

# Economic Impact Study of the Cannabis Sector in the Greater Sacramento area

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## Executive Summary

Legal cannabis would create new industries and economic activity in California. This report estimates the potential economic impacts with a legal (recreational and medical) cannabis sector in the Sacramento area. In this study, we assume legalization is only statewide and would occur through the passage of Proposition 64, entitled: “Control, Regulate and Tax Adult Use of Marijuana Act” also known as AUMA, in the November 2016 election. The study assumes the full legal transition of all medical and recreational sales occurs in 2018 for simplicity, although in reality the transition to a completely legal industry could take several years.

If AUMA passes, it is likely that the legal industry will develop clusters in certain regions of the state. Factors that influence industry clustering include local government policies, production costs, proximity to market, and the availability of investment capital and skilled workers. Because AUMA allows local governments to regulate the cultivation, production of products, and retail sales of cannabis local government decisions will have a major impact on clustering. Sacramento has several attributes that could facilitate the development of the legal cannabis industry, including relatively low costs for California, good access to urban markets, and available workers and investors with knowledge of the industry. Many local governments in the Sacramento area are already considering policies regarding cannabis cultivation, production, and sales but there is still considerable uncertainty about whether the regulatory climate in the region will support the development of an industry cluster. Given this uncertainty, the study includes three over-arching scenarios for the Sacramento area cannabis industry if AUMA passes: a) a limited scenario with tight local regulation, b) a local scenario where the industry primarily serves regional demand, and c) a cluster scenario in which the Sacramento area exports a significant amount of cannabis and cannabis products to other areas in the state. As these scenarios define a market in which recreational cannabis sales are legal at a state level, they define a new market environment. However, not all of the economic impact we calculate represents new economic activity as this total would include economic activity currently associated with the medical market and illegal consumption. The table below summarizes the assumptions that describe the three scenarios we utilize to describe the potential impact on the Sacramento area economy.

### Overview of the Sacramento Area Cannabis Sector and Consumers

Market Scenario	Regional Shares Supplied by Sacramento:		
	Sac Area	Other NorCal	SoCal
Limited Scenario	20%	0%	0%
Local Scenario	80%	10%	0%
Cluster Scenario	90%	50%	10%

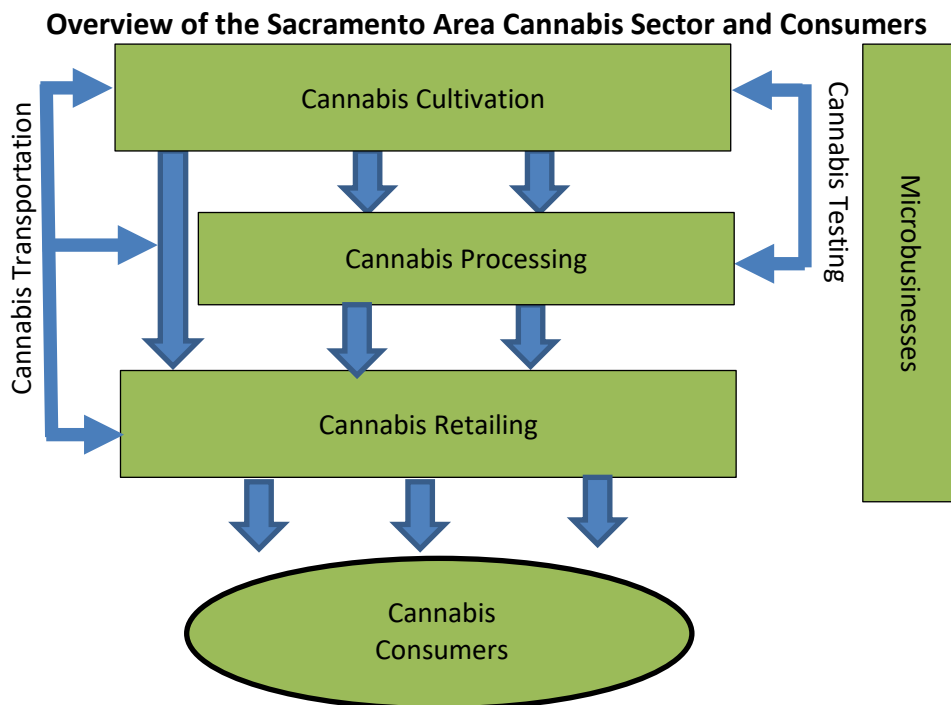
An estimate of baseline statewide and Sacramento area demand for cannabis is necessary to determine the potential market for the Sacramento area’s cannabis sector under legalization. Since the amount of cannabis consumption varies considerably by the frequency of use, we establish ‘typical’ quantities across several levels of use and associate them with projected cannabis consumers to create an estimate of baseline demand for cannabis in California. The table that follows shows that after accounting for rising prevalence of consumption independent of legal status as well as under-reporting

of use because of legal and social concerns, baseline demand across California for the population 21-years and older is estimated to be 640 metric tons (tonnes) in the year 2018. Demand from Sacramento area cannabis users is estimated to be 41.6 tonnes, or about 6.5% of total statewide demand.

**Total estimated California resident consumers’ baseline demand for cannabis in 2018**

Frequency of use (days per month):	Number of Users 21+ years-old	Usage Amounts (Grams)	Share of...	
		Typical	Users	Demand
<1	1,132,355	1,275,858	29.7%	0.2%
1-5	947,980	21,848,340	24.9%	3.8%
6-10	333,669	22,315,134	8.8%	3.8%
11-15	281,049	29,915,579	7.4%	5.1%
16-20	192,533	27,502,622	5.1%	4.7%
21-25	267,588	113,676,709	7.0%	19.5%
26-31	655,102	365,701,112	17.2%	62.8%
<i>Total Users/Use:</i>	<i>3,810,277</i>	<i>582,235,354</i>	<i>100%</i>	<i>100%</i>
Assume 10% under-reporting/prevalence		58,223,535		
<b>Grand Total Baseline Statewide Demand</b>		<b>Grams:</b>	<b>Kilograms:</b>	<b>Tonnes:</b>
		<b>640,458,889</b>	<b>640,459</b>	<b>640</b>

Production characteristics and market scenarios are analyzed in terms of their economic impacts using the IMPLAN model, which allows us to develop a model of the Sacramento area economy. Because a legal cannabis sector does not currently exist, we built several custom industries in IMPLAN to incorporate the cannabis sector into the economic model. The figure below represents the sector’s industries across which we examine in-depth impacts from several hypothetical demand and supply-side environments.



In terms of regional supply, local government policies are assumed to be a primary determinant of whether the Sacramento area industry develops in a limited constrained environment; an intermediate locally focused industry, or a more dynamic cluster with substantial sales outside the region. We also examine three demand alternatives ranging from the baseline demand scenario, described above, to a moderate growth scenario with a 10% increase above the baseline, and concluding with high growth scenario in which demand increases 20% above the baseline. Thus, a total of nine distinct scenarios are created by the three demand-side and three supply-side alternatives.

The economic impacts on the Sacramento area from the sector as a whole is reported in the first table below, while subsequent tables show detailed results for the cultivation, processing, and retail industries. While the economic impacts in these tables represent a new market environment they are not completely new to the economy as they include the existing medical market and existing recreational sales that are currently illegal at the state level.

**Total Economic Impact: Sacramento Area Cannabis Sector by Supply and Demand Scenarios**

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	602	662	722	2,793	3,072	3,351	5,535	6,089	6,642
	Total Effect	1,578	1,736	1,893	7,657	8,423	9,189	16,497	18,147	19,797
Labor Income (\$'000s)	Direct Effect	\$33,861	\$37,247	\$40,633	\$184,077	\$202,485	\$220,893	\$510,533	\$561,587	\$612,640
	Total Effect	\$96,598	\$106,258	\$115,918	\$488,461	\$537,307	\$586,154	\$1,155,270	\$1,270,797	\$1,386,324
Output (\$'000s)	Direct Effect	\$150,650	\$165,715	\$180,780	\$753,621	\$828,983	\$904,345	\$1,708,467	\$1,879,314	\$2,050,161
	Total Effect	\$321,594	\$353,753	\$385,912	\$1,583,375	\$1,741,712	\$1,900,050	\$3,466,058	\$3,812,664	\$4,159,269

**Cannabis Cultivation Economic Impact: Sacramento Area Supply and Demand Scenarios**

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	103	113	123	672	739	806	2,246	2,470	2,695
	Total Effect	260	286	312	1,699	1,869	2,039	5,680	6,248	6,815
Labor Income (\$'000s)	Direct Effect	\$16,360	\$17,996	\$19,632	\$107,110	\$117,821	\$128,532	\$357,964	\$393,760	\$429,557
	Total Effect	\$23,449	\$25,793	\$28,138	\$153,516	\$168,867	\$184,219	\$513,052	\$564,357	\$615,663
Output (\$'000s)	Direct Effect	\$26,010	\$28,611	\$31,212	\$170,287	\$187,316	\$204,345	\$569,102	\$626,013	\$682,923
	Total Effect	\$45,626	\$50,189	\$54,751	\$298,711	\$328,583	\$358,454	\$998,297	\$1,098,127	\$1,197,957

### Cannabis Processing Economic Impact: Sacramento Area by Supply and Demand Scenarios

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	93	103	112	610	671	732	2,040	2,244	2,448
	Total Effect	362	398	434	2,370	2,607	2,844	7,921	8,713	9,505
Labor Income (\$'000s)	Direct Effect	\$9,188	\$10,106	\$11,025	\$60,151	\$66,167	\$72,182	\$201,027	\$221,129	\$241,232
	Total Effect	\$24,969	\$27,466	\$29,963	\$163,469	\$179,816	\$196,163	\$546,316	\$600,947	\$655,579
Output (\$'000s)	Direct Effect	\$41,399	\$45,539	\$49,679	\$271,036	\$298,139	\$325,243	\$905,805	\$996,385	\$1,086,966
	Total Effect	\$83,866	\$92,252	\$100,639	\$549,064	\$603,970	\$658,876	\$1,834,977	\$2,018,475	\$2,201,973

### Cannabis Retailing Economic Impact: Sacramento Area by Supply and Demand Scenarios

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	602	662	722	2,424	2,666	2,909	3,020	3,322	3,624
	Total Effect	1,578	1,736	1,893	6,331	6,964	7,598	7,448	8,192	8,937
Labor Income (\$'000s)	Direct Effect	\$33,861	\$37,247	\$40,633	\$130,953	\$144,048	\$157,143	\$148,021	\$162,823	\$177,625
	Total Effect	\$96,598	\$106,258	\$115,918	\$382,765	\$421,042	\$459,318	\$434,011	\$477,413	\$520,814
Output (\$'000s)	Direct Effect	\$150,650	\$165,715	\$180,780	\$602,601	\$662,861	\$723,121	\$677,926	\$745,718	\$813,511
	Total Effect	\$321,594	\$353,753	\$385,912	\$1,289,574	\$1,418,532	\$1,547,489	\$1,461,201	\$1,607,321	\$1,753,441

The results show a large difference between the cluster and the limited scenario, illustrating a distinct opportunity for the Sacramento area economy. A supportive local policy environment with a community of strong cannabis entrepreneurs in the Sacramento area could potentially develop a cannabis cluster industry that would support a total of nearly 20,000 jobs, \$4.2 billion in annual output, and \$1.4 billion in labor income per year; these numbers represent nearly 2% of the region's current gross economic output. In contrast, the limited scenario where the industry clusters in other areas and most local Sacramento demand is imported from other parts of the state would support about 1,600 local jobs and \$322 million in total output with most activity in retail and local distribution. Thus, the Sacramento area would lose the opportunity for over 18,000 jobs if weak investment and restrictive local policies cause the cannabis industry to locate outside the region.

## Key Findings

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### **The Overall Economic Impact of the Sacramento Area Cannabis Sector:**

- Direct employment by the cannabis sector is between 602 in the limited-baseline scenario and 6,642 jobs in the cluster-high growth scenario.
  - Total employment impacts are between 1,578 in the limited-baseline scenario and 19,797 jobs in the cluster-high growth scenario.
  - Direct output by the cannabis sector is between \$151 million in the limited-baseline scenario and \$2.1 billion in the cluster-high growth scenario.
  - Total output impacts from the sector are between \$322 million in the limited-baseline scenario and \$4.2 billion in the cluster-high growth scenario.
- The sector's total impacts could represent as much as 1.6% of gross regional product under the cluster-high growth scenario, or as little as 0.1% under the most restrictive scenario.

### **The Economic Impact of Cannabis Cultivation in the Sacramento Area:**

- Direct employment by cannabis cultivators is between 103 in the limited-baseline scenario and 2,695 jobs in the cluster-high growth scenario.
  - Total employment impacts are between 260 in the limited-baseline scenario and 6,815 jobs in the cluster-high growth scenario.
  - Direct output by cannabis cultivators is between \$26 million in the limited-baseline scenario and \$683 million in the cluster-high growth scenario.
  - Total output impacts from the industry are between \$46 million in the limited-baseline scenario and \$1.2 billion in the cluster-high growth scenario.
- Under the local/proportional scenario, the value of cannabis cultivation would be similar to the existing value of wine grape cultivation in the Sacramento area, around \$200 million.
- However, under the cluster-high growth scenario, cannabis cultivation in the Sacramento area could be similar in value to wine grape cultivation in Sonoma County, around \$600 million.

## Key Findings (continued)

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### **The Economic Impact of Cannabis Processing in the Sacramento Area:**

- Direct employment by cannabis processors is between 93 in the limited-baseline scenario and 2,448 jobs in the cluster-high growth scenario.
  - Total employment impacts are between 362 in the limited-baseline scenario and 9,505 jobs in the cluster-high growth scenario.
  - Direct output by cannabis processors is between \$41 million in the limited-baseline scenario and \$1.1 billion in the cluster-high growth scenario.
  - Total output impacts from the industry are between \$84 million in the limited-baseline scenario and \$2.2 billion in the cluster-high growth scenario.
- Under the cluster-high growth scenario, the value of cannabis processing would be approximately \$1 billion, which would be larger than roasted nuts and peanut butter manufacturing, which is around \$700 million, but less than soft drink and water manufacturing, which is about \$1.4 billion in the Sacramento area.

### **The Economic Impact of Cannabis Retailing in the Sacramento Area:**

- Direct employment by cannabis retailing is between 602 in the limited-baseline scenario and 3,624 jobs in the cluster-high growth scenario.
  - Total employment impacts are between 1,578 in the limited-baseline scenario and 8,937 jobs in the cluster-high growth scenario.
  - Direct output by cannabis retailing is between \$151 million in the limited-baseline scenario and \$814 million in the cluster-high growth scenario.
  - Total output impacts from the industry are between \$322 million in the limited-baseline scenario and \$1.8 billion in the cluster-high growth scenario.
- Under the local/proportional scenario, the approximately 2,700 jobs in cannabis retailing would be similar in size to Sacramento area employment in retail automotive parts and accessory stores.

## Key Findings (continued)

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### **Cannabis Consumption in the Sacramento Area:**

- Under our 'baseline' scenario in 2018, California's adults will demand 640 metric tons of marijuana (1.41 million pounds)
- Under a 'high-growth' scenario demand by California's adults may equal 768 metric tons
- Demand from Sacramento Area adults is estimated to be between 42 and 50 metric tons
- Heavy consumers (those who consume nearly daily) account for over 80% of cannabis demand but form just 24% of all users

### **The Economic Impact of Other Cannabis Industries in the Sacramento Area:**

- Direct sales in the cannabis transportation industry is between \$3.5 million in the limited-baseline scenario and \$50 million in the cluster-high growth scenario.
  - This would be from about 1% to 7% of existing sales in the area's courier and messenger industry.
- Direct sales in the cannabis testing industry is between \$0.2 million in the limited-baseline scenario and \$20 million in the cluster-high growth scenario.
  - That equates to between 0.01% and 1.1% of existing sales in the area's testing and laboratory services industry.



