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The Economic Contribution of Virginia Precast Concrete Manufacturing







Prepared for the Precast Concrete Association of Virginia

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TABLE OF CONTENTS

List of Tables i
List of Figures ii
Highlights 1
Introduction 2
Virginia's Precast Concrete Manufacturing Industry 3
Methodology and Data 14
Results 16
References 24
Appendix 25

LIST OF TABLES

Table 1. Concrete Pipe Manufacturing and Other Concrete Product Manufacturing Expenditure Patterns 7

Table 2. Virginia Gross Demand by Industry for Concrete Pipe Manufacturing and Other Concrete Product Manufacturing 12

Table 3. Precast Concrete Manufacturing and Wholesale Trade Virginia Economic Impacts in 2022, Employment, Value Added, and Total Industrial Output 17

Table 4. Precast Concrete Manufacturing and Wholesale Trade, Total State and Local Tax Revenue Impacts, 2022 18

Table 5. Precast Concrete Manufacturing and Wholesale Trade Virginia Economic Impact in 2022, Total Impacts by Major Sector 20

LIST OF FIGURES

Figure 1. Precast Concrete Products 5

Figure 2. Virginia Precast Concrete Manufacturing Establishment Locations 6

Figure 3. Concrete Pipe Manufacturing and Other Concrete Product Manufacturing, Virginia and United States, 1990-2022 10

Figure 4. Virginia Employment by Industry, Construction and Concrete Pipe and Other Concrete Product Manufacturing, 1990-2022 11

HIGHLIGHTS

- Precast concrete products used by Virginia firms and agencies tend to be produced in the Commonwealth with local materials and labor. In contrast many competing construction products, though often procured from Virginia based wholesale trade distributors, are usually produced elsewhere in the U.S.
- Fifty-nine precast concrete manufacturing establishments can be found throughout the Commonwealth, including 37 counties and independent cities. Most establishments are located in relatively close proximity to populated centers and interstate highways to minimize transportation costs and maximize speed of delivery.
- The precast concrete manufacturing industry employed an estimated 2,806 workers in 2022, accounting for an estimated $831 million in total industrial output, $396 million in value-added, and generating an estimated $18 million in state and local tax revenue.
- When the multiplier effects resulting from industry payments to Virginia-based businesses and labor are counted, the total economic contribution of precast concrete manufacturing is 5,321 in employment, over $1.3 billion in total industry output, $698 million in value added, and $48 million in tax revenue.
- Virginia-based VDOT quality assurance list firms employed 924 workers, produced $284 million in total industrial output or sales, and $136 million in value-added. These firm activities resulted in a total economic contribution of 1,777 jobs, $461 million in total industrial input or sales, and nearly $238 million in value-added.
- PCAV members employed 622 workers at 11 different establishment locations. This figure represents two-thirds of all VDOT quality assurance list firm employment. PCAV members produced an estimated $196 million in total industrial output, $94 million in value added, and $4.3 million in state and local tax revenue. The total contribution of PCAV members to the Virginia economy is 1,208 jobs, $317 million in total industrial output, $164 million value-added, and $11.1 million in state and local tax revenue.
- Every ten million dollars of purchases of precast concrete products from a Virginia based VDOT quality assurance list manufacturing firm generates 62 jobs and $8.3 million in value added for the Virginia economy as well as $565 thousand in state and local tax revenue compared to just 20 jobs, $2.6 million value added, and $339 thousand in state and local tax revenue for the same level of purchases of competing products from Virginia-based wholesale trade distributors.

INTRODUCTION

Precast concrete products are important building components for Virginia's construction industry. Precast concrete products are widely used in transportation, water, wastewater, and storm water, and building construction projects. The precast concrete manufacturing industry also plays a significant role in the Virginia economy, employing an estimated 2,806 workers in 2022 and accounting for an estimated $831 million in total industrial output, $396 million in value-added, and generating an estimated $18 million in state and local tax revenue. When the multiplier effects resulting from industry payments to Virginia-based businesses and labor are counted, the economic contribution increases to 5,321 workers, over $1.3 billion in total industry output, $698 million in value added, and $48 million in tax revenue.

Virginia's precast products also tend to be procured from Virginia manufacturing sources in contrast to many competing construction products including plastic and metal-based construction products such as corrugated metal pipe that are often procured from Virginia based wholesale distributors but usually are produced elsewhere in the U.S. As will be illustrated in this report, ten million dollars of purchases of precast concrete products from a Virginia based manufacturing firm generates 62 jobs and $8.3 million in value added for the Virginia economy as well as $565 thousand in state and local tax revenue compared to just 20 jobs, $2.6 million value added, and $339 thousand in state and local tax revenue for the same level of purchases of competing products from Virginia-based wholesalers.

This report, conducted for the Precast Concrete Association of Virginia (PCAV), examines in greater details the characteristics of Virginia's precast concrete manufacturing industry and the contribution that the industry makes to the state economy. To conduct the economic impact analysis, the study uses input-output analysis and IMPLAN software. IMPLAN (IMpact analysis for PLANning) is an industry standard input-output model that has been used in many economic impact studies, including industry studies for Virginia and other states. The report estimates the overall employment, output, and value added impacts of the industry as well as state and local tax revenue impacts. Economic impacts are identified as direct (the expenditures of the precast concrete manufacturing), indirect (impacts attributable to purchases of state production inputs) and induced (impacts attributable to employee household spending).

The report is divided into three parts. The first section examines characteristics of Virginia's precast concrete manufacturing industry. The second section describes the methods and data used in the study to measure the economic contribution of the industry. The third section presents the results. Results are provided in aggregate and by various sub-components of the Virginia precast concrete manufacturing industry such as firms on the Virginia Department of Transportation (VDOT) quality assurance list and PCAV members.

