OPERATION AND MAINTENANCE PLAN

T.W. BYRD SONS DAIRY

LAFAYETTE COUNTY, FLORIDA

ANIMAL WASTE MANAGEMENT SYSTEM

December 8, 2003

INDEX

OPERATION AND MAINTENANCE PLAN

T.W. BYRD SONS DAIRY

LAFAYETTE COUNTY

ANIMAL WASTE MANAGEMENT SYSTEM

Revised December 8, 2003

GENERAL

The animal waste management system design is based on nitrogen as the restrictive nutrient. It is recognized that the use of nitrogen as the restrictive nutrient results in the excess application of P_2O_5 and K_2O. Research shows that soils, such as Blanton and Penney, with a silt + clay content $\geq 5\%$ adsorb and retain significant amounts of phosphorous. This retention should prevent any significant environmental impacts due to phosphorous. Over a period of time, the soil profile should begin to reach its maximum retention of phosphorus. Maximum retention is reached when the soil profile above the water table will not retain any additional phosphorus. The maximum amount of phosphorus the soil can retain above the water table has not been determined. If and/or when the soil profile becomes saturated with phosphorus, corrective actions should be taken to limit the amount of P_2O_5 applied to the crop.

The Waste Management System is designed to accommodate 600 milking cows with the average weight of 1250 lbs. It is estimated the milk herd will deposit 48% of the nutrients in the barn area and 52% of the nutrients in pastures based on an annual average 11.5 hours per day confinement time. An average of 50 dry cows will deposit 100% of the nutrients in Fields No. 1-5, planted in bermuda and rye. Fields No. 1-5 are located on the west side of the public road in the southwest corner of property. (See conservation plan map.) An average of 52 heifers will deposit 100% of the nutrients in Field No. 25 and 26, planted in millet and rye, and Fields No. 22 and 24 planted in bermuda with winter overseeding in rye.

The total fresh water for wash and cooling allowed for this system is 36,000 gallons per day (gpd) for the months of May through October and 7,000 gpd for the remaining months. Every effort must be made to not exceed these values.

The waste management system design, excluding storm runoff from the dairy facility, is based on the following estimates:

Milk Barn Parlor flush water (by hose)..... 550 gpd

Milk Barn Cow Washing (by hose)..... 5,250 gpd

HUA Feed and Cooling Barn (Misters)..... 29,000 gpd*

HUA Feed and Cooling Barn Flush Water (by hose).....1,200 gpd

**This value is for the summer months only. During the Months of January, February, March, April, November and December, the cooling sprinklers are not to be operated to avoid overfilling of the waste storage pond (WSP).*

The cows will be fed in the barn with occasional supplemental feeding in the pastures when necessary. Temporary field feeding locations will be rotated to prevent organic build-up around the feeding area and/or a maximum of 0.5 acre of denuded area from developing. The rotation of the feeding locations and water troughs will assist in eliminating high intensity areas (HIA's).

In order to comply with the U. S. Department of Health and Human Services Grade "A" Pasteurized Milk Ordinance, Item 19r., the following should be adhered to in dealing with the solids from the WSP:

During fly season, manure shall be spread directly on the fields; or stored for not more than 7 days in an impervious-floored bin, or on an impervious curbed platform and then spread; or stored in a tight-screened and trapped manure shed; or effectively treated with larvacides.

In order for the Waste Management System to function properly, it must be operated as planned and maintained in good condition. The following operation and maintenance criteria are provided to ensure that the waste management system operates as planned.

CONCRETE SOLIDS SEPARATOR

The solids separator consists of two cells. Allow each cell to fill with solids before changing cells. Each cell should retain approximately 18 days accumulation of solids prior to changing cells. The waste water entering the solids separator should be diverted to only one cell at a time. This is accomplished by using the flow diverter. Using the rope handle on the diverter, swing it into place blocking off flow into one cell and diverting it to the other cell. The cell in use should continue being used until the waste accumulation has reached a level 6 inches below the top of the dividing wall between the two cells. At this time, change cells by swinging the flow diverter into place diverting the flow into the other cell.

The application rate of solids is based on a nutrient content of 3.8 lbs.N/ton of solids. If testing shows this to vary, the application rates will need to be revised. The cell that is full of solids should be emptied on or before the cell being used is half full. The solids are to be removed from the cell and placed into a spreader. The solids from the cell are to be spread uniformly over 5.5 acres (provided the cell filling time is 18 days) located in the spray field (fields No. 6, 9, and 27). Each cell cleanout will require a different 5.5 acres resulting in the waste being spread uniformly over the spray field (fields No. 6, 9, and 27) for the year. No additional solids storage area is provided. If the cell filling time differs from 18 days, the acres required for the solids shall be determined by multiplying the number of days for filling the cell by 0.306. The estimated weight of solids per cell cleanout is 190 tons. When spread over 5.5 acres, the solids application rate is 34.5 tons per acre which is an estimated 130 lbs.N/acre. To determine the tons of solids to be applied per acre for different cell filling times, simply compute the acres required and then divide the acres into the 190 tons removed from the cell.

If the cell is emptied before it is completely full, the volume must be determined. After computing the volume in cubic feet, the acres for the solids to be spread over can be determined by multiplying the volume in cubic feet by 0.00084 acres/cubic feet.

In order to uniformly spread the solids, calibrate the spreading equipment in accordance with the equipment calibration section.

