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Economic and Environmental Benefits Analysis of the Final Meat and Poultry Products Rule

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%DOsat	Percent Dissolved Oxygen Saturation
1Q10	Lowest 1-day average flow that occurs (on average) once every 10 years
7Q10	Lowest 7-day average flow that occurs (on average) once every 10 years
AFO	Animal Feeding Operation
AP	Alkylphenol Polyethoxylates
AQUIRE	Aquatic Information Retrieval System
ASTER	Assessment Tools for Environmental Risk
ATtILA	Analytical Tools Interface for Landscape Assessments
AWQC	Ambient Water Quality Criteria
BAC	Baseline Average Concentration
BAT	Best Available Technology
BCF	Bioconcentration Factor
BOD	Biochemical Oxygen Demand
BOD_5	Biochemical Oxygen Demand
CAFO	Confined Animal Feeding Operation
COD	Chemical Oxygen Demand
CSO	Combined Sewer Overflow
CWS	Community Water System
DAF	Dissolved Air Flotation
DEM	Digital Elevation Model
DO	Dissolved Oxygen
EAD	Engineering and Analysis Division
EC_{50}	Concentration that provokes a response halfway between baseline and maximum
EEBA	Economic and Environmental Benefits Analysis
ELG	Effluent Limitation Guideline
Eutro-WASP5	Eutrophication model in WASP5
FCB	Fecal Coliform Bacteria
FEC	Fecal Coliform
GIS	Geographic Information System
HEAST	Health Effects Assessment Summary Table
IFD	Industrial Facilities Discharge
IRIS	Integrated Risk Information System
LADD	Lifetime Average Daily Doses
LC_{50}	lethal concentration that kills 50% of the test animals
LOEC	Lowest-Observed-Effect Concentration
MATC	Maximum Allowable Toxicant Concentration
MP&M	Metal Products and Machinery
MPP	Meat and Poultry Products
N	Nitrogen
NASQAN	National Stream Quality Accounting Network
NAWQA	National Water Quality Assessment
NED	National Elevation Dataset
NH_3-N	Ammonia Nitrogen
NLCD	National Land Cover Data
NO_3	Nitrate
NODA	Notice of Data Availability

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NOEC	No-Observed-Effect Concentration
NPS	Nonpoint Source
NWPCAM	National Water Pollution Control Assessment Model
O&M	Operation and maintenance
P	Phosphorus
PCS	Permit Compliance System
PO_4	Phosphate
POCs	Pollutants of Concern
PS	Point Source
QSAR	Quantitative Structure Activity Relationship
RBC	Risk-Based Concentration
RF1	Reach File 1
RF3	Reach File 3
RF3 Lite	Subset of Reach File 3
RfD	Reference Dose
RUSLE	Revised Universal Soil Loss Equation
SDWIS	Safe Drinking Water Information System
SF	Slope factor
SPARROW	Spatially Referenced Regressions On Watershed
STORET	Storage and Retrieval Repository for Water Quality and other Data
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TRI	Toxic Release Inventory
TS	Total Solids
TSS	Total Suspended Solids
USGS	U.S. Geological Survey
WASP	Water Quality Simulation Program
WaTER	Water Treatment Estimation Routine
WQI	Water Quality Index
WQL	Water Quality Ladder
WSDB	Water Supply Database
WTP	Willingness to Pay

EXECUTIVE SUMMARY

ES.1 BACKGROUND

The U.S. Environmental Protection Agency is promulgating revised subcategorization and effluent limitations guidelines and standards for the meat and poultry products (MPP) industry point source category. The current meat products rule, 40 CFR Part 432, sets effluent guidelines and limitations for the beef, pork, and rendering sectors of the meat products industry. These standards were set and revised over a number of years, most recently in 1995. This final rule revises the existing subcategories in the industry as well as guidelines for those subcategories, and sets new standards for facilities that perform poultry slaughter and processing operations. Prior to this rule, EPA had set no national effluent limitations guidelines or standards for poultry slaughterers or processors.

With the exception of small processors (Subcategory E), EPA is revising Best Practicable Control Technology Currently Available (BPT), Best Available Technology Economically Achievable (BAT), and New Source Performance Standards (NSPS) in Subcategories A - D (meat facilities that perform slaughter operations), and Subcategories F - I (facilities that process meat not slaughtered at the facility). EPA is revising BAT and NSPS in Subcategory J (rendering facilities). EPA is creating two new subcategories (K and L) for facilities that slaughter and process poultry, and setting BPT, BAT, BCT, and NSPS for these poultry subcategories. EPA is not revising current guidelines and standards for indirect dischargers in the meat subcategories, nor is it setting standards for indirect dischargers in the poultry subcategories.

ES.2 INDUSTRY OVERVIEW

The meat products industry includes establishments that primarily slaughter livestock and/or process meat into products for further processing or for final sale to consumers. The industry can be roughly divided into meat facilities, primarily producing beef or pork products, and poultry facilities, which primarily produce chicken (excluding eggs) and turkey products. (Meat facilities may also process lamb or veal. Poultry facilities may also process other birds, such as ducks and geese, and also small

game, such as rabbits.) Facilities may perform slaughtering operations, processing operations from carcasses slaughtered at other facilities, or both. In addition, rendering operations may be performed either at stand alone facilities, or in combination with slaughter and/or further processing operations. Companies that own meat product facilities may also own facilities that perform "upstream" or "downstream" operations involved in getting meat products from the farm to the consumer (e.g., livestock raising, wholesale distribution), but these facilities are not considered part of the meat products industry.

ES.3 DATA SOURCES

The economic analysis relies on a wide variety of sources. Both data availability and relevance determined the relative reliance EPA placed on different sources for various components of the economic profile, methodology, and analysis.

EPA surveyed the meat products industry under authority of the CWA Section 308 (U.S. EPA, 2002). EPA administered 1,650 screener surveys and 350 detailed surveys. EPA used data from the screener survey to classify and subcategorize facilities by meat type, processes performed, and facility size to determine the relevant industry population potentially affected by the final rule, and to provide a framework for the estimation of compliance costs and economic impacts. EPA used facility and company specific financial data from the detailed survey to develop models for estimating impacts of the final rule.

EPA used the U.S. Census Bureau's *1997 Economic Census* to develop economic model facilities for estimating impacts of the final rule in those subcategories for which detailed survey data were unavailable. EPA also obtained special tabulations of Census data to statistically model the distribution of facilities represented by each model facility. EPA used U.S. Department of Agriculture (USDA) publications as data sources for the baseline economic models and the analysis of changes and trends in the industry over time. Publications by USDA's Economic Research Service were a rich source of information and analysis on important issues such as the demand for meat products, industry concentration, competitiveness, and technological change.

Academic journals were an important source of information on the nature of competition in the meat products industry, technological change, and industry trends. EPA also used academic research to provide econometric estimates of key industry parameters — such as the price elasticities of demand and supply — for its economic impact models. EPA used industry sources such as trade journals and trade associations to develop its industry profile, and to formulate a better understanding of industry changes, trends, and concerns.

ES.4 ECONOMIC METHODOLOGY

EPA developed capital and operating and maintenance (O&M) costs for incremental pollution control. The capital cost, a one-time cost, is the initial investment needed to purchase and install equipment involved in pollution control. The O&M cost is the annual cost of operating and maintaining that equipment; a site incurs its O&M cost each year. For the final rule, EPA estimated facility-specific compliance costs (for details, see the Development Document, U.S. EPA, 2004).

EPA then annualized the estimated capital and O&M compliance costs. Annualized costs are calculated as the equal annual payments of an annuity that has the same present value as the stream of cash outflow over the project life and includes the opportunity cost of money or interest. An annualized cost is analogous to a mortgage payment that spreads the one-time investment of a home over a series of constant monthly payments. EPA annualizes capital and O&M costs because: (1) capital costs are incurred only once in the equipment's lifetime and the initial investment should be expended over the life of the equipment, and (2) money has a time-based value, so expenditures incurred at the end of the equipment's lifetime or O&M expenses in the future are not the same as expenses paid today.

EPA used its estimated annualized compliance costs in four different levels of analysis:

- Facility-level closure impacts model (see Section 3.3 for details),
- Company-level financial ratio analyses (see Section 3.4 for details),
- Market model (see Section 3.5 for details), and
- National impacts (see Section 3.7 for details).

Each is discussed briefly, below. For both the facility and company level analyses, EPA used two distinct sets of models. In Subcategories A - D and K, facility and company specific detailed survey financial data were available, and EPA used discounted cash flow and Altman Z models for the closure and financial ratio analyses respectively. For facilities in Subcategories F - I, J, and L, no detailed survey financial data were available, and EPA used a model facility approach to project impacts.

In Subcategories A - D, and K, EPA projects facility closures using a discounted cash flow analysis that compares the costs incurred during 16-year period from 2005 to 2020 to the net income accumulated during that same period. This analysis discounts both costs and earnings with the facility-specific discount rate reported in the detailed questionnaire to take into account the time value of money and place both time series on a comparable basis. To be considered a closure under the final rule, a facility has to show both (1) positive long-term earnings without the regulation and (2) negative long-term earnings as a result of the regulation in the majority of the forecasts. EPA used a forecasting model based on historical farm-to-wholesale price margin data (wholesale production cost and wholesale price margin for poultry) to project facility net income over the 16 year project life. To account for uncertainty in both the forecast future facility net income, and the appropriate start point of the forecast, EPA selected three methods for projecting future facility net income. EPA used the preponderance of evidence under different forecasting methods to determine if a facility is projected to close. That is, EPA projects a facility will close if the present value (PV) of future compliance costs exceeds the forecast PV of net income under two of the three forecasting methods.

In Subcategories F - I, J, and L, EPA did not receive detailed surveys from direct discharging facilities. On the basis of the screener survey, however, EPA believes that direct discharging facilities, although few, do exist in those subcategories. Therefore, EPA used the facility-level impact methodology from the proposed rule to project impacts in these subcategories (see Section 3.3.2 for details). EPA used *1997 Economic Census* data at the employment class level from the MPP industry NAICS codes to develop model facilities representing meat further processing plants (Subcategories F - I), rendering plants (Subcategory J), and poultry processing plants (Subcategory L). EPA used Census revenue and cost data to estimate net income, and Census special tabulations of the variance of key revenue and cost measures to estimate the variance of each model facility's income. Combining this with the assumption that facility income is normally distributed, EPA estimated a cumulative probability

distribution function for each model facility. This allows EPA not only to estimate impacts to each model facility, but to the entire class of facilities the model represents as well. EPA presents two types of model facility impacts. First, EPA provides the ratio of annualized compliance costs to the net income of the model facility. Second, EPA uses its estimated probability distributions to project the percentage and number of facilities that incur costs exceeding 100 percent of net income.

EPA used financial ratio analysis to examine whether a company can afford the aggregate costs of upgrading all of its sites. Many banks use financial ratio analysis to assess the credit worthiness of a potential borrower. If regulatory costs cause a company's financial ratios to move into an unfavorable range, the company will find it more difficult to borrow money. EPA considers a company in such a condition to be in financial distress. Financial ratio analysis is performed at the company level rather than the facility level. This is because: (1) many firms maintain complete financial statements (balance sheet and income statement) at the business entity or corporate level, but not the site level, (2) significant financial decisions, such as expansion of a site's capacity, are typically made or approved at the corporate level, and (3) the business entity (or corporate parent) is the legal entity responsible for repayment of a loan, and therefore the lending institution evaluates the credit worthiness of the business entity, not the site. EPA selected the Altman Z′ score, a weighted-average of several financial ratios, to characterize the baseline and post-regulation financial conditions of potentially affected firms. The Altman Z′ score simultaneously considers measures of liquidity, leverage, profitability, and asset management. It addresses the problem of how to interpret the data when some financial ratios look "good" while other ratios look "bad." Also, it provides well defined thresholds for classifying firms as in good, indeterminate, and poor financial health.

In Subcategories F - I, J, and L, for which detailed survey data were not available, EPA could not perform an Altman's Z analysis. To analyze the parent companies of these facilities, EPA assumes the facility and company are identical. EPA combines Census data (via the model facilities developed for the closure analysis) with Dun & Bradstreet financial ratio data. For each model facility, EPA divides net income by the median value for return on assets reported by Dun & Bradstreet for the relevant industry to estimate the model facility's total assets. Given the model facility's net income and total assets, EPA calculates the post-regulatory return on assets as: (net income - posttax annualized costs)/(total assets + capital costs).

EPA developed a market model to examine the impacts of the meat products industry final effluent guidelines on the price and output of various meat products. The distinguishing feature of EPA's market model is that it explicitly incorporates cross-market impacts among meat types into the analysis. This is for two reasons. First, the demand for meat products such as beef, pork, broilers, and turkey is closely related; a change in the price of pork will also tend to cause a change in the demand for beef because it is a substitute for pork. Second, EPA's effluent guidelines will simultaneously affect the price of beef, pork, chicken, and turkey, thus the market analysis for each product depends not only on the compliance costs for that product but also on the impact of compliance costs on the prices of the other three meat products. The market model also examines international trade effects of the final rule; the export of meat products is becoming an increasingly important source of growth for U.S. meat producers.

Finally, EPA uses the U.S. Department of Commerce's Bureau of Economic Analysis (BEA) "input-output" multipliers (RIMS II) to examine indirect and induced impacts of the final rule on the national economy. Impacts on the meat product industry are known as direct effects, impacts on industries that supply inputs to the meat products industry economy are known as indirect effects, and effects on consumer demand are known as induced effects.

ES.5 IMPACTS

ES.5.1 Regulatory Options

Table ES-1 presents EPA's revised subcategories for the meat products industry along with facility process combinations (meat type and process classes), production size, and EPA's count of potentially affected facilities (based on survey data) contained in each subcategory. By focusing on nonsmall direct dischargers, EPA projects that about 150 facilities out of the more than 6,600 MPP facilities will be affected by this final rule.

Table ES-2 summarizes the pollution control options considered for each subcategory. EPA set Option 2.5 as BAT and NSPS for nonsmall facilities in all subcategories. Option 2 was selected as BPT for nonsmall facilities in Subcategories A - D, K, and L, as well as BCT in Subcategories K and L. With the exception of NSPS in Subcategories K and L, no requirements were set for small facilities.

Table ES-1
Revised 40 CFR 432 Subcategories
Subcategory, Process, Discharge Type, and Size

Subcategory	Processes	Production Size	Annual Production	Direct Dischargers	Non-direct Dischargers	Total
Total	**NA**	**NA**	**NA**	**288**	**6,331**	**6,619**
Subtotal	**NA**	**Small**	**NA**	**134**	**5,670**	**5,804**
		Nonsmall	**NA**	**154**	**661**	**815**
A - D	Meat First Processing; alone or in combination with Further Processing; and/or Rendering	Small	< 50 million pounds live weight kill	63	1,668	1,731
		Nonsmall	≥ 50 million pounds live weight kill	47	92	139
E	Meat Further Processing; alone or in combination with Rendering	Small	≥ 1.56 million pounds of finished product	25	2,395	2,420
F - I		Small	> 1.56 million pounds of finished product < 50 million pounds of finished product	22	838	860
		Nonsmall	≥ 50 million pounds of finished product	4	146	150
J	Rendering	Small	< 10 million pounds of raw product	0	14	14
		Nonsmall	≥ 10 million pounds of raw product	19	98	117
K	Poultry First Processing; alone or in combination with Further Processing; and/or Rendering	Small	< 100 million pounds live weight kill	17	129	146
		Nonsmall	≥ 100 million pounds live weight kill	79	127	206
L	Poultry Further Processing; alone or in combination with Rendering	Small	< 7 million pounds of finished product	7	626	633
		Nonsmall	≥ 7 million pounds of finished product	5	198	203

Source: U.S. EPA MPP Screener Survey Database.

Table ES-2
Meat Products Industry Treatment Technology Options

Option	Treatment Unit
1 (Small Facilities Only)	Biological Treatment, Partial Nitrification, Disinfection
2	Biological Treatment, *More Complete Nitrification*, Disinfection
2.5[1]	**Biological Treatment, More Complete Nitrification, Disinfection, *Partial Denitrification***
2.5 + P	Biological Treatment, More Complete Nitrification, Disinfection, Partial Denitrification, *Chemical Phosphorus Removal*
4	Biological Treatment, More Complete Nitrification, Disinfection, *More Complete Denitrification*, Chemical Phosphorus Removal

Changes between technology options indicated by italics.
[1] Selected as BAT and NSPS for all nonsmall facilities.

ES.5.2 Impacts

Table ES-3 presents estimated compliance costs by subcategory, and Table ES-4 summarizes the projected economic impacts under the selected option. EPA calculated two cost estimates for the selected option: the "low" costs are based on EPA's selection of input parameters for the cost model, while the "high" cost estimate primarily incorporates industry's input parameters, with the exception of a few values. Total pretax annualized compliance costs are estimated to range from $38.1 million to $52.6 million (1999 dollars; $42.1 million to $58.2 million in 2003 dollars) under the selected option.

Table ES-3
Total Cost of the Rule by Subcategory

Subcategory	Promulgated Option	Pre-tax Annualized Cost (Thousands)			
		Low Estimate		High Estimate	
		1999 Dollars	2003 Dollars	1999 Dollars	2003 Dollars
A - D	2.5	13,242	14,629	16,686	18,435
F - I	2.5	289	319	329	363
J	2.5	1,919	2,120	2,826	3,123
K	2.5	21,906	24,201	31,817	35,151
L	2.5	747	825	983	1,086
Total		**38,103**	**42,095**	**52,641**	**58,158**

Table ES-4
Summary of Economic Impacts of the Rule

Subcategory	Impacts under Promulgated Option
Facility Level Closure Impacts	
Subcategories A - D Subcategory K	**No** facility closures
Subcategories F - I Subcategory J Subcategory L	Less than one facility closure (0.24 to 0.34 facilities) combined
Company Level Financial Ratio Impacts	
Subcategories A - D Subcategory K	**No** changes in company financial health as measured by the Altman Z′ score
Subcategories F - I Subcategory J Subcategory L	ROA decreases from 5.5 to 5.42 ROA decreases from 2.0 to 1.86 ROA decreases from 4.4 to 4.16
Market Level Impacts	
The maximum projected price increase is less than 0.05 percent of baseline price for all products.	
The overall domestic production of meat and poultry products, and therefore industry employment, is projected to decrease by about 0.02 percent	

ES.5.3 Small Business Impacts

According to Small Business Administration (SBA) size standards, a MPP facility is small business owned if the parent company employs less than 500 workers combined at all its facilities. EPA estimates that this final rule will regulate up to 33 small businesses that own MPP facilities. All small business owned facilities that EPA found to be affected by the rule are in Subcategories F-I, Subcategory J, and Subcategory L. Thus, the economic impact analysis for these facilities is based on screener survey data.

EPA projected no small business owned facility closures for the final rule. However, EPA cannot state that the probability of closure as a result of the rule is zero for those facilities, although it is small. In addition, of the 33 potentially small business owned facilities, two are estimated to incur annualized post-tax compliance costs greater than three percent of revenues; 5 are estimated to incur compliance costs composing more than one but less than three percent of revenues; and 24 small entities are estimated to incur compliance costs of less than one percent of revenues.

ES.6 ENVIRONMENTAL ASSESSMENT AND BENEFITS

EPA estimated the environmental and human health benefits, including pollutant reductions, that will occur from this rule. The total monetized benefits associated with the effluent limitation guideline requirements are estimated to approximate $2.6 million (2003$) with a range of approximately zero to $10 million annually. These values represent those benefits for which EPA was able to quantify and determine an economic value. The benefit value estimates reflect only those pollutant reductions and water quality improvements attributable to the MPP industry. As discussed later in this section, EPA identified additional environmental benefits that will result from this rule, but was unable to attribute a specific economic value to benefits that could not be monetized or quantified.

The rule is expected to reduce nitrogen discharges from MPP facilities from 48.5 to 20.0 million pounds and reduce sediment discharge by 2.4 million pounds, annually. Fecal coliform served as a surrogate measure of pathogen reductions that would be achieved by this rule. EPA expects that other pathogens (e.g., *E. coli*) will be reduced from $1{,}340.2\times10^{18}$ cfu to 240.2×10^{18} cfu due to disinfection

requirements. Chapter 7 describes the environmental effects of this rule and details how they impact ecological systems and human health.

For this rule, EPA conducted five benefit studies to estimate the impacts of reductions in pollutant discharges from MPP facilities. The first study used the National Water Pollution Control Assessment Model (NWPCAM), which estimates pollutant discharge to rivers, streams, and, to a lesser extent, lakes in the United States, to estimate the value society places on improvements in surface water quality associated with today's rule. EPA used a newer version of the NWPCAM than was used for the proposal to estimate the value to society of improvements at a sample of MPP facilities. The new version enabled EPA to model nutrient loadings. EPA derived sample weights related to characteristics of the receiving water body and local population to extrapolate the sample results to a national estimate. EPA also derived confidence bounds for the estimates using Monte Carlo techniques. NWPCAM methods and results are discussed in Chapter 8.

