

ECONOMIC IMPACT ANALYSIS

FOR THE

**State Waste Discharge General Permit for
Concentrated Animal Feeding Operations (CAFO)**

Washington State Department of Ecology

October 2005

Executive Summary

The purpose of this economic impact analysis is to determine the costs of the proposed CAFO general permit on small businesses, and to “reduce the economic impact” when it is legal and feasible. The proposed CAFO general permit only imposes small additional compliance costs on the permitted facility. Table 1 shows the approximate state only costs that the proposed permit could impose on facilities.

Table 1. State Only Costs of the Proposed Permit*

		State Only Annual Permit Cost per Facility (over the next five years)
Beef	Large CAFO	\$0-\$94.83
	Medium CAFO	\$0-\$168.36
Dairy	Large CAFO	\$0-\$25.41
	Medium CAFO	\$0-\$50.12
Chicken	Large CAFO	\$0-\$94.83
	Medium CAFO	\$0-\$27.54

* The costs listed are limited to the costs from those state requirements above the corresponding federal requirements. See table A-2 for additional information.

To reduce the economic impact on small businesses, Ecology wrote two provisions in the CAFO general permit:

1. All animal feeding operations can avoid needing a permit. They only need a permit if:
 - a. Pollutants are discharged into waters of the state through a man-made ditch or other similar man-made device; or
 - b. Pollutants are discharged directly into waters of the state which originate outside of and pass over, across, or through the facility or otherwise come into direct contact with the animals confined in the operation.

In addition, small animal feeding operations can avoid needing a permit by not being a significant contributor of pollutants to waters of the state.

Ecology encourages all AFO operations to make the changes necessary to avoid needing a permit.

2. Medium and designated CAFOs have less-stringent environmental monitoring requirements in the proposed permit.

1. BACKGROUND

A recent federal revision to the National Pollutant Discharge Elimination System (NPDES) regulations for concentrated animal feeding operations (CAFOs)¹ (40 CFR Parts 9, 122, 123, and 412) by the Environmental Protection Agency (EPA) changed the regulatory requirements for CAFOs under the Clean Water Act. The revised federal rule made it mandatory for all large CAFOs to apply for an NPDES permit and to develop and implement a nutrient management plan. In addition, the new federal effluent guidelines establish performance expectations for existing and new CAFOs to ensure appropriate storage of manure, as well as expectations for proper land application practices at the CAFO. In 2005 the Federal Second Circuit Court vacated sections of EPA's CAFO Rules. One section the court vacated was the duty for all large CAFOs to apply for NPDES Permits. The court ruled that only CAFOs or AFOs that have a discharge must obtain a permit.

The requirements of the federal CAFO regulation will be implemented by issuing NPDES permits. State regulatory agencies with authorized NPDES programs are principally responsible for implementing and enforcing the federal rule. In Washington, The Department of Ecology is responsible for issuing these permits. The federal CAFO regulation requires states to have technical standards for nutrient management consistent with 40 CFR 412.4(c)(3), and obligates NPDES permit authorities to revise their NPDES programs expeditiously and to issue new or revised NPDES permits to include the revised effluent guidelines and other permit requirements adopted by EPA. At the same time, the proposed CAFO general permit must meet all the requirements of WAC 173-226, Waste Discharge General Permit Program.

As the state regulatory agency, Washington Department of Ecology (Ecology) is revising the draft general permit that covers CAFOs to reflect the revisions to the federal rule and Second Circuit Court decisions.

As required under WAC 173-226-120, Ecology is developing and issuing this Economic Impact Analysis (EIA) as part of this permit process. Ecology will use the information developed in the economic impact analysis as required to ensure that the proposed permit is consistent with the general permit policy.

