Official Draft Public Notice Version **February 5th, 2026**
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STATE OF UTAH
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER QUALITY
PO BOX 144870
SALT LAKE CITY, UTAH 84114-4870

Ground Water Discharge Permit
Permit No. UGW010012

In compliance with the provisions of the Utah Water Quality Act, Title 19, Chapter 5, Utah Code Annotated 1953, as amended, the Act,

Mango II-Milford, LLC- Skyline BioEnergy Plant and Collection System
PO Box 100
Milford UT 84751

hereafter, referred to as the Permittee, is granted a renewed ground water discharge permit for the operation of the Skyline BioEnergy Plant and a Collection System for twenty-three existing finisher farm sites at the Skyline Farm Complex. This permit is for the construction and operation of an Anaerobic Digester System for all finisher farms in the Skyline Farm Complex. The Skyline Farm Complex sites and their anaerobic lagoons are still covered under the existing Ground Water Discharge Permit UGW010002. The Skyline BioEnergy Plant is located in the SW ¼ of the SE ¼ of Section 4, Township 30 South, Range 11 West, Salt Lake Base & Meridian, approximately ten miles west of Minersville, Utah.

This permit shall become effective on **Date**.

This permit and authorization to operate shall expire at midnight **Date**.

Signed this **DATE**.

_____
Candice A. Hasenyager, P.E.
Director

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PART I SPECIFIC CONDITIONS

A. GROUND WATER CLASSIFICATION

Ground water class as defined in Utah Admin. Code R317-6-4 for the Skyline BioEnergy ("SBE") Plant is Class IA, Pristine Ground Water. Ground water classification is determined through background ground water monitoring in upgradient monitoring wells associated with the SBE Plant and containment basins.

B. BACKGROUND GROUND WATER QUALITY

Background is defined as the mean analyte concentration for each monitoring well during the accelerated background monitoring period. For any new wells installed during the permit term, a formal determination of background water quality will be made after completion of accelerated background monitoring as required in Part I.E.5.b.

C. GROUND WATER PROTECTION LEVELS

Ground water protection levels for each monitoring well are presented in Appendix A. Protection levels are based on the results of the accelerated background monitoring period under the requirements of Utah Administrative Code ("Utah Admin. Code") R317-6-4 as required in Part I.E.5.b of this permit.

Protection levels are determined based on the greater of 1.25 times the mean background concentration, the mean background concentration plus twice the standard deviation, or 0.25 times the ground water quality standard for each analyte.

In no case will a pollutant be allowed to exceed the ground water quality standards as listed in Utah Admin. Code R317-6-2 unless otherwise specified by the Director.

D. BEST AVAILABLE TECHNOLOGY (BAT) STANDARD

The administration of this permit is founded on the use of best available technology (BAT), in accordance with the requirements of Utah Admin. Code R317-6-1.3.

The construction permit for the SBE Plant that describes construction standards for the collection and treatment system for finisher farm hog waste was issued on July 25, 2003. The SBE Plant includes anaerobic digesters for treatment and a biogas production facility. A second construction permit was issued for construction of expansion of the collection system and the West Skyline Collection Pond; however, the West Skyline Collection Pond was never constructed. The SBE Plant and its associated collection system is not currently in use and is not expected to operate during this Permit term.

Construction standards for the existing Skyline Farm Complex anaerobic lagoon treatment systems for finisher farm sites are detailed in their associated construction permits. The construction permits for each farm site are listed in Table 1.

Hog waste is collected from all finisher farms at the Skyline Farm Complex where it can be routed to the SBE Plant. A diversion valve connection is installed to either allow the wastewater from the recharge pits to flow into the existing onsite anaerobic lagoon system at the Skyline Farm Complex, or to be diverted into buffer basins for collection and treatment at the SBE Plant.

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TABLE 1 – Construction Permits for Anaerobic Lagoon Systems

Farm Sites	Construction Permit Date
41302, 41303, 41304, 41305	August 10, 1995
41306 through 41315	May 13, 1996
41316 through 41323	July 1, 1997

1. Permitted Facilities

Any inactive or dormant permitted facility must still meet the requirements of this permit. The Permittee must maintain this permit until farm closure requirements have been completed in compliance with the approved *Mango II Disposal and Farm Closure Plan* for the SBE Plant.

Collection System – The system is designed to transfer wastewater from each farm site to the SBE Plant. The collection system, for most farms, consists of an on-farm buffer basin and concrete wet-well pump station usually adjacent to each existing primary lagoon, for inflow equalization basins adjacent to lagoon systems and conveyance pipelines.

On-farm Buffer Basin – An on-farm buffer basin is installed adjacent to each existing primary lagoon for farm sites included in the Central, East and North Skyline layouts. Wastewater is conveyed from recharge pits to the on-farm buffer basin. The buffer basin will have a total depth of 13.5 or 11.1 feet depending on its location. All of the buffer basins are lined with a 60-mil flexible membrane liner (FML) made of high-density polyethylene (HDPE). A 6-inch pipe in the bottom of the basin will flow wastewater by gravity to the adjacent wet-well pump station. Wastewater from farms located in West Skyline was planned to gravity flow from the farm pits through a cement vault to the West Skyline inflow equalization basin at farm 41318. However, phase II of the project was never completed.

Wet-Well Pump Station – The wet well is constructed adjacent to each buffer basin to transfer wastewater from the buffer basin to the inflow equalization basin. Each wet well will usually have a total depth of 18 or 16 feet depending on its location and a precast concrete manhole with a minimum concrete strength of 4,000 psi.

Inflow Equalization Basin (IEB) – Central and East Skyline collection systems have IEBs located adjacent to the existing anaerobic lagoon systems of sites 41306 and 41312, respectively. North and West Skyline collection systems were planned to have IEBs located adjacent to the existing anaerobic lagoon systems of sites 41303 and 41318, respectively. However, phase II of the project was never completed. The IEB at Central Skyline will also be utilized as an on-farm buffer basin for site 41306.

Conveyance Pipelines – SDR 17 HDPE pipelines are installed to convey wastewater to and from the SBE Plant. The pipelines have sewage air release valves spaced at 2,500 feet to prevent air locks in the collection pipelines.

SBE Plant – Functional activity at the SBE has been indefinitely suspended. The following components are being maintained for possible future use: four influent manholes, four gravity thickener tanks, four anaerobic digesters, four effluent equalization basins, and four effluent return pump stations. All facilities in the SBE Plant shall be covered, except the

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gravity thickeners, to capture any biogas and potentially odorous gases.

Influent Manholes – Force main pipelines from the set of farms will enter HDPE manholes prior to flowing into the gravity thickeners. Each manhole will have a diameter of 5 feet and a maximum water depth of 10 feet, a reinforced concrete floor thickness of 12 inches, and a wall thickness of 1.5 inches with a minimum concrete strength of 4,000 psi. Potentially odorous off gases shall be collected and treated from the manholes and conveyed to off-gas scrubbers.

Gravity Thickener – The gravity thickeners are uncovered circular concrete tanks that receive wastewater flows from the influent manhole. The gravity thickeners also hold scum from discharging with the supernatant liquid. This is accomplished by means of a baffle and weir system. Scum then collects on the exposed water surface of the thickener and is skimmed by a skimmer arm into a scum collection box and conveyed to join the thickener underflow to be digested. The thickener separates the wastewater into underflow and supernatant. Each thickener will have a maximum liquid depth of 16 feet, a reinforced concrete floor thickness of 12 inches, and a wall thickness of 12 inches with a minimum concrete strength of 4,000 psi. Three of the thickeners will each have a diameter of 65 feet, and one thickener will have a diameter of 50 feet.

Anaerobic Digester – Thickened underflow from the bottom of a gravity thickener is pumped to the digester for treatment. Each digester will have a maximum water depth of 34 feet. All of the digesters are lined with a 60-mil HDPE. Each digester shall be covered with a gas-tight floating HDPE cover to capture biogas. Biogas is extracted from under the cover with biogas blowers and discharged into the biomethanol plant.

Return Equalization Basin (REB) – Return equalization basins will receive supernatant from the digesters. Each REB will have a maximum water depth of 7 feet. All REBs shall be lined with a 60-mil HDPE plastic liner. The REB shall be covered with a gas-tight floating HDPE cover to capture any biogas release.

Effluent Return Pump Station (ERPS) – ERPSs are a PVC lined concrete wet-well that is located between each REB and the gravity thickeners and receives flow from the REB. Supernatant from the gravity thickener will also enter this pump station where it will mix with REB flow and be pumped back to the primary lagoons at each farm site. Each ERPS will have a maximum water depth of 10 feet and a reinforced concrete floor thickness of 10 inches and a wall thickness of 8 inches with a minimum concrete strength of 4,000 psi. The ERPS are enclosed. Potentially odorous off gases shall be collected and treated from the return pumping stations and conveyed to off-gas scrubbers.

Wastewater Evaporation Basin –The Permittee may use this basin for excess water from farm lagoons and for effluent storage when a lagoon is in the process of sludge removal.

Wastes from the hog-raising operations may be treated in the SBE Plant. Wastes from outside sources may be supplemented to enhance biogas production in the digesters. Wastewater from the unit basins or digesters may be land-applied on an emergency basis. Land application may only occur at or below the agronomic rate according to the most recently revised and approved version of the Nutrient Management Plan (NMP). For the purposes of this permit, the agronomic rate is defined as the rate where all available nitrogen is taken up by crops or other plants before it can leach below the root zone, and where other waste constituents are applied at rates that do not cause ground or surface water

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pollution or plant toxicity incompatible with the intended use of the land. Emergency waste generated as a result of significant spills, the cleanup of a contamination event, or the necessary removal of waste from the facility to allow the investigation of a possible leak or to perform repairs may be land applied in accordance with the NMP.

2. Performance Standard for Best Available Technology

Compliance with the requirements for use of best available technology (BAT) shall be demonstrated by maintenance and operation of the collection and the digester systems according to the construction permits issued with this permit.

a. *Basins and Liner* – BAT will also be demonstrated by maintaining a performing seepage rate at any point on the liner, which is no greater than that provided by one foot of clay with a permeability on the order of 1×10^{-7} cm/sec. Performance of the liners shall be evaluated for compliance with the monitoring required in Part I.E. Liner integrity was verified prior to operation with the approved construction quality assurance/quality control (QA/QC) plans contained in the application for this permit.

The Permittee must maintain liner integrity. Deterioration of materials or any other situation that prevents the liner from functioning according to the approved design shall constitute non-compliance with this permit. Adequate slack and ballast will also be provided if necessary, to minimize stresses and suspensions of the liner at the toe of the dikes due to variations in ambient temperature and incident solar radiation. Any large suspensions or billowing of the synthetic liner is considered a failure of this performance standard. The formation of bulges or "whales" in the liner when the basins or digesters contain water is an indication of a leak in the liner. When whales form in the liner, the liner must be repaired in an expeditious manner. Impact to the underlying soils must be assessed in conformance with the provisions detailed in the most recently revised and approved version of the *Mango II Spill Prevention and Response Plan*.

b. *Collection System and SBE Plant Operation*– The performance standard for the collection system and SBE Plant is based on operating and maintaining the systems in a manner consistent with the design criteria detailed in the construction permit. The collection system and SBE Plant have not been operational since 2007. However, if the Permittee activates the collection system and SBE Plant for operational use, the Permittee must notify the Division prior to active use. The collection system and SBE Plant must be operated in accordance with an approved *Mango II Collection System and SBE Plant Operation and Maintenance Manual*, to be developed by the Permittee. Performance of the collection system and the central plant shall be demonstrated by the monitoring specified in Part I.E.5.a.

The gravity thickeners were installed without covers. The impact of odor production from uncovered gravity thickeners in the SBE Plant must be closely monitored and periodically evaluated by the SBE Plant. In the event of production of excess odor from the SBE Plant, the Permittee will be required to cover the gravity thickeners or to install other effective facilities to correct excessive odor problems. Covers or other appropriate freezing prevention methodologies will also be required if freezing impairs the proper operation of the thickeners. The Permittee will submit a schedule for installing covers or other facilities within 30 days of notice from the Director stating such covers are necessary for either odor

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control or freezing protection.

c. *Land Application*– Land application is currently limited to the parcels of land described in the most recently revised and approved version of the NMP. Land application of wastewater from the farm sites covered by this permit is not planned as a routine method of wastewater treatment, but may need to be employed in an emergency situation as a result of significant spills, the cleanup of a contamination event, or the necessary removal of waste from a facility to allow the investigation of a possible leak or to perform repairs. Land application of wastes generated at any of the facilities covered by this permit may not be performed on a routine basis without first notifying and receiving the approval of the Director. Land application of wastes generated at any of the facilities covered by this permit may not be performed on any parcel of land not described above without first notifying and receiving the approval of the Director. Any land application of wastes generated at any of the facilities covered by this permit must be performed in accordance with the most recently revised and approved version of the NMP.

3. Closure Plan

Any waste handling structure closure from the Collection System and SBE Plant must be undertaken in compliance with the most recently revised and approved version of the *Mango II Sludge Disposal and Farm Closure Plan*. Closure also includes conveyance of all wastewater out of the facilities back to the existing lagoon systems, and removal of all sludge and digested materials and debris from the SBE Plant, in accordance with the *Mango II Sludge Disposal and Farm Closure Plan* .

4. Supplemental Organic Feedstocks (SOF)

If the SBE Plant is reopened and the Permittee wishes to enhance biogas production in the digester system, the Permittee may supplement wastewater inflow with organic waste generated from various outside sources. The Permittee must obtain approval prior to introducing any new SOF material for a trial period or for full-scale application. In order to obtain the approval for a 90-day trial period, the Permittee shall complete the following:

a. Verbally or in writing notify the Division of the sources and provide a brief description of the proposed SOF. The Permittee is allowed to input six test-loads of SOF in the digester system to develop preliminary information to determine whether or not to proceed with the SOF. The six test-loads will not exceed one load per day or a maximum of 6000 gallons per day for a total of six days.

b. A formal written notice will be submitted to the Division if the Permittee desires to proceed with the 90-day trial period based on the preliminary information obtained from the six test-loads. The written notice will incorporate the following items:

1) The Permittee will perform and submit analyses on wastewater composition of the proposed SOF and results of analyses for biological oxygen demand (BOD), chemical oxygen demand (COD), pH, alkalinity, total Kjeldahl nitrogen (TKN), ammonia, volatile fatty acids, total solids, total suspended solids, volatile solids, VSS, nutrients and inorganic metals (phosphorous, potassium, sulfur, calcium, magnesium, sodium, iron and manganese) and heavy metals (arsenic, cadmium, copper, lead, mercury, selenium, zinc);

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2) Estimated quantity of the proposed SOF;

3) Point of SOF application in the digester system;

4) Estimated sludge production rate from the proposed SOF, and

5) A signed statement from the SBE Plant and the Permittee indicating consent to continue with the input of the proposed SOF from outside sources.

After the submittal of the above items to the Division, the Permittee must obtain an approval from the Division prior to proceeding with the 90-day trial period.

Upon completion and evaluation of the 90-days trial study, the Permittee will notify the Division in writing of its intention to convert the trial study to a full-scale application. The notification will incorporate a summary of the trial period and results of additional analyses on normal digester operations, if available. The notification must also incorporate a proposed quantity of SOF for the full-scale application.

The Permittee may discontinue SOF application at any time during the 90-day trial period. No further action will be required from the Permittee or the Division if the Permittee decides not to proceed with utilizing the SOF in full-scale application.

E. CLOSURE PLAN

Any lagoon system closure must be undertaken in compliance with the most recently revised and approved version of the Mango II *Sludge Disposal and Farm Closure Plan* (Appendix G).

The *Sludge Disposal and Farm Closure Plan* primarily relies on in-situ management of sludge within the closed lagoon system. If it is determined that the lagoon system will be permanently removed and abandoned, the steps outlined in the *Sludge Disposal and Farm Closure Plan* will be followed.

Dormant permitted facilities must meet all requirements of this permit until the Permittee meets the criteria in the approved *Sludge Disposal and Farm Closure Plan*.

F. COMPLIANCE MONITORING REQUIREMENTS

The Permittee is required to monitor ground water quality and source activities that could potentially impact the ground water quality. Monitoring shall be performed according to the provisions of Part I.E.5 to assure compliance with the terms of this permit.

1. Compliance Monitoring Wells - The network of monitoring wells shall provide the ability to detect contamination in the uppermost ground water aquifer, which could result from excess basin seepage. Under the provisions of this permit, ground water contamination in the shallow aquifer under the SBE Plant would constitute a reason for the Permittee to take remedial action before further degradation occurs.

   a. *Location of Monitoring Wells* - The Permittee has installed a monitoring well system at each existing farm site to establish the ground water flow gradient underlying each lagoon system and to monitor ground water quality in both the upgradient and downgradient wells. The Permittee shall be required to drill

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additional monitoring wells if the ground water flow directions are different than expected and the existing monitoring wells do not accurately capture potential impacts of lagoon seepage. The locations and status of the wells are described in Appendix B. Information about any new wells installed for the farm sites covered under this permit shall be submitted to the Director and include:

1) Well identification;
2) Latitude and Longitude relative to the North American Datum of 1983 (NAD83);
3) Hinge elevation, and
4) The associated well construction log.

b. *Repair and Replacement of Monitoring Wells* – If a monitoring well becomes damaged, yields insufficient water for sampling, or is otherwise no longer suitable for its intended monitoring purpose, or if a previously observed hydraulic gradient between two monitoring wells becomes reversed, the Permittee shall notify the Director in writing within five (5) days of becoming aware of the condition. Within thirty (30) days of notification, the Permittee shall submit a plan and proposed timeline to the Director for either redevelopment of the compromised well or the installation of a replacement monitoring well.

c. *Future Modification of Monitoring Well Network* - If at any time the Director determines the monitoring well network to be inadequate due to a change in gradient or for any other reason, the Permittee shall submit within 30 days of receipt of notification a plan and compliance schedule to modify the monitoring well network.

2. Monitoring Period - The Permittee shall adhere to the monitoring schedule and associated monitoring report deadlines detailed in Part I.E.5 for the term of the permit.

3. Monitoring Requirements - The Permittee shall comply with the requirements outlined in Utah Admin. Code R317-6, the monitoring requirements outlined in Part I.E.5 of this permit, the ground water quality standards, and the protection levels listed in Appendix A of this permit.

The analytes and monitoring schedule, specified in Part I.E.5 of this permit, are intended to allow the Permittee to identify any discharges to ground water originating from the lagoons and to characterize ground water from different sources. The Ground Water Quality Protection Regulations also contain ground water quality standards for contaminants such as metals, pesticides, and volatile organic compounds. Accordingly, the Permittee must not discharge these or any other contaminants, which could impair beneficial uses of the underlying aquifer.

4. Protection Levels

a. *Application* - The monitoring requirements listed below in Part I.E.5 apply to all compliance monitoring wells. The protection levels for indicator parameters are calculated using the Ground Water Quality Protection Regulations (Utah Admin. Code R317-6-4), background water quality data, and historical well data.

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b. *Upgradient Wells* - If any upgradient well exceeds the protection levels referenced in Part I.C, the Permittee shall document the exceedance in the next semi-annual monitoring report. In addition to reporting the upgradient exceedance, the Permittee shall evaluate whether a reversal of the local hydraulic gradient has occurred for each upgradient monitoring well associated with the farm system. If it is determined that a reversal has occurred and the well is no longer hydraulically upgradient, the well shall be considered out-of-compliance and subject to the conditions specified in Part I.F.2.

As part of resolving the non-compliance status, the Permittee may be required to propose changes to the site's monitoring plan sufficient to demonstrate that ground water is not being impacted.

5. Monitoring Details

a. *Semi-annual Ground Water Quality Compliance Monitoring* - Semi-annual ground water compliance monitoring shall be conducted by the Permittee under the provisions of this permit.

1) Sample collection, handling and analysis shall be conducted in accordance with the most recently revised and approved version of the *Mango II Sampling and Analysis Plan*.

2) Unless revised by the *Mango II Sampling and Analysis Plan*, the field parameters to be measured during the semi-annual monitoring shall include the following: temperature, specific conductance, pH, and ground water elevation. Ground water elevations shall be determined according to Part I.E.5.d.

3) Unless revised by the *Mango II Sampling and Analysis Plan*, the laboratory parameters to be measured during the semi-annual monitoring shall include the following: Nitrate plus Nitrite as Nitrogen, Bicarbonate, Chloride, and Total Dissolved Solids (TDS).

4) The Permittee shall submit the results of the semi-annual compliance monitoring to the Division of Water Quality along with supporting field data in the Semi-annual Ground Water Quality Monitoring Report according to Part I.G, accompanied by any supporting raw data.

b. *Background Ground Water Quality Monitoring* - Background ground water quality has been established in the upgradient monitoring wells for all farm sites covered by this permit for the purpose of establishing ground water Protection Levels. The samples were analyzed for the following parameters: temperature, specific conductance, pH, nitrate plus nitrite as nitrogen, bicarbonate, chloride, TDS, sodium, potassium, magnesium, calcium, carbonate, and sulfate. At least one sample from each downgradient monitoring well was also analyzed for these parameters. If any additional upgradient or downgradient wells are installed, the Permittee shall collect quarterly samples at equal time intervals over a two-year period from each upgradient well and each downgradient well. The samples shall be analyzed for the parameters listed above. Sample collection, handling, and analysis shall be conducted in accordance with the most recently revised and

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approved version of the Mango II *Sampling and Analysis Plan*. The results, accompanied by any supporting raw data, shall be submitted to the Division of Water Quality with the next Semi-annual Ground Water Quality Monitoring Report according to Part I.G.

c. *Depth to Ground Water and Ground Water Elevation* - Depth to ground water shall be measured to the nearest 0.01 foot, below the reference point at the top of the well casing. For each monitoring well, the Permittee shall submit a report to the Division of Water Quality accompanied by a surveyor's report indicating the elevation in feet above mean sea level to the nearest 0.01 foot of the reference point at the top of the well casing from which all ground water depths are measured.

Ground water elevations shall be measured semi-annually at all active monitoring wells at the farm sites covered by this permit. Ground water elevations shall be calculated by subtracting the depth to ground water measurement from the elevation of the reference point at the top of the well casing and reported in feet above mean sea level to the nearest 0.01 foot. Ground water elevation calculations for each semi-annual ground water sampling event shall be submitted with the Semi-annual Ground Water Quality Monitoring Report.

