The Oil and Gas Extraction Sector in the City of Los Angeles

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Brief biographies

Dr. David Rigby is a professor with appointments in geography and statistics at UCLA. He received his PhD from McMaster University in 1988. His early research analyzed the relationship between technological change and regional economic performance. More recent work focuses on the use of micro-data to explore the dynamics of firms, industries and regions. This research is built around three broad themes: investigation of agglomeration economies, exploration of the impacts of trade on labor markets and income inequality, evolutionary analysis of knowledge production and knowledge flow.

Dr. Michael Shin is an associate professor in the Department of Geography at UCLA. He is also the faculty director of the Geospatial @ UCLA initiative. He received his Ph.D. from the University of Colorado at Boulder, and is an expert in the use and application of geographic information systems (GIS), spatial analysis and geostatistics. Dr. Shin previously worked with McKinsey & Company and the Food and Agriculture Organization (FAO) of the United Nations.

Executive Summary

Concerned with the negative effects of pollution generated by oil and gas extraction, the Los Angeles City Council is considering a proposal to halt production at oil and gas wells that are located within a specified distance of sensitive land uses including residences, child care facilities, public or private schools, other educational institutions, hospitals, and similarly designated parcels. This report estimates the economic impact of potential oil and gas well closures within the City of Los Angeles.

Analysis focuses on 2015, the most recent year for which input-output data were available when the project started. Investigation proceeded in five stages:

1. Oil and gas well production and location data for the City of Los Angeles were obtained from the Department of Oil, Gas and Geothermal Resources (DOGGR) of the State of California Department of Conservation
2. A geographic information system (GIS) was used to map oil and gas wells within city boundaries and build setback buffers around sensitive land uses. The GIS identified wells that fall into the setback buffers and that would be closed if the proposed city ordinance was adopted
3. Input-output accounts of the Los Angeles economy were developed to estimate the total volume of economic activity (output and employment) in the City of Los Angeles that is linked to oil and gas extraction
4. Combining the GIS and input-output models details the overall employment loss in the City of Los Angeles associated with closing oil and gas wells that are located within setback buffers around sensitive land uses
5. The last stage of the analysis provided estimates of potential benefits to the City of Los Angeles of well closure. Those benefits are of two kinds. First, employment gains resulting from remediation of closed oil and gas well sites. Second, the reduction in pollution, and potential health cost savings, associated with lower levels of oil and gas production across the city.

The oil and gas industry is an important component of the California state economy, as well as the local economy of the City of Los Angeles. Data from DOGGR, supplemented where possible by the U.S. Energy Information Administration, along with benchmark oil and gas well-price data valued economic output in the oil and gas extraction industry for the state of California in 2015 at approximately $9.7 billion. This represents approximately half of 1% of the state's overall output, its gross product. **Within the City of Los Angeles, the oil and gas extraction sector generated output valued at $182 million in 2015, accounting for about one-tenth of 1% of the city's gross product. According to data from the California Employment Development Department (EDD) and the U.S. Bureau of the Census Non-Employer Survey, the oil and gas extraction industry (North American Industrial Classification 211) employed 345 workers in the City of Los Angeles in 2015 out of a total city-wide workforce of just under 2 million.**

The DOGGR data identified 508 active wells within the City of Los Angeles in 2015 with positive levels of production. A geographic information system fixed the location of these well sites and then

mapped protective buffers, setback distances of 2,500 feet and 1,500 feet, around sensitive land uses as identified by the California Air Resources Board. **Our GIS analysis established that 429 of the active 508 wells in the city were located within 2,500 feet of sensitive land uses.** (The figure was little different for the 1,500 feet setback.) These 429 wells were responsible for approximately 78% of the value of output in the oil and gas extraction sector of the City of Los Angeles in 2015. **Adopting the proposed city ordinance with a 2,500 feet buffer around sensitive land uses would thus reduce oil and gas extraction in Los Angeles by 78%.** The overall economic impact of such a reduction is highlighted next.

If oil and gas production across the City of Los Angeles is reduced in scale, the impact of that reduction will be felt beyond the oil and gas extraction industry itself, for two reasons. First, economic output in any particular industry rests upon the use of inputs that are purchased from many different industrial sectors. Thus, when production in one industry declines, the demand for output across a number of "upstream" sectors is also likely to fall. Second, when an industry contracts it sheds labor and reduces wages paid to remaining workers. That means less local wage-based consumption of a variety of industrial outputs, which in turn reduces demand across the economy further lowering wages and production. These rounds of impacts are known as economic multipliers.

Economic links between industrial sectors and multipliers are conventionally estimated using input-output accounts. Input-output accounts for the City of Los Angeles in 2015 were constructed from data provided by IMPLAN.

Input-output analysis of the Los Angeles economy reveals that closing 429 oil and gas wells and eliminating 78% of production within the oil and gas extraction industry (consistent with the 2,500 feet setback distance) would have the following impacts:

- **269 jobs would be lost within the oil and gas extraction industry**
- **266 jobs would be lost within other sectors of the economy**
- **535 total jobs would be lost across the city.**

Note that use of the 1,500 feet setback distance would result in the overall loss of approximately 532 jobs citywide.

Two caveats should be noted in relation to these figures. First, input-output analysis provides a static set of impacts that largely ignore opportunity costs and the possibilities for re-employment and productive investment elsewhere in the economy. It is difficult to specify the long-run impacts of oil and gas well closure either on workers within the oil and gas extraction sector or those elsewhere in the economy. Second, input-output analysis looks to the upstream supply chain of an industry rather than downstream production. After oil and gas is removed from well-sites it travels by pipeline or truck to storage facilities, to refineries and to end-users. Because local refinery production does not depend heavily on local oil, and because prices for crude and refined petroleum products are largely set in global markets (though they vary regionally because of taxes and local regulation), we do not believe that the loss of local oil and gas extraction capacity would have a significant impact on local energy prices. However, we could see additional employment loss in local parts of the oil and gas transportation system associated with well closure. We anticipate that these impacts would be rather small. Estimating such impacts without reliable data on well-specific oil and gas transportation, and without data on local and non-local oil and gas flow through the local transportation infrastructure, are beyond the scope of this report.

We now turn to the potential benefits of closing oil and gas wells near sensitive land uses within the City of Los Angeles. Section 3 of this report identified 429 active oil and gas wells that are found within 2,500 feet of sensitive land uses. Remediation work, calculated over the year, for each of these sites was estimated to involve 0.5 workers. Thus, 215 full-year jobs would be generated in the city if all wells in the proposed setback zone were remediated at once. Of course, following the logic of the input-output model, these jobs would generate additional employment across the city as a result of multiplier effects associated with the purchase of inputs and consumption from wages. **The overall employment generated through the remediation of oil and gas wells associated with the proposed city ordinance totals 356 jobs. Thus, on top of the 215 workers employed directly in well site remediation, an additional 141 jobs would be generated as a result of remediation elsewhere in the Los Angeles economy. These figures are based on the closure of 429 active wells and assume an average well site remediation cost of approximately $109,000. It is stressed that these employment gains are of a relatively short duration, expected to last only one year.**

Finally, once oil and gas sites have been remediated they may be repurposed for commercial or alternative land use activities, regenerating property and other taxes lost as a result of the cessation of oil and gas activities. It is difficult to estimate how such land might be repurposed and thus what the economic returns to new development might be. There are some well-known examples of oil field redevelopment, notably the Grove in Los Angeles and the Villages at Heritage Springs in the city of Santa Fe Springs. However, it is largely impossible to predict how much land is likely to be "released" as a result of closing active well-sites within the setback zones of Los Angeles. GIS analysis of the 429 well sites for which we have production data in 2015 indicates that they occupy parcels that sum to 1357.4 acres or close to 5.5 million square meters. This does not mean that this area of land could be made available for redevelopment within the city for many of these parcels already house different land uses including residential and commercial activities.

In addition to the direct economic benefits just indicated, oil and gas well closure across the City of Los Angeles will have a significant positive impact by reducing local pollution. Combining input-output data with pollution estimates for all types of industrial production permits estimation of various types of pollution associated with production in the oil and gas extraction industry and the whole supply chain that feeds into this sector, capturing all input-output multiplier effects. Environmental input-output life cycle assessment (EIO-LCA) tools and linked data are used for this purpose.

To estimate pollution associated with oil and gas extraction in the City of Los Angeles, industry output in the oil and gas industry of Los Angeles in 2015 ($182 million) is fed into the EIO-LCA model. The resulting pollution estimates are generated as the product. We then calculate the pollution savings linked to the proposed city ordinance that would reduce oil and gas production by approximately 78% across the city linked to the 2,500 feet setback threshold. A summary of the pollution savings are indicated below:

- **519 metric tons of carbon monoxide annually released would be removed from the atmosphere**
- **384 metric tons of nitrous oxide annually released would be removed from the atmosphere**
- **122 metric tons of sulfur dioxide annually released would be removed from the atmosphere**
- **442 metric tons of volatile organic compounds annually released would be removed from the atmosphere**

- **43 metric tons of PM10 and 15 metric tons of PM2.5 would also be removed from the atmosphere**

In terms of greenhouse gases, the proposed city ordinance could remove 199,000 metric tons of carbon dioxide equivalents released each year in the City of Los Angeles as a result of oil and gas extraction and supporting industrial activities.

Pollution across the City of Los Angeles is associated with significant healthcare costs. While we cannot specify the healthcare cost savings associated with the proposed city ordinance, it seems reasonable to assume that those cost savings are likely to be substantial.

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1 Introduction

In a special meeting, held on June 14, 2017, the Health, Mental Health, and Education Committee of the City Council of Los Angeles approved a motion instructing city departments to examine land use codes related to oil and gas development within the city, and to consider the health effects of oil and gas operations. This motion followed earlier discussion in the City Council concerning oversight of petroleum and natural gas operations within Los Angeles, reflecting growing concerns over environmental and health impacts of oil and gas drilling and extraction. On June 30, 2017, the Los Angeles City Council adopted the recommendations of the Health, Mental Health, and Education Committee instructing city departments to report on the feasibility of amending land use codes in connection with health impacts at oil and gas wells and drill locations.

As part of this action, the Los Angeles City Council is considering a broad range of costs and benefits associated with the possible implementation of revisions to the city's land use codes. These revisions may prohibit new and expanded oil and gas extraction projects, while designating oil and gas extraction wells within a prescribed setback distance from sensitive land uses, defined to include child care facilities, schools and other educational institutions, medical facilities, including hospitals, residential parcels and similar sensitive activities, as non-conforming land uses

This report explores the economic impact, particularly the employment implications, of closing oil and gas wells in the city of Los Angeles within 2,500 feet and 1,500 feet setback distances of sensitive land uses as defined in the city's proposal. Analyses focus on the direct impacts of well closure, along with the indirect (upstream industrial) and induced (wage and income) impacts of such closure throughout the Los Angeles economy.

The investigation proceeds in four stages:

1. Analysis of the size of the oil and gas extraction sector in the economy of Los Angeles, with comparisons to the significance of this industry to the economies of Los Angeles County and the State of California.

2. Mapping the location of all active oil and gas extraction well sites in the City of Los Angeles and identifying those wells that are within specific setback distances of sensitive land uses.

3. Investigation of the employment, and related economic, impacts of ending oil and gas extraction at well sites within the setback distances. The standard techniques of input-output analysis are used to explore the direct, indirect and induced effects of well closure within the City of Los Angeles.

4. Exploration of a series of related concerns:
    a. Environmental impacts of oil and gas extraction and potential health cost savings.
    b. Job creation and associated economic impacts of remediation on closed well sites.

2. Oil and Gas Production in California and Los Angeles

Oil and gas production represent significant components of the California state economy as well as important elements of the economies of Los Angeles County and the City of Los Angeles. Table 2.1 reports oil and gas production for the state, the county and the City of Los Angeles for 2015 and 2016. Note that oil is measured by the barrel (bbl) and gas is measured in units of 1,000 cubic feet (mcf). Well-head prices for oil averaged around $45 per barrel in 2015 and for gas approximately $3 per thousand cubic feet (U.S. Energy Information Administration. Oil prices are for West Texas Intermediate a grade of crude oil commonly used to benchmark oil prices). These figures are presented in current dollars. Using these prices together with the oil and gas production data, yields an estimate of the value of output in the oil and gas extraction industry in the state of around $9.7 billion in 2015. This represents less than half of 1% of the state's gross regional product (the total value of all goods and services produced in the state). The corresponding value of oil and gas output for California in 2016 is approximately $9.2 billion, reflecting lower production and slightly lower average prices.

Table 2.1. Oil and gas production in California and Los Angeles

	2015		2016	
	Oil Production (bbl)	*Gas Production (mcf)*	*Oil Production (bbl)*	*Gas Production (mcf)*
California	201,284,000	409,159,123	186,079,000	351,411,123
Los Angeles County	13,779,758	107,530,192	11,827,518	58,007,984
City of Los Angeles	2,990,608	15,648,223	2,659,412	10,577,427

Source: California Division of Oil, Gas & Geothermal Resources (DOGGR) and Drilling Edge.

The same prices can be used to estimate the value of oil and gas production in Los Angeles County and in the City of Los Angeles, though recognize that the prices given by the U.S. Energy Information Administration represent broad averages over time and space. For 2015, the production and price data reported above yield values of output in oil and gas extraction of around $940 million for Los Angeles County and about $182 million for the city. Thus, output in the oil and gas extraction industry alone comprises only about one-tenth of 1% of the gross product of the City of Los Angeles.

Measures of the economic importance of oil and gas production, and industrial activity in other sectors of the economy, are captured in official statistics of the U.S. government by different agencies. Within the Department of Commerce, the Census Bureau gathers industrial data on output and employment by industry and for sub-national regions of the United States, and the Bureau of Economic Analysis captures related statistics. Another series of labor-related data are gathered by the Bureau of Labor Statistics which is part of the Department of Labor. These agencies are listed because they all provide somewhat different views of the U.S. economy, and the economies of states, counties and smaller geographical regions. This report draws upon these data as well as information prepared by IMPLAN, a private company that produces input-output accounts that can be used to answer a range of questions related to the economic impacts of different types of economic activity. IMPLAN draws most of its data

from the Bureau of Economic Analysis, supplemented by the other agencies listed above. IMPLAN accounts are available at relatively fine levels of geographical detail and for this reason have become an industry standard in terms of computing the overall economic impacts associated with activity in particular sectors. Note, however, that IMPLAN data for small areas, regions smaller than state and county, are often imputed from figures gathered from larger regions. This reflects the paucity of survey data at small spatial scales. Thus, IMPLAN does not offer input-output accounts at the level of the City of Los Angeles, however, it allows users to "construct" such accounts based upon purchasing patterns that are observed between industries surveyed across the United States as a whole and adjusted for regional concentrations of industrial activity. There is always some error involved in using such accounts, but few alternatives exist, and those that do are built around similar assumptions.

The extraction of oil and gas from the ground is but one part of a broader set of activities related to oil and gas processing in the economic system. These activities are detailed in Section 4 of this report. All economic activities are distributed across a series of industrial sectors that are classified under the North American Industrial Classification System or NAICS. Much of the analysis presented in this report focuses on oil and gas extraction, NAICS sector 211, because the proposed city ordinance is directly focused on halting production of oil and gas at well-sites within a specified setback distance of sensitive land uses. NAICS defines sector 211 as follows

> *Industries in the Oil and Gas Extraction subsector operate and/or develop oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, completing, and equipping wells; operating separators, emulsion breakers, desilting equipment, and field gathering lines for crude petroleum and natural gas; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property. This subsector includes the production of crude petroleum, the mining and extraction of oil from oil shale and oil sands, and the production of natural gas, sulfur recovery from natural gas, and recovery of hydrocarbon liquids.*

Source: https://www.census.gov/eos/www/naics/

Table 2.2 reports levels of employment in NAICS 211, the oil and gas extraction industry in 2015, the most recent year for which these data are available. There are a number of sources of employment data for the U.S. economy that are detailed in the discussion below. The figures we highlight in Table 2.2 are those based on information taken from the California Employment Development Department (EDD) and the non-employer survey of the U.S. Census Bureau. The EDD data for the City of Los Angeles are not imputed from broader regional surveys and so are preferred in the analysis that follows.

The Bureau of Labor Statistics compiles estimates of wage and salary employment on the basis of unemployment insurance records gathered from places of work: businesses that employ workers. Full-time and part-time employment is not distinguished in these counts. The unemployment insurance form (ES-202) is the source for these data that are sometimes referred to as ES-202 records. The ES-202 data are the origin of the Quarterly Census of Employment and Wages (QCEW) data and the data used by the California Employment Development Department (EDD)[1]. The QCEW data provide counts

[1] Farm, railroad and some school employment data are not covered by the unemployment insurance system and so employment figures for these sectors of the economy are gathered from other sources, typically the Census Bureau's County Business Pattern data that are themselves based on administrative records from the social security program.

of establishments, employment and wages for place of work locations rather than the place of residence of individual workers. QCEW data are typically gathered at the level of the firm for individual states. Employment across individual firms with more than one establishment in a single state are generated at the workplace level using address information for places of work in ES-202 records (https://www.bls.gov/opub/hom/cew/data.htm). The column headed QCEW/EDD in Table 2.2 displays employment data for the state, county and City of Los Angeles. QCEW/EDD data can be gathered for any location based on the raw counts of individual workers who are employed within any geographical area.

Across many sectors of the economy there is a sizable amount of self-employment. Self-employed workers are not covered by the unemployment insurance system and so are not counted in QCEW/EDD data. Estimates of self-employment are obtained by the U.S. Census Bureau through business income tax records from the Internal Revenue Service (IRS). IRS Schedules B and C gather information on non-farm sole-proprietorships and the number of general partners. The Census Bureau reports that most non-employers are self-employed individuals that operate unincorporated businesses (sole proprietorships). The primary source of non-employer statistics is the Census Bureau's non-employer statistics (NES) program (https://www.census.gov/programs-surveys/nonemployer- statistics/about.html). NES data are available by NAICS sectors at the state and county level. It is important to note that the NES is a place of residence series rather than a place of work series. At the state level and for many counties, the place of residence is likely the same as the place of work, though for individuals living near state and county boundaries this may not be so. The column headed EDD+NES in Table 2.2 combines QCEW counts of wage and salary employment and the NES counts of self-employment[2].

Table 2.2: Employment in NAICS 211: Oil and gas extraction, 2015

	Direct Count of Employed (QCEW/EDD)	Employed + Independent Contractors (EDD+NES)
California	11,200	14,175
Los Angeles County	2,131	3,201
City of Los Angeles	230	345

Source: Quarterly Census of Employment and Wages (QCEW), Employment Development Department (EDD), Non-Employer Survey (NES).

[2] The Bureau of Economic Analysis (BEA) also provides estimates of state and local "employment". Unlike the QCEW and NES data, the BEA data are estimates of wage and salary jobs, sole proprietorships and general partners. The BEA data are jobs based rather than employment based. Again they represent a place of work series insofar as possible (they also utilize the place of residence NES data). Thus, the BEA data measure the number of jobs in a place rather than the number of workers who perform those jobs. These jobs may be full-time or part-time jobs and thus it is possible that one worker in a region may perform a number of jobs. IMPLAN derives small area estimates of jobs based on BEA data for larger regions. The BEA/IMPLAN data suggest that oil and gas extraction totaling $182 million would generate 566 jobs in the City of Los Angeles. This imputed figure is 64% larger than the EDD+NES figure in Table 2.2. For more information, the interested reader can refer to a BEA methodology guide (Local Area Personal Income Methodology, 2016, available from https://www.bea.gov/regional/methods.cfm).