The objective of this economic impact analysis is to reduce, where legal and feasible, the economic impact of the general permit on small business. The contents of an economic impact analysis of a proposed general permit shall include, at a minimum, the following:

- (a) A brief description of the compliance requirements of the general permit, including:
 - (i) The minimum technology based treatment requirements identified as necessary under WAC 173-226-070;
 - (ii) The monitoring requirements contained in the general permit;

¹ The Definition of CAFO, Lager CAFO, Medium CAFO, and Designated CAFO can be found in Definitions page 3 of the proposed permit. * refer to EPA's reg

- (iii) The reporting and recordkeeping requirements; and
- (iv) Any plan submittal requirements

(b) The estimated costs of compliance, based upon existing data for facilities intended to be covered under the general permit. Costs shall include, consistent with subsection (2) of this section the following:

- (i) The costs associated with (a) of this subsection; and
- (ii) The costs of equipment, supplies, labor, and any increased administrative costs;

(c) A comparison, to the greatest extent possible, of the cost of compliance for small businesses with the cost of compliance for the largest ten percent of the facilities intended to be covered under the general permit. The economic impact analysis shall use one or more of the following as a basis for comparing costs:

- (i) Cost per employee;
- (ii) Cost per hour of labor;
- (iii) Cost per one hundred dollars of sales.

2. BRIEF DESCRIPTION OF COMPLIANCE REQUIREMENTS

In 2002, the federal Environmental Protection Agency revised the Clean Water Act regulation for CAFOs. Those rules stated all CAFO owners and operators must apply for a permit. However, in 2005 the Federal Second Circuit Court vacated sections of the revised CAFO regulations. One of the sections vacated was the requirement all CAFOs obtain an NPDES permit. The definition of a CAFO is in the definition section of the proposed State permit. As a result, Ecology must modify its draft CAFO general permit to keep current with the federal regulation and courts decisions.

The permit will require CAFOs to meet certain conditions for their production and land application areas. The production area is the area where animals are housed and manure is stored. The land application area includes all the land under the CAFO's control where it spreads manure.

Permit Requirements:

- Implement a nutrient management plan
- Submit annual reports to the state
- Keep the permit current until the CAFO completely closes the operation and removes all manure
- Retain records of the nutrient management practices for at least 5 years

Nutrient management plans for all CAFOs must include provisions for:

- Assuring adequate manure storage capacity
- Proper handling of dead animals and chemicals
- Diverting clean water from the production area
- Keeping animals out of surface water

- Using site-specific conservation practices
- Testing manure and soil
- Assuring appropriate use of nutrients when the CAFO spreads manure
- Keeping records of the nutrient management practices

Production area requirements:

- Design the production area to contain all of the manure plus the runoff from a 25-year, 24-hour rainfall event (large storms). (Overflows from large storms are allowed only if the operation is designed and operated to meet these specifications.)
- Install depth markers in liquid manure storage structures
- Inspect the production area weekly and all water lines daily
- Correct any problems as soon as possible
- Properly handle dead animals

Transferring manure to other people:

- Retain records for at least five years on the date, recipient, amount, and nutrient content of the manure transferred
- Information about the nutrient content of the manure must be given to the recipient

3. ANALYSIS OF COSTS

The primary reason for Ecology’s revisions to the CAFO general permit is to keep current with the corresponding federal requirements and Second Circuit Court rulings. When adopting a state CAFO general permit, at a minimum, Ecology must meet the federal requirements. The federal CAFO rule has detailed requirements for the large CAFOs, while at the same time, gives Ecology some flexibility in establishing the requirements for medium and designated CAFOs.

WAC 173-226-120 describes the costs that Ecology is required to examine in this economic impact analysis. However, there are certain things that the Ecology does not have to include in the analysis. The rule states that:

- (4) The following compliance costs associated with a general permit shall not be included in the economic impact analysis:*
- (a) The costs necessary to comply with chapters 173-200, 173-201, 173-204, and 173-224 WAC; and*
 - (b) The costs associated with requirements of the general permit which result from conformity or compliance, or both, with federal law or regulations.*

Even if the CAFO general permit did not exist, CAFOs operating in Washington would be required to comply with the federal rule and other state regulations. The proposed CAFO general permit requirements are mostly based on the federal CAFO regulation, Federal Second Circuit Court decisions and various state laws and regulations. If the CAFO general permit requirements are not more stringent than the federal requirements

or other state laws and regulations, they are not considered as an additional cost in this economic impact analysis.

As such, this economic impact analysis will only analyze the additional costs resulting from the permit that are more stringent than those in the federal regulation or other state laws and regulations.

The following provides a brief description and analysis of the compliance requirements of the proposed CAFO general permit that will generate additional costs to those required to comply.