VIRGINIA'S PRECAST CONCRETE MANUFACTURING INDUSTRY

For the purposes of this report, the precast concrete manufacturing industry is defined as firms that manufacture concrete pipe, precast concrete and prestressed concrete products, primarily construction materials. These firms can be found in two North American Industrial Classification System (NAICS) 6-digit industries: (a) 327332—Concrete Pipe Manufacturing and (b) 327333—Other Concrete Product Manufacturing. This latter industry includes all concrete products except for concrete block and brick and concrete pipe. It comprises firms manufacturing precast and prestressed concrete construction materials as well as those producing ornamental stone cast products such as statues and lawn ornaments and burial products such as vaults and headstones. Precast concrete producers in Virginia were identified from industry lists such as Virginia Employment Commission Quarterly Census of Employment and Wages (QCEW) records, the Precast/Prestressed Concrete Institute (PCI) member directory and PCAV member knowledge. These establishments produce primarily concrete products for the construction industry but exclude establishments that may produce some precast concrete products but whose principal activity is construction. The Virginia firms included are listed in **Appendix A**.

Precast concrete products are used as materials in a wide variety of construction environments. Products (see **Figure 1**) include (a) large diameter pipes for use in sanitary and stormwater sewer and water distribution systems, (b) catch basins, tanks, and junction boxes to capture, store, and direct wastewater and stormwater, (c) precast culverts for use in managing and storing storm water and for service tunnels, subways, bridges, and underpasses, (d) wall panels, veneer, and foundations for building construction (e) retaining and sound barrier walls to stabilize earth, control erosion, prevent flooding, and provide protective fencing and insulation from noise, (f) road surface slabs, median barriers, and three sided bridge systems for road and bridge construction, and (g) many other miscellaneous products used for architectural and ornamental purposes.

Precast concrete products are manufactured in factory-controlled settings for a wide variety of shape, size, and color specifications (Yee 2001a). They are produced by mixing cements (primarily Portland cement), aggregates (e.g., sand, sandstone, limestone), water, various admixtures and mixtures to improve workability, strength, and water resistance, and pigments for esthetics (Levitt 2008). The mixture is poured into a mold and allowed to cure. Reinforced precast concrete products are produced in molds with steel or fiber hardware to strengthen the product while prestressed concrete products use pretensioned wires or strands to provide additional tensile strength. Heat, water, and steam are used in temperature-controlled settings to alter the curing process in order to improve manufacturing times and product strength. The product is de-molded and stacked for storage before delivery to the customer.

Substitutes for precast concrete products are ready mix concrete mold poured and cured on-site by construction crews, other concrete products (e.g., concrete block, pre-stressed concrete), plastic (e.g., corrugated high-density polyethylene or HDPE pipe), asphalt, clay brick, steel,

aluminum, glass, stone, and wood- construction products. Precast products offer greater quality control than poured-in-place concrete and masonry structures because they are manufactured in environmentally controlled and engineered conditions to careful industrial specifications, often using advanced technology. These same conditions lead to faster construction timelines and reduced manufacturing costs. The optimal choice of building material varies based on soil conditions, depth, pressures experienced, cost, availability, and many other construction parameters. However, precast products have advantages in many construction environments over competing structural metal, plastic, and composite products. Besides their adaptability, strength, ease of installation and cost effectiveness, precast concrete products are high-performance, sustainable and resilient materials that provide long term durability and the efficient installation required for a low life cycle cost. The products can also be produced in locations that are remote from urban construction sites and shipped to the construction site during off-peak traffic periods, speeding construction times and easing traffic congestion costs (Yee 2001b).

Figure 1. Precast Concrete Products



From clockwise at top left: (a) concrete pipe, (b) wet well, (c) culverts, (d) wall panels, (e) retaining wall, and (f) bridge

Virginia sources the vast majority of its precast concrete products from firms within the state (an estimated 83.9 percent of concrete pipe and 90.7 percent of other concrete products according to IMPLAN computed local purchase percentages). Precast concrete products also are produced largely with local products and services and labor. Manufacturing tends to be located close to the customer base because of low value-to-weight ratios and high transportation and logistics costs. Data from the 2002 Commodity Flow Survey on the average shipment distance for the commodity "articles of cement, concrete, or artificial stone" (which includes prefabricated structural components for building and civil engineering) indicate that it travels an average of 61

miles, in contrast to an average travel distance of 546 miles for all commodities, 503 miles for "manmade fibers and plastics basic shapes," 341 miles for metallic "structures and parts," and 151 miles for metal "pipes and tubes."

Fifty-nine precast concrete manufacturing establishments can be found throughout the Commonwealth, including 37 counties and independent cities. **Figure 2** shows the locations of these establishments, including VDOT quality assurance list firms and members of PCAV (all of whom are VDOT quality assured). Most establishments are located in relatively close proximity to populated centers such as Hampton Roads and interstate highways to minimize transportation costs and maximize speed of delivery.