A critical element of the separator is the 4 inch x 4 inch timber picket fence which retains the solids in the cell. It should be checked daily to ensure blockages are removed as needed to maintain a discharge adequate to remove the inflow between flushes. Some blockage is expected and desireable. Any damage or deteriorated wood or bolts should be promptly replaced.

The wood skimmer should be inspected at the same time as the picket fence. Repair or replace the boards or hardware as needed. Ensure that the opening at the bottom of the skimmer is not blocked.

Inspect the flow diverter each time it is used to divert flow. Repair or replace it and/or the associated hardware as needed.

Inspect the discharge pipe from each cell when inspecting the picket fence. Remove any solids accumulation around the inlet of the pipe and any material causing pipe blockage.

The separator should be visually inspected during each cleanout. Hairline cracks should not pose a problem. Larger cracks should be sealed with a sealant that will remain flexible, adheres to the concrete, and has a long life.

The solid waste removed from the solids separator shall be analyzed for N, P_2O_5, and K_2O in accordance with the testing schedule in Table 2 and appropriate adjustments made.

EQUIPMENT CALIBRATION

Equipment shall be calibrated to ensure uniform distribution of waste solids (nutrients) at recommended rates.

MANURE SPREADER CALIBRATION

There are several methods that can be used to calibrate the application rate of a manure spreader. It is desirable to repeat the calibration procedure 2 to 3 times and average the results to ensure a more accurate calibration.

Before calibrating a manure spreader, the spreader settings such as splash plates should be adjusted so that the spread is uniform. Most spreaders tend to deposit more manure near the spreader than at the edge of the spread pattern. Overlapping can make the overall application more uniform. Calibrating of application rates when overlapping requires measuring the width of two spreads and dividing by two to get the effective spread width.

Calibration should take place annually or whenever manure is being applied from a different source or consistency.

Load – Area Method

The load-area method is the most accurate and can be used for most types of manure handling. This method consists of determining the amount (volume or weight) of manure in a spreader and the total area over which it is applied. The most accurate method to determine the amount of manure in a spreader is to weigh the spreader when it is full of manure and again when it is empty (pad scales work well for this). The difference is the quantity of manure applied over the area covered. Spreader capacities listed by the manufacturers can be used to determine the amount of manure in the spreader. However, care must be taken when using manufacturer's spreader capacities. Heaped loads, loading methods and manure type may vary considerably from what is listed by manufacturers of box and side delivery manure spreaders. Spreader capacities for liquid tankers are accurate provided the tanker is filled to the manufacturer's recommended levels, and no foam is present in the tank.

The area of spread is determined from measuring the length and width of the spread pattern. Measuring can be done with a measuring wheel, measuring tape or by pacing.

The application rate is calculated by dividing the amount of manure in the spreader (Tons or gallons) by the area it is spread over (square feet) times 43,560 ft.^{2}/acre.

$$\text{Application Rate (tons/acre)} = \frac{\text{Spreader capacity (tons)}}{\text{Distance traveled x Spreading width}} \times 43560 \frac{\text{ft}^2}{\text{acre}}$$

Plastic Sheet Method

The plastic sheet method can only be used with solid or semi-solid manure. This method of calibrating spreader application rates involves 1) cutting a plastic sheet to the specified dimensions (56 inches X 56 inches), 2) weighing the clean plastic sheet, 3) laying out the plastic sheet on the ground and driving the manure spreader (applying manure at a recorded

speed and spreader setting) over the sheet, 4) weighing the plastic sheet with the manure on it, and 4) determine the net weight of the manure on the sheet (weight of manure and sheet - weight of the clean sheet), and 5) the net pounds of manure equals tons per acre applied. When calibrating manure spreaders, all details regarding tractor speed and manure spreader settings and date(s) of each calibration should be recorded with manure application information, and directly on the equipment. Mark equipment to ensure a known application rate is applied each time the referenced tractor speed and spreader settings are used. Manure spreader settings can include such things as: fast and slow settings on some box spreaders, gate position on side delivery spreaders and splash plate position.

MANURE TESTING

Sampling Frequency

Even in the most consistent conditions, manures should be sampled at least twice a year, preferably in winter and late summer to capture seasonal variation in the waste. However, management of the waste can be improved if a sample is taken either during field application, or about a month prior to field application to allow time for a testing lab to analyze the manure and provide results of the analysis. A history of analysis can further provide guidance on how often samples should be collected as long as consistent management of the operation is maintained.

The actual amount of nutrients applied can be calculated if sampling the nutrient content of the waste occurred when the waste is field applied provided that the application equipment has been recently calibrated. The disadvantage of sampling the nutrient content of the waste is that a targeted nutrient application rate can not be achieved without knowing the nutrient value and adjusting the application rate accordingly.

To apply the waste at an estimated targeted nutrient application rate, historical analysis or documented data shall be used. Once the actual analysis of the waste is received from the testing lab, the historical analysis and/or documented data can be compared with the actual analysis. This will allow the operator to apply a specific amount of nutrient to a given field.

It is also important to test for minor elements and ash content if selling for crop production.

Collecting a Solid Sample

Following are guidelines for collecting solid manure samples:

Solids Separator

Representative sample is required. If using a narrow bladed shovel, dig down into the pile at various depths, but withdrawing the sample from at least 18-inches below the surface crust. It is also possible to use a metal pipe that has a 3-inch diameter, is 4 to 5 ft long, and sharpened on the bottom end. This pipe can be pressed or driven into the pile, using wooden dowel or broom handle to dislodge the sample from the pipe after it has been withdrawn.

