron	4.0
Boron	1.1

FERTILIZER GUIDELINES IN LBS PER ACRE											
1st Option Intended Crop				2nd Option Intended Crop				3rd Option Intended Crop			
ALFALFA				ALFALFA				ALFALFA			
Yield Goal				Yield Goal				Yield Goal			
3.0 TONS/AC				3.0 TONS/AC				3.0 TONS/AC			
Preceding Crop				Preceding Crop				Preceding Crop			
ALFALFA				ALFALFA				ALFALFA			
PLANT FOOD GUIDELINE RANGES			CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES			CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES			CROP REMOVAL RATES
N	0		60	N	0		72	N	0		84
P ₂ O ₅	65 to	75	53	P ₂ O ₅	70 to	85	63	P ₂ O ₅	85 to	100	74
K ₂ O	155 to	255	175	K ₂ O	100 to	120	210	K ₂ O	155 to	180	245
MgO	0			MgO	0			MgO	0		
S	0			S	0			S	0		
Zn	0			Zn	0			Zn	0 to	2.0	
Mn	0 to	5.0		Mn	0 to	5.0		Mn	0 to	7.0	
Cu	0			Cu	0			Cu	0		
Fe	0 to	5.5		Fe	0 to	6.5		Fe	0 to	7.5	
B	0			B	0			B	0		

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)										ESTIMATED
Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	1.8	3.1-7	16.5	15-20	78.1	65-75	3.6	0-5	27.1

SPECIAL COMMENTS

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.1. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.7.

7 Ton

<u>N</u>	<u>P</u>	<u>K</u>
11	52	24

100 # 11-52

\$14.10

40 # 0-0-60

3.74

140 #

\$17.84

Submitted By

Submitted By

Laboratory Sample #

Date Reported

10-06-2000

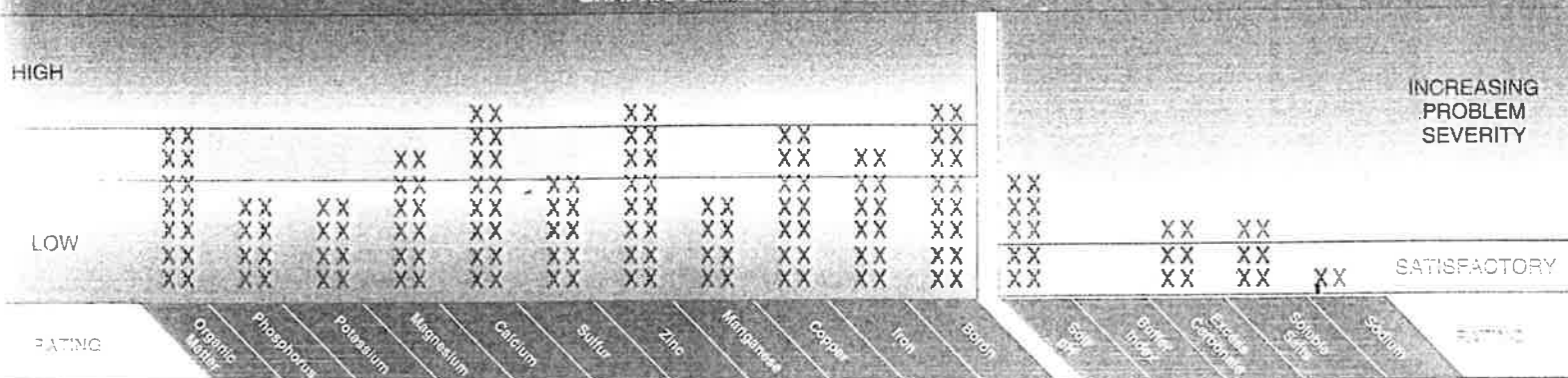
Laboratory Turnaround

1-3 DAYS

Samples Will Be Stored Until

00-XX-0000

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS YOUR SAMPLE NUMBER

F-100

FERTILIZER GUIDELINES IN LBS PER ACRE

1st Option Intended Crop

2nd Option Intended Crop

3rd Option Intended Crop

ALFALFA

ALFALFA

ALFALFA

Yield Goal

Yield Goal

Yield Goal

5.0 TONS/AC

5.0 TONS/AC

5.0 TONS/AC

Preceding Crop

Preceding Crop

Preceding Crop

ALFALFA

ALFALFA

ALFALFA

PLANT FOOD
GUIDELINE RANGES

CROP
REMOVAL
RATES

PLANT FOOD
GUIDELINE RANGES

CROP
REMOVAL
RATES

PLANT FOOD
GUIDELINE RANGES

CROP
REMOVAL
RATES

N 0 60

N 0 60

N 0 64

P₂O₅ 100 50 40 53

P₂O₅ 40 50 50 50

P₂O₅ 50 50 50 74

K₂O 0 50 30 175

K₂O 0 50 25 210

K₂O 0 50 50 245

MgO 0 50 3.5

MgO 0 50 3.5

MgO 0 50 3.5

S 0 50 3.5

S 0 50 3.5

S 0 50 3.5

Zn 0 50 3.5

Zn 0 50 3.5

Zn 0 50 3.5

Mn 0 50 3.5

Mn 0 50 3.5

Mn 0 50 3.5

Cu 0 50 3.5

Cu 0 50 3.5

Cu 0 50 3.5

Fe 0 50 3.5

Fe 0 50 3.5

Fe 0 50 3.5

B 0 50 3.5

B 0 50 3.5

B 0 50 3.5

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 5" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)

ESTIMATED

Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	3.5	3.2-7	16.2	15-20	78.6	65-75	1.7	0-5	25.2

SPECIAL COMMENTS

IF DESIRED APPLY 6 POUNDS OF P2O5/ACRE AND 125 POUNDS OF K2O/ACRE TO RAISE THE SOIL P AND K TO A HIGHER FERTILITY LEVEL. THIS BUILD APPLICATION MAY NOT BE CRITICAL FOR ROUTINE CROP PRODUCTION PRACTICES. IF APPLIED, APPLICATION SHOULD BE DIVIDED OVER A NUMBER OF YEARS.