In the second study, changes in the nutrient criteria exceedances due to reduced MPP facility loads were examined. When discharges from the MPP facilities are reduced in accordance with the requirements under this rule, under one baseline assumption 6 of the 45 excursions are projected to be eliminated under 7Q10 low flow stream conditions. Under different baseline assumptions, 4 of the 41 excursions are projected to be eliminated. When mean stream flow conditions are assumed, approximately one-half of the excursions are projected to be eliminated. Improvements in water quality are also predicted in receiving streams where in-stream nitrogen concentrations are not projected to exceed 304(a) nitrogen criteria. In-stream nitrogen concentrations are projected to be reduced in approximately 60 percent of the non-excursion streams under both 7Q10 low flow and mean flow stream conditions. The methods and results of the nutrient study are reported in Chapter 9.

EPA also assessed the possible impacts of ten toxic pollutants (i.e., ammonia, barium, chromium, copper, manganese, molybdenum, nickel, titanium, vanadium, and zinc) on aquatic life or human health by comparing the modeled instream pollutant concentrations under today's treatment levels to EPA's published guidance for aquatic life criteria or human health criteria. Toxics could be incidentally removed through the biological treatment and DAF system but EPA projects that there are no meaningful human health or aquatic life benefits to be obtained from this action.

Reductions in sediment in drinking water supplies are expected to reduce public water treatment costs. An estimate of the changes in these costs is described in Chapter 11. The results suggest that the cost savings from the reduction in TSS is very small. Even under the most stringent option, the estimated savings amount to $1,500 nationwide annually.

Finally, EPA conducted site-specific analyses of 62 watersheds, which compared the background concentrations of nitrogen (N) with the facility-generated loads. The analyses, discussed in Chapter 12, identified 30 facility locations where background non-point source nitrogen loads are less than 1 percent of facility loads. Implementing the rule at these sites would reduce 20 facility N loads. A second group of 19 locations has background N loads between 1 percent and 25 percent of facility N loads. Implementing the rule at these sites would reduce 12 facility N loads. A companion analysis identified facilities with loads that exceed established nutrient criteria levels with high and low instream decay rates. EPA then determined which facilities' loads would allow instream decay processes to keep stream nutrient levels below established nutrient criteria after implementation of the rule. While instream processing reduced N levels to some extent, phosphorous levels remained high.

ES.7 REFERENCES

U.S. EPA. 2002. 2001 Meat Products Industry Survey. Washington, DC: OMB Control No. 2040-0225. Expiration Date February 29, 2004.

U.S. EPA. 2004. *Development Document for the Final Revisions to the Effluent Limitations Guidelines for the Meat Products Industry*. EPA-xxx-x-xx-xxx. Washington, D.C.: U.S. Environmental Protection Agency, Office of Water.

CHAPTER 1

INTRODUCTION

1.1 SCOPE AND PURPOSE

The U.S. Environmental Protection Agency (EPA) proposes and promulgates water effluent discharge limits (effluent limitations guidelines and standards) for industrial sectors. This Economic and Environmental Benefit Analysis (EEBA) summarizes the costs and economic impacts of technologies that form the bases for setting limits and standards for the meat products industry.[1]

The Federal Water Pollution Control Act (commonly known as the Clean Water Act [CWA, 33 U.S.C. §1251 et seq.]) establishes a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (section 101(a)). EPA is authorized under sections 301, 304, 306, and 307 of the CWA to establish effluent limitations guidelines and standards of performance for industrial dischargers. The standards EPA establishes include:

- Best Practicable Control Technology Currently Available (BPT). Required under section 304(b)(1), these rules apply to existing industrial direct dischargers. BPT limitations are generally based on the average of the best existing performances by plants of various sizes, ages, and unit processes within a point source category or subcategory.
- Best Available Technology Economically Achievable (BAT). Required under section 304(b)(2), these rules control the discharge of toxic and nonconventional pollutants and apply to existing industrial direct dischargers.
- Best Conventional Pollutant Control Technology (BCT). Required under section 304(b)(4), these rules control the discharge of conventional pollutants from existing industrial direct dischargers.[2] BCT limitations must be established in light of a two-part cost-reasonableness test. BCT replaces BAT for control of conventional pollutants.
- Pretreatment Standards for Existing Sources (PSES). Required under section 307. Analogous to BAT controls, these rules apply to existing indirect dischargers (whose discharges flow to publicly owned treatment works [POTWs]).

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[1] The industry, however, is free to use whatever technology it chooses in order to meet the limit.

[2] Conventional pollutants include biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, pH, and oil and grease.

- New Source Performance Standards (NSPS). Required under section 306(b), these rules control the discharge of toxic and nonconventional pollutants and apply to new source industrial direct dischargers.

- Pretreatment Standards for New Sources (PSNS). Required under section 307. Analogous to NSPS controls, these rules apply to new source indirect dischargers (whose discharges flow to POTWs).

The current meat products rule, 40 CFR Part 432, set effluent guidelines and limitations for the beef and pork sectors of the meat products industry. These standards were set and revised over a number of years, most recently in 1995. Table 1-1 presents a listing of the standards set for each of the 10 current subcategories in the meat products industry along with the relevant Federal Register citation. This final rule revises the existing subcategories in the industry, and proposes new standards for facilities that perform poultry slaughter and processing operations. Prior to this rule, EPA has set no national effluent limitations guidelines or standards for poultry slaughterers or processors.

1.2 REPORT ORGANIZATION

This Economic Analysis (EA) is organized as follows:

- Chapter 2—Industry Profile

  Provides background information on the industry affected by this regulation.

- Chapter 3—Economic Impact Analysis Methodology Overview

  Summarizes the economic methodology by which EPA examines incremental pollution control costs and their associated impacts on the industry.

- Chapter 4—Pollution Control Options

  Presents short descriptions of the regulatory options considered by EPA. More detail is given in the Development Document (U.S. EPA, 2004).

Table 1-1
EPA Effluent Limitations Guidelines for Meat Products Industry

Subcategory	Standard	Federal Register Notice
Simple Slaughterhouses (Subpart A)	BPT	39 FR 7897, February 28, 1974; amended at 60 FR 33964, June 29, 1995
	BAT	Reserved
	PSES	40 FR 6446, February 11, 1975; amended at 60 FR 33964, June 29, 1995
	NSPS	39 FR 7897, February 28, 1974; 39 FR 26423, July 19, 1974
	PSNS	60 FR 33964, June 29, 1995
	BCT	51 FR 25001, July 9, 1986
Complex Slaughterhouses (Subpart B)	BPT	39 FR 7897, February 29, 1974; 39 FR 26423, July 19, 1974; amended at 45 FR 82254, December 15, 1980; 60 FR 33964, June 29, 1995
	BAT	Reserved
	PSES	40 FR 6446, February 11, 1975; amended at 60 FR 33965, June 29, 1995
	NSPS	39 FR 7897, February 28, 1974; 39 FR 26423, July 19, 1974
	PSNS	60 FR 33965, June 29, 1995
	BCT	51 FR 25001, July 9, 1986
Low-Processing Packinghouse (Subpart C)	BPT	39 FR 7897, February 28, 1974; amended at 60 FR 33965, June 29, 1995
	BAT	Reserved
	PSES	40 FR 6446, February 11, 1975; amended at 60 FR 33965, June 29, 1995
	NSPS	39 FR 7897, February 28, 1974; 39 FR 26423, July 19, 1974
	PSNS	60 FR 33965, June 29, 1995

Table 1-1 (cont.)
EPA Effluent Limitations Guidelines for Meat Products Industry

Subcategory	Standard	Federal Register Notice
	BCT	51 FR 25001, July 9, 1986
High-Processing Packinghouse (Subpart D)	BPT	39 FR 7897, February 28, 1974; amended at 60 FR 33965, June 29, 1995
	BAT	Reserved
	PSES	40 FR 6446, February 11, 1975; amended at 60 FR 33965, June 29, 1995
	NSPS	39 FR 7897, February 28, 1974; 39 FR 26423, July 19, 1974
	PSNS	60 FR 33965, June 29, 1995
	BCT	51 FR 25001, July 9, 1986
Small-Processor (Subpart E)	BPT	40 FR 905, January 3, 1975; amended at 60 FR 33965, June 29, 1995
	BAT	Reserved
	PSES	Reserved
	NSPS	40 FR 905, January 3, 1975
	PSNS	40 FR 905, January 3, 1975; amended at 60 FR 33965, June 29, 1995
	BCT	51 FR 25001, July 9, 1986
Meat Cutter (Subpart F)	BPT	40 FR 906, January 3, 1975; amended at 60 FR 33965, June 29, 1995
	BAT	44 FR 50748, August 29, 1979
	PSES	Reserved
	NSPS	40 FR 906, January 3, 1975
	PSNS	40 FR 906, January 3, 1975; amended at 60 FR 33965, June 29, 1995
	BCT	51 FR 25001, July 9, 1986

Table 1-1 (cont.)
EPA Effluent Limitations Guidelines for Meat Products Industry

Subcategory	Standard	Federal Register Notice
Sausage and Luncheon Meats Processor (Subpart G)	BPT	40 FR 907, January 3, 1975; amended at 60 FR 33966, June 29, 1995
	BAT	40 FR 50748, August 29, 1979
	PSES	Reserved
	NSPS	40 FR 907, January 3, 1975
	PSNS	40 FR 907, January 3, 1975; amended at 60 FR 33966, June 29, 1995
	BCT	51 FR 25001, July 9, 1986
Ham Processor (Subpart H)	BPT	40 FR 908, January 3, 1975; amended at 60 FR 33966, June 29, 1995
	BAT	44 FR 50748, August 29, 1979
	PSES	Reserved
	NSPS	40 FR 908, January 3, 1975
	PSNS	40 FR 908, January 3, 1975; amended at 60 FR 33966, June 29, 1995
	BCT	51 FR 25001, July 9, 1986
Canned Meats Processor (Subpart I)	BPT	40 FR 909, January 3, 1975; amended at 60 FR 33966, June 29, 1995
	BAT	44 FR 50748, August 29, 1979
	PSES	Reserved
	NSPS	40 FR 909, January 3, 1975
	PSNS	40 FR 909, January 3, 1975; amended at 60 FR 33966, June 29, 1995
	BCT	51 FR 25001, July 9, 1986
Renderer (Subpart J)	BPT	40 FR 910, January 3, 1975; 40 FR 11874, March 14, 1975; amended at 60 FR 33966, June 29, 1995
	BAT	44 FR 50748, August 29, 1979
	PSES	Reserved

Subcategory	Standard	Federal Register Notice
	NSPS	42 FR 54419, October 6, 1977
	PSNS	40 FR 910, January 3, 1975; amended at 60 FR 33966, June 29, 1995
	BCT	51 FR 25001, July 9, 1986

- Chapter 5—Economic Impacts

  Using the methodology presented in Chapter 3, EPA presents the annualized costs reflecting both the capital and annual operating and maintenance costs that are associated with more stringent pollution control. EPA then presents the economic impacts associated with the regulatory costs, including impacts on facilities, companies, industry output, prices, international trade, and employment. In other words, this chapter presents the findings on which EPA based its determination of economic achievability under the CWA.

- Chapter 6—Regulatory Flexibility Analysis

  Pursuant to the Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act, EPA examines whether the regulatory options have a significant adverse impact on a substantial number of small entities.

- Chapter 7—Environmental Impacts and Potential Benefits

  Describes the environmental effects of this rule and details the impact of wastewater on ecological systems and human health. EPA also discusses the water quality improvements realized by the rule.

- Chapter 8—Water Quality Benefits Measured Using NWPCAM

  Using the National Water Pollution Control Assessment Model (NWPCAM), which estimates pollutant discharge to rivers, streams, and, to a lesser extent, lakes in the United States, EPA estimates the value society places on improvements in surface water quality associated with the rule.

- Chapter 9—Changes in Water Quality Measured Using Nutrient Criteria

  Examines changes in the nutrient criteria exceedances due to reduced facility loads and presents the results of such changes.

- Chapter 10—Toxicity Assessment of Changes in Water Quality

  Discusses the assessment of the possible impacts of ten pollutants on aquatic life or human health by comparing the modeled instream pollutant concentrations under today's treatment levels to EPA's published guidance for aquatic life criteria or human health criteria.

- Chapter 11—Benefits from Reduced Drinking Water Treatment Costs

  Estimates changes in public water treatment costs due to reductions in sediment in drinking water supplies.

- Chapter 12—Benefits to New Technology for Reducing Nitrogen Loadings to Streams

  Presents EPA's site-specific analyses of 62 watersheds comparing background concentrations of nitrogen with facility-generated loads.

- Chapter 13—Cost-Benefit Comparison and Unfunded Mandates Reform Act Analysis

  Using the benefits described in Chapters 7 through 12, EPA presents an assessment of the nationwide costs and benefits of the regulation pursuant to Executive Order 12866 and the Unfunded Mandates Reform Act (UMRA).

1.3 REFERENCES

U.S. EPA. 2004. Technical Development Document for the Final Effluent Limitations Guidelines and Standards for the Meat Products Point Source Category. EPA-821-R-04-011. Washington, DC: U.S. Environmental Protection Agency, Office of Water.

CHAPTER 2

INDUSTRY PROFILE

For the proposed rule, EPA's industry profile was based on publicly available information about the meat and poultry products industry. This information was drawn from a number of sources including USDA's Food Safety and Inspection Service (FSIS), USDA's Economic Research Service (ERS), professional journals, trade publications, corporate publications and websites, but primarily the *1997 Economic Census* (U.S. Census Bureau, 1999a through 1999d).

For the final rule, EPA used its authority under Section 308 of the Clean Water Act to collect information not otherwise available to supplement this publicly available information. This included:

- site-specific data
- financial information for privately-held firms.

EPA sent out two surveys: a "detailed" survey and a "screener" survey (so-called because of their relative lengths and complexity). The screener survey was sent to 1,500 facilities. Of these, 1,254 were returned and usable. The detailed survey was sent to 350 facilities, with 328 returned. Numbers presented in the following profile are based on information collected in both surveys. Specifically, facility counts and financial information for Subcategories A - D and K are based on data collected in the detailed survey, while facility counts for Subcategories F - I, J, and K are based on the screener survey and supplemented with Census data. National estimates were calculated by weighting results based on the sampling frame (see the Technical Development Document for details).

Sections 2.1 and 2.2 lay out definitions for facilities affected by this effluent guideline by detailing the subcategory and size definitions used to classify facilities. Section 2.3 summarizes the site-level information, while Section 2.4 reviews the company-level information. This chapter concludes with a discussion in Section 2.5 of possible impacts of the recent discovery of BSE in the U.S. Further background on the MPP industry is contained in the Industry Profile (Chapter 2) from the Proposal EA.

All site and company level information collected was from the 1997-1999 period. Company ownership information presented in this profile is based on this time period and does not include changes in ownership that occurred after 1999.

2.1 SUBCATEGORIZATION

The subcategories developed for this rule modify and extend EPA's existing industry subcategories. Prior to promulgation of this rule, EPA subcategorized the industry as follows:

- Subcategory A — Simple Slaughterhouse
- Subcategory B — Complex Slaughterhouse
- Subcategory C — Low-Processing Packinghouse
- Subcategory D — High- Processing Packinghouse
- Subcategory E — Small Processor
- Subcategory F — Meat Cutter
- Subcategory G — Sausage and Luncheon Meats Processor
- Subcategory H — Ham Processor
- Subcategory I — Canned Meats Processor
- Subcategory J — Renderer

For this final rule, EPA regrouped these 10 subcategories. The first four subcategories are combined to form Subcategories A - D, and the next four are combined to form Subcategories E - I. Subcategory J remains unchanged. Additionally, this rule creates two new subcategories for poultry facilities that were not regulated under the prior effluent guidelines. Thus, the final rule sets effluent guidelines and limitations for five subcategories:

- Subcategory A - D: Meat first processing
- Subcategory E - I: Meat further processing

- Subcategory J: Rendering
- Subcategory K: Poultry first processing
- Subcategory L: Poultry further processing

The first three of these subcategories are already regulated under existing effluent guidelines. The last two subcategories are new and apply to facilities that are not regulated under existing effluent guidelines.

The structure of the subcategorization for the rule is as follows:

- meat facilities that perform first processing (i.e., slaughter) alone or in combination with further processing and/or rendering are assigned to Subcategories A - D.

- meat facilities that perform further processing alone or in combination with rendering, but no first processing, are assigned to Subcategories E - I.

- facilities that perform rendering but no other processes are assigned to Subcategory J.

- poultry facilities that perform first processing alone or in combination with further processing and/or rendering are assigned to Subcategory K.

- poultry facilities that perform further processing alone or in combination with rendering, but no first processing, are assigned to Subcategory L.

- mixed facilities — those that process both meat and poultry — may be subject to guidelines in two subcategories. EPA found that all mixed facilities in its survey database were further processors and thus would be subject to guidelines for Subcategories E - I and Subcategory L.

2.2 CLASSIFICATION OF FACILITIES BY SIZE

2.2.1 Production Thresholds Defining Small and Nonsmall Facilities

In addition to categorizing facilities by meat type and processes performed, EPA also classified facilities by their level of production. Table 2-1 presents the production thresholds EPA set to distinguish small and nonsmall facilities.[1]

Table 2-1
Size Classifications for Meat Products Industry Subcategories

Subcategory	Classification	Definition
A - D	Small	< 50 million pounds live weight kill per year
	Nonsmall	≥ 50 million pounds live weight kill per year
E	NA	≥ 1.56 million pounds of finished product per year
F - I	Small	> 1.56 million pounds of finished product per year < 50 million pounds of finished product per year
	Nonsmall	≥ 50 million pounds of finished product per year
J	NA	≥ 10 million pounds of raw product per year
K	Small	< 100 million pounds live weight kill per year
	Nonsmall	≥ 100 million pounds live weight kill per year
L	Small	< 7 million pounds of finished product per year
	Nonsmall	≥ 7 million pounds of finished product per year

NA: no distinction is made between small and nonsmall facilities in this subcategory.

[1] EPA uses two different size classifications to analyze and present the economic impact analysis for the promulgated rule. The production level classification in Table 2-1 above determines the effluent guidelines and standards the facility must meet; within a subcategory, different guidelines may be set for small and nonsmall facilities. However, for the purposes of the regulatory flexibility analysis (Chapter 6), EPA must also distinguish between facilities that are owned by small business and those that are owned by large businesses. In the MPP industry, a facility is defined as small business owned if its parent company employs less than 500 workers. There is no necessary relationship between these two definitions of small; a facility that is defined as small based on its level of production may be owned by a large business. Similarly, a facility that is defined as nonsmall based on its level of production may be owned by a small business.

2.2.2 Revised Production Threshold in Subcategory K

For the proposed rule, EPA defined small processors in Subcategory K as those facilities that slaughter less than 10 million pounds of poultry per year. For the final rule, EPA has redefined this threshold as 100 million pounds per year. EPA modified the threshold because it found the lower threshold figure could create a potentially substantial competitive disadvantage for small poultry slaughter facilities with respect to both larger poultry facilities and with meat facilities. Major factors contributing to this conclusion were the effects of economies of scale, and the nature of competition between the meat and poultry sectors.

2.2.2.1 Economies of Scale

Based on the most reliable studies performed to date, significant economies of scale exist in poultry slaughter. Extrapolating from Ollinger et al. (2000), a 50 million pounds per year (lbs/yr) poultry plant has about a 3 percent cost advantage over a 10 million lbs/yr plant. For a 100 million lbs/yr plant, the cost advantage is probably in the 7 to 10 percent range, and for a 150 million lbs/yr plant, the advantage is about 15 percent.[2]

Economies of scale in meat slaughter plants are not as significant as in poultry slaughter. Extrapolating from MacDonald et al. (2000), a 150 million lbs/yr meat slaughter plant might have a 5 percent cost advantage over a 10 million lbs/yr plant.

The relative importance of economies of scale in the two sectors is consistent with detailed survey data. In the detailed survey database, only about 1 percent of poultry slaughter plants produce less than 10 million lbs/yr. In the meat sector, about 12 percent of slaughter plants are below that threshold.

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[2] The economies of scale in poultry slaughter are so significant, that Ollinger suggests that smaller poultry slaughter plants stay in business primarily because of special circumstances. Plants might be constrained by poultry supply, environmental conditions, labor force, or other facility-specific factors. Industry also suggests that some of these small producers survive because of niche markets.

Further, in both the meat and poultry sectors, slaughter plants that produce less than 100 million lbs/yr are projected to incur compliance costs per pound of output that are substantially larger than slaughter plants with output greater than 100 million lbs/yr. This exacerbates the competitive disadvantage under which the smaller plants already operate.

2.2.2.2 Competition Between Poultry and Meat Sectors

Consumers consider meat and poultry to be substitutes. That is, if the price of poultry increases relative to that of meat, consumers will increase purchases of meat and decrease purchases of poultry. This effect is not large, but it is statistically significant. In the MPP market model, EPA used a cross-price elasticity of demand between poultry and beef of approximately 0.1; this means a 1 percent increase in the price of poultry is expected to increase the demand for beef by 0.1 percent (holding all other things constant). The cross-price elasticity of demand between pork and poultry is smaller, about 0.05 (i.e., a 1 percent increase in the price of poultry is expected to increase the demand for pork by 0.05 percent, holding all other things constant).

EPA found that compliance costs per pound of poultry were projected to exceed the compliance costs per pound of meat by almost 60 percent under the selected option. (In all cases, the costs per pound were considerably less than $0.01 per pound.) This suggests that the price of poultry will rise relative to the price of meat, and a small shift from poultry to meat consumption can be expected to result from the effluent guideline.