- Brush away exterior crust.
- Collect 10 to 12 sub-samples from all over stack, extending as deeply as possible.
- Pour each sub-sample into a clean plastic bucket, mix well, and place about a quart into a "ziploc"-type plastic bag.
- Label bag (date, time, location) and deliver to testing lab.

Manure Spreader

Collecting a sample from the manure spreader is one of the preferred methods of collecting a solid manure sample, because it represents what is being applied to the field. In addition, by the time manures have been scraped, collected, and loaded into a manure spreader, reasonable mixing has been performed. However, you should still collect at least 5 sub-samples following the collection procedures for the waste storage facility.

Preparing the Sample for Delivery to a Testing Lab

It is important to take special care of the sample once collected. All samples, whether solid or liquid should be delivered as soon as possible after collection. If immediate delivery is not possible, refrigerate solid samples until delivery. Samples to be stored more than 14 days before delivering to the lab should be frozen.

- Deliver or mail samples to the lab as soon as possible.
- DO NOT USE GLASS OR METAL CONTAINERS to collect or ship the sample. Glass can break if miss-handled and metal can contaminate samples. Use only clean plastic bottles, buckets, and bags.
- Double bag all solid samples in a "ziploc"-type plastic bag.
- Attach a completed sample submission form to the samples, making sure that labels on the samples match what is on the form. It is helpful to enclose sample submission forms (and payment, if applicable) in a separate "ziploc"-type plastic bag to protect it in case of condensation, etc.

Consider the postal schedule before collecting a sample. Samples collected and mailed early in the week will stand less chance of sitting idle in the postal system over a weekend.

Soil Tests

Soil tests are required to ensure nutrients are being applied at appropriate agronomic rates. Soil testing should occur as recommended in Table 2. Soil nutrient levels should be monitored by soil testing to determine the requirement or buildup of phosphorus and potassium in the soil. As a minimum, a soil test analysis must include pH, phosphorus, and potassium.

Soil samples are to be collected in accordance with the University of Florida Institute of Food and Agricultural Sciences (IFAS) extension service guidance or standard industry practice if accepted by IFAS.

Soil testing is to be performed by laboratories that are accepted in one or more of the following programs:

- State Certified Programs
- The North American Proficiency Testing Program (Soil Science Society of America)
- Other laboratories whose test results and interpretations of such test are within the currently accepted guidelines of IFAS.

WASTE STORAGE POND

The maximum normal water level, which shall not be exceeded, except for rainfall that results from a 25-year, 24-hour storm, is Elevation 39.6. The 25 year, 24 hour storm is to be retained between elevation 39.6 and 41.5. In order for the WSP to function as planned, it should be pumped down daily, provided the available soil moisture in the crop's root zone receiving the effluent is deficient enough to retain the volume of irrigation applied. If the water level in the WSP reaches elevation 39.6, which is the maximum normal water level, irrigation should commence. Irrigation at this time is to protect against direct discharge from the WSP during a 25-year, 24-hour storm event.

The WSP is sealed with a concrete liner 5 inches thick on the bottom and ramp and 4 inches thick on the sides. The WSP should be checked frequently for signs of cracking. If cracks are discovered they must be repaired immediately. Hairline cracks should not pose a problem. Larger cracks should be sealed with a sealant that will remain flexible, adheres to the concrete and has a long life.

The WSP is designed to allow for limited solids accumulation. The floating solids handling chopper pump will agitate the waste water while pumping and result in most solids being pumped to the waste distribution field. Since the solids accumulation is expected to be minimal, any buildup removed should be placed in the solids separator for dewatering. It can then be spread at a rate of 34.5 tons/acre when the solids separator cell is cleaned. When it is necessary to clean the WSP by mechanical means, the WSP water level should be pumped as low as possible prior to clean out. Care must be taken to prevent damage to the concrete liner.

It is strongly recommended that the contents of the WSP be agitated prior to distributing on the irrigated field. This will uniformly disperse the nutrients in the waste water and minimize the solids being retained in the pond following irrigation. If the waste water is not agitated, more frequent clean outs of the WSP may be required and nutrient content will vary more during the cleanout period.

The embankment around the WSP must be maintained to the design elevation and kept well vegetated. Frequently mow to control the weeds, re-seed, fertilize, and apply herbicide as necessary to maintain a vigorous growth of desirable vegetation.

A staff gauge shall be installed with the depth marked with 1 inch wide red stripes at elevation 39.6 and 41.5. The staff gauge shall be visually checked daily and at each pumping operation. It must be kept at the appropriate location in the WSP. The markings on the staff gauge shall be maintained to allow the operator to see the pertinent elevations to assist in

determining the appropriate time to operate the pump.

WASTE WATER DISTRIBUTION AND IRRIGATION

The waste water from the WSP is to be spread uniformly over Field No. 6, 9 and 27, for a total of 116.2 acres of coastal bermuda hay followed with winter rye.

During the months of December and January the waste water in the WSP should be completely removed and spread uniformly over the 116.2 acre coastal bermuda/winter rye hayfield in order to provide storage for the rainy season.

