# CHAPTER FIVE
# ECONOMIC IMPACT ANALYSIS RESULTS

## 5.1 OVERVIEW OF THE ECONOMIC IMPACT ANALYSIS

This chapter presents the projected economic impacts of the regulatory options discussed in Chapter Three on the C&D industry. In this chapter, EPA evaluates the costs of the options (presented in 2000 dollars) and the impacts of these costs using the methodology, models, and data described in Chapter Four.

The economic impact methodology uses several approaches to assess the economic impacts of the regulatory options on the industry. At the lowest level of analysis, EPA uses models to analyze the impacts on construction projects and individual firms. For higher economic levels, EPA estimates the total national compliance costs to the affected industries and the impact of those costs on consumers, national and regional construction markets, output and employment at the industry and national level, social welfare, and government entities responsible for building roads, schools, and other public facilities.

This chapter is organized as follows:

- **Section 5.2** presents the per-acre costs calculated using the engineering cost estimates discussed in Chapter Four, Section 4.1.2. Three sets of costs are developed: costs per acre over all acres developed (used, for example, to determine national level compliance costs), costs per acre over acres both developed and affected by the provisions for codifying the CGP in Options 2 and 4 (the "CGP-affected" acres–used for firm-level and small business analyses), and state-specific costs per acre (used in EPA's regional market analyses). These per-acre costs are used as direct or indirect inputs to all of the other analyses in this report.

- **Section 5.3** presents EPA's analysis of the economic impacts of the options considered for the Final Action on model C&D projects using EPA's project modeling system, C&D/PrMS. These results are based on the financial analyses developed for representative projects in Chapter Four, Section 4.2.1.

- **Section 5.4** presents the results of EPA's analysis of the impacts of the options considered on model C&D firms using EPA's firm-level modeling system (C&D/FrMS). This section examines the impact of the incremental compliance requirements on the financial condition of representative firms, using data on their present financial condition as a baseline. It also presents EPA's analysis of financial stress, potential employment effects, and potential barriers to entry—that is, how the incremental costs of the options considered could affect the ability of new businesses to enter the market. These estimates are based on the methodologies outlined in Chapter Four, Section 4.2.2.

- **Section 5.5** presents EPA's estimates of the national costs of the options considered. EPA determined those costs by multiplying the per-acre compliance costs by estimates of the number of acres developed annually, subject to the options considered. Chapter Four, Section 4.3.1 presents EPA's methodology for calculating these costs.

- **Section 5.6** presents EPA's market model analyses. This section considers the impact of the incremental compliance requirements on U.S. consumers of building projects, using EPA's Consumer Impact Model. It also estimates the impacts on regional and national construction markets, using EPA's partial equilibrium market modeling system (C&D/PEqMMS). The methodologies for these analyses were presented in Chapter Four, Section 4.3.2.

- **Section 5.7** presents EPA's estimates of net economic impacts, including impacts on economic output, employment and social welfare, regions and communities, and international trade, using methodologies discussed in Chapter Four, Section 4.3.3.

- **Section 5.8** presents EPA's analysis of potential impacts on government units. This section considers the options' various costs to governments using methodologies summarized in Chapter Four, Section 4.3.4.

- **Section 5.9** presents EPA's analysis of additional impacts of the options considered. This section discusses EPA's obligation to consider EO 12866 requirements and presents an assessment of the potential for the Final Action to affect environmental justice and children's health.

As discussed in Section One, EPA's results reflect an assumption of 100 percent compliance with the Phase I & II stormwater requirements and state requirements as the baseline against which to judge regulatory impacts and 100 percent compliance with the Final Action. See also the discussion of the baseline in Chapter Four, Section 4.1.1.

## 5.2 CALCULATION OF PER-ACRE COSTS

EPA engineers calculated the total cost of design, installation, and maintenance by state, separated into site size and land use categories. These costs took into account variations in environmental conditions and current state requirements that are considered equivalent to the options considered. EPA used three approaches to compute cost-per-acre inputs to the economic models:

- Approach 1 used the total national costs by site size and land use type (e.g., single-family residential) with the total number of acres estimated to be developed annually (and subject to the option under consideration) by site size and land use type to calculate a national weighted average cost per acre for each option (see Chapter Four, Section 4.3.1). These cost estimates were used to estimate, for example, total compliance costs and national average house price increases.

- Approach 2 used the compliance costs in states considered not to have stormwater requirements equivalent to the provisions for codifying the CGP in Options 2 and 4 with the acreage in those states, as determined by EPA's engineering cost analysis. These acres are considered the CGP-affected acres. These costs, by site size and land use type, are used in the firm-level and small business analyses to more precisely determine counts of firms that might be adversely affected by the options.

- Approach 3 used the total costs for each state with each state's estimate of developed acreage (also output by EPA's cost models) to compute a state-specific cost per acre for the four major land use types. These costs per acre were used in EPA's regional market analysis to produce state-specific market results. See EPA's Technical Development Document (U.S. EPA, 2004) for more information on the engineering cost models.

Table 5-1 presents the number of acres used to calculate the per-acre costs in Approaches 1 and 2, above. Only Options 1, 2, and 4 are presented; Option 3 is the no-action option. As the table shows, the number of CGP-affected acres is about two-thirds of the total number of developed acres estimated under Options 2 and 4. Note also that the difference in developed acres between Option 1 and Options 2 and 4 is related to the scopes of these options. Option 1 applies to sites of an acre or more, whereas Options 2 and 4 apply to sites of 5 acres or more.

During the calculation of the costs per acre using any of the acreage estimates, EPA also adjusts the costs by a multiplier or multipliers that account for the fact that compliance costs drive increases in other construction costs that depend on the magnitude of total construction costs. Costs that increase as construction costs increase are the opportunity and/or interest costs associated with larger loans or

additional working capital tied up in the construction project. Additionally, profits (if maintained at the same percentage as in the baseline) and overhead also increase as costs increase. See Chapter Four, Section 4.2.2 for more information on how EPA uses these multipliers in the various analyses in this EA. In general, EPA uses total cost multipliers (which account for opportunity and interest costs and increases in total profits and overhead) to estimate the potential for increases in asking price when EPA assumes 100 percent cost passthrough to consumers, but uses only opportunity and interest multipliers to estimate the costs and impacts of the various options on industry. See DCN 45023 in the Rulemaking Record to see how these multipliers are calculated within each model.

**Table 5-1. Number of Acres Used to Calculate per Acre Costs**

| Option/ Site Size | Single Family | | Multifamily | | Commercial | | Industrial | |
|---|---|---|---|---|---|---|---|---|
| | Total Acres | Affected Acres | Total Acres | Affected Acres | Total Acres | Affected Acres | Total Acres | Affected Acres |
| **Option 1** | | | | | | | | |
| 3 acres | 32,796 | 32,796 | 22,224 | 22,224 | 271,377 | 271,377 | 14,796 | 14,796 |
| 7.5 acres | 49,575 | 49,575 | 33,848 | 33,848 | 163,845 | 163,845 | 6,683 | 6,683 |
| 25 acres | 209,650 | 209,650 | 131,425 | 131,425 | 577,850 | 577,850 | 17,700 | 17,700 |
| 70 acres | 99,960 | 99,960 | 51,240 | 51,240 | 319,550 | 319,550 | 18,200 | 18,200 |
| 200 acres | 141,800 | 141,800 | 12,200 | 12,200 | 0 | 0 | 0 | 0 |
| **Option 2** | | | | | | | | |
| 3 acres | 32,796 | 0 | 22,224 | 0 | 271,377 | 0 | 14,796 | 0 |
| 7.5 acres | 49,575 | 49,575 | 33,848 | 33,848 | 163,845 | 163,845 | 6,683 | 6,683 |
| 25 acres | 209,650 | 209,650 | 131,425 | 131,425 | 577,850 | 577,850 | 17,700 | 17,700 |
| 70 acres | 99,960 | 99,960 | 51,240 | 51,240 | 319,550 | 319,550 | 18,200 | 18,200 |
| 200 acres | 141,800 | 141,800 | 12,200 | 12,200 | 0 | 0 | 0 | 0 |
| **Option 4** | | | | | | | | |
| 3 acres | 32,796 | 0 | 22,224 | 0 | 271,377 | 0 | 14,796 | 0 |
| 7.5 acres | 49,575 | 32,078 | 33,848 | 21,900 | 163,845 | 105,983 | 6,683 | 4,335 |
| 25 acres | 209,650 | 135,600 | 131,425 | 85,000 | 577,850 | 373,800 | 17,700 | 11,450 |
| 70 acres | 99,960 | 64,680 | 51,240 | 33,110 | 319,550 | 206,780 | 18,200 | 11,760 |
| 200 acres | 141,800 | 91,800 | 12,200 | 7,800 | 0 | 0 | 0 | 0 |

Source: EPA estimates. See Chapter Four.

Table 5-2 shows the costs per acre derived using the total acres developed annually by site size and land use type for all options. Note that these costs are in 2000 dollars as they are throughout Chapter Five. The Preamble to the Final Action, however, presents costs in 2002 dollars. These costs reflect the use of the opportunity and interest cost multiplier, so these are the costs used to estimate the total national costs of compliance.

**Table 5-2. Costs per Acre Over All Developed Acres (All Dollar Values are in Constant, Pre-tax, 2000 Dollars)**

| Option/Site Size | Single-Family | Multifamily | Commercial | Industrial |
|---|---|---|---|---|
| **Option 1** | | | | |
| 3 acres | $145.70 | $145.70 | $145.70 | $145.70 |
| 7.5 acres | $113.30 | $113.30 | $113.30 | $112.90 |
| 25 acres | $84.50 | $84.50 | $84.50 | $84.70 |
| 70 acres | $61.50 | $61.30 | $61.40 | $60.90 |
| 200 acres[a] | $64.50 | $68.20 | $0.00 | $0.00 |
| **Option 2** | | | | |
| 3 acres[b] | $0.00 | $0.00 | $0.00 | $0.00 |
| 7.5 acres | $258.90 | $292.20 | $308.50 | $339.90 |
| 25 acres | $207.10 | $228.60 | $239.10 | $260.70 |
| 70 acres | $183.20 | $203.80 | $215.10 | $232.80 |
| 200 acres[a] | $187.20 | $210.40 | $0.00 | $0.00 |
| **Option 4** | | | | |
| 3 acres[b] | $0.00 | $0.00 | $0.00 | $0.00 |
| 7.5 acres | $148.90 | $182.10 | $198.40 | $230.30 |
| **Option/Site Size** | **Single-Family** | **Multifamily** | **Commercial** | **Industrial** |
| 25 acres | $124.50 | $146.00 | $156.60 | $178.00 |
| 70 acres | $124.10 | $144.90 | $156.10 | $174.40 |
| 200 acres[a] | $125.20 | $144.90 | $0.00 | $0.00 |

[a]EPA estimates that there are no 200-acre projects in the commercial and industrial sectors.
[b] Not in scope.
Source: EPA estimates. See Chapter Four.

Table 5-3 shows the costs per acre over CGP-affected acres for Options 2 and 4 (also adjusted by the opportunity and interest cost multiplier). As expected, the per acre costs calculated using "CGP-affected" acres in Table 5-3 are higher than their counterparts in Table 5-2.

**Table 5-3. Costs per Acre over CGP-Affected Acres (All Dollar Values are in Constant, Pre-tax, 2000 Dollars)**

| Option/Site Size | Single-Family | Multifamily | Commercial | Industrial |
|---|---|---|---|---|
| **Option 2** | | | | |
| 3 acres[a] | $0.00 | $0.00 | $0.00 | $0.00 |
| 7.5 acres | $615.47 | $683.58 | $717.12 | $778.23 |
| 25 acres | $686.28 | $780.14 | $825.72 | $920.91 |
| 70 acres | $643.24 | $736.66 | $781.35 | $868.34 |
| 200 acres[b] | $655.46 | $801.18 | $0.00 | $0.00 |
| **Option 4** | | | | |
| 3 acres[a] | $0.00 | $0.00 | $0.00 | $0.00 |
| 7.5 acres | $505.40 | $573.50 | $607.10 | $668.50 |
| 25 acres | $603.70 | $697.60 | $743.20 | $838.20 |
| 70 acres | $584.20 | $677.70 | $722.40 | $809.90 |
| 200 acres[b] | $593.40 | $735.60 | $0.00 | $0.00 |

[a] Not in scope.
[b] EPA estimates that there are no 200-acre projects in the commercial and industrial sectors.
Source: EPA estimates. See Chapter Four.