2.1 Effluent limitation

EPA is applying technology-based Effluent Limitation Guidelines and Standards (ELGs) only to those operations that are defined as large CAFOs (40 CFR 122.23). In the case of medium or designated CAFOs, effluent limitations must be established on a case-by-case basis by the permitting authority using Best Professional Judgment (BPJ). In Washington, Ecology is proposing a CAFO general permit that sets almost the same requirements for all CAFOs, no matter whether they are a large, medium, or designated CAFO. Large CAFOs do have additional monitoring and reporting requirements.

Therefore, when conducting this analysis, Ecology needs to compare the EPA standard of BPJ to the standard proposed by Ecology in the permit. BPJ would be different for each state, and EPA expects each state to determine what makes the most sense. Ecology set the requirements for medium and designated CAFOs in the permit using BPJ. Since this matches EPA's requirement², the additional cost of the permit on medium and designated CAFOs is zero.

However, some may argue that the requirements in the permit could have been less stringent, at least in theory. For the purposes of this economic impact analysis, Ecology will also analyze the difference in cost between what is in the proposed permit and an hypothetical scenario with less-stringent requirements for medium and designated CAFOs. For this analysis, Ecology will assume that the hypothetical less-stringent requirements are as low as 75% of the requirements in the proposed general permit. This means that the additional costs incurred by the proposed general permit are assumed to be 25% of the cost for medium and designated CAFOs to meet the requirements of the proposed general permit.

For storage, the hypothetical less-stringent requirement is to process at least 75% of "the runoff and the direct precipitation from a 25-year, 24-hour rainfall event". The additional costs from the permit requirements are the costs to build a larger lagoon or pond to store the additional storm water and corresponding operation and maintenance costs. These costs vary with the types of CAFO waste management systems.

² In its cost analysis, EPA implicitly assumes that most requirements for medium and designated CAFO are the same as those for large CAFO.

For the ground water effluent limitation, the proposed State requirements are not more stringent than those in WAC 173-200. The proposed state CAFO general permit will not incur additional costs to those required to comply.

2.2 Manure Transfer

Medium and designated CAFOs will incur additional costs for record keeping of manure transfer and the depth marker under the hypothesis scenario, which are only explicitly required for large CAFOs under the federal regulations.

Ecology assumes that at most 25% of the costs for medium and designated CAFO to meet the proposed state standard accounts for the additional cost attributed to the proposed general permit. This approach also applies to the cost generated from the requirements in section 2.3 and section 2.4.

2.3 Manure and Soil Sampling

The proposed CAFO general permit requires that manure be analyzed a minimum of once a year for nitrogen and phosphorus content. Soil must be analyzed a minimum of once every five years for phosphorus content. These requirements will incur additional sampling (monitoring) costs to medium and designated CAFOs because the federal requirements are limited to large CAFOs.

2.4 Setback Requirements

The setback requirements in the proposed CAFO general permit apply to all CAFOs, while the federal requirements just apply to large CAFOs. The setback requirements will impose additional cost in terms of land loss, and/or additional capital investment and operation and maintenance costs to medium or designated CAFOs.

2.5 Environmental Monitoring

The proposed CAFO general permit requires that large CAFOs must use environmental monitoring to demonstrate that a nutrient management plan, and its implementation, is effectively treating nutrients in the soil to protect ground water quality. Monitoring must take place at least once a year. In order to meet this requirement, large CAFOs can use annual soil monitoring, or may choose to use ground water monitoring. This requirement is more stringent than the federal regulation, which requires sampling of soil at least once every five years. And, it will incur additional sampling or monitoring costs to large CAFOs. The environmental monitoring requirements do not apply to medium and designated CAFOs.

Other requirements of the proposed CAFO general permit are determined to be no more stringent than those that are in the federal CAFO regulation, and in other state laws and regulations. As such, the proposed CAFO general permit will not generate additional costs from these requirements.

4. ESTIMATED COSTS OF COMPLIANCE AND COMPARISON

WAC 173-226-120 requires that the economic impact analysis estimate the cost of compliance, and compare the cost of compliance for small business with the cost of compliance for the largest ten percent of the facilities intended to be covered under the general permit. The data used in this economic impact analysis for the cost estimation are mostly from:

1. *Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations*, Published by EPA in December 2002;
2. The Washington State Employment Security Department (ESD);
3. The number of large and medium CAFOs in Washington is from the supporting *Fact Sheet* prepared by Ecology for the proposed CAFO permit.

The most important data³ necessary for the cost estimation and cost comparison are listed in the tables in Appendix A.