There are no NES data available for the city of Los Angeles. In Table 2.2, the EDD+NES figure for the city is based on the ratio of self-employed to wage and salary employment at the county level. Note that all employment figures given in this report refer to the number of workers who are currently employed in particular sectors of the economy, whether they are wage and salary workers or self-employed workers.

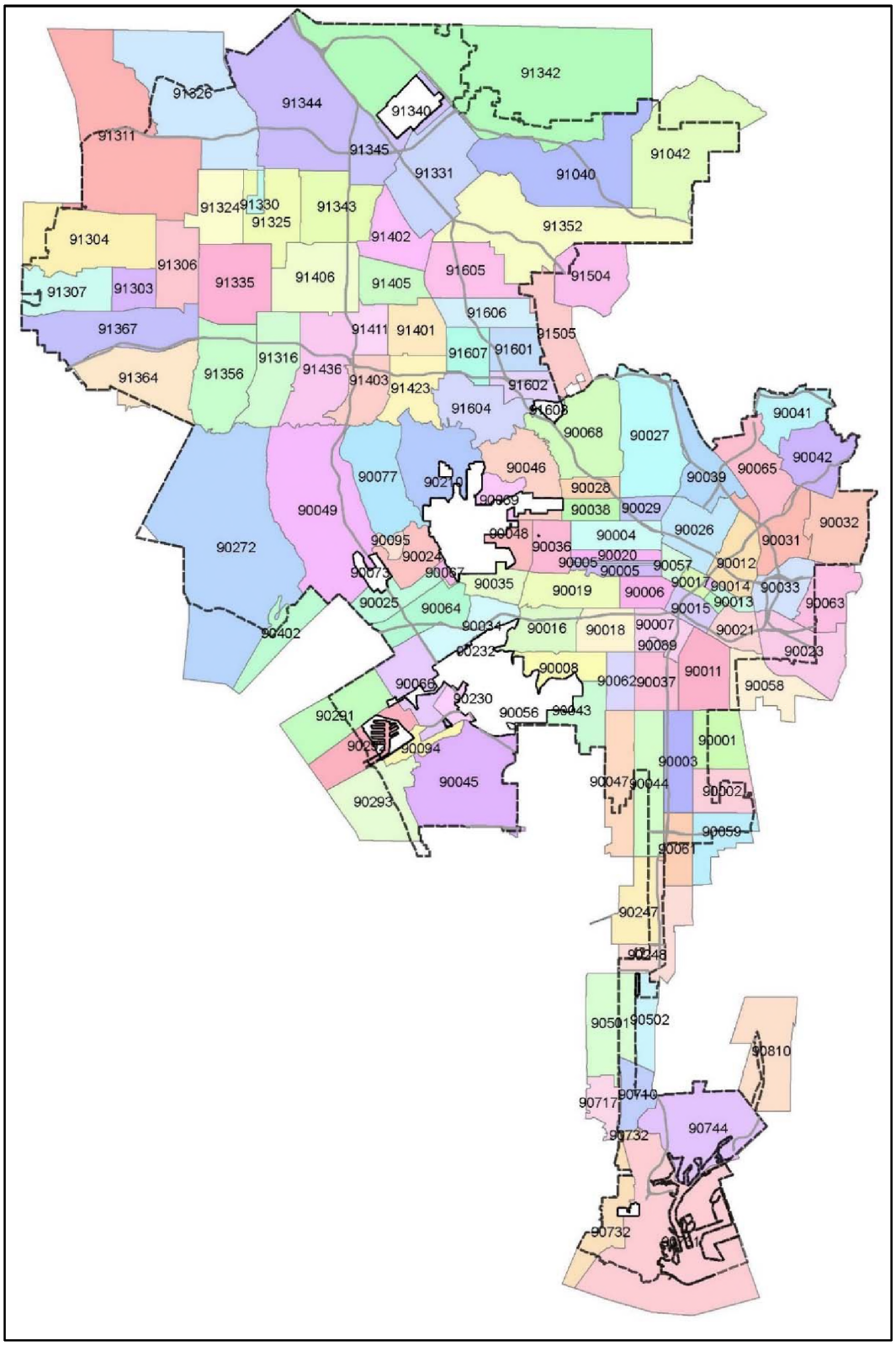
The input-output accounts developed for the analysis in this report are provided by IMPLAN. IMPLAN produces economic data for the nation, for states, counties and zip code tabulation areas (ZCTAs). There are no IMPLAN data directly available for cities such as Los Angeles. City of Los Angeles data in IMPLAN are derived from aggregating ZCTA statistics. Unlike zip codes which refer to delivery routes and address lists, ZCTAs are geographic units of analysis specifically developed by the US Bureau of the Census to tabulate summary statistics. Aggregating data for the City of Los Angeles from ZCTAs is problematic for the border of the city of Los Angeles crosses a large number of individual ZCTAs. Figure 2.1 shows the ZCTAs that are found within the city. ZCTAs that are entirely within the city boundary are included in the definition of the city of Los Angeles. ZCTAs that straddle the city boundary are also included as part of the city if more than 25% of their population is resident within the city. The data for this estimate derives from www.city-data.com/zips. While not an ideal measure of the extent of the City of Los Angeles, this is a conservative estimate of the city's size in the sense that it includes some ZCTAs that lie mostly outside the city's official boundary. Table 2.3 lists the zip codes that are used to define the City of Los Angeles in all input-output analysis using IMPLAN data.

Table 2.3: Zip codes used to define the City of Los Angeles

90001	90002	90003	90004	90005	90006	90007	90008	90010	90011
90012	90013	90014	90015	90016	90017	90018	90019	90020	90021
90023	90024	90025	90026	90027	90028	90029	90031	90032	90033
90034	90035	90036	90037	90038	90039	90041	90042	90043	90044
90045	90046	90047	90048	90049	90056	90057	90059	90061	90062
90064	90065	90066	90067	90068	90069	90071	90077	90089	90094
90095	90210	90211	90212	90247	90248	90272	90291	90292	90293
90501	90710	90731	90732	90744	91040	91303	91304	91306	91307
91311	91316	91324	91325	91326	91330	91331	91335	91342	91343
91344	91345	91352	91356	91364	91367	91401	91402	91403	91405
91406	91411	91423	91436	91601	91602	91604	91605	91606	91607

To provide a sense of the size of the oil and gas extraction sector within the state, county and city economies, Table 2.4 lists employment data for non-farm private sector activities for the state, county and City of Los Angeles in 2015. Employment shares by industry are also provided for the city. These data represent wage and salary employment together with non-employer statistics. Non-employer statistics are available by sector for the state and for the county. They are not available for the City of Los Angeles and were imputed using ratios of non-employers and wage and salary workers by sector at the county level. It is clear from these data that oil and gas extraction is a relatively small component of the employed private, non-farm workforce in the City of Los Angeles. However, oil and gas extraction is part of a larger oil and gas industry cluster that is linked to many other parts of the local economy, not

Figure 2.1: Zip code tabulation areas (ZCTAs) corresponding with the City of Los Angeles



Source: Los Angeles Housing Department

just those we tend to think of as petroleum and gas based. The linkages between the oil and gas extraction sector and other parts of the economy of Los Angeles are detailed in Section 4 of this report.

Table 2.4: Private non-farm employment in California, Los Angeles County and the City of Los Angeles, 2015 (Wage and salary employment and self-employment: EDD+NES)

NAICS	Industry name	California	Los Angeles County	City of Los Angeles
21	Mining, Quarrying, Oil & Gas	29,758	5,051	577 (0.03%)
211	- Oil & Gas Extraction	14,175	3,201	345(0.02%)
22	Utilities	58,757	12,229	2,833(0.17%)
23	Construction	948,370	188,155	59,208(3.46%)
31-33	Manufacturing	1,332,133	370, 694	94, 481(5.53%)
42	Wholesale	777,742	246,213	75,494(4.41%)
44-45	Retail	1,890,618	447,935	164,770(9.64%)
48-49	Transportation & Warehousing	720,142	198,544	81,657(4.78%)
51	Information	543,425	233,992	74,911(4.38%)
52	Finance & Insurance	610,496	147,087	70,676(4.13%)
53	Real Estate, Renting & Leasing	594,401	197,494	64,838(3.79%)
54	Professional, Scientific & Technical Services	1,748,815	431,917	183,392(10.72%)
55	Management of Companies	229,682	57,365	17,819(1.04%)
56	Waste Management	1,303,984	341,548	116,050(6.79%)
61	Educational Services	388,039	120,311	59,151(3.46%)
62	Health Care & Social Assistance	2,352,714	718,366	291,769(17.06%)
71	Arts, Entertainment & Recreation	497,317	178,458	73,858(4.32%)
72	Accommodation & Food Services	1,575,749	416,088	158,371(9.26%)
81	Other Services (except Public Administration)	1,000,805	295,717	120,112(7.02%)
	Total	16,602,947	4,607,164	1,709,967

Source: QCEW/EDD, NES, CBP

Note: Supplemented with data from County Business Patterns (CBP). Including agricultural activity and the public sector raises total employment in the city of Los Angeles to 1.974 million in 2015.

A wide range of occupations support the oil and gas extraction industry. Approximately 40% of the workforce in the industry is employed in managerial, financial, business and sales operations, 23.7% of the workforce are scientists and engineers, while 21% of workers in the sector focus on production and extraction. Table 2. 5 provides the occupational distribution of the sector for the United States as a whole. With regard to the state-level demographics of the oil and gas workforce, two out of three workers in oil and gas are male, the majority of workers are between the ages of 22 and 54 years old, about 50% are White and 30% Hispanic. Approximately 23% of oil and gas sector workers are college-educated (Los Angeles County Economic Development Corporation, 2017).

Table 2.5 Occupational distribution of oil and gas extraction sector workers (U.S. 2016).

Occupation	Share of Oil and Gas Workforce
Management, business, finance & legal	25.9%
Science & Engineering	23.7%
Office & Administration	12.2%
Sales	2.0%
Production & extraction	21.0%
Construction	3.8%
Maintenance & Repair	3.8%
Other	7.6%

Source: U.S. Department of Labor, Bureau of Labor Statistics, Industry-Occupation data https://www.bls.gov/emp/ep_table_109.htm

The average annual wage of all occupations in the oil and gas industry in California (excluding gas station occupations) was $74,690 in 2015. This figure masks notable variations. For instance, the state average wages for general managers, industrial and petroleum engineers was $134,750 in 2015. The state average annual wage for frontline oil and gas extraction workers such as roustabouts and general laborers was $40,077 (Los Angeles County Economic Development Corporation, 2017).

3. The Geography of Oil and Gas Production in Los Angeles

The Department of Oil, Gas and Geothermal Resources (DOGGR) of the Department of Conservation compiles and distributes data and information about oil and gas production sites across the state of California (see: http://www.conservation.ca.gov/dog). Such data include, but are not limited to: unique identifiers for each well; the specific locations of oil and gas wells (i.e., in latitude and longitude); the operational status of such wells; and well operator and lease-holder names. These data are updated on a daily basis. For the following analysis, the data that were available on 11 September 2017 are used.

DOGGR also maintains and distributes an oil and gas well production and injection database. Production and injection data for individual wells are compiled and reported on a monthly basis. In an effort to maintain consistency with the economic data used elsewhere in this report, monthly (i.e., January – December) oil and gas production data, reported in barrels (i.e., bbl) and thousands of cubic feet (i.e, mcf), respectively, are aggregated for the year 2015. Annual oil and gas production amounts for 2015 are then matched back to the oil and gas well location data using the unique identifier for each well.

The following analysis focuses on oil and gas wells, and their respective 2015 production levels, for the City of Los Angeles. The boundary file used to demarcate the geographic limits of the study was obtained from the City of Los Angeles Open Data portal (https://data.lacity.org/).

Oil and gas wells are prominent features of the southern California landscape. In Los Angeles county, there are over 25,000 oil and gas wells registered with DOGGR (as of 11 September 2017, data updated daily). Within the administrative limits of the City of Los Angeles, there are currently 5,234 registered

oil and gas wells (20.6% of county wells), with 853 of the wells located within Los Angeles city limits classified as 'Active' (16.3% of wells within the City of Los Angeles). Tables 3.1, 3.2 and 3.3, and Figure 3.1, provide numeric and geographic profiles of oil and gas wells across the City of Los Angeles. While DOGGR lists the status of current oil and gas wells across the city, it does not provide historical information on well status. However, DOGGR does provide historical information on production at well sites that were active in past years. For 2015, DOGGR reports non-zero production levels at 508 well sites within the City of Los Angeles.

Table 3.1. Oil and gas wells categorized by operational status in the City of Los Angeles, DOGGR (11 September 2017).

Well status	Number
Active	853
Buried	932
Idle	274
New	9
Plugged	3,166
Total	**5,234**

Table 3.2. Five largest oil and gas fields (by total and active well numbers), DOGGR (11 September, 2017).

Oil Field Name	Number of wells (within City of LA)
Wilmington	1350 (active = 417)
Old Wilmington	577 (active = 0)
Los Angeles City	1186 (active = 5)
Salt Lake (Hollywood)	409 (active = 16)
Playa del Rey	337 (active = 42)

Table 3.3. Five largest oil and gas well operators, DOGGR (11 September, 2017).

Operator Name	Number of wells (within City of LA)
ExxonMobil Corporation	711
Chevron U.S.A., Inc.	482
Warren E & P, Inc.	421
Tidelands Oil Production Co.	335
Union Pacific Resources Co.	328

The geographic distribution of oil and gas wells varies across the City of Los Angeles, and reflects the region's underlying petro-geography. Some named oil and gas fields fall entirely within the administrative boundaries of the city (e.g., Los Angeles City, Salt Lake field in Hollywood), whereas others span the irregular borders of the city (e.g., Wilmington). In 2015, a total of 2,990,608 barrels of oil and 15,648,223 thousand cubic feet of gas were produced within the City of Los Angeles according to DOGGR. Oil and gas production varies significantly between wells. Figure 3.2 illustrates the geographic variation in oil and gas production at the 2015 well sites with graduated circles.

Figure 3.1. Oil and gas wells in the City of Los Angeles, 11 September 2017 (DOGGR).

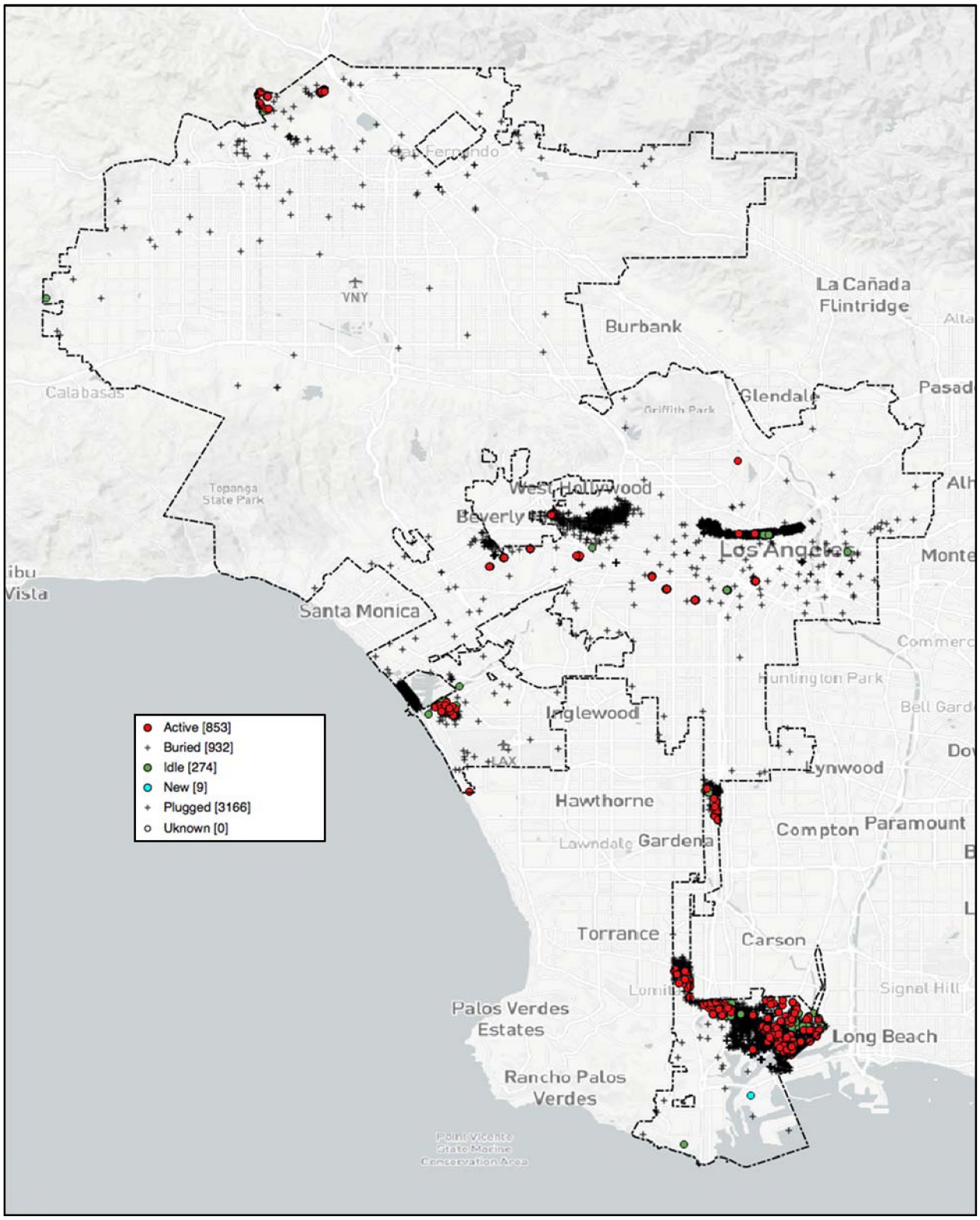
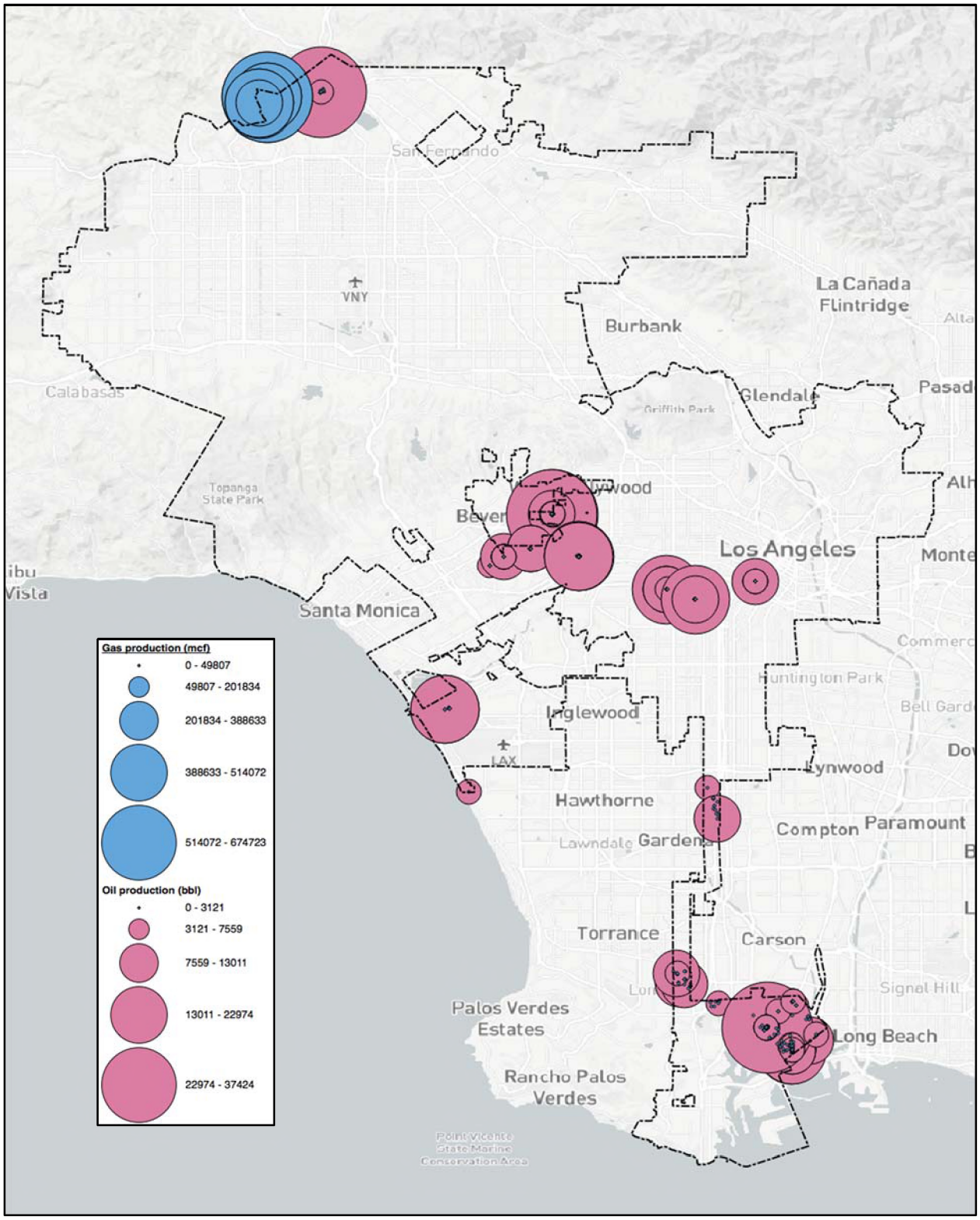


Figure 3.2. Oil and gas production in the City of Los Angeles, 2015, (DOGGR).