The estimated waste water net application depth with estimated nutrients applied is:

TABLE 1 – BERMUDA AND RYE GRASS – FIELD NO. 6, 9 and 27

MONTH	APPLICATION DEPTH (in) (Waste Water)	POUNDS N/ACRE (Waste Water/Solids)	POUNDS P_2O_5/ACRE (Waste Water/Solids)	POUNDS K_2O/ACRE (Waste Water/Solids)
JANUARY	0.12	10.8/10.9	14/14	16.2/10.9
FEBRUARY	0.05	10.8/10.9	14/14	16.2/10.9
MARCH	0.12	10.8/10.9	14/14	16.2/10.9
APRIL	0.11	10.8/10.9	14/14	16.2/10.9
MAY	0.40	10.8/10.9	14/14	16.2/10.9
JUNE	0.41	10.8/10.9	14/14	16.2/10.9
JULY	0.41	10.8/10.9	14/14	16.2/10.9
AUGUST	0.41	10.8/10.9	14/14	16.2/10.9
SEPTEMBER	0.40	10.8/10.9	14/14	16.2/10.9
OCTOBER	0.39	10.8/10.9	14/14	16.2/10.9
NOVEMBER	0.11	10.8/10.9	14/14	16.2/10.9
DECEMBER	0.11	10.8/10.9	14/14	16.2/10.9
TOTAL	3.04	129.6/130.8	168/168	194.4/130.8

NOTE: *Since the values in the tables above are estimates, they are only to be used until actual data for the dairy waste water is obtained. The application depth by the irrigation system can be determined from tables in the owner's manual supplied by the system's manufacturers. The pounds per acre in the table for the solids are the amount that would be applied assuming the solids from each cell cleanout are uniformly spread over the 116.2 acres. Since the solids will be spread over a much smaller acreage at each cleanout, the estimated total amount shown for each column will actually be applied per acre for the smaller acreage. It is not anticipated the same acreage will receive additional solids during the year.*

The waste water from the WSP will be applied uniformly to a 116.2 acre sprayfield by a hard hose traveler irrigation system. Waste water application should commence as soon as the water level in the WSP reaches elevation 39.6 or the available moisture in the root zone is depleted to the point that it will retain the application the traveler will apply, whichever occurs first. Continue irrigating with waste water until the level of water in the WSP has

reached elevation 34.5, or the soil moisture in the irrigated field reaches field capacity. Stop irrigation if it starts to rain unless the water level is at or above elevation 39.6. Place a wire flag or stake at the spot where the traveler is stopped from applying waste water. The next waste water application should begin at the place marked. The irrigation system will not provide adequate water to meet the crops consumptive use. The system must be used for supplemental irrigation. Refer to the Irrigation Water Management (IWM) Plan for recommendations relative to supplemental irrigation.

The sprinkler when should not deposit waste water within the buffer zone.

The waste water in the waste storage pond shall be analyzed monthly for N, P, and K for the first year and then at least quarterly for the following years. Any changes in the cropping system will need to be analyzed to determine the effects that may occur on nutrient uptake and water use in the irrigated area. Periodic sampling of the manure, waste water, ground water, and crop will provide data that will help improve the system's management.

Check the sprinkler nozzles frequently for any blockage. Periodically check and repair if needed the air release valves, pressure gauges, check valves and pressure release valves at the waste distribution pump discharge and at the wells. Flush the waste distribution pipeline periodically with clean water from the connected well. The pressure relief valve is set for 150 psi and should not be altered.

After each operation of Pump No. 2, it is recommended to flush the waste distribution pipeline with clean water from the connected well (Pump No. 3) unless it is determined that the solids buildup in the pipeline is not significant enough to pose a problem to the pipeline. It is important to prevent methane from accumulating in the pipe. The methane poses a potential explosive safety hazard in the pipeline. This is especially important following pumping of a concentration of solids.

Flushing of the waste distribution pipeline with clean water is accomplished by operating only the irrigation well (pump no. 3). To flush the pipeline south of the well, close valves No. V1 and V2, open valve No. V8, open riser No. R1 at the distant end of the pipeline (preferably with the traveler connected to the riser), and operate the pump until the water clears. Now open riser R10, again preferably with a traveler connected and operate the pump until the water clears.

To flush the pipeline between the well and WSP, close all risers, open valves No. V8 and V1, close valve No. V2, and operate pump No. 3 for approximately 8 minutes.

IRRIGATION

The waste management system design is based on the spray field receiving moderate management, which requires supplemental irrigation.

Irrigation shall follow the attached irrigation water management plan. Irrigation should commence with waste water before applying fresh water.

WATER TROUGHS

The water troughs, pipelines, and appurtenances in the pastures and heavy use area must be checked often for leaks and the proper functioning of automatic water level control devices. Replace or repair defective automatic water level controls immediately. Water troughs not in use should be drained to prevent the formation of algae.

The area around the water troughs will need to be shaped and filled to prevent rutting, ponding, organic build-up, and erosion around the limerock. Each grazing field will be equipped with a minimum of two (2) water troughs. Rotation of the water troughs every 7 days will assist in the prevention of HIA's.

HERD LOT MANAGEMENT

The herd lots total 98.1 acres of supplemental irrigated pasture for the milk herds. The herd lots shall be managed for moderately optimal growth of coastal bermuda grass and rye grass. Rotate livestock so as to maintain a good stand of vegetative cover to uptake the nutrients deposited from the waste. Grazing should commence when the grass has reached a height of 6 inches. Grazing should be stopped when the bermuda grass has been reduced to a height of 4 inches and the rye at the height of 3 inches.