In summary, EPA determined that:

- poultry will be somewhat disadvantaged by the rule relative to meat, and
- within the poultry sector, small slaughter facilities will be disadvantaged by the rule relative to large slaughter facilities.

Therefore, EPA increased the production threshold that defines a small poultry slaughter facility from 10 million lbs/yr to 100 million lbs/yr.

2.3 FACILITY LEVEL INFORMATION

2.3.1 National Facility Counts

Based on the results of its screener survey, EPA estimates there are:

- 6,619 meat and poultry sites,
- 288 direct dischargers, and
- 6,331 non-direct dischargers (including indirect and zero dischargers)

in the MPP industry. Table 2-2 details national estimates by subcategory, discharge type, and size classification.

EPA is only promulgating new effluent guidelines for nonsmall direct dischargers. Thus, based on the results of the screener survey, EPA projects the promulgated rule will apply to 154 out of 6,619 facilities, approximately 2.3 percent of all meat and poultry facilities.

EPA used the economic section of the detailed survey to collect financial data in order to perform its economic impact analysis. In some subcategories, EPA did not receive detailed surveys from direct discharging facilities. On the basis of the screener survey, however, EPA believes that direct discharging facilities, although few, do exist in those subcategories. Therefore, EPA used both types of surveys for its economic impact analysis (see Chapter 3 for details).

Table 2-3 presents the number of direct discharger facilities estimated in each subcategory and size class using both screener and detailed survey facility counts. The last two columns provide the facility counts that EPA used to project the economic impacts of the MPP rule, and whether they were based on the screener or the detailed survey. Because the detailed survey provided much more facility level financial information, EPA selected the detailed survey, and its facility counts, to perform that subcategory's economic impact analysis whenever possible.

Table 2-2
National Estimates of Meat and Poultry Facilities by Subcategory and Size
(Screener Survey Database)

Subcategory	Production Size	Direct Dischargers	Non-direct Dischargers	Total	Percent of Facilities Facing Regulation
Total	NA	**288**	**6,331**	**6,619**	**2.3** [1]
Subtotal	Small	**134**	**5,670**	**5,804**	**0.0**
	Nonsmall	**154**	**661**	**815**	**18.9** [2]
A - D	Small	63	1,668	1,731	NA
	Nonsmall	47	92	139	33.8
E	Small	25	2,395	2,420	NA
F - I	Small	22	838	860	NA
	Nonsmall	4	146	150	2.7
J	Small	0	14	14	NA
	Nonsmall	19	98	117	16.2
K	Small	17	129	146	NA
	Nonsmall	79	127	206	38.4
L	Small	7	626	633	NA
	Nonsmall	5	198	203	2.5

Source: U.S. EPA MPP Screener Survey Database.
[1] Calculated as 154 nonsmall direct dischargers divided by 6,619 total MPP facilities.
[2] Calculated as 154 nonsmall direct dischargers divided by 815 total MPP direct discharging facilities.

Table 2-3
Direct Discharging Meat and Poultry Facilities
Analyzed for Economic Impacts by Subcategory and Size
(Screener and Detailed Survey Databases)

Subcategory	Production Size	Direct Discharging Facilities			Source
		Screener Survey	Detailed Survey	Facility Counts for Impact Analysis[1]	
Total	NA	**288**	**195**	**234**	**NA**
Subtotal	Small	**134**	**51**	**65**	**NA**
	Nonsmall	**154**	**144**	**169**	**NA**
A - D	Small	63	15	15	Detailed Survey
	Nonsmall	47	31	31	Detailed Survey
E	Small	25	0	NA	NA
F - I	Small[2]	22	0	11	Screener Survey
	Nonsmall	4	0	4	Screener Survey
J	Small	0	0	NA	NA
	Nonsmall	19	7	19	Screener Survey
K	Small	17	36	36	Detailed Survey
	Nonsmall	79	105	105	Detailed Survey
L	Small[3]	7	0	0	Screener Survey
	Nonsmall[4]	5	1	3	Screener Survey
Mixed Processors[5]	Small[6]	NA	NA	3	Screener Survey
	Nonsmall[7]	NA	NA	7	Screener Survey

Source: U.S. EPA MPP Screener Survey and Detailed Survey Databases.
NA: No distinction between small and non small is made for this subcategory.
[1] Facility counts for the impact analysis differs from facility counts by survey type in that subcategory for two reasons: (1) facility counts for the impact analysis only include facilities for which costs were estimated, and (2) mixed processing facilities that have some production in this subcategory are listed separately below.
[2] With mixed processors included, 21 facilities are analyzed for impacts in this subcategory and size classification.
[3] With mixed processors included, 3 facilities are analyzed for impacts in this subcategory and size classification.
[4] With mixed processors included, 10 facilities are analyzed for impacts in this subcategory and size classification.

[5] To avoid double-counting in the national estimates (Table 2-2), mixed processors were allocated to only one subcategory in which they produced. For analyzing facility level impacts, mixed processors were included in both subcategories in which they produced, leading to the double-counting of 10 facilities.
[6] For 3 small mixed processors, 18 percent of production is subject to guidelines and limitations for small processors in Subcategories F - I, and 82 percent of production is subject to small Subcategory L guidelines and limitations.
[7] For 7 nonsmall mixed processors, 39 percent of production in s subject to guidelines and limitations for small facilities in Subcategories F-I, and 61 percent of production is subject to nonsmall Subcategory L guidelines and limitations.

The number of facilities analyzed for the rule (Table 2-3) may differ from the number of facilities in the national estimates (Table 2-2) for three reasons. First, the national estimates are completely based on screener survey weights, while in the impact analysis, EPA used a mix of detailed and screener survey facility weights. The screener survey was sent to 1,650 facilities, while the detailed survey only went to 350. Thus, the responses from the screener surveys are from over four times as many facilities, yielding survey estimates with twice the precision of those based on the detailed survey responses (standard errors are inversely proportional to the square root of the sample size).[3] Therefore, EPA used the screener survey weights, not the detailed survey weights, to estimate national level facility counts.

Second, EPA did not have sufficient data to estimate costs for some surveyed facilities. These direct dischargers with lack of sufficient cost data were not included in the facility counts for the economic impact analysis.

Third, for the national level facility counts, EPA allocated mixed processing facilities (i.e., facilities with less than 85 percent of total production in one subcategory) exclusively between subcategories. For example, assume that 33 percent of a screener survey facility's total production is further processed poultry, and 67 percent is further processed meat. If that screener survey facility has a weight of 3, then in the national estimates EPA would count it as two Subcategory F - I facilities and one Subcategory L facility. To project economic impacts, EPA analyzed such a facility in both Subcategory F - I and Subcategory L because it could potentially incur compliance costs in both subcategories. Thus, the total number of facilities analyzed for economic impacts includes double-counting of mixed processor facilities.

In Table 2-3, a total of 169 nonsmall direct discharging facilities are analyzed for the rule. Of these, 136 are in Subcategories A - D and K, and have their economic impact analysis based on detailed survey data. The remaining 33 nonsmall direct dischargers in Subcategories F - I, J, and L have their impact analysis based on screener survey data. Economic impacts are also projected for 65 small direct

[3] The screener survey weights and detailed survey weights were constructed to give the same estimates of the number of facilities in each subcategory. Any other estimates calculated using the two sets of weights are likely to produce different estimates. For example, the estimates of number of direct dischargers produced from the two sets of weights will be different.

dischargers, 51 of which are in Subcategories A - D and K and have detailed survey data available, while the remaining 14 are in Subcategories F - I, J, and L and are analyzed using screener survey data.

The rest of the discussion in this chapter deals only with the direct discharging facilities, and the companies that own them. For this profile, EPA focuses primarily on Subcategories A - D and K, which contain 80 percent of facilities within the scope of this regulation, and account for over 90 percent of estimated revenue and employment for facilities affected by this effluent guideline. The profile data for facilities in Subcategories F - I, J, and L were derived from Census data.

2.3.2 Profile of Direct Discharging Facilities

2.3.2.1 Data Sources

The EPA surveys collected information on site-level and company-level bases for a sample of the meat industry. The site-level information forms the basis for the economic impact analysis for the site closure and direct impact analysis. The detailed and screener surveys are the only source for this information. The company information forms the basis of the corporate financial distress analysis. The detailed survey is the only source of information for privately-held firms. (See Chapter 3 for more details on the economic impact methodology.)

The detailed survey collected site and company level financial information. The screener survey primarily focused on production and wastewater treatment characteristics. Financial information presented for Subcategories A - D and K is based on detailed survey data. Facilities in these subcategories represent approximately 71 percent of facilities affected by the promulgated effluent guidelines.

The small number of direct discharging facilities in Subcategories F - I, J, and K meant that almost none of these facilities received a detailed survey. EPA therefore based its analysis of these facilities on screener survey data. Since the screener survey did not collect site or company level financial data, revenue and employment numbers for these subcategories are estimated from surveyed facilities that were matched to model facilities derived from the *1997 Economic Census* data (see Proposal EA Chapter 3 and Appendix B, and Final EEBA Chapter 3).

2.3.2.2 Revenues

Revenues for the direct discharging facilities in all subcategories are $32 billion. Subcategories A - D and K represent the largest individual components at $17 billion and $13 billion respectively. Combined these two subcategories represent about 94 percent of revenues generated by facilities affected by this regulation.

Facilities in Subcategory A - D have the highest average revenue at $564 million per year. The next two largest Subcategories are K at $124 million per facility and Subcategory F - I at $112 per facility. Table 2-4 presents revenue data for all subcategories.

2.3.2.3 Employment

As with revenues, Subcategories A - D and K employ the vast majority of people at facilities within the scope of this effluent guideline. Combined, they represent about 96 percent of employment. In gross terms, large facilities in Subcategory K employ the most people at 107,096. However, on average, facilities in subcategory A - D employ more people than facilities in Subcategory K at 1,601 and 1,020 workers respectively. Table 2-4 presents employment data for all facilities within scope of this regulation.

Table 2-4
Employment and Revenues by Subcategory for Facilities Facing Regulation

Subcategory	Business Size	Number of Facilities	Employment	Average Facility Employment	Revenues (000)	Average Facility Revenue (000)
A - D	Small	15	615	41	$185,760	$12,384
	Nonsmall	31	49,630	1,601	$17,492,882	$564,287
F - I	Small	14	832	59	$237,465	$16,962
	Nonsmall	4	1,506	377	$448,654	$112,164
J	NA	19	1,123	59	$274,270	$14,435
K	Small	36	2,271	63	$276,287	$7,675
	Nonsmall	105	107,096	1,020	$13,022,059	$124,020
L	Small	3	97	32	$22,712	$7,571
	Nonsmall	10	974	97	$223,663	$22,366
Totals		**237**	**164,144**	**NA**	**$32,183,752**	**NA**

Sources: Subcategories A - D and K: U.S. EPA MPP Detailed Survey Database. Subcategories F - I, J, and K: U.S. EPA MPP Screener Survey Database; screener survey facilities matched to model facilities based on U.S. Census Bureau, 1999a - 1999d.

2.4 COMPANY LEVEL INFORMATION

As described above, only the detailed survey collected company level financial data. Information presented in this section is for those companies who reported operating a direct discharging facility in Subcategories A - D or K. These facilities represent 80 percent of the facilities affected under this regulation. Additionally, screener survey data indicate that 11 facilities in Subcategories F - I, J, and K are owned by companies that also own facilities in Subcategories A - D and K.

EPA reviewed the 56 direct discharging facilities in Subcategories A - D and K that received a detailed survey to determine their corporate parent, then compiled a list of all other meat processing facilities owned by each of those corporate parents. Of the 56 surveys, 4 are small producers, and are not within the scope of this effluent guideline. The rest of this section contains information for the 52 surveyed facilities within the scope of this guideline.

EPA used the detailed survey database, the screener survey database and EPA's Water Permit Compliance database to estimate the number of direct discharging facilities owned by these corporate parents that were not represented in the detailed survey database. EPA determined that the 52 surveyed direct dischargers are owned by 25 corporate parents; these companies owned a total of 323 MPP facilities in 1999. EPA then examined the discharge status of these 323 facilities because indirect and zero discharging facilities will not incur costs under this regulation. EPA estimates that of the 323 facilities owned by these corporate parents, approximately 117 were direct dischargers. Of these 117 direct dischargers, 52 received detailed surveys, and 65 required analysis based on non-survey data.

2.4.1 Type of Ownership

The 25 companies owning direct discharging sites in Subcategories A - D and K are primarily organized as corporations:

- 22 C corporations
- 2 S or limited liability corporations
- 1 agricultural cooperative

Almost half of these companies are privately owned; the detailed survey is EPA's only source of financial information for these privately-held firms.

2.4.2 Number of Sites per Company

The majority of the direct dischargers in Subcategories A - D and K (21 out of 25) are multi-site firms. The three companies that each operate 30 or more sites skews the average number of facilities per company upwards. On average, each company owns 13 facilities; however, 44 percent of these companies own 5 facilities or fewer. On average, companies owning 5 facilities or fewer have 1.25 direct dischargers. Companies that own more than 5, but fewer than 30 total facilities each own about 4 direct dischargers. However, the three largest companies own almost 20 direct discharging facilities each.

Table 2-5
Total Number of Facilities Operated by Companies that Own Direct Discharging Facilities

Range of Facilities per Company	Total Facilities Owned	Number Direct Discharging Facilities Owned	Number of Companies
1	4	4	4
2 to 5	25	10	7
6 to 10	44	19	6
11 to 15	51	20	4
16 to 20	0	0	0
21 to 25	21	6	1
26 to 30	0	0	0
More than 30	178	58	3

Source: U.S. EPA MPP Detailed Survey Database.

2.4.3 Company Level Employment and Revenues

Meat products represent the primary source of revenue for a majority of the companies in the survey. However, a significant minority of companies are diversified into other businesses. Based on the information gathered by EPA it was not always possible to separate meat and non-meat business segments for these companies. Therefore, the data presented in Table 2-6 includes revenue and employment for non-meat business segments. Companies that operate facilities processing both meat and poultry were more likely to be diversified into other businesses. Employment and revenue for this category contain the majority of the non-meat related data.

Table 2-6
Employment and Revenue at Companies Owning Meat and Poultry Facilities

Meat Type	Number of Companies	Employment	Revenues (000)
Primarily Owning Meat Processing Facilities	9	80,775	$29,949,011
Primarily Owning Poultry Processing Facilities	12	135,850	$15,441,204
Owning Both Meat and Poultry Processing Facilities	4	184,834	$89,439,473
Totals		**401,459**	**$134,829,688**

Source: U.S. EPA MPP Detailed Survey Database.

2.5 BSE AND EPA'S REGULATION OF THE MPP INDUSTRY

2.5.1 Background

In late December 2003 USDA reported the first BSE cow discovered in the U.S. BSE (bovine spongiform encephalopathy) or "mad cow disease" is a chronic, degenerative disorder affecting the central nervous system of cattle. BSE has been linked with the fatal variant Creutzfeldt-Jacob disease (vCJD) in humans; since 1995, approximately 140 deaths world-wide have resulted from vCJD, probably as a result of eating BSE-infected beef products. In addition, in early February 2004 avian flu was discovered on two Delaware poultry farms. Avian influenza is an extremely infectious and fatal form of avian flu for chickens. U.S. public health officials claim that the flu strain discovered in Delaware is not fatal to humans, unlike the strain in Asia.

2.5.2 Expected Impact on the MPP Industries

2.5.2.1 Short-run Market Effect

The short-run effect of BSE and avian flu have been severe. Immediately following the BSE discovery, cattle feedlot prices dropped sharply from about $92 per hundredweight (cwt) to about $75/cwt during the last week of December, 2003. After the announcements, many U.S. trading partners banned imports of U.S. beef and poultry products, causing some export companies to consider worker layoffs (U.S. exports account for roughly 10 percent of total U.S. beef production and about 15 percent of the nation's broiler production.) Following the avian flu discovery, poultry prices actually rose sharply in response to decreases in overall supplies because of the slaughter of millions of birds worldwide in an effort to contain the virus and the increased demand for U.S. poultry products. However, some USDA economists predict the trade ban may lower the price of frozen leg cuts, which make up roughly two-thirds of U.S. poultry exports.

It is too early, however, to predict the long-run impact of BSE case on the MPP industry. Only a single case of BSE has been reported to date, and much will depend on whether additional cases are reported. USDA has appeared to respond to the case relatively quickly and decisively to reassure the

public of the safety of the food system, and surveys show U.S. consumer confidence in that safety remains strong (Food Policy Institute, 2004; Gallup, 2004; Harvard School of Public Health, 2004). The impact of BSE on the U.S. beef industry may also be mitigated by the fact that the infected cow was imported from Canada, and was old enough to have contracted BSE prior to 1997 regulations designed to eliminate BSE in the U.S. These regulations have been further strengthened since the case was reported.

Although cattle prices have fallen sharply since the reported case of BSE, prices are still higher now than in 2002: beef prices were $69/hundredweight (cwt) at year-end 2002 compared to $75/cwt at year-end 2003. By mid-February, 2004, prices had rebounded to the $77/cwt to $79/cwt range, less than 2 percent lower than mid-February, 2003. Further, weekly slaughter in mid-February was about 5 percent below the same period in 2003; in January 2004 slaughter had been 15 to 20 percent below the previous year. In 2003, cattle prices were unusually high due to: (1) lower cattle supplies due to a drought in prime cattle producing regions, (2) a ban on Canadian beef imports because of a single reported case of BSE in Canada on May 20, 2003, and (3) increased consumer demand attributable to the popularity of "low-carb" diets. Land grant universities are forecasting that further cattle price decreases as a result of BSE will be modest and prices will eventually improve over time. For example, while cattle futures prices for 2004 have not rebounded to the high levels reached prior to the reported case in December, they have returned to the neighborhood of the current spot market price of $75/cwt (Barchart.com, 2004).

Although the cattle industry and the MPP industry are very closely related, they are not identical, and the impact of BSE on each sector of the system that processes beef for final consumption will differ.

Prices for cattle and for processed beef do not move in lockstep. There is a negative correlation between the farm price for cattle and the farm–to-wholesale price spread (the difference between the price per pound paid for cattle, and the price per pound at which the processed meat is sold on the wholesale market). That is, when the price of cattle decreases, the farm–to-wholesale price spread tends to increase, or at least remain stable (EPA analysis of USDA price spread data). Thus, it is possible that the decrease in cattle prices will increase the margin earned by processors on each pound of meat sold.

An improved price spread per pound of beef could be offset if the number of pounds sold declines significantly. Here, survey evidence on domestic consumer confidence is reassuring that — barring further findings of BSE — there will not be a long-term shift in consumer preferences away from beef. Some evidence from Great Britain and Canada seems to support this conclusion. In Britain, beef consumption (and the proportion of meat consumed out of total meat), after falling by 26 percent in 1996, returned to its long term trend by 1997, and remained stable in 1998 (Atkinson, 1999); this is in a country that had experienced over 174,000 cases of BSE and 41 deaths from vCJD between 1966 and 1998 (UKDH, 2004; WOAH, 2004). In Canada, domestic consumption of beef actually increased after the report of BSE as a result of aggressive marketing and an apparent show of consumer support for the industry; Canada is the only country in which domestic consumption of beef has increased after a report of BSE (CAHC, 2003).

The long-term effects of the reported case of BSE on export markets is less easy to determine. U.S. officials have aggressively tried to convince trading partners such as Japan to reopen their markets to U.S. beef. While the U.S. continues to trade boneless beef from cattle under 30 months old (the beef considered least susceptible to BSE) with Canada, that is the only major export market open to the U.S. Both the U.S. and Canada appear confident that trade with Mexico will reopen, but as of February 2004 that had not yet occurred. The international trade ban on Canadian beef, with the limited exception of the U.S., has continued, even though the first and only Canadian case of BSE was reported 6 months before the U.S. case. The European Union waited three years before lifting its ban on British beef in mid-1999. While, British exports of beef remain at a fraction of their pre-BSE level, the data is probably confounded by the outbreak of hoof-and-mouth disease in 2001.

USDA does point out that despite the unknown prognosis for beef exports, the current U.S. market conditions will at least somewhat cushion the industry from the shock of having to absorb 10 percent of its overall meat production in its domestic markets (USDA, 2004). Cattle supply was unusually low in 2003 due to the effects of the drought on cattle grazing areas, lack of imports from Canada, and unusually high demand for beef attributable to the popularity of “low-carb” diets. This was reflected in the extremely high cattle prices observed in 2003. With beef supply so tight, the excess production due to the ban on exports can be more easily absorbed in the domestic market as long as domestic demand remains robust.

While the reported case of BSE will undoubtedly have a negative impact on the beef component of the MPP industry, the pork and poultry components of the industry could benefit from it. Pork and poultry are substitutes for beef. Even if consumers reduce their beef purchases in response to the BSE report, it is highly likely that they will purchase more pork and poultry rather than forgo all meat and poultry products as a source of protein. This will tend to increase both the price and sales of those products. Thus, while the beef sector of the industry is worse off as a result of BSE, other industry sectors may well benefit from the report of BSE. This effect was clearly observed in Great Britain (Atkinson, 1999). This effect was not observed in Canada, but that is because of the unusual increase in domestic purchases of beef after the report of BSE.