Larger circles in Figure 3.2 indicate greater amounts of oil (pink) or gas (blue) production, respectively, in 2015, as reported by the DOGGR Oil and Gas Production and Injection Database. In 2015, oil production occurred throughout the city but the majority of gas production was located on the northern extremities of the City of Los Angeles, in the Aliso Canyon facility operated by Southern California Gas.

The historical status of individual wells is not available, but the oil and gas production database reports output for 508 wells in the city of Los Angeles in 2015. Further investigation indicates that 102 wells designated as 'Active' as of 11 September 2017 report zero or no oil or gas output in 2015. There are also 20 wells currently designated as 'Inactive' that report oil or gas output in 2015. Production amounts and the status of specific oil and gas wells are provided in Appendix A.

3.1 Proximity Analysis of Oil and Gas Production Near Sensitive Land Uses and Vulnerable Populations

A significant amount of oil and gas production occurs very near, and sometimes within, the residential neighborhoods and communities of Los Angeles. Consequently, there is increased concern about the potential health risks associated with living near oil and gas wells and exposure to soil, noise, water and airborne pollutants that are linked to oil and gas extraction (e.g. Chilingar and Endres 2005; McKenzie et al. 2014; McKenzie et al. 2017; Olaguer 2012; Smith 2010). The various contaminants and effluents of oil and gas production have been associated with a range of health issues such as asthma, increased risk of heart disease and infant low birth weight (Peden 2002; Wilhelm and Ritz 2005). Ailments and other health issues such as headaches, dizziness, eye and skin irritation and bloody noses are also reported by residents who live near such facilities (Liberty Hill Foundation 2015). Based on the figures in this section, it is clear that exposure and vulnerability to the byproducts of oil and gas production are not distributed evenly across the City of Los Angeles.

Efforts to study, assess and understand exposure to various environmental toxins and pollutants frequently use a proximity-based approach (e.g., Ghosh et al. 2012; Czolowski et al. 2017). The central premise of proximity analysis is that there is a positive relationship between health risk and proximity to a source of pollution such as a freeway, industrial site or gas well. In other words, adverse health effects tend to increase with proximity to such sites. For pollutants that are not site-bound, but are dispersed through the air or through water, exposure risk is often expressed in terms of a buffer or setback distance around a polluting site or location.

Such buffer and setback distances are also used to guide and inform local regulations and policies regarding the siting, monitoring and operation of such facilities. For example, the California Air Resources Board (CARB) recommends that sensitive land uses such as residential neighborhoods, schools, medical facilities and recreational spaces are set back a minimum of 1,000 feet away from sites generating known pollutants. Moreover, the South Coast Air Quality Management District (AQMD) requires notification and reporting of oil drilling activities that occur within 1,500 feet of "sensitive receptors" such as those identified above by CARB.

Presently under consideration are amendments to current City of Los Angeles land use codes in connection with the potential adverse health impacts of oil and gas well sites that are located near sensitive land uses within the city limits (Health, Mental Health and Education Committee Report 17-0447). In particular, Proposal 1.a. of Report 17-0447 provides general guidelines about such amendments such that:

> *[N]o oil or gas well, or temporary geological exploratory core holes connected with oil and gas production, shall be located within a certain setback proximity of residential uses*

> *(including mobile homes), child care facilities, public or private schools (preschool through high school), educational institutions, medical clinics, hospital, or similar sensitive uses.*

Proximity-based analyses are used here to identify oil and gas wells that are within specified distances of sensitive land uses. To illustrate the differential impact of the choice of setback distances within the City of Los Angeles, the proximity analysis identifies oil and gas wells located within 2,500 feet and 1,500 feet of sensitive land uses. The subsequent analysis proceeds by developing input-output estimates of the overall economic impacts of closing oil and gas extraction facilities that are located within specified setback distances of sensitive land uses.

Two complementary approaches are used to identify sensitive land uses around which 2,500 foot and 1,500 foot setbacks are drawn. The first **land use approach** matches the land uses specified in Proposal 1.a. of Report 17-0447 (above) to those compiled in the Southern California Association of Governments (SCAG) parcel-based land use dataset (2015 update) for Los Angeles (see: http://gisdata-scag.opendata.arcgis.com/datasets/). The SCAG land use data set is recognized to be the most comprehensive and timely land use dataset available for southern California.

The second **vulnerable communities** approach uses data compiled and distributed by CalEnviroScreen (version 3.0) which assigns a vulnerability score to communities (i.e., census tracts) on the basis of exposure to various types of pollution, environmental risks and other social and economic indicators (see: https://oehha.ca.gov/calenviroscreen). Vulnerability scores are calculated for all California communities, which in turn permits the comparative analyses of community vulnerability to pollutants across the entire state. For this analysis, communities that fall within the 75th and 90th percentiles of vulnerability scores are identified as sensitive. A similar approach used the previous version of CalEnviroScreen (version 2.0) to examine environmental justice issues associated with oil and gas production across Los Angeles (Liberty Hill Foundation 2015). Differences between values generated in this report and the earlier Liberty Hill study reflect temporal changes in active well status across the city and the use of updated environmental screens by the California Environmental Protection Agency.

The sensitive land uses around which the setbacks are drawn are illustrated in Figure 3.3 Specifically, the following SCAG land use classifications are considered sensitive: single family residential; multi-family residential; mobile homes and trailer parks, mixed residential, rural residential; major medical health care facilities; religious facilities; educational institutions; and open space and recreation. More detailed definitions for each respective sensitive land use is provided in Appendix B. On the map, land uses are represented with different colors, the 2,500 foot setback is drawn in red and the 1,500 foot setback is drawn in in orange, and oil and gas wells (11 September 2017 data) are represented as black crosshairs (i.e., '+'). The setback lines demarcate the distance to the nearest sensitive land use. Under the proposed amendment, and at the specified setback distances, any oil or gas well within the designated setbacks would need to cease operations. Table 3.4 provides a numeric summary of oil and gas production amounts and wells within each respective setback.

Figure 3.3. Setbacks around sensitive land uses: 2,500 foot (red) and 1,500 foot (orange), (SCAG, DOGGR).

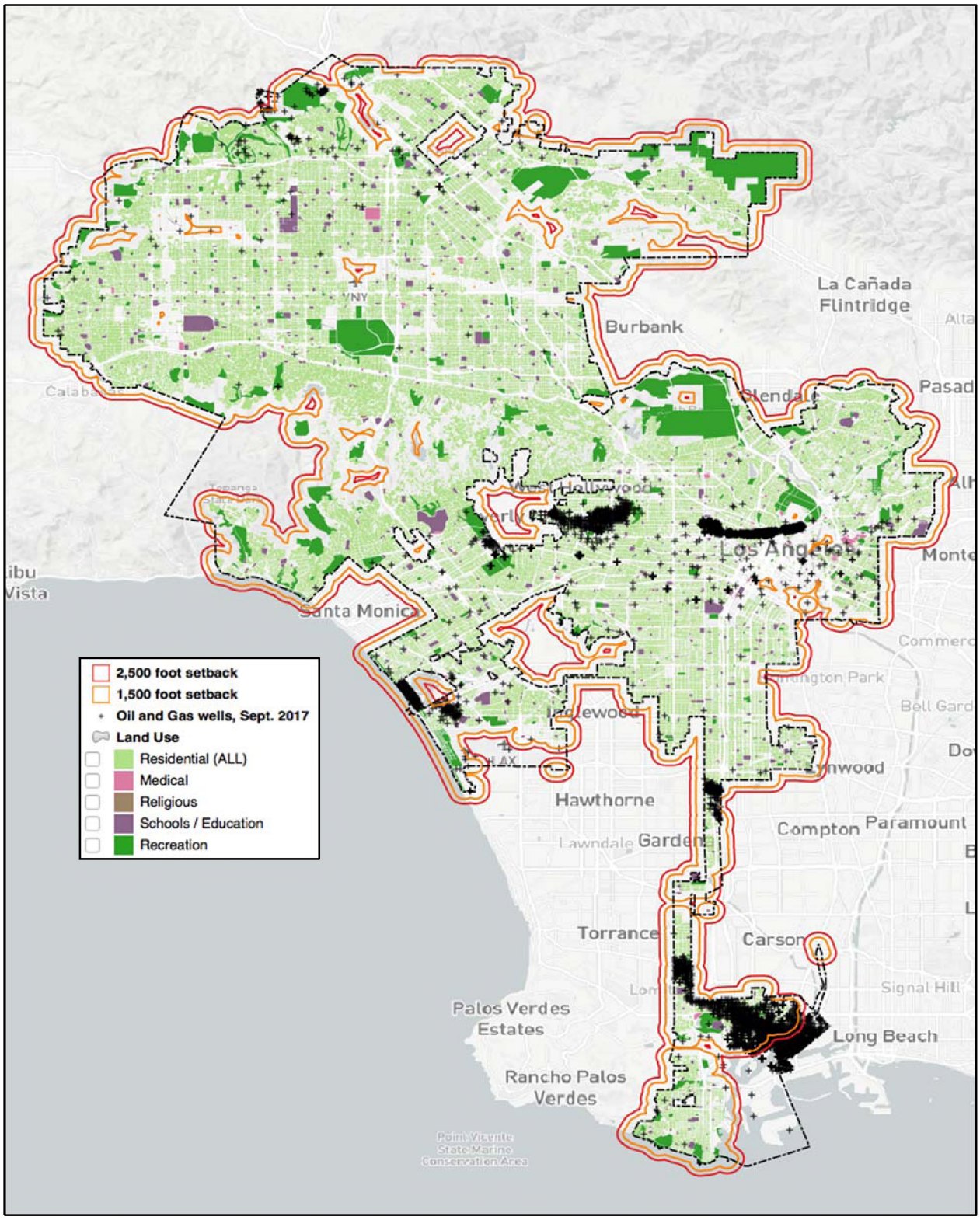


Table 3.4. Source: Oil and gas production (2015) within specified setbacks around sensitive land uses.

	Number of Wells	% of City Wells	Oil production (bbl)	Gas production (mcf)	Percent of Total Oil Production	Percent of Total Gas Production
Wells in City of LA with production data	508	100%	2,990,608	15,648,223	100%	100%
Wells within 2,500 feet of sensitive land uses	429	84.4%	2,627,238	7,775,580	88%	50%
Wells within 1,500 feet of sensitive land uses	420	82.7%	2,601,649	7,775,580	87%	50%

Source: DOGGR Oil and Gas Production and Injection Database.

Figure 3.4a and Figure 3.4b identify census tracts within the city of Los Angeles that fall within the 75th (blue) and 90th (pink) percentiles of CalEnviroScreen 3.0 scores, respectively. Recall that the CalEnviroScreen 3.0 score provides a relative indicator of a community's vulnerability to environmental risks and pollutants. As in the previous analyses, setbacks of 2,500 feet and 1,500 feet are drawn around the communities (i.e., census tracts) that fall within the percentiles of scores identified above. Depending upon the selected setback distance, any oil or gas wells that are located within the proximity buffer would need to be shut down. Oil and gas production amounts and the number of wells within each setback are summarized in Table 3.5. and Table 3.6.

Table 3.5. Oil and gas production (2015) within specified setbacks of 75th percentile CES3.0 scores.

	Number of Wells	% of City Wells	Oil production (bbl)	Gas production (mcf)	Percent of Total Oil Production	Percent of Total Gas Production
Wells with production data	508	100%	2,990,608	15,648,223	100%	100%
Wells in City of LA within 2,500 feet of 75th percentile CES3 score tracts	317	62.4%	1,863,704	936,260	62%	6%
Wells in City of LA within 1,500 feet of 75th percentile CES3 score tracts	290	57.1%	1,746,096	912,126	58%	6%

Source: DOGGR Oil and Gas Production and Injection Database.

Table 3.6. Oil and gas production (2015) within specified setbacks of 90th percentile CES3.0 scores.

	Number of Wells	% of City Wells	Oil production (bbl)	Gas production (mcg)	Percent of Total Oil Production	Percent of Total Gas Production
Wells with production data	508	100%	2,990,608	15,648,223	100%	100%
Wells in City of LA within 2,500 feet of 90th percentile CES3 score tracts	237	46.6%	1,359,355	348,604	45%	2%
Wells in City of LA within 1,500 feet of 90th percentile CES3 score tracts	219	43.1%	1,280,513	333,350	43%	2%

Source: DOGGR Oil and Gas Production and Injection Database.

Oil and gas production figures reported in Tables 3.4, 3.5, and 3.6 serve as the baseline amounts for the subsequent input-output analyses of economic impacts of oil and gas production in the city of Los Angeles.

Figure 3.4a. Setbacks around vulnerable communities (75th percentile of CES3.0 scores): 2,500 foot (red) and1,500 foot (orange).

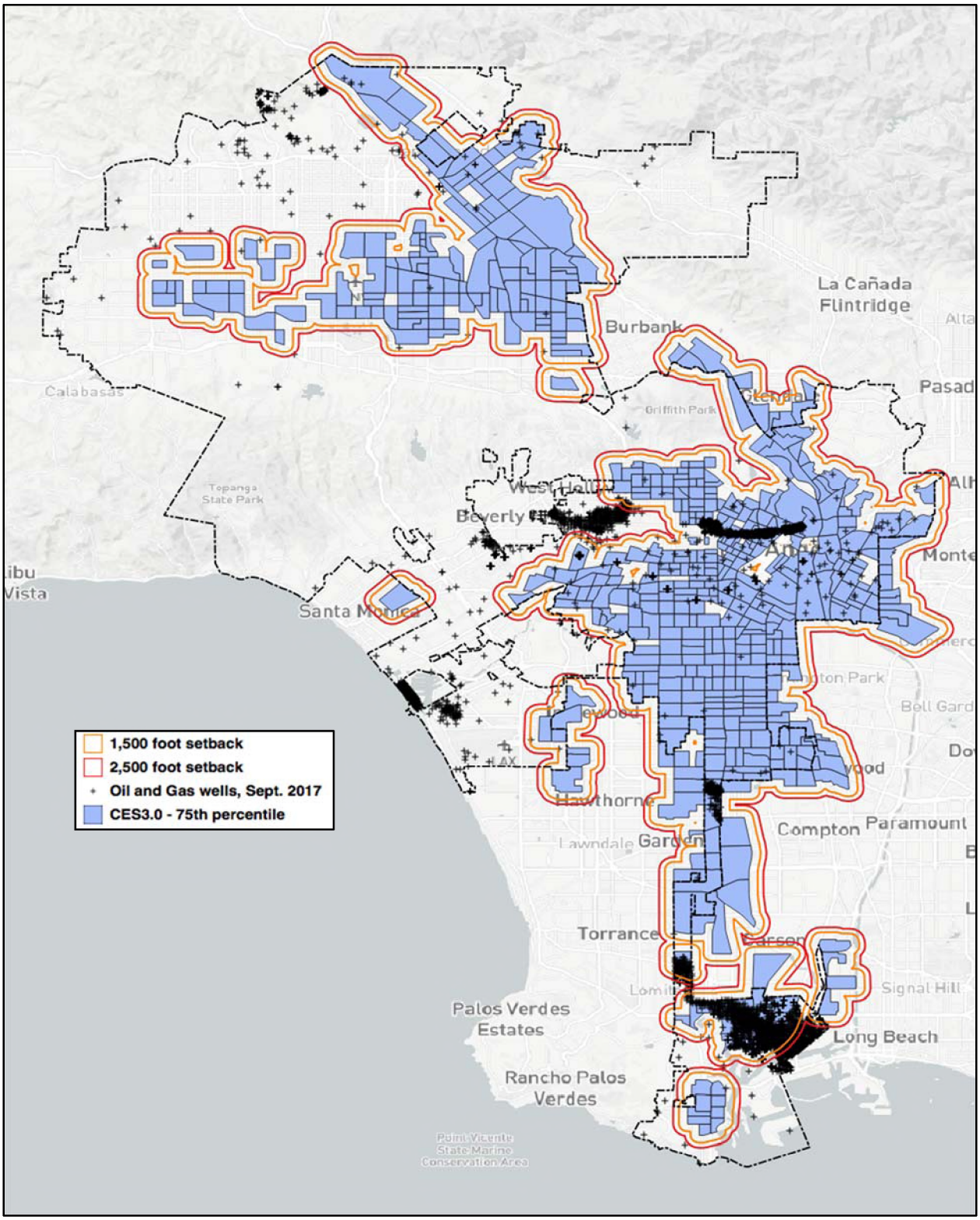
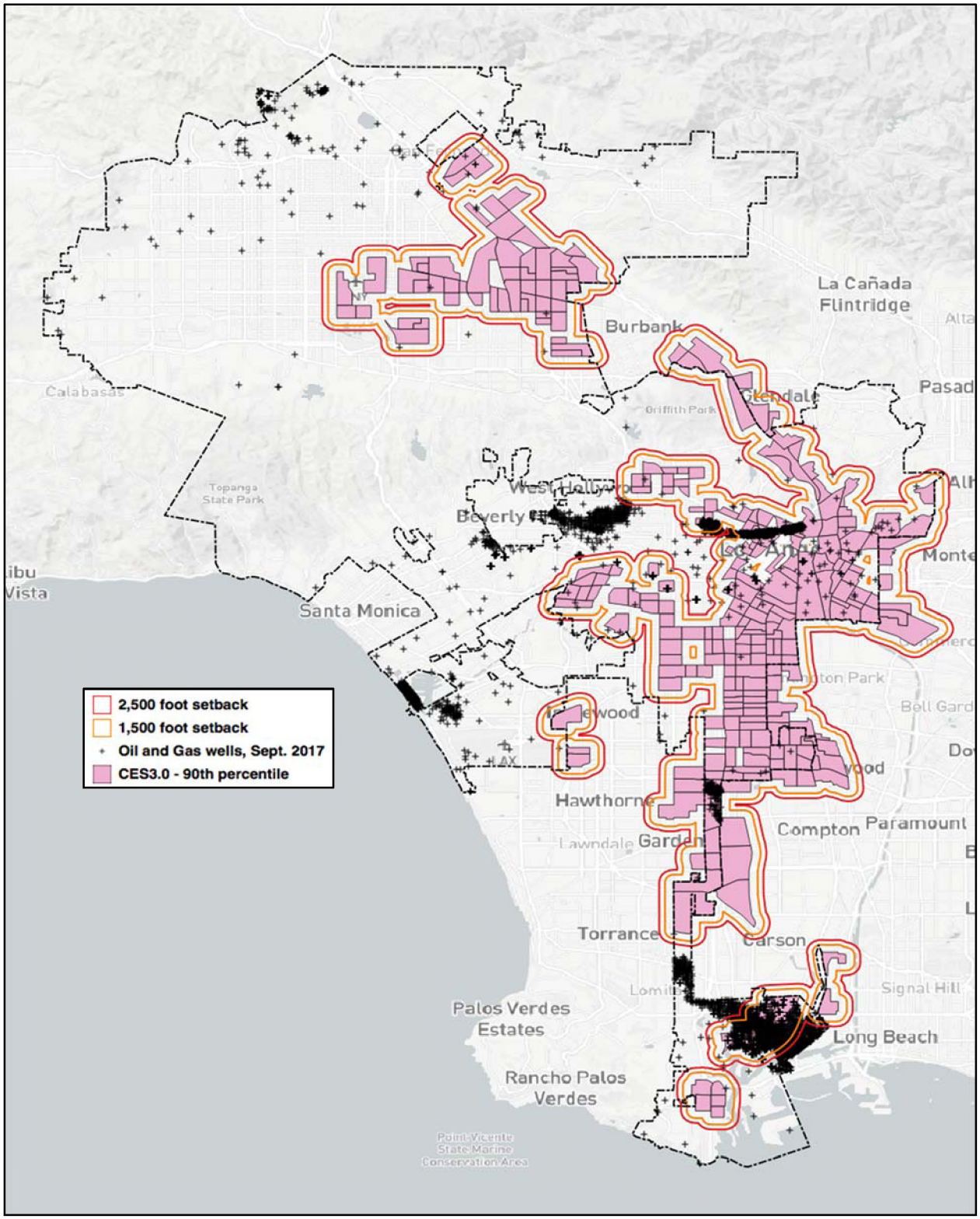


Figure 3.4b. Setbacks around vulnerable communities (90th percentile of CES3.0 scores): 2,500 foot (red) and1,500 foot (orange).