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## Glossary

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<b>Absolutes</b>	The dewaxed essence of a botanical extraction. These are concentrates that are treated with another solvent to remove their waxes and leave just the fragrant oil. These are usually highly concentrated viscous liquids but can be solid or semisolid. Absolutes are the most refined level of plant extracts. See also: Concretes and Essential Oil.
<b>AUMA</b>	Adult Use of Marijuana Act – The future legalization of cannabis initiative on the November 2016 statewide ballot that forms the basis for this report’s analysis. Its full title is: Control, Regulate and Tax Adult Use of Marijuana Act, No. 15-0103 (Michael Sutton and Donald Lyman).
<b>BHO</b>	Abbreviation for “butane hash oil” which can be a number of concentrates derived from butane extraction as well as referring to the raw, unpurged, liquid solution of butane and extract.
<b>Budder</b>	A type of BHO that is opaque and malleable.
<b>Cannabinoid</b>	Any tricyclic compound or class of cellular receptors; those associated with the marijuana plant (as opposed to those naturally occurring in humans and animals) are also known as phytocannabinoids.
<b>CBD</b>	Cannabidiol (CBD) is not psychoactive in the same manner as THC, but can be mood-altering and modulate the psychoactive effects of THC.
<b>Concretes</b>	A botanical extraction that includes the plant’s essential oils, as well as its waxes, lipids, resins and other oil-soluble plant material like cannabinoids. These can be hard, malleable, or viscous depending on wax content. Concretes are an intermediate level of refinement of plant extracts. See also: Absolutes and Essential Oil.
<b>Direct Effects</b>	These are the changes in jobs, sales, and income related exclusively to initial expenditures.
<b>Dry Sift</b>	See: Kief.
<b>Essential oils</b>	A concentrate of hydrophobic liquid containing volatile aroma compounds from plants, it includes its lipids and cannabinoids in the case of marijuana. Essential oil is the least refined level of plant extracts. See also: Concretes and Absolutes.
<b>Employment</b>	This is the number of full- and part-time jobs based on an annual average of monthly jobs. That is, one job lasting 12 months is equal to two jobs lasting six months each and is equal to three jobs lasting four months each.
<b>Gram</b>	A metric unit of mass equal to 1/1,000 <sup>th</sup> of a kilogram. There are approximately 453.592 grams in a pound and 28.3495 grams in an ounce.
<b>GRP</b>	Gross Regional Product – is conceptually equivalent to gross domestic product (GDP); while GDP measures newly created value through production by residents in the domestic economy, GRP measures newly created value through production by residents in the regional economy, be it a state, county, or district.

<b>Hash</b>	This is an extracted product composed of compressed kief. Hash is also called <i>hashish</i> and may be solid or resinous depending on the preparation.
<b>Indirect Effects</b>	These represent the iterative impacts of inter-industry transactions as supplying industries respond to demand from the sector(s) where the initial expenditures occurred.
<b>Induced Effects</b>	These reflect the contribution benefit payments make to household expenditures by direct and indirect sector employees.
<b>Kief</b>	This is a very basic cannabis product composed of the unpressed glands (trichomes) scrapped from dried mature flowers and leaves. Kief, can be consumed directly or more frequently it is pressed to make hash. Kief is also spelled as <i>kif, kef, or kiff</i> and is sometimes called <i>pollen or polm</i> . It is one of the oldest cannabis products.
<b>Kilogram</b>	A metric unit of mass equivalent to 2.20462 pounds or 35.274 ounces.
<b>Labor Income</b>	This is the sum of employee compensation and proprietor income. Employee compensation includes wages, salaries, benefits, and all other employer contributions, while proprietor income consists of payments received by self-employed individuals and unincorporated business owners.
<b>Metric Tonne</b>	See Tonne below for a definition.
<b>Oil</b>	A general term referring to a number of concentrates of different consistencies, as well as raw, unpurged BHO or CO <sub>2</sub> .
<b>Output</b>	This represents the value of industry production. It accounts for the total change in the value of production in an industry for a given time period. Output varies as a measure across industries. For manufacturers, the value of production is sales plus or minus any change in inventories. For service sectors, the value of production equals their sales. While for retail and wholesale trade, the value of production equals their gross margin and not their gross sales.
<b>Shatter</b>	A highly regarded type of BHO characterized by its translucence and its brittleness at room temperature.
<b>THC</b>	Tetrahydrocannabinol (THC) a cannabinoid found in cannabis with powerful psychotropic and therapeutic properties.
<b>Tonne</b>	A metric unit of mass equal to 1,000 kilograms or approximately 2,204.6 pounds.
<b>Total Effects</b>	These are the combined impacts of the Direct, Indirect, and Induced Effects.
<b>Wax</b>	A type of BHO; also a substance excreted by cannabis plants to protect themselves from extreme drying.

# 1 Introduction

Legal cannabis would create new industries and economic activity in California. This report estimates the potential economic impacts with a legal (recreational and medical) cannabis sector in the Sacramento area. In this study we assume recreational legalization is only statewide and occurs through the passage of Proposition 64, a statewide ballot initiative, in the November 2016 election. The title of Proposition 64 is “Control, Regulate and Tax Adult Use of Marijuana Act” or as we will refer to it throughout the remainder of this report, AUMA. Although national legalization may occur in the future, this analysis assumes that medical and recreational marijuana remains illegal on the federal level.

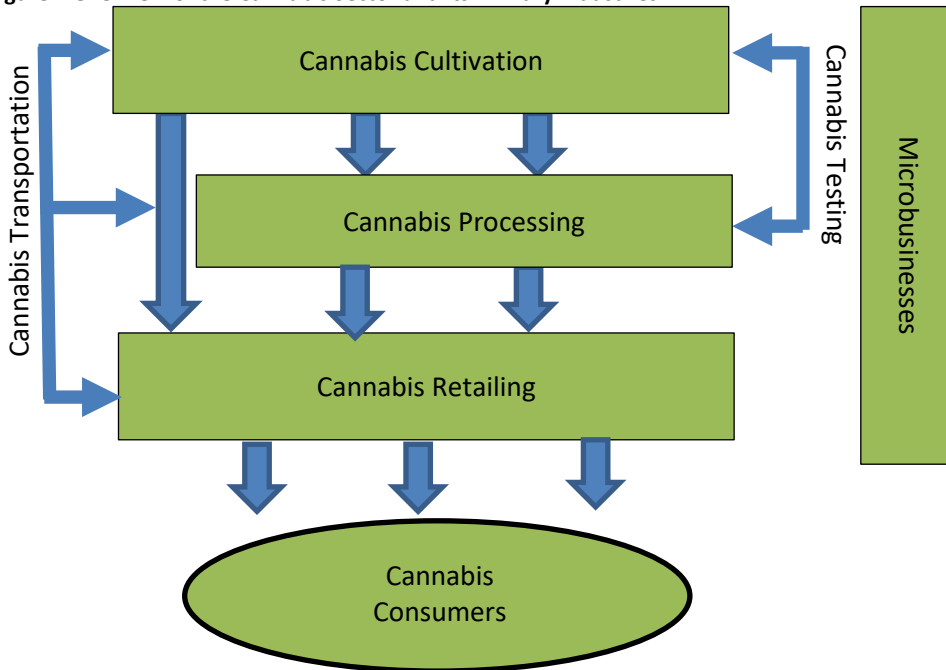
Although it is likely that the transition to a completely legal industry will take several years and may never be fully complete, we assume that a full legal transition of all medical and recreational sales occurs in 2018. This is done for simplicity, but several factors will affect the actual transition, including:

- Extent to which illegal suppliers persist
- Extent to which local autonomy supports or hinders transition
- Speed with which statewide regulatory and enforcement mechanisms implemented
- Federal tolerance, or lack thereof, for state and local legalization

Despite the large medical marijuana industry currently established in California, the illegal market is large and well established. The regulatory requirements of legal (medical and recreational) cannabis will preclude many existing illegal producers from participating in the legal market. Some of those illegal suppliers will remain cost competitive in a legal market, particularly as initial regulatory compliance costs are borne by the legal market. Enforcement of regulations in California and growing support in other states and federally for legalization will reduce the illegal market, but the extent of those impacts may take some time. While medical and recreational use of cannabis may become legal statewide, in California there will remain substantial local authority to prohibit or severely limit cultivation, processing, and retail sales. Therefore, county and city governments will also influence the speed and scope with which legal cannabis replaces illegal cannabis. Lastly, there has been an evolution in federal enforcement policies against cannabis since the mid-2010s. These have allowed increased investment in the medical sector and facilitated statewide legalization of recreational use in several states including Colorado, Oregon, and Washington. The direction of federal enforcement policies in the future will therefore have a significant influence over the extent of the Californian legal market.

As an initial study, the focus of this report is to provide a credible estimate of the cannabis sector and its principal industries. These industries and their associated consumer markets are represented in Figure 1. We hope that this report, and others like it, will inform discussion of costs and benefits of a legalized cannabis sector on the Sacramento area economy.

Figure 1 Overview of the Cannabis Sector and its Primary Industries



Given the importance of the context with which legalization of marijuana occurs, the remainder of this introduction reviews AUMA with an emphasis on key features within it that may determine the eventual structure of a legal cannabis sector. In Part Two, we estimate the baseline statewide demand for cannabis that could be filled by the Sacramento area’s cannabis sector under legalization through AUMA. Typical cannabis cultivation, processing, and retail facilities in a legal market environment are then described in Part Three. Additional key components in the cannabis sector: testing, transportation, and microbusiness are also reviewed in that part of the analysis. In Part Four, a range of demand and supply-side environments are described to define the cannabis market in the Sacramento area. The economic impacts of those scenarios are then analyzed in Part Five across the cannabis sector as a whole as well as the principal industry groups.

### Key Features of the Adult Use of Marijuana Act

Medical marijuana has been legal in California for approximately two decades, and if AUMA is passed, the Bureau of Marijuana Control within the Department of Consumer Affairs will be established to regulate and license both the medical and recreational marijuana industry. While AUMA will set up a comprehensive system governing marijuana businesses at the state level, it will safeguard local control, allowing local governments to regulate marijuana-related activities, subject marijuana businesses to zoning and permitting requirements, and ban marijuana businesses by a vote of the people within a locality. However, AUMA will not allow local governments to prevent personal cultivation or possession of cannabis and products containing cannabis to their residents 21-years of age and older.

Several departments within government at the state level will work with the Bureau of Marijuana Control to regulate and license the sector. These departments are listed in Table 1 across the various

industries they have been assigned responsibility under AUMA. Each regulatory authority will be responsible for licensing businesses under their respective authority. These licenses will be issued in advance of 1 January 2018 when cannabis' legalization is envisioned under AUMA.

**Table 1 Overview of Sub-Industries within the Cannabis Sector under AUMA**

Industry	What	Regulatory Authority
Cultivation	Planting, growing, harvesting, drying, curing, grading, or trimming of marijuana. Cultivation can occur indoors, in greenhouses and/or outdoors	Department of Food and Agriculture
Processing	Compounding, blending, extracting, infusing, or otherwise making or preparing a marijuana product	Department of Public Health
Testing	Testing of marijuana products and accessories, necessary after cultivation and processing before retailing	Department of Public Health
Distribution	Procurement, sale, and transport of marijuana and marijuana products between entities	Bureau of Marijuana Control
Retailing	Retail sale and delivery of marijuana or marijuana products to customers	Bureau of Marijuana Control
Microbusiness	Special vertically integrated industry within the sector that is allowed to engage in cultivation, processing, testing, distribution, and retailing on a small scale basis	Bureau of Marijuana Control

AUMA will ensure the nonmedical marijuana industry in California will be built around small and medium sized businesses by prohibiting large-scale cultivation licenses for the first five years. AUMA also protects consumers and small businesses by imposing strict anti-monopoly restrictions for businesses that participate in the nonmedical marijuana industry. In addition, AUMA will prohibit the sale of nonmedical marijuana by businesses that also sell alcohol or tobacco. Licenses must be renewed annually and multiple factors will be taken into consideration related to the issuing of licenses, such as not concentrating licenses in a specific area and potential for violation of any laws.

Other key features of AUMA include the following:

- Marijuana Cultivation and Possession for Personal Use.
  - Individuals over the age of 21 could lawfully:
    - (1) possess, process, transport, purchase, obtain, or give away to individuals over the age of 21, up to 28.5 grams of marijuana and up to eight grams of concentrated cannabis and
    - (2) cultivate up to six living marijuana plants and possess the marijuana produced by the plants within a private residence if in a locked area on private property that is not visible from a public place.

- Cities and counties could place “reasonable” restrictions on the cultivation of marijuana for personal use but could not prohibit cultivation within a fully enclosed and secure private residence.
- Local Regulation of Marijuana Businesses
 

Cities and counties would continue to have the authority to regulate commercial marijuana businesses in their jurisdiction. Cities and counties could:

  - require marijuana businesses to obtain local licenses
  - set rules for such businesses (such as those related to hours of operation and minimum security levels) and establish restrictions on where they could be located
  - completely ban marijuana-related businesses in their jurisdiction
  - not ban the transportation of marijuana through their jurisdictions
- Industry Regulation
  - Large scale cultivation is prohibited for the first five years (until 1/1/2023)
    - Defined as 1 acre outdoor or 22,000 sq. ft. indoor
  - Anti-monopoly restrictions for business in the marijuana industry including
    - Selling marijuana or marijuana products at less than cost to purposely injure competitors is not allowed
    - No geographic price discrimination permitted
  - Requires tracking and tracing of all nonmedical marijuana from cultivation to sale
  - Prohibits marketing to persons under the age of 21
  - Allows tax policy to be adjusted to limit illicit market
  - Allows industrial hemp to be grown as an agricultural product and allows research in growing as long as the hemp is low-THC, but does not have a provision for marijuana research funding
  - Requires all marijuana to be sold in child resistant containers
  - Allows licenses to be restricted in high ratio areas (licensee to population ratio)
  - Until 1 January 2020, it requires the licensee to have been a California resident continuously since 1 January 2015
  - Until 1 January 2020, priority licensing will be given to businesses that demonstrated compliance with the Compassionate Use Act
  - Large scale cultivators are indefinitely restricted from operating testing, distribution, and microbusiness
  - Marijuana appellations and organic certification will be established
  - Warning labels are mandatory
  - No minors on premises
- Taxation
  - Existing state and local sales taxes applicable to the sale of recreational marijuana products
  - Additional excise tax of 15 percent on the retail sale of marijuana products
  - Additional excise tax on the cultivation of marijuana at \$9.25 per ounce of dried marijuana flowers
  - Additional excise tax on the cultivation of marijuana at \$2.75 per ounce of dried marijuana leaves



- Board of Equalization may annually adjust the tax rate for leaves to reflect fluctuations in the relative price of marijuana flowers to marijuana leaves.
- Board of Equalization may establish other categories of marijuana (such as frozen marijuana) and these categories would be taxed at their value relative to marijuana flowers
- Beginning in 2020, the cultivation tax would be adjusted annually for inflation
- Medical cannabis and related products are exempt from the sales and use tax if the consumer possesses a valid government issued identification card
- Revenues collected from excise tax, as well as certain fines imposed on businesses or individuals who violate regulations established under the measure, would be deposited in a new special fund called the California Marijuana Tax Fund
- Monies from the Marijuana Tax Fund would be used to reimburse state agencies, such as the Bureau of Marijuana Control, for the costs of regulating the commercial marijuana industry not covered by license fees. After reimbursing state agencies for implementation costs, the measure would allocate a portion of the remaining revenues for the following purposes (in order of priority):
  - Any funds remaining after the above allocations would be annually allocated as follows:
    - (1) 60 percent to the state Department of Health Care Services for substance use disorder education and prevention programs for youth;
    - (2) 20 percent to the state Department of Fish and Wildlife (DFW) and the state Department of Parks and Recreation (DPR) for environmental programs designed to clean up and prevent environmental damage resulting from the illegal cultivation of marijuana
    - (3) 20 percent to the California Highway Patrol for programs designed to reduce driving under the influence of alcohol, marijuana, and other drugs as well as to the Board of State and Community Corrections for a grant program designed to mitigate any potential negative impacts on public health or safety resulting from the implementation of the measure.
- Under the measure, beginning July 2028, the Legislature could change the above allocations to further the purpose of the measure, subject to certain limitations.
- The measure also requires that funding provided to the DFW and DPR from the Marijuana Tax Fund not be used to replace other funds currently used by the departments for the purposes described above. As such, the measure requires that General Fund appropriations to the DFW and DPR not be reduced below the levels provided in the 2014-15 Budget Act.

