

## ***What must be included in a CAFO's Nutrient Management Plan?***

In accordance with federal regulations, the revised Order will require concentrated animal feeding operations (CAFOs) that land apply manure, litter, or process wastewater to develop and implement nutrient management plans (NMPs) by **September 30, 2014**. The National Pollutant Discharge Elimination System (NPDES) regulations at 40 CFR 122.42(e)(1) establish minimum elements that each CAFO's NMP must address. The effluent limitations guidelines at 40 CFR 412.4(c)(1) include more specific NMP requirements that apply to certain CAFOs. The table below outlines the types of requirements likely to be included in the revised Order for CAFOs in the Colorado River Basin Region.<sup>1</sup> The NMP must be resubmitted at least every five years and more frequently if it is revised.

<b>NMP Element</b>	<b>Permit Requirement<sup>1</sup></b>
Site-specific conservation practices	Identify site specific conservation practices to be implemented, including as appropriate buffers or equivalent practices to control and minimize pollutant runoff and discharge to waters of the United States.
Manure and soil testing	Identify protocols for testing manure, litter, and process wastewater for nitrogen and phosphorus annually. Dischargers who land apply manure, litter, or process wastewater must identify protocols for testing soil for phosphorus every five years. The permit will include Technical Standards for testing and analysis.
Land application	As applicable, establish protocols to land apply manure, litter, or process wastewater in accordance with site specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients. Land application protocols must be developed in accordance with Technical Standards to be included in the permit.
Records and documentation	Identify specific records that will be maintained to document the development, implementation, and management of the NMP and compliance with the minimum practices.

The technical standards for nutrient management establish specific limits on the maximum application rates for manure, litter, and process wastewater. The technical standards are provided below.

<sup>1</sup> *The requirements and permit information outlined in this handout are tentative; final requirements will be included in the final adopted Order. Please contact the Regional Board with specific questions or concerns about the requirements described here.*

## **DRAFT TECHNICAL STANDARDS FOR NUTRIENT MANAGEMENT**<sup>1</sup>

Dischargers that land apply manure, litter, or process wastewater shall comply with the following technical standards for nutrient management.

### Sampling Requirements

The Discharger shall use sample containers and sample handling, storage, and preservation methods that are accepted or recommended by the selected analytical laboratory or, as appropriate, in accordance with approved U.S. Environmental Protection Agency (USEPA) analytical methods. The following sampling procedures are standards currently recognized by the Regional Water Board. When special procedures appear to be necessary at an individual facility, the Discharger may request approval of alternative sampling procedures for nutrient management. The Executive Officer will review such requests and if adequate justification is provided, may approve the requested alternative sampling procedures.

### *Soil Sampling and Analysis*

1. At least once every 5 years, commencing with the first full calendar year regulated by the Order, the Discharger shall collect and analyze representative soil samples from all land application areas under the Discharger's control where process wastewater and/or manure is applied. Soil samples shall be collected following harvest of a crop and before nutrients are added for the following crop.
2. Soil samples shall be collected as follows:
  - a. Samples shall be collected from each land application area receiving manure and/or process wastewater. A single sample shall represent no more than 10 acres; samples shall be composited for every 80 acres. Samples shall be composited by:
    - i. Placing equal volumes of soil from each 10-acre sample site for each land application area and sample depth, in a clean plastic bucket. Moist soils may be air dried until they can be mixed easily.
    - ii. Thoroughly mixing the sample and placing at least one pint of the composite sample in a clean plastic container to be shipped to the laboratory. The laboratory should be consulted for the exact amount of sample and the sample container needed.
  - b. All samples from the same depth interval for all sites within each land application area shall be composited for analyses.
    - i. For land application areas to be planted in vegetables, samples shall be collected from a depth of 0 to 12 inches.
    - ii. For land application areas to be planted in field crops, subsamples shall be collected from 0 to 24 inches. Samples from each site shall be split into two sections representing depth intervals 0 to 12 inches and 12 to 24 inches.

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- c. Soil samples shall be collected with soil probes or augers from a minimum of 10 sites in each land application area and composited as described below.
  - i. At least three of the 10 samples shall be from the upper third of the land application area.
  - ii. In fields where soil texture, crop yield, or other soil-related factors vary, at least 10 samples shall be collected from each different area and composites from each area shall be analyzed separately.
  - iii. Sample locations in each land application area shall be recorded on a sketch for future sampling consistency.
  - iv. Soil probes or augers shall be cleaned thoroughly between samples by wiping clean with a damp cloth.