## 5.3 ANALYSIS OF IMPACTS ON C&D PROJECTS

Section 5.3.1 summarizes the methodologies and assumptions used to generate the results of EPA's C&D/PrMS. The results of these analyses in terms of impacts on prices paid by consumers and project profits are provided in Section 5.3.2.

### 5.3.1 Overview of Methodology and Assumptions Used in the C&D/PrMS

Within the C&D/PrMS, EPA has created 24 model projects covering six site sizes and four land use types to account for four major types of construction and development, as well as one model for analyzing impacts on nonbuilding construction. The following sections discuss the types of projects analyzed (Section 5.3.1.1), the baseline conditions generated by the models (Section 5.3.1.2), and the cost passthrough assumptions that are used to generate two sets of results (Section 5.3.1.3).

#### *5.3.1.1 Types and Sizes of Projects Analyzed*

Chapter Four, Section 4.2.1, defines a series of model projects. EPA uses these models to analyze the impact of the options on two alternative targets: the typical developer-builder (assuming that they absorb the incremental costs) and the typical consumer (assuming that the same costs are passed on to the buyer). EPA has developed model projects for each of the following:

- A residential development of single-family homes.
- A residential development of multifamily housing units.
- A commercial development (enclosed shopping center).
- An industrial development (industrial park).

Impacts on nonbuilding projects are also presented separately, as represented by an analysis of highway construction projects. See Section 5.2.4.

For each type of model project (other than nonbuilding construction), EPA analyzed costs and impacts for a range of project sizes: 1, 3, 7.5, 25, 70, and 200 acres.[1] The model projects incorporate all of the baseline costs associated with developing a site and completing construction of all housing units or buildings on the site. Accordingly, EPA assumes that the baseline costs include the costs of complying with existing Phase I and Phase II NPDES stormwater regulations as they would apply to the site (100

[1] The 1-acre project is actually representative of projects under an acre in size. Since projects of this size are not within the scope of any of the options considered for the Final Action, the EA does not present any of the results of these models.

percent compliance baseline). The model then allows EPA to assess the incremental impact of additional requirements imposed under the options considered. Chapter Four, Section 4.2.1 provides a detailed description of the model project characteristics, assumptions, and data sources, including an itemized listing of project cost elements.

#### *5.3.1.2 Project Model Baseline Performance*

Under the baseline assumptions and conditions, EPA calculates the sales price for each housing unit (or model commercial or industrial building) and determines the baseline builder-developer profit level based on the sales price. Builder-developer pre-tax profit is assumed to be approximately 10 percent of the building sales price. Table 5-4 shows the baseline sales price and profit for each model project type and each project size. Data and assumptions underlying these estimates are derived in Chapter Four, Section 4.2.1. See the Rulemaking Record for the individual baseline results of each of the component models. The model results presented later in this section show the changes from these baseline values under each regulatory option.

#### *5.3.1.3 Cost Pasthrough Considerations*

The model projects are calibrated to allow analysis under varying assumptions about the degree of cost passthrough from the builder-developer to the buyer.[2] Existing literature and industry information suggests that, particularly in the important single-family home market, pass through of regulatory costs in the new housing market is close to 100 percent (e.g., Luger and Temkin, 2000). The actual incidence of regulatory costs, however, would depend closely on local market conditions. To illustrate the range of possible impacts, EPA has calculated its model results under the extreme conditions of 100 percent and zero percent cost passthrough. The results of each analysis provide upper and lower bounds of impact on industry and consumers. Accordingly, for each sector modeled, there are two sets of results reported.

[2] Cost pass-back to the landowner is possible, but occurs infrequently. See Section 4.2.1. Since EPA lacks data on the actual incidence and extent of cost pass-back, it is not analyzed in detail.

**Table 5-4. Baseline Sales Price and Profit Conditions for the Model Projects (All Dollar Values are in Constant, Pre-tax, 2000 Dollars)**

| Project Type and Size (acres) | Calculated Building Sales Price ($) | Builder-Developer Pre-tax Profit ($) |
|---|---|---|
| ***Single-Family Residential*** | | |
| 3 acres | $316,099 | $31,610 |
| 7.5 acres | $316,099 | $31,610 |
| 25 acres | $315,943 | $31,594 |
| 70 acres | $316,043 | $31,604 |
| 200 acres | $316,060 | $31,606 |
| ***Multifamily Residential*** | | |
| 3 acres | $5,389,995 | $539,000 |
| 7.5 acres | $13,474,991 | $1,347,499 |
| 25 acres | $44,916,775 | $4,491,677 |
| 70 acres | $125,766,936 | $12,576,694 |
| 200 acres | $359,334,211 | $35,933,421 |
| ***Commercial*** | | |
| 3 acres | $4,496,339 | $449,640 |
| 7.5 acres | $11,240,999 | $1,124,100 |
| 25 acres | $37,469,920 | $3,746,992 |
| 70 acres | $104,915,760 | $10,491,576 |
| 200 acres | $299,759,358 | $29,975,936 |
| ***Industrial*** | | |
| 3 acres | $2,852,899 | $285,290 |
| 7.5 acres | $7,132,197 | $713,220 |
| 25 acres | $23,773,989 | $2,377,399 |
| 70 acres | $66,567,119 | $6,656,712 |
| 200 acres | $190,191,761 | $19,019,176 |

Source: EPA estimates based on the methodologies presented in Chapter Four, Section 4.2.1. See DCN 45023 for detailed model spreadsheets.

Under 100 percent cost passthrough, all incremental regulatory costs resulting from the options considered are passed through to end consumers. Under this approach, the costs are also assumed to be marked up to the same degree as other project costs.[3] Consumers feel the impact of the regulations in the form of a higher price for each new building or housing unit. With zero cost passthrough, the incremental regulatory costs are assumed to accrue entirely to the builder-developer, and appear as a reduction in per-project profits. EPA determines this reduction by fixing the final sales price of the housing units and calculating the builder's profit on that project once the regulatory costs are absorbed.

### 5.3.2 Results of the Project-Level Analysis

A summary of the impacts of Options 1 through 4 on projects in the four major land use categories (single-family residential, multifamily residential, commercial, and industrial) is presented in Section 5.3.2.1. Results for the simpler, nonbuilding construction model, as represented by the highway construction sector, are presented in Section 5.3.2.2. Detailed results for all of these models (except the nonbuilding model) can be found in the Rulemaking Record (DCN 45023).

#### *5.3.2.1 Results for the Building Construction Sectors*

Table 5-5a contains a summary of the model results for each option considered for the Final Action under the 100 percent cost passthrough assumption, while Table 5-5b contains a summary of the results under the assumption of zero cost passthrough. In Table 5-5a (100 percent cost passthrough), the impacts of the regulatory options are summarized as the minimum and maximum percentage increase in the sales price over all sizes of model projects within the land use type shown. In Table 5-5b (zero cost passthrough), the impacts of the regulatory options are similarly summarized as the minimum and maximum percentage decrease in builder profits. Detailed results for each model project by land use type and size can be found in the Rulemaking Record (DCN 45023).

[3] The cost markup assumptions (the total cost multipliers) are built into the model and are explained in detail in Chapter Four.

**Table 5-5a. Impact of Regulatory Options on Model Project Financials—100 Percent Cost Passthrough, Summarized Across All Project Sizes**

| | Percent Change in Project Price to Buyer | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Single-Family | | Multifamily | | Commercial | | Industrial | |
| Option | Min | Max | Min | Max | Min | Max | Min | Max |
| 1 | 0.00% | 0.04% | 0.00% | 0.02% | 0.00% | 0.02% | 0.00% | 0.03% |
| 2 | 0.00% | 0.19% | 0.00% | 0.13% | 0.00% | 0.11% | 0.00% | 0.19% |
| 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 4 | 0.00% | 0.16% | 0.00% | 0.12% | 0.00% | 0.10% | 0.00% | 0.17% |

Source: EPA estimates based on the methodologies presented in Chapter Four, Section 4.2.1 using costs shown in Table 5-2. See DCN45023 for detailed, model-specific results.

**Table 5-5b. Impact of Regulatory Options on Model Project Financials—Zero Percent Cost Passtrough, Summarized Across All Project Sizes**

| | Percent Change in Project Profits | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Single-Family | | Multifamily | | Commercial | | Industrial | |
| Option | Min | Max | Min | Max | Min | Max | Min | Max |
| 1 | 0.00% | -0.38% | 0.00% | -0.17% | 0.00% | -0.17% | 0.00% | -0.27% |
| 2 | 0.00% | -1.67% | 0.00% | -1.17% | 0.00% | -0.95% | 0.00% | -1.67% |
| 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 4 | 0.00% | -1.47% | 0.00% | -1.05% | 0.00% | -0.86% | 0.00% | -1.52% |

Source: EPA estimates based on the methodologies presented in Chapter Four, Section 4.2.1, using costs presented in Table 5-2. See DCN45023 for detailed, model-specific results.

Under the 100 percent cost passthrough assumption, EPA estimates that sales prices will rise no more than an average of 0.19 percent for single-family residential, 0.13 percent for multifamily residential, 0.11 percent for commercial, and 0.19 percent for industrial land use categories. All of the maximum impacts occur under Option 2.

Under the zero cost passthrough assumption, the impacts on builders' profits range from a minimum of no change for all project types under the various options to maximum impacts on builders' profits (measured as percent declines in those profits) of under 2 percent for all options and land use types. Maximum impacts all occur under Option 2 as follows:

- Single-family residential: -1.67 percent
- Multifamily residential: -1.17 percent
- Commercial: -0.95 percent
- Industrial: -1.67 percent

#### *5.3.2.2 Results for the Nonbuilding Construction Sectors*

This section presents the results of the model nonbuilding project analysis described in Chapter Four, Section 4.2.1.1.3. As indicated in that section, EPA has not developed actual engineering costs for projects such as roads and highways. As a result, EPA has simulated the impact of the options considered on such projects using worst-case (i.e., highest) estimates of the per-acre engineering costs estimated for building projects.

Due to the lack of engineering costs for this project type, EPA used a "worst-case" assumption of $113 per acre in compliance costs for Option 1, $778 for Option 2, and $669 for Option 4. This figure is based on the highest per-acre compliance cost estimated for a 7.5-acre building project. EPA elected to use the compliance costs for a 7.5-acre project because the model for one mile of a new highway construction project encompasses 10.67 acres. EPA estimates that the baseline costs of construction for one mile of typical road or highway is $5.4 million (see Section 4.2.7). Using the costs per acre shown above, the worst-case estimate of compliance costs associated with one mile of new road or highway construction (10.67 acres) under the highest cost option is about $8,300. This equates to less than 0.2 percent of baseline costs, indicating that even under worst-case assumptions regarding compliance costs, the options considered are unlikely to have a significant impact on representative nonbuilding construction. Given these small impacts, as well as the small impacts in the other C&D industry sectors, EPA believes the options will have a similarly small impact on projects other than highway construction in the heavy construction sector.