Figure 2. Virginia Precast Concrete Manufacturing Establishment Locations

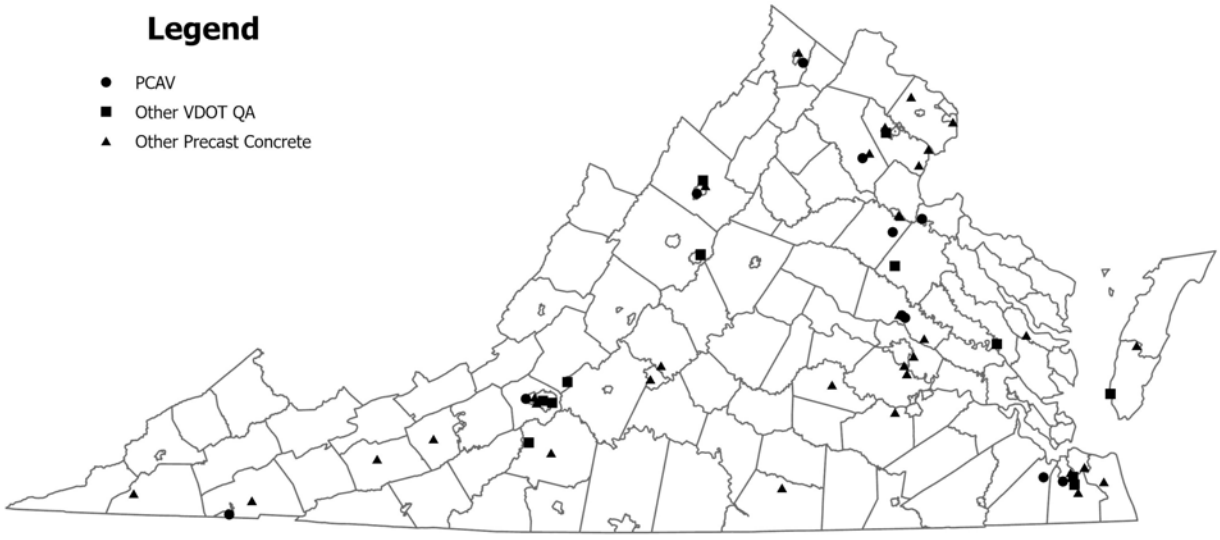


Table 2 shows information on the estimated expenditure patterns of the major industries from which the precast concrete industry is drawn (i.e., concrete pipe and other concrete product manufacturing).[1] It shows the percentages of total industry expenditures made on the top 10 commodity groups, an aggregate residual "other products and services" category, and value added (i.e., employee compensation, proprietor income, other property income and taxes on production and imports). The largest categories of material inputs include cement, sand and gravel, steel wire, paint and coatings, plastics, and iron and steel products. The largest service and trade inputs include transportation, central office management, wholesale trade, and marketing/professional services. The estimated percentage of purchased inputs produced in

[1] *The production function expenditure patterns are drawn from the Virginia IMPLAN model absorption coefficients, value-added coefficients, and regional purchase coefficients (RPCs). The Virginia IMPLAN model is a non-survey regionalized model based on the U.S. benchmark input-output table. Regional Purchase Coefficients (RPC), which show local purchase percentages, are based on a trade flow model using Commodity Flow Survey and other county-to-county distances by mode of transportation data from the Oak Ridge National Labs (Thorvaldson 2018).*

Virginia varies widely: transportation and products purchased from wholesalers are more likely to come from Virginia sources while steel and other metal products (which has a relatively small presence in Virginia) are mostly sourced from outside the state. On average, firms in these concrete-manufacturing industries are estimated to procure about half of their material and service inputs from Virginia sources.

Table 1. Concrete Pipe Manufacturing and Other Concrete Product Manufacturing Expenditure Patterns

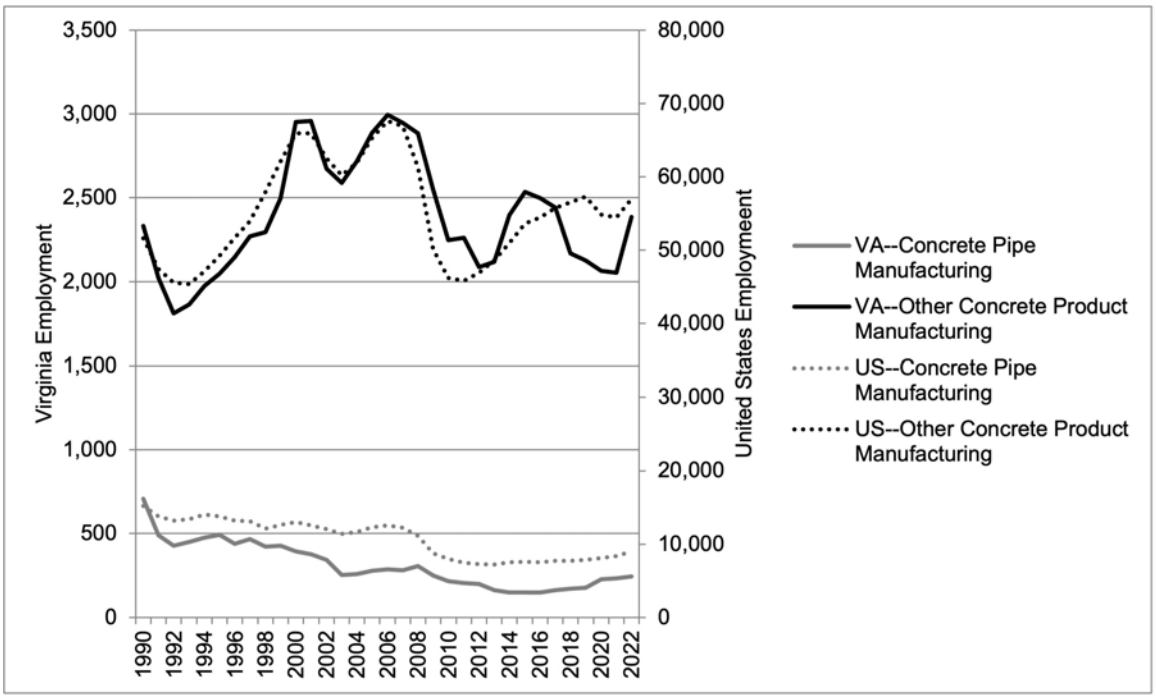
CONCRETE PIPE MANUFACTURING		
	Percent of Total Expenditures	Percent from Virginia
Commodity		
Scenic and sightseeing transportation services and support activities for transportation	6.0	95.2
Other fabricated metals	3.7	4.1
Steel wire	3.5	2.3
Other plastics products	3.2	7.6
Iron and steel and ferroalloy products	3.0	8.7
Cement	2.7	22.6
Wholesale services - Other durable goods merchant wholesalers	2.4	74.9
Truck transportation services	1.9	81.1
Sand and gravel	1.9	27.6
Other concrete products	1.6	89.5
Other products and services	21.0	54.5
Factor		
Employee Compensation	21.4	92.6
Proprietor Income	1.5	100.0
Other Property Type Income	24.9	100.0
Tax on Production and Imports	1.3	100.0
Total	100.0	
Percentage of Total Commodity Expenditures made in Virginia	*46.8*	