To develop ground water potentiometric surface contour maps, ground water elevation data shall be collected on an annual basis. Ground water elevation measurements shall be collected within 48 hours at each respective basin/lagoon system and within one month for the entire SBE Plant. The Permittee shall develop ground water potentiometric contour maps from these data and submit them to the Division of Water Quality with the next Semi-annual Ground Water Quality Monitoring Report according to Part I.G.

d. *Analysis by Certified Laboratories* - All water analyses shall be performed by a laboratory certified by the State of Utah Department of Health in accordance with the most recently revised and approved version of the *Mango II Sampling and Analysis Plan* and the provisions of Utah Admin. Code R317-6-6.3.

e. *Future Modification of Monitoring Plan* - If the Director or Permittee determine that hydrogeologic conditions at any farm site do not allow a direct comparison of upgradient and downgradient ground water quality, the Permittee shall submit the supporting data and a proposed alternative method of compliance within 90 days.

G. NON-COMPLIANCE STATUS

1. Probable Out-of-Compliance Status - The Permittee shall evaluate the results of each ground water sampling event for all compliance monitoring wells to determine any exceedance(s) of the Ground Water Protection Levels found in Appendix A. Upon determination that a Ground Water Protection Level has been exceeded at any compliance monitoring well, the Permittee shall:

a. Notify the Director in writing within 30 days of the receipt of a complete dataset from all monitoring wells listed in Appendix B. The Permittee shall complete all monitoring associated with this permit as consecutively as possible to prevent delays in notification.

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b. Immediately initiate quarterly sampling if the value exceeds both the background concentration of the pollutant by two standard deviations and an applicable permit limit, unless the Director determines that other periodic sampling is appropriate, for a period of two quarters or until the compliance status of the facility can be determined. Results of accelerated quarterly sampling period shall be included in the semi-annual ground water monitoring report as required in Table 2.

2. Out-of-Compliance Status Based on a Confirmed Exceedance of a Ground Water Protection Level

a. *Out-of-Compliance Status* shall be defined as follows:

1) For parameters that have been defined as detectable in the background and for which protection levels have been established, out-of-compliance shall be defined as two consecutive samples exceeding the protection level. An out-of-compliance status for exceedances of bicarbonate or chloride only occurs when their respective protection levels for TDS are also exceeded.

b. *Notification and Accelerated Monitoring* - Upon determination by the Permittee or the Director, in accordance with Utah Admin. Code R317-6-6.17, that an out-of-compliance status exists, the Permittee shall:

1) Verbally notify the Director of the out-of-compliance status within 24 hours and provide written notice within 5 days of the detection of the out-of-compliance status by the Permittee.

i. If multiple farm sites are conducting quarterly monitoring under Part I.G.1.B, the 24-hour verbal notification requirement and subsequent 5-day written notification is based on the detection of the last monitoring well data received.

ii. The Permittee shall complete all monitoring associated with this permit as consecutively as possible to prevent delays in notification.

2) The 5-day written submission required in Part I.G.b.1. shall contain:

i. A description of the noncompliance and its cause;

ii. The period of noncompliance, including exact dates and times;

iii. The estimated amount of time noncompliance is expected to continue if it has not been corrected; and,

iv. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

3) The Permittee shall verbally report any noncompliance, which may endanger public health or the environment, as soon as possible, but no later than 24 hours from the time the Permittee first became aware of the circumstances. The report shall be made to the Utah Department of

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Environmental Quality 24-hour number, (801) 536-4123.

4) Implement an accelerated schedule of quarterly ground water monitoring for at least two quarters and continue quarterly monitoring until the facility is brought into compliance, or as determined by the Director. Results of the accelerated quarterly sampling period shall be included in the semi-annual ground water monitoring report as required in Table 2.

c. *Source and Contamination Assessment Study Plan* - within 90 days after the submission of the semi-annual ground water monitoring reports, as required in Table 2, the Permittee shall submit a *Source and Contamination Assessment Study Plan* and compliance schedule for:

1) Assessment of the source or cause of the contamination, and determination of steps necessary to correct the source, if the contamination is caused by facilities or activities for which the Permittee is responsible.

2) Assessment of the extent of the ground water contamination and any potential dispersion.

3) Evaluation of potential remedial actions to restore and maintain ground water quality and ensure that the ground water standards will not be exceeded at the compliance monitoring wells.

The Permittee shall implement the *Source and Contamination Assessment Study Plan* within 180 days upon approval by the Director and provide a report on relevant findings.

3. Out-of-Compliance Status Based Upon Failure To Maintain Best Available Technology - In the event that BAT monitoring indicates a violation of any of the construction or performance standards outlined in Part I.D of this permit, the Permittee shall submit to the Director a notification and description of the violation in accordance with Part II.I of this permit.

4. Failure to Maintain Best Available Technology Required by Permit - A facility will be considered to be in an out-of-compliance status if best available technology has failed or cannot be maintained according to the provisions required by this permit, unless:

a. The Permittee has notified the Director according to Part I.F.2.b, and

b. The failure was not intentional or was not caused by the Permittee's negligence, either in action or failure to act, and

c. The Permittee has taken adequate remedial measures in a timely manner or has developed an approvable remedial action plan and implementation schedule for restoration of best available control technology, an equivalent control technology, or closure of the facility (implementation of an equivalent technology will require permit modification and re-issuance), and

d. The Permittee has demonstrated that any discharge of a pollutant from the facility is not in violation of the provisions of Utah Admin. Code 19-5-107.

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5. Contingency Plan - If, after reviewing ground water monitoring data, the Source and Contamination Assessment Report, and other relevant information, the Director determines that use of any lagoon has caused an exceedance of ground water protection levels at any compliance monitoring point, the Permittee shall conduct a Contamination Investigation to determine the extent and severity of contamination caused by the lagoon. The Permittee shall submit a proposed Contamination Investigation Plan, including a schedule for review by the Division of Water Quality, within 30 days following approval of the Source and Contamination Assessment Report. The Contamination Investigation Report shall meet the requirements outlined in Utah Admin. Code R317-6-6.15.D.

   After reviewing the Contamination Investigation Report, the Director may require the Permittee to develop a Corrective Action Plan to remediate the contamination identified in the Contamination Investigation Report. Actions taken under the plan may include emptying liquids and sludge from the leaking basins/SBE Plant facility components into one of the other lagoons, repairing or reconstructing as needed, constructing temporary holding ponds lined with flexible membrane liners, and developing wells for the purpose of extracting contaminated ground water. Contaminated ground water may be stored in functioning lagoons or land applied according to the most recently revised and approved NMP, if necessary and feasible.

   Significant hog waste spills from the waste handling system must be addressed in compliance with the most recently revised and approved version of the *Mango II Spill Prevention and Response Manual* that has been prepared by the Permittee. Minor spill events shall be reported with the next Semi-annual Ground Water Quality Monitoring Report according to Part I.G.

H. REPORTING REQUIREMENTS

1. Semi-Annual Ground Water Monitoring - Monitoring required in Part I.E.5 shall be reported according to the schedule in Table 2, unless modified by the Director:

Table 2: Semi-Annual Compliance Monitoring Report Schedule

Monitoring Period	Report Due Date
January 1 - June 30	August 1
July 1- December 31	February 1

2. Water Level Measurements - Water level measurements from ground water monitoring wells will be reported, to the nearest 0.01 foot, as measured depth to ground water from the surveyed casing measuring point, and ground water elevations as converted by casing measuring point elevations.

3. Hydraulic Gradient and Flow Direction - the Permittee shall calculate the hydraulic gradient and flow direction for each farm system that has a confirmed out-of-compliance upgradient monitoring well. Hydraulic gradient and flow direction for each farm system that has a confirmed out-of-compliance upgradient monitoring well shall be included in each semi-annual report listed in Table 2.

4. Ground Water Quality Sampling - reporting will include:

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a. *Field Data Sheets* - or copies thereof, including the field measurements required in Part I.E.5.a above, or as listed in the most recently revised and approved *Mango II Sampling and Analysis Plan*; well name/number, date and time, names of sampling crew, type of sampling pump or bail, volume of water purged before sampling, and any pertinent comments relating to sampling conditions.

b. *Laboratory Analytical Results* - including date sampled, date received; and the results of analysis for each parameter, including: value or concentration, units of measurement, reporting limit (minimum detection limit for the examination), analytical method, and the date of the analysis. The analytical methods and the method detection limits for every parameter must conform to those specified in the most recently revised and approved version of the Mango II *Sampling and Analysis Plan*.

c. *Monitoring Well Construction Report* – For each newly installed monitoring well, the Permittee shall submit descriptions of the final completion. The report shall be provided to the Director within 60 days of the date of well completion. The report shall include the well identification, latitude and longitude relative to NAD83, well installation date, depth to ground water, and well construction information.

5. Annual Sludge Profile Monitoring Report - The report of the annual sludge profile monitoring, if applicable to the SBE basins, shall be submitted within 30 days of completion of all sampling, monitoring, and analysis.

6. Annual Lagoon Performance Monitoring Report - The report of the annual lagoon performance monitoring, if applicable to the SBE basins, shall be submitted within 30 days of completion of all sampling, monitoring, and analysis.

7. Noncompliance or Probable Noncompliance - Reporting requirements for noncompliance or probable noncompliance status shall be according to the provisions of Part I.F.

8. Electronic Filing Requirements - In addition to submittal of the hard copy data, above, the Permittee will electronically submit all required ground water monitoring data (analytical ground water results, water level measurements, water supply, lagoon waste water and sludge analytical results, sludge profile monitoring data, and the lagoon performance data) in the electronic format specified by the Director. A hard copy of the required reports, including data analysis will be provided to the Director. In addition, a pdf version of the full report, including analytical data, will be submitted through the DEQ Web Portal. All analytical data and updated tables will be provided in xlsx format. The data may be submitted through the online DEQ Submission Portal at https://deq.utah.gov/water-quality/water-quality-electronic-submissions.

I. COMPLIANCE SCHEDULE

1. Mango II has submitted a plan to assess the ground water monitoring well network to address a number of non-sampled monitoring wells identified in the *2025 First Half Ground Water Monitoring Report*. The following monitoring wells covered under this permit were not sampled due to insufficient water: MUBB, MDBB, MDBB2, SBMU, and SBMD.

   Mango II is currently evaluating these monitoring wells and will redrill or redevelop them

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as necessary to restore functionality to the ground water monitoring well network for the SBE Plant. Any replacement or redevelopment of nonfunctioning ground water monitoring wells shall comply with the timelines and requirements specified in Part 1.E.1.

2. Currently, the SBE Plant and its associated collection system are not in operation and are not expected to be reopened during the term of this Permit. If the Permittee wishes to reopen the SBE Plant for operation, the Permittee shall submit an updated version of the *Mango II Collection System and SBE Plant Operation and Maintenance Manual* for Division review 60 days prior to reopening of the SBE Plant and collection system.

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PART II MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. REPRESENTATIVE SAMPLING

Samples taken in compliance with the monitoring requirements established under Part I shall be representative of the monitored activity.

B. ANALYTICAL PROCEDURES

Water sample analysis must be conducted according to test procedures specified under Utah Admin. Code R317-6-6.3.L, unless other test procedures have been specified in this permit.

C. PENALTIES FOR TAMPERING

The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

D. REPORTING OF MONITORING RESULTS

Monitoring results obtained during each reporting period specified in the permit, shall be submitted to the Director, Utah Division of Water Quality at the following address no later than the 15th day of the month following the completed reporting period:

State of Utah
Division of Water Quality
P.O. Box 144870
Salt Lake City, Utah 84114-4870
Attention: Ground Water Protection Section

E. COMPLIANCE SCHEDULES

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. ADDITIONAL MONITORING BY THE PERMITTEE

If the Permittee monitors any pollutant more frequently than required by this permit, using approved test procedures as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted. Such increased frequency shall also be indicated.

G. RECORDS CONTENTS

Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements:
2. The individual(s) who performed the sampling or measurements;
3. The date(s) and time(s) analyses were performed;
4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and,
6. The results of such analyses.

H. RETENTION OF RECORDS

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and copies of all reports required by this permit, and records of all data used

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to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended at the request of the Director at any time.

I. TWENTY-FOUR HOUR NOTICE OF NONCOMPLIANCE REPORTING

1. The Permittee shall verbally report any noncompliance that may endanger public health or the environment as soon as possible, but no later than 24 hours from the time the Permittee first became aware of the circumstances. The report shall be made to the Utah Department of Environmental Quality 24-hour number, (801) 536-4123, and to the Division of Water Quality, Ground Water Protection Section at (801) 536-4300, during normal business hours (Monday through Friday 8:00 am - 5:00 pm Mountain Time).

2. A written submission shall also be provided to the Director within five days of the time that the Permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. Figure of spill location with extent dimensions;

   c. The period of noncompliance, including exact dates and times;

   d. The estimated time noncompliance is expected to continue if it has not been corrected; and,

   e. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

3. Reports shall be submitted to the addresses in Part II.D, Reporting of Monitoring Results.

J. OTHER NONCOMPLIANCE REPORTING

Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D are submitted.

K. INSPECTION AND ENTRY

The Permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

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PART III COMPLIANCE RESPONSIBILITIES

A. DUTY TO COMPLY

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The Permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. PENALTIES FOR VIOLATIONS OF PERMIT CONDITIONS

The Act provides that any person who violates a permit condition implementing provisions of the Act is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions is subject to a fine not exceeding $25,000 per day of violation. Any person convicted under Section 19-5-115(2) of the Act a second time shall be punished by a fine not exceeding $50,000 per day. Nothing in this permit shall be construed to relieve the Permittee of the civil or criminal penalties for noncompliance.

C. NEED TO HALT OR REDUCE ACTIVITY NOT A DEFENSE

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. DUTY TO MITIGATE

The Permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. PROPER OPERATION AND MAINTENANCE

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

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PART IV GENERAL REQUIREMENTS

A. PLANNED CHANGES

The Permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required when the alteration or addition could significantly change the nature of the facility or increase the quantity of pollutants discharged.

B. ANTICIPATED NONCOMPLIANCE

The Permittee shall give advance notice of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

C. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. DUTY TO REAPPLY

If the Permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the Permittee must apply for and obtain a permit renewal or extension. The application should be submitted at least 180 days before the expiration date of this permit.

E. DUTY TO PROVIDE INFORMATION

The Permittee shall furnish to the Director, within a reasonable time, any information that the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

F. OTHER INFORMATION

When the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or any report to the Director, it shall promptly submit such facts or information.

G. SIGNATORY REQUIREMENTS

All applications, reports or information submitted to the Director shall be signed and certified.

1. All permit applications shall be signed as follows:

   a. For a corporation: by a responsible corporate officer.

   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.

   c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Director, and,

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b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. A duly authorized representative may thus be either a named individual or any individual occupying a named position.

3. Changes to Authorization. If an authorization under Part IV.G.2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part IV.G.2 must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. PENALTIES FOR FALSIFICATION OF REPORTS

The Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

I. AVAILABILITY OF REPORTS

Except for data determined to be confidential by the Permittee, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Director. As required by the Act, permit applications, permits, effluent data, and ground water quality data shall not be considered confidential.

J. PROPERTY RIGHTS

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

K. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

L. TRANSFERS

This permit may be automatically transferred to a new permittee if:

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1. The current Permittee notifies the Director at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Director does not notify the existing Permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

M. STATE LAWS

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, penalties established pursuant to any applicable state law or regulation under authority preserved by Section 19-5-117 of the Act.

N. REOPENER PROVISION

This permit may be reopened and modified (following proper administrative procedures) to include the appropriate limitations and compliance schedule, if necessary, if one or more of the following events occur:

1. If new ground water standards are adopted by the Board, the permit may be reopened and modified to extend the terms of the permit or to include pollutants covered by new standards. The Permittee may apply for a variance under the conditions outlined in R317-6-6.4.D.

2. If alternative compliance mechanisms are required.

3. If subsequent ground water monitoring data reveals the background water quality values in Part I Table 1 are not accurate.

APPENDIX A

UGW010012 FARM AND MONITORING WELL Ground Water Protection Levels*

BASIN SYSTEM	pH	NITRATE + NITRITE (mg/L)	BICARBONATE (mg/L)	CHLORIDE (mg/L)	TOTAL DISSOLVED SOLIDS (mg/L)
MUBB	6.5 – 8.5	2.5	222	34	408
MDBB1	6.5 – 8.5	2.5	222	34	408
MDBB2	6.5 – 8.5	2.5	222	34	408
SBMU	6.5 – 8.5	2.5	222	44	614
SBMD1	6.5 – 8.5	2.5	222	50	600
SBMD2	6.5 – 8.5	2.5	222	50	600
SBMD3	6.5 – 8.5	2.5	222	44	614

*Ground water protection levels and compliance limits are established in accordance with R317-6-4. Only the highest allowable value is shown in Appendix A.

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APPENDIX B

MONITORING WELL LOCATIONS

Monitoring Well Location	Well	Latitude (North)	Longitude (West)	Hinge Elevation (feet – amsl)	Status
Upgradient from Treatment Plant	MUBB	38.223235	-113.09251	5042.4	active
Downgradient from Treatment Plant	MDBB1	38.224851	-113.09155	5039.9	active
Downgradient from Treatment Plant	MDBB2	38.224825	-113.09061	5040.3	active
Upgradient from Containment Basin	SBMU	38.222654	-113.08883	5043.9	active
Downgradient from Containment Basin	SBMD1	38.224807	-113.08701	5041.8	active
Downgradient from Containment Basin	SBMD2	38.22479	-113.08601	5042.4	active
Downgradient from Containment Basin	SBMD3	38.22479	-113.08601	5042.9	active

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Mango II-Milford

Sampling and Analysis Plan

June 27, 2025

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1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) presents the sampling and analysis protocol for the Mango II swine facility located near Milford, Utah. The SAP contains Data Quality Objectives (DQOs) which are a series of statements which serve to clarify the purpose for implementing each section of the SAP; define the necessary data and the quantity and quality of data to be collected in support of each section of the SAP such that decisions based on the data are defensible; and define the decision tree and action levels to be applied to each data set. Also included are Standard Operating Procedures (SOPs) for conducting field testing and sampling of the ground water monitoring wells, supply wells, lagoon waste water, lagoon sludge, and soils; identifying samples and delivering them to the laboratories for analysis; and analyzing the samples in the laboratory. Quality Assurance/Quality Control (QA/QC) mechanisms are included to ensure consistency in the quality of the data collected.

1.1 General Objectives and Scope of SAP

The Sampling and Analysis Plan was prepared to facilitate the sampling and analysis requirements of Utah Code R317-6 and the Ground Water Discharge Permits held by Mango II. The Ground Water Discharge Permits reference this document. It is understood that all sampling and analysis requirements under Utah Code R317-6 and the Ground Water Discharge Permits are stated herein and any changes to those requirements will be incorporated into revisions of this document and thus incorporated by reference in the Ground Water Discharge Permits held by Mango II.

1.2 Project Organization

The Mango II and Utah Division of Water Quality personnel responsible for ensuring that sampling and analysis comply with this Plan are listed below.

Chief Operating Officer
Mango II 435-691-0825
Responsibilities include day-to-day supervision of environmental programs, and preparation of reports and submittals of data to the DEQ.

Utah Division of Water Quality, Ground Water Protection Section
801-538-6146 Responsibilities include review of data and assurance of compliance relative to the sampling and analysis encompassed by this Plan.

2.0 GROUND WATER MONITORING WELLS

2.1 Monitoring Well Construction

The ground water monitoring well system shall be designed, installed and utilized for the purpose of collecting representative ground water quality samples from and detecting the presence or absence of contaminants in the uppermost aquifer. The proposed monitoring well design shall be submitted to the Division of Water Quality. Ground water monitoring wells are constructed at each farm site

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according to the guidance in the *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document* (RCRA TEGD) (1986) and the National Water Well Association's *Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells* (1989). Additional guidance in the construction of ground water monitoring wells is available in *RCRA Ground-Water Monitoring: Draft Technical Guidance* and *ASTM Standard D 5092-90 (1995) Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers*. Consideration will be given to the possible impact the drilling method (i.e. mud rotary) may have on the quality of ground water samples. Steps will be taken to minimize negative impacts to the ground water quality (e.g. avoid drilling mud with nitrogen-species additives, thoroughly develop well).

Copies of the well driller's field reports for each monitoring well constructed during a quarter will be submitted to the Division with the next semi-annual monitoring report. The elevation and location of each monitoring well will also be submitted to the Division. The locations will be submitted in three formats: metes and bounds, latitude and longitude relative to NAD83, and latitude and longitude relative to NAD27. Upon request, reference maps for each farm site will be made available to the Division that show the locations of ground water monitoring wells, lagoons, barn facilities, and underground waste transfer piping.

2.2 Background Ground Water Quality Monitoring

Accelerated background monitoring is performed during the first year after a monitoring well is installed and commences before manure is introduced into the lagoon system.

2.2.1 Data Quality Objectives

The objective of background ground water monitoring is to characterize the constituent concentrations and to identify the degree of temporal (seasonal) and spatial variability in the constituent concentrations in the ground water of the uppermost aquifer underlying each farm facility. Laboratory analysis of the water samples must be performed by an analytical laboratory certified by the State of Utah under UAC R444-14 Rule for the Certification of Environmental Laboratories. The analytical methods will have method detection limits (MDLs) no greater than the protection levels as they are presented in the Administrative Rules for Ground Water Quality Protection, R317-6, of the Utah Administrative Code. These protection levels are based on the expected class of ground water based on the TDS content. Once the background ground water quality data have been collected, permit limits will be established for those constituents, which may be indicative of a leak from the farm site facilities. Temporal variability will be incorporated in the establishment of the permit limits by adding twice the standard deviation to the mean background concentration of each constituent. If the background and semi-annual data exhibit a distinctive seasonal signature as identified employing the

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methods of the USEPA or other approved methods, permit limits will be adjusted on a case-by-case basis.

2.2.2 Sampling Design, Schedule, and Analytes of Concern

The background ground water sampling protocol will ensure that valid, representative ground water samples will be collected and preserved, if necessary, in the field and delivered to the analytical laboratory in an unaltered state such that the background concentrations of major anions and cations and any other constituent indicative of leakage from the farm site facility may be accurately characterized. Properly purging the well, properly sampling the well, and properly preserving the ground water sample according to the parameters to be analyzed will achieve this requirement. Purging the stagnant ground water from the well will follow the purging protocol presented in Section 2.3.4 – Purging and Measurement of Field Parameters of this SAP. Sampling will be conducted in such a way as to minimize turbulence and aeration during the sampling process that could alter the chemical composition of the sample and will follow the monitoring well sampling protocol presented in Section 2.4.5 – Monitoring Well Sampling. Ground water samples will not be field-filtered. Ground water samples will be preserved and/or refrigerated according to the protocols that accompany the associated analytical methods for each parameter unless otherwise explicitly stated in this SAP. At least eight background-sampling events performed at 6-week intervals occur in the first year after installation for upgradient wells. In the same time period, at least one background sampling event occurs for the downgradient well. The analyses from the upgradient wells will be used to establish background concentrations and permit limits. The sample locations, frequency, and the field and laboratory analytes of concern are listed in Appendix A. The analytical methods for the laboratory analytes of concern are listed in Appendix C.