## 2 Baseline Projected Cannabis Consumption

This section provides an estimate of the demand for cannabis for individuals age 21 and over. Under AUMA, consumption of cannabis will be legal for individuals 21-years of age and older across California beginning in 2018. We estimate demand in four sub-sections. In Section 2.1 we calculate the number of Californians over 21 who would likely consume some cannabis in 2018. The amount of cannabis consumed varies considerably by the frequency of use, therefore Section 2.2 reviews the extent that the quantity of cannabis consumed per use varies and establishes a ‘typical’ quantity consumed by frequency. The annual frequency of use for all cannabis consumers is then estimated in Section 2.3. Combining the frequency, quantity, and number of users from the previous sub-sections, Section 2.4 then estimates the total statewide quantity of cannabis demand in 2018.

### 2.1 Estimated Cannabis Users

In order to estimate future cannabis demand, we begin by estimating current users in California. The best source of information on the incidence of cannabis use we identified is the National Survey on Drug Use and Health (NSDUH).<sup>1</sup> We obtained an estimate from NSDUH of the number of Californians 21-years and older who consumed cannabis at least once during the past year. Since the latest available NSDUH data is from 2013-2014, we inflated those values to reflect the estimated growth in California’s 21-years of age and older population in 2016 and 2018.<sup>2</sup> The 2016 population estimate is used to calibrate our cultivation and processing industries, while the 2018 projection is used to generate the baseline population of the 21-years of age and older population when AUMA would legalize cannabis.

**Table 2 California’s Total and Cannabis User Populations by Age**

California's Population			
Year:	2013/14	2016	2018
Total	38,375,205	39,242,698	39,933,359
12-years & Older	32,338,284	33,180,165	33,839,069
21-years & Older	27,573,227	28,472,833	29,141,290
Cannabis Users in California			
Year:	2013/14	2016	2018
12-years & Older	4,633,000	4,753,614	4,848,013
21-years & Older	3,605,250	3,722,875	3,810,277
Compiled by CBPR based on DOF and NSDUH data			

The 2013-2014 NSDUH estimates that there were 3.6 million Californians who were 21-years and older and 4.6 million Californians 12-years and older who consumed cannabis at least once during the past year. Hence, Table 2 shows that in 2013-2014 13.1% of Californians 21-years of age and older, 3.6 million out of 27.6 million, reported themselves as cannabis users in the past year. That figure is slightly lower than the 14.3% share, 4.6 million out of 32.3 million, that was reported by those 12-years of age and older. Applying those shares to the projected 2016 and 2018 populations, we estimate that in 2016

<sup>1</sup> For details about the survey see it website at: <https://nsduhweb.rti.org/respweb/homepage.cfm>

<sup>2</sup> The estimated 2016 and 2018 populations were taken from the California Department of Finance’s annual population estimates and projections. These estimates are available at the DOF website: <http://www.dof.ca.gov/research/demographic/dru/index.php>

there are 3.7 million Californians 21-years of age and older who will consume cannabis at least once during the year and by 2018 that number will increase to 3.8 million. Since sales to anyone under 21-years of age are not allowed under AUMA, Table 2 shows that there will remain approximately one million cannabis consumers less than 21-years of age for whom cannabis consumption continues to be illegal.

## 2.2 Estimated Quantity of Cannabis per Day of Use

The amount of cannabis consumed by users identified in Section 2.1 will vary. Following a review of several studies, we concluded that it is reasonable to relate the intensity of cannabis use (grams consumed per day) and an individuals’ frequency of use (days of consumption per year).<sup>3</sup> Therefore, we use the estimates from Light et al. (2014) to differentiate intensity and frequency of use. These quantities are reported in Table 3.

**Table 3 Quantity of Cannabis Used per Day by Frequency of Use**

Type of Consumer	Use Days per Year	Use Days per Month	Usage Amounts (Grams per day of use):		
			Low	“Typical”	High
Infrequent	1-11	<1	0.2	<b>0.3</b>	0.6
Regular	12-246	1-20	0.43	<b>0.67</b>	0.95
Heavy	247+	21+	1.3	<b>1.6</b>	1.9

Source: Light et al. 2014

Table 3 is based on several datasets and studies to measure quantity of use, which shows that heavy use forms the majority of cannabis demand in all markets.<sup>4</sup> The table adopts a three-tiered approach to estimate the quantity of cannabis consumed relative to the frequency of use. Based on the analysis of Kilmer et al. (2013), the heaviest tier of users, defined as those using cannabis 21 or more days per month, consume between 1.3 to 1.9 grams per day. Assuming an equal distribution across this tier of consumers, 1.6 grams per day of use is assumed for these heavy users. The next tier is composed of regular users, defined as those using cannabis 1 to 20 days per month, who consume between 0.43 to 0.95 grams per day. An equal distribution of use is also assumed across these regular consumers, equating to 0.67 grams per day of use. In addition to these tiers for regular and heavy users, Light et al. (2013) use a third tier for individuals who use cannabis less than once per month. Using their definitions, which account for a disproportionate number of very low consumption, this infrequent tier of consumers is assumed to use 0.3 grams per day of use.

## 2.3 Estimated Frequency of Cannabis Use

This sub-section estimates the frequency of consumption during the past year. Because of confidentiality, state specific data for California is not available and national frequency of use had to be relied on to estimate this distribution.<sup>5</sup> Table 4 suggests that this is likely to lead to a conservative estimate of cannabis demand in California because Californian’s have a higher overall rate of use than

<sup>3</sup> Burns et al. (2013), and Zeisser et al. (2011).

<sup>4</sup> Asbridge et al. (2014), Kilmer et al. (2013), and Burns et al. (2013).

<sup>5</sup> California specific data from the NSDUH on the frequency of use is typically available on the Substance Abuse and Mental Health Data Archive (SAMHDA) website, but that website has been unavailable during the duration of this study as it transitions to a new software platform.

the nation as a whole across every age group. Nonetheless, California’s cannabis consumption is lower than in states where recreational cannabis is legal. Using the national frequency distribution is therefore assumed to be a conservative proxy for the distribution of California users. Refining this distribution when the state specific data is again available will be important since it will facilitate a more accurate indication of demand from heavy users, which is a very important influence on the state’s demand.

**Table 4 Percentage of Population by Age Group Reporting Cannabis Use in the Past Year**

State	12 or Older	12-17	18-25	26 or Older	18 or Older
Total U.S.	12.90%	13.28%	31.78%	9.63%	12.87%
<b>California</b>	<b>14.49%</b>	<b>15.03%</b>	<b>33.69%</b>	<b>10.91%</b>	<b>14.44%</b>
Washington	18.92%	17.53%	36.50%	16.23%	19.06%
Oregon	19.39%	18.32%	38.05%	16.60%	19.50%
Alaska	19.60%	17.30%	36.47%	16.70%	19.86%
Colorado	20.74%	20.81%	43.95%	16.80%	20.74%

Source: 2013-2014 NSDUH

Table 5 is a summary of cannabis frequency of use distribution nationally across seven intervals. The SAMHDA public-use national files allow us to detail an annual daily frequency distribution for each number of days used per year, from 1 to 365. The table shows that about 30% of cannabis consumers use less than one day per month (11 days per year). The largest share, 46% of cannabis consumers, are regular users who use between 1 to 20 days per month (12-246 days per year). Heavy cannabis consumers, who use cannabis more than 21 days per month (247 or more days per year), compose the smallest share of users: 24%.

**Table 5 Distribution of Users' Frequency of Use**

Type of Consumer	Use Days per Year	Use Days per Month	Share of Users	Typical Grams per Day of Use
Infrequent	1-11	<1	29.7%	0.3
Regular	12-66	1-5	24.9%	0.67
Regular	67-126	6-10	8.8%	0.67
Regular	127-186	11-15	7.4%	0.67
Regular	187-246	16-20	5.1%	0.67
Heavy	247-306	21-25	7.0%	1.6
Heavy	307-365	26-31	17.2%	1.6
			100%	

## 2.4 Projected Demand for Cannabis

Having established the population, frequency, and intensity of cannabis consumers in California, we are able to estimate the total base-line demand for cannabis in the year 2018. This is calculated by taking the total number of cannabis consumers, discussed in Section 2.1, then distributing them across the daily frequency of use, discussed in Section 2.3, and finally multiplying that distribution of consumers by their ‘typical’ daily consumption, found in Section 2.2. As summarized in Table 6, when this calculation is completed it generates an estimated demand of 582 metric tons (tonnes) of cannabis. However, there are two additional issues that need to be accounted for in estimating baseline demand for cannabis: 1)

rising prevalence of consumption independent of legal status, and 2) under-reporting of use because of legal and social concerns.<sup>6</sup> In order to account for these factors, we follow estimates of recent growth in prevalence from Washington State as well as Colorado and assume an additional 10% increase in consumption.<sup>7</sup> This adjustment equates to a further 58 tonnes of cannabis. With this adjustment and our initial calculation, we find that the 2018 baseline demand for cannabis across California will be a grand total of 640 tonnes for the population 21-years and older.

**Table 6 Total estimated California resident consumers baseline demand for cannabis in 2018**

Frequency of use:	Number of Users 21+ years-old	Usage Amounts (Grams)	Share of...	
			Users	Demand
Monthly		Typical		
<1	1,132,355	1,275,858	29.7%	0.2%
1-5	947,980	21,848,340	24.9%	3.8%
6-10	333,669	22,315,134	8.8%	3.8%
11-15	281,049	29,915,579	7.4%	5.1%
16-20	192,533	27,502,622	5.1%	4.7%
21-25	267,588	113,676,709	7.0%	19.5%
26-31	655,102	365,701,112	17.2%	62.8%
<i>Total Users/Use:</i>	<i>3,810,277</i>	<i>582,235,354</i>	<i>100%</i>	<i>100%</i>
Assume 10% under-reporting/prevalence		58,223,535		
<b>Grand Total Baseline Statewide Demand</b>		<b>Grams:</b>	<b>Kilograms:</b>	<b>Tonnes:</b>
		<b>640,458,889</b>	<b>640,459</b>	<b>640</b>

In addition to total baseline demand, Table 6 shows the importance of accounting for differences in the intensity and frequency of cannabis use. Because of their much larger intensity and frequency of use, heavy consumers account for over 80% of cannabis demand, despite accounting for 24% of all users. Similarly, while infrequent consumers account for nearly 30% of all users, their low frequency and intensity of use results in their accounting for less than one percent of demand or 0.2%. While not a focus of this analysis, the marked difference in the type of cannabis user suggests distinct demand structures that should be considered in policy analyses.

### 3 The Legal Cannabis Sector

Typical cannabis cultivation, processing, and retail industries are developed in this part of the report so that they can be applied to generate an estimate of their economic impacts. AUMA’s framework guides assumptions around the characteristics of these industries. We assume that these businesses are legal at a statewide level and are operating within the parameters of their licenses. Section 3.1 examines the cannabis cultivation industry, distinguishing across three types of operations: 1) Indoor grows, 2) Outdoor grows, and 3) Greenhouse grows. Section 3.2 is a preliminary profile of the cannabis processing industry and examines the cannabis processing industry across two stages of production: 1) Extraction of Concentrates, and 2) Manufacture of Cannabis-based Products. Section 3.3 then examines three types

<sup>6</sup> For further discussion of these trends see: Reed (2016).

<sup>7</sup> Light et al (2015) estimate the average users under-report by about 22% and heavy users by 11% in their review of use in Colorado. Kleiman et al (2015) in their study of the Washington State market estimate a range of between a 3% decline to a 27% increase in demand, with a best estimate growth factor of 10%.

of cannabis retailing to consumers: 1) In-Store Sales, 2) On-line/On-demand Delivery Sales, and 3) Food and Accommodation Based Sales. Lastly, Section 3.4 describes three industries in the cannabis sector that require licensing under AUMA but are smaller: 1) Microbusinesses, 2) Cannabis Transit, and 3) Cannabis Testing.

### 3.1 The Cannabis Cultivation Industry

Three distinct types of cannabis cultivation are assumed to supply all cannabis in our analysis: 1) Indoor farming operations, 2) Greenhouse farming operations, and 3) Outdoor farming operations.<sup>8</sup> For each type of facility, we fix their typical physical size, employment, and cannabis production. Assuming fixed characteristics, we impose constant returns to scale in the facilities' operations. That assumption is justified because, as we explained in the introduction, AUMA will restrict cultivation to small and medium size operations between 2018 and 2023. In addition, analyses of the industry show constant returns to scale are a reasonable assumption for this range of facilities.<sup>9</sup> The characteristics of the facilities are based on interviews by our project team with industry experts and available literature.<sup>10</sup>

As such our typical indoor grow is assumed to be in a 10,000 square feet (sq. ft.) facility with 4,900 sq. ft. of canopy and five harvests annually which results in an annual yield of 980 kilograms of cannabis. Greenhouse cannabis grows are assumed to be in 21,000 sq. ft. facilities with 14,700 sq. ft. of canopy and four annual harvests which yield a total of 2,352 kilograms of cannabis annually. The typical outdoor grow is assumed to be in a 10,000 sq. ft. facility with a 7,000 sq. ft. canopy and a single annual harvest that yields 280 kilograms. Based on interviews with Northern California market experts and information from available industry databases,<sup>11</sup> the wholesale value of the facilities' cannabis is assumed to be as follows:

- Indoor grown cannabis is assumed to be worth \$4.50/gram (\$2,040/lbs.).
- Greenhouse grown cannabis is assumed to be worth \$3.50/gram (\$1,588/lbs.).
- Outdoor grown cannabis is assumed to be worth of \$2.25/gram (\$1,020/lbs.).

In terms of output shares and based on the interviews with Northern California market experts we assume that 50% of all cannabis is produced at outdoor grows and the remainder is split equally between indoor and greenhouse grows (25% each).

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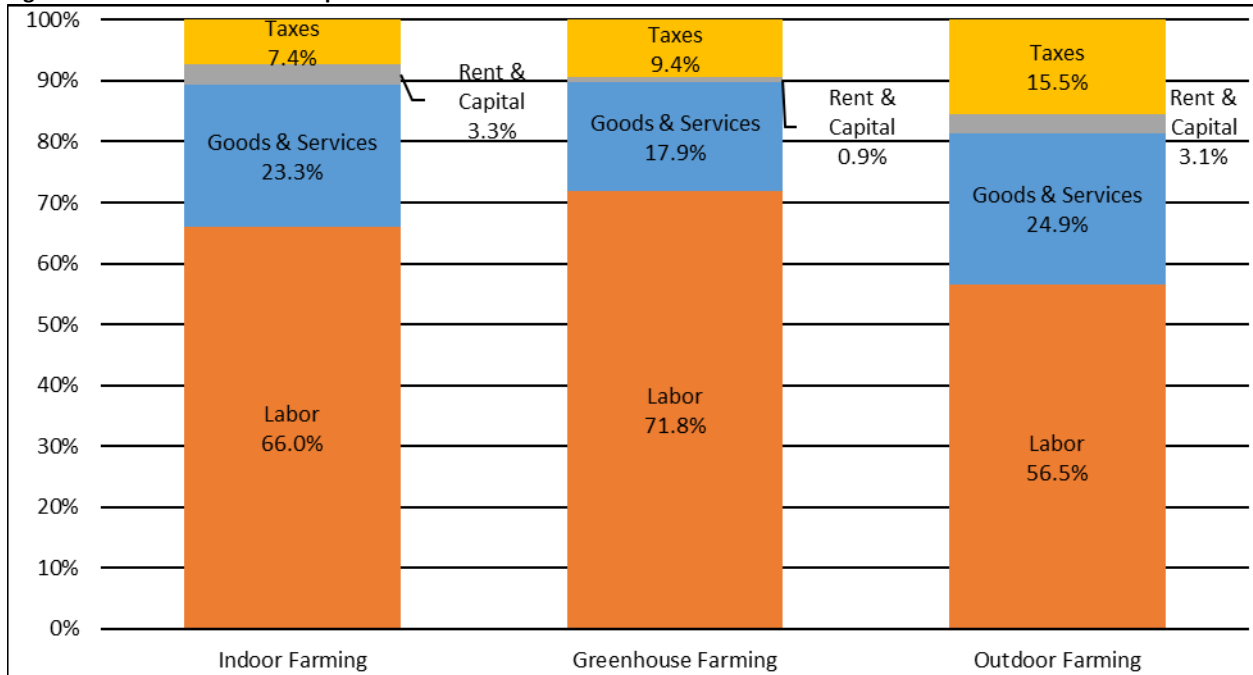
<sup>8</sup> While home-growing is another cultivation option these were not identified as a separate type of producer.