It is estimated, based on design assumptions, that the milkers will need to spend an annual average of 52% of their time (approximately 12.5 hours per day) on the herd lots. The limiting nutrient for the milker herd lots is Nitrogen. Time on herd lots shall be such that the cow/acre/year is uniform.

The dry cows will spend 100% of their time in Fields No. 1 through 5.

The heifers are to be confined 100% of the time in fields 22, 24, 25, and 26. The following is an approximate schedule for the heifers and their pastures:

Heifer Confinement (Days) Per Field Per Month												
Field No.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
22	3.5	3	3.5	15	15.5	13	13	13	13	15.5	15	3.5
24	3.5	3	3.5	15	15.5	13	14	14	13	15.5	15	3.5
25	12	11	12	0	0	2	2	2	2	0	0	12
26	12	11	12	0	0	2	2	2	2	0	0	12

The heifer confinement schedule provides the following:

1. Equal confinement time in days per acre during December – March;
2. 100% confinement to fields 22 and 24 during April, May, October, and November for establishing periods for the millet and rye;
3. About three hours per day confinement in fields No. 25 and 26 for the heifers to graze the millet.

It should be noted that with the low number of heifers, the confinement time may vary considerably provided the plants growth is not adversely compromised.

The herd lots must be managed to **prevent** HIA's from developing. This will be accomplished using gates and fencing to confine cows to specific areas. If an HIA starts to develop, immediate corrective measures must be taken. Corrective measures may include actions such as excluding cows from the affected areas, removing manure buildup, and temporarily fencing around disturbed areas.

The cows should be moved non-stop between the barn and herd lots - ***do not*** allow the cows to pause between destinations. Gates and fences are to keep the cows either on a herd lot or on concrete to avoid creation of HIA's.

Portable feeders, portable shades, temporary fences, and portable water troughs are ways to help distribute the cows, and ultimately evenly spread the nutrients over the herd lots. This will help prevent the formation of HIA's. A daily use record, such as a ledger, should be maintained in order to ensure uniform distribution of the nutrients. A ledger must be kept on the number of cows and their time confined on individual herd lot areas (see sample ledger attached).

Supplemental fertilizer may be needed to maintain vegetation in the herd lots in good condition. A soil test will determine which nutrients are lacking and the amount to apply. Only apply the amount of nutrients recommended by the soil test. The nutrient management plan should be followed.

BARN /HEAVY USE AREA WASH WATER

The flush system consists of a floating solids handling chopper pump (Pump No. 1) in the WSP with pvc pipe discharging the recycled waste water onto the HUA floor. Butterfly valves are provided to control placement of the flush water.

To operate the flush system, it is recommended the following sequence and procedure be followed.

1. First, hose wash HUA Nos. 1 and 2 and the northern most reach of North-South concrete walkway located on the east side of HUA No. 1.

2. Next, open valves No. V3 and V6, close Valves No. V2, V7, V4, and V5, and then activate pump No. 1. Allow the pump to operate approximately 3 minutes and then de-activate pump.

3. Wait until the water level in the solids separator has lowered approximately 6 inches and then proceed to step 4.

4. Begin flushing HUA No. 3 by opening valves No. V3 and V5, close valves No. V2, V6 and V7. Now activate pump No. 1, operate approximately 3 minutes, then open valve No. V4 and close valve No. V5. Allow pump to run another 3 minutes and de-activate.

ANIMAL TRAILS AND WALKWAYS

The walkways should be cleaned frequently to prevent a buildup of manure and reshaped as necessary to facilitate the removal of surface runoff. Fences and gates shall be used to control the access and movement of cattle using the animal trails and walkways and to prevent the creation of ruts in the trails and walkways. Cows will be moved non-stop between the barn and the herd lots and not allowed to loaf or rest in between.

PUMPING PLANT

The pumps for the waste storage pond, irrigation wells, and livestock water well should be maintained according to manufacturers' recommendations. The appurtenances at each pumping plant such as check valves, low pressure drains, air vents, pressure relief valves, butterfly valves, pressure tank, and pressure gauges should be routinely visually checked. Any leaks or malfunctions should be promptly repaired

FENCING

Fences and gates will be inspected often and repaired promptly. Electric twine can be used if it becomes necessary to subdivide the herd lots and to prevent the development of HIA's.

RECORD KEEPING

A record of nutrient application shall be maintained in the form of a ledger for the sites where the waste is being applied. The irrigation system ledger should include the staff gauge reading at the beginning and end of pumping, the hours operated, the crop it was applied to, the acres covered, the nutrient content of the waste applied, the total nutrient application to date, the crop yield and the nutrient content of the harvested crop.

For solid waste application the ledger should include the crop it was applied to, the acres covered, the nutrient content of the waste applied and the total nutrient application to date. Nutrient application is based on crop nutrient uptake. See sample ledger attached.

A record should be kept of the number of cows and their hours per herd lot. This is to include heifers and dry cows.

Table 2: Testing Schedules

Item	*Test for*	*Testing Frequency*
Wastewater in waste storage facility	N, P_2O_5, K_20	Monthly for first year and quarterly thereafter
Solids/sludge from solids separator and waste storage facility	N, P_2O_5, K_20	Monthly for first year and quarterly thereafter
Crops in waste distribution fields	N, P_2O_5, K_2O in plant tissue samples	Each harvest
Pastures	N, P_2O_5, K_2O in plant tissue samples	Once every 6 months
Soil test	P_2O_5, K_2O	Annually

Sample Record Keeping Forms are in Appendix B.