If both upgradient and downgradient wells at a farm site are to be sampled on the same day, the upgradient well should be sampled before downgradient well. Decontamination of the reusable field sampling equipment will be conducted after the collection of a ground water sample at each well according to Section 2.4.7 - Decontamination of Field Equipment of this SAP.

2.3 Semi-Annual

2.3.1 Data Quality Objectives

The objective of semi-annual ground water monitoring is the detection of those constituents most likely to be indicative of a leak from the farm site facilities and to demonstrate compliance with each Ground Water Discharge Permit and the Utah Water Quality Act. As with the background sampling, laboratory analysis of the water samples must be performed by

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an analytical laboratory certified by the State of Utah under UAC R444-14 Rule for the Certification of Environmental Laboratories. The analytical methods will have method detection limits (MDLs) no greater than the permit limits as established from the background ground water quality monitoring and presented in each Ground Water Discharge Permit. The results of the semi-annual sampling will be reported as indicated in the Ground Water Discharge Permit. The results of the semi-annual ground water monitoring will be compared to the permit limits established from the background ground water quality monitoring. Actions required as the result of the identification of any exceedances of permit limits are detailed in each Ground Water Discharge Permit.

2.3.2 Sampling Design, Schedule, and Analytes of Concern

The semi-annual ground water sampling protocol will ensure that valid, representative ground water samples will be collected and preserved, if necessary, in the field and delivered to the analytical laboratory in an unaltered state such that the concentrations of the semi-annual ground water monitoring parameters may be accurately characterized. This requirement will be achieved by purging the stagnant ground water from the well following the purging protocol presented in Section 2.4.3 - Purging and Measurement of Field Parameters in this SAP; sampling in such a way as to minimize turbulence and aeration during the sampling process which could alter the chemical composition of the sample following the monitoring well protocol presented in Section 2.4.4 - Monitoring Well Sampling; and immediate preservation and/or refrigeration of the samples according to the protocols that accompany the associated analytical methods. Grab samples will be collected with the aid of a sampling pump or an approved alternative sampling device from the upgradient and downgradient ground water monitoring wells at each farm site. Ground water samples will not be field-filtered. Semi-Annual ground water sampling events will occur within two six-month periods beginning with January 1 of each year. The sample locations, frequency, and the field and laboratory analytes of concern are listed in Appendix A. The analytical methods for the laboratory analytes of concern are listed in Appendix C.

If both upgradient and downgradient wells at a farm site are to be sampled on the same day, the upgradient well will be sampled before downgradient well. Decontamination of the reusable field-sampling pump will be conducted according to Section 2.4.7 - Decontamination of Field Equipment of this SAP.

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2.4 Field Sampling Methods and Procedures

2.4.1 Data Quality Objectives

The objective of maintaining a series of clearly defined field sampling methods and procedures is to ensure consistency in the sample collection and transference process and to ensure that all conditions required for the collection and transference of representative samples are met. Data quality objectives specific to each field sampling procedure are discussed in the corresponding section below.

2.4.2 Field Instruments

2.4.2.1 Data Quality Objectives

The objectives of maintaining procedures relating to field instruments are to ensure that the field instruments are maintained in properly functioning condition and that data collected with the field instruments is comparable from one sampling event to another.

2.4.2.2 Identification of Field Equipment

Field Equipment changes from time to time. Equipment will be maintained and calibrated according to the manufacturer's recommendations.

2.4.2.3 Calibration Procedures & Frequency

The field instruments will be calibrated according to the procedures and frequencies recommended by the manufacturer. Field measurements shall be made only with instruments calibrated prior to sampling.

2.4.2.4 Maintenance & Function Checks

Field instruments will be maintained in optimum operating condition according to the maintenance recommendations of the manufacturer. The Utah Division of Water Quality will not require the submittal of records of routine maintenance procedures. For each instrument, a permanent logbook for recording calibrations and repairs shall be maintained. Reviewing the logbook prior to leaving for the field site will help to troubleshoot potentially time consuming problems.

2.4.2.5 Record-Keeping Procedures (e.g. Calibration Logs)

Calibration logs will be maintained for each field parameter - pH, electric conductivity, temperature, etc. Calibration logs will be made available to representatives of DWQ at their request.

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2.4.2.6 Field Data Log Book and/or Sheets

Field data logbooks will be made available to representatives of the Division of Water Quality at their request. Copies of blank field data sheets are included with Standard Operating Procedure B3 – Collecting Ground Water Samples from Ground Water Monitoring Wells in Appendix B.

2.4.3 Water Level Measurements

The objectives of collecting ground water elevation measurements is to ensure the proper placement of the monitoring wells and to detect any ground water mounding that may be occurring in the vicinity of the waste storage facilities indicating leakage from those facilities.

Water level measurements will be made in all monitoring wells prior to purging. Water level measurements will follow Standard Operating Procedure B2 - Determination of Static Ground Water Level in Monitoring Wells in Appendix B.

2.4.4 Purging and Measurement of Field Parameters The objective of purging is either to remove all stagnant water from the monitoring well or to ensure stagnant water will not enter the sampling device during sample collection. Removal of stagnant water will be ensured by either purging three well casing volumes or monitoring of the purge indicator parameters pH, temperature, and specific conductance. Of these three parameters, specific conductance is the best indicator that stagnant water has been replaced by formation ground water. Stabilization of specific conductance to within 10% over three or more consecutive readings spaced at approximately 2 minutes or 0.5 well volumes or more apart will indicate the end of purging. Monitoring wells that purge dry and that require approximately an hour or more to return to their pre-purging water level may require the implementation of low-flow purging and sampling techniques which are not discussed in this SAP.

Following the measurement of the static ground water level and prior to the sampling of the ground water monitoring wells, they will be purged according to the Standard Operating Procedure in Appendix B for Purging Ground Water Monitoring Wells. The measurement of ground water temperature, pH, and specific conductance in the field will follow the Standard Operating Procedure in Appendix B for Field Measurement of Groundwater Temperature, pH, and Specific Conductance.

2.4.5 Monitoring Well Sampling

The objective of proper ground water monitoring well sampling is to collect a representative sample, which has not been altered by the sampling process. This objective will be met by minimizing turbulence and aeration

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of the sample stream which may require reduction of the pump flow rate below that of the purge rate; filling the sample bottles by placing the discharge tube from the pump as close to the side of sample bottle without touching it such that the sample stream flows down the side of the bottle; and properly preserving the samples. Samples that will be analyzed for nitrogen species will be collected in sample bottles that contain the appropriate preservatives or will be immediately preserved upon arrival at the analytical laboratory. All sample bottles will be immediately refrigerated such that they arrive at the analytical laboratory at or below the temperature of the groundwater when they were collected.

Ground water samples will be collected from the ground water monitoring wells according to Standard Operating Procedure B3 - Collecting Ground Water Samples from Ground Water Monitoring Wells in Appendix B.

2.4.6 Field Quality Control Samples

A field duplicate will be collected and analyzed for every 10 wells sampled or for each day wells are sampled if fewer than 10 wells are sampled per day. Ground water field duplicate samples shall be collected in succession, immediately one after another. If any doubt exists regarding the representative nature of the samples collected in this manner, samples shall be collected in a gallon container and then transferred to sample containers.

2.4.7 Decontamination of Field Equipment

The objective for decontaminating reusable field sampling equipment is to prevent cross contamination between ground water samples. The field sampling protocol in combination with the field sampling equipment decontamination protocol are designed to minimized cross contamination while minimizing the amount of effort required to achieve this objective.

After collection of the ground water sample, reusable field sampling equipment will be decontaminated by washing and flushing with clean tap water. If the next well to be sampled has had historically lower concentrations than the well just sampled, flushing of the sampling pump and hosing will be complete when the specific conductance of the flush water is within 10% of that of the clean tap water. At the end of a sampling day, the sampling pump and hosing will be decontaminated with tap water and flushing will be complete when the specific conductance of the flush water is within 10% of that of the clean tap water. The specific conductance of the end-of-the-day decontamination flush water will be recorded on the field data sheet for the last well sampled that day.

PRELIMINARY DRAFT

The field sampling equipment will be decontaminated according to Standard Operating Procedure B4 - Decontaminating Field Equipment in Appendix B.

3.0 GROUND WATER – CONTAMINATION INVESTIGATION

Requirements for sampling and analysis of the ground water under a source and contamination investigation will be addressed on an individual basis.

4.0 GROUND WATER - SUPPLY WELLS

The water supply wells for the Skyline and Blue Mountain Farm Complexes are completed in the deep aquifer. The location of these wells are tabulated in Appendix D and indicated on the accompanying maps.

4.1 Data Quality Objectives

The objective of sampling the water supply wells is to establish background concentrations in the deep aquifer of those constituents most likely originating from the farm sites and which may escape detection in the shallower ground water monitoring wells if a strong vertical gradient exists.

4.2 Sampling Design, Schedule, and Analytes of Concern

The water supply sampling protocol will ensure that valid, representative ground water samples will be collected and preserved, if necessary, in the field and delivered to the analytical laboratory in an unaltered state such that the concentrations of the monitoring parameters may be accurately characterized. Samples will be taken as close to the wellhead as possible, bypassing as much of the surface piping as possible. Sampling of the water supply systems will be performed on an annual basis. Ground water supply well samples will not be field-filtered. The sample locations, frequency, and the field and laboratory analytes of concern are listed in Appendix A. The analytical methods for the laboratory analytes of concern are listed in Appendix C.

4.3 Field Sampling Methods and Procedures

4.3.1 Field Instruments

4.3.1.1 Identification of Field Equipment

Field Equipment changes from time to time. Equipment will be maintained and calibrated according to the manufacturer's recommendations.

No equipment used for sampling the water supply wells requires operating instructions, calibration or maintenance.

PRELIMINARY

4.3.2 Well Sampling

The sampling of the water supply wells will follow the Standard Operating Procedure B5 - Collecting Ground Water Sample from Water Supply Wells in Appendix B.

4.3.3 Field Quality Control Samples

A field duplicate will be collected and analyzed for each 10 wells sampled or for each day wells are sampled if fewer than 10 wells are sampled per day. Ground water field duplicate samples shall be collected sequentially and immediately one after another. If any doubt exists regarding the representative nature of the samples collected in this manner, samples shall be collected in a gallon container and then transferred to sample containers.

5.0 LAGOON WASTEWATER

5.1 Data Quality Objectives

There are multiple objectives for monitoring the lagoon wastewater. Lagoon wastewater monitoring of the primary lagoons will be conducted for source characterization and to monitor the evolution of the constituent concentrations in the lagoons from the three different types of farms for its relevance to land application and other waste disposal options. Constituents will be chosen based on their probability of being detected in a monitoring well in a transformed or untransformed state (various nitrogen species), their probability of serving as a good indicator of leakage from the facility, and on their relevance in choosing an appropriate method for routine disposal and for final farm closure. Lagoon performance monitoring will be conducted in accordance with the Anaerobic Lagoon Systems Operation and Maintenance Manual to ensure that the lagoons are operating within an appropriate range allowing for optimal digestion of the organic material by anaerobic processes. Constituents and parameters will be chosen for monitoring based on their potential detrimental impact on the proper operation and maintenance of the lagoons and the anaerobic processes for which they are designed. Finally, the lagoon wastewater will be analyzed according to the Nutrient Management Plan (NMP) for Land Application prior to land application of the wastewater to ensure land application is conducted at the agronomic uptake rate of the crop. As required by the NMP, constituents and parameters will be chosen for monitoring which are required to determine application rate based on agronomic uptake and which have a potential for causing soil and/or plant toxicity.

5.2 Sampling Design, Schedule, and Analytes of Concern

The lagoon wastewater sampling protocol will ensure that valid, representative lagoon wastewater samples will be collected and preserved, if necessary, in the field and delivered to the analytical laboratory in an unaltered state such that the concentrations of the monitoring parameters may be accurately characterized.

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The sample locations, frequency, and the field and laboratory analytes of concern are listed in Appendix A. The analytical methods for the laboratory analytes of concern are listed in Appendix C. These samples will not be field-filtered.

Standard operating procedures for lagoon performance are contained in Appendix B of this document.

Lagoon wastewater samples associated with land application activities will be collected and analyzed in accordance with the Nutrient Management Plan (NMP) for Land Application. The NMP contains protocols for sampling design, sample collection, and the analytical parameters. The analytical parameters and methods in the most recently approved version of the NMP are tabulated in Appendices A and C. Any revisions to these parameters or methods will be made in the NMP and a change-out page for the affected Appendix of this SAP will be issued reflecting those changes. Lagoon wastewater samples associated with land application activities will not be field-filtered.

5.3. Field Sampling Methods and Procedures

5.3.1 Field Instruments

5.3.1.1 Identification of Field Equipment

Field Equipment changes from time to time. Equipment will be maintained and calibrated according to the manufacturer's recommendations.

No equipment used for sampling the lagoon wastewater requires operating instructions, calibration or maintenance.

5.3.2 Lagoon Waste Water Sampling

Sampling of the lagoon wastewater will follow Standard Operating Procedure B6 – Sampling Lagoon Wastewater for Source Characterization in Appendix B.

Sampling of the lagoon wastewater for lagoon performance assessment will follow the Standard Operating Procedure in the Anaerobic Lagoon Systems Operation and Maintenance Manual currently being developed. Once that SOP is developed, it will be included in this SAP as an addition to Appendix B.

Lagoon wastewater samples associated with land application activities will be collected in accordance with the most recently approved version of the Nutrient Management Plan (NMP) for Land Application. The approved sampling protocol incorporates Utah State University's "Guidelines for Manure Sampling", which are included as an Attachment of the NMP.

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Standard Operating Procedure B13 - Sampling Lagoon Wastewater for Land Application is included in Appendix B.

5.3.3 Field Quality Control Samples

A field duplicate will be collected and analyzed for every 10 samples collected per quarter. At least one duplicate will be collected and analyzed per quarter if fewer than 10 lagoons are sampled per quarter. Field duplicates will be collected from the same compositing vessel (SOP B6, Appendix B).

6.0 LAGOON SLUDGE

6.1 Profiling

6.1.1 Data Quality Objectives

The objective for performing lagoon sludge profiling is to monitor the rate at which sludge is building up on the bottom of the primary lagoons. This provides information useful in determining the projected life of the lagoon and in assessing the performance of the anaerobic process in decomposing the organic material.

6.1.2 Sampling Design and Schedule

Sludge accumulation monitoring will begin for each farm within three years after the startup of any new farm lagoon system. Accumulation monitoring will be performed at least once every three years unless the farm has been depopulated and the lagoon volume is less than 75% of its design volume. .

All lagoons will be sampled at a minimum of 9 points. Sample points should be a maximum of 100 feet apart. The goal is to measure the sludge that is accumulated on the bottom, not the side slopes of the lagoon. Measurements should be taken within 25 feet of the projected toe of the lagoon slope completely around the lagoon. Lagoon depth will be measured at one point unless there is reason to believe that the bottom of the lagoon was not constructed level.

The depth to sludge measurement shall be subtracted from the overall water depth measurement to determine sludge depths in these locations. The nominal sludge accumulation depth shall be calculated and reported as the average of the calculated depths from all of the locations.

Sludge thickness is expected to vary somewhat systematically across the bottom of the lagoon. Thickest accumulations are expected to develop on the flat area of the lagoon’s bottom and directly below the discharge pipe.

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Thinnest accumulations are expected on the sloped surfaces of the lagoon's bottom due to slumping of the sludge.

6.1.3 Field Sampling Methods and Procedures

6.1.3.1 Field Instruments

6.1.3.1.1 Identification of Field Equipment

A list of the equipment used to conduct primary lagoon sludge profiling is included in the Standard Operating Procedure B7 - Conducting Primary Lagoon Sludge Profiling in Appendix B.

6.1.3.1.2 Calibration Procedures & Frequency

Field measurements shall be made only with instruments calibrated prior to sampling.

The sludge plate does not require calibration, but the rope used to determine sludge depth will be measured for accuracy at least annually.

6.1.3.1.3Maintenance & Function Checks

Field instruments will be maintained in optimum operating condition according to the maintenance recommendations of the manufacturer. The Utah Division of Water Quality will not require the submittal of records of routine maintenance procedures. For each instrument, a permanent logbook for recording calibrations and repairs shall be maintained. Reviewing the logbook prior to leaving for the field site will help to troubleshoot potentially time consuming problems.

6.1.3.2 Lagoon Sludge Profiling

The lagoon sludge profiling will follow Standard Operating Procedure B7 - Conducting Primary Lagoon Sludge Profiling in Appendix B.

6.2 Analysis

6.2.1 Data Quality Objectives

The objective of the sludge analysis is to track the accumulation of nutrients and metals in the sludge blanket. The concentration of these constituents may have an impact on the choice of ultimate disposal methods of the sludge.

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6.2.2 Sampling Design, Schedule, and Analytes of Concern

Sludge sampling shall be conducted annually according to the most recently approved version of the Mango II Sludge Disposal and Farm Closure Plan.

Generally, multiple samples will be collected, composited, split, and placed in two separate sample containers as representative samples to be tested. The sample locations, frequency, and the field and laboratory analytes of concern are listed in Appendix A. The analytical methods for the laboratory analytes of concern are listed in Appendix C.

6.2.3 Field Sampling Methods and Procedures

6.2.3.1 Field Instruments

6.2.3.1.1 Identification of Field Equipment

A list of the equipment used to sample primary lagoon sludge for chemical analysis is included in the Standard Operating Procedure B8 - Collecting Primary Lagoon Sludge Samples in Appendix B.

No equipment is used for sampling the lagoon sludge that requires operating instructions, calibration or maintenance.

6.2.3.2 Lagoon Sludge Sampling

The lagoon sludge sampling will follow Standard Operating Procedure B8 – Collecting Primary Lagoon Sludge Samples in Appendix B**.**

6.2.3.3 Field Quality Control Samples

A field duplicate will be collected and analyzed for every 10 samples collected per day. At least one duplicate will be collected and analyzed per day if fewer than 10 lagoons are sampled per day. Field duplicates will be collected from the same compositing vessel (SOP B8, Appendix B).

7.0 SOIL - SPILL

7.1 Data Quality Objectives

The objective of sampling the soil associated with a spill is to assess the vertical extent of the impact and provide information pertinent in deciding the most appropriate course of action for cleaning up the spill. Constituents and parameters for monitoring will be chosen based on their potential to adversely impact ground water.

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7.2 Sampling Design, Schedule, and Analytes of Concern

Sampling design for soil sampling from spill-impacted areas is described in detail in the most recently approved version of the Mango II Spill Prevention & Response Manual.

Generally, after the liquid waste has been removed from the area of the spill, soil samples will be collected from the area of greatest impact. Soil samples will be collected from the surface and down to one foot beyond the saturation depth at maximum intervals of one-foot. If the saturation depth is not apparent, samples will be collected in one-foot intervals down to three feet.

7.3 Field Sampling Methods and Procedures

7.3.1 Field Instruments

7.3.1.1 Identification of Field Equipment

A list of the equipment used to sample primary lagoon sludge for chemical analysis is included in the Standard Operating Procedure B9 – Collecting Soil Samples from Spill-Impacted Area in Appendix B.

No equipment is used for soil sampling that requires operating instructions, calibration or maintenance.

7.3.2 Soil Sampling

Soil sampling associated with spill incidences will follow Standard Operating Procedure B9 – Collecting Soil Samples from Spill-Impacted Area in Appendix B. Care will be taken to avoid contamination of deeper soil samples by sloughing of the soil sample borehole.

8.0 SOIL - LAND APPLICATION

8.1 Data Quality Objectives

The objective of sampling the soil prior to land application of the lagoon wastewater is to determine the nutrient content of the soil horizons that will receive the wastewater and to determine the hydraulic properties of the soil. This information is necessary in determining the appropriate application rate to ensure agronomic uptake of the applied nutrients and to prevent infiltration below the root zone of the crop.

8.2 Sampling Design, Schedule, and Analytes of Concern

The soil sampling protocol for the land application site will ensure that valid, representative soil samples will be collected and preserved, if necessary, in the field and delivered to the analytical laboratory in an unaltered state such that the concentrations of the soil nutrients and the hydraulic character of the soils may be accurately characterized. The sampling design, schedule, and analytes of concern are discussed in the most recently approved version of the Nutrient Management Plan for Land Application. The sample locations, frequency, and

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the field and laboratory analytes of concern are listed in Appendix A. The analytical methods for the laboratory analytes of concern are listed in Appendix C.

8.3 Field Sampling Methods and Procedures

8.3.1 Field Instruments

8.3.1.1 Identification of Field Equipment

A list of the equipment used to sample soil in the land application field for chemical analysis is included in the Standard Operating Procedure B10 – Collecting Soil Samples from Land Application Field in Appendix B.

No equipment is used for soil sampling that requires operating instructions, calibration or maintenance.

8.3.1.2 Field Data Log Book and/or Sheets

Field data logbooks will be made available to representatives of the Division of Water Quality at their request. Field data sheets methodology for recording soil moisture are included in the Nutrient Management Plan for Land Application.

8.3.2 Soil Sampling

Soil sampling associated with land application activities will follow the Standard Operating Procedure in Appendix B for Collecting Soil Samples from Land Application Field. This Standard Operating Procedure incorporates the guidance in Chapter 2 of the Utah Fertilizer Guide, which addresses soil sampling.

9.0 SAMPLE HANDLING AND CHAIN OF CUSTODY

The handling of samples and the chain of custody procedures for all samples from all media will follow the Standard Operating Procedure in Appendix B for Packaging Samples and Shipping to Analytical Laboratory. Sample handling and chain-of-custody procedures will be followed to ensure that the possession of each sample is traceable and documentable from the time it is collected until the time it is analyzed. This guarantees the integrity of the sample eliminating any possibility of sample mix-up, tampering, or extraneous contamination.

10.0 LABORATORY ANALYTICAL METHODS & PROCEDURES

The laboratory analytical methods and procedures for each of the media covered by this SAP are tabulated in Appendix C. All analytical data must be known, documented, and comparable. If new methods are proposed, they will be functionally equivalent to the methods being replaced such that data derived from them can be compared.