<sup>9</sup> See for example: Hawken (2013); Caulkins (2010). There is clearer evidence for economies of scale in large greenhouse grows as described in Schumacher et al (2003), but these are most significant well beyond the initial 22,000 square foot capacity imposed by AUMA during the first five years of legalization.

<sup>10</sup> See for example: Zamorra (2013), Hawken (2013), and Caulkins et al. (2014).

<sup>11</sup> Reference product pricing was sourced from the following industry data providers: Cannabis Benchmarks <http://www.cannabisbenchmarks.com/>; Price of Weed <http://www.priceofweed.com/>; Arcview Market Research <http://www.arcviewmarketresearch.com/>.

**Figure 2 Cannabis Cultivation Expenditure Shares**



The division of expenditures across the three types of cultivators are reported in Figure 2 and Table 7 provides a more detailed summary of the goods and services expenditures across each type of operation.<sup>12</sup>

**Table 7 Goods and Services Expenditures in Cannabis Cultivation by Type of Farm**

Sector of Expenditure:	Cannabis Farming		
	Indoor	Greenhouse	Outdoor
Cannabis Sector Inputs	0.2%	0.4%	1.7%
Costs of Premises	1.5%	1.1%	3.7%
Equipment	4.4%	1.6%	1.2%
Growing Material	13.2%	20.2%	46.8%
Insurance Services	0.4%	0.5%	1.2%
Other Operational Expenses	1.2%	1.5%	0.6%
Packaging	0.1%	0.2%	0.1%
Professional Services	36.9%	45.7%	35.3%
Security	2.0%	2.8%	6.7%
Utilities	40.2%	26.0%	2.6%
	<b>100%</b>	<b>100%</b>	<b>100%</b>

### 3.2 The Cannabis Processing Industry

Measuring the economic impacts of processing is challenging because cannabis processing is highly dynamic and one of the fastest growing parts of the cannabis sector. In this initial analysis, we differentiate between two parts of the industry: extraction and manufacturing of cannabis based products. Given that deriving cannabis extracts is necessary before products can be manufactured, we

<sup>12</sup> See Appendix 1 to 3 for further details of the goods and expenditures by the three types of cultivators.

assume that all inputs from the cultivation industry enters into the processing industry through extraction operations. The vast majority of output from extractors (90%) is sold to retailing operations.<sup>13</sup> The remaining 10% of extractors' output is assumed to be sold to product manufacturers.<sup>14</sup>

In developing the production characteristics of extractors, a range of contemporary studies and discussions with knowledgeable Northern California market experts were utilized.<sup>15</sup> While THC, CBD, and other cannabinoids can be extracted from several parts of the cannabis plant besides the flowers (buds),<sup>16</sup> we focus on the flow of output from the cultivation industry. We assume that 70% of all outdoor cannabis, 15% of all greenhouse cannabis, and 5% of indoor cannabis goes to the processing industry.

In analyzing manufacturers of cannabis based products, we developed a highly stylized (aggregated) model of their operations that includes everything from the manufacturing of cannabis based food and drink products to cannabis based salves, ointments, tinctures, and pills. Building this industry began by identifying costs and input purchases from comparable edible (e.g. brownies, oil, candy) and non-edible (e.g. creams, lotions) products already being manufactured in the area. In the non-edibles industries manufacturers of lotions, salves, massage oils and other health and beauty products were used while industries manufacturing a range of food products were similarly used for the edible products.<sup>17</sup> Based on the existing scale of these industries in the Sacramento area, these producers were aggregated across edible and non-edible products respectively then combined into a single aggregated product manufacturing operation. The share of cannabis concentrates' input costs was then estimated through a review of existing medical marijuana dispensaries in the Sacramento area as well as contemporary studies to complete the development of the industry.<sup>18</sup>

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<sup>13</sup> Cannabis extractors produce a range of products. Some of the simplest are keif and hash, but they also include a range of products derived through a process of BHO extraction (budder, shatter, and wax) as well as carbon dioxide (CO<sub>2</sub>) based extracts (essential oils, concrete, and absolutes).

<sup>14</sup> See Figure 6 and Figure 7 for a representation of these flows.

<sup>15</sup> See for example: Rosenthal (2014), and Zamarra (2013).

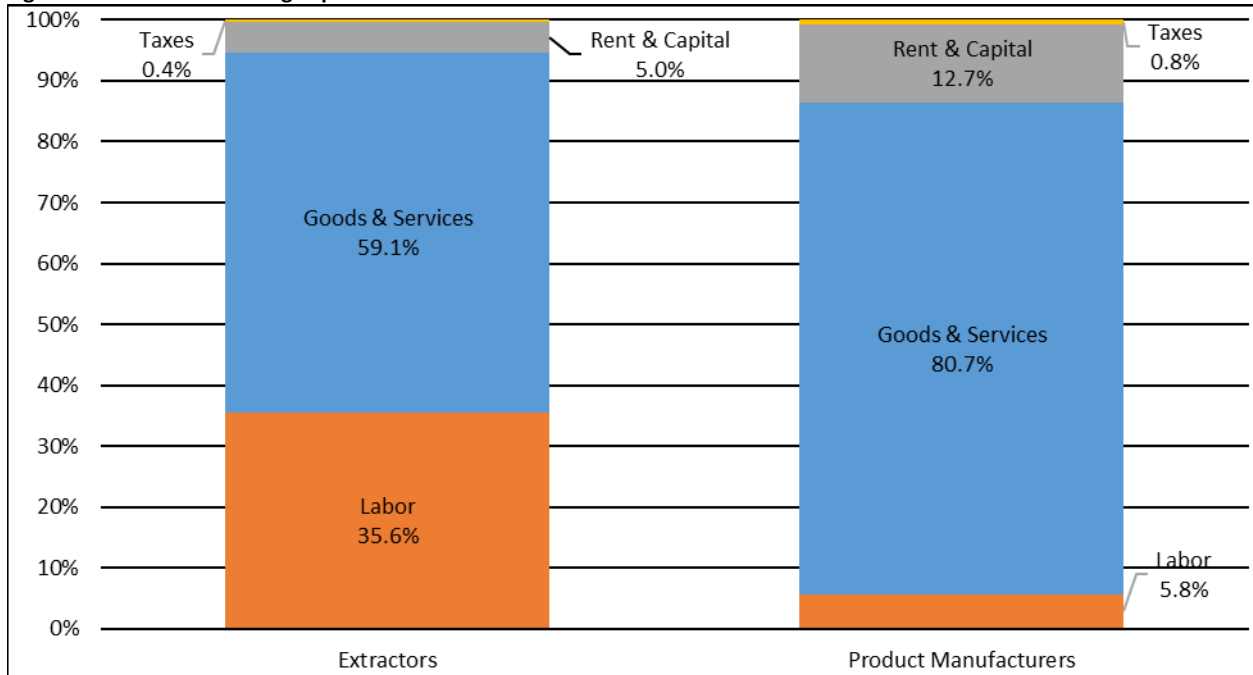
<sup>16</sup> According to Rosenthal (2014) a cannabis plant will have 5-20% THC in its flowers, but THC-containing resin glands are also found in trim, small leaves near the flowers (2-6% THC), fan leaves, large sun leaves (1-3% THC), and other parts of the plant. In fact, these parts of the plant are estimated to contain 10-20% of a cannabis plant's total THC.

<sup>17</sup> These industries included confectionary, dehydrated food, and flavoring/concentrate manufacturing, as well as soda, milk, and other drink manufacturing.

<sup>18</sup> Rosenthal (2014) and Zamarra (2013).



**Figure 3 Cannabis Processing Expenditure Shares**



The division of expenditures across the two types of processors are reported in Figure 3 and Table 8 provides a more detailed summary of the goods and services expenditures by the extractors and product manufacturers.<sup>19</sup>

**Table 8 Goods and Services Expenditures in Cannabis Processing**

Sector of Expenditure:	Cannabis Processing	
	Extractors	Products Mfc.
Cannabis Sector Inputs	53.4%	18.2%
Cannabis Sector Services	9.9%	7.9%
Advertising/Promotion	4.5%	1.9%
Costs of Premises	1.6%	1.0%
Equipment	3.7%	1.0%
Insurance Services	0.9%	0.6%
Other Operational Expenses	5.3%	52.3%
Packaging	14.8%	9.0%
Professional Services	3.4%	6.2%
Security	0.9%	0.5%
Utilities	1.6%	1.4%
	<b>100%</b>	<b>100%</b>

<sup>19</sup> See Appendix 4 and 5 for further details of the goods and expenditures by the extractors and product manufacturers.

### 3.3 The Cannabis Retailing Industry

Cannabis sales to consumers occur through three types of retailers in our analysis: in-store retailers, direct to home (delivery) retail, and retail sales through dedicated restaurants, entertainment venues, and hotels/B&Bs (food and accommodation). The division of sales to consumers across these three channels varies among the various scenarios, which we detail in Part Four.

Based on our review of AUMA, we assume that in-store delivery will consist of dedicated cannabis store sales similar to existing medical marijuana dispensaries. Hence, we used studies of existing stores and dispensaries to estimate these operations' expenditures.<sup>20</sup> The other two channels of cannabis retailing involved fewer precedents from which to draw. Therefore, the retail delivery model is based on e-commerce and non-store retail operations where consumers can go online or call-in orders followed by delivery of their purchases.

While existing non-store retail operations can form a foundation for retail delivery operations, it was necessary to modify the non-store operations to reflect cannabis product costs and transportation restrictions. The cost of cannabis was captured by drawing on the in-store operations, but adjustments for transportation restrictions were slightly more complicated. Because cannabis remains illegal nationally, it is not possible to use existing delivery services such as the US Post Office, Federal Express (FedEx), or United Parcel Service (UPS) to ship purchases to consumers. Therefore, these operations must deliver the purchases directly to consumers themselves or hire a licensed cannabis transportation provider. While it is possible that the cannabis transportation providers will undertake physical delivery, for this analysis we have assumed delivery is provided by these retail operations, hence they incur relatively high capital expenditures that reflect vehicle purchases for delivery.

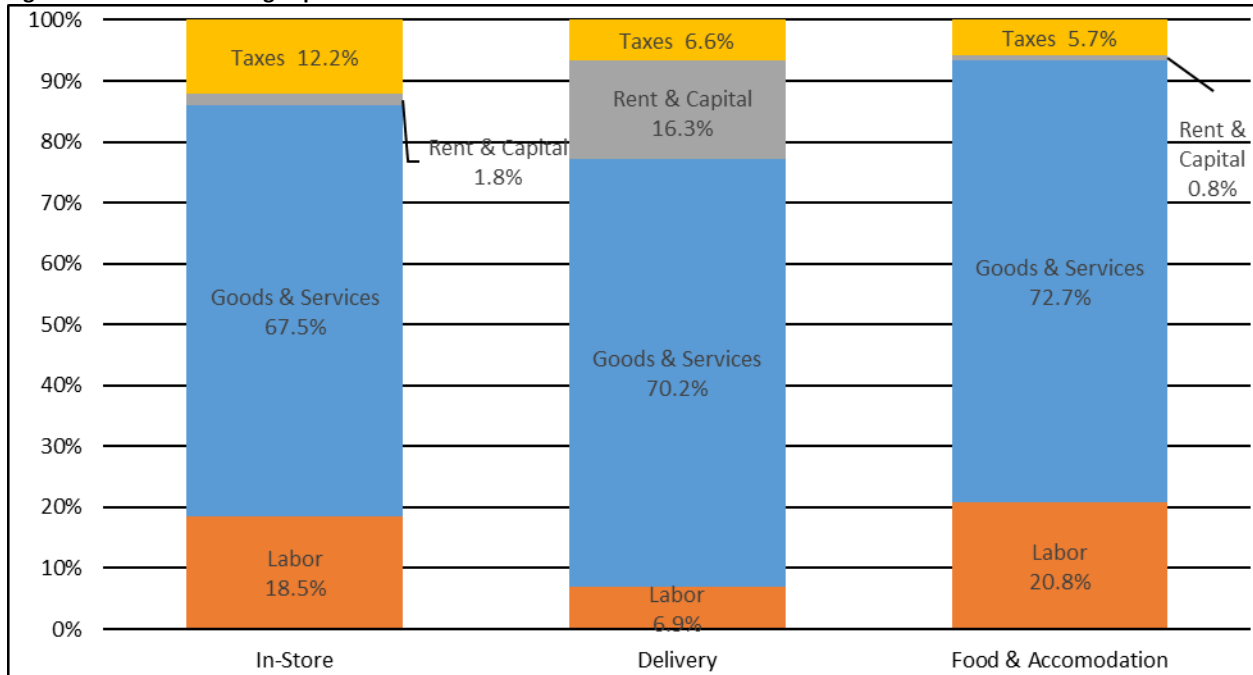
In analyzing food and accommodation retailing, our approach is similar to the one followed in analyzing product manufacturers, namely developing a highly stylized (aggregated) operation that reflects a variety of distinct industries. In this case we combined a range of restaurants and accommodation operations to identify cost and input purchase structures.<sup>21</sup> Using weights to reflect the existing scale of these industries in the Sacramento area, these retailers were then used to define a single food and accommodation operation.

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<sup>20</sup> Caulkin et al. (2013a), Caulkin et al. (2013b), Caulkin and Dahlkemper (2013).

<sup>21</sup> These industries included hotels, motels, and bed and breakfasts, as well as full-service restaurants, limited service restaurants, and drinking establishments.

**Figure 4 Cannabis Retailing Expenditure Shares**



The division of expenditures across the various types of retailers is reported in Figure 4, and Table 9 provides a more detailed summary of their expenditures on goods and services.<sup>22</sup>

**Table 9 Goods and Services Expenditures in Cannabis Retailing**

Sector of Expenditure:	Cannabis Retailing		
	In-Store	Delivery	Food & Acc.
Cannabis Sector Inputs	65.9%	59.6%	60.2%
Cannabis Sector Services	3.6%	3.6%	0.9%
Advertising/Promotion	5.5%	6.1%	3.0%
Costs of Premises	9.8%	6.5%	6.3%
Equipment	1.2%	8.2%	0.9%
Insurance Services	0.8%	0.9%	1.0%
Other Operational Expenses	3.4%	4.6%	16.6%
Professional Services	4.7%	4.6%	7.0%
Security	3.3%	3.5%	0.7%
Utilities	1.9%	2.3%	3.2%
	<b>100%</b>	<b>100%</b>	<b>100%</b>

<sup>22</sup> See Appendix 6 to 8 for further details of the goods and expenditures by the in-store, delivery, and food/accommodation retail.