## 5.4 ANALYSIS OF IMPACTS ON MODEL FIRMS

### 5.4.1 Overview of Methodology and Assumptions Used

EPA undertakes a firm-level analysis to examine the impacts of the compliance costs associated with multiple C&D projects on a group of model firms that characterize the financial conditions of "typical" businesses in each of the four major industry sectors (single-family residential, multifamily residential, commercial, and industrial construction) and the nonbuilding construction sector, represented by highway construction. EPA uses its C&D/FrMS to simulate the impact of the incremental compliance costs on the balance sheet and cash flow of 14 model firms, which expresses the impacts in terms of changes in meaningful business financial ratios. The ratios used in the analysis include:

- Gross profit ratio.
- Return on net worth.
- Current ratio.
- Debt to equity ratio.

These ratios are reviewed in Chapter Four, Section 4.2.2.

EPA determined the baseline characteristics of the model firms for the four major construction sectors by firm size and industry sector, then used the per-acre costs (derived for Options 2 and 4 using the CGP-affected acreage) and assumptions of numbers of projects undertaken by the various firm models to determine the impact of those costs on the ratios listed above. The reason EPA uses cost calculated over CGP-affected acreage here is that the Agency is calculating a total number of firms affected, not a national average of a certain impact measure. The use of the cost per acre over all acres developed could understate the number of firms estimated to experience financial stress under Options 2 and 4, as a comparison of Tables 5-2 and 5-3 will indicate. EPA thus uses the higher cost per acre over CGP-affected acres. EPA also uses the state-specific number of firms in each of the C&D sectors analyzed to compute the total number of firms estimated to experience financial stress on a state-by-state and total national basis. In this way, although EPA did not have sufficient data to create state-specific firm models, EPA was able to calculate state-based differences in average per-acre costs driven by differences in EPA's assessments of state equivalencies to the regulatory options.

Within the C&D/FrMS, EPA also developed a simple highway construction firm model. The model establishment analysis for heavy construction follows the basic methodology outlined in Section 4.2.2 for firms in the commercial and industrial construction industries. As previously discussed, this analysis focuses on highway and street construction contractors (NAICS 23411) due to the lack of financial data for other segments of the heavy construction industry group (NAICS 234). EPA has determined that the median highway construction firm (NAICS 23411), based on revenues, is in the 50 to 99 employee size classification category as defined by Census (U.S. Census, 2000). Within this employment size class, EPA calculates average establishment revenues, employment, and costs as discussed in Section 4.2.1.2.

For the model highway construction firm, EPA examines the economic impacts of the worst-case compliance cost impacts on the same four financial ratios discussed above for the residential, commercial, and industrial construction industries. Due to the lack of actual engineering cost estimates for highway construction, the compliance costs used in this analysis do not correspond to a particular regulatory option. Compliance costs for 7.5-acre projects were chosen for this analysis because they are closest in size to the model highway construction project assumed to be undertaken by the model establishment, which encompasses 10.67 acres.

Once the costs of compliance are input to the models, EPA identifies how the financial ratios change relative to the baseline (see Chapter Four, Section 4.2.2.2.2, for more information on this methodology). Following this analysis, EPA estimates the number of firms expected to experience financial stress and the employment associated with those firms (see Chapter Four, Section 4.2.2.2.3 for more details). Firms expected to experience financial stress are assumed to need to change their business operations. In the worst-case, this might mean the firm must downsize or close, but these are the extremes of actions firms might need to take to adjust to changing business conditions. Effects on employment, therefore, might not materialize.

To perform the financial ratio analysis, EPA examines a weighted average of changes in the current ratio, debt to equity ratio, and return on net worth ratios. EPA then constructs a cumulative distribution function for each ratio to estimate the percentage of establishments that would most likely fall below “critical” values after incurring compliance costs. The percentage falling below these critical values, multiplied by the number of firms represented by the model under evaluation, results in a

projected number of firms estimated to experience financial stress. EPA calculates potential employment effects by multiplying the number of establishments projected to close by employment estimates for the model facility representing those closures.

Section 5.4.1.1 discusses the types and sizes of firms modeled; Section 5.4.1.2 presents the baseline ratio calculations for the models developed, and Section 5.4.1.3 discusses the cost passthrough assumptions used to develop two sets of results.

#### *5.4.1.1 Types and Sizes of Firms*

EPA created 14 model firms. These model firms represent six firm sizes in the single-family residential construction sector, five firm sizes in the multifamily residential construction sector, and one median-sized firm each in the commercial, industrial, and nonbuilding construction sectors. Firm size for the two residential construction sectors are defined by numbers of starts or units constructed annually. Median-size firms in the other sectors are defined by employee size.

#### *5.4.1.2 Firm Model Baseline Performance*

EPA calculates baseline values of the four financial ratios (gross profit ratio, return on net worth, current ratio, and debt to equity ratio for all of the firm models discussed in Section 5.4.1.1, using the financial parameters developed as discussed in Section 4.2.2.1.3. The baseline ratios for all of EPA's firm level models are presented in Table 5-6. The ratios are the same for each industry type across all sizes because of the proportionality assumptions used to create the size categories, although the financial information does vary by size. See Chapter Four, Section 4.2.2 for how the firm model financials were generated. The spreadsheets that contain all of the financial assumptions used to create these ratios for each model firm can be found in the Rulemaking Record (DCN 45031).

**Table 5-6. Baseline Financial Ratio Values**

| Industry Type | Baseline Gross Profit | Baseline Return on Net Worth | Baseline Current Ratio | Baseline Debt to Equity |
|---|---|---|---|---|
| Single Family | 0.2280 | 0.0506 | 1.3936 | 1.9155 |
| Multifamily | 0.1900 | 0.4639 | 1.1265 | 3.0161 |
| Commercial | 0.1590 | 0.2442 | 1.5620 | 1.3364 |
| Industrial | 0.1840 | 0.2530 | 1.5979 | 1.2472 |
| Heavy | 0.2230 | 0.1983 | 0.1630 | 1.0619 |

#### *5.4.1.3 Cost Passthrough Considerations*

As indicated in Chapter Four, Section 4.2.2, the C&D/FrMS simulations have been run under two cost passthrough scenarios: (1) zero cost passthrough from the developer-builder to the consumer, and (2) an estimated actual cost passthrough, where a "realistic" share of the compliance costs are passed though to consumers in the form of higher prices. EPA has estimated a separate cost passthrough factor for each market sector individually (see Section 4.2.2). The zero cost passthrough results represent the "worst case" scenario for industry; impacts under the more realistic cost passthrough assumption are smaller than those for the zero cost passthrough case.

### 5.4.2 Results of the Firm-Level Analysis

The following sections present the results of the C&D/FrMS analysis using the models developed in Chapter Four, Section 4.2.2. Section 5.4.2.1 presents the results, measured as changes in financial ratios. Section 5.4.2.2 provides estimates of numbers of firms estimated to experience financial stress and numbers of potential employment effects for the four major building construction sectors and the highway construction sector due to the options under consideration. Section 5.4.2.3 presents EPA's assessment of the potential for the regulatory options to present a barrier to entry for new construction firms. These results are summaries of detailed model results, which can be found in the Rulemaking Record (DCN 45029).

#### *5.4.2.1 Impacts on Financial Ratios*

The financial ratio changes estimated to occur are presented under the two cost passthrough scenarios discussed previously. Table 5-7a provides a summary of the results for each sector by regulatory option, averaged over all project sizes, assuming all costs are absorbed by the firms (DCN 45028 presents each size result individually). The most severe impacts are measured by the impact on return on net worth, followed by the gross profit, debt to equity, and current ratios. The largest impact is a 10.78 percent decline in the return on net worth ratio for the single-family residential sector under Option 2. With the exception of return on net worth, the remainder of the results are at or below -2.03 percent for all project types.

Table 5-7b provides the same summary of financial ratios as Table 5-7a, but under the estimated actual cost passthrough scenario. As the table shows, the results under the estimated actual cost passthrough scenario indicate lower impacts than those shown in Table 5-8a, with impacts of less than -1.5 percent for all financial ratios and all five project types, with most of the impacts being less than -0.3 percent (with the exception of return on net worth).

#### *5.4.2.2 Impacts on Firm Financial Health and Employment*

To estimate firm financial stress and potential employment effects, EPA analyzed changes in key financial ratios that occur as firms' costs increase in response to the options considered. EPA again used the costs per acre based on CGP-affected acres to gauge the impact of Options 2 and 4 on the financial health of the building construction firms.

**Financial Effects on Firms**

Table 5-8a shows estimates of the number of firms expected to experience financial stress under a zero cost passthrough assumption—the worst case scenario. Results under the "realistic" cost passthrough assumption are presented in Table 5-8b. The largest number of firms estimated to experience financial stress is projected to occur in the commercial sector (115 firms), followed by the single-family

**Table 5-7a. Impact of Regulatory Options on Model Firm Financial Performance (Zero Cost Passthrough)**

| Construction Industry and Regulatory Option | Percent Change in Financial Ratios, From Baseline[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Gross Profit | | Return on Net Worth | | Current Ratio | | Debt to Equity | |
| | Min. | Max | Min. | Max | Min. | Max | Min. | Max |
| ***Single-family residential*** | | | | | | | | |
| Option 1 | 0.00% | -0.20% | 0.00% | -2.31% | 0.00% | -0.02% | 0.00% | 0.08% |
| Option 2 | 0.00% | -0.96% | 0.00% | -10.78% | 0.00% | -0.09% | 0.00% | 0.38% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Option 4 | 0.00% | -0.84% | 0.00% | -9.49% | 0.00% | -0.08% | 0.00% | 0.34% |
| ***Multifamily residential*** | | | | | | | | |
| Option 1 | 0.00% | -0.29% | 0.00% | -0.92% | 0.00% | -0.05% | 0.00% | 0.19% |
| Option 2 | 0.00% | -2.03% | 0.00% | -6.01% | 0.00% | -0.35% | 0.00% | 1.35% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Option 4 | 0.00% | -1.86% | 0.00% | -6.54% | 0.00% | -0.32% | 0.00% | 1.24% |
| ***Commercial*** | | | | | | | | |
| Option 1 | 0.00% | -0.15% | 0.00% | -0.48% | 0.00% | -0.02% | 0.00% | 0.12% |
| Option 2 | 0.00% | -0.86% | 0.00% | -2.72% | 0.00% | -0.12% | 0.00% | 0.67% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Option 4 | 0.00% | -0.78% | 0.00% | -2.45% | 0.00% | -0.11% | 0.00% | 0.60% |
| ***Industrial*** | | | | | | | | |
| Option 1 | 0.00% | -0.12% | 0.00% | -0.39% | 0.00% | -0.02% | 0.00% | 0.11% |
| Option 2 | 0.00% | -0.77% | 0.00% | -2.48% | 0.00% | -0.12% | 0.00% | 0.68% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Option 4 | 0.00% | -0.70% | 0.00% | -2.26% | 0.00% | -0.11% | 0.00% | 0.62% |
| ***Heavy Construction (Highway)*** | | | | | | | | |
| Worst Case | NA | -1.37% | NA | -4.23% | NA | -0.24% | NA | 1.06% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

[a]Ranges (minimum and maximum) reflect results across model firms of varying sizes. See DCN 45028 for detailed results.
Source: EPA estimates based on the methodologies presented in Chapter Four.