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11.0 LABORATORY QUALITY CONTROL SAMPLES

Laboratory quality control sample analyses should be included with the reported data so that the precision and accuracy of the laboratory procedures can be assessed. The Environmental Resources Manager will coordinate communications with each laboratory regarding laboratory QA/QC documentation and reporting.

12.0 DATA MANAGEMENT

Management and validation of the data collected as a result of the implementation of this SAP will be the responsibility of Mango II. Collection and handling of the samples according to the Standard Operating Procedures of this SAP will be the responsibility of the Environmental Technician under the supervision of the Assistant Environmental Manager. Validation of the data collected as a result of the implementation of this SAP will be the responsibility of Mango II. The data validation process shall include data assessment in terms of the following categories to ensure data collection, handling, and analysis were performed according to this SAP: Sampling Design, Sample Collection Procedures, Sampling Handling, Analytical Procedures, Quality Control (field and laboratory), Calibration (field and laboratory), and Data Reduction and Processing. The Assistant Environmental Manager shall be responsible for receiving the analytical data and checking the values against the permit limits. Proper notification, reporting, and action regarding probable non-compliance and non-compliance events will follow the requirements of the associated Ground Water Discharge Permit.

13.0 RECORDS AND REPORTS

All records of monitoring and analysis pertaining to this Sampling and Analysis Plan including field data sheets, calibration records, calculation sheets, laboratory analysis data sheets, and any other documentation relating to the implementation of this SAP will remain in the files of Mango II and made available for review by the Utah Division of Water Quality upon request. Reporting of the information collected as a result of the implementation of this SAP is outlined in the Ground Water Discharge Permits held by Mango II.

14.0 HEALTH AND SAFETY

Mango II is committed to the health and safety of all of its employees. The health and safety of those employees and any other individual involved in any activity associated with the implementation of this SAP will remain a top priority.

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15.0 REFERENCES

EPA Guidance for the Data Quality Objectives Process, EPA QA/G-4, EPA/600/R-96/055, September 1994.

EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, Interim Final, November 1999.

EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, EPA/600/R-98/018, February 1998.

EPA Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, November 2001.

USGS Techniques of Water-Resources Investigations, Book 9, National Field Manual for the Collection of Water-Quality Data

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APPENDIX A

SUMMARY OF SAMPLE LOCATIONS, SCHEDULE AND ANALYTES OF CONCERN

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Appendix A SAMPLING LOCATIONS, SCHEDULE, AND ANALYTES OF CONCERN									
Media	**Sample Locations and Type**	**Sampling Schedule**							
		Background		**Semi Annual**		**Annual**		**Other**	
		Analytes		**Analytes**		**Analytes**		**Analytes**	
Groundwater Monitoring Wells	**Upgradient Wells**	**X**	Field Parameters - pH, Spec. Cond., Temp., GW Elev. Laboratory Parameters - Na, K, Mg, Ca, CO3, HCO3, Total P, Total N+N as N, , SO4, Cl, TDS	**X**	Field Parameters - pH, Spec. Cond., Temp., GW Elev. Laboratory Parameters - HCO3, Total N+N as N, , Cl, TDS				
	Downgradient Wells	**X**	Field Parameters - pH, Spec. Cond., Temp., GW Elev. Laboratory Parameters - Na, K, Mg, Ca, CO3, HCO3, Total P, Total N+N as N, , SO4, Cl, TDS	**X**	Field Parameters - pH, Spec. Cond., Temp., GW Elev. Laboratory Parameters - HCO3, Total N+N as N, , Cl, TDS				
Groundwater Supply Wells	**All Water Supply Wells (See Appendix D)**					**X**	Total N+N as N, TDS		
Lagoon Wastewater	**Primary Lagoon**					**X**	Field Parameters - pH, Spec. Cond., Temp. Laboratory Parameters - Na, K, Mg, Ca, CO3, HCO3, Total P, Total N+N as N, NH3 as N, TKN, SO4, Cl, TDS, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag, and Zn		
	All Primary Lagoons for Lagoon Performance	To be included once the Anaerobic Lagoon Operation and Maintenance Manual has been developed and approved.							

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Appendix A SAMPLING LOCATIONS, SCHEDULE, AND ANALYTES OF CONCERN									
Media	**Sample Locations and Type**	**Sampling Schedule**							
		Background		**Semi Annual**		**Annual**		**Other**	
		Analytes		**Analytes**		**Analytes**		**Analytes**	
Lagoon Wastewater	**Lagoon for land application; 1 composite sample for secondary lagoon, 1 composite sample for each 5-6' of primary lagoon applied**							**X**	Not more than one month before land application, each representative sample will be analyzed for: Nitrate as N, TKN, NH3 as N, Total P, K, TDS, pH, Total Solids, Mg, Ca, Na, HCO3, SO4, Cl, and ECe
Lagoon Sludge Profiling	**All Primary Lagoons, Average of five locations configured like a five on a playing die**							**X**	Thickness of sludge layer. Once every three years
Lagoon Sludge Analysis	**Primary Lagoon composite sample from 4 subsamples**					**X**	Total Solids, Total P, Total N+N, NH3 as N, TKN, Na, Mg, Ca, K, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag, and Zn		

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Appendix A SAMPLING LOCATIONS, SCHEDULE, AND ANALYTES OF CONCERN									
Media	**Sample Locations and Type**	**Sampling Schedule**							
		Background		**Semi Annual**		**Annual**		**Other**	
		Analytes		**Analytes**		**Analytes**		**Analytes**	
Soil	**Spill-impacted Soil; From area of greatest impact at one foot intervals to one foot below saturation; if saturation depth not apparent, one foot intervals to depth of three feet**							**X**	Available P, Available K, and Nitrate as N
	Land Application Field; 3 composite samples of 10 subsamples (per 25 acres) divided as follows: 0 – 12", 13 – 24", 25 – 36"							**X**	No more than one month before land application, the 3 subsamples will be analyzed as follows: 0 – 12": Nitrate as N, TKN, Available P, Available K, pH, SAR, ECe 13 – 24" and 25 – 36": Nitrate as N, TKN, SAR, ECe At least once every 3 years, 0 – 12" will be analyzed for B, Zn, Cu, Fe, and Mn
Solid Manure, Manure-contaminated Soil, and other Biosolids								**X**	No more than one month before land application. each representative sample will be analyzed for : % moisture, Nitrate as N, TKN, NH3 as N, Total P, K, pH, Mg, Ca, Na, SO4, Cl, ECe

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APPENDIX B

STANDARD OPERATING PROCEDURES (SOPs)

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Standard Operation Procedure
B1. Determination of Static Ground Water Level in Monitoring Wells

Equipment: Equipment for water-level measurement will be a water level indicator.

Field data sheets
Water level indicator
Spare Batteries for water level indicator
Wash Water

Procedure:

1) Take one depth-to-water (DTW) measurement to the nearest 0.01 ft

2) Record depth-to-water measurement on field data sheet

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Standard Operation Procedure
B2. Purging Ground Water Monitoring Wells

(Adapted from US Geological Survey TWRI Book 9 National Field manual for the Collection of Water-Quality Data, Chapter A6. Field Measurements)

Equipment: The following is a list of the equipment used during the sampling process:

Pump and Associated Equipment
Sampling Hose
Hose Reel
Wash water in appropriate container
5-Gallon Discharge Bucket
Toolbox
Water Level Indicator
Spare batteries for water level indicator
Flow -Through Cell constructed by Mango II
Meter to measure Temperature, Conductivity, and pH
Spare Batteries for meter or adapter for car jack
Disposable gloves
Logbooks and field data sheets
Appropriate Health & Safety gear

Procedure: To purge the well

1) Determine the volume of water to be purged; a minimum of three well casing volumes.

2) Measure and record the depth to static water level (Appendix B1).

3) Calculate and record the well volume based on the depth to be screened or open interval and the inside casing diameter.

4) Clean Equipment (Appendix B4)

5) Assemble the pumping system and lower a submersible pump. Be sure to lower the equipment slowly and smoothly to avoid stirring up particulates.

6) Start the pump. Gradually adjust the pumping rate to limit drawdown.

7) Do not move the pump during purging or sample collection after the intake has been set at the final location.

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8) Purge a minimum of 3 well casing volumes plus the amount of foreign water introduced into the well, or the purge volume required by this plan. Throughout purging, monitor and record field-measurement readings.

9) Record field measurements at regular time intervals. Time intervals will depend on the aquifer properties but must be sufficiently spaced to yield representative measurements. Consult criteria for field-measurement stabilization (SOP B11). If criteria are met, report the median value.

10) Record the last observed field measurement readings and the final well volume purged. Note any anomalies, difficulties, and adjustments on the field data sheets. Record the purge volume, time and respective readings of sequential field measurements.

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Standard Operating Procedure
B3. Collecting Ground Water Sample from Ground Water Monitoring Wells

(Adapted from US Geological Survey TWRI Book 9 National Field manual for the Collection of Water-Quality Data, Chapter A4. Collection of Water Samples)

Equipment: The following is a list of the equipment used during the sampling process:

Pump and Associated Equipment
Sampling Hose
Hose Reel
Wash water in appropriate container
5-Gallon Discharge Bucket
Toolbox
Water Level Indicator
Spare batteries for water level indicator
Flow -Through Cell constructed by Mango II
Meter to measure Temperature, Conductivity, and pH
Spare Batteries for meter or adapter for car jack
Disposable gloves
Logbooks and field data sheets
Cooler
Sufficient ice such that samples arrive at lab “on ice”
Sample containers and sample labels
Shipping containers and packing materials
Appropriate Health & Safety gear

Procedure: **Pumped Samples:**

1) Prepare for sampling at monitoring well site. Ensure the sample tubing is properly secured.

2) Measure Depth-to-Water (DTW) (Appendix B1.)

3) Purge the well and monitor the field measurements (Appendix B2.)

4) After the field measurements have stabilized (Appendix B11), collect ground water sample (i.e. pull samples) as follows:

   a) Direct the sample flow through the sample tubing. Avoid aeration (i.e. splashing) of sample while filling sample bottles.

   b) Avoid any contact with water flowing into sample container.

   c) If required, collect duplicate samples by either collecting sample in a gallon container and then pouring into sample containers or in

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succession, one immediately after the other.

5) Properly cap and label sample.

6) Immediately, store sample on sufficient ice to ensure samples will arrive at the analytical lab at or below the temperature at which they were collected.

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Standard Operating Procedure
B4. Decontamination of Field Equipment

(Adapted from US Geological Survey TWRI Book 9 National Field manual for the Collection of Water-Quality Data, Chapter A4. Collection of Water Samples)

Equipment: The following is a list of the equipment used during decontamination:

Wash water
Disposable gloves

Procedure:

1) Rinse sampling equipment before the equipment dries by running wash water through equipment.

2) Clean equipment to be used at another well during the same field trip after the wash water rinse and before moving to the next site.

3) Clean all instruments according to the manufacturer's recommendations.

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Standard Operating Procedure
B5. Collecting Ground Water Sample from Water Supply Wells

(Adapted from US Geological Survey TWRI Book 9 National Field manual for the Collection of Water-Quality Data, Chapter A4. Collection of Water Samples)

Equipment: The following is a list of the equipment used during the sampling process:

Cooler
Sufficient ice such that samples arrive at lab “on ice”
Disposable gloves
Sample container
Preservatives
Logbooks and sample labels
Appropriate Health & Safety gear
Shipping containers and packing materials

Procedure

1) Turn on pump if not running.

2) Open sampling valve.

3) Run water for five minutes to assure the sample is uncontaminated by the piping.

4) Monitor field measurements if any.

5) The pump should produce a smooth, solid stream of water without air or gas bubbles and without pump cavitation during field measurements and sample withdrawal.

6) Flow should be constant and uninterrupted during purging and sampling. Regulate flow at the pump.

7) Take sample, avoiding contact with the water or the inside of the sample container.

8) Clean Equipment (Appendix B4).

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Standard Operating Procedure
B6. Sampling Lagoon Wastewater for Source Characterization

Equipment: The following is a list of the equipment used during the sampling process:

Wide-mouthed sample containers
Cooler
Sufficient ice such that samples arrive at the lab “on ice”
Sampling vessels
Compositing vessel
Disposable gloves
Sample labels
Indelible marker
Appropriate Health & Safety gear
Shipping containers and packing materials
Distilled water and water container
Wash water in appropriate container

Procedure: These procedures follow the Guidance for Sampling Manure prepared by Utah State University Extension and included in Mango II’ Nutrient Management Plan for Land Application.

1) Four to six subsamples shall be collected from around the lagoon taking care to exclude any floating debris from the subsample.

2) Pour each subsample into the compositing vessel and mix thoroughly.

3) Transfer into the clean, wide-mouthed sample container. Leave approximately 1" of air space in the container. Securely tighten container top.

4) If duplicate samples are required, ensure that the sample is adequately “split” between the bottles.

5) Immediately, store sample on sufficient ice to ensure samples will arrive at the analytical lab at or below the temperature at which they were collected. Do not freeze the samples.

6) Sample containers should be marked using an indelible marker to indicate sample date and sample ID.

7) Clean the equipment before moving to another lagoon for sampling.

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Standard Operating Procedure
B7. Conducting Primary Lagoon Sludge Profiling

Equipment: The following is a list of the equipment used during the sampling process:

Lagoon dimension/information sheets
Marker flags or paint
Boat
12" diameter sludge plate
Appropriate Health & Safety gear
Field data sheets, logbooks
Minimum of 2 assistants
Measuring Rod

Procedure: To determine the accumulated sludge volume in primary lagoons:

1.) All lagoons will be sampled at a minimum of 9 points. These points should consist of rows of samples points evenly spaced across the lagoon surface.

2.) Sample points should be a maximum of 100 feet apart.

3.) The approximate lagoon dimensions and location of the lagoon bottom should be estimated using the 'as-constructed' lagoon dimensions, depth and side slope. The estimated location of the lagoon floor should be marked on the top of the lagoon berm with two flags or painted marks located on each side of the lagoon. Sludge evaluation will only occur in the interior area of a lagoon over the lagoon's floor. From the edges of the bottom of the lagoon a grid should be established and marked so that sampling points are a maximum of 100 feet apart. Establish the grid based on sampling 9 points (or the appropriate number based on lagoon size and the 100' max distance between points) and mark the lagoon sidewalls above the waterline accordingly. Grid reference points can be staked, painted or established with GPS and should be clearly visible to operators working from a boat on the surface of the lagoon.

4.) The goal is to measure the sludge that is accumulated on the bottom, not the side slopes of the lagoon. Assume a 3/1 sidewall slope unless lagoon plans and "as built" information indicates that a different sidewall slope was used. Measurements should be taken within 25 feet of the projected toe of the lagoon slope completely around the lagoon.

5.) All sludge sampling will be with a 12" diameter sludge plate.
The sludge plate shall be 12" in diameter, made of 3/16" steel, and have (4) 1 5/8" diameter evenly spaced holes, that help reduce swaying as the plate is lowered into the lagoon A 3/16" rope shall be tied to the plate by passing

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through a center ¼" hole. The rope shall be graduated in feet so that the depth to the top of the sludge layer can be determined. The plate is lowered straight down into the lagoon and the depth determined by reading the graduated rope when the plate first rests on the sludge layer and a minimal amount of slack is felt on the rope.

6.) Lagoon depth will need to be measured at one point unless there is reason to believe that the bottom of the lagoon was not constructed level. This measurement will be taken in the center of the lagoon. Depth reading will be taken using a measuring rod.

7.) Sludge accumulation monitoring will begin for each farm within three years after the startup of any new farm lagoon system. Accumulation monitoring will be performed at least once every three years unless the farm has been depopulated and the lagoon volume is less than 75% of its design volume.

8.) The mean of the sludge depths should be used to determine the accumulated sludge volume. The sludge depth and 'as-constructed' dimensions of each lagoon should be used in determining the lagoon volume and the resulting sludge volume.

9.) The sludge accumulation rate will be determined using the sludge volume determined, age of lagoon and facility population.

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Standard Operating Procedure
B8. Collecting Primary Lagoon Sludge Samples

Equipment: The following is a list of the equipment used during the sampling process:

Lagoon dimension/information sheets
Marker flags
Boat
Appropriate Health & Safety gear
Logbooks and sample labels
Minimum of 2 assistants
Sampling containers
Sampling equipment
Compositing vessel
Disposable gloves
Shipping containers and packing materials

Procedure: To obtain a sludge sample from the primary lagoon:

1) The approximate lagoon dimensions and location of the lagoon bottom should be estimated using the 'as-constructed' lagoon dimensions, depth and side slope. The estimated location of the lagoon floor should be marked on the top of the lagoon berm with two flags located on each side of the lagoon. Sludge evaluation will only occur in the interior area of a lagoon over the lagoon's floor.

2) The boat should be positioned so that it is interior of the flags. The boat should be held in position.

3) The Sludge Judge sampler is assembled and lowered into the lagoon sludge layer. Once the Sludge Judge reaches the bottom, the mechanism is triggered to take a grab sample. The Sludge Judge is then pulled back to the surface and the sample is deposited in the compositing vessel.

4) Step 3 is repeated until 4 samples have been pulled and an adequate composite sample is acquired. After thorough mixing the subsamples in the compositing vessel, transfer a representative aliquot to the sample container.

5) The Sample should then be capped, properly labeled and then stored on ice until it reaches the lab to be processed.

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Standard Operating Procedure
B9. Collecting Soil Samples from Spill Impacted Area

Equipment: The following is a list of the equipment used during the sampling process:

Disposable gloves
Indelible marker
Soil auger
Appropriate Health & Safety gear
Sample container
Shipping containers and packing materials
Wash water in appropriate container
Disinfectant

Procedure:

1) Mango II is responsible for reporting significant spills to DWQ. A representative of DWQ will be invited to be present to witness the soil sampling. Soil samples will be taken within five days of the spill event.

2) Photograph spill for documentation.

3) After standing liquid waste has been removed from the area of the spill, collect soil samples from the area of greatest impact.

4) Collect soil samples from the surface down to one foot beyond the saturation depth at maximum intervals of one-foot. If the saturation depth is not apparent, samples will be collected in one-foot intervals down to three feet.

5) Care must be exercised to avoid contamination of the samples through sloughing of material down the borehole. The sampler should avoid collecting large non-homogeneous particles and objects.

6) A map outlining the spill area as well as locations of monitoring wells, and numbered soil sample locations, will be included in the package sent to the DWQ.

7) Samples will be placed in an appropriate sample container and labeled. Samples will be placed on ice for transport to the analytical lab.

8) Sampling equipment will be cleaned and disinfected.

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Standard Operating Procedure
B10. Collecting Soil Samples from Land Application Field

Equipment: The following is a list of the equipment used during the sampling process:

Coring tool, or shovel
Three Compositing vessels
Soil Moisture sheet
Sample containers and sample labels
Fields maps
Disposable gloves
Field data sheets
Indelible marker
Appropriate Health & Safety gear
Shipping containers and packing materials
Wash water in an appropriate container

Procedure: According to the Nutrient Management Plan (NMP) for Land Application, soil samples shall be collected no more than one month prior to application to a field of liquid or solid manure, biosolids resulting from an anaerobic digester or the Bion system, and manure-contaminated soil. These procedures for collecting soil samples from the land application field follow the guidance presented in Chapter 2 of the Utah Fertilizer Guide included in the NMP as Attachment 3.

1) For every 25 acres of a given application field, soil borings will be collected from 10 randomly selected locations within the field. Selection of the random locations within the field will follow the guidance presented in Chapter 2 of the Utah Fertilizer Guide.

2) Soil borings at each random location will extend from the surface to 36” below the surface. The borings will be subdivided into 3 subsamples according to depth as follows: surface to 12”, 13” to 24”, and 25” to 36”. The Surface to 12” subsample from each of the random sampling locations will be collected in the first compositing vessel, 13” to 24” subsample in the second compositing vessel, and the 25” to 36” subsample in the third.

3) After all the soil borings have been collected and subdivided into their respective compositing vessels, thoroughly mix the contents of each vessel and collect a representative sample from each vessel for submittal to the analytical lab.

4) The three final soil samples will be placed in plastic bags, labeled with the day, time, sampler, field identification and soil strata using an indelible marker, and stored in a cool, dry environment between collection and

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delivery to the lab.

5) Soil samples will be sent to Utah State University or other laboratory that is certified through the North American Proficiency Testing Program. Soil tests will be sent within 24 hours after collection.

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Standard Operating Procedure
B11. Field Measurement of Groundwater Temperature, pH, and Specific Conductance

(Adapted from US Geological Survey TWRI Book 9 National Field manual for the Collection of Water-Quality Data, Chapter A6. Field Measurements)

TEMPERATURE

Equipment: Meter
Read thoroughly the instruction manual provided by the manufacturer.

Procedure:

1) Begin water withdrawal from the well.

2) Shield the instrument and sensor from direct sunlight.

3) Toward the end of purging, record measurements, at evenly spaced increments.

4) If the thermometer temperature is stable within the 0.2°C report measurements.

5) If the stability criterion has not been met, extend the purge time. Record any instability on field data sheets.

6) Remove and clean the temperature sensors.

pH

Equipment: Meter
Read thoroughly the instruction manual provided by the manufacturer.

Procedure:

1) Calibrate the pH instrument system on site according to the instruction manual.

2) If necessary, bring buffer solutions to the temperature of the water to be measured (allow 15 minutes for temperature equilibration)

3) After calibration, rinse the pH electrode thoroughly with distilled water and blot it out to remove excess water. Do not wipe the electrode.

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4) Shield the instrument and sensor from direct sunlight.

5) Record pH values at regularly spaced time intervals throughout purging. Compare the variability of the pH values toward the end of purging with the stability criterion. The stability criterion is met when readings made at regularly spaced time intervals are within 0.1 standard pH units or less. Routine measurement must fall within the +/- 0.1 unit criterion.

6) If the criterion is not met, extend the purge period in accordance with this plan, and continue to record measurements at regularly spaced time intervals. Record any difficulty on the field forms.

7) Measure and report the pH.

SPECIFIC CONDUCTANCE

Equipment: Meter
Read thoroughly the instruction manual provided by the manufacturer.

Procedure:

1) Calibrate the conductivity instrument on site if necessary.

2) After calibration, rinse the conductivity and temperature sensors thoroughly with distilled water.

3) Shield the instrument and sensor from direct sunlight.

4) Measure conductivity at regular intervals throughout purging; record the conductivity values in the field data sheets.