## **3.4 Other Cannabis Industries**

### **3.4.1 The Cannabis Transportation Industry**

AUMA requires that any cannabis transported between premises takes place under a licensed cannabis transportation provider. This means that all shipments between industries and among operations within industries in the cannabis sector must be made by a licensed cannabis transportation service provider. These operations are essentially similar to other transit service providers like FedEx and UPS, but federal law prevents these carriers from transporting cannabis. Therefore, we separate these expenditures for transportation within the sector. However, we have in this analysis limited industry scope to intra-sectoral transportation and assume that, in-line with AUMA, sales to consumers are provided by retail delivery operations.

### **3.4.2 The Cannabis Testing Industry**

Testing of all cannabis sold to consumers for its potency and cannabinoid composition is another requirement of AUMA. This requires laboratory analysis of the product similar to nutritional labeling on food products. As such, we assume that cannabis testing occurs through the existing laboratory and analytical testing services sector. Because these services are part of the cannabis production process, we separate these expenditures and identify them as the additional distinct component of production costs which they form.

### **3.4.3 The Cannabis Microbusiness Industry**

AUMA is structured to limit the extent to which large corporate operations can dominate the sector. An important part of these restrictions is in general limiting a license holder to a single operation. That is, under AUMA you could not get a license to cultivate and process cannabis. However, AUMA allows for a number of licenses across stages under the Microbusiness Industry. A business operating with a microbusiness license cannot cultivate an area of 10,000 square feet or more but may engage in all other aspects of the sector as long as those operations involve the product it's cultivated and they do not source product from other cultivators or processors.

## 4 Cannabis Sector Market Scenarios

Alternative supply-side and demand-side influences defining the structures of a legal cannabis sector in the Sacramento area are described in this part of the analysis. In Section 4.1 three alternative policy environments influencing cannabis supplies in the Sacramento area are described. A range of three alternative forecasts regarding statewide demand for cannabis are then detailed in Section 4.2. The nine distinct market structures formed from this combination of supply and demand alternatives are then set out in Section 4.3 along with their associated direct employment and output values. Those values are then used in Part Five to analyze the economic impact of a legal cannabis sector in 2018 on the Sacramento area economy.

### 4.1 Sacramento Area Cannabis Supply Scenarios

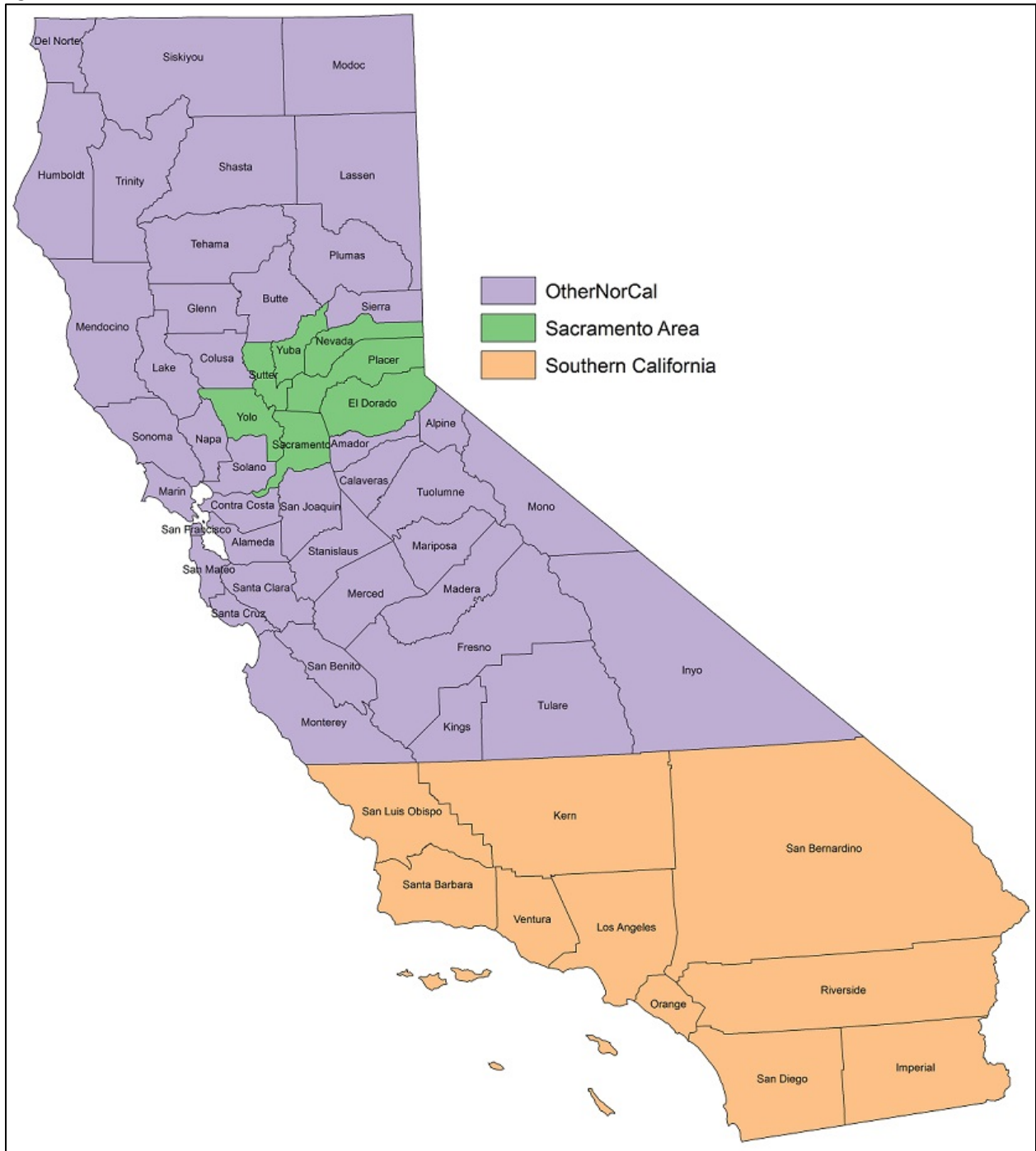
The statewide supply provided by Sacramento area cultivators and processors depends on their comparative advantage. There are three distinct geographically defined California markets available to the Sacramento area cannabis sector in this analysis: 1) The Sacramento area, 2) Other Northern California, and 3) Southern California. These markets and their constituent counties are represented in Figure 5 on the next page.

We propose three alternative cannabis market supply scenarios. In the first scenario, local and county governments are assumed to take a hostile anti-cannabis industry stance. As a result, the Sacramento area has a very limited cannabis sector that supplies only a minority of the region's demand and does not export to other parts of the state. In the second scenario, we assume local governments have a more moderate attitude towards the sector and has some capacity to supply other parts of Northern California. The last scenario assumes local governments seek to maximize the economic potential of the sector and existing capabilities in cannabis across the region are leveraged in a recreationally legal cannabis market to create a cannabis cluster that supplies a significant share of demand across the state. These market scenarios and their supply shares are summarized in Table 10 below.

**Table 10 Sacramento Area Regional Cannabis Supply in 2018**

Market Scenario	Regional Shares Supplied by Sacramento:		
	GSA	Other NorCal	SoCal
Limited Scenario	20%	0%	0%
Local Scenario	80%	10%	0%
Cluster Scenario	90%	50%	10%

Figure 5 Statewide Cannabis Markets



## 4.2 Sacramento Area Cannabis Demand Scenarios

In Part Two, a ‘baseline’ statewide demand for cannabis in 2018 by those age 21 and over was estimated to be 640 tonnes. In order to find the geographic distribution, we assume that demand is proportional to projected 2018 statewide population shares.<sup>23</sup> Table 11 reports these projected shares of the 21-years of age and older population across our three California markets.

**Table 11 Geographic distribution of cannabis demand in 2018**

Region	% of 2018 CA Demand	Baseline demand (kg)
<b>Greater Sacramento Area</b>	<b>6.5%</b>	<b>41,630</b>
<b>Other NorCal</b>	<b>33.1%</b>	<b>211,992</b>
<b>SoCal</b>	<b>60.4%</b>	<b>386,837</b>
<b>Grand Total</b>	<b>100%</b>	<b>640,459</b>

Next, statewide and regional shares of demand for cannabis in a recreationally legal market environment need to be estimated. In addition to ‘baseline’ demand determined in Section Two, we develop two additional demand scenarios. Both cases reflect very general statewide changes in demand and incorporate initial experience with legalization in the states of Colorado and Washington.<sup>24</sup> Under our moderate “low-growth” scenario, baseline demand increases by an additional 10% or 64 tonnes, which equates to total demand of 704.5 tonnes. In the second case, we propose a more aggressive “high-growth” scenario where baseline demand increases by 20% or 121.1 tonnes, bringing total demand to 768.6 tonnes. These three demand scenarios are summarized in Table 12 below according to their associated statewide and regional shares of demand.

**Table 12 Statewide & Regional Cannabis Demand in 2018**

2018 Demand by Region:	Tonnes:		
	Baseline	Low-Growth	High-Growth
<b>Greater Sacramento Area</b>	41.6	45.8	50.0
<b>Other NorCal</b>	212.0	233.2	254.4
<b>SoCal</b>	386.8	425.5	464.2
<b>Statewide Grand Total</b>	<b>640.5</b>	<b>704.5</b>	<b>768.6</b>

## 4.3 Sacramento Area Cannabis Market Scenarios

The supply scenarios from Table 10 are combined with the demand scenarios in Table 12 to estimate Sacramento area market output for each scenario. For example, under baseline demand and the limited supply scenario, Sacramento area demand is 41.6 tonnes of which 20% is supplied by the local industry.<sup>25</sup> Similarly, under that market scenario, Other Northern California demand is 212 tonnes and

<sup>23</sup> As noted in Part Two, NSDUH data from the SAMHDA website should be able to provide some regional information about the regional incidence of cannabis consumption in California, but that data is currently unavailable and so it is necessary to assume similar statewide frequency and intensity of cannabis consumption. Some details of statewide variation in cannabis consumption is available in Kilmer et al. (2010).

<sup>24</sup> See for example Kleiman et al (2015) and Reed (2016).

<sup>25</sup> See Row One, Column One of Table 10 and Row One, Column One of Table 12.

Southern California demand is 386.8 tonnes; these markets are not supplied by the Sacramento industry.<sup>26</sup> Therefore, Sacramento area output under this market scenario is 8.3 tonnes, which can be expressed by the following equation:  $41.6*(20\%)+212*(0\%)+386.8*(0\%)=8.3$  tonnes. Following similar calculations, Table 13 reports cultivator and, by assumption, sector-wide output for each market scenario.

**Table 13 Sacramento Area Cannabis Output by Market Scenario**

Market Scenario:		Tonnes of SAC Output:
Limited Scenario	Baseline	8.3
	Low-Growth	9.2
	High-Growth	10.0
Local Scenario	Baseline	54.5
	Low-Growth	60.0
	High-Growth	65.4
Cluster Scenario	Baseline	182.2
	Low-Growth	200.4
	High-Growth	218.6

The considerable range in the scale of local market impacts that are reported in Table 13 are important to highlight. Table 13 shows that local market output is heavily dependent on the assumed supply-side conditions. While we assume demand varies between the baseline and high-growth environments by up to 20%, under similar demand conditions the cluster supply-side environment is over 20 times the size of the limited conditions. Refining the likely supply-side conditions is therefore important to narrowing the range of potential impacts.

**Table 14 Sacramento Area Cannabis Sector Output (\$millions) by Industry and Supply/Demand Scenario**

Supply/Demand Scenario:		Total Cannabis Industry Employment					
		Cultivators	Processors	Retail	Transport	Testing	Micro
Limited Scenario	Baseline	26.0	41.4	150.7	3.5	0.2	15.1
	Low-Growth	28.6	45.5	165.7	3.8	0.2	16.6
	High-Growth	31.2	49.7	180.8	4.2	0.3	18.1
Local Scenario	Baseline	170.3	271.0	602.6	17.5	3.2	75.4
	Low-Growth	187.3	298.1	662.9	19.2	3.5	82.9
	High-Growth	204.3	325.2	723.1	21.0	3.8	90.4
Cluster Scenario	Baseline	569.1	905.8	677.9	42.0	16.6	170.9
	Low-Growth	626.0	996.4	745.7	46.2	18.2	187.9
	High-Growth	682.9	1,087.0	813.5	50.4	19.9	205.0

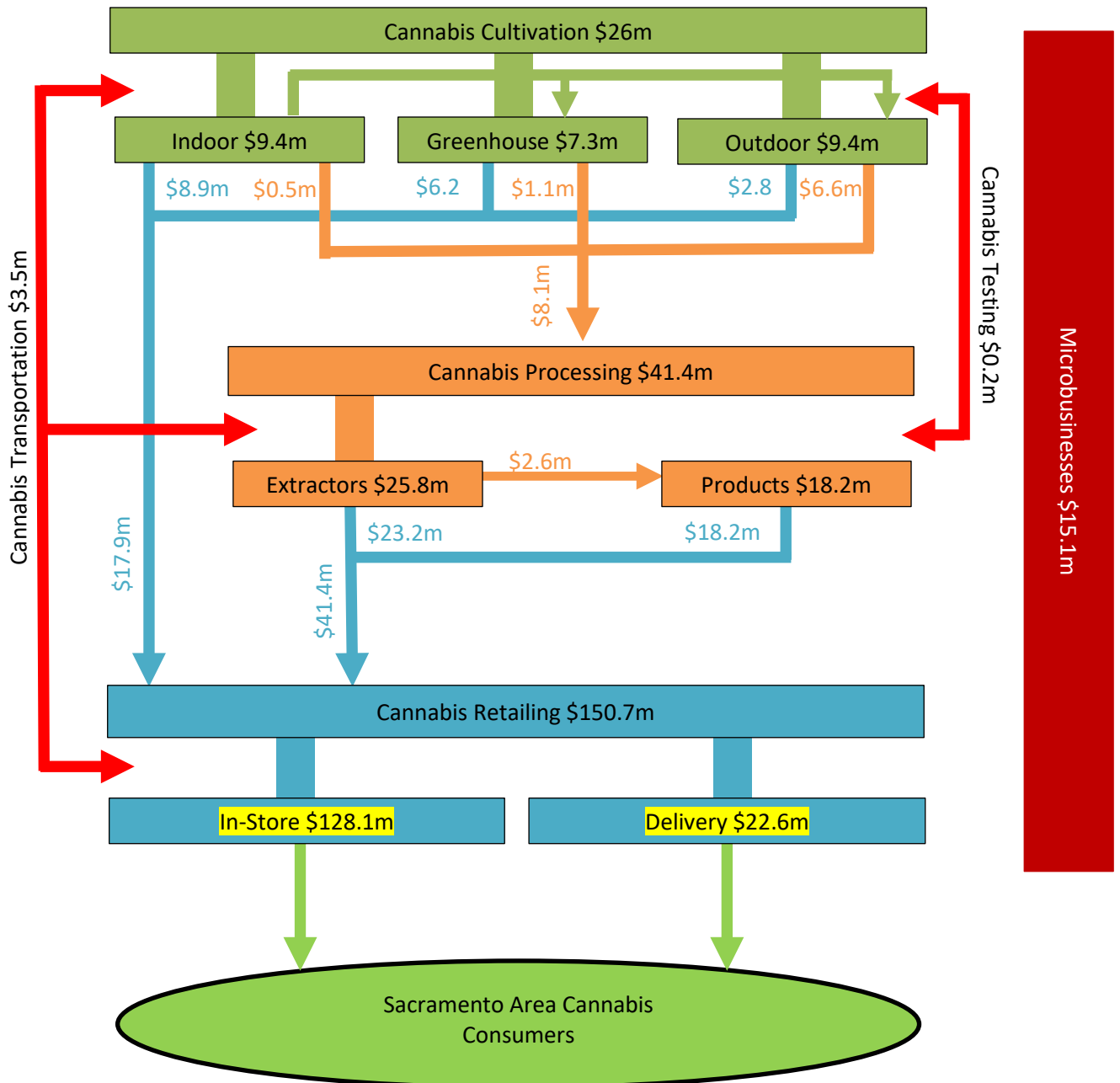
Using the assumption of constant returns to scale, the amount supplied by each grow facility (Section 3.1), can be divided by the Sacramento area market demand in Table 13 to establish the associated direct sales (output) from the cultivation industry. Similarly, the cannabis flows from the cultivation industry down the value chain create impacts through the rest of the sector. Applying the assumptions

<sup>26</sup> See Row One, Column Two of Table 10 and Row Two, Column One of Table 12 as well as Row One, Column Three of Table 10 and Row Three, Column One of Table 12 .



of the flows detailed in Part Three, Table 14 summarizes the direct output effects associated with each scenario. As these scenarios define a market in which recreational cannabis sales are legal at a state level, they define a new market environment. However, the economic impact of that market is only new in that it is not part of the existing medical market nor part of the existing illegal market.