MONITORING

The installation of ground water monitoring wells is recommended. If monitoring is implemented, ground water samples should be taken from the monitoring wells on a quarterly basis and analyzed by a laboratory approved by the Florida Department of Health and Rehabilitation Services. Follow proper procedures while sampling, preserving, and transporting these samples. As a minimum, water samples should be analyzed for the following parameters:

Total Nitrogen (as N)
Nitrate Nitrogen (as N)
Total Phosphorus (as P)
Ortho Phosphorus (as P)

Other parameters of interest that can be tested for are:

Fecal Coliform
Specific Conductance
pH
Chlorides
Depth to Ground Water
Ground Water Elevation (NGVD - National Geodetic Vertical Datum)

Results of the samples will be maintained at the dairy.

SAFETY

Due to the possible entrance to the facility by the public, placing warning signs around the waste storage pond as a precautionary measure is strongly recommended. NRCS personnel will provide assistance in sign wording and location upon request.

ACCEPTANCE OF O&M PLAN

The undersigned has read and agrees with all the terms and conditions of this Operation and Maintenance Plan.

_____ _____

(Owner) (Date)

Appendix A

Irrigation Water Management Plan

IRRIGATION WATER

MANAGEMENT PLAN

FOR

T.W. BYRD SONS DAIRY

INDEX

PASTURE
IRRIGATION WATER MANAGEMENT PLAN

DATE: 12/03

COOPERATOR: T.W. Byrd Sons Dairy, Lafayette County

LOCATION: Sect. 18,19 Twp.5 S, Range 13 E

FIELD NUMBERS: 11-12, 14-17, and 20

CROP: Bermuda and winter rye/oats

ROOTING DEPTH: Bermuda = 30"
Rye/Oats = 18"

ESTIMATED YIELDS: Bermuda = 6.2 tons/acre
Rye/Oats = 1.0 ton/acre

IRRIGATION SYSTEM: Traveling Gun with a 425' wetted dia., discharge 500 gpm at 76 psi nozzle pressure; Lane spacing of 300'

WATER SUPPLY: Well water (pump no. 4)

PREDOMINATE SOIL SERIES: Blanton

Table 1:

Crop	Rooting Depth (inches)	[1/] AWC (inches)	[2/] MAD (in)	[3/] Gross application per irrigation(inches)	Critical Irrigation Period	[4/] Travel Speed (ft/min)	[4/] Time per 1300 (hr.)
Rye/Oats	0 – 12"	0.60	0.30	0.46	Pre-planting	5.8	3.0
	12" – 18"	0.90	0.45	0.69	And boot stage	3.9	4.5
Bermuda	30"	1.50	0.75	1.15	Immediately Following Grazing & During Droughts	2.3	7.6

[1/] - *Available Water Capacity within the root zone (AWC).*
[2/] - *Management Allowed Depletion (MAD) of 50%.*
[3/] - *Application depth necessary to replace water used by crop assuming an application efficiency of 65%.*
[4/] - *Some travelers will not reach the higher travel speeds. In this case, use the fastest speed available to keep water waste to a mininum.*

CURRENT MANAGEMENT PRACTICE: None

RECOMMENDATIONS:

The most important aspect of irrigation water management is properly evaluating and monitoring the available soil moisture for the particular crop. The feel and appearance method will be used for determining soil moisture and when irrigation is needed. See attached feel and appearance worksheets.

The system is designed to supplement irrigation water for the bermuda and rye/oats in fields 11-12, 14-17, and 20. The irrigation pump will not provide the rate of water needed to irrigate to consumptive use.

Planned pasture grass yields can be obtained with minimal quantities of irrigation water. Irrigation should, as a minimum, be applied at the critical periods for the planned crops which are at pre-planting for the rye/oats and immediately following the cows being rotated from the pasture. The soil moisture should be checked to determine how much irrigation should be applied for each irrigation period. Prior to planting rye/oats, or soon thereafter, the 12 inch root zone should be brought up to field capacity. If operated properly, supplemental irrigation can result in moderate crop production. The system should be managed as much as possible to maintain a high moisture level in the root zone. This will ensure that moisture is available if a drought begins.

For planned crop yield, during the critical irrigation period, irrigation should commence when the available soil moisture drops below the MAD and should continue until the soil reaches field capacity. See Table 1 for how long to operate the system for various rooting depths and a MAD of 50%.

The irrigation system should be checked periodically to ensure proper operation of the pump, pipeline, risers and traveling gun. Some puddling may occur during system operation. If significant puddling or runoff occurs, the system should be operated at the fastest speed available and the frequency of irrigation increased.

Check the condition of the crop to ensure that growth is occurring and that the crop looks consistent in color and height to determine adequacy and uniformity of irrigation. If application is not uniform, a system evaluation should be performed.

If there is change in the soil moisture monitoring method or irrigation method, the NRCS office in Mayo, Florida, should be contacted.