OTHER CONCRETE PRODUCT MANUFACTURING		
	Percent of Total Expenditures	**Percent from Virginia**
Commodity		
Management of companies and enterprises	3.1	7.6
Wholesale trade- Other durable goods merchant wholesalers	3.1	74.9
Cement manufacturing	2.9	68.8
Steel wire drawing	2.8	4.1
Other fabricated metal manufacturing	2.7	22.6
Other plastics product manufacturing	2.2	2.3
Marketing research and all other miscellaneous professional, scientific, and technical services	2.2	77.3
Sand and gravel mining	2.0	97.5
Truck transportation	1.7	81.1
Paint and coating manufacturing	1.5	7.8
Other products and services	28.2	56.3
Factor		
Employee Compensation	24.4	92.6
Proprietor Income	2.3	100.0
Other Property Type Income	19.8	100.0
Tax on Production and Imports	1.1	100.0
Total	100.0	
Percentage of Total Commodity Expenditures made in Virginia	*50.2*	

Source: IMPLAN®

Figure 3 indicates the state and national employment trends in the concrete pipe and other concrete products industries. Virginia employment has historically tracked national employment trends in these industries fairly closely. Other concrete product manufacturing (which consists largely of precast concrete products) tends to grow during business expansions and contract during recessions while concrete pipe manufacturing activity has been fairly steady during the last decade. Beginning in 2017, Virginia employment in other concrete product manufacturing began to fall below the U.S. trend, perhaps partly because of slower rates of economic growth in Virginia than the nation in 2017-2019. Dips in national and Virginia employment occurred in 2020 and 2021 likely because of COVID-19 impacts on the economy and pandemic-related supply-chain and production bottlenecks.

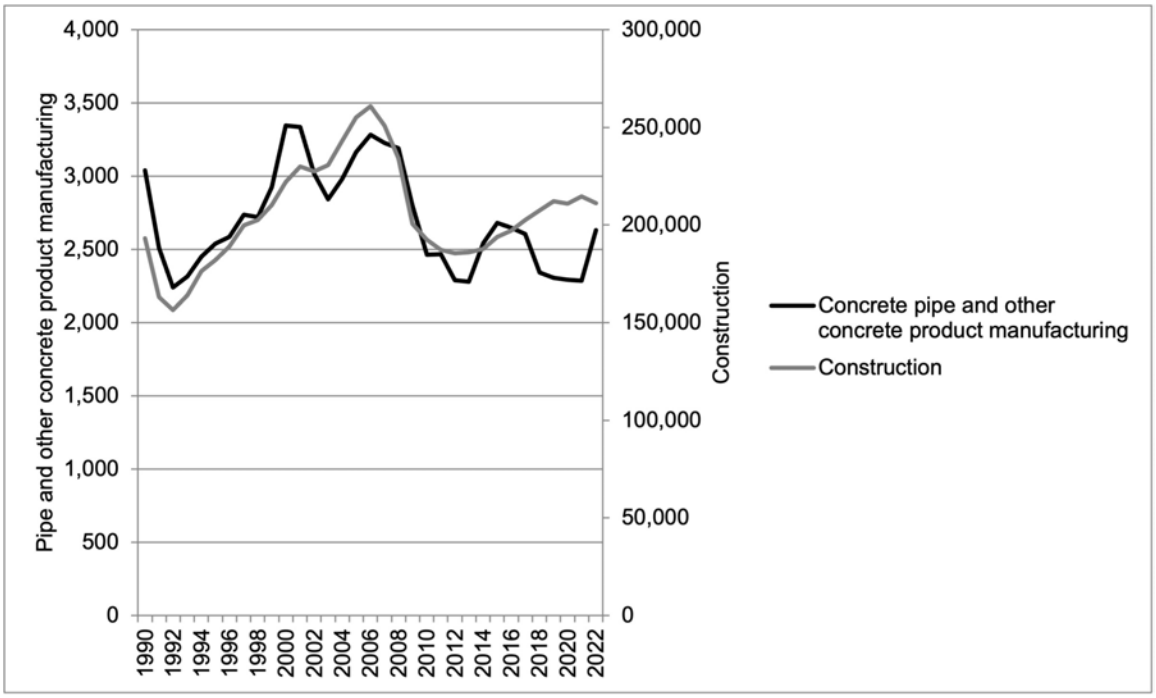
Figure 3. Concrete Pipe Manufacturing and Other Concrete Product Manufacturing, Virginia and United States, 1990-2022



Source: Bureau of Labor Statistics (U.S.) and Virginia Employment Commission (Virginia), Quarterly Census of Employment and Wages

Figure 4 shows that Virginia pipe and other concrete product manufacturing recent trajectory has also varied slightly from that of the Virginia construction industry, its primary buyer. The principal purchaser of Virginia pipe and other concrete products (see **Table 2**) is the construction industry, particularly construction of new nonresidential structures such as commercial buildings, institutional buildings, highways, streets, bridges, tunnels, water and wastewater infrastructure, and power and communications infrastructure and maintenance of new nonresidential structures.