### *Manure Sampling*

Manure samples shall be collected as follows:

1. At least 10 equal-size samples of manure shall be collected from various portions of the manure pile, with most samples from the center. No more than two samples shall be collected from the surface and two from the bottom.
2. The 10 samples shall be placed in a container and mixed well before a subsample is placed in a clean container provided by or approved by the analytical laboratory that will receive the samples.
3. Sample containers that are reused shall be washed with soap and thoroughly rinsed with clean (tap) water.

### *Process Wastewater Sampling*

Process wastewater composite samples shall be collected as follows:

1. A representative composite sample of process wastewater shall be prepared based on a minimum of three time-series samples collected during a discharge event that are representative of the beginning, middle, and end of the process wastewater discharge. These samples shall be combined in a single container, mixed, and poured into a clean container provided by or approved by the laboratory that will receive the samples. Containers that are reused shall be washed with soap and thoroughly rinsed with clean (tap) water.
2. The samples shall be collected at a point that is prior to any dilution or blending with irrigation water and shall be representative of the process wastewater applied to the land application area.

### Analytical Requirements

1. Analyses of soil samples shall be conducted using methods utilized by the North American Proficiency Testing (NAPT) program or accepted by the University of California (available on the Internet at <http://anlab.ucdavis.edu/analyses/soil>).
2. Analyses of manure shall be conducted by: methods utilized by the Manure Analyses Proficiency (MAP) Testing Program or accepted by the University of California; and laboratories participating in the MAP Testing Program or other programs whose tests are accepted by the University of California.
3. Analyses of process wastewater samples shall be conducted using methods described by the MAP Testing Program or California Department of Health Services Environmental Laboratory Analytical Procedures accredited for wastewater analyses.

### Crop Nutrient Requirements

Each crop's nutrient requirements for nitrogen and phosphorus shall be determined based on recommendations from the University of California Cooperative Extension's Guidelines for Vegetable Crops – Bulletin 104-V (available for purchase - see <http://ceimperial.ucanr.edu/files/131143.doc>) or Guidelines for Field Crops – Bulletin 104-F (available for purchase – see <http://ceimperial.ucanr.edu/files/131142.docx>), or from historic crop nutrient removal. Nutrient requirements based on historic crop nutrient removal must be clearly documented in the Nutrient Management Plan (NMP).

### Available Nutrients

1. A nutrient budget for nitrogen shall be prepared that considers all potential sources of nutrients including, but not limited to animal manure and organic byproducts, waste water, commercial fertilizer, crop residues, legume credits, and irrigation water. A nutrient budget for phosphorus is required for fields rated “Medium” or higher risk using the Phosphorus Index.
2. Nutrient values of soil, manure, process wastewater, and irrigation water shall be determined based on laboratory analysis. “Book values” for manure and process wastewater may be used for planning of first year application(s) during initial development of the NMP if necessary. Acceptable book values are those values recognized by American Society of Agricultural and Biological Engineers (ASABE), the Natural Resources Conservation Service (NRCS), and/or the University of California that accurately estimate the nutrient content of the material. The nutrient content of commercial fertilizers shall be derived from the published values certified by the California Department of Food and Agriculture.
3. Nutrient credit from previous legume crops shall be determined using values based on University of California's Manure Technical Guide Series for Crop Management Professionals, *Legume N Credit for Crops Following Alfalfa* published in December 2009 (<http://groups.ucanr.org/manuremanagement/files/74626.pdf>). For legumes other than alfalfa, nutrient credits shall be determined by methods acceptable to the University of California Cooperative Extension, NRCS, or a specialist certified in preparing NMPs and the methods and values used shall be documented in the NMP.

## Nutrient Application Rates

### *General*

1. NMPs shall specify the form, source, amount, timing, and method of application of nutrients on each field to minimize nitrogen and/or phosphorus movement to surface and/or ground waters to the extent necessary to meet the provisions of the Order.
2. Where crop material is not removed from the field, waste applications are not allowed. For example, if a pasture is not grazed or mowed (and cuttings removed from the field), waste shall not be applied to the pasture.
3. Manure and/or process wastewater will be applied to the field for use by the first crop covered by the NMP only to the extent that soil tests indicate a need for nitrogen application.
4. Nutrient application rates shall not attempt to approach a site's maximum ability to contain one or more nutrients through soil adsorption. Excess applications or applications that cause soil imbalances should be avoided. Excess manure nutrients generated by the Discharger shall be handled by export to a good steward of the manure, or the development of alternative uses.
5. Planned rates of nutrient application shall be determined based on soil test results, nutrient credits, manure and process wastewater analysis, crop requirements and growth stage, seasonal and climatic conditions, and use and timing of irrigation water.
  - a. For purposes of calculating nutrient credits, mineralization rates for prior manure applications shall be determined using the values provide in Table C-1. Alternative values may be used if they are recognized by ASABE, the NRCS, and/or the University of California. Alternative mineralization rates and the source of the alternative rates must be documented in the NMP and are subject to approval of the Executive Officer.