The following methodology/assumptions were used when conducting this section of the economic impact analysis:

1. The cost estimation methods are based on the type of waste management system and the size of CAFO (large, medium, or designated).
2. Small business defined in WAC 19.85.020 refers to businesses with 50 or fewer employees, while the definition of CAFO is based on the number of animals. Most CAFOs meet the definition for small business. Therefore, a business that meets the definition of *small business* may be a large CAFO, and incur the costs of a large CAFO.
3. Due to data limitations, this economic impact analysis will only analyze Cattle CAFOs and Dairy CAFOs in detail, and will provide a rough estimate for the egg layer CAFOs. For other CAFOs, the existing data can not make a reliable distinction of businesses and CAFOs. Moreover, the business units in some CAFO categories are of similar size with respect to employee numbers, and all are small businesses.
4. Most individual CAFOs are currently implementing certain waste management techniques or practices that are called for in the proposed permit. Only costs that are the direct result of the permit are included in the cost model. Therefore, costs already incurred by existing operations are not attributed to the proposed permit. When analyzing the impacts from the proposed permit, this economic impact analysis will use the same methodology posed by EPA (the frequency factors) to adjust the results.
5. If data for Washington are not available, Ecology used data from the Pacific region⁴, or from the whole nation, on a ratio basis, to substitute.

³ Not all data are listed. Other data can be found easily in the data sources.

⁴ California, Oregon, and Washington.

6. Cost estimations are based on the types of waste management system in addition to the types of CAFO. Ecology uses the same model farm waste management systems as those used by EPA to estimate the additional compliance cost of the proposed CAFO general permit. Appendix B depicts these systems. A type of CAFO may have more than one type of waste management system, such as dairy and egg layer CAFOs.

Based on the data and model mentioned above and listed in the Appendices, Ecology can estimate the costs to different CAFOs. The results are listed in Table A-11 of Appendix A. Comparing the additional costs from the proposed general permit with the costs generated from the federal regulations, listed in Table A-2 of Appendix A, the maximum additional costs from the proposed permit are no more than a few percentage of the total compliance costs (including the cost to comply with federal regulations). The cost per employee is listed in the table below:

Table 2. Cost Per Employee from the Proposed Permit ⁵

	<i>Small business</i>	<i>Top 10% business</i>
Cattle CAFO	\$0-\$10.79	\$0-\$1.29
Dairy CAFO	\$0-\$5.08	\$0-\$1.16
Egg Layer CAFO	\$0-\$7.02	\$0-\$2.31

From Table 2, it is clear that the cost per employee for small businesses is not large, but can be significantly greater than the largest ten percent of the facilities (businesses) covered under the general permit. This result is consistent across the three CAFO categories.

5. REDUCING THE ECONOMIC IMPACTS

As required by WAC 173-226-120 (2), the purpose of the economic impact analysis is to reduce the economic impact of the general permit on small business. Ecology is reducing the impacts to small business, where is legal and feasible, by:

(a) Only AFOs that have an discharge are always required to obtain a permit. All animal feeding operations can avoid needing a permit. They only need a permit if:

- a. Pollutants are discharged into waters of the state through a man-made ditch or other similar man-made device; or
- b. Pollutants are discharged directly into waters of the state which originate outside of and pass over, across, or through the facility or otherwise come into direct contact with the animals confined in the operation.

In addition, small animal feeding operations can avoid needing a permit by not being a significant contributor of pollutants to waters of the state.

⁵ Small business may include both large CAFO and medium CAFO.

Ecology encourages all AFO operations to make the changes necessary to avoid needing a permit.

(b) Only requiring large CAFOs to do the environmental monitoring and certain record keeping. This exempts small businesses from parts of the general permit. It establishes differing compliance and reporting requirements for small business. It also clarifies, consolidates, and simplifies the compliance and reporting requirements under the general permit for small business.

(c) Establishing performance rather than design standards. Many of the permit requirements are based on performance.

Appendix A. Tables

Table A-1. Size of firms in Washington. For example, there are 11 “cattle feedlots” in Washington with one to four employees. Those 11 feedlots employ 23 people total.