Figure 4. Virginia Employment by Industry, Construction and Concrete Pipe and Other Concrete Product Manufacturing, 1990-2022



Source: Virginia Employment Commission, Quarterly Census of Employment and Wages

Table 2. Virginia Gross Demand by Industry for Concrete Pipe Manufacturing and Other Concrete Product Manufacturing

CONCRETE PIPE, BRICK, AND BLOCK MANUFACTURING		
	Gross Commodity Demand	**Percent of Total**
Industry		
Construction of other new nonresidential structures	$26,814,637	32.4
Construction of new highways and streets	$11,007,206	13.3
Other local government enterprises	$8,814,759	10.7
Construction of new commercial structures, including farm structures	$5,871,360	7.1
Maintenance and repair construction of nonresidential structures	$5,053,163	6.1
Construction of new educational and vocational structures	$4,738,778	5.7
Construction of new single-family residential structures	$3,363,736	4.1
Construction of new health care structures	$2,309,772	2.8
Construction of other new residential structures	$1,975,299	2.4
Wireless telecommunications carriers (except satellite)	$1,656,800	2.0
Construction of new power and communication structures	$1,648,410	2.0
All other industries	$9,440,379	11.4
Total Gross Commodity Demand	$82,694,301	100.0

Table 2 Continued

OTHER CONCRETE PRODUCT MANUFACTURING		
	Gross Commodity Demand	**Percent of Total**
Industry		
Construction of new commercial structures, including farm structures	$79,376,653	18.2
Construction of other new nonresidential structures	$75,959,380	17.4
Construction of new highways and streets	$32,893,473	7.5
Maintenance and repair construction of nonresidential structures	$26,047,051	6.0
Construction of new educational and vocational structures	$19,475,343	4.5
Construction of new manufacturing structures	$19,273,477	4.4
Construction of new single-family residential structures	$18,261,131	4.2
Construction of new health care structures	$16,565,825	3.8
Data processing, hosting, and related services	$16,337,181	3.7
Construction of other new residential structures	$15,496,447	3.5
All other industries	$117,381,749	26.9
Total Gross Commodity Demand	$437,067,711	100.0

Source: IMPLAN®

METHODOLOGY AND DATA

This study examines the contribution of the Virginia concrete pipe and precast industry with input-output analysis. Input-output analysis produces industry economic multipliers that show how changes in the industry activity affect the state economy. The total economic impact consists of three parts: a "direct effect," "an indirect effect," and an "induced effect." The "direct effect" consists of the injection of economic activity or expenditure into the region. For example, the industrial output of Virginia precast concrete manufacturing counts as the direct effect. The direct expenditure to support this output then causes a "ripple effect" on the state economy when money is re-spent. For instance, state businesses provide supplies and services to precast concrete manufacturers such as cement, truck transportation, utilities, and insurance. These businesses spend a portion of their sales revenues on their supplies and services from other state firms who, in turn, purchase a portion of their supplies and services from other state firms. This cascading sequence of spending continues until the subsequent rounds of spending dissipate due to leakages in the form of spending outside the state. The cumulative effect of these cascading rounds of inter-industry purchases is referred to as the "indirect effect." The final component of total impact (the "induced effect" or "induced impact") is attributable to the spending of households. Businesses pay households for their labor services. These households then purchase goods and services from state firms who in turn receive a portion of their labor, material and public service inputs from within the state. Again, leakages occur at each round due to purchases of goods and services outside the state. The "induced effect" is the sum of the impacts associated with these household purchases.

The impact analysis for this study used IMPLAN (Impact analysis for PLANning), including the most recent 546 sector model based on 2021 data released in November 2022. Economic impacts are evaluated within IMPLAN using three different measures: (a) total sales or total industrial output (TIO), (b) value-added, and (c) employment. Total sales or industry output is the total value of industry production during a period. It measures sales of intermediate inputs for use in production as well as sales of products to final consumers. Value-added is a subset of total industrial output. It reflects only sales to final consumers and therefore avoids the double counting that occurs when intermediate inputs are included. It is the most commonly used measure of economic activity. Value-added is the concept behind gross domestic product (GDP) and can be compared to the GDP numbers provided by the Bureau of Economic Analysis for states and metropolitan areas. It can also be represented as total factor income plus taxes on production and imports (e.g., sales and excise taxes, customs duties, property taxes). Employment is measured in terms of person-years of employment. A person-year of employment is a job of one year in duration. Employment includes full-time and part-time employment as well as the self-employed and is measured by place of work.

This study draws data from the Virginia Employment Quarterly Census for Employment and Wages (QCEW). Establishment level records from the second quarter of 2022 were used, which is typically representative of the entire year and is the same quarter used for the previous 2015

study (Rephann 2015). Establishments listed in Appendix A. were matched with the establishments in the QCEW records to identify employment totals for two IMPLAN concrete manufacturing industries: IMPLAN Sector 206 – Concrete pipe manufacturing and IMPLAN Sector 207 – Other concrete product manufacturing. These IMPLAN sectors align with the NAICS 6-digit industries described earlier: 327332—Concrete Pipe Manufacturing and 327333—Other Concrete Product Manufacturing. In addition, a supplemental list of establishments not in these industries providing primarily precast products for construction purposes was provided by PCAV.