4. Input-Output Analysis of the Economic Impacts of Oil and Gas Production Associated with Proposed Land Use Amendments in the City of Los Angeles

In this section of the report, we estimate the impact across the Los Angeles economy of the proposed ordinance to curtail the production of oil and gas at well sites that are within a certain distance of sensitive land uses. The number of active oil and gas well sites in the City of Los Angeles and the number of sites that are at risk of closure associated with different setback criteria were identified in Section 3. We combine these figures, with well-specific output data to estimate the direct impact of well closure on the oil and gas extraction sector and across the broader Los Angeles economy. The conventional technique to explore this question is input-output analysis. A brief introduction to input-output analysis is provided below, before we turn to the results of our investigation. An extended overview of input-output analysis is provided in Appendix C.

The input-output data used in this report come from IMPLAN, a private firm that enables researchers to construct input-output accounts for local area analysis. Industry employment data in the IMPLAN accounts were adjusted to match the City of Los Angeles employment figures (EDD+NES) given in Tables 2.2 and 2.4 presented above. Local industrial output was also adjusted to maintain the productivity values (output/employment) in the original IMPLAN data. All other input-output data used in the analysis below rest directly upon IMPLAN estimates.

4.1 Input-Output Analysis: A Primer

Economic production is typically associated with the provision of a variety of different goods and services. We often divide the economy into a series of industrial sectors. We tend to think of each sector as comprising a series of firms producing a similar type of output. Thus, the oil and gas extraction sector consists of firms largely engaged in the removal of oil and gas from underground wells. Across the economy, industrial sectors are more or less closely connected with one another through patterns of purchases and sales. The automobile industry, for example, purchases a lot of steel and aluminum, along with rubber and plastics, glass and electronics. Thus, the automobile sector is linked closely to other industries that produce the materials out of which automobiles are constructed. We think of these other industries as being "upstream" of automobile production. In another example we might imagine the fiber, yarn and thread mills of the textile industry as selling a lot of their output to "downstream" sectors such as carpets and apparel.

All of these purchases and sales between industrial sectors, along with imports and exports, are recorded for the national economy. One can think of the imports and exports as being upstream and downstream activities that are outside the economy of interest. These data are gathered every few years by the Bureau of Economic Analysis and form the basis for what are known as input-output accounts (https://www.bea.gov/industry/io_annual.htm). Alongside the buying and selling of industrial goods, the input-output accounts also record purchases of commodities by households and the government. Sales between industries are often regarded as intermediate goods sales, because they involve the purchase of one industry's output for the purpose of making output in another industry. Sales to the government and households are regarded as elements of final demand, for their consumption does not directly result in the production of another type of output. Note that input-output data also record the purchase of labor, from the household sector, by each industry in the economy. These data report how many workers are employed within each industrial sector.

In general, input-output accounts provide a recipe of what kinds of inputs, and how much of those inputs, are required to produce output in every industry in the economy. Thus, we can say that if we want to satisfy final demand for $1 million worth of automobiles, how much production will have to occur throughout the economy. Obviously, the major part of meeting such final demand will consist of the output of automobiles themselves, but the production of those autos will set in motion a chain of activity in sectors that are upstream of automobile production that provide the inputs out of which finished automobiles are manufactured. The output of automobiles in this example is referred to as direct output. The output of all other commodities that support auto production is defined as indirect output. However, indirect output also takes into account a series of feedback relationships between all the sectors in the economy. For example, the steel that is used as an indirect input to make automobiles itself has to be produced. That steel might use some automobiles in its production and those automobiles have to be produced using yet further inputs of steel, etc. This chain of feedbacks in the production system is examined until it is exhausted: that is until there are not further indirect inputs to add into the production system.

By adding together the direct and the indirect outputs and then dividing this sum by the direct output, we obtain what is conventionally regarded as a Type-1 output multiplier. This multiplier reports the total value of output (direct + indirect) that must be produced within the economy to satisfy one million dollar's worth of final demand in the automobile sector. Type-1 multipliers vary in value across industrial sectors. They tend to be larger when an industry depends heavily on a large number of upstream activities in order to produce its output.

This is not the end of the story, however. In order to satisfy final demand in the automobile, or any other, sector, labor must also be purchased in return for a wage. Those wages are spent, at least in part, within the economy and so induce further economic activity. For example, wages must be paid in the auto sector and in other parts of the economy upstream of the auto industry in order to satisfy the final demand for automobiles. The wages of all these workers are used to purchase some combination of goods and services that must also be produced within the economy. If we take all this additional or induced production into account, we end up with a Type-3 output multiplier that reports the overall production of output in the economy (direct + indirect + induced) required to satisfy $1 million in final demand for automobiles. The value of the Type-3 multiplier is always larger than the value of the Type-1 multiplier. Often we find that the induced effect of the output multiplier is significantly larger than the indirect effect.

We can generate multipliers for employment as well as output. The employment multiplier is the focus in this report. The Type-1 employment multiplier tells us how much labor is required (direct + indirect) to produce all the goods and services necessary to support $1 million of final demand in the oil and gas extraction sector. The direct labor input in this case represents the labor employed within the oil and gas extraction industry to produce $1 million worth of output, while the indirect labor input represents that labor employed across the economy to produce intermediate inputs consumed by the oil and gas extraction sector. The Type-3 employment multiplier adds induced effects into the mix and represents how much labor is required throughout all sectors of the economy to produce the goods and services that are consumed out of the wages paid to workers directly and indirectly in support of oil and gas extraction. Once more, these multipliers are generated over many rounds of activity.

Because the methodology of input-output analysis is based upon linear production technology (see Appendix C), the technique may be used to generate multipliers associated with increasing economic

output or with decreasing economic output. In the subsections below, we present output and employment multipliers for the oil and gas extraction industry in the City of Los Angeles, and then we provide estimates of the total employment loss associated with the proposed city ordinance. Note that across these discussions, the focus of our analysis is directed upon the employment data derived from the Quarterly Census of Employment and Wages (QCEW) and the Non-Employer Survey. These data provide our best estimate of city employment by industry. These estimates are bracketed on the low side by QCEW/EDD data and on the high side by the job count data provided by the Bureau of Economic Analysis and IMPLAN.

4.2 Output and Employment Multipliers in the Oil and Gas Industry in Los Angeles

The oil and gas extraction sector in the city of Los Angeles produced output estimated at $182 million in 2015. Employment in this industry (wage and salary and contract workers) was estimated at 345 workers (see Section 2). We know from discussion of the methodology of input-output analysis that production within one sector of the economy is likely to have multiplier effects throughout the economy as a whole that are greater than the sector specific figures just outlined. Those multiplier effects are a function of how much one particular industry within an economy is integrated with the rest of the economy. That integration tends to be higher when the industry purchases a relatively large volume of intermediate inputs from other sectors. It is also important to note that multiplier effects also tend to be larger as the size of the region under examination gets larger, for the simple reason that larger regions tend to produce a greater variety of goods and services than smaller regions. Small regions often have to import inputs from elsewhere and imports do not have much influence on multipliers that are usually specific to the region in question.

Table 4.1 provides summary output and employment multipliers for the oil and gas extraction industry in the city of Los Angeles for 2015. The output multiplier has a value of 1.326 that is interpreted in the following way. For $1 of output from the oil and gas extraction industry demanded in the local economy, overall output valued at $1.326 is generated across the Los Angeles city economy. Of this overall output, $0.152 comprises indirect economic activity or production stimulated by inter-industry patterns of buying and selling across the local economy, and $0.173 is production that is induced by consumption resulting from wage payments to Los Angeles labor associated with the original demand for oil and gas sector output. The output multiplier is simply the ratio of overall output within the Los Angeles economy (that can be linked to oil and gas extraction) to the original final demand of $1 for oil and gas sector direct output. The multipliers discussed throughout this section are those most commonly discussed in the literature (Miller and Blair, 1985).

In similar fashion, the employment multiplier is the ratio of total employment across the Los Angeles economy that is associated with one unit of direct employment in the oil and gas extraction sector. The employment multiplier has a value of 1,997. Thus for each worker directly employed within the oil and gas extraction sector, an additional 0.997 workers are employed in supporting jobs across the city. The indirect and induced employment multipliers may be understood in the same way as their output counterparts. For completeness, Appendices D and E provide summary output and employment multipliers associated with EDD wage and salary data alone and then for the BEA/IMPLAN job totals.

Table 4.1: Output and employment multipliers for the oil and gas extraction industry (NAICS 211) in Los Angeles, 2015

	Direct	Indirect	Induced	Multiplier
Output	1.0	0.152147	0.173356	1.325503
Employment	1.0	0.307515	0.689764	1.997279

Source: IMPLAN based on EDD+NES employment data and DOGGR output data

Armed with these multipliers, we can now investigate more carefully the role that the oil and gas extraction industry plays across the Los Angeles economy. Starting first with output, we explore how much overall production is linked to output in oil and gas extraction estimated at $181.5 million in 2015. It is convention in input-output analysis to relate overall economic activity to what is known as final demand (direct output in a sector) rather than the sector's total output. Table 4.2 reports the total output and employment effects of production in the oil and gas extraction industry, building on the multipliers in Table 4.1. Overall output of $240 million across the Los Angeles economy is associated with the production of $182 million in the oil and gas extraction sector. This much oil and gas production is required to satisfy final demand requirements (direct output) of $180,876,455. In terms of employment, Table 4.2 shows that 686.6 workers hold jobs across the city economy that are related to the direct employment of 343.8 workers in the oil and gas extraction industry. Of those 686.6 workers, 1.5 are employed in oil and gas extraction related to indirect and induced impacts, taking total employment in the oil and gas extraction sector in the region up to 345 workers. Appendices D and E provide related information for EDD and BEA/IMPLAN employment and jobs data. Note that estimates of induced effects rely heavily on employee compensation across different sectors of the economy. Those compensation values are not significantly different when comparing the EDD+NES model here and the BEA/IMPLAN model.

Table 4.2: Overall impacts of the oil and gas extraction industry on the Los Angeles economy, 2015

	Direct	Indirect	Induced	Total
Output	$180,876,455	$27,519,877	$31,356,035	$239,752,367
Employment	343.8	105.7	237.1	686.6

Source: IMPLAN based on EDD+NES employment data and DOGGR output data

Table 4.3 illustrates the top ten local sectors in terms of output that are impacted by oil and gas extraction in Los Angeles. Note that the top row of Table 4.3 shows the overall output of the oil and gas extraction sector and its associated employment, matching the figures given earlier. The difference in output and employment values for oil and gas between Tables 4.2 and 4.3 reflects measures of final demand versus overall output. Overall output is that production required to satisfy a given level of final demand. The difference between these output figures captures indirect and induced production within the oil and gas industry alone. Table 4.3 includes a number of sectors not usually associated with the oil and gas petroleum complex, such as hospitals, real estate and owner-occupied dwellings. These sectors do not contribute in terms of key inputs to oil and gas production, but they are large local sectors whose

products and services are in demand by workers employed throughout the economy whose jobs are connected through input-output linkages to oil and gas extraction.

Table 4.3: Top ten sectors (by output) impacted by production in the oil and gas extraction sector in Los Angeles, 2015

Sector	Output $	Employment
Oil and gas extraction	181,522,029	345.0
Management of companies	4,695.056	20.0
Maintenance & repair construction, non-residential	4,569,022	28.6
Wholesale trade	3,753,402	15.1
Petroleum refineries	3,136,606	0.6
Pipeline transportation	3,075,299	3.4
Real estate	2,053,448	8.6
Hospitals	1,786,709	10.4
Owner-occupied dwellings	1,758,636	0.0
Commercial & industrial machinery& equipment renting & leasing	1,504,337	5.3

Source: IMPLAN based on EDD+NES employment data and DOGGR output data

4.3 Employment Impacts of Well Closure in Oil and Gas Extraction in Los Angeles as a Result of the Proposed City Ordinance

Oil and gas production data are well-specific. Production data for all active wells within the city of Los Angeles are the basis for the output figures for oil and gas extraction identified in Section 2. These output data measure the direct production activity that drives the multipliers examined in the input-output analysis above. Section 3 of this report begins analysis of production data associated with individual wells. In Section 3, geographical information system (GIS) tools were used to identify the number of active oil and gas wells located within two setback distances (1500 feet and 2500 feet) of sensitive land uses. Sensitive land uses were defined using setback distances between individual wells and land use parcels deemed sensitive according to the proposed city ordinance. We also made use of CalEnviro-Screen 3.0 as an alternative means of identifying "communities disproportionally burdened by multiple sources of pollution" (https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30).

The employment impacts (direct and total) associated with ceasing production at active well sites within different setback distances of sensitive land uses is the focus of the following analyses. We explore these impacts for the different designations of sensitive land uses identified in Section 3. We begin with the land use (SCAG data) estimates and then examine vulnerable communities (CalEnviroScreen 3.0 data).

4.3.1 Sensitive land use analysis

Section 3 revealed that in 2015, there were 508 active wells in the city of Los Angeles with non-zero production. 429 of these wells were located within 2,500 feet of sensitive land uses as defined in Section 3, producing some 88% of the city's oil and 50% of its gas. Using the smaller setback distance of

1,500 feet from sensitive land uses identified 420 active wells with non-zero production numbers. These wells overlapped very closely with the first set and generated 87% of the city's oil and 50% of its gas (see Table 3.4) Note, that the data for well production in 2016 (see Appendix A), suggests that wells within the 1,500 feet and 2,500 feet setback distance are responsible for significantly different volumes of oil and gas production.

The analysis in this section is focused on 2015 oil and gas production because of available economic data. We do not know exactly how much employment is associated with each well site, nor how overall oil and gas employment is separated into that associated with extracting oil versus gas. Thus, we estimate the total value of oil and gas production at well-sites within the proposed setback distances as a share of overall industry output in the city and use that to find the associated employment. Thus, in the case of the 2,500 setback distance:

{(2,627,238bbl)($45) + (7,775,580Mcf)($3)} / $181.522 million = 0.7798.

Thus, we estimate that 345(0.7798) = 269 workers in the oil and gas extraction sector are employed within the 2,500 feet setback distance. Because input-output analysis is linear, this also means that overall city employment associated with oil and gas extraction can be obtained in similar fashion. Table 4.4 reports oil and gas employment and overall employment in the city associated with the different setback zones.

Table 4.4: Employment reductions of proposed city ordinance – Sensitive land use analysis

Setback Distances	Oil and Gas Employment Effects	Total Employment Effects
2500 feet	269	535.4
1500 feet	267.1	531.6

Source: IMPLAN based on EDD+NES employment data and DOGGR output data

Table 4.4 identifies the employment losses in the City of Los Angeles associated with halting oil and gas extraction within the given setback distances. The oil and gas employment figures show the number of extraction workers whose jobs will end with well closure. Those job losses in the oil and gas sector will generate additional multiplier employment reductions across the city of Los Angeles. Those additional job losses are the indirect effects of reduced expenditures on intermediate goods destined for oil and gas extraction and the induced impacts of reduced wage spending across the city economy. To be clear, with a setback distance of 2,500 feet, 269 workers will lose their jobs in the oil and gas extraction industry as wells cease production. An additional 266 workers in the city face job losses as a result of multiplier effects, for a total job loss of 535.4 workers. The total employment reduction for the city of closing oil and gas wells within 1,500 feet of sensitive land uses is estimated to be 532 workers.

4.3.2 Vulnerable community analysis

In this section examining the employment impacts of the proposed city ordinance, we base our construction of sensitive land uses not on specific activities identified by the city, but on state identification of vulnerable communities (i.e., census tracts) on the basis of the CalEnviroScreen 3 (CES3). More information on CalEnviroScreen 3.0 is provided in Section 3. Tables 3.5 and 3.6 uses the

same analysis as reported above, building on the identification of oil and gas wells within 1,500 feet and 2,500 feet of census tracts that score at or above the 75th and 90th percentiles in the CES3 scheme.

Table 4.5: Employment reductions of proposed city ordinance – Vulnerable communities analysis

Setback Distances	Oil and Gas Employment Effects	Total Employment Effects	Oil and Gas Employment Effects	Total Employment Effects
	75th percentile CES 3 census tracts		90th percentile CES 3 census tracts	
2500 feet	164.7	327.8	118.2	235.3
1500 feet	154.5	307.6	111.4	221.7

Source: IMPLAN based on EDD+NES employment data and DOGGR output data

Table 4.5 shows that the closure of active oil and gas wells located within 2,500 feet of census tracts that exceed the 75th percentile in terms of CES3 scores would reduce total city employment by 327.8 workers (164.7 of those workers in the oil and gas extraction sector). Well closures within the 1,500 feet setback distance of CES3 tracts above the 75th percentile would reduce total city employment by 307.6 workers (154.5 of those workers in the oil and gas extraction sector). If we increased the CES3 threshold to census tracts above the 90th percentile, then the closure of wells within the 2,500 feet setback distance would reduce overall city employment by 235.3 workers (118.2 in the oil and gas extraction sector). Closing wells within the 1,500 feet setback distance would reduce city employment by a total of 221.7 workers (111.4 of those employed in oil and gas extraction).