NAICS Code	Animal Type	Grand Total		Firms with 0 Employees		Firms with 1-4 Employees Each		Firms with 5-9 Employees Each		Firms with 10-19 Employees Each		Firms with 20-49 Employees Each		Firms with 50-99 Employees Each	
		# of firms	Total # of Employees	# of firms	Total # of Employees	# of firms	Total # of Employees	# of firms	Total # of Employees	# of firms	Total # of Employees	# of firms	Total # of Employees	# of firms	Total # of Employees
112111	Beef cattle ranching and farming	260	466	83	0	152	267	19	133	6	66	0	0	0	0
112112	Cattle feedlots	23	533	0	0	11	23	4	28	*	*	*	*	3	221
112120	Dairy cattle and milk	485 ⁶	3323	50	0	223	539	114	733	70	985	20	567	8	499
112210	Hog and pig farming	4	3	*	*	*	*	0	0	0	0	0	0	0	0
112310	Chicken egg production	24	446	*	*	3	11	11	76	3	39	3	123	*	*
112320	Broilers and meat type chicken production	19	47	*	*	13	26	4	21	0	0	0	0	0	0
112330	Turkey production	*	*	*	*	*	*	*	*	*	*	*	*	*	*
112340	Poultry hatcheries	4	87	0	0	*	*	0	0	*	*	*	*	0	0
112390	Other poultry production	4	20	0	0	*	*	*	*	*	*	0	0	0	0
112410	Sheep farming	5	7	*	*	3	7	0	0	0	0	0	0	0	0
112420	Goat farming	*	*	*	*	*	*	*	*	*	*	*	*	*	*
112920	Horses and other equine	84	163	22	0	54	104	7	48	*	*	0	0	0	0
112990	All other animal	32	121	5	0	21	34	*	*	*	*	*	*	0	0
TOTAL		946	5,234	168	-	486	1,024	162	1,057	87	1,192	29	865	*	*

* Employment Securities did not supply this data due to confidentiality concerns.

⁶ The number of firms in the table uses the North American Industry Classification System (NAICS) code “112120” called “Dairy Cattle and Milk Production.” The number of firms comes from Unemployment Insurance Covered Employment and Payroll database of Washington State Department of Employment Security. This database is estimated including 85-90% of all employers in the state, so some smaller farms may not be included in the total number of firms. According to the Washington State Dairy Federation there are 560 dairies in the state. There are currently 127 dairies permitted by Ecology in Washington.

Table A-2. Costs. The costs from the federal requirements (not annualized) are from the EPA and are listed in the table. The capital costs from the federal requirements range from about \$8,000 to \$470,000. The annualized permit costs range from \$0-\$168. In this table, for the beef and dairy facilities the manure type is liquid/solid, while the chicken facilities are solid.

Animal	Farm Type	Size Class	Costs from Federal Requirements (not annualized)					Annualized Permit Cost
			Capital costs	Fixed Costs	Annual O&M Costs	3-Year Recurring O&M Costs	5-year Recurring O&M Costs	
Beef	Beef	Large 1	\$45,860	\$2,601	\$26,189	\$334	\$1,301	\$0-\$94.83
Beef	Beef	Large 2	\$473,834	\$14,747	\$49,378	\$3,605	\$18,533	
Beef	Beef	Medium 1	\$29,721	\$1,732	\$3,535	\$945	\$364	\$0-\$168.36
Beef	Beef	Medium 2	\$50,000	\$2,118	\$4,141	\$1,464	\$784	
Beef	Beef	Medium 3	\$53,167	\$2,572	\$5,458	\$2,072	\$1,279	
Dairy	Flush	Large 1	\$110,106	\$1,866	\$195,249	\$138	\$642	\$0-\$25.41
Dairy	Flush	Medium 1	\$29,008	\$1,862	\$2,116	\$144	\$595	\$0-\$50.12
Dairy	Flush	Medium 2	\$45,130	\$1,640	\$53,190	\$88	\$314	
Dairy	Flush	Medium 3	\$60,657	\$2,044	\$9,242	\$196	\$825	
Dairy	Hose	Large 1	\$19,407	\$1,866	\$5,805	\$138	\$642	\$0-\$25.41
Dairy	Hose	Medium 1	\$19,702	\$1,862	\$2,755	\$2,958	\$595	\$0-\$50.12
Dairy	Hose	Medium 2	\$47,815	\$1,640	\$3,351	\$1,312	\$314	
Dairy	Hose	Medium 3	\$51,284	\$2,044	\$4,042	\$1,420	\$825	
Chicken	Solid	Large 1	\$32,906	\$142	\$2,221	\$19	\$35	\$0-\$94.83
Chicken	Solid	Large 2	\$96,519	\$153	\$4,047	\$24	\$45	
Chicken	Solid	Medium 1	\$8,257	\$171	\$1,201	\$34	\$63	\$0-\$27.54
Chicken	Solid	Medium 2	\$14,037	\$225	\$1,339	\$63	\$117	
Chicken	Solid	Medium 3	\$17,832	\$460	\$1,303	\$189	\$352	

Table A-3. EPA's Size Classes for Estimating the Costs of Model Farms. The number of animals are listed in the table.