5) Check the variability of the conductivity values toward the end of purging. The stability criterion is met when readings taken at regularly spaced intervals are within 3% to 5% of the full scale.

6) If the criterion is not met, extend the purge period and continue to record measurements at regularly spaced intervals. Record any difficulty on the field forms.

7) Record the conductivity.

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Standard Operating Procedure
B12. Packaging Samples and Shipping to Analytical Laboratory

Equipment: The following is a list of the equipment used during the packaging and shipping process:

Shipping containers
Packaging materials
Chain of Custody forms
Cooler

Procedure: Samples will be packed and shipped to the analytical laboratory in such a manner that they do not degrade in transit and they do not exceed their maximum holding time (i.e. expire.)

1) The sampler is responsible for properly packaging, labeling, and transferring possession of the samples.

2) Samples will be preserved for transit to the analytical laboratory as prescribed by the analytical method to be performed on the sample (Appendix C of this SAP). Generally, the minimal requirement is packing the samples in a sufficient volume of ice so that they arrive at the lab “on ice” or, otherwise, refrigerating the samples to inhibit their degradation in transit. Under no circumstances should water samples be frozen.

3) Samples should be packed properly to prevent breakage of the sample containers or leakage of into or out of the containers. The shipping container should be sealed or locked so that any evidence of tampering would be readily detected.

4) All sample shipments must be accompanied by a completed, signed and dated Chain-of-Custody form (COC). The sampler will complete the COC form. One copy will be retained. Another copy will be delivered to the lab with the samples. All receipts associated with the shipment will be retained. The lab will return a completed copy of the COC form along with the laboratory results.

5) Each person who handles the sample on its way to the laboratory must sign the COC form and include the time and date in which he/she had possession of it. This will ensure the integrity of the sample as it is shipped to the laboratory. In general, custody transfers are made for each sample, although samples may be transferred as a group. Each person who takes custody must fill in the appropriate section of the Chain-of-Custody record.

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The following information is contained on the COC form.

Facility name/location
Sample site description
Sample number
Signature/initials of collector for each sample
Date and time of collection
Sample identification and type
Number of samples
Identification of parameter to be analyzed

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Standard Operating Procedure
B13. Sampling Lagoon Wastewater for Land Application

Equipment: The following is a list of the equipment used during the sampling process:

Wide-mouthed sample containers
Cooler
Sufficient ice such that samples arrive at the lab “on ice”
Sampling vessels
Compositing vessel
Disposable gloves
Field data sheets, and sample labels
Indelible marker
Appropriate Health & Safety gear
Shipping containers and packing materials
Distilled water and water container
Wash water in appropriate container

Procedure: These procedures follow the Guidance for Sampling Manure prepared by Utah State University Extension and included in Mango II’ Nutrient Management Plan for Land Application. Samples shall be collected no more than one month prior to application to a field of lagoon wastewater.

1) At least six subsamples shall be collected from around the lagoon from which wastewater will be land applied. Take care to exclude any floating debris from the subsample. If more than 5 to 6 feet (depth) of lagoon wastewater is to be land applied, another set of subsamples will be taken at that depth.

2) Pour each subsample into the compositing vessel and mix thoroughly.

3) Transfer into the clean, wide-mouthed sample container. Leave approximately 1" of air space in the container. Securely tighten container top.

4) Immediately, store sample on sufficient ice to ensure samples will arrive at the analytical lab at or below the temperature at which they were collected. Do not freeze the samples.

5) Sample containers should be marked using an indelible marker to indicate sample date and sample ID.

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Standard Operating Procedure
B14. Sampling Solid Manure, BioSolids, or Manure-Contaminated Soil for Land Application.

Equipment: The following is a list of the equipment used during the sampling process:

Wide-mouthed sample containers
Cooler
Sufficient ice such that samples arrive at the lab “on ice”
Sampling vessels
Compositing vessel
Disposable gloves
Field data sheets, and sample labels
Indelible marker
Appropriate Health & Safety gear
Shipping containers and packing materials
Distilled water and water container
Wash water in appropriate container

Procedure: Follow the Guidance for Sampling Manure (Sampling Solids) prepared by Utah State University Extension and included in Mango II’ Nutrient Management Plan for Land Application. Samples shall be collected no more than one month prior to application to a field of solid manure, biosolids resulting from an anaerobic digester or the Bion system, or manure-contaminated soil.

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APPENDIX C

Laboratory Parameters and Methods

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Sampling and Analysis Plan

Media	Back-ground	Semi Annual	Parameter[1]	Units	Analytical Method[1]			Method Description[1]	Preservatives[2]	Maximum Holding Time[2]
					EPA [3]	Standard Methods [4] (Edition(s))	SW846 [5]			
Ground Water Monitoring Wells										
	X	X	Bicarbonate (as $HCO_3\Gamma$)	mg/l	310.2	2320 B (18th, 19th, 20th)		Colorimetric titration, manual or automatic	Cool, 4 deg C	14 days
	X		Calcium - Total	mg/l	215.1	3111 B (18th and 19th)	7140	AA direct aspiration	HNO_3 to pH2	6 months
	X		Carbonate (as $CO_3^2\Gamma$)	mg/l	310.2	2320 B (18th, 19th, 20th)		Colorimetric titration, manual or automatic	Cool, 4 deg C	14 days
	X	X	Chloride	mg/l		4500-Cl^- B (18th, 19th, 20th)	9253	Titrimetric (silver nitrate)	None Required	28 days
	X		Magnesium - Total	mg/l	242.1	3111 B (18th and 19th)	7420	AA direct aspiration	HNO_3 to pH2	6 months
	X		Phosphorus - Total	mg/l	365.2 or 365.3	4500-P E (18th, 19th, 20th)		Manual ascorbic acid reduction	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	X		Potassium - Total	mg/l	258.1	3111 B (18th and 19th)	7610	AA direct aspiration	HNO_3 to pH2	6 months
	X		Sodium - Total	mg/l	273.1	3111 B (18th and 19th)	7770	AA direct aspiration	HNO_3 to pH2	6 months
Ground Water	X		Sulfate (as SO_4)	mg/l	375.4		9038	Turbidimetric	Cool, 4 deg C	28 days

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Monitoring Wells	**X**	**X**	Residue – filterable; (Total Dissolved Solids, TDS)	mg/l	160.1	2540-C (18th, 19th, 20th)		Gravimetric, 180EC	Cool, 4 deg C	7 days
	X	**X**	Nitrate-Nitrite (as N)	mg/l	353.3 or 353.2	4500-NO3 E or F (18th, 19th, 20th)		Cadmium reduction, manual or automated	Cool, 4 deg C; H_2SO_4 to pH2	28 days

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Sampling and Analysis Plan

Media	Annual	Parameter[1]	Units	Analytical Method[1]			Method Description[1]	Preservatives[2]	Maximum Holding Time[2]
				EPA [3]	Standard Methods [4] (Edition(s))	SW846 [5]			
Ground Water Supply Wells	**X**	Residue – filterable; (Total Dissolved Solids, TDS)	mg/l	160.1	2540-C (18th, 19th, 20th)		Gravimetric, 180EC	Cool, 4 deg C	7 days
	X	Nitrate-Nitrite (as N)	mg/l	353.3 or 353.2	4500-NO3 E or F (18th, 19th, 20th)		Cadmium reduction, manual or automated	Cool, 4 deg C; H_2SO_4 to pH2	28 days

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Sampling and Analysis Plan

Media	Annual	Parameter[1]	Units	Analytical Method[1]			Method Description[1]	Preservatives[2]	Maximum Holding Time[2]
				EPA [3]	Standard Methods [4] (Edition(s))	SW846 [5]			
Lagoon Waste Water for Source Charact-erization	**X**	Ammonia (as N)	mg/l	350.3	4500-NH_3 F or G (18^{th}); 4500-NH_3 D or E (19^{th} or 20^{th})		Electrode	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	X	Nitrate-Nitrite (as N)	mg/l	353.3 or 353.2	4500-NO3 E or F (18^{th}, 19^{th}, 20^{th})		Cadmium reduction, manual or automated	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	X	Kjeldahl Nitrogen - Total (as N)	mg/l	351.2			Semi-automated block digester colorimetric	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	X	Bicarbonate (as $HCO_3\Gamma$)	mg/l	310.2	2320 B (18^{th}, 19^{th}, 20^{th})		Colorimetric titration, manual or automatic	Cool, 4 deg C	14 days
	X	Carbonate (as $CO_3^2\Gamma$)	mg/l	310.2	2320 B (18^{th}, 19^{th}, 20^{th})		Colorimetric titration, manual or automatic	Cool, 4 deg C	14 days
	X	Calcium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	Inductively Coupled Plasma / Atomic Emissions Spectrometry (ICP/AES)	HNO_3 to pH2	6 months
	X	Chloride	mg/l		4500-Cl^- B (18^{th}, 19^{th}, 20^{th})	9253	Titrimetric (silver nitrate)	None Required	28 days
	X	Magnesium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Phosphorus – Total	mg/l	365.4			Semi-automated block digestor	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	X	Potassium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	ICP/AES	HNO_3 to pH2	6 months

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	X	Sodium - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Sulfate (as SO_4)	mg/l	375.4		9038	Turbidimetric	Cool, 4 deg C	28 days
	X	Residue – filterable; (Total Dissolved Solids, TDS)	mg/l	160.1	2540 C (18th, 19th, 20th)		Gravimetric, 180EC	Cool, 4 deg C	7 days
	X	Arsenic - Total	mg/l	206.2	3113 B (18th and 19th)	7060A	AA furnace	HNO_3 to pH2	6 months
	X	Barium - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Cadmium - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Chromium - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Copper - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Lead - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Mercury - Total	mg/l	245.1 or 2	3112 B (18th and 19th)	7470A or 7471A	Cold vapor, manual or automated	HNO_3 to pH2	28 days
	X	Selenium - Total	mg/l	270.2	3113 B (18th and 19th)	7740	AA furnace	HNO_3 to pH2	6 months
	X	Silver - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Zinc - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months

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Sampling and Analysis Plan

Media	Parameter[1]	Units	Analytical Method[1]			Method Description[1]	Preservatives[2]	Maximum Holding Time[2]
			EPA [3]	Standard Methods [4] (Edition(s))	SW846 [5]			
Lagoon Waste Water for Land Application	Ammonia (as N)	mg/l	350.3	4500-NH_3 F or G (18^{th}); 4500-NH_3 D or E (19^{th} or 20^{th})		Electrode	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	Nitrate-Nitrite (as N)	mg/l	353.3 or 353.2	4500-NO3 E or F (18^{th}, 19^{th}, 20^{th})		Cadmium reduction, manual or automated	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	Kjeldahl Nitrogen - Total (as N)	mg/l	351.2			Semi-automated block digester colorimetric	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	Bicarbonate (as $HCO_3\Gamma$)	mg/l	310.2	2320 B (18^{th}, 19^{th}, 20^{th})		Colorimetric titration, manual or automatic	Cool, 4 deg C	14 days
	Calcium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	Inductively Coupled Plasma / Atomic Emissions Spectrometry (ICP/AES)	HNO_3 to pH2	6 months
	Chloride	mg/l		4500-Cl^- B (18^{th}, 19^{th}, 20^{th})	9253	Titrimetric (silver nitrate)	None Required	28 days
	Magnesium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	ICP/AES	HNO_3 to pH2	6 months
	Phosphorus – Total	mg/l	365.4			Semi-automated block digestor	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	Potassium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	ICP/AES	HNO_3 to pH2	6 months

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	Sodium - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	Sulfate (as SO_4)	mg/l	375.4		9038	Turbidimetric	Cool, 4 deg C	28 days
	Residue – filterable; (Total Dissolved Solids, TDS)	mg/l	160.1	2540 C (18th, 19th, 20th)		Gravimetric, 180EC	Cool, 4 deg C	7 days

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Sampling and Analysis Plan

Media	Annual	Parameter[1]	Units	Analytical Method[1]			Method Description[1]	Preservatives[2]	Maximum Holding Time[2]
				EPA [3]	Standard Methods [4] (Edition(s))	SW846 [5]			
Primary Lagoon Sludge	X	Ammonia (as N)	mg/kg	350.3	4500-NH_3 F or G (18^{th}); 4500-NH_3 D or E (19^{th} or 20^{th})		Electrode	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	X	Nitrate-Nitrite (as N)	mg/kg	353.3 or 353.2	4500-NO3 E or F (18^{th}, 19^{th}, 20^{th})		Cadmium reduction, manual or automated	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	X	Kjeldahl Nitrogen - Total (as N)	mg/kg	351.2			Semi-automated block digester colorimetric	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	X	Phosphorus - Total	mg/kg	365.4			Semi-automated block digestor	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	X	Calcium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	Inductively Coupled Plasma / Atomic Emissions Spectrometry	HNO_3 to pH2	6 months
	X	Magnesium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Potassium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Sodium - Total	mg/l	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Residue – Total	%	160.3	2540 B(18^{th}, 19^{th}, 20^{th})		Gravimetric, 103 – 105 EC	Cool, 4 deg C	7 days
	X	Arsenic - Total	mg/kg	206.2	3113 B (18^{th} and 19^{th})	7060A	AA furnace	HNO_3 to pH2	6 months
	X	Barium - Total	mg/kg	200.7	3120 B (18^{th}, 19^{th}, 20^{th})	6010B	ICP/AES	HNO_3 to pH2	6 months

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	X	Cadmium - Total	mg/kg	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Chromium - Total	mg/kg	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Copper - Total	mg/kg	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Lead - Total	mg/kg	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Mercury - Total	mg/kg	245.1 or 2	3112 B (18th and 19th)	7470A or 7471A	Cold vapor, manual or automated	HNO_3 to pH2	28 days
	X	Selenium - Total	mg/kg	270.2	3113 B (18th and 19th)	7740	AA furnace	HNO_3 to pH2	6 months
	X	Silver - Total	mg/kg	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	X	Zinc - Total	mg/kg	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months

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Sampling and Analysis Plan

Media	Parameter[1]	Units	Analytical Method[1]			Method Description[1]	Preservatives[2]	Maximum Holding Time[2]
			EPA [3]	Standard Methods [4] (Edition(s))	SW846 [5]			
Solid Manure, Manure-contaminated Soil, and other Biosolids for Land Application	Ammonia (as N)	mg/l	350.3	4500-NH3 F or G (18th); 4500-NH3 D or E (19th or 20th)		Electrode	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	Nitrate-Nitrite (as N)	mg/l	353.3 or 353.2	4500-NO3 E or F (18th, 19th, 20th)		Cadmium reduction, manual or automated	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	Kjeldahl Nitrogen - Total (as N)	mg/l	351.2			Semi-automated block digester colorimetric	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	Calcium - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	Inductively Coupled Plasma / Atomic Emissions Spectrometry (ICP/AES)	HNO_3 to pH2	6 months
	Chloride	mg/l		4500-Cl^- B (18th, 19th, 20th)	9253	Titrimetric (silver nitrate)	None Required	28 days
	Magnesium - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	Phosphorus – Total	mg/l	365.4			Semi-automated block digestor	Cool, 4 deg C; H_2SO_4 to pH2	28 days
	Potassium - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months

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	Sodium - Total	mg/l	200.7	3120 B (18th, 19th, 20th)	6010B	ICP/AES	HNO_3 to pH2	6 months
	Sulfate (as SO_4)	mg/l	375.4		9038	Turbidimetric	Cool, 4 deg C	28 days

[1] - Parameter description, analytical method numbers, analytical method description from Federal Register, Volume 67, No. 205, October 23, 2002, pages 65219 – 65253.

[2] - Preservation and maximum holding times from 40 CFR 136.3 Table II – Required Containers, Preservation Techniques, and Holding Times.

[3] - USEPA. 1983. Methods for Chemical Analysis of Water and Wastes. 3rd Edition. USEPA, Environmental Monitoring and Support Laboratory, Cincinnati, OH. EPA600/4-79-020

[4] - Standard Methods for the Examination of Water and Wastewater. 18th , 19th, and 20th Editions.

[5] - USEPA Test Methods for Evaluating Solid Wastes Physical / Chemical Methods. SW-846 3rd Edition.

AA Furnace method was used to analyze for arsenic and selenium because, according to at least one analytical lab, the detection limit is better with this method relative to ICP/AES.

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Mango II-Milford

Spill Prevention
&
Response Manual

June 27, 2025

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Mango II-Milford
Spill Prevention & Response Manual

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I. Introduction

The Spill Prevention and Response Manual is a resource of guidelines designed to address waste spill prevention and response policies. It is the responsibility of all Mango II employees, lessors and contractors to be aware of the preventive and responsive guidelines set forth in this manual and to act upon them as needed.

Spill Prevention
The policies addressed require daily and monthly inspections of the waste handling system by farm personnel and indicate how to respond to potential problems.

Spill Response
The policies that the farm managers and contractors will follow in the event of a waste spill. This section also identifies some remedial actions that may be used by maintenance or Environmental Resources to clean up the spill site.

II. Waste Handling System

The waste handling system is composed of the barn pits, the discharge system, the primary lagoon, the containment basin, and the recycle system. A site plan of the farm's waste handling system is available through the environmental department.

Barn Pits – the receptacle under the swine that collects waste and recycle water until the waste is released by a pull-plug into the discharge pipelines.

Discharge System – piping that conveys wastewater from the barn pits to the primary lagoon. The lines are located underground, but have clean-out pipes indicating the general location of the pipelines.

Primary Lagoon – the first stage of the anaerobic lagoon system that provides a microbial environment that decomposes the waste solids portion of the manure and provides storage for sludge accumulation.

Containment Basin – the second stage of the lagoon system that provides additional surface area to evaporate water. It stores wastewater during the low evaporation winter months.

Recycle System – a pump and piping system that conveys liquid from the primary lagoon back to the barn pits.

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III. Waste Spill Prevention

Awareness and action are the keys to preventing waste spills.

A.) Daily Inspections – Perform a daily visual inspection of the farm complex. This inspection is typically done by the specific farm staff and only at populated sites.

At a minimum look for the following:

- No evidence of seepage around facility or lagoon; Evidence includes, but not limited to wet & discolored soil, etc.
- Look at foundations for cracks that may indicate waste water is seeping through concrete
- Fresh water lines in good repair
- No standing water around or between barns and lagoon
- Pits cleaned & flushed per schedule, minimal buildup, no mortality, and pits are filling if charging
- Recycle pump(s) operational, and pipes/valves delivering sufficient water without leaks/plugs
- Structural Integrity (no broken, unsecured, or missing cleanouts/caps/pipes)
- Effluent properly contained
- Fuel/oil storage containers have no evidence of leaks
- Fuel/oil spills are cleaned up
- Record lagoon or manure structure liquid level
- Lagoon level changes from one day to another by 1/2 foot up or down
  - Without obvious reasons (heavy rain events, pumping)
- No exposed drain or recycle pipes
- No damage, holes or whaling of lagoon liner
- No significant embankment erosion
- Minimal trash in or around lagoon
- Cross-over pipe is flowing or is above the water level
- Pumps and controls are functional
- No Trash in Pits

1.) Fill out the Daily Checklist. This report needs to be filled out daily. Anything requiring further attention must be repaired or a work order must be submitted

B.) Monthly Inspections – Walk around the farm buildings and lagoon system each month.

This inspection is typically done by someone from the environmental department. The items inspected are very similar to those inspected during the daily

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inspection. However this inspection is designed to have a third party verification as well as someone who has a greater depth of experience inspect the site.

C.) Operational Prevention – Educate all employees about what could cause a waste spill and make sure they know the proper emergency response procedure.

1.) The following farm procedures and information needs to be continuously emphasized:

- The farm has a proper pit-pull procedure that should be followed.
- Barn pits are not trash cans, nor proper disposal for mortalities.
- Although feed spills happen, they need to be handled in a manner that will not clog any pipes.
- A recycle valve needs to be open if the recycle pump is operational.

2.) Fresh Water Contamination Prevention. Any pipes, hoses or other structure designed to convey fresh water, whether from a well or a water system, shall never be allowed to come in contact with wastewater. If for any reason fresh water is being discharged into a waste lagoon, there shall be a minimum of three feet separation between the surface of the lagoon water and the discharge of the fresh water pipe.

Any modifications to the waste handling system or fresh water system which may have a negative impact on groundwater quality must be reviewed by the Environmental Department leadership prior to implementation. The Environmental Department will inspect the site to ensure the system is operating properly during and after the implementation of the modification.

IV. Waste Spill Response Plan

A. Potential Problem Response. A potential problem is defined as a situation, which would not immediately result in a spill if not directly addressed. Responses to potential waste handling problems are reported directly to Mango II-Milford. The following items need to be reported to Mango II-Milford personnel:

1. A verbal commitment as to how and when the problem will be repaired or addressed.

2. A verbal report after correction that the problem has been resolved.

B. Broken Clean Out procedures. In the event that a clean out pipe is hit or broken the following procedures will be followed so that a spill will be avoided:

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1. The person who breaks the clean out is personally responsible for notifying the farm leader that they should not pull their pits until the cleanout is repaired.

2. If the break occurs during the day, you must not leave that farm until you have personally spoken to the farm leader to let him/her know they should not pull the pit.

3. If the break occurs after hours, you must call the farm leader at home. If the farm leader is not home, you should call the farm leader on their cell phone. If the farm leader does not answer the call, call that farm leader's production leader at home or on their cell phone. Keep going through the chain of command until you personally notify someone of the broken cleanout and that the pits should not be pulled. Direct personal contact is required. Leaving a voice mail is unacceptable.

4. You must leave a note on the farm office door telling farm personell not to pull the pit until the cleanout is repaired unless you have personally spoken to the farm leader.

5. The farm leader is responsible for immediately instructing his/her employees not to pull the pits until the cleanout is repaired.

6. Maintenance will notify the farm leader when the cleanout is repaired and it's okay to pull the pits.

C. Waste Spill Response. In the event of an actual spill, it is important to return the waste back into the lagoons or waste handling system as soon as possible. After a detected spill, the following procedure must be followed:

1. Take whatever measure needed to stop the spill, i.e., re-install the pit plugs, turn off the recycle pump, etc.

2. Record the time when the waste spill was first detected and estimate the time when the waste spill first took place.

3. Report the spill to Maintenance and make sure they are fully aware of the situation.

4. Maintenance reports to the spill for cleanup and repairs, and mobilizes any necessary clean-up equipment.

5. Maintenance calls and notifies the environmental department.

6. The representatives from the Environmental Department then report to the spill location as well and clean up the spill to Mango II-Milford personnel .