2.5.2.2 Longer-run Production Cost Effect

The collective response by USDA, FDA, and the industry has been relatively quick and decisive, resulting in production level changes that should help prevent cases of BSE and avian flu. These production level changes will likely result in changes in industry cost structures as new food safety rules are implemented by all meat packing and poultry processing facilities. The cost of these new procedures will depend on implementation details which are currently being determined and are not available for inclusion in the final MPP rule.

Prior to last year's BSE discovery, in November 2003, USDA's Animal and Plant Health Inspection Service proposed to amend regulations on the importation of animals and animal products to recognize a category of regions that present a minimal risk of introducing BSE into the U.S. via live ruminants and ruminant products. See "Bovine Spongiform Encephalopathy; Minimal Risk Regions and Importation of Commodities" (USDA, 2003) published in the Federal Register on November 4, 2003 (Volume 68, Number 213:62386-62405).

Following the December BSE discovery, USDA's Food Safety and Inspection Service issued four new rules in January 2004 to further enhance safeguards against BSE. The following four emergency actions went into effect on January 12, 2004. First, one action will establish "product holding" standards requiring that cattle test negative for BSE before FSIS inspectors considered them as "inspected and passed" (DCN 329501). A second action will require all federally inspected slaughter

establishments remove, segregate and dispose of all "specified risk material" (e.g., skull, brain, trigeminal ganglia, eyes, vertebral column, spinal cord and dorsal root ganglia, etc.) and ensure these do not enter the food chain (DCN 329502). A third action will expand current prohibitions on what may be labeled as "meat" from "advanced meat recovery" to include dorsal root ganglia, clusters of nerve cells connected to the spinal cord along the vertebral column, along with spinal cord tissue (DCN 329503). Finally, a fourth action will ban the practice of "air-injection stunning" so that portions of the brain are not dislocated into the tissues of the carcass as a consequence of stunning cattle during the slaughter process (DCN 329504).

To date, EPA is not aware of any proposed or enacted USDA or FDA regulations or emergency actions to prevent further cases of avian flu that could affect poultry growers and processors.

2.5.3 Combined Effect of BSE and EPA's Rule on the MPP Industry

Chapter 5 of this report outlines EPA's reasons for its preliminary assessment that its determination of economic achievability for the final MPP rule would not change if the Agency were able to take into account recent events attributable to BSE and other related events, such as avian influenza. These reasons center on the ability of the Agency's financial models, based on information obtained through its detailed survey of the MPP industry and the conservative assumptions in the model facilities, which provide substantial margin for these models to be able to absorb additional costs and/or additional decreases in net income before showing additional facility closures. More information is provided in Chapter 5.

In addition, the overwhelming majority of the meat and poultry processing facilities in the U.S. will, however, not be subject to the final MPP rule. The MPP regulation affects 35 meat packing plants and about 110 poultry processing facilities. Department of Commerce's latest Census of Manufacturers reports that there were about 1,400 meat packing plants and about 500 poultry processing facilities in 1997 (U.S. Census Bureau, 1999a through 1999d). Thus, a very small percentage of the entire MPP industry is affected by both the effluent guideline and the potential impacts of BSE.

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CHAPTER 3

ECONOMIC IMPACT METHODOLOGY

3.1 BACKGROUND

EPA tailored its economic analysis to the Meat and Poultry Products industry and the data available. The data gathering effort is outlined in Figure 3-1. EPA selected a sample of 2,000 MPP facilities from a list of approximately 8,200 facilities. The set of 2,000 facilities was divided into those that were sent a screener survey (1,650 facilities) and those that were a detailed survey (350 facilities). From these data, EPA identified direct discharging facilities for further investigation.[1] Due to the longer amount of time required to complete and process the detailed survey compared to the screener survey, EPA had the screener survey data at proposal and knew the detailed survey data would be available for final promulgation. EPA therefore presented two methodologies in the Economic Analysis document accompanying the proposed rule. The first methodology was based on public and screener survey data and intended for use in the proposed rule while the second was based on detailed survey data and intended for use in the final rule.

As the results of the detailed survey data were analyzed, it became clear that few—if any—direct discharging further processors or renderers (Subcategories E - I, Subcategory J, and Subcategory L) had received a detailed survey. On the basis of the screener survey, EPA believes that a small number of direct discharging facilities do exist in these subcategories. Therefore, for the final rule EPA used detailed survey data and the associated methodologies to project economic impacts on direct discharging slaughter facilities (Subcategories A - D and Subcategory K), but continued to use the proposal methodology and screener survey data to project economic impacts on direct discharging facilities in Subcategories E - I, Subcategory J, and Subcategory L.

[1] See preamble to the final rule for EPA's decision to exclude indirect discharging facilities in the MPP industry from the scope of this rule.

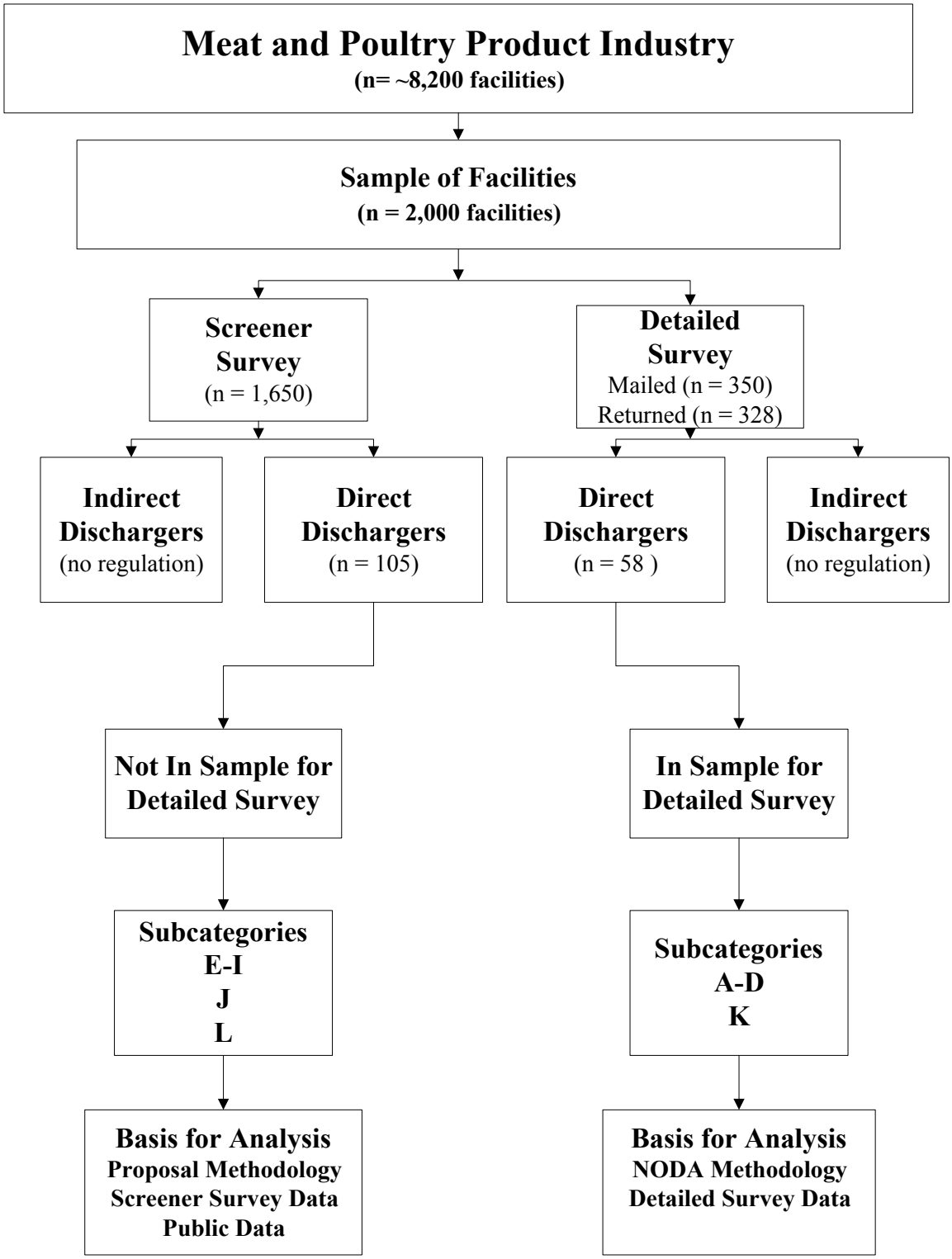

Figure 3-1

Road Map to Methodology by Subcategory

The rest of this chapter is predominantly a road map that explains which method was used to evaluate impacts by level and subcategory. It is organized by level: cost annualization, facility, company, market, and national. All methodologies were presented in detail in the proposal EA (hereafter "proposal EA," U.S. EPA, 2002) and Notice of Data Availability (FR, 2003). This chapter provides a brief overview and describes any modifications that EPA made in response to comments.

3.2 COST ANNUALIZATION

The beginning point for any analysis is the cost annualization model (see Figure 3-2). Annualized costs are calculated as the equal annual payments of an annuity that has the same present value as the stream of cash outflow over the project life and includes the opportunity cost of money or interest. An annualized cost is analogous to a mortgage payment that spreads the one-time investment of a home over a series of constant monthly payments. There are two reasons to annualize capital and O&M costs. First, the capital cost is incurred only once in the equipment's lifetime; therefore, initial investment should be expended over the life of the equipment. Second, money has a time-based value, so expenditures incurred at the end of the equipment's lifetime or O&M expenses in the future are not the same as expenses paid today.

Inputs to the cost annualization model come from EPA's engineering staff, secondary data, and detailed survey data. EPA's engineering staff developed capital and operating and maintenance (O&M) costs for incremental pollution control. The capital cost, a one-time cost, is the initial investment needed to purchase and install equipment involved in pollution control.[2] The O&M cost is the annual cost of operating and maintaining that equipment; a site incurs its O&M cost each year.

Secondary data sources provide the depreciation method, federal and state tax rates, and deflator indices. The depreciation method used in the cost annualization model is the Modified Accelerated Cost Recovery System (MACRS). MACRS can model businesses as depreciating a higher percentage of an investment in the early years and a lower percentage in the later years. The Internal Revenue Code Section 168 classifies an investment with a lifetime of at least 20 years but less than 25 years as 15-year

[2] One-time costs are included in capital costs.

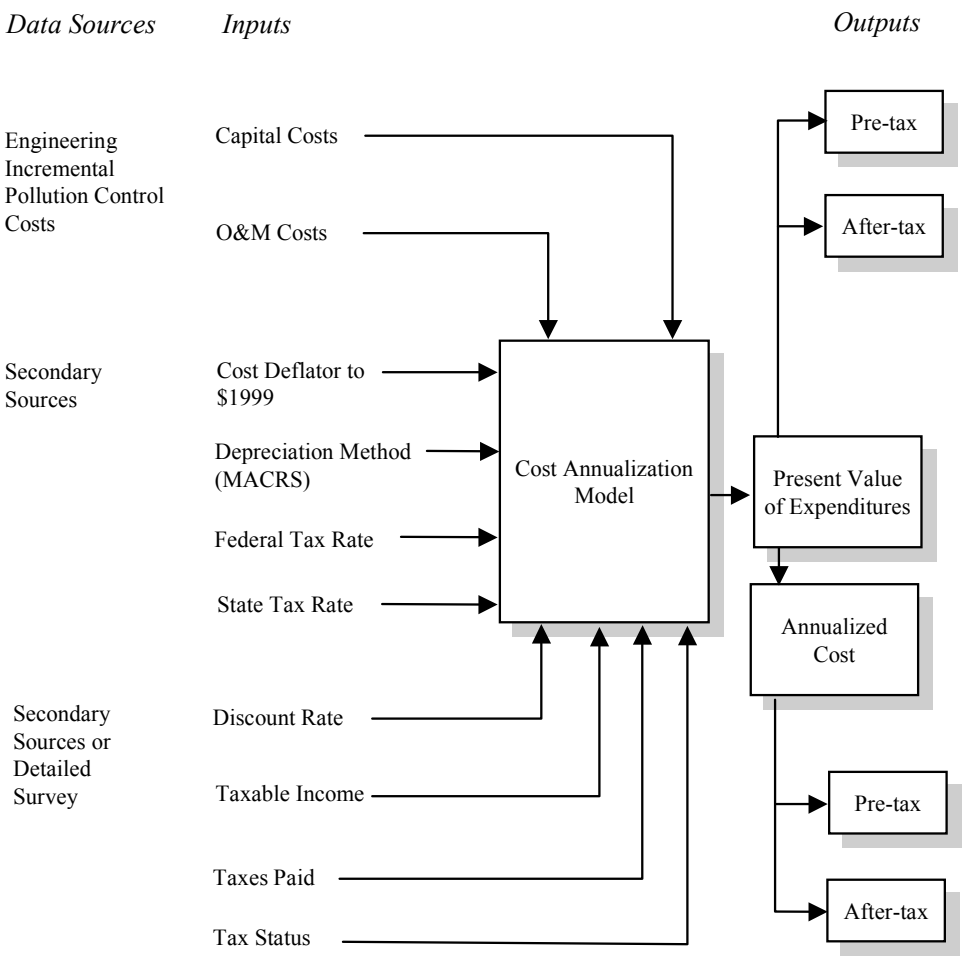

Figure 3-2

Cost Annualization Model

property. Therefore, the cost annualization model uses a 15-year depreciable lifetime for the capital cost. A mid-year depreciation convention is used; that is, EPA assumes that a 6-month period elapses between purchase of equipment and time of operation. As such, the model covers a 16-year period, with a 6-month period in the first year and a 6-month period in the sixteenth year (RIA, 1999).

Tax rates are determined by the national average state tax rate plus the federal tax rate. The model uses flags to identify whether a facility pays taxes at corporate rate, personal rate, or is an S/limited liability corporation which distributes earnings to its shareholders prior to taxation (CCH, 1999a and 1999b). The tax shield on compliance costs is limited to the average annual tax paid by the facility over the survey period.[3]

The Consumer Price Index (CPI) is used to estimate the average inflation rate for the 1987 to 1999 time period (CEA, 2002). Costs are deflated to $1999 values with the Engineering News Record Construction Cost Index to use with the 1999 data collected in the detailed questionnaire (ENR, 2000).

Several inputs to the cost annualization model vary depending on whether detailed survey data are available or not. For facilities with survey data, the discount rate reported in the detailed questionnaire adjusted for inflation by the CPI, taxable income is calculated as earnings before taxes (EBT),[4] and taxes paid are reported in the survey as tax status (corporate or personal). For facilities without detailed survey data, EPA used a real discount rate of 6.7 percent, which is the average real discount rate for detailed survey facilities. Taxable income and taxes paid are calculated from Census data and corporate tax rates as described in the proposal EA, Section 3.1.2.2[3] and Appendix B. Appendix A of the proposal EA provides a sample cost annualization spreadsheet and detailed descriptions of the calculations.

[3] For screener survey facilities, EPA assumed the tax shield was equal to zero to avoid underestimating facility costs and impacts.

[4] Taxable income was originally calculated on EBIT; this modification was made in response to a comment.

3.3 FACILITY ANALYSIS

The facility-level analysis is a closure analysis that examines whether an otherwise profitable site closes in response to the additional costs of increased pollution control. Direct impacts, such as closures and losses in employment and revenue are calculated based on the survey data for the facilities projected to close as a result of the regulation.

As indicated in Figure 3-1, EPA developed two methods of evaluating facility closure. The first method, described in Section 3.3.1, is based on detailed questionnaire data and is therefore used for Subcategories A - D and Subcategory K. Facilities in Subcategories E - I, Subcategory J, and Subcategory L are not represented in the returned detailed questionnaires. EPA used a combination of data from the screener survey and public sources to analyze these facilities, see discussion in Section 3.3.2.

3.3.1 Sites with Detailed Questionnaire Data

The closure analysis is a discounted cash flow analysis that compares the costs incurred during the 2005 to 2020 time period to the earnings accumulated during the same period. Both costs and earnings are discounted with the same value to put both time series on a comparable basis. To be considered a closure as a result of the rule, a facility has to show (1) positive long-term earnings without the rule and (2) negative long-term earnings as a result of the rule in the majority of the forecasts.

3.3.1.1 Forecasting Methods and Assumptions

While the analysis may be described simply, there are many complexities to address in building the model, such as what to consider as earnings, what costs are considered, and the number and type of forecasting methods used. As mentioned, the facility closure analysis was discussed in the Proposal EA, Section 3.2 and a revised forecasting method based on U.S. Department of Agriculture's Economic Research Service time series on the farm-to-wholesale price spread to develop an index that reflects the industry's cyclicality (FR, 2003).

For the purposes of this analysis, EPA used net income as an estimate of earnings even though it contains the non-cash cost of depreciation.[5] EPA developed several forecasting methods to account for uncertainty in both the forecast future facility net income, and the appropriate start point of the forecast. EPA has the 1997-1999 net income data as reported in the detailed survey and the indices developed from USDA ERS data from 1970 to 2002. The rule was promulgated in 2004, so costs to respond to the rule could be incurred as early as 2005. EPA first uses the indices to project the survey data from 2000 to 2005, the time period between the most recent data collected in the survey and promulgation. The earnings for 1997 and 1998 are re-calculated based on the ratio of the actual to forecast values for 1999. The year 2005 becomes the new starting point for the earnings forecast. That is, the time period over which to calculate the present value of earnings is 2005-2020; the same period over which the costs are projected. From these combinations, EPA selected the following three projection methods for net income:

- using a simple average of 1997, 1998, and 1999 net income projected over the 15 year project life to provide an unsophisticated baseline;
- using 2005 net income as the start point for projections using Cycle 1 in Table 3-1 (index initial value is 2005);
- using the three years average of each facility's net income (from the detailed survey) as the start point for projections using Cycle 2 in Table 3-1 (index initial value is the largest margin in the 1995 and 2001 period).

EPA used a "weight of evidence" approach to determine if a facility is projected to close. That is, a facility is projected to close if the PV of future compliance costs exceeds the forecast PV of net income under two of the three forecasting methods.

[5] In theory, depreciation is supposed to reflect wear and tear over the useful life of the asset, it does not necessarily do so for tax purposes due to the accelerated cost system.

Table 3-1
Business Cycle Indices for Forecasting Net Income

	Cycle 1			Cycle 2		
	Year 1 of Cycle Equals 2005			Year 1 of Cycle Equals High Point of 1995 - 2001		
Year	Beef	Pork	Broilers	Beef	Pork	Broilers
1	1.00	1.00	1.00	1.00	1.00	1.00
2	0.97	0.99	0.86	0.95	0.84	0.81
3	1.00	1.19	1.34	0.94	0.84	0.63
4	1.05	1.16	1.00	0.98	0.83	0.95
5	0.93	0.97	0.86	0.86	0.87	0.61
6	0.89	0.91	1.34	0.83	0.79	0.48
7	0.90	1.06	1.00	0.86	0.67	0.99
8	0.96	1.13	0.86	0.91	0.66	0.70
9	0.87	0.95	1.34	0.80	0.79	0.63
10	0.81	0.84	1.00	0.76	0.77	0.97
11	0.81	0.92	0.86	0.78	0.65	0.73
12	0.87	1.08	1.34	0.83	0.60	0.63
13	0.80	0.92	1.00	0.75	0.70	0.97
14	0.73	0.79	0.86	0.70	0.75	0.73
15	0.73	0.82	1.34	0.70	0.63	0.63
16	0.76	0.99	1.00	0.75	0.56	0.97

3.3.1.2 Baseline Conditions

The focus of the analysis is to evaluate impacts that result from the rule. A facility might be projected to close without any compliance costs. This will occur if: (1) the company does not record sufficient information at the site level for the closure analysis to be performed, (2) the company does not assign costs and revenues that reflect the site's true financial health (e.g., the facility is a cost center or a captive site), or (3) the site is already in financial trouble.

Under the first two conditions, EPA does not have sufficient information to evaluate impacts at the site level *as a result of the rule.* In the case of the MPP industry, many companies do not maintain financial records at the facility level. Instead they maintain their financial records at, for example, the company level, division level or product line level. EPA found that less than 40 percent of direct

discharging facilities provided facility level financial data in the detailed survey. EPA did collect company level financial data in the detailed survey. Therefore, EPA performed a closure analysis at the company level in addition to the facility level analysis, see Section 3.4. In the third case, the facility is unprofitable prior to the regulation, and the company may decide to close the site even in the absence of the rule. The projected closure of a site that is unprofitable prior to a regulatory action is not attributed to the regulation.

3.3.1.3 Adjustment of Facility Weights to Account for Detailed Survey Nonresponse

As previously noted, EPA did not receive facility level financial data from a significant portion of respondents in response to the Agency's detailed survey. In particular, 10 facilities (18 weighted) in Subcategories A - D (both small and nonsmall) and 27 facilities (97 weighted) in Subcategory K facilities (both small and nonsmall) did not provide sufficient financial information for use in EPA's closure analysis. This was generally because the companies do not maintain the type of information about each facility that EPA requested. Instead, the information is consolidated at the company level.