Overall city employment was estimated at 1.615 million non-farm private sector workers (EDD+NES) in 2015, Adding the agricultural sector and government workers push the overall employment figure to 1.94 million in the city. In terms of the proposed city ordinance, using the 2500 feet setback for the sensitive land use analysis (i.e., the model with the highest employment loss) would result in a short-term loss of city employment of around 0.035 percent of its overall workforce.

Two caveats should be noted in relation to these figures. First, input-output analysis provides a static set of impacts that largely ignore opportunity costs and the possibilities for employment and productive investment elsewhere in the economy. It is difficult to specify the long-run impacts of oil and gas well closure either on workers within the oil and gas extraction sector or those elsewhere in the economy. These longer run impacts will typically be more favorable if well closure occurs in a period of relatively low unemployment. Second, input-output analysis looks to the upstream supply chain of an industry rather than downstream production. After oil and gas is removed from well-sites it travels by pipeline or truck to storage facilities, to refineries and to end-users. Local refinery production does not depend extensively on local oil and prices for crude and refined petroleum products are set in global markets, though they vary regionally because of taxes and local regulation. Thus, we do not see the loss of local oil and gas capacity as having a significant impact on local prices. However, we could see additional employment loss in local parts of the oil and gas transportation system associated with well closure. That said, estimating these impacts without reliable data on well-specific oil and gas transportation, and without data on local and non-local oil and gas flow through the local transportation infrastructure, are beyond the scope of this report.

5. Related Analysis

To this point in the report, we have looked at the negative impacts of oil and gas well closure on employment across the City of Los Angeles. However, it is the case that some jobs will be added to the local economy as a result of well closure and the resulting remediation that would be performed at abandoned oil and gas extraction sites. On top of these job gains, the reduction in pollution that would accompany the closure of oil and gas wells in Los Angeles is significant, potentially reducing health costs for vulnerable populations. Finally, since the development of many of the oil and gas well sites, the Los Angeles region has experience a boom in land values and in many cases the economic potential of current well sites might well be more fully realized with remediation and redevelopment. These issues are examined briefly in this section of the report.

5.1 Input-Output Analysis of the Environmental Benefits of Reduced Oil and Gas Extraction in Los Angeles

Economic activity involves transforming various kinds of inputs into commodities, goods and services, demanded in the market. This transformation of inputs to outputs often generates a series of byproducts that include pollutants of various sorts. Thus, when we burn fossil fuels to generate electricity we release carbon dioxide into the atmosphere. Following the same logic, when we extract oil and gas from the ground we produce a series of byproducts. The production of these pollutants may be traced directly to activities within the oil and gas extraction sector. However, activities within this sector have broader implications for the production of waste materials. Just as in the input-output model where we trace the chain of inputs required within an industry to produce a unit of output, so we can link pollutants to that production chain to estimate the total amount of pollution generated across the economy that is associated with the production of a certain volume of output in a particular economic sector.

In order to produce input-output measures of environmental emissions associated with industrial activity we need to combine information on industry by industry transactions, that are the core of the input-output methodology, with data on pollution gathered at the individual industry level. The simple mathematics of how this is done is discussed in Appendix G of this report. An Economic Input-Output Life Cycle Assessment (EIO-LCA) tool that combines input-output and pollution data by sector has been generated a the Green Design Institute of Carnegie Mellon University (http://www.eiolca.net/) . This tool is built from U.S. benchmark input-output data (the BEA input-output benchmark data are standard for the U.S. and also used by IMPLAN), and from pollution data gathered by the government from individual industrial sectors. It is important to note that there is a good deal of missing and incomplete data in the construction of these accounts, yet EIO-LCA remains one of the most widely used tools to explore the production of various forms of pollution associated with industrial activity within the United States.

In this section of the report, we take measures of output in the Los Angeles oil and gas industry for 2015 and we feed them into the EIO-LCA tool to report how much pollution is generated across the local economy that may be associated with oil and gas well activity. First we report the total production of pollutants using the 2015 output data and then we show the pollution cost savings that may be associated with the proposed city ordinance. To do this we assume a setback distance of 2,500 feet and use the sensitive land use approach presented in Section 3 of this report. The links between pollution

and health care are reasonably well developed, even if the health care costs associated with different volumes of various kinds of pollutants are somewhat difficult to estimate. At the end of this section, we highlight some of the links between pollution and health care. The take home message is that, in terms of pollution, the proposed city ordinance is likely to generate a series of benefits that could be priced in terms of health care cost savings, both to local and non-local residents. These benefits are also important in terms of the state assembly bill 32 (AB32) and California's efforts to transition to a sustainable, low carbon future.

5.1.1 Pollution Associated with Oil and Gas Extraction

The estimates of pollution associated with oil and gas activity in the City of Los Angeles presented in this section of the report are based on 2002 input-output accounts developed at the national (U.S.) level and on national estimates of pollution associated with different kinds of industrial activity. (The EIOLCA data have not been updated since the 2002 benchmark U.S. input-output accounts were published.) In this sense those estimates should be seen as relatively imprecise. They are imprecise for two main reasons, First, the data used are relatively old, even though input-output coefficients tend to change relatively slowly over time. Improvements over time in economic efficiency and in environmental efficiency, we hope, lead to reductions in pollution per unit of industrial output. Second, the input-output tables used in this part of the analysis represent the economy of the United States as a whole rather than that of Los Angeles. (Note that the analysis in Section 4 and Section 5.3 of this report is based upon input-output accounts for the City of Los Angeles.) The Los Angeles economy, while large, does not produce all inputs that are required to sustain all kinds of industrial output. Thus, the gross pollution data that is presented below in support of oil and gas extraction is biased upwards. Future analysis might combine the pollution data from EIOLCA with input-output data restricted to the Los Angeles economy.

To estimate pollution associated with oil and gas extraction in the City of Los Angeles, industry output in the oil and gas industry of Los Angeles in 2015 ($182 million) is fed into the EIO-LCA model. The resulting pollution estimates are presented below. We then calculate the pollution savings linked to the proposed city ordinance. These savings highlight the reductions in various kinds of pollution that would result from halting oil and gas production within 2500 feet of sensitive land-uses.

The first step in this process is to deflate industrial output in 2015 dollars into output in year 2002 dollars. This is done using producer price indices for the oil and gas extraction industry available from the Bureau of Labor Statistics (https://www.bls.gov/ppi/ppiover.htm). Producer price indices measure changes over time in the selling prices received by producers of various goods and services. PPI data are available for most all sectors of the economy on a monthly basis extending back for many years. The oil and gas PPI indicates that a year 2002 dollar of output in the oil and gas sector is equivalent to $1.3951 of sector output in 2015 dollars.

The results are presented in Tables 5.1, 5.2 and 5.3. These report the amount of emissions of various types associated directly with oil and gas extraction, and those emissions that are associated with upstream production that is linked to output in the oil and gas sector. In these data, there are no induced effects of emissions generated by consumption out of wages (emissions linked to the production of goods that are purchased with wages). Most of the emissions are generated in oil and gas extraction and that means they are local. Some of the indirect emissions may be produced outside the region.

Table 5.1: Conventional emissions associated with oil and gas extraction in the City of Los Angeles, 2015 (Top 10 sectors)

Sector	CO	NH_3	N_2O	PM10	PM2.5	SO_2	VOC
Oil & gas extraction	527	0.37	383	3.59	3.08	25.8	535
Commercial & industrial machinery rent & lease	30	0.002	0.463	0.096	0.085	0.176	2.44
Natural gas distribution	13.1	0.003	0.582	0.038	0.034	0.188	0.59
Support activities for oil & gas operations	12.5	0.014	10.3	0.905	0.857	1.81	1.62
Iron & steel mills	10.5	0.03	1.57	0.438	0.351	1.18	0.356
Non-residential repair & maintenance construction	9.66	0.008	3.66	26.3	3.18	0.36	3.95
Power generation & supply	6.61	0.313	47.7	6.66	5.36	106	0.478
Truck transportation	6.01	0.017	6.34	1.81	0.317	0.131	0.674
Household goods repair & maintenance	5.02	0	0.071	0.015	0.014	0.005	0.419
Alumina refining & primary production	3.97	0.008	0.173	0.126	0.081	1.26	0.052
Total all sectors	**666**	**3**	**492**	**54.9**	**18.5**	**157**	**561**

Source: EIO-LCA (2017). Data from Los Angeles oil and gas extraction sector.

Notes: All figures are in metric tons released to the atmosphere: CO (carbon monoxide), NH_3 (ammonia), N_2O (nitrous oxide), PM10 (particulate matter less than 10 microns in diameter), PM2.5 (particulate matter less than 2.5 microns in diameter), SO_2 (sulfur dioxide), VOC (volatile organic compounds).

Table 5.1 shows the conventional emissions (in metric tons) associated with the chain of industrial activity supporting the output of $182 million of output in the Los Angeles oil and gas extraction industry. The table reveals that most emissions are associated with the oil and gas extraction itself. The remaining emissions are those generated upstream in support of this sector. The table highlights the top 10 sectors associated with oil and gas activity in terms of generating conventional emissions. The emissions totals for each type of release across the economy as a whole are listed in the last row of the table.

Table 5.2 identifies greenhouse gases associated with oil and gas extraction in Los Angeles. The table lists the total volume of greenhouse gases of different kinds measured in terms of CO_2 equivalents in metric tons. The largest emissions once more are those associated directly with production in the oil and gas extraction sector. The other sectors identified are those with the largest GHG production that is connected to oil and gas extraction operations. Because of caveats regarding the EIO-LCA data, we can be confident that the figures for oil and gas extraction are city-based, while the GHG emissions from allied sectors is found both within and outside the city of Los Angeles. For example, coal mining is listed because it is a significant fuel for electricity that is consumed by oil and gas extraction and upstream industrial activity. There is no coal mining in the city and so these emissions would be located

elsewhere. However, given that we are talking about GHG emissions, perhaps location is not that important.

Table 5.2: Greenhouse gas emissions associated with oil and gas extraction in Los Angeles, 2015 (Top 10 sectors)

Sector	Total	CO_2 Fossil	CO_2 Other	CH_4	N_2O	HFC/ PFC
Oil & gas extraction	208,000	58,500	38,000	111,000	0	0
Power generation & supply	25,700	25,300	0	69.6	157	163
Pipeline transportation	2,320	1,060	2.9	1,260	0	0
Non-residential repair & maintenance constructn	2,140	2,140	0	0	0	0
Iron & steel mills	2,110	797	1,300	12.9	0	0
Petroleum refineries	1,800	1,800	0	5.6	0	0
Industrial gas mnfctrg	1,490	173	0	0	0	1,320
Coal mining	1,410	160	0	1,260	0	0
Cement manufacturing	1,370	571	796	0	0	0
Other basic organic chemical mnfctrg	806	723	0	0	82.9	0
Total all sectors	**254,888**	**97,300**	**40,500**	**115,000**	**498**	**1,590**

Source: EIO-LCA (2017). Data from Los Angeles oil and gas extraction sector.

Notes: All figures are shown in metric tons of CO_2 equivalent and represent greenhouse warming potential. CO_2 Fossil (CO_2 emissions tied to burning fossil fuels), CO_2 Other (CO_2 emissions not linked to fossil fuel use), CH_4 (methane), N_2O (nitrous oxide), HFC/PFC (hydrofluorocarbons and perfluorocarbons).

Table 5.3 lists TRACI data (Tools for Reduction and Assessment of Chemicals and other environmental Impacts) connected to $182 million of output in the oil and gas extraction sector in Los Angeles. Key individual upstream sector emissions are also highlighted. The TRACI data are shown because they provide information on some pollutants that are not captured in Tables 5.1 and 5.2. Caution is urged, again, as not all these releases occur within the City of Los Angeles, though we assume that the majority, connected to oil and gas extraction, are local.

5.1.2 Pollution Reductions Associated with the Proposed City Ordinance

Because of the linear nature of input-output analysis and the EIO-LCA tool, we can easily capture the likely pollution savings, or reductions, associated with the proposed city ordinance. The analysis in Section 3 of the report indicated that 78% of oil and gas extraction activities lie within a 2,500 feet setback distance of sensitive land uses. Under this scenario, this means that we can expect pollution cost reductions of 78% of the figures calculated in Tables 5.1, 5.2 and 5.3. To give just one example, overall GHG emissions associated with oil and gas extraction in Los Angeles are estimated to equal 255,000 metric tons of CO_2 equivalents. The city ordinance could reduce those GHG emissions by 78%, or by 199,000 metric tons, each year.

Table 5.3: TRACI Emissions (limited) connected to oil and gas extraction in Los Angeles, 2015 (Top 10 sectors)

Sector	Ozone Depletion	Smog Air	Benzene Release Low	Benzene Release High
Oil & gas extraction	0	11,500,000	0	0
Power generation & supply	0	1,190,000	437	1,310
Pipeline transportation	0	25,000	0	0
Non-residential repair & maintenance constr.	0	105,000	0	0
Iron & steel mills	0	40,900	220	242
Petroleum refineries	0.175	45,600	50	136
Industrial gas mfg.	0.046	11,400	11	12.2
Coal mining	0	83,300	230	3,320
Cement manufacturing	0.008	93,900	307	586
Other basic organic chemical mfg.	6.24	51,000	72.5	337
Total all sectors	**16.4**	**14, 200,000**	**4,500**	**23,600**

Source: EIO-LCA (2017). Data from Los Angeles oil and gas extraction sector.

Notes: This is a partial set of TRACI emissions not covered in other tables (https://www.epa.gov). Ozone depletion (Ozone depletion air, kilograms of CFC-11 equivalents), Smog air (kilograms of ozone equivalent releases), Benzene Release Low (kg of benzene releases, low estimate), Benzene Release High (kg of benzene releases, high estimate).

5.2 Healthcare Costs and Savings Associated with Air Pollution in California

According to a recent study by the World Bank, the cost of premature deaths attributed to air pollution worldwide was $5 trillion in 2013 (World Bank 2017). For the same year, the World Bank estimates that $225 billion was lost in terms of labor income. A 2010 study carried out by the Rand Corporation concluded that failure to meet federal air quality standards in California resulted in nearly 30,000 hospital visits that were equivalent to approximately $193 million in direct hospital costs over the two-year period, 2005-2007.

Oil and gas production are but one component of southern California's air pollution problem, but pollutants (e.g., PM2.5, VOCs) known to be harmful to population and individual health are indeed byproducts of such extraction activities. Therefore, any reduction in the amount of such pollutants is likely to reduce the burden of disease in California. It is also likely to lead to decreases in healthcare costs which can then be reallocated to more productive activities in the state.

The creation and distribution of such pollutants varies over time as well as geographically. As already presented, oil and gas production figure prominently in southern California and more specifically within the city of Los Angeles. The estimated adverse health effects and consequences of air pollution in the greater Los Angeles region alone include: over 3,800 premature deaths of those over the age of 30; over

3.5 million days of reduced activity by adults; 141,000 asthma attacks, 1.26 million missed school days; and, 2,800 emergency room visits (Hall and Brajer, 2008). In financial terms, it was estimated in 2008 that air pollution costs each individual in the South Coast Air Basin $1,250. Using this figure as a very conservative estimate in light of rising healthcare costs over the last decade, this translates to over $19 billion in savings for the 3.9 million inhabitants of the city of Los Angeles if federal ozone and PM2.5 standards were achieved.

5.3 Economic Impacts of Remediation on Oil and Gas Well Sites

A second way in which the proposed city ordinance might generate benefits to the city that offset some of the anticipated employment losses noted in Section 4 of this report is through job creation related to remediation activities at oil and gas well sites that are shut down. Once a decision has been made to halt production at an oil well, a process of remediation can begin. Remediation is undertaken to ensure that underground reserves of oil and gas, and any saline or fresh water aquifers penetrated by the well, remain isolated from one another over time. Well remediation requirements vary with local and state regulations, but typically involve the "plugging and abandonment" of a well site. The California Code of Regulations, Section 1723 outlines the requirements for well plugging and abandonment in California. The process of plugging typically involves the filling of the well hole with drilling mud and the placement of cement plugs across all oil or gas zones, any water interfaces and at the surface. Additional cement plugs may be required depending on the condition of the well. Plugs placed into the well-bore prevent communication between subsurface rock layers (Testa and Jacobs, 2014).

The process of remediation involves use of a drilling rig to remove equipment inside the well and to ensure that the well is unobstructed so that isolation plugs can be effectively installed. Additional work involves removal of the well-head, sampling and testing for soil, and possibly water, contamination surrounding the well site. Older wells might have above surface or underground tanks that require further clean up, removal and additional testing for subsurface leakage and contamination. Contaminated soils require careful disposal, before the well site can be brought back to the required standards for commercial or even residential use. It is important for the city and oil producers to ensure timely remediation at oil and gas wells for idle wells pose significant concerns. Indeed, the California Department of Conservation's Division of Oil, Gas, & Geothermal Resources (DOGGR), estimated more than 23,000 idle wells in the state pose risks of desertion and contamination. State assembly bill AB 2729, filed in 2016, is aimed at reducing such risk.

Oil and gas well sites are so heterogeneous that making broad claims regarding average remediation cost is difficult and must always be treated with a good deal of caution. Nonetheless, for the purpose of generating some estimates of employment related to remediation activities at well sites that might be closed as a result of the proposed city ordinance, some data are generated below. The input for these accounts results from conversations between the researchers and the principal of a Los Angeles based environmental remediation firm, specializing in oil and gas field remediation work. Those conversations discussed requirements for local regulators, for drill-rig or other heavy equipment operators, for soil scientists and geotechnical field agents and related personnel and for the length of time such individuals might be employed at a well-site. Though exceedingly coarse, a figure of half a person-year, was established as a baseline to examine the employment impacts of well remediation at an average drill site using input-output analysis.

The IMPLAN input-output model includes a sector that captures waste management and remediation services. Though not specific to oil and gas operations, this sector might be used to provide some

general indications of employment related to oil and gas well remediation throughout the city economy. It should be noted that remediation efforts are one-time activities that are estimated here to cover just one year in the input-output accounts. The regular employment lost through the closure of wells, reported earlier, might extend of many years.

Section 3 of this report identified 429 active oil and gas wells that are found within 2,500 feet of sensitive land uses. Remediation work, calculated over the year, for each of these sites was estimated to involve 0.5 workers. Thus, 215 full-year jobs would be generated in the city of all wells in the proposed setback zone were remediated at once. Of course, following the logic of the input-output model, these jobs would generate additional employment across the city as a result of indirect and induced effects. Table 5.4 shows the overall employment and output impacts of oil and gas well remediation associated with the proposed city ordinance. To repeat, these figures are based on the closure of 429 active wells and assume an average well site remediation cost of approximately $109,000.

Table 5.4: Overall impacts of remediation of oil and gas wells in Los Angeles, 2015 (single year impacts only)

	Direct	Indirect	Induced	Total
Output	$46,836,890	$11,651,814	$8,925,265	$67,413,969
Employment	215	73.7	67.0	355.7

Source: IMPLAN based on EDD+NES employment data and industry expert direct employment required for remediation.

The multiplier values in table 5.4 suggest that the direct employment of 215 full-year operatives engaged in well site remediation support an additional 141 workers throughout the rest of the city economy. Note that these employment figures are assumed to be generated for a single year of remediation work only. After the year, these figures are assumed to drop to zero. Nonetheless, the data here make clear that remediation efforts will offset the majority of the employment lost throughout the city as a result of the proposed ordinance, but only in the very short-term.