**Table C-1. Mineralization rates for nitrogen – dairy manure**

Waste and nitrogen content	Years after initial application		
	1	2	3
	Percent available <sup>a</sup> (percent of original N applied, accumulative)		
Fresh bovine waste, 3.5% N	75	84	85.6
Dry corral manure, 2.5% N	40	55	57.7
Dry corral manure, 1.5% N	35	44.7	47.2
Dry corral manure, 1.0% N	20	28	29.4
a. Table assumes annual applications on the same site. If a one-time application, the decay series can be estimated by subtracting year 1 from year 2 and year 2 from year 3. The decay rate becomes essentially constant after 3 years.			
Source: Alison Van Eenennaam. No date. <i>Dairy Manure as a Soil Amendment</i> . University of California Cooperative Extension after Azevedo, J. and P. R. Stout. 1974. <i>Farm animal manures: an overview of their role in the agricultural environment</i> . University of California, Manual 44.			

**Table C-5. Mineralization rates for nitrogen – other manure types**

	Years after initial application		
	1	2	3
	Percent available <sup>a</sup> (percent of original N applied, accumulative)		
<b>Waste and management</b>			
Fresh poultry manure	90	92	93
Fresh swine or cattle manure	75	79	81
Layer manure from pit storage	80	82	83
Swine or cattle manure stored in covered storage	65	70	73
Swine or cattle manure stored in open structure or pond (undiluted)	60	66	68
Cattle manure with bedding stored in roofed area	60	66	68
Effluent from lagoon or diluted waste storage pond	40	46	49
Manure stored on open lot, cool-humid	50	55	57
Manure stored on open lot, hot-arid	45	50	53
a. Table assumes annual applications on the same site. If a one-time application, the decay series can be estimated by subtracting year 1 from year 2 and year 2 from year 3. For example, the decay series for fresh poultry manure would be 0.90, 0.02, 0.01. The decay rate becomes essentially constant after 3 years.			
Source: Table 11-9, USDA-NRCS Agricultural Waste Management Field Handbook			

- b. Realistic yield goals for the crop(s) to be grown shall be used in determining crop nutrient requirements. Where historic crop yield data are available, those data must be used to determine yield goals by calculating the average of the 3 highest yields for the 5 most recent years the crop was grown in the field. Where historic crop yield data are unavailable, realistic yield goals may be based on average yields published by the Imperial County Agriculture Commissioner using the average of the 3 highest yields for the 5 most recent years reported.<sup>1</sup>

Actual applications of nitrogen and phosphorus to any crop shall be limited to the amounts specified below.

### *Nitrogen*

1. The California Nitrogen Index, located in Section I of the NRCS Field Office Technical Guide (Agronomy Technical Note No. 72), shall be used to assess the risk of nitrogen loss via leaching from each field. The manure application rates, best management practices, and other relevant variables used in the index evaluation that impact nitrogen leaching potential shall be documented in the NMP. Nitrogen shall be managed to minimize leaching in accordance with the recommendations of the Nitrogen Leaching Index as follows:
  - a. **Very Low (0 – 10) or Low (>10 – 22) Risk:** Fields with a very low or low risk for N leaching may be managed using application rates and best management practices consistent with those used in the Nitrogen Index evaluation to result in the very low or low risk rating.

<sup>1</sup> The Imperial County Agricultural Commissioner’s Office publishes annual Agricultural Crop and Livestock Reports on its website: [http://www.co.imperial.ca.us/ag/Departments\\_A/agricultural\\_crop\\_&\\_livestock\\_reports.htm](http://www.co.imperial.ca.us/ag/Departments_A/agricultural_crop_&_livestock_reports.htm)  
 Technical Standards for Nutrient Management