To account for the lack of facility level data in the facility closure analysis for Subcategories A - D and Subcategory K, EPA conducted its facility level closure analysis on the 10 facilities (28 weighted) in Subcategory A - D (both small and nonsmall) and 9 facilities (45 weighted) in Subcategory K (both small and nonsmall) that provided sufficient data about each facility. EPA then incorporated additional adjustments to the survey weights to account for the facilities without the financial information, but that had otherwise responded to the questionnaire. By adjusting in this manner, EPA is assuming that the facilities that provided facility-level information are similar to those that did not. EPA only uses these adjusted weights for the facility level closure analysis in Subcategories A - D and Subcategory K.

Table 3-2 lists the number of facilities by subcategory and production size, as well as the numbers of facilities that did and did not provide financial information for the closure analysis (see the TDD and the rulemaking docket for further details on survey stratification and facility counts).

Table 3-2
Facility Counts

Subcategory	Production Size	Facility Counts			"Economic Analysis" Adjustment Factor (N/n_1)
		Eligible (N)	With Data (n_1)	Without Data (n_2)	
A - D	nonsmall	31	13	18	2.38
	small	15	15	0	1.00
K	nonsmall	105	36	69	2.92
	small	36	9	27	4.15

The final weight w_{hi} for a facility i in stratum h can be written as follows:

$$w_{h,i} = (\text{base weight})_{h,i} \times (\text{economic analysis adjustment factor})_h$$

$$w_{h,i} = (\text{base weight})_{h,i} \times (N / n_1)_h$$

In other words, the 13 non-small facilities that provided facility level financial data in Subcategories A - D, for example, would have its detailed survey weight multiplied by 2.38 (13 × 2.38 = 31), and so forth for the remaining subcategories and size classes.

3.3.2 Sites without Detailed Questionnaire Data

3.3.2.1 Economic Impact Analysis Using Model Facilities

Facilities in Subcategories E - I, Subcategory J, and Subcategory L, were not represented in the detailed questionnaire data. However, these facilities were represented in the screener survey database. EPA therefore used the methodology for the proposed rule based primarily on Census data to project impacts for these facilities (see Proposal EA, Section 3.1.2 for details).

EPA developed economic model facilities based on the U.S. Census Bureau's 1997 Economic Census of the four NAICS codes for meat and poultry product industries (NAICS 311611, 311612, 311613, and 311615; see U.S. Census Bureau, 1999a through d). EPA used Census revenue and cost information at both the industry level and disaggregated into size groupings based on the number of employees at the establishment ("employment class"). At the employment class level, EPA used the Census' value of total shipments, payroll, and material costs data. (Total shipments serves as a proxy for total revenues.) EPA used industry level data on benefits, depreciation, rent, and purchased services and attributed it to the employment class level using a small number of reasonable assumptions (e.g., employment benefits are proportionate to payroll, refuse removal costs are proportionate to material costs). EPA divided each component of facility income by the number of establishments in the employment class to calculate the average for that class. EPA then estimated model facility earnings before interest and taxes (EBIT) in each class as the average value of shipments minus payroll, material costs, benefits, depreciation, rent, and purchased services. Because revenues, payroll and cost of materials are the most significant components of EBIT, the relative error introduced by attributing industry level data to the employment class level should be small.

EPA used data from Census' Annual Survey of Manufactures (ASM, 2000), 1997 Economic Census, and the Internal Revenue Service code combined with additional assumptions to estimate model facility net income from EBIT. EPA estimated industry level interest payments using a combination of ASM data on past investment by industry, Census data on relative investment in buildings and equipment, and assumptions about investment behavior (e.g., all investment in each year was funded through bank loans, the interest rate on those loans was equal to the nominal prime rate for that year plus 1 percent). Interest payments were then attributed to each employment class based on the percentage of industry investment accounted for by that employment class in the 1997 Census. EPA assumed model facility EBIT less interest (EBT) is equal to business entity taxable income as the basis for calculating tax payments; EPA then applied 1999 federal and an average of state corporate tax rates to EBT. EPA estimated net income as EBIT less estimated tax and interest payments for each model facility. EPA inflated all model income measures from the Census year, 1997, to the baseline year, 1999, using the implicit price deflator for the meat and poultry products industry (U.S. DOC, 2000 and U.S. DOC, 2001).

However, the model facility in reality represents a distribution of facility incomes around the mean. Therefore, EPA estimated this distribution of income around the model facility mean by obtaining

from Census a special tabulation of the variances and covariances for value of shipments, material costs, and payroll in each employment class (U.S. DOC, 2001). EPA assumed that the distribution of each variable is normal; given the relatively large number of observations within each employment class, this assumption is reasonable. Because model facility EBIT is calculated as a linear function of the means of its components, the variance of EBIT for each employment class can be calculated as a linear function of the variances and covariances of the components using well established formulae. Because the actual income measures differed from the approximate income measure (EBIT) on which variance was estimated, EPA adjusted the variance of each income measure using standard rules concerning the expected value of mean and variance.

In order to perform the economic impact analysis, EPA matched its economic model facilities to the screener survey facilities that were costed. All meat facilities that perform animal slaughter, whether alone or in combination with other processes, were assigned economic model facilities from NAICS 311611. Meat facilities that perform further processing but no slaughtering activities processes were assigned economic model facilities from NAICS 311612, as were facilities that process a mix of both meat and poultry (approximately 70 percent of their production is meat). Facilities that process poultry, with or without slaughter, were assigned economic model facilities from NAICS 311615. Finally, facilities that only perform rendering operations were classified as NAICS 311613. The model economic facilities were further matched to the screener survey facilities by size. EPA used facility production from the screener survey, combined with representative meat product prices for 1999, to estimate facility revenues. The screener survey facility was then assigned an economic model that most closely matched its estimated revenues.

EPA chose the ratio of cost/net income as its preferred (central) measure of economic achievability. EPA also estimated the probability that a facility would close because the cost of compliance exceeded net income. EPA estimated these probabilities by using the variance and covariance information provided by the Census Bureau to derive the variance of net income. The probability that annualized compliance costs are greater than net income provides a rough estimate of the probability of that facility closing.

EPA is cognizant that the use of average ratios could mask considerable variability in economic impacts. This is a shortcoming of the use of model facilities. EPA took several steps to minimize this

effect by: (1) using multiple model facilities within each subcategory, (2) being relatively conservative in its choice of average ratios that are deemed economically achievable, and (3) estimating the probabilities of closure (i.e., the likelihood of closure given the uncertainty around the estimated average income for the model facility).

3.3.2.2 Combining Detailed Survey Facility and Screener Survey Facility Costs

In Subcategories F - I, J, and L, EPA found that it had only two detailed surveys from direct discharger facilities, and, as explained in Section 2.3.1, chose to use direct discharging screener survey facilities to estimate costs and project economic impacts. Restricting the analysis in these subcategories to detailed survey facilities only would result in very unstable estimates because of the small number of direct dischargers found through the detailed survey.

However, rather than restrict the analysis in these subcategories to only screener survey facilities, and thus ignoring the information provided by the detailed survey facilities, EPA chose to use both data sources. The cost estimates are improved by determining an average cost per direct discharging facility, regardless of survey source, then multiplying that average cost by the weights from the larger screener survey. Detailed survey weights and screener survey weights are non-additive, thus only one set of weights can be applied. Because the screener survey weights are more precise (see Section 2.3.1), the screener survey weights are used.

For example, assume that compliance costs are estimated from a matched set of three screener survey facilities, S_1, S_2, and S_3, and one detailed survey facility, D_1 (i.e., based on production data, all four facilities would use the same model facility for projecting economic impacts). The facilities' corresponding weights are SS_1, SS_2, SS_3, and DS_1. The average cost for this group of facilities is calculated as:

$$\text{Average Cost} = (COST_{S1} + COST_{S2} + COST_{S3} + COST_{D1})/(4)$$

Total costs for this group of facilities are estimated as:

$$\text{Total Cost} = (\text{Average Cost})*(SS_1 + SS_2 + SS_3)$$

To project facility level impacts, EPA uses the average cost to the model facility to project impacts, and applies the sum of screener survey weights ($SS_1 + SS_2 + SS_3$) to the model facility to scale the results of that analysis. For national level costs, EPA uses the total cost as estimated above.

3.4 COMPANY ANALYSIS

EPA used three methods to examine impacts on companies: closure, Altman's Z′, and a financial ratio analysis. As with the facility analysis, the method used depend on whether the subcategory is represented in the detailed questionnaire data. EPA developed the company-level closure analysis because a substantial portion of the industry does not maintain financial records at the company level. The Altman's Z analysis was described in the proposal EA (Section 3.1.3.2). The financial ratio analysis is for that part of the industry not represented in the detailed questionnaire.

3.4.1 Companies with Detailed Survey Data

3.4.1.1 Estimation of Company Costs

For companies represented in the detailed survey, EPA constructed total company costs from costs for direct discharge facilities represented in the detailed survey data base, and estimated costs for other facilities owned by the same company that did not receive a detailed survey. EPA focused on estimating company costs for those within the scope of the final rule. EPA determined production thresholds below which a facility would not be within scope of the regulation (see Chapter 2, Industry Profile and Chapter 4, Options). Facilities that produce above the threshold and are within the scope of the regulated community are termed "nonsmall" facilities. That is, EPA developed company costs only

for companies that owned at least one nonsmall, direct discharging facility and received a detailed survey.

EPA's steps in identifying the number of companies, the facilities they owned in 1999, and the number of facilities for which costs were needed were:

- review the 53 nonsmall detailed survey direct discharging facilities in Subcategories A - D and Subcategory K to determine their corporate parent.
- compile a list of companies/corporate parents. There are 25 companies on this list.
- for each company, identify all other meat processing facilities owned by that company. EPA used screener survey, PCS, and public data to do this. EPA estimates that the 25 corporate parents of the 53 nonsmall direct dischargers owned about 323 MPP facilities in 1999.
- determine the discharge status of these 323 facilities because indirect discharging facilities will not incur costs under this regulation. EPA estimated that approximately 117 of the 323 facilities owned by these corporate parents were direct dischargers.

Of these 117 direct dischargers, 53 received detailed surveys, and 64 required analysis based on non-survey data. EPA estimated costs for the 53 facilities on the basis of their detailed survey data.

To estimate compliance costs attributable to the 64 non-surveyed facilities, EPA applied average compliance costs by meat type (meat or poultry) to each facility. EPA examined alternative means of allocating compliance costs to these facilities, such as matching costs from detailed survey facilities based on meat type and processes performed. EPA determined that applying average costs by meat type to non-surveyed facilities resulted in more conservative (i.e., higher) cost estimates. See Franz, 2003a (DCN 125501), for additional information on the estimation of non-surveyed direct discharge facilities.

3.4.1.2 Closure Analysis

The company level closure analysis is identical to the facility level closure analysis with company earnings and costs replacing facility earnings and costs in the discounted cash flow calculations. If a company is projected to close, company output and employment are considered lost.

EPA did not attempt to scale up the projected company closures to correspond to a national estimate because EPA lacks data on which to base sample weights for the 25 companies. Thus, the company level analysis reflects closures only among the 25 companies analyzed. EPA made an effort to determine whether there are additional companies that own direct discharging MPP facilities and found three additional companies based on the screener survey results that may own direct discharging MPP facilities. Therefore, the company level analysis could underestimate the number of company closures nationally.

3.4.1.3 Altman's Z′-score

There is no change from EPA's proposed methodology on using an Altman Z′-score to assess the financial health of a company before and after incremental pollution control costs (see Proposal EA, Section 3.1.3.2; Altman, 1993). Altman Z′-score analysis uses on a statistical technique called multiple discriminant analysis calculate a weighted combination of financial ratios. The Altman Z′-score is a widely-used tool used to predict firm "financial distress" or bankruptcy. It takes into account a company's total assets, total liabilities and earnings, which are influenced by total compliance capital costs incurred by a company because of the proposal as well as pre-tax annualized compliance costs.

The score places firms into three categories of financial health *if no corrective action is taken by the company*: (1) financial distress is unlikely, (2) financial distress is indeterminate, and (3) financial distress is likely. EPA considered firms that move from an indeterminate or unlikely distress category to a likely distress category to be at risk of bankruptcy or other serious financial disruption. The actual effects of financial distress are inherently unpredictable and a firm may avoid legal bankruptcy by taking other measures such as laying off employees, closing facilities, or selling assets. These firms still may incur very significant impacts even if they do not file for bankruptcy.

EPA used the Altman Z′-score to assess the baseline financial condition of MPP firms and the incremental impacts of the rule on their financial health. This analysis includes the same 26 companies analyzed for company closure analysis.

3.4.2 Companies Without Detailed Survey Data

For companies and sites without detailed survey data, EPA assumed the facility and company are the same. EPA combined Census data (via the model facilities developed for the closure analysis) with Dun & Bradstreet financial ratio data (D&B, 1998). For each model facility, EPA divided net income by the median value for return on assets reported by Dun & Bradstreet for the relevant industry to estimate the model facility's total assets. Given the model facility's net income and total assets, EPA calculated the post-regulatory return on assets as: (net income - posttax annualized costs)/(total assets + capital costs).

3.5 MARKET MODEL

3.5.1 Overview

EPA developed a market model to examine the impacts of the proposal on the price and output of various meat and poultry products. The market model was described in the Proposal EA, Section 3.1.4, Appendix C (Market Model Methodology), and Appendix D (Summary of Supply and Demand Elasticity Literature).

The market analysis for each product depends not only on the compliance costs for that product but also on the impact of costs on the prices of the other three meat and poultry products because as prices for one product rise, consumers will purchase less of that product and more of the other three products. EPA selected a perfectly competitive structure for the meat and poultry products market model after performing an extensive literature search. EPA developed standard domestic supply, domestic demand, import supply, and export demand equations for each meat and poultry product. Domestic demand for each meat and poultry product is specified as a function of the price of the other three meat and poultry products in addition to its own price. EPA used USDA data to determine baseline market prices and quantities. Key model parameters (*e.g.*, price elasticities) were selected from existing published sources after an extensive search. For each meat and poultry product market to be in

equilibrium, that is, U.S. domestic demand plus foreign demand (exports) must equal U.S. domestic supply plus foreign sales (imports) at its current market price.

Compliance costs shift the supply curve for each meat and poultry product by the pre-tax annualized compliance costs per pound of carcass weight for each of the four meat types. The most appropriate measure of the shift in supply is the cost per pound of total industry production because: (1) the majority of facilities incur no costs, and (2) the competition from facilities that do not incur costs will discourage affected facilities from increasing price by the full cost per pound of the ELG.

Given the supply shift for each product, EPA solves for the post-regulatory set of meat prices that results in equilibrium in all four markets. This solution provides estimates of post-regulatory impacts. Finally, the post-regulatory prices are substituted back into the individual component equations to estimate post-regulatory domestic supply, domestic demand, import supply, and export demand for each meat and poultry product. Changes in prices and these quantities for each meat and poultry product measure the market-level impacts of the final rule.

3.5.2 Revision to Trade Elasticities

The primary factor in determining trade impacts are the trade elasticities specified in the model. EPA received comments that it did not adequately address trade impacts on the poultry sector. In response, EPA reviewed the two frameworks for deriving the trade elasticities. The first assumes that one country's meats are an imperfect substitute for those of other countries (i.e., Armington's framework). The second assumes that each country's meat products are perfect substitutes for those of any other country (i.e., Orcutt's framework).

EPA found sufficient evidence in the published literature to retain the Armington framework it had proposed. However, EPA decided to revise how it estimated the trade elasticities. EPA now believes it is more appropriate to use the U.S. own price elasticity of mead demand as a direct proxy for the price elasticity of U.S. demand for meat products regardless of the country of origin. This is because econometric studies measure the responsiveness of meat purchases by consumers regardless of the

country of origin of those meat products. This modification was presented in the NODA and the detailed discussion and equations are in the rulemaking docket (Franz, 2003b; DCN 125503). Table 3-3 summarizes the two sets of estimates.

Table 3-3
Estimates of Armington Trade Elasticities for the MPP Market Model

	Import Elasticities[a]		Export Elasticities[b]	
Meat Type	**Proposal**	**Revised**	**Proposal**	**Revised**
Beef	0.0968	1.9994	-1.5584	-1.5316
Pork	0.0346	1.3337	-1.5745	-1.5711
Broilers	0.0002	1.1458	-1.2017	-1.1903
Turkeys	0.0002	1.1600	-1.1865	-1.1557

[a] The percent change in U.S. demand for rest of the world (ROW) meat products resulting from a one percent change in U.S. price.
[b] The percent change in ROW demand for U.S. meat products resulting from a one percent change in U.S. price.

3.6 DIRECT IMPACTS

Direct impacts are calculated from facility closures estimated from the detailed survey data and the probablistic method based on public data and model facilities (Sections 3.3.1 and 3.3.2, respectively). All employment, production, exports, and revenue associated with the closed sites are considered lost when the sites close.[6]

3.7 NATIONAL DIRECT AND INDIRECT IMPACTS

Impacts on the meat product industry are known as direct effects, impacts that continue to resonate through the economy are known as indirect effects (effects on input industries), and effects on consumer demand are known as induced effects. The U.S. Department of Commerce's Bureau of

[6] This approach projects the severest effects because it does not account for other sites increasing production or hiring workers in response to the site closure. The market model, however, accounts for this effect.

Economic Analysis (BEA) tracks these effects both nationally and regionally in massive "input-output" tables, published as the Regional Input-Output Model (RIMS II) multipliers. For every dollar in a "spending" industry, these tables identify the portion spent in contributing, or "vendor," industries.

For this analysis, EPA calculated direct and indirect impacts using the national-level final-demand multipliers for BEA industries 14.0103 (meat packing plants, sausages, and other prepared meats):

- Output: 4.9661 dollars of total output per dollar of meat products
- Employment: 46.9297 FTEs per $1 million in output in 1992 dollars

and these multipliers for BEA 14.0105, poultry slaughtering and processing:

- Output: 4.3518 dollars of total output per dollar of meat products
- Employment: 45.1800 FTEs per $1 million in output in 1992 dollars

Because employment multipliers are based on 1992 data, the value of lost output needs to be deflated to 1992 dollars before estimating employment impacts. (U.S. DOC, 1996). EPA used Gross Domestic Product (GDP) data by industry for the years 1947 to 2000, compiled by the Bureau of Economic Analysis (BEA), to calculate the implicit price deflator for the Food and Kindred Products industry in the period 1992 to 1999 (U.S. DOC, 2001).

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CHAPTER 4

POLLUTION CONTROL OPTIONS

4.1 EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

The Federal Water Pollution Control Act (commonly known as the Clean Water Act [CWA, 33 U.S.C. §1251 et seq.]) establishes a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (§101(a)). EPA is authorized under sections 301, 304, 306, and 307 of the CWA to establish effluent limitations guidelines and pretreatment standards of performance for industrial dischargers. The standards EPA establishes include:

- Best Practicable Control Technology Currently Available (BPT) . Required under section 304(b)(1), these rules apply to existing industrial direct dischargers. BPT limitations are generally based on the average of the best existing performances by plants of various sizes, ages, and unit processes within a point source category or subcategory.

- Best Available Technology Economically Achievable (BAT). Required under section 304(b)(2), these rules control the discharge of toxic and nonconventional pollutants and apply to existing industrial direct dischargers.

- Best Conventional Pollutant Control Technology (BCT). Required under section 304(b)(4), these rules control the discharge of conventional pollutants from existing industrial direct dischargers.[1] BCT limitations must be established in light of a two-part cost-reasonableness test. BCT replaces BAT for control of conventional pollutants.

- Pretreatment Standards for Existing Sources (PSES). Required under section 307. Analogous to BAT controls, these rules apply to existing indirect dischargers (whose discharges flow to publicly owned treatment works (POTWs).

- New Source Performance Standards (NSPS). Required under section 306(b), these rules control the discharge of toxic and nonconventional pollutants and apply to new source industrial direct dischargers.

- Pretreatment Standards for New Sources (PSNS). Required under section 307. Analogous to NSPS controls, these rules apply to new source indirect dischargers (whose discharges flow to [POTWs]).

[1] Conventional pollutants include biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, pH, and oil and grease.

EPA is promulgating final effluent limitations guidelines for the meat products industry in this rulemaking effort.

4.2 TECHNOLOGY OPTIONS

EPA does not mandate technologies when establishing effluent limitations guidelines and pretreatment standards. However, EPA evaluates various technology options in order to base the limitations on demonstrated technologies and to evaluate the economic impact of the cost of those technologies on the regulated industry. This section briefly describes the pollution control options evaluated for each subcategory within the meat products industry. The Development Document (U.S. EPA, 2004) provides a detailed description of the meat products industry subcategories and pollution control options for each subcategory.

Table 4-1 summarizes the technology options considered for each meat products industry subcategory. The first column indicates the option number that appears in the cost and impact tables in Chapters 5 through 8. The second column contains a brief description of the technology option. For the proposed rule, EPA examined costs and impacts of guidelines and standards to both direct and indirect discharging facilities. The rule as promulgated only sets effluent limitations for direct dischargers.

Table 4-1
Meat Products Industry Treatment Technology Options
Direct Dischargers

Option	Treatment Unit
1	Biological Treatment, Partial Nitrification, Disinfection
2	Biological Treatment, *More Complete Nitrification*, Disinfection
2.5	Biological Treatment, More Complete Nitrification, Disinfection, *Partial Denitrification*
2.5 + P	Biological Treatment, More Complete Nitrification, Disinfection, Partial Denitrification, *Chemical Phosphorus Removal*
4	Biological Treatment, More Complete Nitrification, Disinfection, *More Complete Denitrification*, Chemical Phosphorus Removal

Changes between technology options indicated by italics.