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7. If upon arriving at the spill, flow is not stopped, maintenance shall take whatever steps necessary to stop the flow.

8. Environmental Technicians will contact the Environmental Department leadership and Mango II- Milford personnel to identify the situation.

9. If a spill is significant, waste will be pumped back into the lagoons or waste handling system. Most spills will gravity flow and pond in a localized area. A sump should be excavated into the pooled area with a backhoe and then pumped from the sump into the lagoons or into the waste pipeline. If the spill is a significant distance away from the lagoons, it may be necessary to first repair a broken pipeline so that the waste can be pumped directly into a nearby cleanout.

10. Once repairs have been made maintenance or environmental should notify the Farm Leader.

11. The Environmental Department will be responsible for gathering all applicable information to inform production

12. Mango II-Milford will call and inform the Division of Water Quality if necessary.

D. Leaking Lagoon Response. In the event that it is suspected that a lagoon is leaking the following procedures will be followed to minimize the potential impact to ground water:

1. First a qualified engineer will inspect the lagoon for structural integrity. The engineer will decide if there is an eminent danger of the lagoon releasing its contents to the surrounding land. If it is decided that there is an eminent danger of release then equipment will be mobilized to immediately pump down the lagoon to a point where there is no danger of release. Equipment will also be mobilized immediately to reinforce the integrity of the lagoon.

2. If monitor well level compliance limits are exceeded as dictated by the issued permits. The first step will be to conduct a statistical analysis on the historical groundwater testing results to identify if the elevated parameters are significant to evaluate whether the lagoon is leaking or not.

3. If it is determined that the increase in parameter levels is significant then the next step will be to contract with a reputable company specializing in leak location identification to identify if the lagoon is leaking and if so where the leak(s) are located. This leak detection survey should be done while the

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lagoon is full of water as to identify all leaks in the side-slope as well as the floor of the lagoon.

4. If it is confirmed from the survey that the lagoon is leaking then the following steps will be implemented:
    - If leak(s) are coming from the primary lagoon, discharge piping from the farm will be reconfigured to flow to the secondary so that no new waste is introduced into the leaking lagoon.
    - Recycle lines will also be reconfigured to pump from the secondary lagoon, until the primary lagoon can be repaired.
    - The leaking lagoon will be pumped to adjacent lagoon systems that have adequate space to accept the additional wastewater. Secondary lagoon space at other farms may have to be utilized until correct operation can be restored to the repaired lagoon. When transferring wastewater to another lagoon, care will be taken to ensure that permit design criteria are not violated.
    - A timeline will be prepared to outline the steps necessary for the completion of the project. A copy of this timeline will be forwarded to the DWQ by Mango II-Milford.

5. During warm weather operation, pumps and pipeline will be checked 3 times daily for correct operation and for leakage.

6. If PVC pipes are installed above ground to convey the wastewater the lines will be marked to protect the pipes from vehicular damage.

7. During cold weather operation, pumps and pipelines will be checked regularly during daytime hours and hourly through the night for correct operation and for leakage. In the event that the pump is or has to be shut down for longer than an hour, the pipeline will be drained to prevent freezing. Additional personnel may have to be hired on a temporary basis for the duration of the project.

8. It may become necessary to introduce additional water to liquefy the sludge In order to remove the majority of the sludge.

9. After the majority of the sludge and wastewater has been removed, the remaining waste will be allowed to dry and then scraped away from the suspected leaking location using rubber squeegees.

10. All locations identified by the initial leak location survey will be investigated thoroughly.

11. Once the leaks have been repaired according to section G below, the lagoon will be returned to normal operation. The normal water treatment volume will

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be restored by pumping back part of the water removed and by the addition of fresh water. Water will continue to be added until the water level reaches the correct design level.

E. Evaluation of Spill Impact.

The impacted soils will be sampled according to the procedures found in the Sampling and Analysis Plan. If the spill is significant and a large enough amount of water was released to potentially impact the ground water then the following general guidelines for evaluating the impact of a spill should be followed:

Note: Not all spills require soil sampling to be performed as outlined above. If the process of soil sampling will cause a significant amount of damage to the surrounding liner or subsurface, or could create a potential pathway for the wastewater to the groundwater then soil sampling should not be done. However, if it is determined that there is no other available method to evaluate the extent of the spill, soil tests should be performed. In this case, care will be taken as to minimize the damage to the FML and subsurface. Care will also be taken to seal the soil-sampling borehole with bentonite clay.

1. After the liquid waste has been removed from the area of the spill, soil samples will be collected from the area of greatest impact and analyzed by a certified laboratory for:
   Phosphorous, Potassium, TKN, Ammonia, Nitrate plus Nitrite as Nitrogen, pH, Calcium, Chloride, Magnesium, Sodium, Sulfate

   Soil samples will be collected from the surface and down to one foot beyond the saturation depth at maximum intervals of one-foot. If the saturation depth is not apparent, samples will be collected in one-foot intervals down to three feet. Soil samples will be taken within five days of the spill event.

   A map outlining the spill area as well as locations of monitoring wells, and numbered soil sample locations, will be included in the package sent to the DWQ. Photographs will also be taken at the time of the spill evaluation to document the spill.

2. Further investigation will include the evaluation of the underlying soils with regards to water holding capacity, the amount of saturation and depth of the spill. In the Milford valley no aquifer recharge is contributed to the valley floor (Mower and Cordova, Technical Publication No. 43). Therefore, it is extremely unlikely that leaching of contaminants from a relatively small spill would occur from non-irrigated land. All of the farm sites that have been constructed are on non-irrigated land. If it is determined that the wastewater could not reach the aquifer due to the size of the spill and water holding capacity of the underlying soils then no

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remedial action will be required. When evaluating the potential for ground water degradation past spill events will also be considered.

3. If it is determined from these evaluations that there is substantial risk that the spill will have a negative impact on ground water quality, mitigation efforts such as excavation of the soil and land application, or disposal of the soil may be needed. These mitigation efforts will be started within 10 days of determination that the ground water will be negatively impacted. If it is determined from the evaluation that there will be no negative impacts of significance on groundwater quality, or if all parameters tested decline deeper into the soil, no further action will be required. Land application, if necessary, will be done in accordance to the Mango II's Nutrient Management Plan.

F. Repair of Liner (FML) Procedures.

Occasionally holes will form in the liner of the lagoon system due to a variety of factors. Mango II will repair minor holes as part of their routine maintenance of the lagoon system. If Mango II decides that the repairs to be done are major repairs then use of a third party independent Professional Engineer will be used to verify proper repair.

Repair of holes in the liner that are above the water line will done according to the following procedures:

1. Location of holes must be identified, marked and documented.

2. Holes will then be repaired with a patch of new FML and an extrusion welder.

3. The patch will then be vacuum tested to assure proper repair.

Repair of holes in the liner that are below the water line will be done according to the following procedure:

1. Signs of holes that are under the water line include whaling, unusual stretching and/or floating liner.

2. The farm will then be notified of the condition and instructed to reduce the use of the fresh water going into their system while repairs are being performed.

3. Location of the hole(s) must be identified, marked clearly on the slope of the lagoon, and documented.

4. Lagoon will then be pumped to remove the water from the lagoon until the hole(s) can be safely accessed for repair.

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5. Liner and subsurface will then be allowed to dry out if possible.

6. Hole(s) in the liner will then be repaired with a patch of new FML and an extrusion welder.

7. The patch will then be vacuum tested to assure proper repair.

Once all of the procedures have been followed above the lagoon will be put back into service.

V. Waste Spill State Compliance Issues

A. First 24-Hour Response Requirements. A State reportable incident shall be defined as any occurrence or failure of Best Available Technology (BAT) to contain waste as defined in the State issued Construction and Ground Water Discharge Permits that may potentially cause damage to the waters of the State. This would include any significant spillage or release of waste from lagoons, barn pits, or waste handling pipes to the ground surface, or to the ground water. It would also apply to any significant release of any other chemical or biological agent to the ground surface or ground water that could cause a threat to human health.

The Smithfield Environmental Manager shall verbally report any noncompliance waste handling incident to Mango II, which will in turn report to the State. In the event the Environmental Manager is absent the responsibility will fall onto the other Environmental Department Leadership, or other Mango II personnel. The incident must be reported as soon as possible, but no later than 24 hours from the time the representative first becomes aware of the event. The verbal report shall be made to one of the following numbers:

<u>During normal business hours (8:00 am – 5:00 pm Mountain Time)</u>
Division of Water Quality, Ground Water Protection Section - (801) 536-4300.

<u>24 Hour Number</u>
Utah Department of Environmental Quality 24 Hour Number - (801) 536-4123.

In addition to DWQ, the County Commissioners of the county in which the incident occurs and the Southwest Health Department will be verbally notified of a reportable spill within 24 hours or the first working day following a spill.

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B. Written Report Requirement within Five Days of Waste Spill. A written report describing the waste-handling spill or leak will be submitted to the Division of Environmental Quality's Executive Secretary within five days from the time the incident was detected. The written submission shall contain:

1.) A description of the noncompliance and its cause

2.) The period of noncompliance, including exact dates and times

3.) The estimated time noncompliance is expected to continue if it has not been corrected

4.) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance

The letter should also contain the following information if the situation did not occur due to a failure of BAT:

1.) The incident had been reported according to Section V A. and B.

2.) The incident was not intentional or was not caused by Mango II's negligence, either in action or failure to act

3.) Adequate remedial measures were taken in a timely manner or an acceptable remedial action plan was developed. In addition a schedule was implemented to restore the best available control technology, utilize equivalent control technology. (Implementation of an equivalent technology will require permit modification and re-issuance.)

4.) Mango II can demonstrate that any discharge of a pollutant from the facility is not in violation of the provisions of UAC 19-5-107

In the event of out-of-compliance status due to either an exceedance of ground water protection levels or a failure of BAT, Mango II shall notify the appropriate County Commission, as applicable, and the Southwest Utah Health Department within 24 hours of becoming aware of the out-of-compliance status.

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Mango II-Milford

SLUDGE DISPOSAL AND FARM CLOSURE PLAN

MARCH 25, 2025

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1.0 GENERAL

This plan identifies disposal options for lagoon sludge for ongoing farm operation, farm closure scenarios for all Mango II-Milford farm sites, and abandonment practices for lagoon and/or farm closure.

1.1 Routine Sludge Removal

Mango II-Milford currently owns numerous agricultural properties in Beaver, Iron, and Millard Counties, which have historically operated as hog farms. Each property contains at least one primary treatment lagoon or digester and one secondary treatment lagoon/evaporation basin. It has and will be necessary to dispose of accumulated solids on a routine basis for continued operation. Each primary treatment lagoon has approximately 1/3 of the total volume dedicated to solids accumulation. Over time, accumulation will continue until the storage capacity is reached. The principal utilization option presented in this plan is to land apply the solids at agronomic rates onto agricultural crop land after it has been dried within engineered drying pads. The target is to dispose of solids at 100% of design storage volume. However, disposal may occur for any accumulation amount up to 120 percent of design storage accumulation.

1.2 Farm Closure

Should Mango II-Milford discontinue operations at any farm or totally discontinue operations altogether, it will be necessary to close down the waste handling systems and to properly address the remaining liquid.

1.3 Sludge Management

In-situ management of the sludge is the preferred method of managing the remaining sludge after site closure. Land application/sludge removal in compliance with the Manure Drying Plan (included in section 3.2 of this document) is the preferred method for periodic removal of solids during operation and the optional removal of solids post-closure.

1.4 Scheduling of Disposal Operations

Actual accumulation rates and volumes to be disposed of will vary with continued operation of Mango II-Milford sites. The amount to be disposed of in any given year or disposal event may be a determining factor in selection of the method utilized. Mango II-Milford is required by permit to monitor and submit sludge accumulation reports on an annual basis to the DEQ. The monitoring and reporting program will determine accumulation rates and assist in forecasting disposal operations (see section 5). It is anticipated that approximately 20 years of farm operation may be allowed before accumulation will require disposal. However, actual accelerated (or decelerated) accumulation rates may determine that disposal events may occur prior to, or after 20 years of farm operation.

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2.0 PROJECTED ANNUAL DISPOSAL QUANTITIES

The anticipated annual volume of sludge to be disposed can be estimated using development rates of Mango II-Milford production facilities. Mango II-Milford profiles the sludge layers at every farm every third year. Sludge profiling is completed according to the most recently approved version of the Sampling and Analysis Plan.

Mango II-Milford submits an Annual Sludge monitoring report as required by our permits. This report details the measured sludge layer results and the anticipated removal dates.

3.0 ROUTINE SLUDGE REMOVAL

The routine removal procedures outlined in this section include land application and sludge drying.

3.1 Land Application

Land application of solids is the primary option for sludge utilization. Land application will be done taking into consideration two principal nutrient parameters, nitrogen and phosphorus, as well as the metals content of the solids. Because it is not known what the actual chemical constituency of the solids will be until the material is tested and ready for disposal, land application will normally be done by the farmer to whom the solids are sold and should be done at agronomic rates. If the solids are applied to property owned by Mango II-Milford, then the application will be done according to the most recently approved Nutrient Management Plan.

3.2 Sludge Drying

Due to liquid hauling costs, it is more economical to dry the solids before applying them at agronomic rates. Below are the approved procedures and requirements for the Sludge Drying Program at Mango II-Milford:

Manure Drying Program Plan

Currently, Mango II-Milford has numerous farm sites in operation covered under multiple DEQ permits; each farm site has at least one primary lagoon or digester where manure solids are collected. It is necessary to periodically remove accumulated solids from the bottom of each primary lagoon at the farm sites. Mango II-Milford has implemented a program to remove the solids from the lagoons and dry the manure on a drying pad near the lagoon. The manure is a valuable nutrient source and drying of the manure will allow the nutrients to be applied to local cropland at agronomic rates without posing a risk to groundwater. This manure drying program is applicable every time a lagoon is de-sludged. Below are the minimum criteria for construction and operation of the sludge drying pad:

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- Depth to groundwater must be at least 20 feet below the bottom of the lagoon liner.
- Drying pads will not be located in stream beds or washes
- The drying pad will be located near the primary lagoon at the selected farm site so manure transportation distances will be minimized.
- Once a site has been selected, a drying pad will be constructed to the below criteria:
  1. The existing vegetation will be cleared and grubbed.
  2. The existing soil will be scarified to a minimum of 10 to 12 inches below the existing ground surface.
  3. The ground surface will be conditioned with 0 to 5 percent above optimum moisture content.
  4. The soil will be compacted to a minimum of 90 percent of ASTM D698 on both the outside berms and the floor of the sludge drying pad.
  5. Density testing will be performed at a minimum of every 10,000 square feet of surface area.
  6. Infiltrometer testing will also be performed prior to any manure transfer. Infiltrometer results must be less than 1.8x10-5 cm/sec.
  7. Soil compaction and infiltrometer testing results will be submitted to the DWQ.
  8. The sludge pad will not be put into use until the State DWQ has approved its use.
- Berms will be constructed on the downhill side of the drying area with lateral berms to contain any leachate or run-off from precipitation.

- Pre- and post-soil sampling is not required by the DWQ, unless a sensitive area is proposed as a drying site. There will be a total of five soil sample locations in the manure drying pad when soil sampling is required. They will be located in each corner of the pad and one in the center. Soils will be sampled (if required) at 1-foot intervals to a depth of 10 feet below ground surface and then sent for laboratory testing. Soil samples will be collected from the area of greatest impact and analyzed by a certified laboratory for:
  - Phosphorous, Potassium, TKN, Ammonia, Nitrate plus Nitrite as Nitrogen, pH, Calcium, Chloride, Magnesium, Sodium, Sulfate

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- Sumps, or pumping areas, will be strategically placed inside the berm area, and leachate or precipitation will be pumped into a permitted lagoon.
- While in the liquid stage, manure will not be more than 2 feet in depth. However, in the final stage of drying, stacked manure in windrows may be up to 6-8 feet in height.

  To sufficiently dry the manure, it may remain on the drying area for up to 9 months. However, it is anticipated that within 30 to 60 days, the decanted and free or excess water will be gone. Once the leachate has been removed and the manure is dry, it will be formed into wind rows. Wind rows will be periodically turned by a composter until it is ready to be hauled to agricultural fields for application.

4.0 FARM CLOSURE

This portion of the plan addresses the event of farm closure at an individual farm or shutdown of all of Mango II-Milford's permitted facilities. If a farm is closed, the primary option for sludge management/disposal is in-situ management. By allowing in-situ management of sludge material within the lined lagoons and/or digesters without destroying and abandoning the lagoon berms and liners, it will allow for future use of the lagoons and/or digesters to meet the evolving business needs of future owners or tenants.

4.1 In-Situ Management

The operation for in-situ stabilization at farm closure would be the removal of liquid from the system. This could be done by transferring the liquid to the evaporation ponds or by natural evaporation.

Land application of lagoon liquids and/or solids shall be done according to the most recently approved version of the Nutrient Management Plan and the Manure Drying Plan.

Naturally high evaporation rates in the area will be utilized to dry out the liquid from the lagoons, and facilitate final drying of the solids. Historic sludge samples taken over the years verify that sludge contains approximately 10-15% solids. Thus, once the sludge is dried, the dried sludge volume should only be 10-15% of the total amount originally measured. For example, a 10-foot sludge layer would evaporate down to 1-1.5 feet of dried sludge.

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4.1.1 Requirements for In-Situ Management of Sludge and Permit Closure

For in-situ management of sludge to be considered, the following conditions should be met:

1. The farm site should be depopulated, and any remaining pumpable liquid in the primary lagoon or digester (above the sludge layer) should be removed and/or evaporated.
2. Site groundwater monitoring wells must be in compliance after depopulation.
3. Monitoring wells will continue to be monitored according to the permit requirements until the pumpable liquid has been removed and/or evaporated.
4. Once the pumpable liquid has been removed and/or evaporated, the site's monitoring wells will be monitored annually for two years.
5. If the site's monitoring wells are out of compliance at the time of depopulation or if they exceed the site-specific Protection Levels outlined in the permit during the post depopulation monitoring period, they must continue to be monitored according to the permit requirements until the monitoring wells have been in compliance for a minimum of two years.

If the above conditions are met, then the individual farm site can be removed from the permit at the option of Mango II-Milford. After the farm site has been removed from the permit, Mango II-Milford will:

1. Cap the monitor wells in such a way as to prevent any contamination from entering the wells and
2. Secure and lock each monitoring well monument.

After permit closure, if a new owner, tenant, or the current owner desires to use the lagoons or digesters again, a new application for a groundwater discharge permit and liner integrity assessment (for both primary and secondary lagoons) will have to be submitted and approved by the DWQ before the lagoons or digesters could be put back into use.

4.1.2 Justification for Long-Term In-Situ Management of Sludge and Permit Closure

Below are the justifications explaining how the in-situ management of dried sludge in a lagoon is protective of groundwater:

- Once the farm is depopulated, the pumpable liquids are removed from the sludge layer, and no new liquids are introduced by the farm, there will likely be insufficient hydraulic head to facilitate transport of contaminants into the groundwater. Once the sludge layer is dried, no water will be present to allow for the transport of contaminants to groundwater.

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- According to the USGS, in cooperation with the Utah Department of Natural Resources Division of Water Rights, in a report titled ”Water Resources of the Milford Area, Utah, with emphasis on ground water” Technical publication number 43, under the heading “Infiltration from precipitation on the valley floor” it says, “The average annual precipitation on most of the valley floor is less than 10 inches (254mm) (pl.1), far less than could be consumed by evapotranspiration under normal conditions. Contributions to recharge from precipitation probably are so small everywhere on the valley floor, except on irrigated fields, that it may be considered nil.” Page 21
- With negligible recharge to the aquifer from precipitation, contaminants are unlikely to reach the aquifer once the water is removed from the lagoons.
- Milford Valley pan evaporation is 78 inches per year.
- The first unconfined aquifer ranges from around 30-200 feet below the bottom of the lagoons. The drinking water aquifers are 500-800 feet below the bottom of the lagoons, with some confining layers in between.
- Per the DWQ-issued construction permits, underlying the synthetic liner is a compacted 8-inch layer of soil that was compacted to 90% dry density.

The above reasons demonstrate that the in-situ management of sludge in dormant lagoons will not present an ongoing risk to human health or the environment, groundwater quality, or future beneficial uses of groundwater.

4.2 Other Waste Handling Facilities Abandonment

Farm closure will require abandonment of other regulated on-farm waste retention and conveyance facilities. The concrete pits under the slatted or grated flooring of the production building will be emptied of waste. The pits will be filled once with fresh water and then once again drained. The pipeline into the lagoon systems will be permanently capped so that no further inflow will be introduced into the abandoned lagoon area.

4.7 Notification of Closure and Abandonment

In the event a farm or treatment system is to be closed, an application requesting removal from the permits will be submitted to the DEQ. Detailed information shall be presented in the request and approval shall be received prior to closure.

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5.0 SLUDGE MONITORING

Mango II-Milford will commence a detailed sludge monitoring program. The purpose of the monitoring program will be to monitor accumulation rates, calculate the remaining sludge storage capacity, and project future sludge disposal events. In addition, sludge samples will be taken and analyzed for chemical composition. The monitoring will result in an annual report, which shall be submitted to the DEQ by February 1, of each year.

5.1 Sludge Monitoring Schedule and Methodology

Sludge accumulation monitoring will occur at each currently populated farm at least once every 3 years. Sludge monitoring is not required once a farm has been depopulated. Preferred monitoring will occur in the fall of the year. At Mango II-Milford's option, spring monitoring may be done. This will provide data on undigested materials in the lagoon due to the seasonal cooling and digestive inactivity in the treatment ponds. If spring monitoring is done, the data from this monitoring will be included in the annual report. Fall monitoring will provide a comparison of accumulation rates after seasonally high digestion activity during the summer months.

The method used to monitor sludge accumulation shall be detailed in the most recently approved Sampling and Analysis Plan.

5.2 Sludge Sampling and Testing

Sludge sampling shall be done at the representative farm sites as outlined in the Groundwater Discharge Permits issued by the DWQ. Sampling will be done according to the most recently approved Sampling and Analysis Plan.

5.3 Reporting

Results from sludge monitoring shall be combined and reported on a spreadsheet indicating all data obtained. The report shall include columnar data for each of the following: farm site, initial site population date, site depopulation date, the date of last sludge removal, overall liquid depth, sludge depth measurements, average depth, volume of accumulated solids, design storage volume, percentage of design volume taken, and projected sludge capacity/disposal date.

The projected sludge capacity/disposal date shall be preliminarily calculated in linear accumulation rates.