Finally, once oil and gas sites have been remediated they may be repurposed for commercial or alternative land use activities, regenerating property and other taxes lost as a result of the cessation of oil and gas activities. It is difficult to estimate how such land might be repurposed and thus what the economic returns to new development might be. There are some well-known examples of oil field redevelopment, notably the Grove in Los Angeles and the Villages at Heritage Springs in the city of Santa Fe Springs. However, it is largely impossible to predict how much land is likely to be "released" as a result of closing active well-sites within the setback zones of Los Angeles. GIS analysis of the 429 well sites for which we have production data in 2015 indicates that they occupy parcels that sum to 1357.4 acres or close to 5.5 million square meters. This does not mean that this area of land could be made available for redevelopment within the city for many of these parcels already house different land uses including residential and commercial activities.

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Appendices

Appendix A: Oil and Gas Well Production (2015, 2016) and setback locations in the city of Los Angeles

Appendix B: Selected land use definitions from the Southern California Association of Governments (SCAG)

Appendix C: Overview of Input-Output Analysis

Appendix D: Employment Multiplier Data

Appendix E: Output Multiplier Data

Appendix F: Alternative Input-Output Results

Appendix G: Input-Output Analysis of Environmental Emissions

Appendix A

Oil and Gas Well Production (2015, 2016) and setback locations in the City of Los Angeles

SCAG LU refers to sensitive land uses; CES3 refers to 75th or 90th percentile of vulnerability scores (refer to Section 3 of report)
Only wells with oil or gas production data in 2015 or 2016 within the city of Los Angeles included.

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3721624	Active	Warren E & P, Inc.	2,909	-	317	-	Yes	Yes	Yes	Yes	Yes	Yes
3700285	Active	Sentinel Peak Resources California, LLC	3,327	2,969	5,354	4,992	Yes	Yes	Yes	Yes	No	No
3724263	Active	DCOR, LLC	7,637	5,534	15,699	9,003	Yes	Yes	No	No	No	No
3724264	Active	DCOR, LLC	9,517	6,925	17,614	13,259	Yes	Yes	No	No	No	No
3721626	Active	Warren E & P, Inc.	4,947	5,549	515	498	Yes	Yes	Yes	Yes	Yes	Yes
3700288	Active	Sentinel Peak Resources California, LLC	-	-	-	71	Yes	Yes	Yes	Yes	Yes	Yes
3711867	Inactive	Nasco Petroleum, LLC	791	-	475	27	Yes	Yes	Yes	Yes	Yes	Yes
3711868	Inactive	Nasco Petroleum, LLC	-	-	-	1,539	Yes	Yes	Yes	Yes	Yes	Yes
3700294	Active	Sentinel Peak Resources California, LLC	13,940	17,959	2,223	1,924	Yes	Yes	Yes	Yes	No	No
3724270	Active	DCOR, LLC	43,651	36,429	36,054	33,423	Yes	Yes	No	No	No	No
3721658	Active	Cooper & Brain Inc.	2,084	2,156	295	307	Yes	Yes	Yes	Yes	Yes	Yes
3700295	Active	Sentinel Peak Resources California, LLC	3,565	4,930	1,879	1,616	Yes	Yes	Yes	Yes	No	No
3721659	Active	Cooper & Brain Inc.	4,171	4,317	587	620	Yes	Yes	Yes	Yes	Yes	Yes
3711869	Active	Nasco Petroleum, LLC	-	-	1,619	1,240	Yes	Yes	Yes	Yes	Yes	Yes
3724272	Active	DCOR, LLC	9,422	7,471	15,254	12,933	Yes	Yes	No	No	No	No
3700296	Active	Sentinel Peak Resources California, LLC	11,412	7,016	9,443	12,872	Yes	Yes	Yes	Yes	No	No
3727292	Active	Tidelands Oil Prod. Co.	3,883	5,326	748	1,090	No	No	No	No	No	No
3711870	Active	Nasco Petroleum, LLC	4,616	4,426	1,886	1,019	Yes	Yes	Yes	Yes	Yes	Yes
3700297	Active	Sentinel Peak Resources California, LLC	13,416	12,325	5,765	4,808	Yes	Yes	Yes	Yes	No	No
3711873	Active	Nasco Petroleum, LLC	164	-	10,618	11,169	Yes	Yes	Yes	Yes	Yes	Yes
3700302	Active	Sentinel Peak Resources California, LLC	12,407	10,101	1,195	946	Yes	Yes	Yes	Yes	No	No
3700303	Active	Sentinel Peak Resources California, LLC	1,129	1,334	623	688	Yes	Yes	Yes	Yes	No	No
3700304	Active	Sentinel Peak Resources California, LLC	2,743	797	2,855	965	Yes	Yes	Yes	Yes	No	No
3722247	Active	Brea Canon Oil Co.	4,711	3,724	1,225	1,428	Yes	Yes	No	No	No	No
3700308	Active	Sentinel Peak Resources California, LLC	-	-	-	250	Yes	Yes	Yes	Yes	Yes	Yes
3722248	Active	Brea Canon Oil Co.	13,752	8,942	1,229	1,421	Yes	Yes	No	No	No	No
3700309	Active	Sentinel Peak Resources California, LLC	-	-	-	170	Yes	Yes	Yes	Yes	Yes	Yes
3700311	Inactive	Sentinel Peak Resources California, LLC	-	-	-	206	Yes	Yes	Yes	Yes	Yes	Yes
3722251	Active	Brea Canon Oil Co.	3,631	2,780	1,278	1,496	Yes	Yes	No	Yes	No	No
3721844	Active	Thomas R. Banks	2,016	1,918	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3700313	Active	Sentinel Peak Resources California, LLC	-	-	-	109	Yes	Yes	Yes	Yes	Yes	Yes
3722252	Active	Brea Canon Oil Co.	3,522	3,121	1,070	1,239	Yes	Yes	No	Yes	No	No
3700315	Active	Sentinel Peak Resources California, LLC	-	-	-	134	Yes	Yes	Yes	Yes	Yes	Yes
3722253	Active	Brea Canon Oil Co.	7,331	4,624	1,055	1,233	Yes	Yes	No	Yes	No	No
3722254	Active	Brea Canon Oil Co.	4,206	2,665	1,113	1,278	Yes	Yes	No	No	No	No
3700317	Active	Sentinel Peak Resources California, LLC	-	-	-	84	Yes	Yes	Yes	Yes	Yes	Yes
3722255	Active	Brea Canon Oil Co.	684	6,604	1,261	1,455	Yes	Yes	No	No	No	No
3722256	Active	Cooper & Brain Inc.	3,909	4,043	552	579	Yes	Yes	Yes	Yes	Yes	Yes
3722258	Active	Thomas R. Banks	1,962	623	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3700320	Active	Sentinel Peak Resources California, LLC	-	-	-	88	Yes	Yes	Yes	Yes	Yes	Yes
3722259	Active	Thomas R. Banks	1,162	1,607	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3722260	Active	Thomas R. Banks	1,987	1,199	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3700322	Active	Sentinel Peak Resources California, LLC	6,849	2,331	1,908	944	Yes	Yes	Yes	Yes	Yes	Yes
3722261	Active	Thomas R. Banks	1,276	1,216	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3729999	Active	Tidelands Oil Prod. Co.	3,931	4,608	796	944	No	No	No	No	No	No
3730000	Active	Tidelands Oil Prod. Co.	957	1,125	214	229	No	No	No	No	No	No
3730001	Active	Tidelands Oil Prod. Co.	7,026	5,679	1,385	1,210	No	No	No	No	No	No
3730002	Active	Tidelands Oil Prod. Co.	7,822	4,999	1,501	973	No	No	No	No	No	No
3722383	Active	Brea Canon Oil Co.	8,004	5,297	1,335	1,567	Yes	Yes	Yes	Yes	No	No

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3721994	Active	Pacific Coast Energy Company LP	3,314	833	8,104	3,377	Yes	Yes	No	No	No	No
3730374	Active	Southern California Gas Company	-	10	-	5,366	No	No	No	No	No	No
3721996	Active	Pacific Coast Energy Company LP	8,974	4,743	6,653	4,478	Yes	Yes	No	No	No	No
3700369	Active	Sentinel Peak Resources California, LLC	10,025	9,923	5,592	8,129	Yes	Yes	Yes	Yes	Yes	Yes
3700371	Active	Sentinel Peak Resources California, LLC	10,072	13,011	3,217	2,556	Yes	Yes	Yes	Yes	Yes	Yes
3700372	Active	Sentinel Peak Resources California, LLC	3,197	1,243	1,162	384	Yes	Yes	Yes	Yes	Yes	Yes
3700373	Active	Sentinel Peak Resources California, LLC	3,674	1,945	4,689	1,599	Yes	Yes	Yes	Yes	Yes	Yes
3722017	Active	Warren E & P, Inc.	1,040	741	103	69	No	No	No	Yes	No	Yes
3700374	Active	Sentinel Peak Resources California, LLC	21,216	21,511	26,960	26,230	Yes	Yes	Yes	Yes	Yes	Yes
3700375	Active	Sentinel Peak Resources California, LLC	13,976	733	9,312	927	Yes	Yes	Yes	Yes	Yes	Yes
3700378	Active	Sentinel Peak Resources California, LLC	8,989	6,442	3,452	2,187	Yes	Yes	Yes	Yes	Yes	Yes
3700379	Active	Sentinel Peak Resources California, LLC	5,329	3,732	7,598	7,675	Yes	Yes	Yes	Yes	Yes	Yes
3700380	Active	Sentinel Peak Resources California, LLC	11,346	12,778	2,670	2,592	Yes	Yes	Yes	Yes	Yes	Yes
3700381	Active	Sentinel Peak Resources California, LLC	5,792	869	4,434	785	Yes	Yes	Yes	Yes	Yes	Yes
3722452	Active	California Resources Long Beach, Inc.	4,191	5,644	263	360	Yes	Yes	Yes	Yes	Yes	Yes
3700383	Active	Sentinel Peak Resources California, LLC	1,577	2	901	1	Yes	Yes	Yes	Yes	Yes	Yes
3722455	Active	Warren E & P, Inc.	2,741	3,466	472	726	No	Yes	Yes	Yes	Yes	Yes
3700384	Active	Sentinel Peak Resources California, LLC	9,296	10,081	3,575	3,440	Yes	Yes	Yes	Yes	Yes	Yes
3722457	Active	California Resources Long Beach, Inc.	2,733	2,332	172	134	Yes	Yes	Yes	Yes	Yes	Yes
3700385	Active	Sentinel Peak Resources California, LLC	7,214	3,071	3,988	2,924	Yes	Yes	Yes	Yes	Yes	Yes
3722458	Active	California Resources Long Beach, Inc.	2,524	2,510	178	161	Yes	Yes	Yes	Yes	Yes	Yes
3722459	Active	California Resources Long Beach, Inc.	914	353	67	21	Yes	Yes	Yes	Yes	Yes	Yes
3722487	Active	E & B Natural Resources Management Corporation	506	424	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3722495	Active	Sampson Operators	359	260	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3722505	Active	Sampson Operators	123	103	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3722508	Active	Tidelands Oil Prod. Co.	1,882	-	393	-	No	No	Yes	Yes	Yes	Yes
3722510	Active	Sampson Operators	261	150	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3722550	Active	Brea Canon Oil Co.	2,057	2,845	1,189	1,361	Yes	Yes	Yes	Yes	No	No
3722588	Active	Axis Petroleum Co.	1,717	1,458	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3722589	Active	Axis Petroleum Co.	1,715	1,458	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3700463	Active	Nasco Petroleum, LLC	3,351	5,272	3,630	2,493	Yes	Yes	Yes	Yes	Yes	Yes
3700465	Active	Nasco Petroleum, LLC	2,885	202	1,377	75	Yes	Yes	Yes	Yes	Yes	Yes
3722676	Active	Cooper & Brain Inc.	3,652	3,779	515	542	Yes	Yes	Yes	Yes	Yes	Yes
3700466	Active	Nasco Petroleum, LLC	580	2,918	866	824	Yes	Yes	Yes	Yes	Yes	Yes
3722753	Active	Tidelands Oil Prod. Co.	4,808	4,564	1,021	939	No	No	No	Yes	No	Yes
3727297	Active	Warren E & P, Inc.	14,563	12,529	2,163	1,770	Yes	Yes	Yes	Yes	Yes	Yes
3722905	Active	Southern California Gas Company	-	-	221,779	61,710	Yes	Yes	No	No	No	No
3722921	Active	Southern California Gas Company	-	-	148,180	20,607	Yes	Yes	No	No	No	No
3700913	Active	Tidelands Oil Prod. Co.	1,185	1,193	253	245	No	Yes	Yes	Yes	Yes	Yes
3722977	Active	Southern California Gas Company	-	-	9,321	39,895	Yes	Yes	No	No	No	No
3700995	Active	Pacific Coast Energy Company LP	1,935	1,009	5,949	1,565	Yes	Yes	No	No	No	No
3700996	Active	Pacific Coast Energy Company LP	3,144	992	6,453	4,061	Yes	Yes	No	No	No	No
3722984	Active	E & B Natural Resources Management Corporation	2,629	2,207	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3700997	Active	Pacific Coast Energy Company LP	1,765	161	7,056	1,496	Yes	Yes	No	No	No	No
3700998	Active	Pacific Coast Energy Company LP	3,946	1,449	10,655	5,408	Yes	Yes	No	No	No	No
3727344	Active	Warren E & P, Inc.	3,195	2,747	464	390	Yes	Yes	Yes	Yes	Yes	Yes
3700999	Active	Pacific Coast Energy Company LP	1,233	3	15,949	48	Yes	Yes	No	No	No	No
3701051	Active	Pacific Coast Energy Company LP	5,494	3,187	8,174	6,649	Yes	Yes	No	No	No	No
3727345	Active	Warren E & P, Inc.	30,188	22,974	4,508	3,238	Yes	Yes	Yes	Yes	Yes	Yes
3701052	Active	Hillcrest Beverly Oil Corp.	6,003	3,613	1,823	1,889	Yes	Yes	No	No	No	No
3701053	Active	Hillcrest Beverly Oil Corp.	5,145	5,555	1,499	3,170	Yes	Yes	No	No	No	No
3723036	Active	PS126 Investments, LLC	854	1,665	-	810	Yes	Yes	Yes	Yes	Yes	Yes
3701280	Active	Warren E & P, Inc.	167	-	20	-	No	No	No	Yes	No	Yes
3723037	Active	PS126 Investments, LLC	933	1,404	-	810	Yes	Yes	Yes	Yes	Yes	Yes

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3723038	Inactive	PS126 Investments, LLC	-	464	-	324	Yes	Yes	Yes	Yes	Yes	Yes
3701403	Active	Axis Petroleum Co.	1,720	1,465	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3701404	Active	Axis Petroleum Co.	1,720	1,463	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3701405	Active	Axis Petroleum Co.	1,719	1,461	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3701406	Plugged	Axis Petroleum Co.	242	-	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3730275	Active	Warren E & P, Inc.	11,990	13,639	1,802	1,924	Yes	Yes	Yes	Yes	Yes	Yes
3723078	Active	E & B Natural Resources Management Corporation	3,471	2,915	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3730137	Active	Warren E & P, Inc.	2,568	2,893	374	402	Yes	Yes	Yes	Yes	Yes	Yes
3730138	Active	Warren E & P, Inc.	2,975	4,453	443	622	Yes	Yes	Yes	Yes	Yes	Yes
3730406	Active	Warren E & P, Inc.	15,366	6,895	2,310	980	Yes	Yes	Yes	Yes	Yes	Yes
3701480	Active	Warren E & P, Inc.	389	-	61	-	Yes	Yes	Yes	Yes	Yes	Yes
3713612	Active	Sherwin D. Yoelin	4,459	4,537	4,468	2,604	Yes	Yes	Yes	Yes	Yes	Yes
3713614	Active	Sherwin D. Yoelin	2,592	2,470	2,317	1,519	Yes	Yes	Yes	Yes	Yes	Yes
3723144	Active	Tidelands Oil Prod. Co.	3,793	3,916	844	973	No	No	No	Yes	No	Yes
3713615	Active	Sherwin D. Yoelin	2,152	2,237	3,210	1,390	Yes	Yes	Yes	Yes	Yes	Yes
3727346	Active	Tidelands Oil Prod. Co.	5,168	6,280	1,000	1,298	No	No	No	No	No	No
3713628	Active	Guzman Energy Inc.	1,563	949	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3706480	Active	Sentinel Peak Resources California, LLC	3,680	3,932	3,423	3,245	Yes	Yes	No	No	No	No
3730023	Active	Tidelands Oil Prod. Co.	8,503	7,182	1,666	1,532	No	No	No	No	No	No
3730024	Active	Tidelands Oil Prod. Co.	9,771	10,085	1,917	2,040	No	No	No	No	No	No
3723366	Active	Cooper & Brain Inc.	2,937	3,038	416	436	Yes	Yes	Yes	Yes	Yes	Yes
3730476	Active	Tidelands Oil Prod. Co.	-	9,398	-	1,900	No	No	No	No	No	No
3713999	Active	Southern California Gas Company	-	-	53,900	56,276	Yes	Yes	No	No	No	No
3730025	Active	Tidelands Oil Prod. Co.	4,330	1,411	871	300	No	No	No	No	No	No
3730026	Active	Tidelands Oil Prod. Co.	14,909	9,576	2,836	1,916	No	No	No	No	No	No
3730027	Active	Tidelands Oil Prod. Co.	5,888	5,663	1,161	1,129	No	No	No	No	No	No
3714003	Active	Southern California Gas Company	-	-	102	94	Yes	Yes	No	No	No	No
3701702	Active	Warren E & P, Inc.	5,078	4,629	538	415	Yes	Yes	Yes	Yes	Yes	Yes
3701704	Active	Warren E & P, Inc.	359	-	39	-	Yes	Yes	Yes	Yes	Yes	Yes
3723493	Active	Tidelands Oil Prod. Co.	5,787	5,889	1,074	1,138	No	No	No	Yes	No	Yes
3727352	Active	Tidelands Oil Prod. Co.	3,095	3,340	553	712	No	No	No	No	No	No
3714027	Active	Southern California Gas Company	-	-	113,324	119,026	Yes	Yes	No	No	No	No
3714028	Active	Southern California Gas Company	-	-	208,595	74,033	Yes	Yes	No	No	No	No
3714034	Active	Southern California Gas Company	-	-	423,103	483,902	Yes	Yes	No	No	No	No
3714035	Active	Southern California Gas Company	-	1	-	890	Yes	Yes	No	No	No	No
3727304	Active	Warren E & P, Inc.	13,085	9,185	1,946	1,295	Yes	Yes	Yes	Yes	Yes	Yes
3714036	Active	Southern California Gas Company	-	-	110,546	7,155	Yes	Yes	No	No	No	No
3714038	Active	Southern California Gas Company	-	-	216,626	1,419,376	Yes	Yes	No	No	No	No
3714039	Active	Southern California Gas Company	-	-	18,642	26,433	Yes	Yes	No	No	No	No
3714042	Active	Southern California Gas Company	-	-	129,380	162,023	Yes	Yes	No	No	No	No
3723567	Active	Tidelands Oil Prod. Co.	588	1,520	92	283	No	No	No	No	No	No
3714044	Active	Southern California Gas Company	-	-	178,350	103,738	Yes	Yes	No	No	No	No
3714046	Active	Southern California Gas Company	-	-	215,267	91,299	Yes	Yes	No	No	No	No
3723582	Active	Tidelands Oil Prod. Co.	20,064	12,461	3,807	2,494	No	No	No	No	No	No
3714063	Active	Southern California Gas Company	-	-	305,811	1,170	Yes	Yes	No	No	No	No
3723585	Active	Tidelands Oil Prod. Co.	3,231	2,839	659	570	No	No	No	No	No	No
3714064	Active	Southern California Gas Company	-	-	122,927	7,670	Yes	Yes	No	No	No	No
3723591	Active	Tidelands Oil Prod. Co.	3,408	-	694	-	No	No	No	No	No	No
3714065	Active	Southern California Gas Company	-	-	489,660	170,822	Yes	Yes	No	No	No	No
3714066	Active	Southern California Gas Company	-	-	193,370	3,123	Yes	Yes	No	No	No	No
3714067	Active	Southern California Gas Company	-	-	137,206	2,164	Yes	Yes	No	No	No	No
3714068	Active	Southern California Gas Company	-	-	59,656	868	Yes	Yes	No	No	No	No
3714069	Active	Southern California Gas Company	-	-	24,334	-	Yes	Yes	No	No	No	No
3714072	Active	Southern California Gas Company	-	-	1,036,569	62,905	Yes	Yes	No	No	No	No