**Table 5-7b. Impact of Regulatory Options on Model Firm Financial Performance (Estimated Actual Cost Passthrough[a])**

| Construction Industry and Regulatory Option | Percent Change in Financial Ratios, From Baseline[b] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Gross Profit | | Return on Net Worth | | Current Ratio | | Debt to Equity | |
| | Min. | Max | Min. | Max | Min. | Max | Min. | Max |
| ***Single-family residential*** | | | | | | | | |
| Option 1 | 0.00% | -0.03% | 0.00% | -0.32% | 0.00% | 0.00% | 0.00% | 0.01% |
| Option 2 | 0.00% | -0.13% | 0.00% | -1.48% | 0.00% | -0.01% | 0.00% | 0.05% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Option 4 | 0.00% | -0.12% | 0.00% | -1.31% | 0.00% | -0.01% | 0.00% | 0.05% |
| ***Multifamily residential*** | | | | | | | | |
| Option 1 | 0.00% | -0.04% | 0.00% | -0.13% | 0.00% | -0.01% | 0.00% | 0.03% |
| Option 2 | 0.00% | -0.28% | 0.00% | -0.84% | 0.00% | -0.05% | 0.00% | 0.17% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Option 4 | 0.00% | -0.26% | 0.00% | -0.91% | 0.00% | -0.04% | 0.00% | 0.19% |
| ***Commercial*** | | | | | | | | |
| Option 1 | 0.00% | -0.01% | 0.00% | -0.05% | 0.00% | 0.00% | 0.00% | 0.01% |
| Option 2 | 0.00% | -0.08% | 0.00% | -0.26% | 0.00% | -0.01% | 0.00% | 0.06% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Option 4 | 0.00% | -0.07% | 0.00% | -0.23% | 0.00% | -0.01% | 0.00% | 0.06% |
| ***Industrial*** | | | | | | | | |
| Option 1 | 0.00% | -0.02% | 0.00% | -0.06% | 0.00% | 0.00% | 0.00% | 0.02% |
| Option 2 | 0.00% | -0.12% | 0.00% | -0.40% | 0.00% | -0.02% | 0.00% | 0.11% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Option 4 | 0.00% | -0.11% | 0.00% | -0.36% | 0.00% | -0.02% | 0.00% | 0.10% |
| ***Heavy Construction (Highway)*** | | | | | | | | |
| Worst-Case | NA | -0.22% | NA | -0.68% | NA | -0.04% | NA | 0.17% |
| Option 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

[a]EPA applied the following estimated cost passthrough factors: Single-family residential, 86%; Multifamily residential, 86%; Commercial, 91%; Industrial, 84%.
[b]Ranges (minimum and maximum) reflect results across model firms of varying sizes. See DCN 45028 for detailed results.
Source: EPA estimates based on the methodologies presented in Chapter Four.

**Table 5-8a. Estimated Numbers of Firms Expected To Experience Financial Stress (Zero Cost Passthrough)**

| Option | Single-Family | | Multifamily | | Commercial | |
|---|---|---|---|---|---|---|
| | Number | Pct. of Total | Number | Pct. of Total | Number | Pct. of Total |
| 1 | 5 | 0.0% | 1 | 0.0% | 19 | 0.0% |
| 2 | 36 | 0.1% | 10 | 0.2% | 133 | 0.3% |
| 3 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| 4 | 31 | 0.0% | 9 | 0.2% | 115 | 0.3% |
| **Option** | **Industrial** | | **Heavy** | | **TOTAL** | |
| | **Number** | **Pct. of Total** | **Number** | **Pct. of Total** | **Number** | **Pct. of Total** |
| 1 | 4 | 0.1% | 8 | 0.1% | 37 | 0.0% |
| 2 | 25 | 0.3% | 54 | 0.5% | 258 | 0.3% |
| 3 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| 4 | 22 | 0.3% | 35 | 0.4% | 212 | 0.2% |

Source: EPA estimates based on the methodologies presented in Chapter Four. See DCN 45029 for detailed results.

**Table 5-8b. Estimated Number of Firms Expected To Experience Financial Stress ("Realistic" Cost Passthrough Assumption)**

| Option | Single-Family | | Multifamily | | Commercial | |
|---|---|---|---|---|---|---|
| | Number | Pct. of Total | Number | Pct. of Total | Number | Pct. of Total |
| 1 | 1 | 0.0% | 0 | 0.0% | 2 | 0.0% |
| 2 | 5 | 0.0% | 1 | 0.0% | 12 | 0.0% |
| 3 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| 4 | 4 | 0.0% | 1 | 0.0% | 11 | 0.0% |
| | | | | | | |
| **Option** | **Industrial** | | **Heavy** | | **TOTAL** | |
| | **Number** | **Pct. of Total** | **Number** | **Pct. of Total** | **Number** | **Pct. of Total** |
| 1 | 1 | 0.0% | 1 | 0.0% | 5 | 0.0% |
| 2 | 4 | 0.0% | 9 | 0.1% | 31 | 0.0% |
| 3 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| 4 | 4 | 0.0% | 6 | 0.1% | 26 | 0.0% |

Source: EPA estimates based on the methodologies presented in Chapter Four. See DCN 45029 for detailed results.

residential sector (31 firms). Firm stress as a percent of total firms is, at most, 0.3 percent under all options considered and for all industry sectors. As seen in Table 5-8b, firm impacts are even smaller when estimated actual cost passthrough is accounted for. Impacts on the heavy construction sector not represented by highway construction are expected to be similarly very small.

### Potential Employment Effects

Table 5-9a presents employment effects analysis results under a zero cost passthrough assumption to show the worst case scenario. Results under an estimated actual cost passthrough assumption are presented in Table 5-9b.

**Table 5-9a. Estimated Potential Employment Effects (Zero Cost Passthrough)**

| | Single-Family | | Multifamily | | Commercial | |
|---|---|---|---|---|---|---|
| **Option** | **Number** | **Pct. of Total** | **Number** | **Pct. of Total** | **Number** | **Pct. of Total** |
| 1 | 131 | 0.0% | 58 | 0.2% | 267 | 0.0% |
| 2 | 1,043 | 0.4% | 494 | 1.4% | 1,853 | 0.3% |
| 3 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| 4 | 888 | 0.3% | 420 | 1.2% | 1,607 | 0.3% |

| | Industrial | | Heavy | | TOTAL | |
|---|---|---|---|---|---|---|
| **Option** | **Number** | **Pct. of Total** | **Number** | **Pct. of Total** | **Number** | **Pct. of Total** |
| 1 | 65 | 0.0% | 193 | 0.1% | 714 | 0.0% |
| 2 | 457 | 0.3% | 1,331 | 0.5% | 5,178 | 0.4% |
| 3 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| 4 | 403 | 0.3% | 803 | 0.4% | 4,121 | 0.3% |

Source: EPA estimates based on the methodologies presented in Chapter Four. See DCN 45029 for detailed results.

**Table 5-9b. Estimated Potential Employment Effects ("Realistic" Cost Passthrough Assumption)**

| Option | Single-Family | | Multifamily | | Commercial | |
|---|---|---|---|---|---|---|
| | Number | Pct. of Total | Number | Pct. of Total | Number | Pct. of Total |
| 1 | 18 | 0.0% | 8 | 0.0% | 25 | 0.0% |
| 2 | 144 | 0.0% | 69 | 0.2% | 175 | 0.0% |
| 3 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| 4 | 122 | 0.0% | 59 | 0.2% | 152 | 0.0% |

| Option | Industrial | | Heavy | | TOTAL | |
|---|---|---|---|---|---|---|
| | Number | Pct. of Total | Number | Pct. of Total | Number | Pct. of Total |
| 1 | 10 | 0.0% | 31 | 0.0% | 92 | 0.0% |
| 2 | 73 | 0.0% | 212 | 0.1% | 673 | 0.0% |
| 3 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| 4 | 64 | 0.0% | 128 | 0.1% | 525 | 0.0% |

Source: EPA estimates based on the methodologies presented in Chapter Four.

Potential employment impacts as a percentage of each sector's total employment are roughly the same as the firm effects. This is to be expected, because EPA estimated potential employment effects by multiplying projected numbers of firms experiencing financial stress by the number of employees per firm. Note that in the multifamily sector, the percentage of potential employment effects is slightly higher than the percentage of firms estimated to experience financial stress. This occurs because the model firms most affected by the options considered account for a disproportionately high percentage of sector employment. As before, the losses estimated using the actual estimated cost passthrough assumption are less than those estimated using the zero cost passthrough assumption. In no case, however, does the impact exceed 1.4 percent, even under the worst-case scenario of zero cost passthrough. Impacts on employment in other heavy construction sectors not represented by highway construction are also expected to be minimal.

#### *5.4.2.3 Barrier to Entry Results*

This section presents the results of EPA's barrier to entry analysis for the five industry sectors. As discussed in Section 4.2.2.2.4, EPA examined the ratio of compliance costs to current and total assets to determine if new market entrants would find it more difficult to obtain construction loans to start a project than would existing firms. As discussed in more detail in that section, this methodology is conservative by design because it does not account for the fact that a firm would typically be expected to finance 20 percent of the incremental compliance costs to obtain the loan—not the full amount as assumed here.

This analysis is run only under the zero cost passthrough assumption. As shown in Table 5-10, compliance costs represent a maximum of 1.7 percent of a model establishment's current assets (1.3 percent of total assets) across all options and project types (excluding highway construction). These maximum projected impacts occur in the multifamily sector. For the industrial and commercial sectors, compliance costs are less than 0.6 percent of current assets, while in the single-family sector, costs are less than 0.4 percent of current assets. The impacts would be smaller under an estimated actual cost passthrough scenario.

## 5.5 ANALYSIS OF NATIONAL COMPLIANCE COSTS

In this section, EPA presents an overview of the methodology used to compute the national compliance costs of all options considered for the Final Action (Section 5.5.1). These national compliance costs are then presented as totals by industry sector and option (Section 5.5.2) and on a per-unit basis, also by industry sector and option (Section 5.5.3). Spreadsheets used to calculate these costs are available in the Rulemaking Record (DCN 45039).

### 5.5.1 Overview of Methodology and Assumptions Used in the National Compliance Cost Model

EPA calculates the national compliance costs associated with the options considered by multiplying the compliance costs per acre (by project type and size; see Table 5-2) by estimates of the

**Table 5-10. Barrier to Entry Analysis (Zero Cost Passthrough)**

| Option | Compliance Costs Divided by: | | | |
|---|---|---|---|---|
| | Current Assets | | Total Assets | |
| | Min. | Max. | Min. | Max. |
| ***Single-Family Residential*** | | | | |
| 1 | 0.0% | 0.1% | 0.0% | 0.1% |
| 2 | 0.0% | 0.4% | 0.0% | 0.3% |
| 3 | 0.0% | 0.0% | 0.0% | 0.0% |
| 4 | 0.0% | 0.4% | 0.0% | 0.3% |
| ***Multifamily Residential*** | | | | |
| 1 | 0.0% | 0.3% | 0.0% | 0.2% |
| 2 | 0.0% | 1.7% | 0.0% | 1.3% |
| 3 | 0.0% | 0.0% | 0.0% | 0.0% |
| 4 | 0.0% | 1.6% | 0.0% | 1.2% |
| ***Commercial*** | | | | |
| 1 | 0.0% | 0.1% | 0.0% | 0.1% |
| 2 | 0.0% | 0.6% | 0.0% | 0.5% |
| 3 | 0.0% | 0.0% | 0.0% | 0.0% |
| 4 | 0.0% | 0.5% | 0.0% | 0.3% |
| ***Industrial*** | | | | |
| 1 | 0.0% | 0.1% | 0.0% | 0.1% |
| 2 | 0.0% | 0.6% | 0.0% | 0.5% |
| 3 | 0.0% | 0.0% | 0.0% | 0.0% |
| 4 | 0.0% | 0.6% | 0.0% | 0.4% |
| ***Heavy (Highway Construction)*** | | | | |
| Worst Case | NA | 1.2% | NA | 0.7% |
| 3 | 0.0% | 0.0% | 0.0% | 0.0% |

Source: EPA estimates based on the methodologies presented in Chapter Four.

total number of acres developed per year (see Chapter Four, Section 4.3). EPA uses data from the USDA NRI to estimate the number of acres developed per year. According to this source, approximately 2.2 million acres of undeveloped land are converted to a developed state every year. EPA has adjusted this total to account for differences in regulatory coverage between Option 1 and Option 2.[4] As described in Chapter Four, Section 4.3, both the 14-Community Study (conducted in support of the Phase II NPDES stormwater rule development) and building permits data from Census were used to allocate the developed acreage by project type and size (U.S. EPA, 1999; U.S Bureau of the Census, 2000c).