- b. **Medium Risk (>22 – 33):** Fields with a medium risk for N leaching may be managed using application rates and best management practices consistent with those used in the Nitrogen Index evaluation to result in the medium risk rating. The operator should consider use of practices to further reduce N loss potential and improve N use efficiency, particularly for fields where the Nitrogen Index predicts very high soil residual nitrate.
  - c. **High (>33 – 45) or Very High (>45 – 58) Risk:** For fields with a high or very high risk for N leaching, nitrogen management practices must be re-evaluated. Nitrogen budgets should be used as the basis for modifying practices. Practices must be modified to reduce the nitrogen inputs that increase the risk of N leaching. Inputs of organic or inorganic N should be reduced and/or managed to better synchronize N applications with N uptake by the crop.
2. Total nitrogen from all sources including residual nitrogen in the soil and nitrogen applied in the form of manure, process wastewater, commercial fertilizer, compost, and other amendments as well as irrigation water<sup>1</sup> for each field shall not exceed the total nitrogen expected to be removed from the field through the harvest and removal of the crop to be grown. Additional nitrogen may be applied if the following conditions are met:
    - a. Plant tissue testing has been conducted and it indicates that additional nitrogen is required to obtain a crop yield typical for the soils and other local conditions;
    - b. The amount of additional nitrogen applied is based on the plant tissue testing and is consistent with University of California Cooperative Extension written guidelines or written recommendations from a professional agronomist;
    - c. The form, timing, and method of application make the nitrogen immediately available to the crop; and
    - d. Records are maintained documenting the need for additional applications.

### *Phosphorus*

1. The California Phosphorus Index, located in Section I of the NRCS Field Office Technical Guide (Agronomy Technical Note No. 62), shall be used to evaluate the risk of phosphorus transport. The California Phosphorus Index shall be used to assess all fields where manure, litter, or process wastewater will be applied, regardless of whether the field is in an area with a known phosphorus impairment. Phosphorus applications shall be made to each field based on the Phosphorus Index Risk Rating as follows:
  - a. **Low Risk:** Fields with low risk for P loss may receive manure at rates based on the N content of the manure and calculated to meet crop nitrogen needs based on a nitrogen budget. Commercial P fertilizers may be applied, if needed, utilizing soil or tissue sampling procedures and the P response threshold of the crop.
  - b. **Medium Risk:** Fields with medium risk for P loss may receive manure at rates based on the N content of the manure and calculated to meet crop nitrogen needs based on a nitrogen

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<sup>1</sup> Where available, existing published data on irrigation water nitrogen content may be used in determining the total amount of nitrogen applied. For example, Imperial Irrigation District publishes the results water quality analyses for the All-American Canal, East Highline Canal, Central Main Canal, and Westside Main Canal: <http://www.iid.com/index.aspx?page=183>.

budget. Commercial P fertilizers may be applied, if needed, utilizing soil or tissue sampling procedures and the P response threshold of the crop. Existing management on these fields will probably lead to higher risk over time. Risk should be monitored periodically using the P Index.

- c. **High Risk:** Fields at high risk for P loss may receive manure at rates to meet crop P requirements based on the P content of the manure and anticipated crop yield. Commercial P fertilizers or organic fertilizers may be applied, utilizing soil or tissue sampling procedures and the P response threshold of the crop. The Discharger shall prepare and implement a conservation plan that will lower the risk category to at least Medium when implemented. After implementation of the conservation plan has lowered the risk level, the actions required at the lower risk levels will apply.
- d. **Very High Risk:** Fields rated very high risk for P loss must not receive manure or other organic forms of P fertilizer. Commercial P fertilizers may be applied according to University of California guidelines, or guidelines recognized by the University, utilizing soil or tissue sampling procedures and P response thresholds for the crop. P may not be applied from any source if the Soil Test P exceeds 80 ppm (Olsen) or 120 ppm (Bray). When seeding winter vegetables into soils below 55 degrees Fahrenheit, 30 lbs./ac or less of P<sub>2</sub>O<sub>5</sub> may be injected as a starter fertilizer. The Discharger shall prepare a conservation plan that will lower the risk category to at least High when implemented. After implementation of the conservation plan has lowered the risk level, the actions required at the lower risk levels will apply.

2. A single application of phosphorus applied as manure may be made at a rate equal to the recommended phosphorus application or estimated phosphorus removal in harvested plant biomass for the crop rotation or multiple years in the crop sequence. When such applications are made, the application rate shall:

- not exceed the recommended nitrogen application rate during the year of application, or
- not exceed the estimated nitrogen removal in harvested plant biomass during the year of application when there is no recommended nitrogen application.
- be consistent with the P Index risk category of the field, including:
  - applications shall not be made on fields rated Very High Risk
  - applications may be made on fields rated High Risk only where the application is consistent with the required conservation plan

In addition, when such applications are made, no additional phosphorus may be applied until the amount applied in the single application has been removed through plant uptake and harvest (e.g., no additional applications for the number of years covered by the single application).