	Large 1	Large 2	Medium 1	Medium 2	Medium 3
Beef	1,000 – 7,999	>=8,000	300-499	500-749	750-999
Dairy-Flush	>=700	N/A	200-349	350-524	525-699
Dairy-Hose	>=700	N/A	200-349	350-524	525-699
Chicken	82,000-599,999	>600,000	25,000-49,999	50,000-74,999	75,000-81,999

Table A-4. Acreage for Beef and Dairy CAFO

		Category* 1 Acreage		Category* 2 Acreage	
		N-Based	P-Based	N-Based	P-Based
Beef	Large 1	155	1317	25	417
	Large 2	2189	18544	685	5721
	Medium 1	31	265	8	116
	Medium 2	47	395	23	246
	Medium 3	65	549	41	399
Dairy-Flush	Large 1	240	1242	48	182
	Medium 1	42	217	32	177
	Medium 2	71	369	16	94
	Medium 3	101	521	45	245
Dairy-Hose	Large 1	240	1242	48	182
	Medium 1	42	217	32	177
	Medium 2	71	369	16	94
	Medium 3	101	521	45	245

* Each model farm is analyzed under three possible land availability scenarios, named Category 1, Category 2, and Category 3. Operations in Category 1 have sufficient cropland to land apply all of their manure and waste, and therefore have no transportation costs. Operations in Category 2 have some cropland. Therefore, Category 2 operations land apply a portion of their manure and waste and transport the remainder off site. Operations in Category 3 have no cropland, and therefore transport all of their manure and waste off site. Note that some operations are Category 1 when applying manure and wastewater on a nitrogen-based (N-Based) rate, but may become Category 2 operations when applying manure and wastewater on a phosphorus based (P-Based) rate.

Table A-5. Percentage of N and P Based Application for Beef and Dairy CAFO

		Nitrogen Based Application			Phosphorus Based Application		
		Category* 1	Category* 2	Category* 3	Category* 1	Category* 2	Category* 3
Beef	Medium 1	84%	9%	7%	62%	31%	7%
	Medium 2						
	Medium 3						
	Large 1	68%	21%	11%	22%	67%	11%
	Large 2	8%	53%	39%	1%	60%	39%
Dairy	Medium 1	50%	36%	14%	25%	61%	14%
	Medium 2						
	Medium 3						
	Large 1	27%	51%	22%	10%	68%	22%

Table A-6. Cost of Lagoon or Pond

	Pacific	Capital (\$)	O&M (\$)
Beef	Large 1	43,420	2,171
	Large 2	217,952	10,898
	Medium 1	19,011	951
	Medium 2	22,843	1,142
	Medium 3	26,865	1,343
Dairy-Flush	Large 1	250,951	12,548
	Medium 1	73,971	3,699
	Medium 2	104,068	5,203
	Medium 3	134,457	6,723
Dairy-Hose	Large 1	136,355	6,818
	Medium 1	39,573	1,979
	Medium 2	54,965	2,748
	Medium 3	69,723	3,486

Table A-7. Percentage of CAFOs incurring a cost to install a lagoon or pond

Beef	Large 1	0%
	Large 2	0%
	Medium 1	50%
	Medium 2	50%
	Medium 3	50%
Dairy	Large 1	0%
	Medium 1	10%
	Medium 2	10%
	Medium 3	10%

Table A-8. Runoff from CAFOs

		Six-Month Runoff Volumes (ft ³)	25-Year, 24-Hour Rainfall Event Runoff Values (ft ³)
Beef	Medium 1	131,905	134,742
	Medium 2	196,788	201,020
	Medium 3	273,079	278,952
	Large 1	655,604	669,703
	Large 2	9,232,281	9,430,824
Dairy	Medium 1	40,106	40,969
	Medium 2	68,181	69,647
	Medium 3	96,255	98,325
	Large 1	229,408	234,341