As can be observed in Table 4-1, the treatment trains costed in the higher numbered options build upon the set of technologies costed for the first option. Thus, under Option 1, direct dischargers were costed for: biological treatment, partial nitrification, and disinfection. These components are also included in Options 2 through 4. Option 2 increases the degree of nitrification, while Options 2.5, 2.5 + P, and 4 add denitrification. Chemical phosphorus removal is added to Option 2.5 + P and Option 4.

EPA examined the costs and economic impacts of Options 1 and 2 on small processors; nonsmall processors were not costed for Option 1, but were costed for all higher options. The levels of production that EPA used to define small facilities are presented in Table 4-2. For the proposed rule, EPA defined small processors in Subcategory K as those facilities that slaughter less than 10 million pounds of poultry per year. For the final rule, EPA has redefined this threshold as 100 million pounds per year. EPA modified the threshold because it found significant economies of scale for poultry slaughter facilities. This results in relatively little production (and pollutant loads in the wastewater) from facilities that produce below this threshold. Further details of the analysis of this threshold may be found in docket item DCN 321001.

Table 4-2

Size Classifications for Meat Products Industry Subcategories

Subcategory	Classification	Definition
A - D	Small	< 50 million pounds live weight kill per year
	Nonsmall	≥ 50 million pounds live weight kill per year
E	NA	≥ 1.56 million pounds of finished product per year
F - I	Small	> 1.56 million pounds of finished product per year < 50 million pounds of finished product per year
	Nonsmall	≥ 50 million pounds of finished product per year
J	NA	≥ 10 million pounds of raw product per year
K	Small	< 100 million pounds live weight kill per year
	Nonsmall	≥ 100 million pounds live weight kill per year
L	Small	< 7 million pounds of finished product per year
	Nonsmall	≥ 7 million pounds of finished product per year

NA: no distinction is made between small and nonsmall facilities in this subcategory.

Table 4-3 summarizes the technology options selected for direct discharging facilities in each meat products industry subcategory. EPA is excluding small facilities in Subcategories A though J from the revised limitations, and is only setting new source standards for small facilities in Subcategory K and Subcategory L. EPA is not revising pretreatment standards for indirect dischargers in any subcategory.

Table 4-3
Technology Options for Meat Products Industry Subcategories
Direct Dischargers

Subcategory		Selected Option for Final Rule				
		1	2	2.5	2.5 + P	4
A - D[1]	Nonsmall		BPT	BAT, NSPS		
F - I[2]	Nonsmall			BAT, NSPS		
J[3]	NA			BAT, NSPS		
K[4]	Small		NSPS			
	Nonsmall		BPT, BCT	BAT, NSPS		
L[5]	Small		NSPS			
	Nonsmall		BPT, BCT	BAT, NSPS		

NA: no distinction is made between small and nonsmall facilities in this subcategory.
[1] Guidelines for small facilities are not revised under this rulemaking. BCT for nonsmall facilities is not revised under this rulemaking.
[2] Guidelines for subcategory E and for small processors in subcategory F - I are not revised under this rulemaking. BPT and BCT for nonsmall processors are not revised under this rulemaking.
[3] BPT and BCT are not revised under this rulemaking.
[4] EPA chose not to set BPT, BCT, and BAT for small facilities in Subcategory K.
[5] EPA chose not to set BPT, BCT, and BAT for small facilities in Subcategory L.

4.3 REFERENCES

U.S. EPA. 2004. Technical Development Document for the Final Effluent Limitations Guidelines and Standards for the Meat Products Point Source Category. EPA-821-R-04-011. Washington, DC: U.S. Environmental Protection Agency, Office of Water.

CHAPTER 5

COSTS AND ECONOMIC IMPACTS

The national costs for the options described in Chapter 4 are presented in Section 5.1. Section 5.2 presents the estimated impacts on existing facilities while Section 5.3 discusses barriers to entry for new facilities. Section 5.4 is a summary of the impacts under the final rule.

EPA exercised its authority for regulatory flexibility and evaluated several production thresholds below which a facility was excluded from the scope of this rule, see Chapter 2 (Industry Profile) and Chapter 4 (Options). Facilities that produce more than the threshold amount, and are therefore subject to the rule, are called "nonsmall" facilities. Facilities that produce below that threshold, and are not subject to the rule, are called "small" facilities.

5.1 NATIONAL COSTS

All costs are presented in 1999 dollars unless otherwise identified.

5.1.1 Costs for Nonsmall Facilities

Table 5-1 presents the pre-tax and post-tax annualized costs for nonsmall facilities. The costs are reported by subcategory and option. Pre-tax annualized costs are the most complete estimates of annualized control costs, but the post-tax costs more accurately reflect the costs businesses will incur because they net out tax savings. For that reason, both pre-tax and post-tax costs are used in the economic impact analysis. Pre-tax costs, however, more accurately reflect the total cost to society of the rule and are used in the E.O. 13258 analysis, the cost-effectiveness analysis, and elsewhere.

EPA calculated two cost estimates for the selected option: the "low" costs are based on EPA's selection of input parameters for the cost model, while the "high" cost estimate includes industry's input parameters, with the exception of a few values where EPA disagreed with industry's comments.

Table 5-1
Total and Average Compliance Costs for Nonsmall Processors by Subcategory and Option

Option	Total Costs (000)			Average Costs (000)		
	Capital	Post-tax Annualized	Pre-tax Annualized	Capital	Post-tax Annualized	Pre-tax Annualized
Subcategory A-D (29 facilities)						
Option 2	$24,588	$4,687	$7,288	$793	$151	$235
Option 2.5 (Low)	**$55,801**	**$8,886**	**$13,242**	**$1,800**	**$287**	**$427**
Option 2.5 (High)	**$67,940**	**$11,219**	**$16,686**	**$2,192**	**$362**	**$538**
Option 2.5 + P	$88,398	$27,873	$42,914	$2,852	$899	$1,384
Option 4	$110,203	$33,836	$52,001	$3,555	$1,091	$1,677
Subcategory F-I (4 facilities)[1]						
Option 2	$1,001	$266	$266	$250	$66	$66
Option 2.5 (Low)	**$717**	**$289**	**$289**	**$179**	**$72**	**$72**
Option 2.5 (High)	**$1,017**	**$329**	**$329**	**$254**	**$82**	**$82**
Option 2.5 + P	$1,101	$359	$359	$275	$90	$90
Option 4	$2,127	$798	$798	$532	$200	$200
Subcategory J (19 facilities)[1]						
Option 2	$1,294	$627	$627	$68	$33	$33
Option 2.5 (Low)	**$5,960**	**$1,919**	**$1,919**	**$314**	**$101**	**$101**
Option 2.5 (High)	**$7,019**	**$2,826**	**$2,826**	**$369**	**$149**	**$149**
Option 2.5 + P	$9,031	$7,433	$7,433	$475	$391	$391
Option 4	$11,610	$10,171	$10,171	$611	$535	$535
Subcategory K (96 facilities)						
Option 2	$63,948	$13,600	$17,739	$608	$130	$169
Option 2.5 (Low)	**$103,751**	**$17,700**	**$21,906**	**$988**	**$169**	**$209**
Option 2.5 (High)	**$133,591**	**$25,404**	**$31,817**	**$1,272**	**$242**	**$303**
Option 2.5 + P	$160,601	$48,308	$63,384	$1,530	$460	$604
Option 4	$331,343	$84,547	$109,077	$3,156	$805	$1,039
Subcategory L (10 facilities)[1, 2]						
Option 2	$1,353	$557	$557	$135	$56	$56
Option 2.5 (Low)	**$2,229**	**$747**	**$747**	**$223**	**$75**	**$75**
Option 2.5 (High)	**$2,367**	**$983**	**$983**	**$237**	**$98**	**$98**
Option 2.5 + P	$3,808	$1,475	$1,475	$381	$148	$148
Option 4	$7,822	$3,269	$3,269	$782	$327	$327

[1] For nonsmall facilities in Subcategories F - I, J, and L, post-tax annualized costs are equal to pre-tax annualized costs because the analysis is based on model facilities, and EPA assumed a tax shield of $0 to avoid underestimating impacts.

[2] Subcategory includes 7 mixed processor facilities with nonsmall levels of production in Subcategory L and small levels of production in Subcategory F - I; on average, 61 percent of their production falls into Subcategory L.

Total pre-tax annualized costs of the rule under the selected Option 2.5 range from $38.1 million to $52.6 million. Capital costs are projected to total from $168.5 to $211.9 million under the selected option. Pre-tax annualized costs per facility are consistently largest in Subcategories A - D ($0.4 to $0.5 million), and smallest in Subcategories F - I ($72,000 to $82,000).

5.1.2 Costs for Small Facilities

Table 5-2 presents estimated total and average compliance costs for small facilities. These costs are reported for completeness; EPA chose not to set new effluent limitations and guidelines for small processors under this rule.

Table 5-1 includes only that percentage of costs for mixed processors that is attributable to nonsmall levels of production of further processed poultry (Subcategory L). Similarly, Table 5-2 includes costs for mixed processors that are attributable to small levels of production of further processed meat (Subcategories F - I) and poultry (Subcategory L). Therefore, the facility counts presented in these tables include the double counting of 7 facilities with nonsmall levels of production in Subcategory L and small levels of production in Subcategories F - I, and 3 facilities with small levels of production in both Subcategory L and Subcategories F - I.

Table 5-2
Total and Average Compliance Costs for Small Processors by Subcategory and Option

Option	Total Costs (000)			Average Costs (000)		
	Capital	Post-tax Annualized[1]	Pre-tax Annualized[1]	Capital	Post-tax Annualized[1]	Pre-tax Annualized[1]
Subcategory A-D (14 facilities)[2, 3]						
Option 1	$1,000-$3,000	$1,000-$2,500	$1,000-$2,500	$150 - $175	$80 - $120	$80 - $120
Option 2	NA	NA	NA	NA	NA	NA
Subcategory F-I (21 facilities)[4]						
Option 1	$2,308	$1,108	$1,108	$110	$53	$53
Option 2	$2,308	$1,116	$1,116	$110	$53	$53
Subcategory K (36 facilities)[2]						
Option 1	$7,000-$10,000	$2,000-$4,000	$2,000-$4,000	$200 - $275	$50 - $120	$50 - $120
Option 2	$7,000-$10,000	$2,000-$4,000	$2,000-$4,000	$200 - $275	$50 - $120	$50 - $120
Subcategory L (3 facilities)[5]						
Option 1	$17	$13	$13	$6	$4	$4
Option 2	$17	$13	$13	$6	$4	$4

[1] For small facilities, post-tax annualized costs are equal to pre-tax annualized costs because: (1) the facility is an S corporation or LLC (Subcategories A - D and K), so taxes are paid on the income of the owning partners, or (2) the analysis is based on model facilities (Subcategories F - I and L), and EPA assumed a tax shield of $0 to avoid underestimating impacts.
[2] Estimated costs are presented as a range to prevent the disclosure of confidential business information.
[3] Option 2 was not costed for small facilities in this subcategory, because EPA did not propose further regulations.
[4] Subcategory includes 7 mixed processor facilities with small levels of production in Subcategory F - I and nonsmall levels of production in Subcategory L. This subcategory also includes 3 mixed processor facilities with small levels of production in Subcategory F - I and small levels of production in Subcategory L. Compliance costs for mixed processor facilities are distributed between subcategories based on their percentage of production in each.
[5] Subcategory includes 3 mixed processor facilities with small levels of production in Subcategory L and small levels of production in Subcategory F - I. Compliance costs for mixed processor facilities are distributed between subcategories based on their percentage of production in each.

5.1.3 National Costs for Rule

The national cost for the rule depends on the option selected for each of the subcategories, see Table 5-3. The subcategory costs correspond to those shown in Table 5-1 because EPA chose not the regulate small facilities under this rule. The national cost of the rule is $52.6 million dollars (1999

dollars), less than the $100 million threshold to be considered a "major" rule under E.O. 13258 and the Unfunded Mandates Reform Act.

Table 5-3
Total Cost of the Rule by Subcategory

Subcategory	Promulgated Option	Pre-tax Annualized Cost (Thousands)			
		Low Estimate		High Estimate	
		1999 Dollars	2003 Dollars	1999 Dollars	2003 Dollars
A - D	2.5	13,242	14,629	16,686	18,435
F - I	2.5	289	319	329	363
J	2.5	1,919	2,120	2,826	3,123
K	2.5	21,906	24,201	31,817	35,151
L	2.5	747	825	983	1,086
Total		**38,103**	**42,095**	**52,641**	**58,158**

5.2 ECONOMIC IMPACTS ON EXISTING FACILITIES (BAT)

5.2.1 Facility Analysis

5.2.1.1 Nonsmall Facilities

Subcategories A - D. Facilities in Subcategories A - D were represented in the detailed survey. The closure analysis therefore follows the methodology described in Section 3.3.1. The results are reported in Table 5-4.

Eighteen of the 31 facilities did not report site-level financial data. To account for this the remaining facilities were reweighted. This methodology is described in Section 3.3.1.3.

Of the 31 facilities, 5 were forecast to have negative earnings (i.e., net present value of net income) prior to imposition of regulatory costs under at least 2 of the 3 forecasting methods described in Section 3.3.1.1. The economic impact of the rule on "baseline closures" cannot be assessed using the closure model. **No closures** are projected as a result of the rule.

Table 5-4
Summary of Projected Nonsmall Facility Closure Impacts by Subcategory and Option
Subcategories A - D

Option	Baseline Conditions and Projected Incremental Closure Impacts		
	Number of Facilities	Total Revenues (000)	Employees
Total Facilities Analyzed	31	$17,492,882	49,630
Baseline Closures[1]	5	$2,000-$4,000	13,000-15,000
Option 2 Closures	0	$0	0
Option 2.5 Closures (Low)	0	$0	0
Option 2.5 Closures (High)	0	$0	0
Option 2.5 + P Closures	0	$0	0
Option 4 Closures	0	$0	0

[1] Revenues and employment are presented as a range to prevent the disclosure of confidential business information.

The Potential Effects of BSE on the Facility Closure Analysis for Subcategories A - D

EPA believes the closure analysis for facilities in Subcategories A - D, and its determination of economic achievability would not change if the Agency were able to take into account recent events attributable to BSE and other related events, such as avian influenza.

Despite the recent market changes attributable to these events, there are encouraging signs that U.S. markets in these sectors will recover, as described in Chapter 2 of this report. In the beef sector, only a single BSE case has been reported and the infected cow was imported from Canada and was old enough to have contracted BSE prior to 1997 regulations designed to eliminate BSE. Price decreases have been severe on the cattle feeding sectors with relatively less effect on packers and processors: there is often a negative correlation between farm and wholesale level prices, such that when farm prices drop,

wholesale prices rise or remain stable. Land grant universities are forecasting that further cattle price decreases will be modest and prices will eventually improve over time. Gallup polls immediately following the BSE discovery showed that confidence among U.S. consumers remains strong, with only one in three Americans viewing BSE in the U.S. as a major problem or crisis. Confidence among our trading partners also appears to be improving. These encouraging signs are partly attributable to the relatively quick and decisive response by USDA, FDA, and the industry, resulting in production level changes that should help prevent additional major outbreaks.

EPA expects that recent market changes attributable to BSE and avian flu would not alter the conclusions of its economic impact analysis of MPP facilities in the beef and poultry sectors that are affected by these final regulations. The basis for this determination is as follows. First, the results of EPA's analysis are mostly cost-driven such that projected facility closures are consistent across different cost options, affecting only those regulated facilities that either incur high costs because they do not have existing treatment technologies in place or affecting those facilities that are financially vulnerable prior to regulation. Second, EPA's financial models use a conservative projection of future net income streams. This can be observed by the overall long-term downward in the forecast cycle presented in Table 3-1. Third, financial data suggest that the farm to wholesale margin for beef appears adequate to absorb short-term market changes, whether caused by increased production costs or lowered sales income. EPA used data through 2002 to estimate economic effects and did not include record high meat prices in 2003 which could tend to improve the overall livestock industry profit picture and make new regulations appear more affordable. USDA data indicate that the farm-to-wholesale price spread for beef averaged $0.42/lb in 2003, compared to $0.35/lb in 2002 and $0.38/lb in 2001. Therefore, while EPA's forecast of future facility net income, which is based on the farm-to-wholesale price spread, does not incorporate the effects of a potentially bad year (2004), neither does it incorporate an unusually good year (2003).

Finally, EPA's conclusions are supported by its examination of the projected discounted flow of net income for facilities in Subcategories A - D. Even after accounting for compliance costs under the selected option, the majority of facilities in these subcategories have sufficient margin to absorb impacts of BSE and remain open. In general, the distribution of facility net income tends to be bimodal: facilities are either in poor financial condition (either baseline closures, or at best show borderline viability) or are in fairly robust financial health. Thus, in Subcategories A - D, the majority of facilities that are not

baseline closures could absorb an additional 90 percent decrease in net income before risking potential closure. Even those facilities that are in worse financial condition could absorb an additional 65 percent decrease in net income before closing. (For the poultry sector net income would also have to decrease dramatically, from 50 percent to 90 percent, before additional facility closures would occur.) Hence, unless the outbreak of BSE becomes more severe and prolonged than currently seems probable, EPA believes that this margin is sufficient to absorb these market impacts without changing the Agency's determination of economic achievability for the MPP regulation.

In addition, EPA believes that its determination of economic achievability for the final MPP regulation would not change even considering the combined effects with changes in cost structures due to other food safety and inspection regulations that may be implemented USDA, FDA, and the industry to prevent future outbreaks. These production level changes will likely result in changes in industry cost structures as new food safety rules are implemented by all meat packing and poultry processing facilities. The cost of these new procedures will depend on implementation details which are currently being determined and are not available for inclusion in the final rule.

Despite these expected production cost increases from the USDA food safety and inspections actions, EPA expects these cost changes would likely not alter the conclusions of its economic impact analysis of MPP facilities for the following reasons. First, the results of EPA's analysis are mostly cost-driven such that projected facility closures are consistent across different cost options, affecting only those regulated facilities that either incur high costs because they do not have existing treatment technologies in place or affecting those facilities that are financially vulnerable prior to regulation. As demonstrated for the proposed rulemaking, even the significantly higher-cost technology options that EPA evaluated for the beef sector showed no additional closures despite higher costs in the range of 40 percent to 700 percent. Second, EPA's financial models are conservative and use data through 2002 to estimate economic effects and did not include record high meat prices in 2003 which could tend to improve the overall livestock industry profit picture and make new regulations appear more affordable. Financial data used by EPA to model industry impacts from today's rule suggest that net income would have to decrease dramatically (i.e., in the range of 50 to 90 percent) before additional facility closures would occur. Expressed in terms of baseline production costs, baseline costs could increase by between 2 times to more than 100 times greater than the selected technology option before EPA's analysis would show additional facility closures. EPA believes that this margin is sufficient to absorb the combined

effect of the MPP regulation along with other food safety and inspection regulations that may be implemented to prevent future outbreaks.

Finally, the overwhelming majority of the meat and poultry processing facilities in the U.S. will, however, not be subject to the final MPP rule. The MPP regulation affects 35 meat packing plants and about 110 poultry processing facilities. Department of Commerce's latest Census of Manufacturers reports that there were about 1,400 meat packing plants and about 500 poultry processing facilities in 1997 (U.S. Census Bureau, 1999a through 1999d). Thus, a very small percentage of the entire MPP industry is affected by both the effluent guideline and the potential impacts of BSE.

Subcategory K. Facilities in Subcategory K were represented in the detailed survey. The closure analysis therefore follows the methodology described in Section 3.3.1. The results are reported in Table 5-5. As with facilities in Subcategories A - D, not all facilities in Subcategory K keep site-level financial data. To account for this results are reweighted as described in Section 3.3.1.3.

Thirty facilities were forecast to have negative earnings (i.e., net present value of net income) before inclusion of regulatory costs under 2 or more of the 3 forecasting methods described in Section 3.3.1.1. The economic impact of the rule on these "baseline closures" cannot be assessed using the closure model. Of the 105 facilities, no closures are projected under either variant of Option 2.5. Twenty-two are projected to close under Option 4.

Table 5-5
Summary of Projected Nonsmall Facility Closure Impacts by Subcategory and Option
Subcategory K

Option	Baseline Conditions and Projected Incremental Closure Impacts		
	Number of Facilities	Total Revenues (000)	Employees
Total Facilities Analyzed	105	$13,022,059	107,096
Baseline Closures	30	$4,326,777	41,038
Option 2 Closures	0	$0	0
Option 2.5 Closures (Low)	0	$0	0
Option 2.5 Closures (High)	0	$0	0
Option 2.5 + P Closures	0	$0	0
Option 4 Closures	22	$800,000 - $1,000,000	10,000 - 14,000

Subcategories F - I, Subcategory J, and Subcategory L. Facilities in Subcategories F - I, Subcategory J, and Subcategory L were not represented in the detailed survey. The closure analysis therefore follows the methodology used to evaluate screener survey facilities. The methodology is described in the Proposal EA in detail and summarized in Section 3.3.2.