EPA also calculates the national costs by unit, using numbers of single family homes and units for multifamily residential construction and by square footage for commercial and industrial development. Section 4.3.1.2 presents the estimates of units (in terms of numbers of houses, units, and square footage) in the discussions concerning the distribution of numbers of developed acres by land use type and size.

### 5.5.2 Estimate of Total National Compliance Costs

Table 5-11 contains EPA's estimates of the annual national costs of the regulatory options. The national costs of the options considered range from $0 for each project type (Option 3) to maximums of $143 million for single-family residential construction, $103 million for multifamily residential construction, $296 million for commercial construction, and $13 million for industrial construction (all Option 2).[5]

The combined annual national compliance costs across all sectors are shown in the final rows of Table 5-11. The national compliance costs are $264 million under Option 1, $556 million under Option 2, and $360 million under Option 4. Option 3, the no-action option, results in no incremental compliance costs.

---

[4] Option 1 applies to sites of one acre or more, while Option 2 applies to sites of five acres or more. Adjustments are not made for Option 4, since it does not matter whether EPA multiplies cost per acre developed by total developed acres or cost per acre affected by total affected acres.

[5] Note that the costs to the heavy construction sector are accounted for, although the additional costs for this sector are distributed among the four major industry sectors in proportion to their acreage (see Section 4.3.1.2).

**Table 5-11. Estimated Annual National Cost of Stormwater Control Options (All Dollar Amounts Are in Constant, Pre-tax, 2000 Dollars)**

| Option | Estimated National Costs ($ 1,000) |
|---|---|
| ***Single-Family Residential*** | |
| Option 1 | $63,652 |
| Option 2 | $143,197 |
| Option 3 | $0 |
| Option 4 | $88,262 |
| ***Multifamily Residential*** | |
| Option 1 | $45,820 |
| Option 2 | $103,234 |
| Option 3 | $0 |
| Option 4 | $65,200 |
| ***Commercial*** | |
| Option 1 | $148,173 |
| Option 2 | $296,446 |
| Option 3 | $0 |
| Option 4 | $197,440 |
| ***Industrial*** | |
| Option 1 | $6,458 |
| Option 2 | $12,797 |
| Option 3 | $0 |
| Option 4 | $8,979 |
| ***Total*** | |
| **Option 1** | **$264,104** |
| **Option 2** | **$555,675** |
| **Option 3** | **$0** |
| **Option 4** | **$359,882** |

Source: EPA estimates.

National costs reflect the absence of costs associated with developed acres in states where state requirements are deemed equivalent to the options under consideration. See the Technical Development Document (U.S. EPA, 2004) for a discussion of state equivalency. Chapter Four, Section 4.1.2.1 provides a summary of this information.

### 5.5.3 Estimates of Compliance Cost on a Per-Unit Basis

Table 5-12 shows the calculation of cost per unit for Options 1, 2, and 4. Units are "dollars per house" and "dollars per unit" for single-family residential and multifamily residential construction, respectively, and "dollars per square foot" for all other categories. Total costs are as shown in Table 5-11 and include builders' opportunity and interest costs. In effect, Table 5-12 shows the cost per unit assuming 100 percent cost passthrough. Units per acre were estimated in Section 4.3.1.2 and are repeated in the table.

The cost to build a new single-family home increases by $44.66 under Option 1, $107.05 under Option 2, and $65.98 under Option 4. The cost to build a new multifamily home increases by $17.66 under Option 1, $43.65 under Option 2, and $27.57 under Option 4. Costs per square foot for commercial space and industrial space increase by 0.01 cent for Option 1, 0.03 and 0.04 cents respectively for Option 2, and 0.02 and 0.03 cents respectively for Option 4. The impacts of these cost increases on the markets for new construction are explored in Section 5.6.

## 5.6 ANALYSIS OF IMPACTS ON CONSTRUCTION MARKETS

EPA uses three analytical approaches to estimate the potential impacts of the regulatory options on the various construction and development markets and the impact of changes in those markets on consumers of single family housing. These analyses use somewhat different underlying assumptions and are thus not expected to produce the same results. Each analysis, however, provides slightly different information. Combined, these analyses contribute to a better understanding of the magnitude of the estimated impacts.

**Table 5-12. Calculation of Total Cost per Unit (Includes the Impact of Equivalent State Programs; All Dollar Amounts Are in Constant, Pre-tax, 2000 Dollars)**

| Ratio | Single-Family | Multi-Family | Commercial | Industrial | Total |
|---|---|---|---|---|---|
| **Option 1** | | | | | |
| Total Costs | $63,652,385 | $45,820,378 | $148,172,832 | $6,458,434 | $264,104,029 |
| Total Acres | 533,781 | 250,937 | 1,332,622 | 57,379 | 2,174,718 |
| | | | | | |
| Cost per Acre | $119.25 | $182.60 | $111.19 | $112.56 | |
| Units per Acre | 2.67 | 10 | 8,320 | 8,555 | |
| Cost per Unit | $44.66 | $17.66 | $0.01 | $0.01 | |
| **Option 2** | | | | | |
| Total Costs | $143,196,670 | $103,234,363 | $296,446,381 | $12,797,180 | $555,674,594 |
| Total Acres | 500,985 | 228,713 | 1,061,245 | 42,583 | 1,833,525 |
| | | | | | |
| Cost per Acre | $285.83 | $451.37 | $279.34 | $300.53 | |
| Units per Acre | 2.67 | 10 | 8,320 | 8,555 | |
| Cost per Unit | $107.05 | $43.65 | $0.03 | $0.04 | |
| **Option 4** | | | | | |
| Total Costs | $88,262,015 | $65,200,328 | $197,440,003 | $8,979,489 | $359,881,835 |
| Total Acres | 500,985 | 228,713 | 1,061,245 | 42,583 | 1,833,525 |
| | | | | | |
| Cost per Acre | $176.18 | $285.08 | $186.05 | $210.87 | |
| Units per Acre | 2.67 | 10.34 | 8,320 | 8,555 | |
| Cost per Unit | $65.98 | $27.57 | $0.02 | $0.03 | |

Source: EPA estimates based on the methodologies presented in Chapter Four. See DCN 45039 for detailed results.

The first approach measures impacts on consumers using EPA's Consumer Impact Model (Section 5.6.1). The other two approaches are the basis of two of three modules in EPA's partial equilibrium modeling system, C&D/PEqMMS. EPA's second approach and first module of the C&D/PEqMMS, the National Housing Model, measures impacts on prices and quantities in the national housing market (Section 5.6.2). The third approach and second module of the C&D/PEqMMS, the Regional Market Modeling Module, estimates impacts on regional markets for all four major C&D sectors (Section 5.6.3). The last module of the C&D/PEqMMS is the Net Economic Impact Model, which is discussed in Section 5.7.

### 5.6.1 Analysis of Consumer Impacts

#### *5.6.1.1 Overview of Methodology and Assumptions Used in the Consumer Impact Model*

EPA analyzed the impacts on consumers using EPA's Consumer Impact Model. To estimate worst-case impacts on consumers, EPA assumes that developers and builders pass on 100 percent of the costs to the new single-family home buyer. EPA's model estimates the change in income needed to qualify for financing to purchase the (higher priced) housing unit, and then estimates the change in the number of households that would meet the higher income criteria. In theory, this provides an estimate of the change in new housing demand that could arise as a result of the options considered. The methodology for this model was discussed in Chapter Four, Section 4.3.2.1.

#### *5.6.1.2 Estimates of Consumer Impacts*

Table 5-13 shows that the incremental costs of the options considered add a maximum of $43 to the $90,393 in income that is required to purchase the baseline model home. (i.e., a $43 increase in income is needed to accommodate the most expensive option for the model representing the highest cost per acre for a single family residence, (the 7.5-acre model). Given this qualifying income change, between 0 and 15,000 households (0 percent to 0.09 percent of total qualifying households) would fail to qualify for a mortgage for the median priced home.

**Table 5-13. Impact of Option Compliance Costs on Housing Affordability (All Dollar Amounts are in Constant, Pre-tax, 2000 Dollars)**

| Option | ESC Costs ($/Unit) | Total Change in Costs ($/Unit) | Income Needed to Qualify ($) | Change in Income Needed ($) | Number of Households Shifted (Thousands) | Percent of Households Shifted that Could Afford Baseline |
|---|---|---|---|---|---|---|
| 1 | $30 | $65 | $90,412 | $18 | (6.4) | -0.04% |
| 2 | $70 | $150 | $90,436 | $43 | (14.9) | -0.09% |
| 3 | $0 | $0 | $90,393 | $0 | 0.0 | 0.00% |
| 4 | $44 | $95 | $90,421 | $27 | (9.4) | -0.06% |

Source: EPA estimates based on the methodologies presented in Chapter Four.

### 5.6.2 Analysis of the National Housing Market

#### *5.6.2.1 Overview of Methodology and Assumptions Used in the National Housing Model*

In this analysis, EPA uses a national partial equilibrium model of single-family housing. Partial equilibrium models use information on estimated elasticities of market supply and demand to estimate the impact of incremental costs on the supply curve and, thus, on prices and quantities of construction products. Additional costs of compliance generally shift the supply curve up. This shift typically drives changes in prices (prices rise) and quantities (quantities fall). This model calculates changes in housing prices and quantities of single-family housing (see Section 5.6.2). The detailed methodology for this National Housing Market Model was presented Chapter Four, Section 4.3.2.2.

#### *5.6.2.2 Estimates of Impacts on the National Housing Market*

Table 5-14 shows the results of EPA's analysis using the National Housing Market Model. The table shows the estimated changes in median single-family home prices as a result of the options considered. The changes in costs range from $0 to $70. The market model recognizes that market conditions control how much of these costs can be passed through to consumers. Thus, the price increase is somewhat smaller than the related cost increase, reflecting the fact that some costs would be borne by

the builder-developer. The largest increase in price reduces the quantity that can be sold by about 0.01 percent. The total loss in output to the construction industry ranges from $0 to $49.6 million. See also DCN 45026 in the Rulemaking Record.

**Table 5-14. Single-Family Residential—Changes in Price and Quantity From the Baseline (All Dollar Values Are in Constant, Pre-tax, 2000 Dollars)**

| Option | Change in Cost ($/Unit) | New Price ($/Unit) | Price Change ($/Unit) | Quantity Change (Units) | Quantity Change (Percent) | Loss of Output ($ Million) |
|---|---|---|---|---|---|---|
| 1 | $30 | $316,126 | $27 | (67) | 0.00% | $(21.3) |
| 2 | $70 | $316,162 | $62 | (157) | -0.01% | $(49.6) |
| 3 | $0 | $316,099 | $0 | 0 | 0.00% | $0 |
| 4 | $44 | $316,139 | $39 | (99) | -0.01% | $(31.2) |

Source: EPA estimates based on the methodologies presented in Chapter Four.

### 5.6.3 Analysis of Regional Markets

#### *5.6.3.1 Overview of Methodologies and Assumptions Used in the Regional Market Modeling Module*

EPA analyzes regional markets for the four major sectors (single-family, multifamily, commercial, and industrial), again using partial equilibrium market models within the C&D/PEqMMS. These models, known collectively as the Regional Market Modeling Module, use state-specific costs per acre as discussed in Chapter Four, Section 4.3.2.3. The outputs of these regional analyses are somewhat different among the sectors. EPA's focus on analyzing the single-family sector is to provide another measure of housing affordability, since price and quantity effects can also be measured at the regional level, as in Section 5.6.2. However, EPA is analyzing the multifamily, commercial, and industrial sectors with the Regional Market Modeling Module to calculate the national-level changes in price and quantity due to the effect of regulatory cost increases in these sectors and to determine regional-level net economic impacts (discussed in Section 5.7). Chapter Four, Section 4.3.2.3 discusses the methodologies used to perform these analyses in detail.