Table A-9. Manure Generation

		lbs/day
Beef	Medium 1	20,427
	Medium 2	30,495
	Medium 3	42,330
	Large 1	101,590
	Large 2	1,430,804
Dairy	Medium 1	17,010
	Medium 2	26,578
	Medium 3	37,209
	Large 1	63,787

Table A-10. Waste Water Generation

		Average Head	gal/day
Dairy - Flush	Medium 1	250	34,808
	Medium 2	425	58,570
	Medium 3	600	82,933
	Large 1	1430	186,378
Dairy - Hose	Medium 1	250	692
	Medium 2	425	856
	Medium 3	600	1,020
	Large 1	1430	1,371

Table A-11. CAFO costs

	Average Annualized Total Compliance Cost ⁷		
Large CAFO	Cattle	Dairy ⁸	Layer ⁹
Soil Sampling	\$0-\$94.83	\$0-\$25.41	\$0-\$94.83
Total	\$0-\$94.83	\$0-\$25.41	\$0-\$94.83
Medium CAFO			
Runoff	\$0-\$148.08	\$0-\$34.60	\$0-\$7.40
Marker ¹⁰	\$0-\$0.15	\$0-\$0.15	\$0-\$0.01
Setback	\$0-\$12.00	\$0-\$7.63	\$0-\$12.00
Soil Sampling	\$0-\$1.20	\$0-\$0.81	\$0-\$1.20
Manure Sampling	\$0-\$5.75	\$0-\$5.75	\$0-\$5.75
Transfer Document	\$0-\$1.18	\$0-\$1.18	\$0-\$1.18
Total	\$0-\$168.36	\$0-\$50.12	\$0-\$27.54

Table A-12. Average Number of Employees

	<i>Small business</i>	<i>Top 10% business</i>
Cattle CAFO	15.60	73.67
Dairy CAFO	5.92	21.99
Egg Layer CAFO	12.45	41.00

Table A-13. Cost Per Employee¹¹

	<i>Small business</i>	<i>Top 10% business</i>
Cattle CAFO	\$0-\$10.79	\$0-\$1.29
Dairy CAFO	\$0-\$5.08	\$0-\$1.16
Egg Layer CAFO	\$0-\$7.02	\$0-\$2.31

⁷ The annualized cost uses a discount rate of 5% to convert one time capital cost.

⁸ Assume flush dairy CAFO and hose dairy CAFO half by half.

⁹ The results of egg layer CAFO are of the least accuracy. Some of the parameters of the waste management system are derived from cattle CAFO.

¹⁰ Assume change a marker every 5 years.

¹¹ Small business may include both large CAFO and medium CAFO. The percentage is derived by comparing data from the *Fact Sheet* and ESD's employment data.