Table 5-6 shows that fractions of facilities are projected to close under each option. This result is attributable to the methodology used to estimate the probability of closure due to the rule. The probability of closure is estimated using a continuous distribution function. The number of closures is then calculated by multiplying the probability of closure by the number of facilities represented by that model facility. Because relatively few facilities are in each subcategory, and because the incremental probabilities of closure are relatively small, the projected number of closures in each subcategory is less than one. However, to report that no closures are projected is not accurate since the probability of closure, while small, is clearly greater than zero.

Under Option 2.5, facilities in Subcategories F - I are projected to incur compliance costs that are 1.1 to 1.2 percent of net income; facilities in these subcategories are expected to have about a 0.2 percent probability of closure due to the rule. Facilities in Subcategory J are projected to incur compliance costs of 4.6 to 6.7 percent of net income under Option 2.5. Probability of closure due to the rule ranges from 0.9 percent to 1.3 percent for these facilities under the selected option. In Subcategory L, facilities are expected to incur compliance costs ranging from 3.9 to 5.1 percent of net income under the selected option. The probability of closure due to the rule for these facilities is about 0.7 to 0.9 percent.

Table 5-6
Summary of Projected Nonsmall Facility Closure Impacts by Subcategory and Option
Subcategories F - I, Subcategory J, and Subcategory L

Option	Average Annualized Costs as Percent of Net Income[1]	Probability of Closure Due to Rule[1]	Number of Facilities[2]	Total Revenues (000)[2]	Employees[2]
Subcategory F - I					
Baseline	NA	NA	4	$448,654	1,506
Option 2	1.0	0.2%	0.01	$751	3
Option 2.5 (Low)	1.1	0.2%	0.01	$816	3
Option 2.5 (High)	1.2	0.2%	0.01	$930	3
Option 2.5+P	1.3	0.2%	0.01	$1,014	3
Option 4	3.0	0.5%	0.02	$2,259	8
Subcategory J					
Baseline	NA	NA	19	$274,270	1,123
Option 2	1.5	0.3%	0.06	$809	3
Option 2.5 (Low)	4.6	0.9%	0.17	$2,493	11
Option 2.5 (High)	6.7	1.3%	0.25	$3,687	16
Option 2.5+P	17.1	3.3%	0.63	$9,986	45
Option 4	24.2	4.8%	0.91	$13,591	58
Subcategory L					
Baseline	NA	NA	10	$223,663	974
Option 2	2.8	0.5%	0.05	$1,135	5
Option 2.5 (Low)	3.9	0.7%	0.07	$1,477	6
Option 2.5 (High)	5.1	0.9%	0.09	$1,941	8
Option 2.5+P	7.7	1.4%	0.14	$2,937	12
Option 4	16.8	3.0%	0.30	$6,689	29

[1] Presented as a weighted average of results over all model facilities in the subcategory.
[2] Calculated as the probability of closure for each individual model facility multiplied by the number of facilities, revenues and employment represented by that model facility. The results are then summed over all model facilities in the subcategory.

5.2.1.2 Small Facilities

Subcategories A - D and Subcategory K. As with the nonsmall facilities in these subcategories, the facility analysis is based on detailed survey data and the methodology described in Section 3.3.1. They are also reweighted to account for sites not reporting financial data as described Section 3.3.1.3. Table 5-7 presents the facility impact analysis for small facilities in Subcategories A - D and Subcategory K. For Subcategories A - D, there are 15 facilities, no baseline closures, and no closures under Option 1. Of the 36 facilities in Subcategory K, there were no baseline closures, and **all 36 facilities are projected to close under both options examined**.

Table 5-7
Summary of Projected Small Facility Closure Impacts by Subcategory and Option
Subcategories A - D and Subcategory K

Option	Baseline Conditions and Projected Incremental Closure Impacts[1]		
	Number of Facilities	**Total Revenues (000)**	**Employees**
Subcategories A - D			
Total Facilities Analyzed	15	$150,000 - $200,000	500 - 750
Baseline Closures	0	$0	0
Option 1 Closures	0	$0	0
Option 2 Closures[2]	NA	NA	NA
Subcategory K			
Total Facilities Analyzed	36	$250,000 - $280,000	2,000 - 2,500
Baseline Closures	0	$0	0
Option 1 Closures	36	$250,000 - $280,000	2,000 - 2,500
Option 2 Closures	36	$250,000 - $280,000	2,000 - 2,500

[1] Projected revenue and employment impacts are presented as a range to prevent the disclosure of confidential business information.
[2] Option 2 was not costed for small facilities in this subcategory.

Subcategory J. EPA found no small direct discharging facilities in these subcategory J.

Subcategories F - I and L. The facility analysis for small facilities in these categories rests on screener survey data and the methodology presented in Section 3.3.2. The results are presented in Table 5-8. Small facilities in Subcategories F - I are projected to incur compliance costs that are 9.4 percent of net income, resulting in a probability of closure due to the rule of 1.5 percent, while small facilities in Subcategory L are projected to bear cost that are 1.0 percent of net income and have a 0.15 percent probability of closure.

These results include facilities that operate in more than one subcategory. For these facilities, costs are attributed to each subcategory based on the percentage of production in that subcategory. The portion of the facility that operates in a different subcategory is assumed to be uncosted. While this is the best way to present subcategory closures accurately it may undercount potential impacts on these facilities. Section 5.2.1.3 will examine impacts more fully.

Table 5-8
Summary of Projected Small Facility Closure Impacts by Subcategory and Option
Screener Survey Facility Analysis

Option	Average Annualized Costs as Percent of Net Income[1]	Probability of Closure Due to Rule[1]	Number of Facilities[2]	Total Revenues (000)[2]	Employees[2]
Subcategories F - I[3]					
Baseline	NA	NA	21	$369,692	1,316
Option 1	9.4	1.49%	0.31	$2,632	11
Option 2	9.4	1.51%	0.31	$2,633	11
Subcategory L[4]					
Baseline	NA	NA	3	$22,712	97
Option 1	0.9	0.15%	0	$33	0
Option 2	1.0	0.15%	0	$33	0

[1] Presented as a weighted average of results over all model facilities in the subcategory.
[2] Calculated as the probability of closure for each individual model facility multiplied by the number of facilities, revenues and employment represented by that model facility. The results are then summed over all model facilities in the subcategory.
[3] Includes costs and impacts on the portion of production that falls under small processor Subcategories F - I guidelines for 7 mixed processors, assuming no costs for that portion of their output that falls under nonsmall processor Subcategory L guidelines, and for 3 mixed processors, assuming no costs for that portion of their output that falls under small processor Subcategory L guidelines. Costs and impacts if guidelines for both types of production are promulgated are covered in Section 5.2.1.3 below.
[4] Includes costs and impacts on the portion of production that falls under small processor Subcategory L guidelines for 3 mixed processors, assuming no costs for that portion of their output that falls under small processor Subcategories F - I guidelines. Costs and impacts if guidelines for both types of production are promulgated are covered in Section 5.2.1.3 below.

5.2.1.3 Mixed Processors

For mixed processors, the results of the closure model are presented as a matrix. This is because a mixed processing facility might be subject to two different regulatory options depending on the type of meat, type of production processes, and quantity of production in different parts of the plant. Table 5-9 presents the average annualized costs as a percent of net income and the probability of closure due to the rule for 7 facilities that are **nonsmall** poultry further processors (and are therefore subject to Subcategory L guidelines and limitations on that portion of their output) and small meat further processors (Subcategories F - I). Under the combination of Option 2.5 selected for nonsmall poultry further processing, and no option selected for small meat further processing, these facilities are expected to incur

compliance costs ranging from 4.5 to 5.9 percent of net income. These costs result in a 0.8 to 1.0 percent probability of closure due to the rule.

Table 5-9
Summary of Projected Mixed Processor Facility Closure Impacts

Options for Nonsmall Facilities in Subcategory L[1]	Variable	Options for Small Facilities in Subcategories F - I[1]		
		None	Option 1	Option 2
None	Average Annualized Costs as Percent of Net Income	NA	1.4%	1.4%
	Probability of Closure Due to Rule	NA	0.2%	0.2%
Option 2	Average Annualized Costs as Percent of Net Income	2.9%	4.4%	4.4%
	Probability of Closure Due to Rule	0.5%	0.7%	0.7%
Option 2.5 (Low)	Average Annualized Costs as Percent of Net Income	4.5%	5.9%	5.9%
	Probability of Closure Due to Rule	0.8%	1.0%	1.0%
Option 2.5 (High)	Average Annualized Costs as Percent of Net Income	5.9%	7.4%	7.4%
	Probability of Closure Due to Rule	1.0%	1.3%	1.3%
Option 2.5 + P	Average Annualized Costs as Percent of Net Income	8.7%	10.1%	10.1%
	Probability of Closure Due to Rule	1.5%	1.7%	1.7%
Option 4	Average Annualized Costs as Percent of Net Income	18.2%	19.6%	19.6%
	Probability of Closure Due to Rule	3.1%	3.4%	3.4%

[1] This group contains 7 facilities, with estimated revenues of $132 million and 484 employees. On average, 39 percent of production is subject to guidelines and limitations for small processors in Subcategories F - I, and 61 percent of production is subject to nonsmall Subcategory L guidelines and limitations.

Three mixed processors were found to be **small** further processors in both the poultry (Subcategory L) and meat (Subcategories F - I) sectors. EPA chose not to select a regulatory option for small processors of either meat type. Therefore, no impacts are projected for these facilities. Table 5-10

presents the results of the impact analysis under all possible combinations of regulatory options to which these facilities might have been subject.

Table 5-10
Summary of Projected Small Mixed Processor Facility Closure Impacts

Options for Small Facilities in Subcategory L[1]	Variable	Options for Small Facilities in Subcategories F - I[1]		
		None	Option 1	Option 2
None	Average Annualized Costs as Percent of Net Income	NA	4.3%	4.4%
	Probability of Closure Due to Rule	NA	0.9%	0.7%
Option 1	Average Annualized Costs as Percent of Net Income	1.0%	5.2%	5.2%
	Probability of Closure Due to Rule	0.2%	0.8%	0.8%
Option 2	Average Annualized Costs as Percent of Net Income	1.0%	5.3%	5.3%
	Probability of Closure Due to Rule	0.2%	0.8%	0.8%

[1] This group contains 3 facilities, with estimated revenues of $22.7 million and 97 employees. On average, 18 percent of production is subject to guidelines and limitations for small processors in Subcategories F - I, and 82 percent of production is subject to small Subcategory L guidelines and limitations.

To present results concisely, the number of projected closures, revenue and employment losses were not included in the two mixed processor closure impact tables. However, all information necessary to make those calculations is provided in the tables, and the complete results are included in the docket (DCN 324001).

5.2.2 Company Analysis

For the company analyses, EPA estimated compliance costs for each company that owned a direct discharging facility that submitted a detailed survey. The estimated costs for each company included all facilities that EPA was able to identify as a direct discharger, regardless of whether the facility completed a detailed survey, a screener survey, or neither; see Section 3.4.1.1 for details.

Company level results are unweighted because the survey sampling frame was stratified on the basis of facility level data. Therefore, the facility level and company level results are not additive.

5.2.2.1 Closure Analysis

Subcategories A - D and Subcategory K. For these subcategories, EPA had detailed survey data at the company level. As discussed in the facility level closure analysis (Section 5.2.1), companies did not record financial information at the facility level for between 50 to 70 percent of the facilities in Subcategories A - D and Subcategory K. EPA therefore analyzed the impact of the aggregate costs on the company's net income, see Section 3.4.1.2. EPA estimated that the 25 companies in the company level analysis own at least 117 of the 136 in-scope facilities in Subcategories A - D and K that EPA projects will be subject to regulation. In the company level closure analysis, one poultry company is projected to close under Option 2.5 + P, and Option 4 (see Table 5-11). This company employs between 2,500 and 5,000 workers. The poultry company that is projected to close did not provide facility level financial information, therefore the facilities owned by this company could not be analyzed.

5.2.2.2 Altman's Z′-Score Analysis

Subcategories A - D and Subcategory K. As mentioned above, EPA had detailed survey data at the company level for facilities in these subcategories. The data availability permitted EPA to examine corporate financial health by a weighted average of financial ratios called Altman's Z′- score (see Section 3.4.1.3).

EPA classified the 25 companies that held **nonsmall** facilities into three groups, depending on whether they predominantly owned meat processing facilities, poultry processing facilities, or a mix of meat and poultry facilities. Table 5-12 summarizes the changes in financial health as a result of incurring incremental pollution control costs. Prior to incurring any incremental costs, the Altman Z′- score analysis shows that 7 meat companies and 8 poultry companies are considered financially healthy in the baseline. One meat company, 4 poultry companies, and 3 mixed meat companies have Altman Z′- scores

in the indeterminate range for financial health; 1 meat company and 1 mixed meat company are considered financially stressed.

No impacts are seen under either variant of Option 2.5. Under Option 4, the Altman Z′- score for one poultry company changed from the financially healthy to the indeterminate range (represented by the +1 and -1 on Table 5-12).

Table 5-11

Summary of Projected Company Closure Impacts by Subcategory and Option

Option	Baseline Conditions and Projected Incremental Closure Impacts[1]		
	Number of Companies	Total Revenues (Millions)	Employees
Meat (Predominantly Own Facilities in Subcategories A - I)			
Total Companies Analyzed	9	$29,949	80,755
Baseline Closures	1	$250-$500	1,000 - 4,000
Option 2 Closures	0	$0	0
Option 2.5 Closures (Low)	0	$0	0
Option 2.5 Closures (High)	0	$0	0
Option 2.5 + P Closures	0	$0	0
Option 4 Closures	0	$0	0
Poultry (Predominantly Own Facilities in Subcategories K and L)			
Total Companies Analyzed	12	$15,441	135,850
Baseline Closures	5	$3,384	31,042
Option 2 Closures	0	$0	0
Option 2.5 Closures (Low)	0	$0	0
Option 2.5 Closures (High)	0	$0	0
Option 2.5 + P Closures	1	$100 - $150	2,500 - 5,000
Option 4 Closures	1	$100 - $150	2,500 - 5,000
Mixed (Own facilities in both meat and poultry subcategories)			
Total Companies Analyzed	4	$89,439	184,834
Baseline Closures	0	N/A	N/A
Option 2 Closures	0	$0	0
Option 2.5 Closures (Low)	0	$0	0
Option 2.5 Closures (High)	0	$0	0
Option 2.5 + P Closures	0	$0	0
Option 4 Closures	0	$0	0

[1] Projected revenue and employment impacts are presented as a range to prevent the disclosure of confidential business information.

Table 5-12
Projected Impacts on Companies with Nonsmall Facilities
Subcategories A-I, Subcategory K, Subcategory L, and Mixed
Altman Z′-Score by Meat Type and Option

Option	Number of Companies with Baseline Altman Z' Score in Specified Range and Incremental Changes in Score		
	Financially Healthy	**Indeterminate**	**Bankruptcy Likely**
Meat (predominantly own facilities in Subcategories A-I)			
Baseline	7	1	1
Option 2	0	0	0
Option 2.5 (Low)	0	0	0
Option 2.5 (High)	0	0	0
Option 2.5 + P	0	0	0
Option 4	0	0	0
Poultry (predominantly own facilities in Subcategories K and L)			
Baseline	8	4	0
Option 2	0	0	0
Option 2.5 (Low)	0	0	0
Option 2.5 (High)	0	0	0
Option 2.5 + P	0	0	0
Option 4	-1	+1	0
Mixed (own facilities in both meat and poultry subcategories)			
Baseline	0	3	1
Option 2	0	0	0
Option 2.5 (Low)	0	0	0
Option 2.5 (High)	0	0	0
Option 2.5 + P	0	0	0
Option 4	0	0	0

Note: A change from one state (e.g., financially healthy) to another state (e.g., indeterminate) is indicated by "-1" and "+1".

Two companies that own **small** facilities in Subcategories A - D and Subcategory K provided sufficient financial data to analyze using the Altman Z′-score. Both of these companies were determined to be financially healthy in the baseline, and did not incur financial distress under any of the potential regulatory options examined.

5.2.2.3 Financial Ratio Analysis

Subcategories F - I, Subcategory J, and Subcategory L

Because facilities in these subcategories are not represented in the detailed survey data, neither are their corporate parents. The analysis for these companies, then, rests on screener survey and public data (see Section 3.4.2). EPA calculated the post-regulatory median return on assets ratio to project impacts to the balance sheet of companies in Subcategories F - I, Subcategory J, and Subcategory L.

The results for **nonsmall** companies are presented in Table 5-13. For nonsmall companies in Subcategories F - I, the selected option is projected to decrease return on assets by 1.2 to 1.4 percent. In Subcategory J, return on assets is projected to decrease by 4.8 to 7.0 percent, while in Subcategory L, it declines by 4.9 to 6.2 percent.

The results for **small** companies in Subcategories F - I are in Table 5-14. Option 1 results in an estimated 10.2 percent decrease on return to assets, while in Subcategory L it declines by 1 percent. EPA found no small direct discharging facilities in Subcategory J. Some mixed processing facilities are covered by the guidelines for Subcategory L; impacts on those facilities are examined separately in Tables 5-15 and 5-16.

Table 5-13
Projected Impacts to Return on Assets Ratio by Subcategory and Option
Companies with Nonsmall Facilities in Subcategories F - I, Subcategory J, and Subcategory L

Option	Median Return on Assets (percent)	Percent Change in Return on Assets
Subcategories F-I (4 Companies)[1]		
Baseline	5.50	NA
Option 2	5.43	-1.2
Option 2.5 (Low)	5.43	-1.2
Option 2.5 (High)	5.42	-1.4
Option 2.5+P	5.41	-1.6
Option 4	5.31	-3.4
Subcategory J (19 Companies)[1]		
Baseline	2.00	NA
Option 2	1.97	-1.6
Option 2.5 (Low)	1.90	-4.8
Option 2.5 (High)	1.86	-7.0
Option 2.5+P	1.65	-17.4
Option 4	1.51	-24.6
Subcategory L (3 Companies)[1]		
Baseline	4.43	NA
Option 2	4.29	-3.3
Option 2.5 (Low)	4.22	-4.9
Option 2.5 (High)	4.16	-6.2
Option 2.5+P	4.02	-9.4
Option 4	3.58	-19.3

[1] For the purpose of this analysis, EPA assumes the companies are identical to the facilities.

Table 5-14
Projected Impacts to Return on Assets Ratio by Subcategory and Option
Companies with Small Facilities in Subcategories F - I, Subcategory J, and Subcategory L

Option	Median Return on Assets (percent)	Percent Change in Return on Assets
Subcategory F-I (21 Companies)[1]		
Baseline	5.50	NA
Option 1	4.94	-10.2
Option 2	4.94	-10.2
Subcategory L (3 Companies)[1]		
Baseline	5.50	NA
Option 1	5.44	-1.0
Option 2	5.44	-1.0

[1] For the purpose of this analysis, EPA assumes the companies are identical to the facilities.

Mixed Processors

For mixed processors, the results of the financial ratio analysis are presented as a matrix. This is because a mixed processing facility might be subject to two different regulatory options depending on the type of meat, type of production processes, and quantity of production in different parts of the plant. Table 5-15 presents the projected post-regulatory return on assets and the percent change from the baseline value for 7 facilities that are **nonsmall** poultry further processors (and are therefore subject to Subcategory L guidelines and limitations on that portion of their output) and small meat further processors (Subcategories F - I). Under the combination of Option 2.5 selected for nonsmall poultry further processing, and no option selected for small meat further processing, these facilities' compliance costs decrease median return on assets (the baseline value) from 5.50 to 5.13.

Table 5-15
Projected Impacts to Return on Assets Ratio for Mixed Processors by Subcategory and Option
Companies with Small Production in Subcategories F - I, Nonsmall Production in Subcategory L

Options for Nonsmall Facilities in Subcategory L[1]	Variable	Options for Small Facilities in Subcategories F - I[1]		
		None	Option 1	Option 2
None	Median return on assets (percent)	5.50	5.41	5.41
	Percent change in return on assets	NA	-1.6	-1.6
Option 2	Median return on assets (percent)	5.31	5.23	5.23
	Percent change in return on assets	-3.4	-5.0	-5.0
Option 2.5 (Low)	Median return on assets (percent)	5.21	5.13	5.13
	Percent change in return on assets	-5.2	-6.8	-6.8
Option 2.5 (High)	Median return on assets (percent)	5.13	5.04	5.04
	Percent change in return on assets	-6.7	-8.3	-8.3
Option 2.5 + P	Median return on assets (percent)	4.95	4.86	4.86
	Percent change in return on assets	-10.0	-11.6	-11.6
Option 4	Median return on assets (percent)	4.40	4.31	4.31
	Percent change in return on assets	-20.1	-21.6	-22.6

[1] This group contains 7 facilities, with estimated revenues of $132 million and 484 employees. On average, 39 percent of production is subject to guidelines and limitations for small processors in Subcategories F - I, and 61 percent of production is subject to nonsmall Subcategory L guidelines and limitations.

Three mixed processors were found to be **small** further processors in both the poultry (Subcategory L) and meat (Subcategories F - I) sectors. Table 5-16 presents the results of the financial ratio analysis under all possible combinations of regulatory options to which these facilities might have been subject had EPA chosen to regulate small processors.