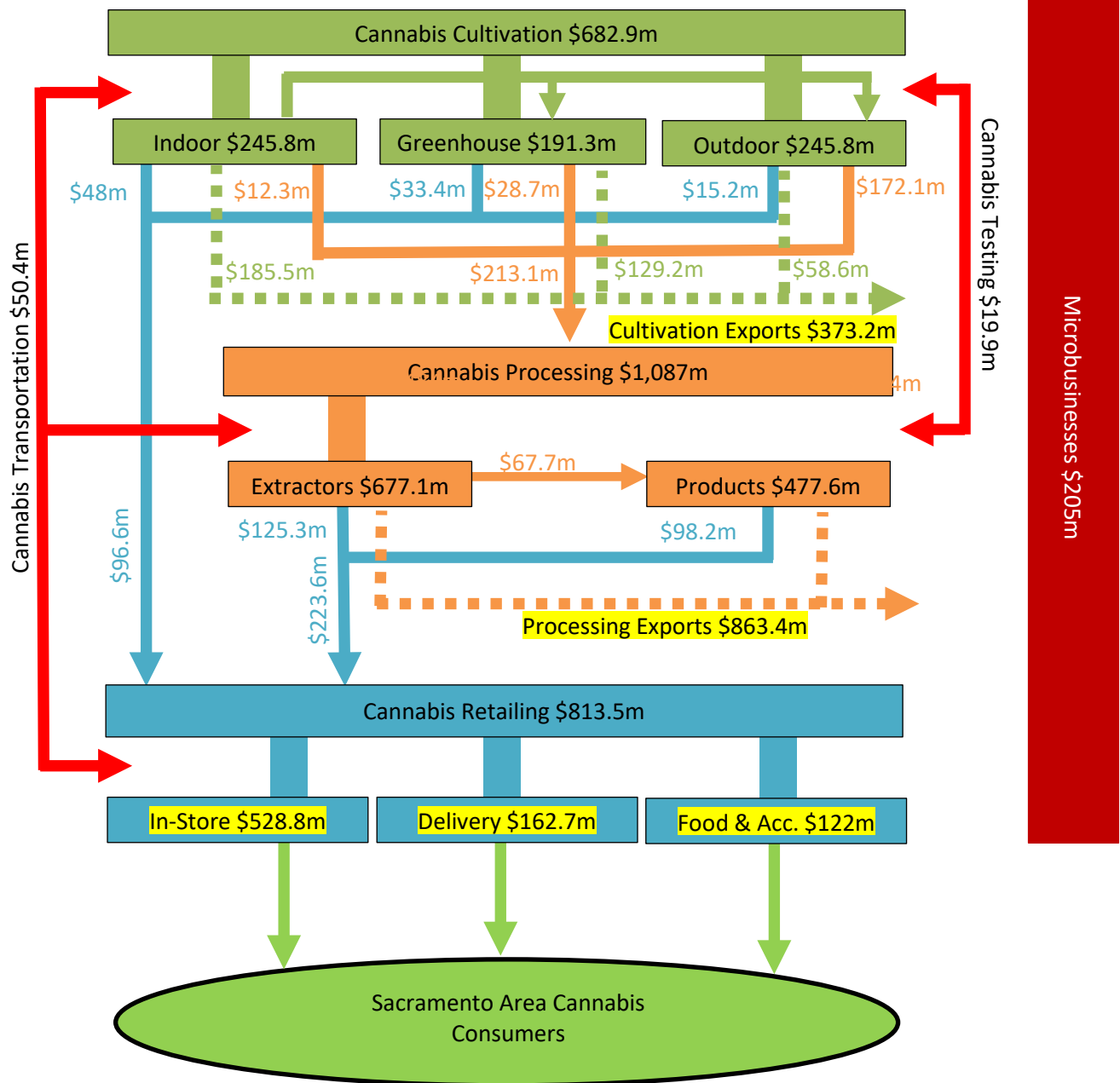
Figure 6 Overview of the Cannabis Sector Impacts under Limited Baseline Scenario



The flow of sales and the value addition associated with each stage in the cannabis sector under the limited baseline scenario are illustrated in Figure 6. Under this scenario there are no supplies of cannabis to other regions. Sales (highlighted in yellow) to Sacramento area consumers represent the total direct

impact of the sector.<sup>27</sup> However, if sales to other California regions are occurring, these exports must be added to the sales to Sacramento area consumers in order to derive the total direct impact of the cannabis sector. These additional flows are illustrated in Figure 7 below.<sup>28</sup> The component industry totals in Table 14 and the overall total direct output impacts from each scenario, such as those described in Figure 6 and Figure 7, form the basis with which we can analyze the associated economic impacts in Part Five.

**Figure 7 Overview of the Cannabis Sector Direct Impacts under Cluster High-Growth Scenario**



<sup>27</sup> As described in Part 5, the total direct output impact under the limited baseline scenario is \$150.7 million.

<sup>28</sup> As described in Part 5, the total direct output impact under the cluster high-growth scenario is \$2,050.2 million.

## 5 Economic Impact Analysis

In order to analyze the economic impacts of the sector and its industries, we utilize economic modelling software called IMPLAN, which allows us to develop a model of the Sacramento area economy.<sup>29</sup> This model is in a sense a general accounting system of transactions between industries, businesses, and consumers that estimates the range of economic impacts. We thereby create a complete, extremely detailed Social Accounting Matrices and Multiplier Models of the Sacramento Area economy that enables in-depth examination of the impacts of a legal cannabis industry in 2018.

IMPLAN was developed in the late-1970s by the United States Forest Service and researchers at the University of Minnesota. The software was initially based on input-output accounts whose analysis was pioneered in the Nobel Prize winning work of Wassily Leontief. As the software evolved, it began using Social Accounting Matrices to incorporate transactions among institutional agents in its analysis. Currently, IMPLAN is among the most widely used economic impact modeling systems. It provides a transparent and detailed approximation of economic impacts that is widely utilized by businesses and government agencies.

The full range of economic impacts that result from the sector's employment, known as the Total Effect, is the sum of the direct, indirect, and induced effects:

- **Direct Effects** are the changes in jobs and income directly supported by the industry such as the jobs held by a greenhouse cannabis farm's employees.
- **Indirect Effects** represent the iterative impacts of inter-industry transactions as supplying industries respond to demand from the sector(s) where the initial expenditures occurred. An example of an indirect impact would be employees of a plant nutrient supplier to an indoor cannabis farm.
- **Induced Effects** reflect the expenditures made by recipients of wages in the direct and indirect industries. Examples of induced impacts include employees' expenditures on items such as retail purchases, housing, food, medical services, banking, and insurance.

In these analyses, the total, direct, indirect, and induced effects are reported by employment, output, and labor income:

- **Employment** is the number of full- and part-time jobs based on an annual average of monthly jobs. In other words, employment is measured as a full year of employment. Thus, 3 temporary jobs that lasted for 4 months are reported as 1 job.
- **Output** represents the value of industry production. It accounts for the total change in the value of production in an industry for a given time period. Output varies as a measure across industries. For manufacturers, the value of production is sales plus or minus any change in inventories. For

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<sup>29</sup> Specifically, in this analysis we use IMPLAN Version 3.1 with calendar year 2013 data and results adjusted to 2016 values.

service sectors, the value of production equals their sales. While for retail and wholesale trade, the value of production equals their gross margin and not their gross sales.

- **Labor Income** is the sum of employee compensation and proprietor income. Employee compensation includes wages, salaries, benefits, and all other employer contributions, while proprietor income consists of payments received by self-employed individuals, and unincorporated business owners.

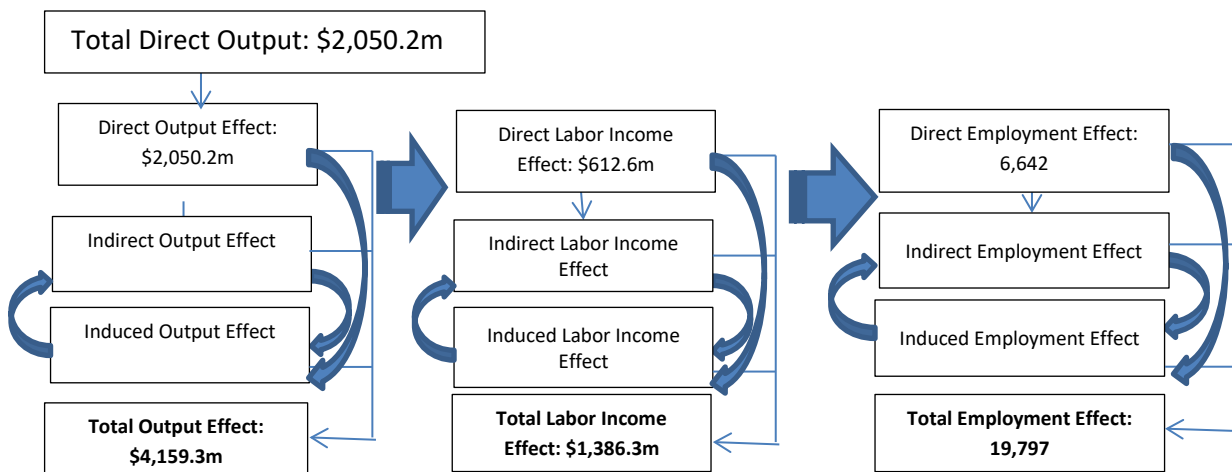
The economic model is defined for a specific geographic area, and economic impacts are calculated for that area. Indirect and induced effects are calculated using regional purchase coefficients calculated by IMPLAN, and thus economic impacts do not include spending outside the region of analysis even if the purchases are made by individuals or businesses located within that region.

### 5.1 Economic Impacts of the Cannabis Sector

In Section 4.3, the Sacramento area’s 2018 total direct output impacts were calculated and illustrated for the limited baseline scenario and the cluster high-growth scenario. Analyzing each of the other 25 scenarios in this analysis we confirmed that those two scenarios had the smallest and largest direct impacts respectively. As such we find that the sector’s direct output impacts range from \$150.7 million to \$2,050 million. Our analysis equates that level of output to direct employment between 602 and 6,642 jobs. Similarly, the direct effect on labor income is estimated from \$33.9 million to \$612.6 million.

In order to estimate the sector’s total effects indirect and induced impacts need to be estimated and combined with the direct effects. Figure 8 illustrates the generation of these total effects under the scenario of high demand growth and a strong comparative advantage in the market under the cluster scenario. Therefore, we see how the \$2.1 billion in cannabis sector output generates a total of \$4.2 billion of output in the Sacramento area economy. Likewise, the figure shows how the direct labor income of \$0.6 billion under that scenario leads to a total labor income effect of \$1.4 billion and the 6,642 in direct jobs leads to 19,797 in total employment.

**Figure 8 Illustrative Impacts of High Demand & Cluster Supply Scenario Cannabis Sector on the Sacramento Area Economy**



Estimating the total effects for each scenario requires a similar process to the one illustrated in Figure 8. Those calculations were made within our impact analysis model and the results for each supply/demand scenario are reported in Table 15 below. Our analysis suggests that in 2018 the cannabis sector may support output between \$322 million and \$4.2 billion in the Sacramento area’s economy through its total effects. Those levels of output equal total labor income effects from \$97 million to \$1.4 billion. Similarly, the total effects on employment are estimated to range between 1,578 and 19,797 jobs.

**Table 15 Sacramento Area Cannabis Sector Economic Impacts by Supply and Demand Scenarios**

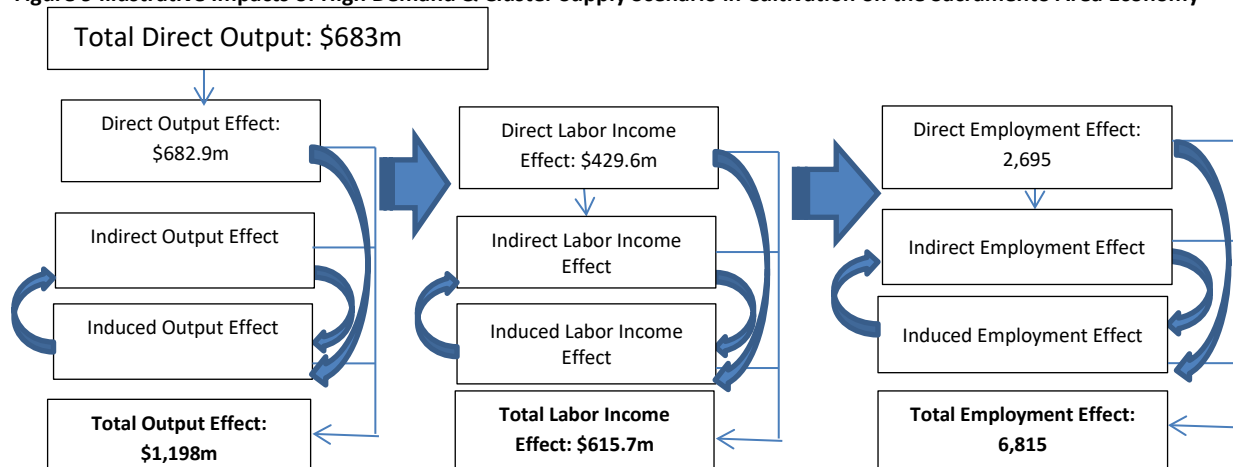
Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	602	662	722	2,793	3,072	3,351	5,535	6,089	6,642
	Total Effect	1,578	1,736	1,893	7,657	8,423	9,189	16,497	18,147	19,797
Labor Income (\$'000s)	Direct Effect	\$33,861	\$37,247	\$40,633	\$184,077	\$202,485	\$220,893	\$510,533	\$561,587	\$612,640
	Total Effect	\$96,598	\$106,258	\$115,918	\$488,461	\$537,307	\$586,154	\$1,155,270	\$1,270,797	\$1,386,324
Output (\$'000s)	Direct Effect	\$150,650	\$165,715	\$180,780	\$753,621	\$828,983	\$904,345	\$1,708,467	\$1,879,314	\$2,050,161
	Total Effect	\$321,594	\$353,753	\$385,912	\$1,583,375	\$1,741,712	\$1,900,050	\$3,466,058	\$3,812,664	\$4,159,269

## 5.2 Economic Impacts of Cannabis Industries

### 5.2.1 Economic Impacts of Cultivation

The Sacramento Area’s 2018 total direct output impacts from cannabis cultivation were reported in Table 14 in Section 4.3. These showed that cultivation operations’ direct output impacts range from \$45.6 million to \$1,198 million. That level of output equates to a direct effect on labor income between \$16.3 million and \$429.6 million. Similarly, the direct employment effect is estimated between 103 and 2,695 jobs. Estimating the industry’s total effects requires indirect and induced impacts to be estimated and combined with the direct effects. In similar fashion to the analysis of the sector as a whole, Figure 9 illustrates the generation of these total effects under the scenario of high demand growth and a strong comparative advantage in the market under the cluster scenario.

**Figure 9 Illustrative Impacts of High Demand & Cluster Supply Scenario in Cultivation on the Sacramento Area Economy**



Estimating the total effects for each scenario requires a similar process to the one illustrated in Figure 9. Those calculations were made within our impact analysis model and the results for each supply/demand scenario are reported in Table 16 below. Our analysis suggests that in 2018 the cannabis cultivation industry support output between \$45.6 million and \$1.2 billion in the Sacramento Area’s economy through its total effects. Those levels of output equal total labor income effects from \$23.5 million to \$616 million. The total effects on employment are estimated to range between 260 and 6,815 jobs.