Appendix B Waste Management System

Figure 1. Cattle Model Farm Waste Management System

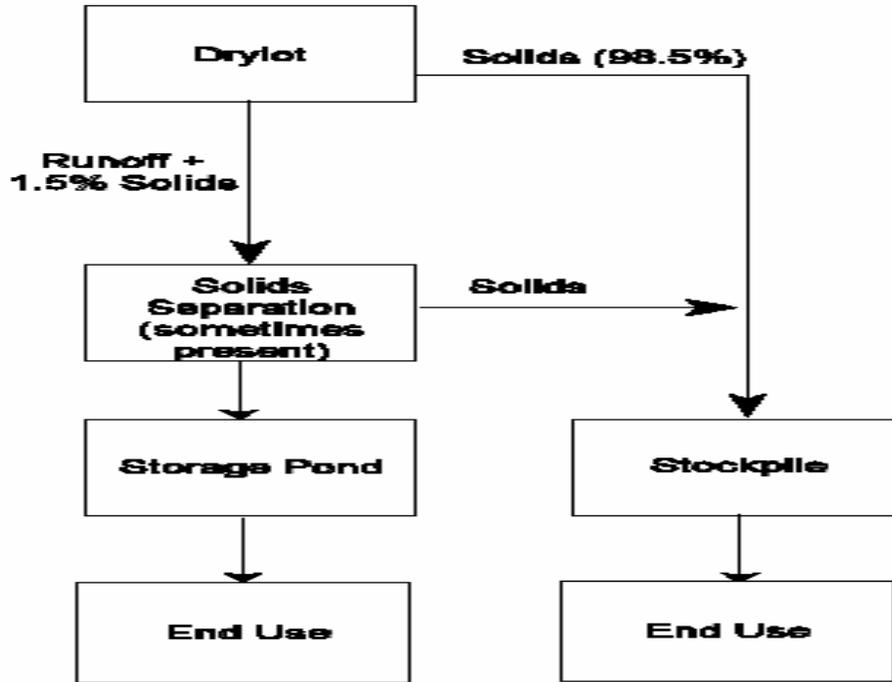


Figure 2. Layer Model Farm Waste Management System

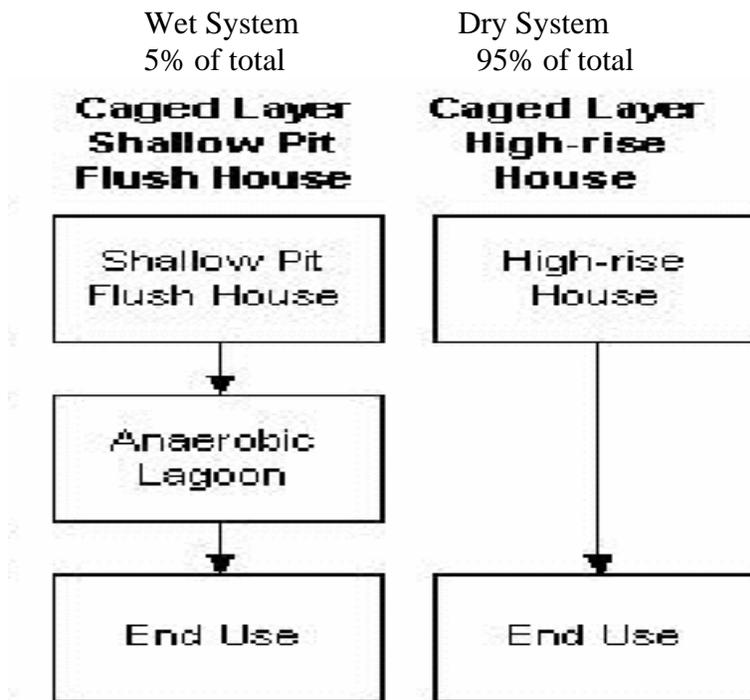


Figure 3. Flush Dairy Model Farm Waste Management System

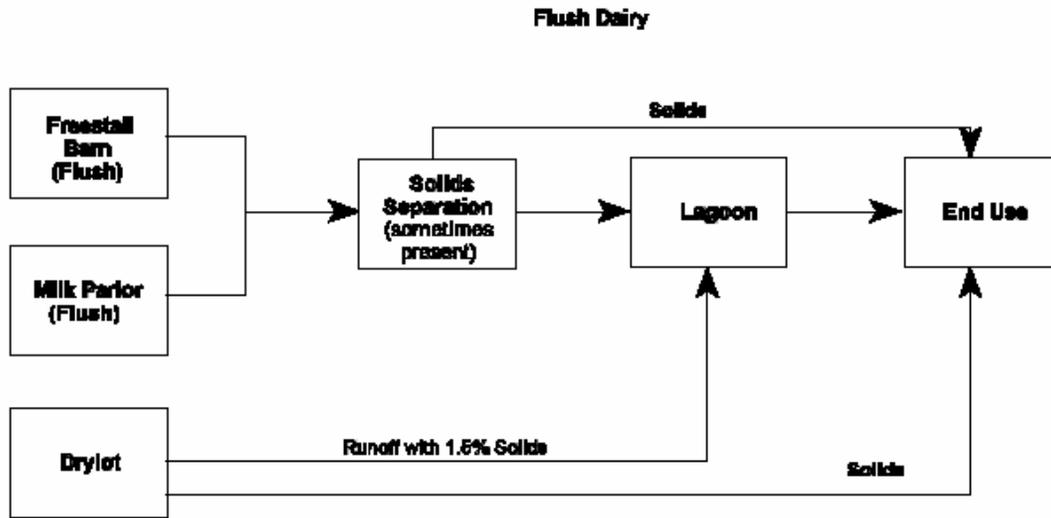


Figure 4. Scrape/Hoss Dairy Model Farm Waste Management System