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3723610	Active	Tidelands Oil Prod. Co.	382	-	72	-	No	No	No	No	No	No
3714073	Active	Southern California Gas Company	-	-	91,094	9,062	Yes	Yes	No	No	No	No
3723611	Active	Tidelands Oil Prod. Co.	714	-	143	-	No	No	No	No	No	No
3714371	Active	Guzman Energy Inc.	1,081	923	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3714392	Active	Garner Engineering, Inc.	6,352	6,344	4,018	3,452	Yes	Yes	Yes	Yes	Yes	Yes
3723657	Active	Tidelands Oil Prod. Co.	3,741	2,372	647	390	No	No	No	Yes	No	Yes
3714405	Active	Cooper & Brain Inc.	751	700	684	652	Yes	Yes	Yes	Yes	Yes	Yes
3723659	Active	Tidelands Oil Prod. Co.	9,937	7,528	1,880	1,478	No	No	No	Yes	No	Yes
3714406	Active	Cooper & Brain Inc.	2,683	2,501	2,444	2,331	Yes	Yes	Yes	Yes	Yes	Yes
3723660	Active	Tidelands Oil Prod. Co.	6,499	5,873	1,261	1,200	No	No	No	Yes	No	Yes
3714408	Active	Cooper & Brain Inc.	6,868	6,407	6,249	5,966	Yes	Yes	Yes	Yes	Yes	Yes
3703176	Active	Warren E & P, Inc.	2,691	4,730	472	964	Yes	Yes	Yes	Yes	Yes	Yes
3723661	Active	Tidelands Oil Prod. Co.	2,098	-	402	-	No	No	No	Yes	No	Yes
3714410	Active	Cooper & Brain Inc.	1,273	1,476	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3723674	Active	Southern California Gas Company	24,770	18,305	13,946	13,162	Yes	Yes	No	No	No	No
3714451	Active	Breitburn Operating L.P.	6,852	9,137	3,829	4,788	Yes	Yes	Yes	Yes	Yes	Yes
3723681	Active	Southern California Gas Company	17,881	17,642	33,519	17,433	Yes	Yes	No	No	No	No
3727307	Active	Warren E & P, Inc.	22,227	14,703	3,297	2,062	Yes	Yes	Yes	Yes	Yes	Yes
3714979	Active	Cooper & Brain Inc.	1,265	2,056	2,123	2,650	Yes	Yes	Yes	Yes	Yes	Yes
3714980	Active	Cooper & Brain Inc.	2,272	2,141	4,583	5,380	Yes	Yes	Yes	Yes	Yes	Yes
3727354	Active	Warren E & P, Inc.	6,717	5,299	983	749	Yes	Yes	Yes	Yes	Yes	Yes
3703682	Active	Warren E & P, Inc.	4,510	5,538	781	1,146	Yes	Yes	Yes	Yes	Yes	Yes
3730143	Active	Warren E & P, Inc.	9,904	2,454	1,430	347	Yes	Yes	Yes	Yes	Yes	Yes
3708268	Active	Brea Canon Oil Co.	3,357	3,870	1,292	1,212	Yes	Yes	Yes	Yes	No	No
3708269	Active	Brea Canon Oil Co.	9,286	8,231	1,262	1,477	Yes	Yes	Yes	Yes	No	No
3727356	Active	Warren E & P, Inc.	2,329	1,416	342	197	Yes	Yes	Yes	Yes	Yes	Yes
3703789	Active	O'Donnell Oil, LLC	4,182	4,190	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3720044	Active	Sentinel Peak Resources California, LLC	7,090	5,271	4,786	3,458	Yes	Yes	Yes	Yes	No	No
3720055	Active	Sentinel Peak Resources California, LLC	7,895	6,337	5,216	4,941	Yes	Yes	Yes	Yes	No	No
3703815	Active	Warren E & P, Inc.	254	-	40	-	Yes	Yes	Yes	Yes	Yes	Yes
3727358	Active	Brea Canon Oil Co.	3,347	3,074	818	947	Yes	Yes	No	No	No	No
3703833	Active	Warren E & P, Inc.	445	1,297	79	269	No	Yes	Yes	Yes	Yes	Yes
3703834	Active	Warren E & P, Inc.	10,849	17,490	1,887	3,588	No	Yes	Yes	Yes	Yes	Yes
3720148	Active	Sentinel Peak Resources California, LLC	4,649	5,847	1,943	3,194	Yes	Yes	No	No	No	No
3720196	Active	Sentinel Peak Resources California, LLC	59	573	798	2,667	Yes	Yes	Yes	Yes	No	No
3703864	Active	Warren E & P, Inc.	681	-	76	-	Yes	Yes	Yes	Yes	Yes	Yes
3720232	Active	Sentinel Peak Resources California, LLC	15,776	14,022	15,012	12,969	Yes	Yes	Yes	Yes	No	No
3720234	Active	Sentinel Peak Resources California, LLC	3,562	3,366	6,562	6,347	Yes	Yes	Yes	Yes	No	No
3720268	Active	Sentinel Peak Resources California, LLC	10,706	9,142	7,573	6,713	Yes	Yes	Yes	Yes	No	No
3720293	Active	Sentinel Peak Resources California, LLC	7,739	6,976	8,037	8,188	Yes	Yes	Yes	Yes	No	No
3720323	Active	Sentinel Peak Resources California, LLC	4,401	4,967	5,384	5,946	Yes	Yes	Yes	Yes	No	No
3720363	Active	Sentinel Peak Resources California, LLC	6,299	3,762	19,831	14,350	Yes	Yes	Yes	Yes	No	No
3720365	Active	Sentinel Peak Resources California, LLC	8,365	6,786	16,598	13,077	Yes	Yes	Yes	Yes	No	No
3730280	Active	Warren E & P, Inc.	11,208	10,855	1,637	1,522	Yes	Yes	Yes	Yes	Yes	Yes
3727308	Active	Warren E & P, Inc.	1,658	-	224	-	Yes	Yes	Yes	Yes	Yes	Yes
3720429	Active	Sentinel Peak Resources California, LLC	21,224	19,369	21,130	19,537	Yes	Yes	Yes	Yes	No	No
3720441	Active	Sentinel Peak Resources California, LLC	12,486	12,147	15,572	14,262	Yes	Yes	Yes	Yes	No	No
3720477	Active	Sentinel Peak Resources California, LLC	4,198	4,282	5,219	5,645	Yes	Yes	Yes	Yes	No	No
3727310	Active	Tidelands Oil Prod. Co.	3,898	4,201	684	833	No	No	No	No	No	No
3720512	Active	Sentinel Peak Resources California, LLC	3,014	3,499	9,627	10,084	Yes	Yes	Yes	Yes	No	No
3720553	Active	Sentinel Peak Resources California, LLC	1,427	1,147	9,306	7,550	Yes	Yes	Yes	Yes	No	No
3727311	Active	Warren E & P, Inc.	2,908	-	403	-	Yes	Yes	Yes	Yes	Yes	Yes
3720562	Active	Sentinel Peak Resources California, LLC	8,306	7,300	12,555	11,492	Yes	Yes	Yes	Yes	No	No
3720603	Active	Sentinel Peak Resources California, LLC	10,055	9,927	3,943	3,943	Yes	Yes	Yes	Yes	No	No

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3720624	Active	Sentinel Peak Resources California, LLC	2,827	2,124	2,725	1,688	Yes	Yes	Yes	Yes	No	No
3720643	Active	Sentinel Peak Resources California, LLC	8,943	7,233	13,514	10,181	Yes	Yes	Yes	Yes	No	No
3720666	Active	Sentinel Peak Resources California, LLC	4,197	5,498	4,889	6,065	Yes	Yes	No	No	No	No
3720672	Active	Sentinel Peak Resources California, LLC	4,568	8,319	9,000	10,544	Yes	Yes	Yes	Yes	No	No
3730423	Active	Warren E & P, Inc.	37,792	37,424	5,606	5,261	Yes	Yes	Yes	Yes	Yes	Yes
3720688	Active	Sentinel Peak Resources California, LLC	2,656	3,707	7,451	3,977	Yes	Yes	Yes	Yes	No	No
3720723	Active	Sentinel Peak Resources California, LLC	2,020	5,065	12,120	10,588	Yes	Yes	No	No	No	No
3720729	Active	Sentinel Peak Resources California, LLC	2,047	1,752	10,438	4,735	Yes	Yes	Yes	Yes	No	No
3716578	Active	Chaim Nathan & Edie Bato	1,216	459	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3703887	Active	Sampson Operators	219	152	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3716591	Active	E & B Natural Resources Management Corporation	2,532	1,957	-	-	Yes	Yes	Yes	Yes	No	No
3730149	Active	Warren E & P, Inc.	6,111	7,262	902	1,018	Yes	Yes	Yes	Yes	Yes	Yes
3730150	Active	Warren E & P, Inc.	1,146	-	153	-	Yes	Yes	Yes	Yes	Yes	Yes
3730151	Active	Warren E & P, Inc.	6,831	6,763	1,016	952	Yes	Yes	Yes	Yes	Yes	Yes
3720769	Active	Sentinel Peak Resources California, LLC	14,178	13,782	14,382	10,037	Yes	Yes	Yes	Yes	No	No
3716597	Active	E & B Natural Resources Management Corporation	2,492	1,833	-	-	Yes	Yes	Yes	Yes	No	No
3716598	Active	E & B Natural Resources Management Corporation	1,616	1,397	-	-	Yes	Yes	Yes	Yes	No	No
3716599	Active	E & B Natural Resources Management Corporation	2,504	2,166	-	-	Yes	Yes	Yes	Yes	No	No
3716600	Active	E & B Natural Resources Management Corporation	1,910	1,848	-	-	Yes	Yes	Yes	Yes	No	No
3720779	Active	Sentinel Peak Resources California, LLC	6,369	4,996	14,068	11,706	Yes	Yes	Yes	Yes	No	No
3716601	Active	E & B Natural Resources Management Corporation	8,059	7,794	-	-	Yes	Yes	Yes	Yes	No	No
3720790	Active	Sentinel Peak Resources California, LLC	11,566	12,671	13,045	14,941	Yes	Yes	Yes	Yes	No	No
3716602	Active	E & B Natural Resources Management Corporation	5,339	3,897	-	-	Yes	Yes	Yes	Yes	No	No
3716604	Active	E & B Natural Resources Management Corporation	2,871	4,732	-	-	Yes	Yes	Yes	Yes	No	No
3720831	Active	Sentinel Peak Resources California, LLC	21,927	20,713	32,800	38,254	Yes	Yes	Yes	Yes	No	No
3716605	Active	E & B Natural Resources Management Corporation	1,716	1,420	-	-	Yes	Yes	Yes	Yes	No	No
3720834	Active	Sentinel Peak Resources California, LLC	4,118	1,898	10,093	5,764	Yes	Yes	No	No	No	No
3730043	Active	Warren E & P, Inc.	3,961	5,715	607	803	Yes	Yes	Yes	Yes	Yes	Yes
3716608	Active	E & B Natural Resources Management Corporation	2,861	1,961	-	-	Yes	Yes	Yes	Yes	No	No
3730044	Active	Warren E & P, Inc.	555	41	90	7	Yes	Yes	Yes	Yes	Yes	Yes
3727372	Active	Warren E & P, Inc.	10,158	7,016	1,497	991	Yes	Yes	Yes	Yes	Yes	Yes
3720889	Active	Sentinel Peak Resources California, LLC	7,241	5,025	7,153	5,032	Yes	Yes	No	No	No	No
3720891	Active	Sentinel Peak Resources California, LLC	15,050	14,676	10,636	7,546	Yes	Yes	No	No	No	No
3720904	Active	Sentinel Peak Resources California, LLC	5,057	5,412	6,266	7,260	Yes	Yes	Yes	Yes	No	No
3720914	Active	Sentinel Peak Resources California, LLC	6,637	4,532	10,307	6,133	Yes	Yes	No	No	No	No
3720915	Active	Sentinel Peak Resources California, LLC	16,361	15,217	6,197	7,631	Yes	Yes	Yes	Yes	No	No
3720916	Active	Sentinel Peak Resources California, LLC	11,782	9,180	22,503	15,486	Yes	Yes	Yes	Yes	No	No
3720933	Active	Sentinel Peak Resources California, LLC	2,367	6,846	6,454	4,877	Yes	Yes	No	No	No	No
3720936	Active	Sentinel Peak Resources California, LLC	13,263	12,742	13,073	11,768	Yes	Yes	Yes	Yes	No	No
3720946	Active	Sentinel Peak Resources California, LLC	8,073	8,654	18,750	15,045	Yes	Yes	Yes	Yes	No	No
3720956	Active	Sentinel Peak Resources California, LLC	5,417	5,488	3,706	3,710	Yes	Yes	No	No	No	No
3720963	Active	Sentinel Peak Resources California, LLC	1,657	-	1,638	-	Yes	Yes	No	No	No	No
3720974	Active	Sentinel Peak Resources California, LLC	4,589	3,890	2,344	3,745	Yes	Yes	No	No	No	No
3730427	Active	Warren E & P, Inc.	7,673	1,886	1,126	261	Yes	Yes	Yes	Yes	Yes	Yes
3721011	Active	Sentinel Peak Resources California, LLC	10,877	10,862	3,837	4,559	Yes	Yes	No	No	No	No
3721023	Active	Sentinel Peak Resources California, LLC	784	283	2,393	582	Yes	Yes	No	No	No	No
3721045	Active	Sentinel Peak Resources California, LLC	4,152	3,538	11,035	9,571	Yes	Yes	No	No	No	No
3704030	Active	Tidelands Oil Prod. Co.	1,636	906	319	184	No	No	Yes	Yes	Yes	Yes
3721055	Active	Sentinel Peak Resources California, LLC	6,065	3,845	22,664	16,245	Yes	Yes	No	No	No	No
3721062	Active	Sentinel Peak Resources California, LLC	4,648	3,457	2,475	2,306	Yes	Yes	No	No	No	No
3721063	Active	Sentinel Peak Resources California, LLC	11,667	11,522	7,725	6,183	Yes	Yes	No	No	No	No
3717088	Active	Hunt Enterprises	2,088	1,562	-	-	Yes	Yes	Yes	Yes	No	No
3721096	Active	Sentinel Peak Resources California, LLC	5,746	6,315	4,920	4,465	Yes	Yes	No	No	No	No
3721114	Active	Sentinel Peak Resources California, LLC	5,665	5,052	17,062	15,400	Yes	Yes	Yes	Yes	No	No

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3727415	Active	Warren E & P, Inc.	1,420	1,296	208	180	Yes	Yes	Yes	Yes	Yes	Yes
3721117	Active	Sentinel Peak Resources California, LLC	5,174	4,784	4,640	3,586	Yes	Yes	Yes	Yes	No	No
3721125	Active	Sentinel Peak Resources California, LLC	2,161	1,485	3,633	3,252	Yes	Yes	Yes	Yes	No	No
3721130	Active	Sentinel Peak Resources California, LLC	7,858	7,057	6,969	4,917	Yes	Yes	No	No	No	No
3721132	Active	Sentinel Peak Resources California, LLC	20	-	2,199	-	Yes	Yes	Yes	Yes	No	No
3721135	Active	Sentinel Peak Resources California, LLC	1,298	1,663	20,458	19,941	Yes	Yes	Yes	Yes	No	No
3721136	Active	Sentinel Peak Resources California, LLC	13,593	18,526	18,456	17,964	Yes	Yes	No	No	No	No
3717250	Active	O'Donnell Oil, LLC	1,363	1,581	-	-	Yes	Yes	Yes	Yes	No	No
3727417	Active	Warren E & P, Inc.	679	78	120	13	Yes	Yes	Yes	Yes	Yes	Yes
3721144	Active	Sentinel Peak Resources California, LLC	424	1,745	3,452	3,792	Yes	Yes	Yes	Yes	No	No
3717299	Active	Cooper & Brain Inc.	2,293	2,401	-	-	Yes	Yes	Yes	Yes	No	No
3717300	Active	Cooper & Brain Inc.	3,145	2,416	-	-	Yes	Yes	Yes	Yes	No	No
3730048	Active	Tidelands Oil Prod. Co.	1,329	-	283	-	No	No	No	No	No	No
3717301	Active	Cooper & Brain Inc.	1,550	1,770	-	-	Yes	Yes	Yes	Yes	No	No
3717302	Active	Cooper & Brain Inc.	1,919	2,306	-	-	Yes	Yes	Yes	Yes	No	No
3717303	Active	Cooper & Brain Inc.	3,217	2,441	-	-	Yes	Yes	Yes	Yes	No	No
3721157	Active	Sentinel Peak Resources California, LLC	6,340	9,018	5,895	8,978	Yes	Yes	No	No	No	No
3717305	Active	Cooper & Brain Inc.	1,729	2,076	-	-	Yes	Yes	Yes	Yes	No	No
3717349	Active	O'Donnell Oil, LLC	3,100	2,666	-	-	Yes	Yes	Yes	Yes	No	No
3721177	Active	Sentinel Peak Resources California, LLC	26,627	25,842	12,224	10,294	Yes	Yes	No	No	No	No
3704301	Active	Tidelands Oil Prod. Co.	2,426	2,260	574	523	No	No	Yes	Yes	Yes	Yes
3721190	Active	Sentinel Peak Resources California, LLC	19,531	17,920	16,460	12,669	Yes	Yes	No	No	No	No
3721192	Active	Sentinel Peak Resources California, LLC	-	-	609	3,192	Yes	Yes	Yes	Yes	No	No
3717475	Active	O'Donnell Oil, LLC	2,463	2,616	-	-	Yes	Yes	Yes	Yes	No	No
3721200	Active	Sentinel Peak Resources California, LLC	9,377	7,145	8,940	7,784	Yes	Yes	No	No	No	No
3717527	Active	Brea Canon Oil Co.	5,552	4,213	1,299	1,531	Yes	Yes	Yes	Yes	No	No
3717529	Active	O'Donnell Oil, LLC	5,001	5,159	-	-	Yes	Yes	Yes	Yes	No	No
3721236	Active	Sentinel Peak Resources California, LLC	454	-	1,141	-	Yes	Yes	Yes	Yes	No	No
3717532	Active	O'Donnell Oil, LLC	3,048	2,999	-	-	Yes	Yes	Yes	Yes	No	No
3717533	Active	O'Donnell Oil, LLC	4,555	4,435	-	-	Yes	Yes	Yes	Yes	No	No
3721248	Active	Sentinel Peak Resources California, LLC	627	-	217	-	Yes	Yes	No	No	No	No
3717538	Active	O'Donnell Oil, LLC	5,240	5,127	-	-	Yes	Yes	Yes	Yes	No	No
3717539	Active	O'Donnell Oil, LLC	4,780	4,611	-	-	Yes	Yes	Yes	Yes	No	No
3717541	Active	O'Donnell Oil, LLC	5,395	5,029	-	-	Yes	Yes	Yes	Yes	No	No
3717542	Active	O'Donnell Oil, LLC	6,452	5,742	-	-	Yes	Yes	Yes	Yes	No	No
3717577	Active	Hillcrest Beverly Oil Corp.	82	220	19	87	Yes	Yes	No	No	No	No
3721265	Active	Sentinel Peak Resources California, LLC	15,951	16,828	7,234	7,747	Yes	Yes	No	No	No	No
3717586	Active	Hillcrest Beverly Oil Corp.	2,948	465	1,060	614	Yes	Yes	No	No	No	No
3717587	Inactive	Hillcrest Beverly Oil Corp.	-	548	-	723	Yes	Yes	No	No	No	No
3721310	Active	Sentinel Peak Resources California, LLC	2,639	-	6,008	-	Yes	Yes	No	No	No	No
3717588	Active	Hillcrest Beverly Oil Corp.	2,780	337	1,527	192	Yes	Yes	No	No	No	No
3721315	Active	Sentinel Peak Resources California, LLC	8,366	5,436	10,123	7,457	Yes	Yes	No	No	No	No
3717589	Active	Hillcrest Beverly Oil Corp.	3,557	4,901	2,114	6,443	Yes	Yes	No	No	No	No
3721334	Active	Sentinel Peak Resources California, LLC	11,488	9,724	13,208	10,604	Yes	Yes	No	No	No	No
3717594	Active	Hillcrest Beverly Oil Corp.	1,086	648	564	923	Yes	Yes	No	No	No	No
3721346	Active	Sentinel Peak Resources California, LLC	8,867	10,972	9,550	22,378	Yes	Yes	No	No	No	No
3721382	Active	Sentinel Peak Resources California, LLC	20,441	15,955	10,578	11,991	Yes	Yes	No	No	No	No
3721385	Active	Sentinel Peak Resources California, LLC	7,857	7,382	6,313	5,287	Yes	Yes	No	No	No	No
3721386	Active	Sentinel Peak Resources California, LLC	10,546	7,693	4,869	5,044	Yes	Yes	No	No	No	No
3717599	Active	Hillcrest Beverly Oil Corp.	2,349	2,473	1,174	3,286	Yes	Yes	No	No	No	No
3717600	Active	Hillcrest Beverly Oil Corp.	842	2,773	242	1,285	Yes	Yes	No	No	No	No
3704550	Active	Tidelands Oil Prod. Co.	2,274	2,367	472	536	No	No	No	Yes	No	Yes
3717624	Active	E & B Natural Resources Management Corporation	1,896	1,245	-	-	Yes	Yes	Yes	Yes	No	No
3704585	Active	Tidelands Oil Prod. Co.	4,304	-	883	-	No	No	Yes	Yes	Yes	Yes