EPA's regional analysis of the single-family housing market looks at affordabilty using a Housing Opportunity Index (HOI) approach. The HOI is an alternative measure of housing affordability. It measures the percentage of households in a region that can afford the median-priced house in that region. EPA uses a rough estimate of HOI, which is termed RHOI as explained in Chapter Four. EPA estimated the change in RHOI from its baseline value for 215 regional housing markets using the price changes predicted in each of those markets by the partial equilibrium models. A change downward in the RHOI percentage indicates the number of households that can no longer afford the median-priced home.

EPA's regional analysis of the multifamily, commercial, and industrial construction markets also use partial equilibrium models, but fewer regions could be analyzed in the commercial and industrial C&D sectors. The regional results are aggregated to estimate a national average effect on prices and quantities in these markets for input to the Net Economic Impact Model (see Section 5.7).

#### *5.6.3.2 Estimates of Regional Market Impacts*

##### 5.6.3.2.1 Single-Family Housing Market

Table 5-15 summarizes the results of the analysis of the single-family housing market in terms of the average change in RHOI calculated across each Census Bureau division. The change in RHOI value from baseline can be seen by comparing Option 1, 2, and 4 RHOI values to those for Option 3. Since the RHOI encompasses both existing and new housing, the results show the net effect for the entire housing market. The value of the RHOI varies considerably by region. In the Pacific region, high real estate prices result in only one third of households having sufficient income to purchase the median-priced home. In the central regions, however, three-quarters of households can afford the median-priced home.

The regulatory options have little effect on regional RHOI. Table 5-16 shows the percentage change in RHOI by Census division. Option 1 changes RHOI by a maximum of 0.04 percent in all regions. Option 2 changes RHOI by a maximum of 0.23 percent. Option 4 changes RHOI by a maximum of 0.19 percent. The largest changes occur in the East North Central region. These changes are much smaller in scale than annual changes that result from normal shifts in real estate market conditions and

demography of the market areas. More detailed results can be seen in DCN 45026, in the Rulemaking Record.

**Table 5-15. Single-Family Residential Average RHOI by Census Division**

| | Census Division | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Option** | **1 New England** | **2 Middle Atlantic** | **3 East North Central** | **4 West North Central** | **5 South Atlantic** | **6 East South Central** | **7 West South Central** | **8 Mountain** | **9 Pacific** |
| 1 | 54.21 | 62.33 | 72.64 | 78.79 | 70.28 | 69.67 | 64.70 | 44.55 | 32.61 |
| 2 | 54.15 | 62.27 | 72.50 | 78.72 | 70.24 | 69.65 | 64.68 | 44.51 | 32.58 |
| 3 | 54.24 | 62.37 | 72.67 | 78.82 | 70.31 | 69.70 | 64.73 | 44.58 | 32.63 |
| 4 | 54.18 | 62.30 | 72.53 | 78.75 | 70.29 | 69.68 | 64.72 | 44.55 | 32.59 |

RHOI indicates the percentage of households in each region that can afford the median-priced house.
Source: EPA estimates based on the methodologies presented in Chapter Four.

**Table 5-16. Single-Family Residential—Percentage Change in RHOI by Census Division**

| | Census Division | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Option** | **1 New England** | **2 Middle Atlantic** | **3 East North Central** | **4 West North Central** | **5 South Atlantic** | **6 East South Central** | **7 West South Central** | **8 Mountain** | **9 Pacific** |
| 1 | -0.05% | -0.06% | -0.04% | -0.04% | -0.05% | -0.05% | -0.05% | -0.07% | -0.06% |
| 2 | -0.17% | -0.17% | -0.23% | -0.13% | -0.10% | -0.08% | -0.08% | -0.16% | -0.16% |
| 3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 4 | -0.11% | -0.12% | -0.19% | -0.10% | -0.03% | -0.03% | -0.03% | -0.05% | -0.11% |

RHOI indicates the percentage of households in each region that can afford the median-priced house.
Source: EPA estimates based on the methodologies presented in Chapter Four.

#### 5.6.3.2.2 Multifamily Housing Markets

Table 5-17 shows the estimated changes in median price of a unit in a multifamily building from the options considered. The changes in costs range from $0 to $77 per unit. Multifamily housing disturbs a smaller area per unit, so any ESC-related costs are spread over more units. The market model suggests a higher share of compliance costs in multifamily housing would be passed through to consumers compared to single-family homes, so price changes are closer to the actual change in builder costs. The price changes passed through to consumers range from $0 to $72 per unit.

**Table 5-17. Multifamily Residential—Changes in Price and Quantity From the Baseline (All Dollar Values Are in Constant, Pre-tax, 2000 Dollars)**

| Option | Change in Cost ($/Unit) | New Price ($1,000/ Unit) | Price Change ($/Unit) | Quantity Change (Units) | Quantity Change (Percent) | Loss of Output ($ Million) |
|---|---|---|---|---|---|---|
| 1 | $21 | $132.54 | $19 | (34) | -0.01% | ($4.5) |
| 2 | $77 | $132.60 | $72 | (115) | -0.04% | ($15.0) |
| 3 | $0 | $132.53 | $0 | 0 | 0.00% | $0.0 |
| 4 | $38 | $132.56 | $35 | (54) | -0.02% | ($7.1) |

Source: EPA estimates based on the methodologies presented in Chapter Four.

#### 5.6.3.2.3 Commercial Space Markets

Rental prices for commercial space are typically quoted in dollars per square foot per year. Table 5-18 shows the estimated changes in median rental rate of a square foot of commercial space from the options considered. The changes in costs range from $0 to $0.06 per square foot. Tenants of commercial space are considerably more price sensitive than residential buyers, so less of the change in costs can be passed through to tenants. The change in average price per square foot reflects this absorption of compliance costs by builders and building owners.

Price changes range from $0 to $0.05 per square foot. Quantity reductions are estimated to reach -0.16 percent for the most costly option. The total loss in output to the construction industry ranges from $0 to $262.2 million.

**Table 5-18. Commercial—Changes in Price and Quantity From the Baseline (All Dollar Values Are in Constant, Pre-tax, 2000 Dollars)**

| Option | Change in Cost ($/Sq. Ft.) | New Price ($/Sq. Ft.) | Price Change ($/Sq. Ft.) | Quantity Change (Units) | Quantity Change (Percent) | Loss of Output ($ Million) |
|---|---|---|---|---|---|---|
| 1 | $0.01 | $14.68 | $0.01 | (119) | -0.03% | $62.5 |
| 2 | $0.06 | $14.72 | $0.05 | (509) | -0.16% | ($262.2) |
| 3 | $0.00 | $14.66 | $0.00 | 0 | 0.00% | $0.0 |
| 4 | $0.04 | $14.70 | $0.04 | (339) | -0.11% | ($174.8) |

Source: EPA estimates based on the methodologies presented in Chapter Four.

#### 5.6.3.2.4 Industrial Space Markets

Only 12,100 industrial projects are expected to start in the base year. Rental prices for industrial space are typically quoted in dollars per square foot per year. Table 5-19 shows the estimated changes in median rental rate of a square foot of industrial/warehouse space from the options considered. The changes in costs range from $0 to $0.08 per square foot. Buyers of industrial space are considerably more price sensitive than homeowners, so less of the change in costs can be passed through to the end users. The change in average price per square foot reflects this absorption of compliance costs by builders and developers.

Price changes range from $0 to $0.07 per square foot. Quantity is reduced by about 1 percent for the most costly option, albeit on a small number of projects in the baseline. The total loss in output to the industrial construction industry ranges from $0 to $24.9 million.

**Table 5-19. Industrial—Changes in Price and Quantity From the Baseline (All Dollar Values Are in Constant, Pre-tax, 2000 Dollars)**

| Option | Change in Cost ($/Sq. Ft.) | New Price ($/Sq. Ft.) | Price Change ($/Sq. Ft.) | Quantity Change (Units) | Quantity Change (Percent) | Loss of Output ($ Million) |
|---|---|---|---|---|---|---|
| 1 | $0.01 | $5.18 | $0.01 | (27) | -0.19% | ($4.7) |
| 2 | $0.08 | $5.24 | $0.07 | (144) | -1.01% | ($24.9) |
| 3 | $0.00 | $5.16 | $0.00 | 0 | 0.00% | $0.0 |
| 4 | $0.06 | $5.22 | $0.05 | (107) | -0.73% | ($18.6) |

Source: EPA estimates based on the methodologies presented in Chapter Four.

## 5.7 ANALYSIS OF NET ECONOMIC IMPACTS

EPA's analysis of net economic impacts uses the last module of the C&D/PEqMMS, the Net Economic Impact Model. The analysis focuses on three areas of potential impact: (1) impacts on U.S. economic output and employment (Section 5.7.1); (2) impacts on measures of consumer and producer welfare (Section 5.7.2); and (3) impacts on regions and communities (Section 5.7.3). Additionally, EPA qualitatively analyzes impacts on international trade outside the C&D/PEqMMS (Section 5.7.4). With the exception of international trade, all of these impacts are calculated within the framework of the partial equilibrium market models described in Section 5.6 previously. Net impacts on output and employment stemming from the market for single-family homes are calculated using the National Housing Model discussed in Section 5.6.2. Output and employment impacts for the multifamily, commercial, and industrial sectors are derived from the Regional Market Modeling Module. The analysis of impacts on regions and communities use the outputs of the regional market models to develop state-specific estimates of impacts on output and employment. The spreadsheets used to calculate these net economic impacts are available in the Rulemaking Record (DCNs 45025, 45027, and 45038).

### 5.7.1 Impacts on Output and Employment

#### *5.7.1.1 Overview of Methodology and Assumptions*

EPA uses the results of the National Housing Model for the single-family sector and the Regional Market Modeling Module for the multifamily, commercial and industrial sectors. These models provide the change in price and quantity expected on average in each market. The changes in price and quantity are used to compute the direct output (revenue) changes in the industry sectors themselves. These output changes have a ripple effect in the rest of the economy, which can be measured using input-output multipliers developed by the Bureau of Economic Analysis (U.S. Department of Commerce, 1996). These multipliers also can be used to estimate the impacts of output changes in the industry to calculate employment changes both within the industry and in the rest of the U.S. economy.

Compliance costs generate economic gains as well. Economic gains are derived from the economic activity of installing and maintaining ESCs, as well as from inspecting and certifying sites. In this analysis, EPA calculates the losses to industry and the U.S. economy and the gains of output and employment separately, then calculates the net gains or losses in the U.S. economy as a whole. Additional details about this methodology can be seen in Chapter Four, Section 4.3.3.

#### *5.7.1.2 Estimates of Output and Employment Losses*

As discussed previously, additional compliance costs reduce the output of the construction industry as the increased price reduces sales. The estimate of this effect is shown in the “Loss of Output” column of Table 5-20. Most of the losses are in the large, single-family residential and commercial construction sectors. These losses are offset, however, by increases in output and employment in those industries associated with compliance, i.e., design, installation, and inspection of ESCs. The estimate of the amount of new work generated in these activities is shown in the “Offset from Compliance Work” column. The next two columns show the changes in jobs related to the loss in construction spending and (offsetting) increase in regulatory compliance spending. Under both options, the need for labor associated with compliance activities and the subsequent direct and indirect effects of that additional labor adds more jobs than the loss of output takes away, resulting in a positive net employment change.