HAYFIELD

IRRIGATION WATER MANAGEMENT PLAN

(SPRAY FIELD)

DATE:	12/03
COOPERATOR:	T.W. Byrd Sons Dairy, Lafayette County
LOCATION:	Sect. 18,19 Twp.5 S, Range 13 E
FIELD NUMBERS:	6, 9, and 27
CROP:	Bermuda and winter rye/oats
ROOTING DEPTH:	Bermuda = 30" Rye/Oats = 18"
ESTIMATED YIELDS:	Bermuda = 6.2 tons/acre Rye/Oats = 1.0 ton/acre
IRRIGATION SYSTEM:	One Traveler Operating: Traveling Gun with a 425' wetted dia., discharge 500 gpm at 76 psi nozzle pressure; Lane spacing of 280' Two Travelers Operating: Each Traveling Gun with a 404' wetted dia., discharge of 430 gpm at 75 psi nozzle pressure; Land spacing of 280'; Total pumping rate of 860 gpm.
WATER SUPPLY:	Table 2: Well water (pump no. 3) or from wsp; 1 traveler operating only Table 3: Well water (pump no. 3) with 2 travelers operating
PREDOMINATE SOIL SERIES:	Blanton

Table 2:

Crop	Rooting Depth (inches)	[1/]AWC (inches)	[2/]MAD (in)	[3/]Gross application per irrigation (inches)	Critical Irrigation Period	Risers 1-3, 5-7, 10-14		[5/]Risers 4, 8, 9	
						[4/]Travel Speed (ft/min)	[4/]Time per 1050' (hr.)	[4/]Travel Speed (ft/min)	[4/]Time per 1300' (hr.)
Rye/Oats	0 – 12"	0.60	0.30	0.46	Pre-planting	6.2	3.5	12.4	1.75
	12" – 18"	0.90	0.45	0.69	And boot stage	4.2	5.2	8.2	2.64
Bermuda	30"	1.50	0.75	1.15	Immediately Following Cutting & During Droughts	2.5	8.7	5.0	4.33

Table 3:

Crop	Rooting Depth (inches)	[1/]AWC (inches)	[2/]MAD (in)	[3/]Gross application per irrigation (inches)	Critical Irrigation Period	Risers 1-3, 5-7, 10-14		[2/]Risers 4, 8, 9	
						[4/]Travel Speed (ft/min)	[4/]Time per 1050' (hr.)	[4/]Travel Speed (ft/min)	[4/]Time per 1300' (hr.)
Rye/Oats	0 – 12"	0.60	0.30	0.46	Pre-planting	5.4	4.0	10.8	2.0
	12" – 18"	0.90	0.45	0.69	And boot stage	3.6	6.0	7.2	3.0
Bermuda	30"	1.50	0.75	1.15	Immediately After Grazing & During Droughts	2.1	10.3	4.2	5.2

[1/] - *Available Water Capacity within the root zone (AWC).*
[2/] - *Management Allowed Depletion (MAD) of 50%.*
[3/] - *Application depth necessary to replace water used by crop assuming an application efficiency of 65%.*
[4/] - *Some travelers will not reach the higher travel speeds. In this case, use the fastest speed available to keep water waste to a minimum.*
[5/] - *Operating ½ circle on one side (not ahead of or behind unit).*

CURRENT MANAGEMENT PRACTICE: None

RECOMMENDATIONS:

The most important aspect of irrigation water management is properly evaluating and monitoring the available soil moisture for the particular crop. The feel and appearance method will be used for determining soil moisture and when irrigation is needed. See attached feel and appearance worksheets.

The system is designed to supplement irrigation water for the bermuda and rye/oats in fields 6, 9, and 27. The system will also be used to distribute the waste water (nutrients) from the waste storage pond (wsp) over the same fields. The irrigation pump (pump no. 3) and the WSP will not provide the rate of water needed to irrigate to consumptive use.

Planned hay yields can be obtained with minimal quantities of irrigation water. Irrigation should, as a minimum, be applied at the critical periods for the planned crops which are at pre-planting and boot stage for the rye/oats, and immediately following cutting the Bermuda. The soil moisture should be checked to determine how much irrigation should be applied for each irrigation period. Prior to planting rye/oats, or soon thereafter, the 12 inch root zone should be brought up to field capacity. If operated properly, supplemental irrigation can result in moderate crop production. The system should be managed as much as possible to maintain a high moisture level in the root zone. This will ensure that moisture is available if a drought begins.

For planned crop yield, during the critical irrigation period, irrigation should commence when the available soil moisture drops below the MAD and should continue until the soil reaches field capacity. See Table 1 for how long to operate the system for various rooting depths and a MAD of 50%. For waste water application, the irrigation system may need to be operated more frequently to properly manage the waste management system. Refer to the Operation and Maintenance Plan for the waste management system for additional information and guidance.

The irrigation system should be checked periodically to ensure proper operation of the pump, pipeline, risers and traveling gun. Some puddling may occur during system operation. If significant puddling or runoff occurs, the system should be operated at the fastest speed available and the frequency of irrigation increased.

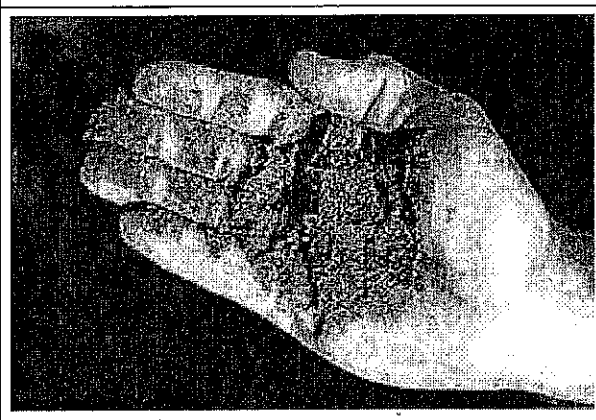
Check the condition of the crop to ensure that growth is occurring and that the crop looks consistent in color and height to determine adequacy and uniformity of irrigation. If application is not uniform, a system evaluation should be performed.