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO POUNDS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.1 THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.2.

6 Ton

<u>N</u>	<u>P</u>	<u>K</u>	<u>MN</u>	<u>Fe</u>
11	52	48	5.5	4

100 #	11-52	14.10
80 #	0-0-60	7.48
9 #	8% Mn	5.85
5 #	10% Fron	3.25
<u>194 #</u>		<u>\$30.68</u>

Laboratory Methods Used: Soil pH and Soluble Salt, 1:1 water to soil ratio; Buffer pH, SMP buffer solution; Cations (Ca, Mg, K, Na), extracted by a modified Ammonium Acetate Method; Traces (Zn, Mn, Cu, Fe), extracted by a modified DTPA method; Organic Matter, Loss-on-Ignition; Phosphorus, extracted by either Bray I or Olsen method; Sulfur, determined by ICP; Boron, determined by ICP; Nitrate, cadmium reduction method.

Analytical Data Supported by: Steve Frack, Technical Support

Submitted By:

Submitted For:

Laboratory Sample #

Field Identification

Acres Sampled

Date Reported

10-26-2003

Laboratory Turnaround

3 DAYS

Samples Will Be Stored Until

00-XXX-0000

GRAPHIC SUMMARY OF TEST RESULTS

HIGH

INCREASING
PROBLEM
SEVERITY

LOW

SATISFACTORY

RATING

RATING

Organic Matter

Phosphorus

Potassium

Magnesium

Calcium

Sulfur

Zinc

Manganese

Copper

Iron

Boron

Soil pH

Buffer Index

Excess Carbonate

Soluble Salts

Sodium

REPORT OF ANALYSIS

YOUR SAMPLE NUMBER

F4-03

Soil pH

6.4

Buffer Index

1.0

Excess Carbonate

0

Soluble Salts (mmhos/cm)

0.0

Sodium ppm

270

% Organic Matter

1.1

ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)

Nitrate N

22

Phosphorus Bray I Olsen

10

Potassium

293

Magnesium

553

Calcium

4266

Sulfate Sulfur

16

Zinc

1.8

Manganese

1.5

Copper

1.6

Iron

7.1

Boron

1.2

FERTILIZER GUIDELINES IN LBS PER ACRE

1st Option Intended Crop

ALFALFA

Yield Goal

5.0 TONS/AC

Preceding Crop

ALFALFA

PLANT FOOD GUIDELINE RANGES

CROP REMOVAL RATES

N 0 60

P₂O₅ 35 to 45 53

K₂O 40 to 50 175

MgO 0

S 0

Zn 0

Mn 0 to 4.5

Cu 0

Fe 0

B 0

2nd Option Intended Crop

ALFALFA

Yield Goal

5.0 TONS/AC

Preceding Crop

ALFALFA

PLANT FOOD GUIDELINE RANGES

CROP REMOVAL RATES

N 0 72

P₂O₅ 50 to 60 63

K₂O 45 to 55 210

MgO 0

S 0

Zn 0

Mn 0 to 5.5

Cu 0

Fe 0 to 4.0

B 0

3rd Option Intended Crop

ALFALFA

Yield Goal

7.0 TONS/AC

Preceding Crop

ALFALFA

PLANT FOOD GUIDELINE RANGES

CROP REMOVAL RATES

N 0 84

P₂O₅ 50 to 70 74

K₂O 45 to 55 245

MgO 0

S 0

Zn 0

Mn 0 to 6.5

Cu 0

Fe 0 to 4.0

B 0

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)

ESTIMATED

Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
0.0	0-5	2.6	3.0-7	19.6	15-20	73.6	65-75	4.2	0-5	29.0

SPECIAL COMMENTS

IF DESIRED APPLY 75 POUNDS OF P2O5/ACRE AND 350 POUNDS OF K2O/ACRE TO RAISE THE SOIL P AND K TO A HIGHER FERTILITY LEVEL. THIS BUILD APPLICATION MAY NOT BE CRITICAL FOR ROUTINE CROP PRODUCTION PRACTICES. IF APPLIED, APPLICATION SHOULD BE DIVIDED OVER A NUMBER OF YEARS.

THE BULK DENSITY OF THE SOIL DETERMINES THE FACTOR WHICH CONVERTS PPM INTO LBS/ACRE. THIS SAMPLE HAS A DENSITY OF 1.0. THEREFORE THE ACCURATE FACTOR TO CONVERT PPM INTO LBS/ACRE IS 1.5.

CERTAIN SOIL CONDITIONS MAY MAKE IRON UNAVAILABLE FOR PLANT GROWTH EVEN THOUGH THE DETECTABLE IRON CONTENT OF THIS SOIL IS HIGH.

6 Ton

<u>N</u>	<u>P</u>	<u>K</u>	<u>MN</u>	<u>Fe</u>
15.95	25.4	102	4	6

145 # 11-52

20.44

170 # 0-0-60

15.89

10 # 5% MN

6.50

8 # 10% Iron

5.20

333 #

48.03