**Table 5-20. Changes in Output and Total Employment From the Baseline (All Dollar Values Are in Constant, Pre-tax, 2000 Dollars)**

| Option | Loss of Output ($ Million) | Stimulus from Added Work ($ Million) | Change in Employment from Lost Output (Jobs) | Change in Employment from Stimulus (Jobs) | Net Change in Employment From Construction Impacts (Jobs) | Change in Employment From Construction Impacts (Jobs) | Net Change in Total Employment (Jobs) |
|---|---|---|---|---|---|---|---|
| ***Single-Family Residential*** | | | | | | | |
| 1 | ($21.3) | $47.9 | (791) | 1,781 | 989 | (1,162) | (173) |
| 2 | ($49.6) | $111.6 | (1,844) | 4,148 | 2,304 | (2,707) | (403) |
| 3 | $0.0 | $0.0 | 0 | 0 | 0 | 0 | 0 |
| 4 | ($31.2) | $70.3 | (1,160) | 2,611 | 1,450 | (1,704) | (254) |
| ***Multifamily Residential*** | | | | | | | |
| 1 | ($4.5) | $7.2 | (169) | 267 | 98 | (196) | (98) |
| 2 | ($15.0) | $24.0 | (558) | 891 | 334 | (655) | (321) |
| 3 | $0.0 | $0.0 | 0 | 0 | 0 | 0 | 0 |
| 4 | ($7.1) | $11.2 | (265) | 418 | 153 | (307) | (154) |
| ***Commercial*** | | | | | | | |
| 1 | ($62.5) | $164.2 | (2,322) | 6,102 | 3,780 | (4,055) | (275) |
| 2 | ($262.2) | $661.0 | (9,743) | 24,560 | 14,817 | (16,265) | (1,448) |
| 3 | $0.0 | $0.0 | 0 | 0 | 0 | 0 | 0 |
| 4 | ($174.8) | ($417.4) | (6,495) | 15,509 | 9,014 | (10,209) | (1,194) |
| ***Industrial*** | | | | | | | |
| 1 | ($4.7) | $7.3 | (175) | 273 | 98 | (169) | (71) |
| 2 | ($24.9) | $39.0 | (926) | 1,448 | 522 | (901) | (379) |
| 3 | $0.0 | $0.0 | 0 | 0 | 0 | 0 | 0 |
| 4 | ($18.6) | $29.1 | (692) | 1,080 | 388 | (672) | (284) |
| ***Total*** | | | | | | | |
| 1 | ($93.0) | $226.7 | (3,457) | 8,422 | 4,965 | (5,581) | (616) |
| 2 | ($351.8) | $835.5 | (13,070) | 31,047 | 17,976 | (20,528) | (2,552) |
| 3 | $0.0 | $0.0 | 0 | 0 | 0 | 0 | 0 |
| 4 | ($231.8) | $527.9 | (8,612) | 19,618 | 11,006 | (12,892) | (1,886) |

Source: EPA estimates based on the methodologies presented in Chapter Four.

In the single-family sector under Option 1, for example, there is a loss of $21.3 million of output but an offsetting stimulus of $48 million. The loss represents 791 jobs, but the offset generates 1,781 jobs; the net result is the generation of 989 more jobs. Note that these job estimates apply to the entire economy, not just the construction sectors. They represent all of the impacts that result as changes in the construction industry ripple through other sectors.

The stimulus to the construction industry comes at the expense of consumer spending, as home buyers and other consumers devote more of their income to housing. EPA assumes that this loss of consumer surplus takes the form of reduced spending for other products, though it might also take the form of reduced amenities in housing construction. Removing this spending from the national economy reduces the employment that arises in response to consumer spending. The "Change in Employment From Consumer Spending" column shows this reduction in jobs, which offsets the stimulus to construction. When this effect is factored in, the net change in total employment is negative.

Total employment losses range from 0 to 2,552 jobs. These estimates do not consider how long individuals may be out of work, nor do they consider individuals' alternative opportunities. Because of this, such input-output analysis results are usually considered an over-estimate of the hardship initiated by the change to the economy.

### 5.7.2 Impacts on Welfare Measures

#### *5.7.2.1 Overview of Methodology and Assumptions*

As discussed in Chapter Four, Section 4.3.3, the incremental regulatory options (Options 1, 2 and 4) shift the supply curves for new construction in each sector. This shift alters the balance between consumers and producers. Each group contributes to the costs of complying with the regulation. Producers lose as their margin falls. Consumers lose in that they must allocate more of their resources to housing rather than other things that give them pleasure. Much of the loss in consumer welfare is shifted to producers, but generally both consumers and producers lose some surplus that is not gained elsewhere in the economy. Loss that is not compensated by gain elsewhere in the economy is termed "deadweight" loss. The consumer, producer, and deadweight losses are calculated using the same market models used

to calculate output losses. These calculations depend on the interactions between the supply and demand curves in each model and the magnitude of the shift in the supply curve, as discussed in more detail in Chapter Four, Section 4.3.3.

#### *5.7.2.2 Estimates of Impacts on Welfare Measures*

As Table 5-21 indicates, consumers may lose from $0 to $752.4 million, depending on the option selected. Producers lose from $0 to $87.8 million. Almost all of this loss is shifted from consumers and construction firm owners to construction firms to pay the costs of complying with the regulation. As shown in the last section, the net effect on construction may be a stimulus. However, a small portion is utterly lost to society. This portion, the "deadweight loss," ranges from $0 to $965,000. The calculations of these losses can be seen in DCN 45026 in the Rulemaking Record.

**Table 5-21. Annual Changes in Social Welfare Measures—All Sectors Combined (All Dollar Values Are in Constant, Pre-tax, 2000 Dollars)**

| Option | Total Deadweight Loss ($ Million) | Total Consumer Surplus Loss ($ Million) | Total Producer Surplus Loss ($ Million) |
|---|---|---|---|
| 1 | $0.044 | $204.6 | $23.3 |
| 2 | $0.965 | $752.4 | $87.8 |
| 3 | $0.000 | $0.0 | $0.0 |
| 4 | $0.647 | $472.5 | $57.9 |

Source: EPA estimates based on the methodologies presented in Chapter Four.

### 5.7.3 Impacts on Regions and Communities

#### *5.7.3.1 Overview of Methodology and Assumptions Used*

The multifamily housing and nonresidential market models estimate impacts on output and employment at the state level based on information about local real estate markets. The single-family housing market model estimates market effects at the Metropolitan Statistical Area (MSA) level, which EPA then aggregates to the state level. The distribution of these impacts can be used to identify which states might be more or less affected by the options considered for the Final Action. As before at the national level, these impacts are measured in terms of output and employment gains and losses. Section 4.3.2.3 discusses this methodology in more detail.

#### *5.7.3.2 Estimates of Impacts on Regions and Communities*

Table 5-22 shows the loss in output to the construction industry, by state, as a result of compliance with Option 2, the most expensive option. Loss of output largely follows the expected pattern of population and growth. Several states show zero loss for some categories because there is so little activity in that state that the effect could not be measured. Under Option 2, states are either affected by the inspection and certification provisions (I&C) or both the I&C and CGP provisions. Those states with very small impacts most likely have regulations equivalent to the CGP provisions and, therefore, show no impacts under Option 4. See DCN 45026 in the Rulemaking Record for the detailed results of all options.

Table 5-23 provides a similar state-by-state breakdown of the net change in employment as a result of compliance with Option 2. In several states, multifamily housing, commercial, and industrial stimulus effects are greater than the losses, and the regulation causes a small net positive change in employment within those categories. Again, results for Options 1 and 4 are lower and distributed differently because of state equivalency. DCN 45024 in the Rulemaking Record provides the results for all options.

**Table 5-22. Changes in Output to the Construction Industry by State and Use Category Under Option 2 ($ Millions) (All Dollar Values Are in Constant, Pre-tax, 2000 Dollars)**

| State | Single-Family | Multifamily | Commercial | Industrial | Total |
|---|---|---|---|---|---|
| Alabama | $(0.3) | $(0.1) | $(1.6) | $(0.2) | $(2.2) |
| Alaska | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Arizona | $(0.9) | $(0.2) | $(3.6) | $(0.1) | $(5.0) |
| Arkansas | $(0.1) | $0.0 | $(0.5) | $(0.1) | $(0.7) |
| California | $(5.4) | $(1.7) | $(14.5) | $(1.3) | $(23.0) |
| Colorado | $(4.2) | $(1.0) | $(4.4) | $(0.7) | $(10.2) |
| Connecticut | $(1.5) | $0.0 | $(1.2) | $(0.1) | $(2.9) |
| Delaware | $(0.1) | $0.0 | $(0.9) | $0.0 | $(1.1) |
| District of Columbia | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Florida | $(1.9) | $(0.8) | $(25.8) | $(0.6) | $(29.1) |
| Georgia | $(3.8) | $(0.8) | $(13.7) | $(1.8) | $(20.2) |
| Hawaii | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 |
| Idaho | $0.0 | $0.0 | $(0.6) | $(0.1) | $(0.7) |
| Illinois | $(6.4) | $(1.1) | $(21.5) | $(1.9) | $(30.9) |
| Indiana | $(3.6) | $(0.5) | $(16.0) | $(1.6) | $(21.7) |
| Iowa | $(0.1) | $0.0 | $(1.2) | $(0.6) | $(2.0) |
| Kansas | $(0.1) | $0.0 | $(1.7) | $(0.4) | $(2.2) |
| Kentucky | $(0.3) | $(0.1) | $(2.4) | $(0.6) | $(3.4) |
| Louisiana | $(0.3) | $0.0 | $(1.4) | $(0.1) | $(1.9) |
| Maine | $0.0 | $0.0 | $(0.4) | $(0.1) | $(0.5) |
| Maryland | $(1.9) | $(0.2) | $(6.2) | $(0.3) | $(8.6) |
| Massachusetts | $(0.5) | $(0.1) | $(1.5) | $(0.1) | $(2.2) |
| Michigan | $(5.7) | $(0.6) | $(23.6) | $(1.3) | $(31.1) |
| Minnesota | $(0.8) | $(0.2) | $(4.6) | $(0.7) | $(6.4) |
| Mississippi | $(0.2) | $(0.1) | $(1.4) | $(0.2) | $(1.8) |
| Missouri | $(3.6) | $(0.6) | $(6.9) | $(0.7) | $(11.9) |
| Montana | $0.0 | $0.0 | $(0.5) | $(0.1) | $(0.5) |
| Nebraska | $(0.7) | $(0.2) | $(2.5) | $(0.2) | $(3.5) |
| Nevada | $0.0 | $(0.1) | $(0.6) | $(0.1) | $(0.8) |
| New Hampshire | $(0.1) | $0.0 | $(0.3) | $(0.1) | $(0.5) |
| New Jersey | $(4.1) | $(0.8) | $(5.7) | $(0.1) | $(10.7) |
| New Mexico | $(0.1) | $0.0 | $(0.4) | $0.0 | $(0.6) |
| New York | $(2.3) | $(1.6) | $(22.4) | $(0.4) | $(26.7) |
| North Carolina | $(1.1) | $(0.4) | $(6.0) | $(1.1) | $(8.6) |
| North Dakota | $(0.1) | $0.0 | $(0.7) | $(0.2) | $(1.1) |
| Ohio | $(6.9) | $(1.0) | $(11.6) | $(1.4) | $(20.8) |
| Oklahoma | $(0.2) | $0.0 | $(3.1) | $(0.1) | $(3.6) |
| Oregon | $(1.6) | $(0.3) | $(2.6) | $(1.0) | $(5.6) |
| Pennsylvania | $(1.0) | $(0.2) | $(11.2) | $(1.1) | $(13.6) |
| Rhode Island | $(0.8) | $(0.1) | $(0.5) | $(0.3) | $(1.6) |
| South Carolina | $(0.3) | $(0.1) | $(3.6) | $(0.3) | $(4.3) |
| South Dakota | $0.0 | $0.0 | $(0.8) | $(0.1) | $(1.0) |
| Tennessee | $(0.5) | $(0.2) | $(3.8) | $(0.6) | $(5.0) |
| Texas | $(2.4) | $(0.6) | $(2.3) | $(0.8) | $(6.1) |

**Table 5-22. Changes in Output to the Construction Industry by State and Use Category Under Option 2 ($ Millions) (All Dollar Values Are in Constant, Pre-tax, 2000 Dollars)**

| State | Single-Family | Multifamily | Commercial | Industrial | Total |
|---|---|---|---|---|---|
| Utah | $(0.1) | $0.0 | $(1.4) | $(0.3) | $(1.8) |
| Vermont | $(0.1) | $0.0 | $(0.4) | $(0.1) | $(0.7) |
| Virginia | $(0.3) | $0.0 | $(9.7) | $(0.7) | $(10.7) |
| Washington | $(2.5) | $(0.8) | $(1.8) | $(0.6) | $(5.7) |
| West Virginia | $0.0 | $0.0 | $(1.2) | $(0.1) | $(1.3) |
| Wisconsin | $(2.1) | $(0.6) | $(12.6) | $(1.5) | $(16.8) |
| Wyoming | $0.0 | $0.0 | $(0.4) | $0.0 | $(0.4) |
| **United States Total** | **$(69.3)** | **$(15.0)** | **$(262.2)** | **$(24.9)** | **$(371.5)** |

Source: EPA estimates based on the methodologies presented in Chapter Four.