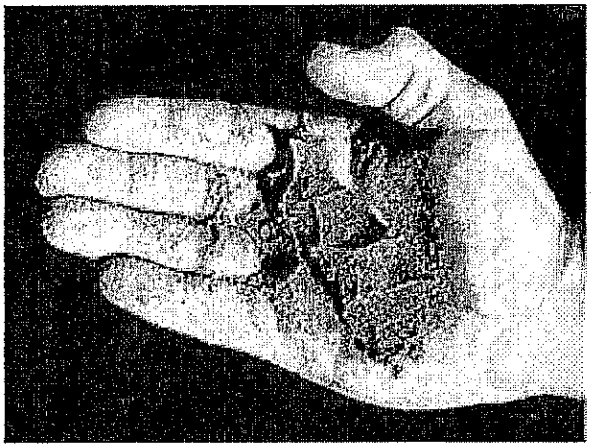
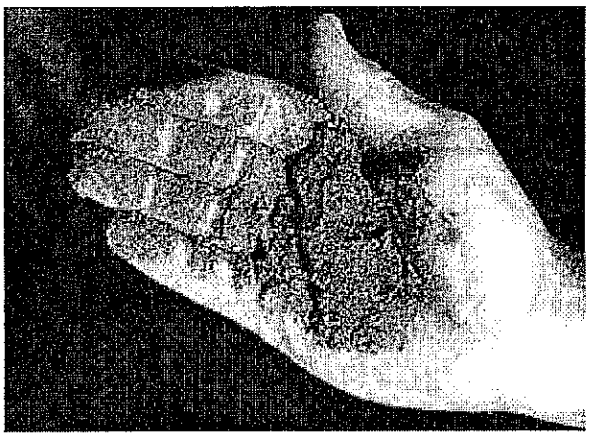
Risers no. 4, 8, and 9 must operate at ½ circle to one side of the traveler. Refer to tables 2 and 3 for the proper operating speed.

If there is change in the soil moisture monitoring method or irrigation method, the NRCS office in Mayo, Florida, should be contacted.

FINE SAND AND LOAMY FINE SAND SOILS

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

Available Soil Moisture Remaining	Appearance of soil
0-25 percent available	Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure.
25-50 percent available	 Slightly moist, forms a very weak ball with well-defined finger marks, light coating of loose and aggregated sand grains remains on fingers.

50-75 percent available	 Moist, forms a weak ball with loose and aggregated sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
75-100 percent available	 Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers, will not ribbon.
100 percent available	Wet, forms a weak ball, moderate to heavy soil/water coating on fingers, wet outline of soft ball remains on hand

Courtesy of the United States Department of Agriculture, Natural Resource Conservation Service, *Estimating Soil Moisture by Feel and Appearance* (Program Aid 1619)

Appendix B

Forms

Dairy Name: _____

Date	WSP Staff Gauge Reading [1/]	Vegetation		alysis (lbs/ton)		Nutrient Removal (lbs/ac) [4/]		
		Field No.	Cr	P_2O_5	K_2O	N	P_2O_5	K_2O

[1/] At beginning of each pumpage

[2/] Analysis of nutrients in waste storage po

[3/] Nutrient Applied (lbs/ac) = Nutrient Cont

[4/] Nutrient Removal (lbs/ac) = Yield (tons/a

Attachment 2 – Solids/Sludge Ledger

Dairy Name: _____ Landowner: _____

Date	Name of Recipient	(1) # of loads removed	(2) Load or truck capacity (ft^3 x 62.4 lbs/ft^3 / 2000 = tons)	Tons of Solids Removed (ton/ac) (1) x (2)	Lab Analysis of Solids/Sludge[1/] Nutrient Content (lbs/ton) N	P_2O_5	K_2O	Nutrient Removed Offsite or applied (lbs) [2/] N	P_2O_5	K_2O

[1/] Analysis of nutrients in waste storage pond when pumped out or in solids separator

[2/] Nutrient Applied (lbs/ac) = Nutrient Content (lbs of nutrient/ton) x Tons of Solids Applied

Attachment 3 – Crop Planting Harvesting Ledger

Dairy Name: _____ Landowner: _____

Date	Planting/ Harvesting	Vegetation			Crop Data						
					Yield (ton/ac)	Crop Analysis (lbs/ton)			Nutrient Removal (lbs/ac) [1/]		
		Field #	Crop	Acres		N	P_2O_5	K_2O	N	P_2O_5	K_2O

[1/] Nutrient Removal (lbs/ac) = Yield (tons/ac) x Crop Analysis (lbs of nutrient/ton)

Attachment 4 – Operation and Maintenance and Inspection

Poultry Name: _____

Type of Inspections Completed	Date	Name of Inspector	Comments	Date	Name of Inspector	Comments
1.						
2.						
3.						
4.						
5.						
6.						
7.						

Type of Repairs Completed	Date	Name of Repairer	Comments	Date	Name of Repairer	Comments
1.						
2.						
3.						
4.						
5.						
6.						
7.						

Attachment 5 – Pasture Use Ledger

Dairy Name: ____________________ Landowner: _______________ Herd No: _____

Date	Herd Lot No.	Crop	Acres	# of Cows	Avg. Weight of Cows (lbs)	Time in Herd Lots (hours)