Table 5-16
Projected Impacts to Return on Assets Ratio for Mixed Processors by Subcategory and Option
Companies with Small Production in Subcategories F - I and Subcategory L

Options for Small Facilities in Subcategory L[1]	Variable	Options for Small Facilities in Subcategories F - I[1]		
		None	Option 1	Option 2
None	Median return on assets (percent)	5.50	5.25	5.24
	Percent change in return on assets	NA	-4.6	-4.6
Option 1	Median return on assets (percent)	5.44	5.19	5.19
	Percent change in return on assets	-1.0	-5.6	-5.7
Option 2	Median return on assets (percent)	5.44	5.19	5.19
	Percent change in return on assets	-1.0	-5.6	-5.7

[1] This group contains 3 facilities, with estimated revenues of $22.7 million and 97 employees. On average, 18 percent of production is subject to guidelines and limitations for small processors in Subcategories F - I, and 82 percent of production is subject to small Subcategory L guidelines and limitations.

5.2.3 Market Level Impacts

5.2.3.1 Impacts on Domestic Prices and Quantities

Table 5-17 summarizes the results from the market model analysis on domestic prices and quantities. The market model analysis show that the decrease in supply will be smallest for pork under the selected option, where the costs per pound of total production are estimated at approximately $0.00014, and largest for chicken with costs per pound of total production ranging of about $0.00079. The maximum projected price increase is less than 0.05 percent of baseline price for all products under Option 2.5.

The domestic production of meat products, and therefore industry employment, is projected to decrease by about 0.02 percent under Option 2.5. In general, impacts to domestic consumption of meat products are somewhat smaller than impacts to domestic supply due to partially offsetting increases in meat imports.

Table 5-17
Projected Impacts on Meat Product Markets

Option	Price (cost/lb.)	Domestic Supply (lbs. x 1 mil.)	Domestic Demand (lbs. x 1 mil.)	Quantity Imported (lbs. x 1 mil.)	Quantity Exported (lbs. x 1 mil.)	Compliance Costs per Pound
Beef						
Baseline	$1.1105	26,386.0	26,843.0	2,874.0	2,417.0	NA
Option 2	$1.1106	26,383.2	26,841.3	2,874.7	2,416.6	$0.00025
Option 2.5 (Low)	$1.1107	26,381.3	26,840.1	2,875.1	2,416.3	$0.00041
Option 2.5 (High)	$1.1108	26,380.3	26,839.6	2,875.4	2,416.1	$0.00050
Option 2.5 + P	$1.1110	26,375.3	26,836.6	2,876.6	2,415.3	$0.00095
Option 4	$1.1111	26,373.3	26,835.5	2,877.2	2,415.0	$0.00113
Pork						
Baseline	$1.0038	19,278.0	18,827.0	827.0	1,278.0	NA
Option 2	$1.0038	19,278.0	18,827.1	827.0	1,277.9	$0.00003
Option 2.5 (Low)	$1.0039	19,277.6	18,826.8	827.1	1,277.9	$0.00010
Option 2.5 (High)	$1.0039	19,277.5	18,826.7	827.1	1,277.8	$0.00014
Option 2.5 + P	$1.0040	19,276.0	18,825.7	827.3	1,277.5	$0.00040
Option 4	$1.0041	19,275.4	18,825.3	827.3	1,277.4	$0.00051
Chicken						
Baseline	$0.5807	29,741.0	24,826.0	5.000	4,920.0	NA
Option 2	$0.5808	29,737.8	24,824.2	5.001	4,918.7	$0.00044
Option 2.5 (Low)	$0.5809	29,737.1	24,823.8	5.002	4,918.3	$0.00055
Option 2.5 (High)	$0.5809	29,735.4	24,822.8	5.002	4,917.6	$0.00079
Option 2.5 + P	$0.5812	29,729.7	24,819.6	5.005	4,915.1	$0.00159
Option 4	$0.5815	29,721.6	24,814.7	5.008	4,911.9	$0.00270
Turkey						
Baseline	$0.6898	5,297.0	4,919.3	1.2500	379.0	NA
Option 2	$0.6899	5,296.7	4,919.0	1.2501	379.0	$0.00026
Option 2.5 (Low)	$0.6899	5,296.6	4,919.0	1.2502	378.9	$0.00032
Option 2.5 (High)	$0.6899	5,296.5	4,918.8	1.2503	378.9	$0.00046
Option 2.5 + P	$0.6900	5,296.3	4,918.7	1.2500	378.9	$0.00066
Option 4	$0.6902	5,295.5	4,918.0	1.2510	378.8	$0.00132

5.2.3.2 Foreign Trade Impacts

Despite its position as one of the largest agricultural producers in the world, historically the U.S. has not been a major player in world markets for meat products. In fact, until recently, the U.S. was a net importer of these products. The presence of a large domestic market for meat has limited U.S. reliance on developing export markets for its products. As the U.S. has taken steps to expand export markets for meat, one major obstacle has been that it remains a relatively high cost producer of these products compared to other net exporters, such as New Zealand, Australia, Brazil, and other Latin American countries, as well as other more established and government-subsidized exporting countries, including Canada and the countries in the European Union. Increasingly, however, continued efficiency gains and low-cost feed are making the U.S. more competitive in world markets for meat.

In contrast, U.S. poultry products account for a significant share of world trade and exports account for a sizable share of annual U.S. production. One factor suggests that trade impacts may be smaller than projected using the market model, at least for poultry products. It has been noted above that the U.S. primarily exports dark poultry meat, considered inferior by U.S. consumers, while the U.S. domestic market is dominated by sales of white poultry meat (Aylward, 2002; Salin et al., 2002; Standard & Poor's, 2000). However, dark meat and white meat are joint products of the poultry industry — obviously, one cannot be produced without simultaneously producing the other. Under conditions of joint production, the price of each product will tend towards its marginal cost of production (in the absence of market power; Layard and Walters, 1978).

In the case of the U.S. poultry industry, the dominant market is the U.S. domestic market — the market for white meat. Although export sales are very important, they still compose less than 17 percent of U.S. production. The market for dark meat, whether domestic or foreign, is secondary. This suggests that the marginal cost of producing dark meat is relatively low. Chickens are bred, raised, slaughtered and processed primarily for their white meat, thus the marginal cost of producing white poultry meat is composed of the variable costs of these activities. Given that the chicken has already been bred, raised, slaughtered and processed for its white meat, the marginal cost of producing dark meat would be relatively low — the incremental cost of processing the dark meat given that the white meat has been processed (part of this incremental cost could include greater care needed to process white meat without

damaging the dark meat). Because dark meat is a secondary product, its marginal cost, and therefore its price, are relatively low.

It has been estimated that U.S. production costs per pound of broiler meat exceeds those of Brazil by almost 50 percent. However, while the U.S. export price for both boneless breast meat and whole broilers substantially exceeds the Brazilian export price, the U.S. export price for chicken leg quarters is less than the Brazilian export price (Joiner, 2003). This evidence is consistent with the discussion above of joint production.

For the same reason, there should be little increase in the marginal cost of processing dark meat due to the effluent guideline and therefore little increase in its price. The impact on the marginal cost of producing dark meat given that white meat is already produced (and wastewater treatment already purchased for its processing) should be relatively small: primarily the higher cost of treating the incremental water used to process dark meat. Therefore, the increase in the marginal cost of producing dark meat should be smaller than the increase in the marginal cost of producing white meat. The increase in price necessary to earn an adequate rate of return can be smaller for exports than for domestic sales, and therefore the decrease in exports of dark meat should be smaller than projected by the market model, which is based on the change in domestic price.

As part of its market analysis, EPA evaluated the potential for changes in traded volumes, such as increases in imports and decreases in exports. In addition, EPA performed a sensitivity analysis to ensure that trade impacts were not underestimated under the selected option (Table 5-18). In the standard analysis, the decrease in supply (compliance costs per pound) is calculated as a weighted average of compliance costs per pound of production for direct dischargers and compliance costs per pound for indirect dischargers (which are zero), where the weights are the relative share of total production. The sensitivity analysis assumes the decrease in supply is equal to the average compliance costs per pound of production to direct dischargers only. The standard assumption is more appropriate because the competition of indirect dischargers with zero compliance costs will discourage direct dischargers from raising their price in response to their increased costs.

Under the sensitivity analysis, compliance costs per pound are 2.0 (chicken) to 6.3 (turkey) times larger than the standard analysis. The largest impact under the sensitivity analysis is observed in the beef

market, where exports are projected to decrease by 0.11 percent per year, and overall domestic production is projected to decrease by 0.06 percent per year. Under the more realistic standard analysis, the largest decrease in exports occurs in the chicken market (0.05 percent per year) with an overall decrease in domestic production of 0.02 percent per year.

Table 5-18
Projected Impacts on Foreign Trade in Meat and Poultry Products under the Selected Option

Option	Price (cost/lb.)	Domestic Supply (lbs. x 1 mil.)	Domestic Demand (lbs. x 1 mil.)	Quantity Imported (lbs. x 1 mil.)	Quantity Exported (lbs. x 1 mil.)	Compliance Costs per Pound
Beef						
Baseline	$1.1105	26,386.0	26,843.0	2,874.0	2,417.0	
Option 2.5[1]	$1.1108	26,380.3	26,839.6	2,875.4	2,416.3	$0.00050
Sensitivity Analysis[2]	$1.1113	26,369.1	26,832.6	2,878.0	2,414.4	$0.00147
Pork						
Baseline	$1.0038	19,278.0	18,827.0	827.0	1,278.0	
Option 2.5[1]	$1.0039	19,277.5	18,826.7	827.1	1,277.8	$0.00014
Sensitivity Analysis[2]	$1.0040	19,276.8	18,826.6	827.3	1,277.5	$0.00034
Chicken						
Baseline	$0.5807	29,741.0	24,826.0	5.0	4,920.0	
Option 2.5[1]	$0.5809	29,735.4	24,822.8	5.0	4,917.6	$0.00079
Sensitivity Analysis[2]	$0.5812	29,730.0	24,819.9	5.0	4,915.1	$0.00156
Turkey						
Baseline	$0.6898	5,297.0	4,919.3	1.3	379.0	
Option 2.5[1]	$0.6899	5,296.7	4,919.0	1.3	379.0	$0.00030
Sensitivity Analysis[2]	$0.6903	5,294.9	4,917.5	1.3	378.7	$0.00189

[1] Compliance costs per pound (shift in supply) are equal to the weighted average of compliance costs per pound of production for direct dischargers and compliance costs per pound for indirect dischargers (which are zero), where the weights are the relative share of total production.
[2] Compliance costs per pound (shift in supply) are equal to the average compliance costs per pound of production to direct dischargers.

The projected trade impacts presented in Table 5-18 incorporate only the impacts of the MPP effluent guideline on U.S. trade in meat and poultry products. Many nonprice events, such as the political decision by Russia to set poultry import quotas (April 2003), or the closing of export markets to

U.S. beef following the discovery of BSE in Washington state (December 2003), can play a very significant role in determining trade volumes in meat and poultry products. What Table 5-18 demonstrates is that the MPP effluent guideline will have a very marginal effect on trade volumes.

5.2.4 Community Impacts

The communities where the meat products facilities are located may be affected by the final regulation if facilities cut back operations; local employment and income may fall, sending ripple effects throughout the local community. Under the option selected for this rule, no facilities are projected to close, hence no community impacts are estimated for the rule.

The facility closure analysis and the company closure analysis show impacts under Option 2.5 + P and Option 4. Twenty-two facilities are projected to close under Option 4. The community impact analysis is not presented for these facilities, however, due to CBI concerns. The company projected to close is a poultry processor with approximately 2,500 to 5,000 employees. All facilities owned by this company are located in the same state. Based on detailed survey employment data, and Census' *County Business Patterns* data, EPA estimated that the company projected to close represents the following percentage of total employment in the specified regions:

- 0.13 percent of state level employment;
- from 5.7 percent to 7.6 percent of county level employment.

The details of this analysis can be found in the docket (DCN 328003).

5.2.5 National Direct, Indirect, and Induced Impacts

Changes in output and employment are directly proportional to costs of compliance, that is, higher costs lead to lower output and employment. The impacts resonate through the economy causing a "ripple" effect. EPA used the Department of Commerce's national final demand multipliers from the Regional Input-Output Modeling System to estimate these effects (RIMS II; U.S. DOC, 1996).

The methodology used for the input-output analysis is explained in Section 3.7. The final demand output multipliers used here are 4.96 for meat and 4.35 for poultry, which means that for every $1 million of output lost in the meat and poultry industry, an additional $3.96 million and $3.35 million respectively is lost throughout the U.S. economy. The employment multipliers are 46.93 for meat and 45.18 for poultry. That is, for every $1 million in output loss in the meat industry, 46.93 full-time equivalent (FTEs: 1 FTE equals 2,080 hours and can be equated with one full-time job) jobs are lost in the U.S. economy (see Section 3.7 for more detail).

The larger the compliance costs, the greater the output and employment impacts. This is the reason why the subcategories with the largest impacts will be the same as those with the largest costs presented in Section 5.1.1. Table 5-19 presents the output and employment impacts stemming from compliance costs in each subcategory. These losses are spread over a wide variety of industries in addition to the meat products industry. Also note that the input-output methodology used for this analysis overestimates changes in output and employment because it does not allow for impact reducing substitutions between final products by consumers or inputs by producers.

Total direct, indirect, and induced output and employment losses under Option 2.5 are as follows:

- Subcategory A - D: $68 million 644 FTEs
- Subcategory E - I: $1 million 13 FTEs
- Subcategory J: $12 million 109 FTEs
- Subcategory K: $114 million 1,183 FTEs
- Subcategory L: $4 million 37 FTEs

Table 5-19

National Direct and Indirect Output and Employment Impacts

Subcategory and Option	Pretax Annualized Costs (Millions)	Total Change in Output [1] (Millions)	Total Change in Employment [2] (Millions)
Subcategory A - D			
Option 2	$6	($30)	(281)
Option 2.5 (High)	$14	($68)	(641)
Option 2.5+P	$35	($175)	(1,657)
Option 4	$43	($212)	(2,008)
Subcategory E - I			
Option 2	$0	($1)	(10)
Option 2.5 (High)	$0	($1)	(13)
Option 2.5+P	$0	($1)	(14)
Option 4	$1	($3)	(31)
Subcategory J			
Option 2	$1	($3)	(24)
Option 2.5 (High)	$2	($12)	(109)
Option 2.5+P	$6	($30)	(287)
Option 4	$8	($42)	(393)
Subcategory K			
Option 2	$15	($63)	(659)
Option 2.5 (High)	$26	($114)	(1,183)
Option 2.5+P	$52	($227)	(2,356)
Option 4	$90	($390)	(4,055)
Subcategory L			
Option 2	$0	($2)	(21)
Option 2.5 (High)	$1	($4)	(37)
Option 2.5+P	$1	($5)	(55)
Option 4	$3	($12)	(122)

Source: U.S. DOC, 1996 and U.S. DOC, 2001

[1] Based on a total loss of $4.96 million for the meat industry and $4.35 million for the poultry industry for each $1 million loss in output in the affected industry.

[2] Based on 47 jobs lost in the meat industry and 45 in the poultry industry per $1 million change in output.

5.3 ECONOMIC IMPACTS ON NEW SOURCES (NSPS)

When establishing the NSPS level of control, EPA considers the barrier that compliance costs due to the effluent guidelines regulation pose to entry into the industry for a new facility. In general, it is less costly to incorporate waste water treatment technologies as a facility is built than it is to retrofit existing facilities. Therefore, because the rule is economically achievable for existing facilities, it will also be economically achievable for new facilities that can meet the same guidelines at lower cost. However, it is possible that if the upfront costs of building a new facility are significantly increased as a result of the rule, prospective builders may face difficulties in raising additional capital. This could present a barrier to entry. Therefore, as part of its barrier to entry analysis, EPA compares estimated average incremental facility or company capital costs incurred to meet the effluent guidelines to average total assets of existing facilities to ensure that additional capital requirements are relatively small.

Tables 5-20 and 5-21, provide the results of the nonsmall facility level and company level analysis. Average capital costs of $1.9 million per facility under the selected Option 2.5 comprise 1.6 percent of average facility assets in Subcategories A - D. In Subcategory K, average capital costs of $1.1 million per facility are 4.0 percent of average facility assets under the selected option. The company level ratio of capital costs to total assets under Option 2.5 is 2.6 percent for meat companies, and 1.6 percent for poultry companies. For companies that own both meat and poultry facilities, the analysis projects that capital costs will comprise about 0.1 percent of company total assets under the selected option. Based on the results of this analysis, EPA concludes that this rule should not present barriers to entry for new businesses.

Table 5-20
Summary of Nonsmall Facility Level Ratio of Capital Costs to Assets (Barrier to Entry)[1]

Subcategory	Option 2	Option 2.5 (Low)	Option 2.5 (High)	Option 2.5 + P	Option 4
A - D	0.6%	1.3%	1.6%	2.6%	3.3%
K	2.1%	3.2%	4.0%	4.2%	12.3%

[1] Percentages are based on those facilities for which EPA had asset data and compliance costs.

Table 5-21
Summary of Nonsmall Company Level Ratio of Capital Costs to Assets (Barrier to Entry)[1]

Subcategory	Option 2	Options 2.5 (Low)	Option 2.5 (High)	Option 2.5 + P	Option 4
Meat	0.8%	2.1%	2.6%	3.5%	4.4%
Poultry	1.0%	1.3%	1.6%	2.1%	4.6%
Mixed Meat	0.1%	0.1%	0.1%	0.2%	0.3%

[1] Percentages are based on those facilities for which EPA had asset data and compliance costs.

Table 5-22 provides the small facility level ratios. In Subcategories A - D, average capital costs comprise between 15 and 20 percent of average facility assets. Average capital costs are 12.9 percent of average facility assets in Subcategory K.

Table 5-22
Summary of Small Facility Level Ratio of Capital Costs to Assets (Barrier to Entry)[1]

Subcategory	Option 1	Option 2
A - D[2]	15% - 20%	NA
K	12.9%	12.9%

[1] Percentages are based on those facilities for which EPA had asset data and compliance costs.
[2] Ratio of capital costs to total assets presented as a range to prevent the disclosure of confidential business information.

EPA also compared projected capital costs with estimated total assets for the model facilities used to analyze impacts in Subcategories F - I, J, and L. EPA estimated model facility total assets from model facility income (based on Census data) combined with the median return on assets for the appropriate NAICS code as reported in Dun and Bradstreet (see Proposal EA, Chapter 3 for more details). Thus, the analysis presented below incorporates a greater degree of uncertainty than the results based on detailed survey data for Subcategories A - D and K.

Tables 5-23 and 5-24 present the results of this analysis to nonsmall and small facilities respectively. These tables only include facilities with production that is classified solely in the indicated subcategories; the results for mixed processors, with production that is classified in more than one subcategory, are presented in Table 5-25 below. In general, the model facility analysis suggests that capital costs are not expected to exceed 2 percent of facility assets.

Table 5-23
Summary of Nonsmall Facility Level Ratio of Capital Costs to Assets (Barrier to Entry)
Screener Survey Facility Analysis

Subcategory	Option 2	Option 2.5	Option 2.5 + P	Option 4
F - I	0.2%	0.2%	0.2%	0.4%
J	0.1%	0.3%	0.4%	0.5%
L[1]	0.1%	0.1%	0.1%	0.6%

[1] Results do not include mixed processor facilities.

Table 5-24
Summary of Small Facility Level Ratio of Capital Costs to Assets (Barrier to Entry)
Screener Survey Facility Analysis

Subcategory	Option 1	Option 2
F - I[1]	1.7%	1.7%

[1] Results do not include mixed processor facilities.

Table 5-25
Summary of Mixed Processor Facility Ratio of Capital Costs to Assets (Barrier to Entry)
Screener Survey Facility Analysis

Subcategory Combination and Option	Ratio of Capital Costs to Assets
Nonsmall L (Option 2.5), Small F - I (Option 2)	1.1%
Small L (Option 2), Small F - I (Option 2)	0.4%

The results for mixed processors include capital costs for both subcategories in which they operate, even though NSPS was not set for small facilities in Subcategories F - I. Comparing capital costs for only a percentage of production (i.e., small or nonsmall levels of production in Subcategory L) with a facility's total assets for all production could result in a misleadingly small ratio of capital costs to total assets. Even with this more costly estimate, the ratio of capital costs to total assets does not exceed 1.1 percent for mixed processors.

5.4 SUMMARY OF FINAL OPTION

Under the promulgated rule, EPA estimates that there will be:

- **No** facility closures in Subcategories A - D and Subcategory K.
  Less than one facility closure (0.24 to 0.34 facility) in Subcategories F - I, Subcategory J, and Subcategory L combined.

- **No** company closures in Subcategories A - D and Subcategory K.
  No changes in company financial health in Subcategories A - D
  and Subcategory K.
  ROA decreases by less than 1.5 percent for companies in Subcategories F - I.
  ROA decreases by less than 7.5 percent for companies in Subcategory J.
  ROA decreases by less than 6.5 percent for companies in Subcategory L

- The maximum projected price increase is less than 0.05 percent of baseline price for all products.

- The domestic production of meat products, and therefore industry employment, is projected to decrease by about 0.02 percent.

5.5 REFERENCES

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