### 5.7.4 Impacts on International Trade

As discussed in depth in Chapter Four, Section 4.3.3, EPA has determined that impacts on international trade will be minimal.

## 5.8 IMPACTS ON GOVERNMENTAL UNITS

As Section 4.8 discusses, EPA estimates that the options considered can impose some costs on governmental units involved in "codifying" the construction general permit. This section examines the costs imposed on governmental units associated with Options 2 and 4. The costs were derived at proposal. EPA has not re-evaluated these costs, but believes, given the level of equivalency found in most state regulations, that estimates from proposal are conservatively high. Option 4 costs are assumed to be the same as Option 2 costs.

### 5.8.1 Construction Program Administration

EPA has analyzed the costs to governments under the assumption that the majority of construction-related regulatory costs would be associated with processing general permits. As noted

**Table 5-23. Net Change in Total Employment by State and Use Category (Jobs) Under Option 2**

| State | Single-Family | Multifamily | Commercial | Industrial | Total |
|---|---|---|---|---|---|
| Alabama | (1) | (1) | (10) | (4) | (15) |
| Alaska | 0 | 0 | 0 | 0 | 0 |
| Arizona | 0 | (5) | (22) | (2) | (28) |
| Arkansas | 0 | 0 | 4 | (2) | 2 |
| California | (18) | (38) | 168 | (12) | 99 |
| Colorado | (31) | (21) | (26) | (6) | (84) |
| Connecticut | (14) | (1) | 86 | 0 | 71 |
| Delaware | 0 | (1) | (6) | 0 | (7) |
| District of Columbia | 0 | 0 | 0 | 0 | 0 |
| Florida | 0 | (14) | (155) | (10) | (179) |
| Georgia | (8) | (12) | (84) | (33) | (136) |
| Hawaii | 0 | 0 | 0 | 0 | 0 |
| Idaho | 0 | 0 | 2 | (1) | 1 |
| Illinois | (53) | (25) | (338) | (31) | (447) |
| Indiana | (29) | (10) | (210) | (32) | (281) |
| Iowa | 0 | (1) | (7) | (14) | (22) |
| Kansas | 0 | 0 | (10) | (7) | (18) |
| Kentucky | (1) | (1) | (15) | (9) | (26) |
| Louisiana | 0 | (1) | 11 | (2) | 9 |
| Maine | 0 | 0 | 30 | 0 | 30 |
| Maryland | (16) | (4) | (38) | (5) | (63) |
| Massachusetts | 0 | (3) | 104 | 0 | 101 |
| Michigan | (49) | (15) | (289) | (10) | (363) |
| Minnesota | (2) | (5) | (28) | (13) | (48) |
| Mississippi | 0 | (1) | (8) | (2) | (12) |
| Missouri | (28) | (12) | (42) | (12) | (95) |
| Montana | 0 | 0 | 2 | (1) | 1 |
| Nebraska | (5) | (3) | (15) | (3) | (26) |
| Nevada | 0 | 1 | 44 | (2) | 43 |
| New Hampshire | 0 | 0 | 21 | 0 | 21 |
| New Jersey | (38) | (18) | (89) | 1 | (144) |
| New Mexico | 0 | 0 | 2 | 0 | 2 |
| New York | 0 | (39) | (236) | (2) | (277) |
| North Carolina | (2) | (7) | (36) | (20) | (66) |
| North Dakota | 0 | (1) | (5) | (4) | (10) |
| Ohio | (59) | (23) | (151) | (24) | (257) |
| Oklahoma | 0 | (1) | (49) | (1) | (51) |
| Oregon | (8) | (5) | 39 | (15) | 11 |
| Pennsylvania | (1) | (4) | (68) | (22) | (94) |
| Rhode Island | (8) | (2) | 37 | (1) | 27 |
| South Carolina | 0 | (1) | (22) | (5) | (28) |
| South Dakota | 0 | 0 | (5) | (2) | (7) |
| Tennessee | 0 | (3) | (23) | (8) | (34) |
| Texas | 0 | (14) | 162 | (14) | 134 |

**Table 5-23. Net Change in Total Employment by State and Use Category (Jobs) Under Option 2**

| State | Single-Family | Multifamily | Commercial | Industrial | Total |
|---|---|---|---|---|---|
| Utah | 0 | 0 | (8) | (3) | (12) |
| Vermont | (1) | 0 | 29 | 0 | 28 |
| Virginia | 0 | (1) | (152) | (13) | (165) |
| Washington | (16) | (15) | 127 | (6) | 90 |
| West Virginia | 0 | 0 | (7) | (2) | (9) |
| Wisconsin | (15) | (13) | (165) | (25) | (217) |
| Wyoming | 0 | 0 | 2 | 0 | 1 |
| **United States Total** | **(403)** | **(321)** | **(1,448)** | **(379)** | **(2,552)** |

Source: EPA estimates based on the methodologies presented in Chapter Four.

previously, EPA assumes that the majority of NPDES Phase I and Phase II stormwater permit programs are fully implemented, and that any new regulatory requirements would be superimposed upon these programs.

Based on the assumption that all states would change their stormwater programs to include certification of sedimentation basins and other aspects of the incremental regulatory options, EPA estimated the annual costs of establishing such a program. These costs are presented in Table 5-24. EPA estimates that states experience $0.24 million in costs per year to stay current with federal guidance, state guidance, and evolving industry practice (U.S. EPA, 2002).

**Table 5-24. Costs To Establish Construction Programs (All Dollar Values are in Constant, Pre-Tax, 2000 Dollars)**

| Element | Value | Units |
|---|---|---|
| Labor hours to review EPA regulation and modify state practices | 200 | Hours/Year |
| Labor cost | $24.36 | $/Hour/State |
| State Cost per year | $4,871 | $/Year/State |
| Number of States | 50 | States |
| **Total** | $243,551 | $/Year |

Source: U.S. EPA, 2002.

In evaluating the annual costs, EPA assumed that the current trend—states taking the lead in implementing the regulation of construction activities—will continue in the future. EPA elected not to evaluate how to distribute its total estimated implementation cost between state and municipal agencies, and instead has attributed all costs to states.

### 5.8.2 Government Construction Costs

Government entities commission nearly a quarter of the value of construction put in place (Census, 2000). Government projects may need to comply with one of the incremental regulatory options, if selected for the Final Action. In that case, their costs would increase, just as costs for private projects would. Roughly one-half of government projects are maintenance or reconstruction of existing structures that do not entail new ground disturbance. EPA estimates that approximately 24.7 percent of total impacts would fall on government projects resulting in a $72.4 million additional cost to government entities under Option 1, a $137.3 million additional cost under Option 2, or a $88.9 million additional cost to government entities under Option 4.[6] This effect is discussed in detail in the Unfunded Mandates Reform Act (UMRA) analysis in Chapter Nine.

## 5.9 OTHER IMPACTS

This section addresses Executive Order (EO) 12866, which directs federal agencies to assess the costs and benefits of each significant rule they propose or promulgate, as well as issues of environmental justice and children's health. Section 5.9.1 describes the administrative requirements of EO 12866. Sections 5.9.2 and 5.9.3 describe EPA's analysis of environmental justice and children's health issues for the options considered. Another piece of legislation—the Unfunded Mandates Reform Act, or UMRA—also has requirements relevant to EPA's plans. Chapter Nine addresses UMRA.

[6] Additional cost to government entities under the ESC options includes costs potentially incurred by Federal, State, and local government entities.

Much of the information provided in this section is summarized from other documents that support the Final Action, as well as other sections of this report.

### 5.9.1 Requirements of Executive Order 12866

Under EO 12866 (58 FR 51735, October 4, 1993), the Agency is to determine whether a regulatory action is "significant" and therefore subject to OMB review and the directives of the EO. The Order defines a "significant regulatory action" as one that is likely to result in a rule that may:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

EPA has determined that if Options 1, 2, or 4 are chosen for the Final Action, they will result in a "significant regulatory action" under the terms of EO 12866, because the total costs of these options are estimated to exceed $100 million annually. As such, this action was submitted to OMB before proposal.

Among the EO are that the Agency perform an analysis comparing the benefits of the regulation to the costs that the regulation imposes, that the Agency analyze alternative approaches for the Final Action, and that the reason for the Final Action be identified. Wherever possible, the costs and benefits of the Final Action are to be expressed in monetary terms. Chapter Eight of this EA presents the estimated social costs, pollutant reductions, and monetary benefits of the Final Action. Section 5.8 addresses the impacts of the options considered on governmental units. An in-depth profile of the potentially affected industry sectors is presented in Chapter Two of this report.

Executive Order 12866 directs the Agency to identify the reason for the incremental regulatory options being considered. The reasons for considering Options 1, 2, and 4 are stated throughout this report (Chapters One and Six).

Both UMRA and EO 12866 require the statutory authority for the rule to be cited. A detailed discussion of the objectives and legal basis for the Final Action is presented in the preamble. A discussion of the UMRA is presented in Chapter Nine of this report.

### 5.9.2 Environmental Justice

According to EO 12898, *Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations*, Federal agencies are to address potential environmental justice issues that may be triggered by the options considered. Based on guidance in EPA's *Guidelines for Preparing Economic Analyses*, the potential effects of the options considered on minority and low-income populations have been considered (U.S. EPA, 2000). EPA has determined that the Final Action will not have a disproportionately large effect on minority or low-income populations, nor would it have disproportionately high human health or environmental effects, regardless of option selected. Thus, no further analysis on environmental justice issues has been conducted for the Final Action.

### 5.9.3 Children's Health

Pursuant to EO 13045, *Protection of Children From Environmental Health Risks and Safety Risks*, EPA has considered whether this Final Action would have any significant effects on children's health or safety (U.S. EPA, 2000). EPA has determined, based on the information provided throughout this report, that the Final Action will not have any significant effects on children's health or safety, regardless of option selected, and no further analysis has been conducted for this Final Action.

## 5.10 REFERENCES


Tetra Tech. 2002. Personal communication from J. Swanson of Tetra Tech, Inc., to J. Cantin of ERG, Inc. January 29.

U.S. Census Bureau 2000. 1997 Economic Census: Construction: Subject Series. January.

U.S. Department of Commerce. 1996. Bureau of Economic Analysis. Regional Input/Output Modeling System (RIMS II). Table A-24 - Total Multiplier, by Industry Aggregation for Output, Earnings, and Employment. Washington, DC: U.S. Department of Commerce.

U.S. EPA. 2000. Guidelines for Preparing Economic Analyses. Washington, DC: U.S. Environmental Protection Agency, EPA 240-R-00-003, September.

U.S. EPA 2002. Development Document for the Proposed Effluent Guidelines and Standards for the Construction and Development Point Source Category. Washington, DC: U.S. Environmental Protection Agency.

U.S. EPA. 2002a. Economic Analysis of Proposed Effluent Guidelines and Standards for the Construction and Development Category. Washington, DC: U.S. Environmental Protection Agency, EPA-821-R-02–008, May.

U.S. EPA. 2004. Development Document for Final Action for Effluent Guidelines and Standards for the Construction and Development Category. Washington, DC: U.S. Environmental Protection Agency. EPA-821-B-04-001.