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Mango II-Milford

Nutrient Management Plan

June 27, 2025

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Introduction

Mango II will use the following plan to apply lagoon liquid and/or solids at agronomic rates to ensure maximum crop growth and economic return while protecting ground water quality. This plan will apply to solid manure, manure contaminated soils, solids from an anaerobic digester or lagoon sludge.

Overview

Best management practices will be utilized to ensure that applications of lagoon liquid or solids match plant nutrient uptake. Appropriate local irrigation and application scheduling procedures as outlined by NRCS will be followed. The irrigation and spreading equipment will be maintained and operated to ensure the uniform application of nutrients.

Field Soil Sampling and Testing

Each field to receive lagoon liquid or solids will be soil tested prior to application to determine its nutrient content and to track nutrient movement and build-up. Soil moisture will also be measured to determine the soil water holding capacity. The following procedures and guidelines will be followed:

Soil Nutrient Testing

- Application rates will be calculated on a field basis. Except where a portion of the field has received lagoon liquid or solids from a previous application then that portion will be treated as a separate plot to assure correct calculations of application rates. Applicability of the sampling protocol will be assessed for each new land application field or for a change in land application activity.
- Soils will be tested no more than one month before application of lagoon water or solids.
- Three representative composite soil samples will be analyzed for every 25 acres of a given application field. Each soil sample submitted will be a composite of 10 randomly collected soil cores from the same soil strata mixed together. Cores will be sampled as follows:
  - 0” – 12” depth
  - 13” – 24” depth
  - 25”-36” depth
- The uppermost (0” – 12”) soil sample will be analyzed for the following parameters:
  - Nitrate-N, TKN, Available Phosphorus, Available Potassium, pH, SAR and Ec_e.
  - Soils will be analyzed for B, Zn, Cu, Fe, and Mn at least once every three years.

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- The lower (13” – 24” and 25” – 36”) soil samples will be analyzed for Nitrate-N, TKN, SAR and Ec_e.
- Random samples will be collected according to figure 2.2 of the Utah Fertilizer Guide.
- The final soil sample will be properly stored and labeled with the day, time, sampler, field identification and soil strata.
- Soil samples will be sent to Utah State University or other laboratory that is certified through the North American Proficiency Testing Program. Soil tests will be sent within 24 hours after collection. Samples will be stored in a cool, dry environment between collection and delivery to the lab.

Soil Moisture Testing

- The Appearance and Feel Method will be used to determine soil moisture.
    - Three sample cores will be taken. One from the top, middle and bottom of each field starting from the side where irrigation will begin.
    - Soil cores will be taken to the rooting depth of the crops.

Lagoon Liquid or Solids Sampling and Testing

The source of lagoon liquid or solids will be analyzed for its nutrient content prior to determining an application rate. Lagoon liquids and solids will be collected according to the most recently approved version of the Sampling and Analysis Plan. Below are some general guidelines for sample collection:

- The lagoon liquid or solids to be applied will be sampled and shipped to Utah State University or other laboratory certified through the North American Proficiency Testing Program.
- A representative liquid sample will be taken for each 5 to 6 foot depth of primary lagoon water that is to be pumped from the lagoon (pump intake will also be set at 5 to 6 foot depths).
- One representative liquid sample will be taken from the secondary lagoon to be pumped.
    - Representative samples will be taken according to the USU guidelines found in the “Guidelines for Sampling Manure”.
- Solid samples will be taken according to the guidelines given by Utah State University Extension for sampling solids in the “Guidelines for Sampling Manure”.
- Samples will not be taken more than one month prior to application event.
- Each liquid sample collected will be analyzed for the following parameters:

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- Nitrate-N, TKN, Ammonia-N, Total Phosphorus, Potassium, Total Dissolved Solids, pH, Total Solids, Mg, Ca, Na, Bicarbonate, Sulfate, Chloride and Ec_e.

- Each solid sample collected will be analyzed for the following parameters:
  - % Moisture, Nitrate-N, TKN, Ammonia-N, Total Phosphorus, Potassium, pH, Mg, Ca, Na, Sulfate, Chloride and Ec_e.

Application Rate Calculations for Liquid Manure

Manure applications will be made according to the most recently approve NRCS practice standard for Nutrient Management(590). This strategy will limit excessive nitrate migration, phosphate build-up, or soil salinity build-up.

The following calculations take into consideration best management practices for the production of a crop and protection of the environment:

I.) Determination of Liquid Manure Composition and Nutrient Availability

Test results from the liquid manure analysis in ppm or lb/acre-inch where 1ppm = .2266 lb/acre-inch.

(1.a) TKN _____ ppm

(1.b) Ammonia-N _____ ppm

(1.c) P_2O_5 (P x 2.29) _____ ppm _____lb/acre-in

(1.d) K_2O (K x 1.20) _____ ppm _____lb/acre-in

Plant available nitrogen (PAN) will be determined by the following formula:

PAN= (MR x (TKN, ppm – Ammonia, ppm)) + ((1 – VR) x Ammonia, ppm)

PAN = (.49 x (_____ (1.a) – _____ (1.b)) + ((1-_____) x _____(1.b))

Where: MR = mineralization rate (3rd year mineralization rates are being used to assure conservative application rates) Source: USDA-NRCS AWMFH, Table 11-9

VR = volatilization rate (see Table 1)

(1.e) PAN = _____ ppm

(1.f) PAN = _____lbs. nitrogen/acre-in liquid

Table 1.

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Nitrogen Volatilization Percentages (VR)

Method of Application	Type of Manure	% Nitrogen loss (VR factor)
Injection	Liquid	5
Sprinkling	Liquid	25

Source: USDA-NRCS AWMFH, Table 11-6

2.) Determination of Nutrient Value Existing in the Soil

Test results from the 0" – 12" soil analysis in ppm or lb/acre where 1 ppm = 3.8 lb/acre.

(2.a) K_2O (K x 1.20) _____ ppm _____ lb./acre

(2.b) P_2O_5 (avail. P x 2.29) _____ ppm _____ lb./acre

(2.c) Nitrate – N _____ ppm _____ lb./acre

(2.e) pH _____

(2.f) EC_e _____ mmhos/cm

3.) Determination of Nutrient Needs of a Crop

Average yields for the Milford area are currently being used for determining crop nutrient needs.

(3.a) Crop to Be Grown _____

(3.b) Yield Goal (bu or ton/acre) _____

Threshold salinity value for crop (use Table 2)

(3.c) EC_e threshold (Closest value to 2.f) _____ mmhos/cm

(3.d) % of normal Crop Yield (see Table 2) _____ %

(3.e) Anticipated Crop Yield (3.b x 3.d/100) _____ (bu or ton/acre)

Table 2. Crop Tolerance to Soil Salinity

Crop	% of Normal Crop Yield			
	100	90	75	50
Alfalfa Threshold (mmhos/cm)	2.0	3.4	5.4	8.8
Barley Threshold (mmhos/cm)	8.0	9.6	13.0	17.0
Barley, forage Threshold (mmhos/cm)	5.3	7.4	9.5	13.0
Corn, silage Threshold (mmhos/cm)	1.8	2.7	6.8	8.6
Wheat grass, crested (mmhos/cm)	3.5	6.0	9.8	12

Source: Salinity and Crop Tolerance, by J.Kotoby-Amacher, Boyd Kitchen, and R.T. Koenig. USU Extension

Nutrients needed by anticipated crop yield (3.e x appropriate value from table 3)

(3.f) N required _____ lb/acre

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(3.g) P_2O_5 required _____ lb/acre

(3.h) K_2O required _____ lb/acre

Table 3. Crop Nutrient Uptake Rates

Crop	Unit	N (lb/unit)	P_2O_5 (lb/unit)	K_2O (lb/unit)
Alfalfa	Ton	34	13.3	60
Barley	Bushel	1.45	.55	1.45
Corn	Bushel	.9	.37	.87
Corn Silage	Ton	9	3.1	9
Wheat	Bushel	1.7	.7	2

Source: USDA NRCS values

4.) Determination of Liquid Manure Application Rate

Application rates will be determined according to the NRCS practice standard for Nutrient Management. The rates of application will be based on Soil Test Phosphorous (STP) according to the following Table:

Table 4. NRCS Criteria for Manure Application

*Soil test for available phosphorus	Application based on
< 50 parts per million	Nitrogen requirement
50 – 100 parts per million	Annual phosphorus removal by the crop
>100 parts per million	No application of phosphorus

* Based on Olsen Method

Source: USDA NRCS Nutrient Management Standard (Code 590)

Manure application rates for nitrogen will be based on soil test results and crop utilization values. Manure application rates for phosphorus and potassium will be based on crop nutrient utilization values.

Application for phosphorus can be made for multiple year crop phosphorus needs following the NRCS practice standard for Nutrient Management (Code 590).

Plant nitrogen requirements will be calculated according to the nitrogen demands of the crop, residual nitrogen in the field, and plant available nitrogen in the application source. The rate will be calculated according to the following formula:

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(4.a) N to be Applied = Crop Uptake N (3.f) – Soil Residual N (2.c)

= _____(lb/acre) - _____ (lb/acre) = _____ lb/acre

(4.b) Liquid Application Rate = Applied N (4.a) / PAN (1.f)

= _____ (lb/acre) / _____ (lb/acre-in) = _____ inches lagoon liquid

Plant phosphorus requirements, if required by the above chart, will be calculated according to the following formula:

(4.c) P_2O_5 to be Applied = _____ (3.g) lb/acre

(4.d) Liquid Application Rate = (P_2O_5 to be Applied 4.c / P_2O_5 in Manure 1.c / Mineralization rate (=0.9) (3^{rd} year mineralization rates are being used to assure conservative application rates) Source: USDA-NRCS AWMFH, Table 11-9

= _____ (lb/acre) / _____ (lb/acre-in) / 0.9 = _____ inches lagoon liquid to be applied

Sodium Adsorption Ratio (SAR)

No application of manure will be allowed on soils with a SAR greater than 13. Source: USDA-NRCS AWMFH, page 5-12.

Soil Available Water Holding Capacity (AWC)

No single liquid application will exceed the water holding capacity of the soil (field capacity) or NRCS nutrient limitations. Fields will be managed such that only 50% of the available water holding capacity will be utilized when applying during the spring, summer, or fall. If a situation arises where fields will be irrigated at greater than 50% AWC, the amount of water added will be reduced accordingly. If necessary, evapotranspiration information will be used to determine the number of days before irrigation is needed. Liquid manure applications can be made outside the active growing season but will not exceed 70% of AWC. The total amount of water/lagoon liquid to be applied will be determined by the following formula:

AWC - _____ Amount of moisture in the soil prior to land application = Maximum allowed inches in a single land application event.

Sample Calculations for Lagoon Liquid Application

Actual test results will be used. Some assumptions are made because of inadequate availability of test information.

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Test results from the liquid manure analysis in ppm or lb/acre-inch where 1ppm = .2266 lb/acre-inch.

(1.a) TKN **1097** ppm

(1.b) Ammonia-N **932.1** ppm

(1.c) P_2O_5 (P x 2.29) **98.9** ppm **22.4** lb/acre-in

(1.d) K_2O (K x 1.20) **1532.9** ppm **347.5** lb/acre-in

Plant available nitrogen (PAN) will be determined by the following formula:

PAN= (MR x (TKN, ppm – Ammonia, ppm)) + ((1 – VR) x Ammonia, ppm)

PAN = (**.49** x (**1097** (1.a) – **932.1** (1.b)) + ((1-**.25**) x **932.1**(1.b))

Where: MR = mineralization rate

VR = volatilization rate (see Table 2)

(1.e) PAN = **779.88** ppm

(1.f) PAN = **176.72** lbs. nitrogen/acre-in liquid

Test results from the 0" – 12" soil analysis in ppm or lb/acre where 1 ppm = 3.8 lb/acre.

(2.a) K_2O (K x 1.20)= 214 x 1.2= **257** ppm **976.6** lb./acre

(2.b) P_2O_5 (avail. P x 2.29)= 2.7 x 2.29 = **6.18** ppm **23.48** lb./acre

(2.c) Nitrate – N **5.5** ppm **20.9** lb./acre

(2.e) pH **7.6**

(2.f) EC_e **0.8** mmhos/cm

(3.a) Crop to Be Grown **Alfalfa**

(3.b) Yield Goal (bu or ton/acre) **5**

Threshold salinity value for crop (use Table 2)

(3.c) EC_e threshold (Closest value to 2.f) **2.0** mmhos/cm

(3.d) Crop Yield Decrement (see Table 2) **100** decreases

(3.e) Anticipated Crop Yield (3.b x 3.d/100) **5** (bu or ton/acre)

Nutrients needed by anticipated crop yield (3.e x appropriate value from table 3)

(3.f) N required 5 x 34 = **170** lb/acre

(3.g) P_2O_5 required 5 x 13.3 = **66.5** lb/acre

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(3.h) K_2O required 5 x 60 = **300** lb/acre

(4.a) N to be Applied = Crop Uptake N (3.f) – Soil Residual N (2.c)

= **170** (lb/acre) - **20.9** (lb/acre) = **149.1** lb/acre

(4.b) Liquid Application Rate = Applied N (4.a) / PAN (1.f)

= 149.1 (lb/acre) / 176.72 (lb/acre-in) = 0.84 inches lagoon liquid

(4.c) P_2O_5 to be Applied = **66.5** (3.g) lb/acre

(4.d) Liquid Application Rate = (P_2O_5 to be Applied 4.c / P_2O_5 in Manure 1.c / Mineralization rate (=0.9)

= 66.5 (lb/acre) / 22.4 (lb/acre-in) / 0.9 = 3.3 inches lagoon liquid to be applied

Lagoon liquids will be applied based on crop nitrogen requirements because soil concentrations are not above 50ppm phosphorus. Nitrogen is the limiting nutrient.

Soil Available Water Holding Capacity (AWC)

AWC - _____ Amount of moisture in the soil prior to land application = Maximum allowed inches in a single land application event

AWC= 7-8.5 inches--Average 7.75inches

Example 1-Irrigation at 50% AWC

50% moisture in the soil x 7.75 = 3.875 inches of water in the soil

7.75 – 3.875 = 3.875 maximum allowed inches in a single land application event.

Example 2-Irrigation at 70% AWC

70% moisture in the soil x 7.75 = 5.425 inches of water in the soil

7.75 – 5.425 = 2.325 maximum allowed inches in a single land application event.

Example 3-Irrigation at 40% AWC outside of the growing season

40% moisture in the soil x 7.75 = 3.1 inches of water in the soil

7.75 x 70% = 5.425

5.425 – 3.1 = 2.325 maximum allowed inches in a single land application event.

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Calculation Data Sheet for Lagoon Liquid Application

Dates of Application	
Lagoon (site)	
Field Location	
Field Size (Acres)	
Total Amount Applied (Acre-inches or tons/acre)	
Method of application	

Test results from the liquid manure analysis in ppm or lb/acre-inch where 1ppm = .2266 lb/acre-inch.

(1.a) TKN _____ ppm

(1.b) Ammonia-N _____ ppm

(1.c) P_2O_5 (P x 2.29) _____ ppm _____lb/acre-in

(1.d) K_2O (K x 1.20) _____ ppm _____lb/acre-in

Plant available nitrogen (PAN) will be determined by the following formula:

PAN= (MR x (TKN, ppm – Ammonia, ppm)) + ((1 – VR) x Ammonia, ppm)

PAN = (.49 x (_____ (1.a) – _____ (1.b)) + ((1-_____) x _____(1.b))

Where: MR = mineralization rate

VR = volatilization rate (see Table 1)

(1.e) PAN = _____ ppm

(1.f) PAN = _____lbs. nitrogen/acre-in liquid

Test results from the 0” – 12” soil analysis in ppm or lb/acre where 1 ppm = 3.8 lb/acre.

(2.a) K_2O (K x 1.20) _____ppm _____ lb./acre

(2.b) P_2O_5 (avail. P x 2.29)____ppm _____ lb./acre

(2.c) Nitrate – N _____ ppm _____ lb./acre

(2.e) pH _____

(2.f) EC_e _____ mmhos/cm

(3.a) Crop to Be Grown _____

(3.b) Yield Goal (bu or ton/acre) _____

Threshold salinity value for crop (use Table 2)

(3.c) EC_e threshold (Closest value to 2.f) _____ mmhos/cm

(3.d) Crop Yield Decrement (see Table 2)_____ decreases

(3.e) Anticipated Crop Yield (3.b x 3.d/100) _____ (bu or ton/acre)

Nutrients needed by anticipated crop yield (3.e x appropriate value from table 3)

(3.f) N required _____ lb/acre

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(3.g) P_2O_5 required _____ lb/acre

(3.h) K_2O required _____ lb/acre

(4.a) N to be Applied = Crop Uptake N (3.f) – Soil Residual N (2.c)

= _____(lb/acre) - _____ (lb/acre) = _____ lb/acre

(4.b) Liquid Application Rate = Applied N (4.a) / PAN (1.f)

= _____ (lb/acre) / _____(lb/acre-in) = ____inches lagoon liquid

(4.c) P_2O_5 to be Applied = _____ (3.g) lb/acre

(4.d) Liquid Application Rate = (P_20_5 to be Applied 4.c / P_20_5 in Manure 1.c / Mineralization rate (=0.9)

= _____ (lb/acre) / _____lb/acre-in) / 0.9 = _____inches lagoon liquid to be applied

AWC - _____ Amount of moisture in the soil prior to land application = Maximum allowed inches in a single land application event

AWC= _____

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Application Rate Calculations for Solid Manure

Manure applications will be made according to the most recently approve NRCS practice standard for Nutrient Management (590). This strategy will limit excessive nitrate migration, phosphate build-up, or soil salinity build-up.

The following calculations take into consideration best management practices for the production of a crop and protection of the environment:

1.) Determination of Solid Composition and Nutrient Availability

(1.a) TKN _____ Lbs/Ton (Dry Basis)

(1.b) Ammonia-N _____ Lbs/Ton (Dry Basis)

(1.c) P_2O_5 (P x 2.29) _____ Lbs/Ton (Dry Basis)

(1.d) K_2O (K x 1.20) _____ Lbs/Ton (Dry Basis)

Plant available nitrogen (PAN) will be determined by the following formula:

PAN= (MR x (TKN, Lbs/Ton – Ammonia, Lbs/Ton)) + ((1 – VR) x Ammonia, Lbs/Ton)

PAN = (.49 x (_____ (1.a) – _____ (1.b)) + ((1-_____) x _____(1.b))

Where: MR = mineralization rate (3rd year mineralization rates are being used to assure conservative application rates) Source: USDA-NRCS AWMFH, Table 11-9

VR = volatilization rate (see Table 1)

(1.e) PAN = _____ Lbs/Ton

Table 1.
Nitrogen Volatilization Percentages (VR)

Method of Application	Type of Manure	% Nitrogen loss (VR factor)
Broadcast without incorporation	Solid	15-30
Broadcast with incorporation within a couple of hours	Solid	1-5

Source: Colorado State University Cooperative Extension Bulletin 552a, table 5

2.) Determination of Nutrient Value Existing in the Soil

Test results from the 0" – 12" soil analysis in ppm or lb/acre where 1 ppm = 3.8 lb/acre.

(2.a) K_2O (K x 1.20) _____ ppm _____ lb./acre

(2.b) P_2O_5 (avail. P x 2.29)_____ ppm _____ lb./acre

(2.c) Nitrate – N _____ ppm _____ lb./acre

(2.e) pH _____

(2.f) EC_e _____ mmhos/cm

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3.) Determination of Nutrient Needs of a Crop

Average yields for the Milford area are currently being used for determining crop nutrient needs. Yield data is currently being gathered on individual fields. Where three or more years of data have been gathered, the average of those yields will be used to determine crop nutrient needs.

(3.a) Crop to Be Grown _____

(3.b) Yield Goal (bu or ton/acre) _____

Threshold salinity value for crop (use Table 2)

(3.c) EC_e threshold (Closest value to 2.f) _____ mmhos/cm

(3.d) Crop Yield Decrement (see Table 2) _____ % decreases

(3.e) Anticipated Crop Yield (3.b x 3.d/100) _____ (bu or ton/acre)

Table 2. Crop Tolerance to Soil Salinity

Crop	% of Normal Crop Yield			
	100	90	75	50
Alfalfa Threshold (mmhos/cm)	2.0	3.4	5.4	8.8
Barley Threshold (mmhos/cm)	8.0	9.6	13.0	17.0
Barley, forage Threshold (mmhos/cm)	5.3	7.4	9.5	13.0
Corn, silage Threshold (mmhos/cm)	1.8	2.7	6.8	8.6
Wheat grass, crested (mmhos/cm)	3.5	6.0	9.8	12

Source: Salinity and Crop Tolerance, by J.Kotoby-Amacher, Boyd Kitchen, and R.T. Koenig. USU Extension

Nutrients needed by anticipated crop yield (3.e x appropriate value from table 3)

(3.f) N required _____ lb/acre

(3.g) P_2O_5 required _____ lb/acre

(3.h) K_2O required _____ lb/acre

Table 3. Crop Nutrient Uptake Rates

Crop	Unit	N	P_2O_5	K_2O

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		(lb/unit)	(lb/unit)	(lb/unit)
Alfalfa	Ton	34	13.3	60
Barley	Bushel	1.45	.55	1.45
Corn	Bushel	.9	.37	.87
Corn Silage	Ton	9	3.1	9
Wheat	Bushel	1.7	.7	2

Source: Kerry Goodrich USDA NRCS values

4.) Determination of Solid Manure Application Rate

Application rates will be determined according to the NRCS practice standard for Nutrient Management. The rates of application will be based on Soil Test Phosphorous (STP) according to the following Table:

Table 4. NRCS Criteria for Manure Application

*Soil test for available phosphorus	Application based on
< 50 parts per million	Nitrogen requirement
50 – 100 parts per million	Annual phosphorus removal by the crop
>100 parts per million	No application of phosphorus

* Based on Olsen Method
Source: USDA NRCS Nutrient Management Standard (Code 590)

Manure application rates for nitrogen will be based on soil test recommendations and crop utilization values. Manure application rates for phosphorus and potassium will be based on crop nutrient utilization values.

Application for phosphorus can be made for multiple year crop phosphorus needs following the NRCS practice standard for Nutrient Management (Code 590).