The economic impact results reported in the next section examine several categories of precast concrete manufacturing firms, including: (a) a comprehensive industry category encompassing all precast producers as described above, (b) a sub-category of VDOT quality assurance list firms, and (c) a slightly smaller category consisting of PCAV members, which is a subset of the VDOT list. Employment totals for each category of firms were entered into the IMPLAN model and were converted to sales/output equivalent figures by the model for use in generating economic impact results. In addition, economic impacts were generated for the wholesale trade industry. This latter analysis was performed to estimate the comparative economic impacts of out-of-state manufactured alternative products purchased from Virginia-based wholesale trade establishments (IMPLAN sector 396—Wholesale trade – Other durable goods merchant wholesalers, which includes wholesale sales of products such as metal and plastic culvert pipe and other plastics, and metal construction products) that were equivalent in size to the entire output of Virginia based VDOT quality assurance listed firms. The difference between the economic impact in (b) above and this latter counterfactual economic impact provides an alternative and arguably more accurate measurement of the economic impact of this component of the precast concrete manufacturing industry.

RESULTS

Tables 3 and **4**. report economic and tax revenue impact results for each of the categories described in the previous section: (a) the comprehensive precast concrete manufacturing industry – labeled "precast concrete manufacturing," (b) VDOT quality assured firms in the precast concrete manufacturing industry—labeled "VDOT Quality Assured," (c) Precast Concrete Association of Virginia members from the precast concrete manufacturing industry—labeled "PCAV," and (d) a wholesale trade distribution counterfactual—labeled "Wholesale Trade Distribution." The latter economic impact scenario assumes that the entire value of sales/output for Virginia-based precast concrete manufacturing VDOT quality assured establishments ($284 million) during 2022 was instead spent on substitute products manufactured outside the state but purchased from Virginia-based wholesale trade establishments. For these firms, only the wholesale trade and transportation margins are retained within the state. Therefore, the direct output impact reported in Table 3 consists of these retained margins ($74 million).[2]

[2] *The direct sales for this sector consisted of the wholesale margins of 26 percent.*

Table 3. Precast Concrete Manufacturing and Wholesale Trade Virginia Economic Impacts in 2022, Employment, Value Added, and Total Industrial Output

	Effect	Employment	Value-Added	Total Industrial Output
Precast Concrete Manufacturing				
	Direct	2,806	$395,831,218	$830,671,134
	Indirect	1,284	$168,273,756	$305,322,413
	Induced	1,230	$133,569,285	$222,433,409
	Total	5,321	$697,674,259	$1,358,426,955
VDOT Quality Assured				
	Direct	924	$135,777,028	$283,609,255
	Indirect	438	$56,724,947	$102,733,776
	Induced	415	$45,060,898	$75,040,091
	Total	1,777	$237,562,873	$461,383,122
PCAV				
	Direct	622	$93,920,063	$195,588,592
	Indirect	302	$38,794,346	$70,173,721
	Induced	284	$30,833,045	$51,346,398
	Total	1,208	$163,547,454	$317,108,711
Wholesale Trade Distribution				
	Direct	227	$38,860,426	$73,738,406
	Indirect	202	$22,461,133	$38,746,106
	Induced	132	$14,330,672	$23,864,780
	Total	561	$75,652,231	$136,349,292

Table 4. Precast Concrete Manufacturing and Wholesale Trade, Total State and Local Tax Revenue Impacts, 2022

Revenue Category	Precast Concrete Manufacturing	VDOT Quality Assured	PCAV	Wholesale Trade Distribution
Tax on Production and Imports: Sales Tax	$15,147,026	$5,145,880	$3,537,334	$3,608,915
Tax on Production and Imports: Property Tax	$16,927,939	$5,750,907	$3,953,236	$4,033,233
Tax on Production and Imports: Motor Vehicle Licenses	$274,043	$93,100	$63,998	$65,293
Tax on Production and Imports: Severance Tax	$6,231	$2,117	$1,455	$1,485
Tax on Production and Imports: Other Taxes	$2,719,062	$923,743	$634,991	$647,841
Tax on Production and Imports: Special Assessments	$63,832	$21,686	$14,907	$15,209
Corporate Profits Tax	$2,153,255	$742,820	$515,703	$210,749
Personal Tax: Income Tax	$9,522,965	$3,213,062	$2,198,727	$1,018,248
Personal Tax: Motor Vehicle License	$257,659	$86,919	$59,472	$27,677
Personal Tax: Property Taxes	$493,514	$166,495	$113,926	$52,910
Personal Tax: Other Tax	$64,918	$21,904	$14,990	$6,932
Total State and Local Tax	$47,630,442	$16,168,634	$11,108,740	$9,688,491

Table 3 shows that Virginia's precast concrete manufacturers employed 2,806 workers. The industry produced an estimated $831 million in total industrial output and $396 in value-added (consisting of labor income, proprietor income, other property income and taxes on production and imports). The industry also directly generated an estimated $18.1 million in state and local tax revenue. When the indirect and indirect effects impacts that result from precast concrete manufacturer purchase and payrolls are included, the total economic impact grows to 5,321 jobs, over $1.3 billion in total industrial output, value added of $698 million, and $48 million in state and local tax revenue.