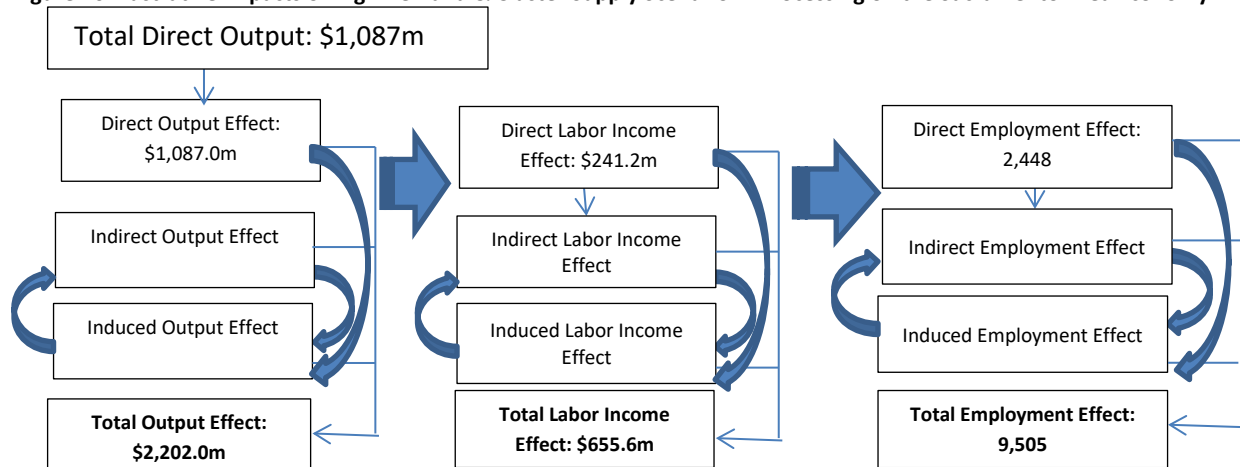
**Table 16 Sacramento Area Cannabis Cultivation Economic Impacts by Supply and Demand Scenarios**

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	103	113	123	672	739	806	2,246	2,470	2,695
	Total Effect	260	286	312	1,699	1,869	2,039	5,680	6,248	6,815
Labor Income (\$'000s)	Direct Effect	\$16,360	\$17,996	\$19,632	\$107,110	\$117,821	\$128,532	\$357,964	\$393,760	\$429,557
	Total Effect	\$23,449	\$25,793	\$28,138	\$153,516	\$168,867	\$184,219	\$513,052	\$564,357	\$615,663
Output (\$'000s)	Direct Effect	\$26,010	\$28,611	\$31,212	\$170,287	\$187,316	\$204,345	\$569,102	\$626,013	\$682,923
	Total Effect	\$45,626	\$50,189	\$54,751	\$298,711	\$328,583	\$358,454	\$998,297	\$1,098,127	\$1,197,957

### 5.2.2 Economic Impacts of Processing

The Sacramento Area’s 2018 total direct output impacts from cannabis processing were reported in Table 14 in Section 4.3. These showed that processing operations’ direct output impacts range from \$41.4 million to \$1,087 million. That level of output equates to a direct effect on labor income between \$9.2 million and \$241.2 million. Similarly, the direct employment effect is estimated between 93 and 2,448 jobs. Estimating the industry’s total effects requires indirect and induced impacts to be estimated and combined with the direct effects. In similar fashion to the analysis of the sector as a whole and cultivation, Figure 10 illustrates the generation of these total effects under the scenario of high demand growth and a strong comparative advantage in the market under the cluster scenario.

**Figure 10 Illustrative Impacts of High Demand & Cluster Supply Scenario in Processing on the Sacramento Area Economy**



Estimating the total effects for each scenario within our impact analysis model results in the direct and total effects reported in Table 17 below. Our analysis suggests that in 2018 the cannabis processing industry may support output between \$83.9 million and \$2.2 billion in the Sacramento Area’s economy through its total effects. Those levels of output equal total labor income effects from \$25 million to \$656 million. Similarly, the total effects on employment are estimated to range between 362 and 9,505 jobs.

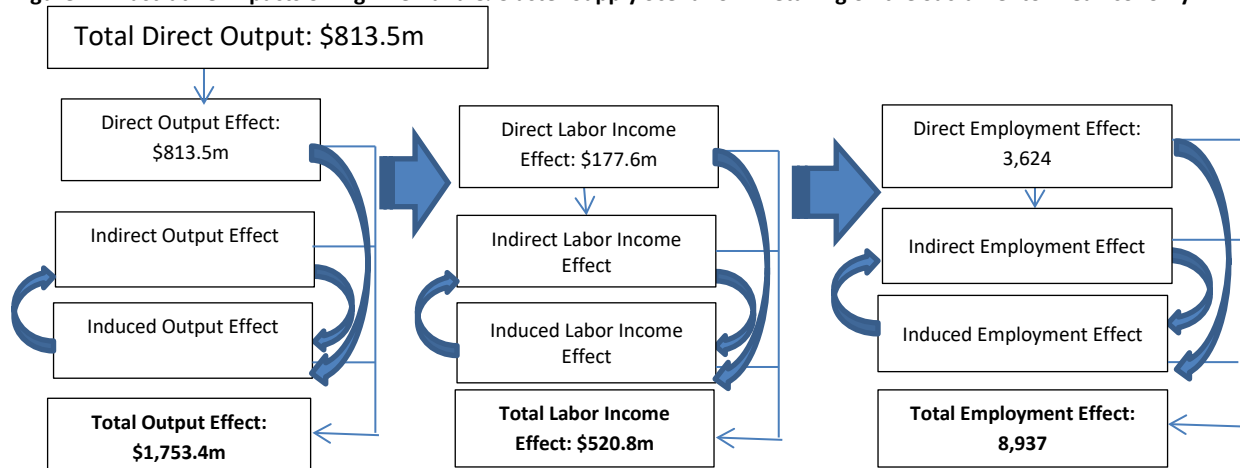
**Table 17 Sacramento Area Cannabis Processing Economic Impacts by Supply and Demand Scenarios**

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	93	103	112	610	671	732	2,040	2,244	2,448
	Total Effect	362	398	434	2,370	2,607	2,844	7,921	8,713	9,505
Labor Income (\$'000s)	Direct Effect	\$9,188	\$10,106	\$11,025	\$60,151	\$66,167	\$72,182	\$201,027	\$221,129	\$241,232
	Total Effect	\$24,969	\$27,466	\$29,963	\$163,469	\$179,816	\$196,163	\$546,316	\$600,947	\$655,579
Output (\$'000s)	Direct Effect	\$41,399	\$45,539	\$49,679	\$271,036	\$298,139	\$325,243	\$905,805	\$996,385	\$1,086,966
	Total Effect	\$83,866	\$92,252	\$100,639	\$549,064	\$603,970	\$658,876	\$1,834,977	\$2,018,475	\$2,201,973

### 5.2.3 Economic Impacts of Retailing

The Sacramento Area’s 2018 total direct output impacts from cannabis retailing were reported in Table 14 in Section 4.3. These showed that retailing operations’ direct output impacts range from \$150.7 million to \$813.5 million. That level of output equates to a direct effect on labor income between \$33.9 million and \$117.6 million. Similarly, the direct employment effect is estimated between 602 and 3,624 jobs. Estimating the industry’s total effects requires indirect and induced impacts to be estimated and combined with the direct effects. In similar fashion to the analysis of the sector as a whole and the other industries, Figure 11 illustrates the generation of these total effects under the scenario of high demand growth and a strong comparative advantage in the market under the cluster scenario.

**Figure 11 Illustrative Impacts of High Demand & Cluster Supply Scenario in Retailing on the Sacramento Area Economy**



Estimating the total effects for each scenario within our impact analysis model results in the direct and total effects reported in Table 18 below. Our analysis suggests that in 2018 the cannabis retailing industry may support output between \$321.6 million and \$1.8 billion in the Sacramento area’s economy through its total effects. Those levels of output equal total labor income effects from \$97.6 million to \$520.8 million. Similarly, the total effects on employment are estimated to range between 1,578 and 8,937 jobs.

**Table 18 Sacramento Area Cannabis Retailing Economic Impacts by Supply and Demand Scenarios**

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	602	662	722	2,424	2,666	2,909	3,020	3,322	3,624
	Total Effect	1,578	1,736	1,893	6,331	6,964	7,598	7,448	8,192	8,937
Labor Income (\$'000s)	Direct Effect	\$33,861	\$37,247	\$40,633	\$130,953	\$144,048	\$157,143	\$148,021	\$162,823	\$177,625
	Total Effect	\$96,598	\$106,258	\$115,918	\$382,765	\$421,042	\$459,318	\$434,011	\$477,413	\$520,814
Output (\$'000s)	Direct Effect	\$150,650	\$165,715	\$180,780	\$602,601	\$662,861	\$723,121	\$677,926	\$745,718	\$813,511
	Total Effect	\$321,594	\$353,753	\$385,912	\$1,289,574	\$1,418,532	\$1,547,489	\$1,461,201	\$1,607,321	\$1,753,441

## 5.2.4 Economic Impacts of Other Cannabis Industries

### Cannabis Transportation

The cannabis transportation industry’s total direct output impacts in the Sacramento area were reported in Table 14 in Section 4.3. Following a similar methodology to the other sectors the total effects for each scenario within our impact analysis model are reported in Table 19 below.

**Table 19 Sacramento Area Cannabis Transportation Economic Impacts by Supply and Demand Scenarios**

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	31	34	38	158	174	190	380	418	456
	Total Effect	48	52	57	241	265	289	579	636	694
Labor Income (\$'000s)	Direct Effect	\$1,197	\$1,317	\$1,436	\$6,045	\$6,649	\$7,254	\$14,533	\$15,986	\$17,440
	Total Effect	\$2,088	\$2,296	\$2,505	\$10,542	\$11,596	\$12,651	\$25,346	\$27,881	\$30,416
Output (\$'000s)	Direct Effect	\$3,460	\$3,807	\$4,153	\$17,475	\$19,222	\$20,969	\$42,014	\$46,215	\$50,416
	Total Effect	\$5,898	\$6,488	\$7,077	\$29,782	\$32,760	\$35,739	\$71,605	\$78,765	\$85,926



## **Cannabis Testing**

The cannabis transportation industry’s total direct output impacts in the Sacramento Area were reported in Table 14 in Section 4.3. Following a similar methodology to the other sectors the total effects for each scenario within our impact analysis model are reported in Table 20 below.

**Table 20 Sacramento Area Cannabis Testing Economic Impacts by Supply and Demand Scenarios**

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	2	2	2	25	28	30	131	144	158
	Total Effect	4	4	4	51	56	61	266	292	319
Labor Income (\$'000s)	Direct Effect	\$133	\$147	\$160	\$1,898	\$2,087	\$2,277	\$9,945	\$10,940	\$11,934
	Total Effect	\$221	\$243	\$265	\$3,146	\$3,461	\$3,776	\$16,488	\$18,137	\$19,786
Output (\$'000s)	Direct Effect	\$222	\$244	\$266	\$3,160	\$3,476	\$3,792	\$16,561	\$18,217	\$19,873
	Total Effect	\$464	\$510	\$557	\$6,611	\$7,272	\$7,933	\$34,643	\$38,107	\$41,571

## **Cannabis Microbusinesses**

Given that the microbusinesses are assumed to form a portion of the sector as a whole, the direct, indirect and induced impacts are a corresponding portion of the sector-wide impacts.<sup>30</sup> These total effects for each scenario within our impact analysis model are reported in Table 21 below.

**Table 21 Sacramento Area Cannabis Microbusiness Economic Impacts by Supply and Demand Scenarios**

Impact:	Supply:	Limited			Local			Cluster		
	Demand:	Base	Medium	High	Base	Medium	High	Base	Medium	High
Employment	Direct Effect	60	66	72	279	307	335	554	609	664
	Total Effect	158	174	189	766	842	919	1,650	1,815	1,980
Labor Income (\$'000s)	Direct Effect	\$3,386	\$3,725	\$4,063	\$18,408	\$20,248	\$22,089	\$51,053	\$56,159	\$61,264
	Total Effect	\$9,660	\$10,626	\$11,592	\$48,846	\$53,731	\$58,615	\$115,527	\$127,080	\$138,632
Output (\$'000s)	Direct Effect	\$15,065	\$16,572	\$18,078	\$75,362	\$82,898	\$90,434	\$170,847	\$187,931	\$205,016
	Total Effect	\$32,159	\$35,375	\$38,591	\$158,337	\$174,171	\$190,005	\$346,606	\$381,266	\$415,927

<sup>30</sup> See Section 3.4.3 for a further discussion of the Microbusiness industry’s structure in our analysis.

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# Appendices

## Appendix One Indoor Farming Goods and Services Expenditure Shares

<b><i>Cannabis Sector Inputs</i></b>	
Indoor Cannabis Farming	0.23%
<b><i>Costs of Premises</i></b>	
Newly constructed commercial structures, including farm structures	0.88%
Maintained and repaired nonresidential structures	0.34%
Real estate buying and selling, leasing, managing, and related services	0.20%
Landscape and horticultural services	0.05%
Services to buildings	0.01%
<b><i>Equipment</i></b>	
Lighting fixtures	1.655%
Air conditioning, refrigeration, and warm air heating equipment	1.317%
Farm machinery and equipment	0.640%
Handtools	0.181%
Lawn and garden equipment	0.131%
Motor vehicle electrical and electronic equipment	0.096%
Leasing of nonfinancial intangible assets	0.095%
Power-driven handtools	0.058%
Commercial and industrial machinery and equipment rental and leasing services	0.047%
Storage batteries	0.035%
All other miscellaneous manufactured products	0.027%
Rubber and plastics hoses and belts	0.022%
Scales, balances, and miscellaneous general purpose machinery	0.022%
Steel wire	0.009%
Motors and generators	0.009%
Rope, cordage, twine, tire cord and tire fabric	0.008%
All other miscellaneous wood products	0.008%
<b><i>Growing Material</i></b>	
Retail services - Building material and garden equipment and supplies stores	6.30%
Other basic inorganic chemicals	1.75%
Pesticides and other agricultural chemicals	1.74%
Phosphatic fertilizer	1.73%
Nitrogenous fertilizer	1.58%
Other miscellaneous chemical products	0.05%
<b><i>Insurance Services</i></b>	
Insurance	0.34%
Insurance agencies, brokerages, and related services	0.04%
<b><i>Other Operational Expenses</i></b>	
Commercial and industrial machinery and equipment repair and maintenance	0.10%
Monetary authorities and depository credit intermediation	0.70%
Other financial investment services	0.09%
Electronic and precision equipment repair and maintenance	0.02%
Retail services - Nonstore retailers	0.08%
Nondepository credit intermediation and related activities	0.08%
Retail services- Clothing and clothing accessories stores	0.06%
Software publishers	0.03%
Securities and commodity contracts intermediation and brokerage	0.02%
Retail services - Miscellaneous store retailers	0.02%
Retail services - Gasoline stores	0.02%
<b><i>Packaging</i></b>	
Plastics packaging materials and unlaminated films and sheets	0.13%
Textile bags and canvas	0.003%
<b><i>Professional Services</i></b>	
Support activities for agriculture and forestry	36.07%
Accounting, tax preparation, bookkeeping, and payroll services	0.41%
Other computer related services, including facilities management services	0.16%
Computer systems design services	0.08%
Business and professional services	0.08%
Legal services	0.06%
Business support services	0.01%
<b><i>Security</i></b>	
Investigation and security services	1.99%
<b><i>Utilities</i></b>	
Electricity transmission and distribution	39.09%
Natural gas distribution	0.47%
Water, sewage and other systems	0.47%
Wired telecommunications	0.06%
Wireless telecommunications (except satellite)	0.10%
Satellite, telecommunications resellers, and all other telecommunications	0.01%