Plant nitrogen requirements will be calculated according to the nitrogen demands of the crop, residual nitrogen in the field, and plant available nitrogen in the application source. The rate will be calculated according to the following formula:

(4.a) N to be Applied = Crop Uptake N (3.f) – Soil Residual N (2.c)

= _____(lb/acre) - _____ (lb/acre) = _____ lb/acre

(4.b) Solid Application Rate = Applied N (4.a) / PAN (1.e)

= _____ (lb/acre) / _____ (lbs/Ton) = _____ Tons/Acre

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Plant phosphorus requirements, if required by the above chart, will be calculated according to the following formula:

(4.c) P_2O_5 to be Applied = _____ (3.g) lb/acre

(4.d) Liquid Application Rate = (P_2O_5 to be Applied 4.c / P_2O_5 in Manure 1.c / Mineralization rate (=0.9) (3^{rd} year mineralization rates are being used to assure conservative application rates) Source: USDA-NRCS AWMFH, Table 11-9

= _____ (lb/acre) / _____ (lb/Ton) / 0.9 = _____

Tons/Acre

Sodium Adsorption Ratio (SAR)

No application of manure will be allowed on soils with a SAR greater than 13. Source: USDA-NRCS AWMFH, page 5-12.

Sample Calculations for Solid Application

Actual test results will be used. Below are some sample calculations using data found in Attachment 7.

(1.a) TKN	**81.8**	Lbs/Ton (Dry Basis)
(1.b) Ammonia-N	**27.6**	Lbs/Ton (Dry Basis)
(1.c) P_2O_5 (P x 2.29)	**256.5**	Lbs/Ton (Dry Basis)
(1.d) K_2O (K x 1.20)	**51.4**	Lbs/Ton (Dry Basis)

Plant available nitrogen (PAN) will be determined by the following formula:

PAN= (MR x (TKN, Lbs/Ton – Ammonia, Lbs/Ton)) + ((1 – VR) x Ammonia, Lbs/Ton)

PAN = (.49 x (**81.8** (1.a) – **27.6** (1.b)) + ((1- **.15**) x **27.6** (1.b))

Where: MR = mineralization rate

VR = volatilization rate (see Table 1)

(1.e) PAN = **50.02** Lbs/Ton

Test results from the 0” – 12” soil analysis in ppm or lb/acre where 1 ppm = 3.8 lb/acre.

(2.a) K_2O (K x 1.20) = 214 x 1.2 = **256.8** ppm **975.8** lb./acre

(2.b) P_2O_5 (avail. P x 2.29) = 2.7 x 2.29 = **6.18** ppm **23.48** lb./acre

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(2.c) Nitrate – N __**5.5**__ ppm __**20.9**__ lb./acre

(2.e) pH __**7.6**_____

(2.f) EC_e ___**0.8**_____ mmhos/cm

(3.a) Crop to Be Grown _**Alfalfa**__

(3.b) Yield Goal (bu or ton/acre) ____**5**_____

Threshold salinity value for crop (use Table 2)

(3.c) EC_e threshold (Closest value to 2.f) ___**2.0**___ mmhos/cm

(3.d) Crop Yield Decrement (see Table 2) __**100**__ decreases

(3.e) Anticipated Crop Yield (3.b x 3.d/100) ____**5**____ (bu or ton/acre)

Nutrients needed by anticipated crop yield (3.e x appropriate value from table 3)

(3.f) N required 5x 34 = **170** lb/acre

(3.g) P_2O_5 required 5 x 13.3 = **66.5** lb/acre

(3.h) K_2O required 5 x 60 = **300** lb/acre

(4.a) N to be Applied = Crop Uptake N (3.f) – Soil Residual N (2.c)

= **170** (lb/acre) - **20.9** (lb/acre) = **149.1** lb/acre

(4.b) Solid Application Rate = Applied N (4.a) / PAN (1.e)

= 149.1 (lb/acre) / 50.02 (lbs/Ton) = 2.98 Tons/Acre

(4.c) P_2O_5 to be Applied = **66.5** (3.g) lb/acre

(4.d) Solid Application Rate = (P_20_5 to be Applied 4.c / P_20_5 in Manure 1.c / Mineralization rate (=0.9)

= 66.5 (lb/acre) / 256.5 (lb/Ton) / 0.9 =. 288 Tons/Acre

Phosphorus is the limiting nutrient. Application will be .29 tons/Acre or the crop rotational need for phosphorus (according to the NRCS practice standard) which would be .29 tons/acre x 5 years= 1.45 tons/acre

Sodium Adsorption Ratio (SAR)

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No application of manure will be allowed on soils with a SAR greater than 13.
Source: USDA-NRCS AWMFH, page 5-12.

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Calculation Data Sheet for Solid Manure Application

Dates of Application	
Lagoon (site)	
Field Location	
Field Size (Acres)	
Total Amount Applied (Acre-inches or tons/acre)	
Method of application	

(1.a) TKN _____ lbs/Ton (Dry Basis)

(1.b) Ammonia-N _____ lbs/Ton (Dry Basis)

(1.c) P_2O_5 (P x 2.29) _____ lbs/Ton (Dry Basis)

(1.d) K_2O (K x 1.20) _____ lbs/Ton (Dry Basis)

Plant available nitrogen (PAN) will be determined by the following formula:

PAN= (MR x (TKN, Lbs/Ton – Ammonia, Lbs/Ton)) + ((1 – VR) x Ammonia, Lbs/Ton)

PAN = (.49 x (_____ (1.a) – _____ (1.b)) + ((1-_____) x _____(1.b))

Where: MR = mineralization rate

VR = volatilization rate (see Table 1)

(1.e) PAN = _____ lbs/Ton

(1.f) PAN = _____lbs/Ton

Test results from the 0” – 12” soil analysis in ppm or lb/acre where 1 ppm = 3.8 lb/acre.

(2.a) K_2O (K x 1.20) _____ppm _____ lb./acre

(2.b) P_2O_5 (avail. P x 2.29)____ppm _____ lb./acre

(2.c) Nitrate – N _____ ppm _____ lb./acre

(2.e) pH _____

(2.f) EC_e _____ mmhos/cm

(3.a) Crop to Be Grown _____

(3.b) Yield Goal (bu or ton/acre) _____

Threshold salinity value for crop (use Table 2)

(3.c) EC_e threshold (Closest value to 2.f) _____ mmhos/cm

(3.d) Crop Yield Decrement (see Table 2) _____ decreases

(3.e) Anticipated Crop Yield (3.b x 3.d/100) _____ (bu or ton/acre)

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Nutrients needed by anticipated crop yield (3.e x appropriate value from table 3)

(3.f) N required _____ lb/acre

(3.g) P_2O_5 required _____ lb/acre

(3.h) K_2O required _____ lb/acre

(4.a) N to be Applied = Crop Uptake N (3.f) – Soil Residual N (2.c)

= _____(lb/acre) - _____ (lb/acre) = _____ lb/acre

(4.b) Solid Application Rate = Applied N (4.a) / PAN (1.f)

= _____ (lb/acre) / _____(lb/Ton) = ____ Tons/Acre

(4.c) P_2O_5 to be Applied = _____ (3.g) lb/acre

(4.d) Solid Application Rate = (P_2O_5 to be Applied 4.c / P_2O_5 in Manure 1.c / Mineralization rate (=0.9)

= _____ (lb/acre) / _____lb/Ton) / 0.9 = _____

Tons/Acre of Manure to be applied

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Application

Land application of lagoon liquids or solids will not be made on frozen, saturated, or snow covered ground. Applications will generally be made just prior to or after planting in the spring for annual crops or prior to spring crop growth on alfalfa. Applications may also be made between alfalfa harvests provided caution is used to avoid leaf burn of the alfalfa. Fall or winter applications will be made only in emergency situations or on winter annuals such as winter wheat.

Applications will be timed to minimize odors and applied in such a manner as to avoid contamination of surface waters, springs, drinking wells, pipelines, and groundwater.

The method of application may be by wheel line irrigation, center pivot irrigation, water cannon, spreader trucks or other methods of reliable application. In the event the rate of liquid or solids application cannot be reliably calculated, buckets placed in the field will be used to measure the rate of application.

Removal of Manure

If Liquid or Solid manure is given away or sold to any other person or organization the following guidelines will be followed:

- The person taking the manure will be given a report summarizing the nutrient content of the manure.
- The person will be given general manure application guidelines.
- The person will be required to sign a release form.

Record Keeping

Records will be kept for a minimum of five years. Records will provide information on each land application. Information contained in the records will include field applied to, field size, manure source, laboratory test results for the soil and the manure, method of application, date of application, amount of effluent or solids applied, available water holding capacity of the soil, crop yield and application rate calculations. For each land application event a copy of this land application plan will be completed. All records will be kept on file for inspection by the Division of Water Quality if requested.

Dates of Application	
Lagoon (site)	
Field Location	
Field Size (Acres)	
Total Amount Applied (Acre-inches or tons/acre)	
Method of application	

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Mango II Milford, LLC

Operating and Maintenance Manual
for
Primary Anaerobic Treatment Lagoon
and
Containment Basin
Waste Systems

January 27, 2026

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1.0 INTRODUCTION

1.1 This manual satisfies the Utah Department of Environmental Quality, Division of Water Quality (DWQ) requirement for lagoon operation and maintenance as required in Groundwater Discharge Permit No. UGW010002, UGW21005, UGW010008, UGW0100012and UGW010016. This document will be referenced in future issued permits as well as renewed permits as a compliance document for all farm sites. It is a guideline and reference document for the proper operation and maintenance of Mango II-Milford anaerobic treatment lagoon systems. This manual outlines the best management practices to be followed by all employees of Mango II-Milford. Employees will be trained to follow and implement the guidelines contained in this manual.

1.2 This manual generally applies to all Mango II-Milford sites. Portions of this manual will apply to all waste handling systems, due to the similarity in construction.

1.3 The procedures for start-up, normal operating, inspecting, monitoring for proper operation, and repairs to the lagoons are included in this manual.

1.4 Requirements for annual analytical testing of Mango II-Milford lagoons are contained in the DEQ Ground Water Discharge Permits.

2.0 LAGOON INSPECTIONS

2.1 **General.** The following routine inspections are to be performed at each lagoon site that is in use:
a. Daily inspections by farm personnel at populated sites.
b. Non-farm personnel inspection by an Environmental Technician.

2.1. a. Daily farm personnel inspections at populated sites
This inspection is designed to be a cursory overview of the farm in order to catch anything that could pose an immediate threat to the environment. Farm personnel should drive or walk the alignment of the waste system piping and inspect the lagoon system. While performing the inspection farm personnel are to observe that:

- Lagoon Levels have not changed more than a ½ foot since last inspection
- Crossover Pipe is Flowing or above water line
- No Broken Clean outs
- No Missing or Unsecured Cleanout Caps
- No Wet Soil Around Pits, Pipes or Lagoon
- No Exposed Drain pipes

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- No Whaling of Lagoon Liner
- Recycle Pump Operating Correctly
- Minimal Debris in Lagoon (less than a 16 gallon trash bag full)
- Minimal trash and weeds around barns (less than a 16 gallon trash bag full)
- No spilled feed
- Feed bins and lines are in good working order
- Rodent bait stations are properly secured (daily) and baited (at least monthly)
- Mortalities placed in dumpster at the end of the day

Any item found that could potentially cause a loss of waste containment, or a release of waste to the ground surface or ground water, shall be immediately reported to Mango II-Milford. Priority shall be given to such items to make repairs to restore the item to proper working order, or measures shall be taken to prevent waste spillage or release from the waste piping and treatment system until such measures can be taken. These inspections only happen at populated sites.

2.1. b. Inspection schedule by non-farm personnel. Mango II-Milford Environmental personnel shall perform the non-farm personnel inspection. This inspection is to be comprehensive in nature and provides a detailed second person inspection of each waste system. The same items in 2.1.a. are to be inspected. All new or outstanding repairs that need to be made will be documented. All Mango II-Milford sites at a minimum will be inspected according to the following schedule:

- **Sites that are populated**
  - Monthly inspections by the environmental department
- **Sites that are NOT populated, but lagoons still have pumpable Liquid**
  - Quarterly inspections by the environmental department
- **Sites that are not populated and lagoons that do NOT have any pumpable liquid, but the site has NOT been removed from the permits**
  - Semi Annual inspections by the environmental department.

At completion of the inspection, The Environmental Technician shall then compile a report, describing lagoon levels, and any repairs that need to be addressed and prioritized. Any repairs will be documented.

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3.0 LAGOON WATER CHEMISTRY TESTING

3.1 Procedure.

3.1.1 Calibrate pH/ORP and salinity (EC) meter prior to obtaining sample. Calibration of these meters will be done according to the instruction manual for each meter and shall be done using standardized buffer solutions. Calibrations will be done at the beginning of each day of sampling.

3.1.2 Measurements. ORP, conductivity, and pH readings should be taken one to two feet below the surface of the lagoon.

Measurements will be taken in one corner of the lagoon. All lagoons should be measured yearly.

3.1.3 Rinse probe after use and store in appropriate solution.

3.2 Records. Keep records of lagoon testing in a safe permanent place where they can be stored, archived, and retrieved for future reference. Transfer data to the overall Mango II-Milford Sampling and Monitoring Database. The database will be made available to the DWQ when requested.

3.3 Recommended Operational Ranges for Field Test Values. Below are the recommended ranges for ORP, pH and conductivity; these ranges are based upon our testing and limited published data. These recommended values are not intended to be a compliance limit but rather to be used as a leading indicator of lagoon functionality.

- ORP results should fall at or below –50 mV.
- The pH value for field lagoon testing should fall above 6.5.
- Conductivity will be tracked to identify trends in ionic concentrations.
- Sludge profiling is also an indicator of proper lagoon operation. Sludge profiling is done according to the approved plan. We will monitor sludge profiling in conjunction with the other recommended values mentioned above.

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4.0 OPERATION AND MAINTENANCE PROCEDURES

4.1 General. This section describes start-up, normal operating procedures, inspection response procedures, loss of waste containment procedures, and field sampling and testing response procedures.

4.2 Start-up Procedures. Fresh water should be added to the lagoon before population up to 60 percent of the total treatment volume of the lagoon according to ANSI/ASAE Engineering Practice EP403.3. Otherwise, once the lagoon liner is certified, fresh water will be immediately added through the pits in the barns so that the manure is diluted at least 60 percent. Fresh water will continue to be added until the lagoon reaches the proper seasonal level. This procedure will ensure proper conditions for bacterial growth within the lagoon.

4.3 Normal Operating Procedures. Keys to the proper operation of the system are assurance of proper water levels, development and adherence to a regular pit pull plug schedule to assure uniform loading, assurance of operational pipe and pumping equipment, good housekeeping measures, and good record keeping. The farm leader is responsible to assure compliance with normal operating procedures.

4.3.1 Correct Water Levels. The assurance of maintaining proper water levels in the lagoon will maximize treatment efficiency of hog manure, benefit hog health by providing higher quality recycle water back to the barns, and assures operation within design parameters. Each farm has a specific water balance sheet. The farm leader is to be cognizant of the appropriate water level in their lagoon at all times. Farm Leaders will refer to the water balance sheet. Water conservation measures are to be implemented if lagoon levels are too high. Supplemental water may be added at the pits inside the barn if lagoon water levels are too low. Supplemental water should be added inside the barn, using the approved hose and backflow prevention device, preferably at a location near the end of the pit, opposite the pull plug. If a site is depopulated lagoon levels will be decreasing until empty.

4.3.2 Pit Pull Plug Schedule. Several pits and pit plugs exist at each farm site. A daily pit pull plug schedule has been developed that will provide a consistent loading rate of nutrients to the lagoon system. The pit pull schedule should allow the maximum number of pits to be pulled and filled each day. When pulling a pit plug, pit wastewater is drained by gravity to the lagoon system. Once a pit is emptied, plugs should be replaced and valves from the recycle system should be opened to refill the pit. Pit plugs will not be left out over night. All pits have an overflow feature that will overflow water to the pipelines to the lagoons when the pit is full. When the

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recycle pump is running there shall always be at least two valves on the recycle system open at all times. Interruptions in the schedule, such as a broken recycle pump, may occur. Therefore, the pit pull schedule should be floating with no specific day of the week assigned to any pit, so that after interruptions, the rotation of pit changing can resume where it was interrupted.

4.3.3 Pipeline O & M. Gravity pipelines from the barn pits to the lagoons, as well as the recycle system, should be kept open and operational at all times. Take all precautions necessary to keep unwanted debris out of the waste system. Do not allow trash, feed spills, pigs, pig mortalities, or other unwanted debris into the waste system through floor grating or slats. If a noticeable increase in pit drain time is noticed maintenance should be contacted to evaluate and possibly clean out the line to remove any possible debris. Recycle pump motors and shafts should be greased by Mango II-Milford maintenance according to the Mango II-Milford preventative maintenance plan. Assure that caps are securely installed at all cleanout pipes. Obtain assistance from maintenance personnel if an unpreventable or noticed blockage in the pipeline system is detected.

4.3.4 Good Housekeeping Measures. Debris on the lagoon water surface must be removed on a monthly schedule. This keeps the lagoon aesthetically more attractive, keeps debris from clogging the lagoon crossover pipe, and prevents unwanted recycle pump failure due to a plugged intake or debris inside the pump. Upstream prevention to keep debris out of the system is the key; by assuring farm employees do not dispose of garbage, gloves, or other floating debris through slats or grating into the pits. Floating debris on the lagoon surface is to be removed using the approved devices provided at each farm site. Care will be taken to assure that the devices are used so that they will not damage the lagoon liner in any way. Dispose of debris in the on-site farm trash dumpster after removal from the lagoon. An anaerobic lagoon will naturally form a floating scum layer on the surface; this scum layer is beneficial to the lagoon and should not be removed with the debris.

4.3.5 Record Keeping. The monthly Water Usage Report and the Daily Lagoon Inspection report are to be completely filled out. The Water Usage Report is to be submitted by the farm leader to the Environmental Department at the end of each month, and no later than the first Monday of the following month. Environmental will review this report as received. Farm water use, water levels, and current water use strategies will be checked for appropriateness and if not appropriate, farm leaders will be notified of the corrective actions to be taken. Production Team Leaders will also be provided a copy of a summary report showing all farms, and

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corrective actions that needs to be taken, if any. The Daily Inspection Report will be kept in the farm's files.

4.3.6 Average Number of Animals. All farms are designed for a target number of animals, however as with any living system, some variation is to be expected in population numbers based on a seasonal and a production-needs basis. The annual average number of animals at all sow farms, the controlling factor in our production system, should be maintained at design limits to assure correct annual lagoon loading rates. All records of site animal populations will be kept on file for review.

4.4 Inspection Response Maintenance. This section describes the inspection response maintenance procedures for items requiring attention, found in the daily inspections, or monthly inspections.

4.4.1 Maintenance items that are non-urgent, but requiring attention can be corrected either by on-farm personnel, or by the maintenance department. If work is to be done by maintenance personnel a work order request form must be filled out and given to data entry. If work is urgent, i.e. waste spillage apparent, contact maintenance immediately according to the emergency action plan. For work that is not urgent and is found during the monthly inspections, Environmental will determine the items that can be repaired by maintenance personnel, or which items need to be addressed by an outside contractor. Environmental shall issue a work order to the internal maintenance personnel for the appropriate items to be repaired. The technician compiling the monthly lagoon inspection report will keep a copy of the inspection in their file box.

All work to be done on the systems shall be performed in such a manner as to bring the waste handling system within specifications of the original construction.

4.4.2 Loss of Waste Containment Procedure. In the event that there is a significant loss of waste containment the procedures described in the Spill Response Manual will be implemented. The DWQ shall be notified verbally within 24 hours of such instances. Following this notification a follow-up letter describing the leakage and the plan for making the correction shall be sent to the DWQ within 5 business days.

4.4.3 Rodent Intrusion. Rodent intrusion is defined as excessive burrowing in a lagoon dike embankment. The procedure to exterminate rodent intrusion shall be to spread rodent poison along the banks of the lagoon. Care will be taken to assure that no poison is accidentally spread into the lagoon. Rodent burrows will be backfilled as appropriate.

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4.4.4 Vegetation Control. Vegetation with deep penetrating roots should be killed on sites with clay-lined lagoons. The banks of all clayed lined lagoons will be sprayed with herbicide annually to kill the weeds. Care will be taken to assure that no herbicide is accidentally sprayed into the lagoon.

4.4.5 Erosion to Clay Lined Embankments. Erosion to clay-lined lagoon embankments usually occurs in areas where heavy wave action is present, or where riprap protection is inadequate. In areas where erosion of the embankment is evident, repairs must be made. Repairs include, but are not limited to, installation of bentonite clay chips at the erosion area, and new rip-rap installed over the eroded area at a minimum of 8-inches in thickness, using 2 to 6-inch gradation rock.

4.5 Freeboard Maintenance. Freeboard describes the measurement in elevation difference between the maximum design water level in the lagoon and the top of the dike, where water would overflow if allowed to raise above the freeboard allowance. Freeboard provides space for wave action, excessive storm water accumulation, and for emergency use for lagoon dewatering and temporary storage. All lagoon systems feature at least one primary lagoon, and one secondary lagoon (or containment basin). Each lagoon system has a specific freeboard allowance ranging from 1 foot to 3 feet.

Freeboard in the primary lagoon, in most cases, is controlled automatically by the installed crossover pipe elevation. Water cannot rise past this level, unless the secondary lagoon water level is high enough to back water into the primary lagoon or there is a blockage in the crossover pipe. If there is a few feet of elevation difference between the top of the dikes in the primary and secondary lagoons, it will be impossible for the secondary lagoon to back water up into the primary lagoon.

4.5.1 Minimal Freeboard Maintenance. Minimal freeboard maintenance describes the condition where very little freeboard exists, or lagoon water levels are high. The freeboard in the secondary lagoon (or containment basin) is the water level that needs to be monitored to assure that lagoons do not become too full. Both lagoons should be at maximum level in late spring (May), i.e., the containment basin level is full to the maximum allowable freeboard allowance. In late summer (Aug.-Sept.) the secondary lagoons should be nearly empty due to evaporation, ready to receive water from overflow from the primary during the winter months when evaporation is very low. In the event lagoon water levels exceed the freeboard allowance, reduce water consumption by enacting water conservation measures inside the barns.

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4.5.2 Excessive Freeboard Maintenance. Excessive freeboard maintenance describes the condition where lagoon water levels are too low. Only in the instance of farm depopulation should the water level in the primary lagoon be allowed to drop more than one (1) foot below the crossover pipe. Supplemental water may be added at the pits inside the barn if lagoon water levels are too low or directly to the lagoon in extreme cases. Where possible, supplemental water should be added inside the barn, using the approved hose and backflow prevention device, preferably at a location near the end of the pit, opposite the pull plug.

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