Virginia-based VDOT quality assurance list firms employed 924 workers, produced $284 million in total industrial output or sales, and $136 million in value-added. These firm activities resulted in a total economic contribution of 1,777 jobs $461 million in total industrial output, $238 million in value-added, and $16.2 million in state and local tax revenue. Had the same amount of sales been made redirected instead to Virginia-based wholesale trade distributors, only 561 jobs would have resulted, $136 million in total industrial output, $76 million in value-added, and $9.7 million in state and local tax revenue.

Another way of examining the relative contributions of Virginia based manufacturing purchases compared to wholesale trade distribution of out-of-state manufactured products is to look at the economic impact of a $10 million expenditure for each category. Ten million dollars of purchases of precast concrete products from a Virginia-based VDOT quality assurance list manufacturing firm generates 62 jobs, $8.3 million in value added for the Virginia economy and $565 thousand in state and local tax revenue compared to just 20 jobs, $2.6 million value added, and $339 thousand in state and local tax revenue for the same level of purchases of competing products from Virginia-based wholesale trade distributors.

PCAV members employed 622 workers at 11 different establishment locations. This figure represents two-thirds of all VDOT quality assurance list firm employment. PCAV members produced an estimated $196 million in total industrial output, $94 million in value added, and $4.3 million in state and local tax revenue. The total contribution of PCAV members to the Virginia economy is 1,208 jobs, $317 million in total industrial output, $164 million value-added, and $11.1 million in state and local tax revenue.

Table 5. shows a breakdown of total economic impact by major sector. Over of the economic impact (55 percent) occurs in the manufacturing sector (2,925 jobs, $880 in total industrial output, and $415 million value-added). This economic impact mainly reflects the precast concrete manufacturing direct activity. However, one hundred and nineteen manufacturing jobs can be traced to the effect of precast concrete manufacturing expenditures as measured by indirect and induced impacts. Four-hundred and seventy retail and wholesale trade sector jobs as well as 304 administrative and support services jobs, and 252 transportation and warehousing jobs. Services sectors such as health care and social assistance (244 jobs), professional, scientific and technical services (225) accommodation and food services (204), and other services (196) are also significantly stimulated. A similar distribution but smaller magnitudes are found for VDOT quality assurance list firms. In contrast, wholesale trade distribution has much weaker linkages to goods producing sectors such as manufacturing.

Table 5. Precast Concrete Manufacturing and Wholesale Trade Virginia Economic Impact in 2022, Total Impacts by Major Sector

PRECAST CONCRETE MANUFACTURING			
Description	**Employment**	**Value-Added**	**Total Industrial Output**
Total	5,321	$697,674,259	$1,358,426,955
Ag, Forestry, Fish & Hunting	9	$342,839	$706,129
Mining	22	$3,403,013	$7,982,163
Utilities	10	$7,699,266	$14,399,705
Construction	21	$2,353,151	$5,612,342
Manufacturing	2,925	$415,452,027	$879,543,697
Wholesale Trade	155	$31,104,749	$54,404,080
Retail Trade	221	$15,177,604	$25,396,712
Transportation & Warehousing	252	$19,351,860	$37,452,769
Information	45	$12,429,235	$30,005,107
Finance & Insurance	134	$23,750,684	$44,653,015
Real Estate & Rental	124	$41,194,865	$61,704,405
Professional, Scientific & Technical Services	225	$36,884,281	$51,027,612
Management of Companies	88	$16,038,603	$24,553,152
Administrative and Support and Waste Management and Remediation Services	304	$22,033,417	$37,088,317
Educational Services	42	$2,123,214	$3,008,771
Health Care and Social Assistance	244	$19,090,735	$29,430,285
Arts, Entertainment & Recreation	54	$2,431,471	$4,135,952
Accommodation & Food Services	204	$9,751,751	$18,408,800
Other Services	196	$10,996,266	$17,598,007
Government Enterprises	44	$6,065,227	$11,315,934

VDOT QUALITY ASSURED			
Description	**Employment**	**Value-Added**	**Total Industrial Output**
Total	1,777	$237,562,873	$461,383,122
Ag, Forestry, Fish & Hunting	3	$116,322	$239,206
Mining	8	$1,185,973	$2,789,705
Utilities	3	$2,581,519	$4,828,773
Construction	8	$826,350	$1,971,081
Manufacturing	965	$142,413,327	$300,040,626
Wholesale Trade	51	$10,253,156	$17,925,127
Retail Trade	75	$5,130,217	$8,584,844
Transportation & Warehousing	102	$8,065,620	$14,783,738
Information	15	$4,073,483	$9,816,199
Finance & Insurance	45	$7,961,827	$15,090,278
Real Estate & Rental	41	$13,766,860	$20,561,930
Professional, Scientific & Technical Services	72	$11,774,080	$16,297,560
Management of Companies	28	$5,185,784	$7,938,805
Administrative and Support and Waste Management and Remediation Services	97	$7,016,942	$11,842,791
Educational Services	14	$715,775	$1,014,175
Health Care and Social Assistance	82	$6,440,287	$9,928,340
Arts, Entertainment & Recreation	18	$804,755	$1,371,238
Accommodation & Food Services	68	$3,262,898	$6,163,250
Other Services	66	$3,704,436	$5,928,261
Government Enterprises	16	$2,283,262	$4,267,194