## Appendix Two Greenhouse Farming Goods and Services Expenditure Shares

<i>Cannabis Sector Inputs</i>	
Indoor Cannabis Farming	0.36%
<i>Costs of Premises</i>	
Newly constructed commercial structures, including farm structures	1.12%
<i>Equipment</i>	
Lighting fixtures	0.40%
Air conditioning, refrigeration, and warm air heating equipment	0.32%
Handtools	0.22%
Farm machinery and equipment	0.15%
Motor vehicle electrical and electronic equipment	0.12%
Leasing of nonfinancial intangible assets	0.12%
Power-driven handtools	0.07%
Storage batteries	0.04%
All other miscellaneous manufactured products	0.03%
Lawn and garden equipment	0.03%
Rubber and plastics hoses and belts	0.03%
Scales, balances, and miscellaneous general purpose machinery	0.03%
Commercial and industrial machinery and equipment rental and leasing services	0.01%
Steel wire	0.01%
Motors and generators	0.01%
Rope, cordage, twine, tire cord and tire fabric	0.01%
All other miscellaneous wood products	0.01%
Overhead cranes, hoists, and monorail systems	0.001%
<i>Growing Material</i>	
Retail services - Building material and garden equipment and supplies stores	12.55%
Other basic inorganic chemicals	1.96%
Pesticides and other agricultural chemicals	1.95%
Phosphatic fertilizer	1.94%
Nitrogenous fertilizer	1.77%
Other miscellaneous chemical products	0.06%
<i>Insurance Services</i>	
Insurance	0.45%
Insurance agencies, brokerages, and related services	0.05%
<i>Other Operational Expenses</i>	
Monetary authorities and depository credit intermediation	0.86%
Commercial and industrial machinery and equipment repair and maintenance	0.12%
Other financial investment services	0.12%
Retail services - Nonstore retailers	0.10%
Nondepository credit intermediation and related activities	0.09%
Retail services- Clothing and clothing accessories stores	0.07%
Retail services - General merchandise stores	0.07%
Software publishers	0.03%
Securities and commodity contracts intermediation and brokerage	0.03%
Electronic and precision equipment repair and maintenance	0.02%
Retail services - Gasoline stores	0.02%
<i>Packaging</i>	
Textile bags and canvas	0.00%
Plastics packaging materials and unlaminated films and sheets	0.15%
<i>Professional Services</i>	
Support activities for agriculture and forestry	44.77%
Accounting, tax preparation, bookkeeping, and payroll services	0.50%
Other computer related services, including facilities management services	0.20%
Computer systems design services	0.10%
Business and professional services	0.09%
Legal services	0.08%
Business support services	0.01%
<i>Security</i>	
Investigation and security services	2.77%
<i>Utilities</i>	
Electricity transmission and distribution	24.71%
Natural gas distribution	0.52%
Water, sewage and other systems	0.52%
Wireless telecommunications (except satellite)	0.13%
Satellite, telecommunications resellers, and all other telecommunications	0.01%
Wired telecommunications	0.08%

## Appendix Three Outdoor Farming Goods and Services Expenditure Shares

<i>Cannabis Sector Inputs</i>	
Indoor Cannabis Farming	1.7%
<i>Costs of Premises</i>	
Newly constructed commercial structures, including farm structures	3.7%
<i>Equipment</i>	
Farm machinery and equipment	0.771%
Lawn and garden equipment	0.158%
Handtools	0.099%
Commercial and industrial machinery and equipment rental and leasing services	0.057%
Leasing of nonfinancial intangible assets	0.052%
Storage batteries	0.019%
All other miscellaneous manufactured products	0.015%
Rubber and plastics hoses and belts	0.012%
Scales, balances, and miscellaneous general purpose machinery	0.012%
Steel wire	0.005%
Motors and generators	0.005%
Rope, cordage, twine, tire cord and tire fabric	0.004%
All other miscellaneous wood products	0.004%
<i>Growing Material</i>	
Retail services - Building material and garden equipment and supplies stores	19.0%
Pesticides and other agricultural chemicals	9.5%
Phosphatic fertilizer	9.4%
Nitrogenous fertilizer	8.6%
Other miscellaneous chemical products	0.3%
<i>Insurance Services</i>	
Insurance	1.1%
Insurance agencies, brokerages, and related services	0.1%
<i>Other Operational Expenses</i>	
Monetary authorities and depository credit intermediation	0.38%
Commercial and industrial machinery and equipment repair and maintenance	0.05%
Other financial investment services	0.05%
Nondepository credit intermediation and related activities	0.04%
Retail services- Clothing and clothing accessories stores	0.03%
Retail services - General merchandise stores	0.03%
Software publishers	0.02%
Securities and commodity contracts intermediation and brokerage	0.01%
Electronic and precision equipment repair and maintenance	0.01%
Retail services - Miscellaneous store retailers	0.01%
Retail services - Gasoline stores	0.01%
<i>Packaging</i>	
Plastics packaging materials and unlaminated films and sheets	0.1%
<i>Professional Services</i>	
Support activities for agriculture and forestry	34.89%
Accounting, tax preparation, bookkeeping, and payroll services	0.22%
Other computer related services, including facilities management services	0.09%
Business and professional services	0.04%
Legal services	0.04%
Business support services	0.004%
<i>Security</i>	
Investigation and security services	6.7%
<i>Utilities</i>	
Water, sewage and other systems	2.5%
Wireless telecommunications (except satellite)	0.1%
Satellite, telecommunications resellers, and all other telecommunications	0.01%

## Appendix Four Extractors Goods and Services Expenditure Shares

<i>Cannabis Sector Inputs</i>	
Outdoor Cannabis Farming	46.69%
Greenhouse Cannabis Farming	5.00%
Indoor Cannabis Farming	1.67%
<i>Cannabis Sector Services</i>	
Cannabis Transportation	6.02%
Cannabis Testing	3.91%
<i>Advertising/Promotion</i>	
Advertising, public relations, and related services	4.51%
<i>Costs of Premises</i>	
Newly constructed commercial structures, including farm structures	0.83%
Maintained and repaired nonresidential structures	0.30%
Services to buildings	0.30%
Real estate buying and selling, leasing, managing, and related services	0.20%
<i>Equipment</i>	
Air conditioning, refrigeration, and warm air heating equipment	0.90%
Valve and fittings, other than plumbing	0.89%
Metal cans	0.46%
Other fabricated metals	0.41%
Machined products	0.36%
Commercial and industrial machinery and equipment rental and leasing services	0.29%
Air purification and ventilation equipment	0.22%
Air and gas compressors	0.17%
<i>Insurance Services</i>	
Insurance	0.87%
<i>Other Operational Expenses</i>	
Other basic inorganic chemicals	2.01%
Other basic organic chemicals	1.64%
Other miscellaneous chemical products	0.517%
Plastics materials and resins	0.384%
Industrial gases	0.234%
Retail services - General merchandise stores	0.200%
Commercial and industrial machinery and equipment repair and maintenance	0.179%
Monetary authorities and depository credit intermediation	0.083%
Waste management and remediation services	0.063%
<i>Packaging</i>	
Other plastics products	11.14%
Plastics packaging materials and unlaminated films and sheets	1.55%
Other pressed and blown glass and glassware	1.52%
Synthetic rubbers	0.63%
<i>Professional Services</i>	
Management consulting services	1.45%
Legal services	1.02%
Accounting, tax preparation, bookkeeping, and payroll services	0.69%
Computer systems design services	0.19%
<i>Security</i>	
Investigation and security services	0.86%
<i>Utilities</i>	
Electricity transmission and distribution	0.85%
Natural gas distribution	0.36%
Water, sewage and other systems	0.23%
Wired telecommunications	0.20%

## Appendix Five Product Manufacturers Goods and Services Expenditure Shares

<i>Cannabis Sector Inputs</i>	
Cannabis Extracts	17.56%
Other Cannabis Products	0.62%
<i>Cannabis Sector Services</i>	
Cannabis Testing	0.48%
Cannabis Transportation	7.41%
<i>Advertising/Promotion</i>	
Advertising, public relations, and related services	1.90%
<i>Costs of Premises</i>	
Newly constructed commercial structures, including farm structures	0.49%
Maintained and repaired nonresidential structures	0.50%
<i>Equipment</i>	
Valve and fittings, other than plumbing	0.73%
Air conditioning, refrigeration, and warm air heating equipment	0.26%
<i>Insurance Services</i>	
Insurance	0.58%
<i>Other Operational Expenses</i>	
Soybean and other oilseed processing	9.10%
Oilseeds	6.81%
Flavoring syrup and concentrate	4.33%
Dairy cattle and milk products	3.64%
Flour	3.17%
Fruit	3.08%
Industrial gases	2.79%
Other basic organic chemicals	2.35%
Sugar cane	2.30%
Fluid milk	2.27%
Wet corn	1.91%
Dehydrated food products	1.82%
Chocolate and confectioneries from cacao beans	1.51%
All other crops	1.43%
Coffee and tea	1.35%
Medicines and botanicals	1.08%
Toilet preparations	0.81%
Poultry and egg products	0.75%
Tree nuts	0.66%
Grains	0.63%
Monetary authorities and depository credit intermediation	0.41%
Plastics materials and resins	0.16%
<i>Packaging</i>	
Paperboard containers	4.95%
Other plastics products	2.74%
Plastics packaging materials and unlaminated films and sheets	1.29%
<i>Professional Services</i>	
Management consulting services	6.07%
Legal services	0.14%
<i>Security</i>	
Investigation and security services	0.54%
<i>Utilities</i>	
Electricity transmission and distribution	0.90%
Natural gas distribution	0.50%



## Appendix Six In-Store Retail Goods and Services Expenditure Shares

<i>Cannabis Sector Inputs</i>	
Cannabis Extracts	18.97%
Indoor Cannabis Farming	16.61%
Cannabis Products	13.55%
Greenhouse Cannabis Farming	11.57%
Outdoor Cannabis Farming	5.25%
<i>Cannabis Sector Services</i>	
Cannabis Laboratory Fees & Testing	0.23%
Cannabis Transportation Services	3.37%
<i>Advertising/Promotion</i>	
Advertising, public relations, and related services	5.45%
<i>Costs of Premises</i>	
Maintained and repaired nonresidential structures	0.51%
Real estate buying and selling, leasing, managing, and related services	8.93%
Landscape and horticultural services	0.11%
Services to buildings	0.25%
<i>Equipment</i>	
Hardware	0.13%
Commercial and industrial machinery and equipment repair and maintenance	0.51%
Leasing of nonfinancial intangible assets	0.56%
<i>Insurance Services</i>	
Insurance	0.77%
<i>Other Operational Expenses</i>	
Monetary authorities and depository credit intermediation	1.72%
Data processing, hosting, and related services	0.40%
Printed materials	0.30%
Waste management and remediation services	0.24%
Other plastics products	0.21%
Retail services - Nonstore retailers	0.13%
Retail services- Clothing and clothing accessories stores	0.09%
Finished textiles and fabrics	0.09%
Plastics packaging materials and unlaminated films and sheets	0.09%
Paper bags and coated and treated paper	0.09%
<i>Professional Services</i>	
Management of companies and enterprises	2.41%
Accounting, tax preparation, bookkeeping, and payroll services	0.59%
Employment services	0.57%
Business support services	0.53%
Legal services	0.27%
Other computer related services, including facilities management services	0.16%
Computer systems design services	0.14%
<i>Security</i>	
Investigation and security services	3.32%
<i>Utilities</i>	
Electricity transmission and distribution	1.14%
Wired telecommunications	0.51%
Wireless telecommunications (except satellite)	0.24%

## Appendix Seven Delivery Retail Goods and Services Expenditure Shares

<i>Cannabis Sector Inputs</i>	
Indoor Cannabis Farming	16.45%
Cannabis Extracts	15.49%
Greenhouse Cannabis Farming	11.46%
Cannabis Products	11.06%
Outdoor Cannabis Farming	5.19%
<i>Cannabis Sector Services</i>	
Cannabis Laboratory Fees & Testing	0.16%
Cannabis Transportation Services	3.42%
<i>Advertising/Promotion</i>	
Advertising, public relations, and related services	6.09%
<i>Costs of Premises</i>	
Maintained and repaired nonresidential structures	0.62%
Real estate buying and selling, leasing, managing, and related services	5.60%
Services to buildings	0.30%
<i>Equipment</i>	
Automotive equipment rental and leasing services	6.91%
Scenic and sightseeing transportation services and support activities for transportation	1.04%
Hardware	0.15%
Other motor vehicle parts	0.13%
<i>Insurance Services</i>	
Insurance	0.79%
Insurance agencies, brokerages, and related services	0.15%
<i>Other Operational Expenses</i>	
Monetary authorities and depository credit intermediation	2.09%
Commercial and industrial machinery and equipment repair and maintenance	0.50%
Data processing, hosting, and related services	0.49%
Printed materials	0.37%
Refined petroleum products	0.30%
Waste management and remediation services	0.29%
Other plastics products	0.25%
Automotive repair and maintenance, except car washes	0.19%
Retail services - Motor vehicle and parts dealers	0.12%
<i>Professional Services</i>	
Management of companies and enterprises	2.82%
Employment services	0.57%
Accounting, tax preparation, bookkeeping, and payroll services	0.51%
Computer systems design services	0.37%
Legal services	0.32%
<i>Security</i>	
Investigation and security services	3.46%
<i>Utilities</i>	
Electricity transmission and distribution	1.39%
Wired telecommunications	0.62%
Wireless telecommunications (except satellite)	0.30%

## Appendix Eight Food and Accommodation Retail Goods and Services Expenditure Share

<i>Cannabis Sector Inputs</i>	
Cannabis Extracts	3.44%
Indoor Cannabis Farming	16.79%
Cannabis Products	17.01%
Greenhouse Cannabis Farming	11.69%
Cannabis Retail Food and Accommodation	6.01%
Outdoor Cannabis Farming	5.30%
<i>Cannabis Sector Services</i>	
Cannabis Laboratory Fees & Testing	0.23%
Cannabis Transportation Services	0.67%
<i>Advertising/Promotion</i>	
Internet publishing and broadcasting and web search portals	0.29%
Advertising, public relations, and related services	2.74%
<i>Costs of Premises</i>	
Real estate buying and selling, leasing, managing, and related services	5.13%
Maintained and repaired nonresidential structures	1.16%
<i>Equipment</i>	
Leasing of nonfinancial intangible assets	0.94%
<i>Insurance Services</i>	
Insurance	1.00%
<i>Other Operational Expenses</i>	
Soybean and other oilseed processing	1.68%
Canned specialties	1.72%
Meat (except poultry) produced in slaughtering plant	0.95%
Processed poultry meat products	0.91%
Seafood products	0.93%
Bread and bakery products, except frozen	0.54%
Coffee and tea	0.22%
Flavoring syrup and concentrate	0.69%
Bottled and canned soft drinks and water	0.98%
Paper bags and coated and treated paper	0.50%
Printed materials	0.42%
Other plastics products	1.15%
Curtains and linens	0.19%
Other fabricated metals	0.40%
Retail services - Health and personal care stores	0.25%
Retail services- Clothing and clothing accessories stores	0.40%
Retail services - General merchandise stores	0.55%
Retail services - Nonstore retailers	0.51%
Monetary authorities and depository credit intermediation	1.08%
Waste management and remediation services	0.59%
Commercial and industrial machinery and equipment repair and maintenance	0.68%
Limited-service restaurants	0.87%
Dry-cleaning and laundry services	0.35%
<i>Professional Services</i>	
Legal services	0.42%
Accounting, tax preparation, bookkeeping, and payroll services	0.83%
Computer systems design services	0.24%
Management of companies and enterprises	4.73%
Employment services	0.82%
<i>Security</i>	
Investigation and security services	0.74%
<i>Utilities</i>	
Electricity transmission and distribution	2.20%
Wired telecommunications	0.63%
Natural gas distribution	0.24%
Water, sewage and other systems	0.18%