PCAV			
Description	**Employment**	**Value-Added**	**Total Industrial Output**
Total	1,208	$163,547,454	$317,108,711
Ag, Forestry, Fish & Hunting	2	$79,893	$164,125
Mining	5	$828,685	$1,952,724
Utilities	2	$1,759,209	$3,290,919
Construction	5	$580,147	$1,383,909
Manufacturing	650	$98,468,681	$206,806,322
Wholesale Trade	34	$6,906,906	$12,071,201
Retail Trade	51	$3,514,851	$5,881,910
Transportation & Warehousing	77	$6,215,054	$11,088,932
Information	10	$2,733,108	$6,578,033
Finance & Insurance	31	$5,424,942	$10,337,407
Real Estate & Rental	28	$9,360,851	$13,954,228
Professional, Scientific & Technical Services	48	$7,753,377	$10,736,304
Management of Companies	19	$3,446,488	$5,276,155
Administrative and Support and Waste Management and Remediation Services	64	$4,612,848	$7,800,336
Educational Services	10	$489,539	$693,561
Health Care and Social Assistance	56	$4,406,712	$6,793,380
Arts, Entertainment & Recreation	12	$543,625	$927,374
Accommodation & Food Services	46	$2,220,441	$4,195,873
Other Services	45	$2,532,387	$4,052,535
Government Enterprises	11	$1,669,709	$3,123,483

WHOLESALE TRADE DISTRIBUTION			
Description	**Employment**	**Value-Added**	**Total Industrial Output**
Total	561	$75,652,231	$136,349,292
Ag, Forestry, Fish & Hunting	1	$27,849	$62,016
Mining	0	$6,881	$32,938
Utilities	1	$916,658	$1,727,544
Construction	2	$256,970	$612,917
Manufacturing	3	$405,837	$1,105,766
Wholesale Trade	237	$41,358,120	$77,676,976
Retail Trade	23	$1,561,434	$2,629,427
Transportation & Warehousing	52	$3,057,818	$5,281,522
Information	7	$1,981,260	$4,978,075
Finance & Insurance	17	$3,134,402	$5,965,024
Real Estate & Rental	29	$5,890,992	$10,072,970
Professional, Scientific & Technical Services	31	$4,670,338	$6,477,919
Management of Companies	14	$2,508,243	$3,839,816
Administrative and Support and Waste Management and Remediation Services	43	$3,206,162	$5,295,741
Educational Services	5	$250,194	$354,084
Health Care and Social Assistance	26	$2,048,949	$3,158,836
Arts, Entertainment & Recreation	7	$383,946	$612,513
Accommodation & Food Services	22	$1,056,709	$1,977,102
Other Services	27	$1,614,199	$2,542,441
Government Enterprises	11	$1,315,270	$1,945,664

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APPENDIX

Virginia Precast Concrete Manufacturing Establishments

Firm Name	City	VDOT QA	PCAV
Action Resources Inc.	Roanoke	✓	
Allied Concrete Company	Waynesboro	✓	
American Stone Virginia	Ruther Glen	✓	
Andrews Burial Vault Inc.	Lynchburg		
Arban & Carosi Inc	Woodbridge		
Arban Precast Stone LTD	Dumfries		
Atlantic Metrocast Inc	Portsmouth	✓	
Boxley Ready Mix, LLC	Blue Ridge	✓	
C.T. Jamison Precast, Inc.	Callaway	✓	
Cemex Incorporated	Roanoke		
Coastal Precast Systems, LLC	Cape Charles	✓	
Coastal Precast Systems, LLC	Chesapeake	✓	
Concrete Creations Inc	Virginia Beach		
Concrete Pipe & Precast LLC	Ashland	✓	✓
Concrete Pipe & Precast LLC	Chesapeake	✓	✓
Concrete Pipe & Precast LLC	Salem	✓	✓
Concrete Pipe & Precast LLC	Ashland	✓	✓
Concrete Pipe & Precast LLC	Harrisonburg	✓	✓
Concrete Specialties Inc	Roanoke	✓	
Concrete Systems Inc	Chesapeake		
Curtis Contracting Inc	West Point	✓	

Firm Name	City	VDOT QA	PCAV
DBA Permatile Concrete Products Company	Bristol	✓	✓
Faddis Concrete Products Inc	King George	✓	✓
Gate Precast Company	Mechanicsville		
Golden Eagle Vault Services	Rocky Mount		
Hampton Roads Connector Partners JV	Chesapeake		
Hanover Precast Inc	Ashland		
Harpers Statuary & Water LLC	Harrisonburg		
Hollands Richards Vault Service	Salem		
James Hardie Building Pro Inc	Pulaski		
Lakeside Ready Mix Inc	Abingdon		
Markham Inc	Richmond		
ME Concrete Products, Inc	Catlett		
Mercer Vault Company	Fredericksburg		
Metromont Corporation	Winchester		
Metromont Corporation	Richmond		
Nansemond Precast Concrete	Suffolk	✓	✓
Northern Virginia Cast Stone	Manassas		
Oldcastle Infrastructure, Inc.	Fredericksburg	✓	✓
Reinforced Earth Company	Reston		
Rockingham Precast Inc	Rockingham	✓	
Roland Vaults	Norfolk		
Sam Green Vault Corp	Madison Heights		
Seaboard Concrete Products	Richmond		

Firm Name	City	VDOT QA	PCAV
Shore Vault & Precast Company	Exmore		
Smith Midland Corporation	Midland	✓	✓
Southside Grave & Vault Inc	Chase City		
Stafford Stone Works	Fredericksburg		
Stonewall Concrete Inc	Manassas	✓	
Superior Walls of Central VA Inc	Amelia Courthouse		
Technopref Industries, Inc.	Alexandria		
Tindall Concrete Products Inc	Petersburg		
Tri County Vault Co Inc	Saluda		
VFP Inc	Duffield		
Virginia Cast Stone Inc	Waynesboro		
Waterway Materials Recycling, LLC	Chesapeake		
West End Precast	Wytheville		
Wimbrough & Sons Inc	Portsmouth		
Winchester Precast by Evercast	Winchester	✓	✓