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3717650	Active	Brea Canon Oil Co.	4,945	4,318	336	387	Yes	Yes	No	Yes	No	No
3721415	Active	Sentinel Peak Resources California, LLC	5,392	6,909	6,988	4,529	Yes	Yes	No	No	No	No
3717905	Active	Imperial Occidental	2,407	892	-	-	Yes	Yes	Yes	Yes	No	No
3704600	Active	Tidelands Oil Prod. Co.	8,688	10,460	1,807	2,261	No	No	No	No	No	No
3721422	Active	Sentinel Peak Resources California, LLC	7,152	3,470	8,412	6,697	Yes	Yes	Yes	Yes	No	No
3721426	Active	Sentinel Peak Resources California, LLC	2,641	1,984	2,053	1,592	Yes	Yes	No	No	No	No
3717978	Inactive	Hillcrest Beverly Oil Corp.	-	239	-	69	Yes	Yes	No	No	No	No
3717980	Active	Hillcrest Beverly Oil Corp.	1,751	2,208	488	805	Yes	Yes	No	No	No	No
3717981	Active	Hillcrest Beverly Oil Corp.	9,365	10,693	2,656	5,360	Yes	Yes	No	No	No	No
3717984	Active	Hillcrest Beverly Oil Corp.	5,111	5,507	1,528	3,266	Yes	Yes	No	No	No	No
3718007	Active	Brea Canon Oil Co.	2,061	1,970	863	1,018	Yes	Yes	No	Yes	No	No
3721479	Active	Sentinel Peak Resources California, LLC	7,034	7,360	5,192	5,062	Yes	Yes	No	No	No	No
3700029	Active	Sentinel Peak Resources California, LLC	5,819	6,368	5,821	5,517	Yes	Yes	Yes	Yes	No	No
3721493	Active	Sentinel Peak Resources California, LLC	-	-	375	-	Yes	Yes	No	No	No	No
3704738	Active	Tidelands Oil Prod. Co.	3,910	4,150	975	976	No	No	No	No	No	No
3718026	Active	Brea Canon Oil Co.	1,804	2,251	491	556	Yes	Yes	Yes	Yes	No	No
3718028	Active	Brea Canon Oil Co.	2,774	1,974	421	485	Yes	Yes	Yes	Yes	No	No
3705057	Active	Cooper & Brain Inc.	4,693	4,855	662	694	Yes	Yes	Yes	Yes	Yes	Yes
3718031	Active	Brea Canon Oil Co.	1,547	1,949	463	529	Yes	Yes	Yes	Yes	No	No
3730286	Active	Tidelands Oil Prod. Co.	4,350	2,886	932	652	No	No	No	Yes	No	Yes
3718036	Active	Brea Canon Oil Co.	1,540	2,267	192	215	Yes	Yes	Yes	Yes	No	No
3706291	Active	Brea Canon Oil Co.	9,410	9,301	965	1,122	Yes	Yes	No	Yes	No	No
3718037	Active	Brea Canon Oil Co.	2,356	1,835	1,397	1,584	Yes	Yes	Yes	Yes	No	No
3730289	Active	Tidelands Oil Prod. Co.	4,387	6,830	847	1,422	No	No	No	Yes	No	Yes
3718041	Active	Brea Canon Oil Co.	4,843	4,973	1,118	1,281	Yes	Yes	Yes	Yes	No	No
3718080	Active	M & B Oil Co.	994	409	-	-	Yes	Yes	Yes	Yes	No	No
3722000	Active	Sentinel Peak Resources California, LLC	21,853	20,996	14,956	13,978	Yes	Yes	No	No	No	No
3706411	Active	Brea Canon Oil Co.	1,581	4,947	1,170	1,351	Yes	Yes	No	Yes	No	No
3722008	Active	Sentinel Peak Resources California, LLC	1,634	1,877	1,889	3,077	Yes	Yes	No	No	No	No
3722009	Active	Sentinel Peak Resources California, LLC	2,249	2,150	3,720	3,853	Yes	Yes	No	No	No	No
3724363	Active	DCOR, LLC	22,748	16,258	28,760	22,692	Yes	Yes	No	No	No	No
3727312	Active	Tidelands Oil Prod. Co.	3,191	-	575	-	No	No	No	No	No	No
3722187	Active	Sentinel Peak Resources California, LLC	845	-	2,283	-	Yes	Yes	No	No	No	No
3727313	Active	Tidelands Oil Prod. Co.	15,153	13,672	2,872	2,690	No	No	No	No	No	No
3727391	Active	Warren E & P, Inc.	5,438	5,256	826	741	Yes	Yes	Yes	Yes	Yes	Yes
3730076	Active	Warren E & P, Inc.	5,882	6,811	876	958	Yes	Yes	Yes	Yes	Yes	Yes
3730078	Active	Warren E & P, Inc.	295	75	46	12	Yes	Yes	Yes	Yes	Yes	Yes
3730293	Active	Warren E & P, Inc.	8,956	7,547	1,325	1,055	Yes	Yes	Yes	Yes	Yes	Yes
3726442	Active	Tidelands Oil Prod. Co.	7,649	11,213	1,652	2,476	No	No	No	No	No	No
3726450	Active	Tidelands Oil Prod. Co.	4,466	-	912	-	No	No	No	No	No	No
3730170	Active	Sentinel Peak Resources California, LLC	8,777	6,521	15,268	15,257	Yes	Yes	Yes	Yes	Yes	Yes
3726533	Active	Tidelands Oil Prod. Co.	4,994	1,700	923	325	No	No	No	No	No	No
3706498	Active	E & B Natural Resources Management Corporation	3,948	3,000	-	-	Yes	Yes	Yes	Yes	No	No
3726534	Inactive	Warren E & P, Inc.	464	-	78	-	Yes	Yes	Yes	Yes	Yes	Yes
3726535	Active	Warren E & P, Inc.	13,083	10,958	1,972	1,543	Yes	Yes	Yes	Yes	Yes	Yes
3726536	Inactive	Warren E & P, Inc.	67	-	10	-	Yes	Yes	Yes	Yes	Yes	Yes
3726537	Active	Warren E & P, Inc.	7,538	7,893	1,108	1,105	Yes	Yes	Yes	Yes	Yes	Yes
3727316	Active	Tidelands Oil Prod. Co.	9,827	8,789	1,871	1,752	No	No	No	No	No	No
3718961	Inactive	Vida Resources LLC	817	491	-	-	Yes	Yes	Yes	Yes	Yes	Yes
3726544	Active	Warren E & P, Inc.	350	-	59	-	Yes	Yes	Yes	Yes	Yes	Yes
3726545	Inactive	Warren E & P, Inc.	247	-	39	-	Yes	Yes	Yes	Yes	Yes	Yes
3726546	Active	Warren E & P, Inc.	4,535	6,482	678	910	Yes	Yes	Yes	Yes	Yes	Yes
3726557	Active	Warren E & P, Inc.	3,387	3,769	88	531	Yes	Yes	Yes	Yes	Yes	Yes
3726558	Active	Warren E & P, Inc.	5,196	249	774	47	Yes	Yes	Yes	Yes	Yes	Yes

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3726559	Active	Warren E & P, Inc.	10,931	7,502	1,646	1,056	Yes	Yes	Yes	Yes	Yes	Yes
3726562	Active	Warren E & P, Inc.	272	-	48	-	Yes	Yes	Yes	Yes	Yes	Yes
3726563	Active	Warren E & P, Inc.	269	-	43	-	Yes	Yes	Yes	Yes	Yes	Yes
3726564	Active	Warren E & P, Inc.	898	77	160	13	Yes	Yes	Yes	Yes	Yes	Yes
3726565	Active	Warren E & P, Inc.	319	-	51	-	Yes	Yes	Yes	Yes	Yes	Yes
3726578	Active	Tidelands Oil Prod. Co.	3,164	3,055	610	561	No	No	No	No	No	No
3726615	Active	Pacific Coast Energy Company LP	11,517	7,559	8,776	8,212	Yes	Yes	No	No	No	No
3726616	Active	Warren E & P, Inc.	7,013	4,829	1,045	682	Yes	Yes	Yes	Yes	Yes	Yes
3726618	Active	Warren E & P, Inc.	5,547	5,716	817	802	Yes	Yes	Yes	Yes	Yes	Yes
3726619	Inactive	Warren E & P, Inc.	84	-	13	-	Yes	Yes	Yes	Yes	Yes	Yes
3719008	Active	PS126 Investments, LLC	1,316	2,406	-	810	Yes	Yes	Yes	Yes	Yes	Yes
3726624	Active	Warren E & P, Inc.	11,462	19,117	1,725	2,676	Yes	Yes	Yes	Yes	Yes	Yes
3719010	Active	PS126 Investments, LLC	2,095	1,649	-	810	Yes	Yes	Yes	Yes	Yes	Yes
3726660	Active	Warren E & P, Inc.	1,220	110	181	16	Yes	Yes	Yes	Yes	Yes	Yes
3726662	Active	Warren E & P, Inc.	1,098	240	191	45	Yes	Yes	Yes	Yes	Yes	Yes
3730086	Active	Warren E & P, Inc.	3,527	4,828	528	676	Yes	Yes	Yes	Yes	Yes	Yes
3726663	Active	Warren E & P, Inc.	12,096	7,033	1,829	991	Yes	Yes	Yes	Yes	Yes	Yes
3726703	Active	Warren E & P, Inc.	5,579	4,363	807	612	Yes	Yes	Yes	Yes	Yes	Yes
3730264	Active	Warren E & P, Inc.	12,704	15,874	1,880	2,228	Yes	Yes	Yes	Yes	Yes	Yes
3730456	Active	Southern California Gas Company	-	10	-	5,366	No	Yes	No	No	No	No
3727407	Active	Warren E & P, Inc.	1,388	269	250	44	Yes	Yes	Yes	Yes	Yes	Yes
3726745	Active	Warren E & P, Inc.	11,486	11,483	1,719	1,617	Yes	Yes	Yes	Yes	Yes	Yes
3730265	Active	Warren E & P, Inc.	17,070	17,169	2,540	2,411	Yes	Yes	Yes	Yes	Yes	Yes
3726747	Active	Warren E & P, Inc.	2,370	2,668	333	377	Yes	Yes	Yes	Yes	Yes	Yes
3730087	Active	Warren E & P, Inc.	6,193	6,149	910	865	Yes	Yes	Yes	Yes	Yes	Yes
3726752	Active	Warren E & P, Inc.	6,296	5,958	893	838	Yes	Yes	Yes	Yes	Yes	Yes
3726753	Active	Warren E & P, Inc.	2,142	-	315	-	Yes	Yes	Yes	Yes	Yes	Yes
3726754	Active	Warren E & P, Inc.	6,370	3,587	935	511	Yes	Yes	Yes	Yes	Yes	Yes
3727439	Active	Warren E & P, Inc.	157	38	27	6	Yes	Yes	Yes	Yes	Yes	Yes
3727412	Active	Warren E & P, Inc.	4,919	4,389	738	618	Yes	Yes	Yes	Yes	Yes	Yes
3726769	Active	Warren E & P, Inc.	17,633	14,248	2,564	2,002	Yes	Yes	Yes	Yes	Yes	Yes
3730298	Active	Warren E & P, Inc.	18,679	10,670	2,770	1,496	Yes	Yes	Yes	Yes	Yes	Yes
3726770	Active	Warren E & P, Inc.	8,045	8,187	1,194	1,154	Yes	Yes	Yes	Yes	Yes	Yes
3727319	Active	Tidelands Oil Prod. Co.	15,060	14,815	2,877	2,916	No	No	No	No	No	No
3727438	Active	Warren E & P, Inc.	4,611	5,909	708	826	Yes	Yes	Yes	Yes	Yes	Yes
3726782	Active	Warren E & P, Inc.	8,369	9,804	1,243	1,373	Yes	Yes	Yes	Yes	Yes	Yes
3726783	Active	Warren E & P, Inc.	1,995	200	285	33	Yes	Yes	Yes	Yes	Yes	Yes
3721278	Active	Southern California Gas Company	91	141	515,101	514,072	No	Yes	No	No	No	No
3726784	Active	Warren E & P, Inc.	4,771	4,116	704	577	Yes	Yes	Yes	Yes	Yes	Yes
3720013	Active	Pacific Coast Energy Company LP	4,191	3,003	8,392	6,096	Yes	Yes	No	No	No	No
3721279	Active	Southern California Gas Company	111	71	551,130	363,127	No	Yes	No	No	No	No
3726785	Active	Warren E & P, Inc.	7,445	9,604	1,101	1,347	Yes	Yes	Yes	Yes	Yes	Yes
3726786	Active	Warren E & P, Inc.	3,249	6,026	474	843	Yes	Yes	Yes	Yes	Yes	Yes
3721313	Active	Southern California Gas Company	79	146	519,101	617,448	No	No	No	No	No	No
3720054	Active	Sentinel Peak Resources California, LLC	9,183	8,228	24,693	25,024	Yes	Yes	Yes	Yes	No	No
3726789	Active	Tidelands Oil Prod. Co.	7,520	8,559	1,652	1,921	No	No	No	No	No	No
3720073	Active	Pacific Coast Energy Company LP	6,527	4,484	8,705	5,205	Yes	Yes	No	No	No	No
3726791	Active	Warren E & P, Inc.	11,727	8,955	1,716	1,254	Yes	Yes	Yes	Yes	Yes	Yes
3714616	Active	Sentinel Peak Resources California, LLC	27,467	27,965	27,149	27,521	Yes	Yes	No	No	No	No
3726793	Active	Warren E & P, Inc.	1,004	70	167	11	Yes	Yes	Yes	Yes	Yes	Yes
3720099	Active	Sentinel Peak Resources California, LLC	5,756	8,305	2,266	2,131	Yes	Yes	Yes	Yes	No	No
3720105	Active	Pacific Coast Energy Company LP	2,676	938	4,928	1,223	Yes	Yes	No	No	No	No
3720118	Active	Nasco Petroleum, LLC	9,326	9,225	3,562	2,096	Yes	Yes	Yes	Yes	Yes	Yes
3726801	Active	Warren E & P, Inc.	4,881	3,809	712	534	Yes	Yes	Yes	Yes	Yes	Yes

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3726831	Active	Warren E & P, Inc.	1,541	1,311	236	180	Yes	Yes	Yes	Yes	Yes	Yes
3721356	Active	Southern California Gas Company	19	20	119,842	117,217	No	No	No	No	No	No
3726840	Active	Warren E & P, Inc.	11,369	15,434	1,686	2,165	Yes	Yes	Yes	Yes	Yes	Yes
3721358	Active	Southern California Gas Company	118	151	466,939	468,377	No	No	No	No	No	No
3720146	Active	Pacific Coast Energy Company LP	16,981	5,780	16,231	6,597	Yes	Yes	No	No	No	No
3721359	Active	Southern California Gas Company	193	170	1,016,812	674,723	No	No	No	No	No	No
3726871	Active	Warren E & P, Inc.	8,913	8,419	1,308	1,178	Yes	Yes	Yes	Yes	Yes	Yes
3726872	Active	Warren E & P, Inc.	10,024	7,475	1,481	1,058	Yes	Yes	Yes	Yes	Yes	Yes
3726882	Active	Warren E & P, Inc.	1,607	2,808	240	393	Yes	Yes	Yes	Yes	Yes	Yes
3726899	Active	Warren E & P, Inc.	503	-	94	-	Yes	Yes	Yes	Yes	Yes	Yes
3720189	Active	Pacific Coast Energy Company LP	5,385	2,922	6,160	4,638	Yes	Yes	No	No	No	No
3726900	Inactive	Warren E & P, Inc.	321	-	55	-	Yes	Yes	Yes	Yes	Yes	Yes
3726901	Inactive	Warren E & P, Inc.	315	-	52	-	Yes	Yes	Yes	Yes	Yes	Yes
3726903	Inactive	Warren E & P, Inc.	297	-	46	-	Yes	Yes	Yes	Yes	Yes	Yes
3726904	Active	Warren E & P, Inc.	7,843	9,998	1,159	1,409	Yes	Yes	Yes	Yes	Yes	Yes
3720204	Active	Nasco Petroleum, LLC	6,093	2,637	3,237	2,464	Yes	Yes	Yes	Yes	Yes	Yes
3721452	Active	DCOR, LLC	2,255	1,964	615	608	Yes	Yes	No	No	No	No
3720212	Active	Pacific Coast Energy Company LP	4,260	3,508	11,023	9,678	Yes	Yes	No	No	No	No
3726909	Inactive	Warren E & P, Inc.	32	-	5	-	Yes	Yes	Yes	Yes	Yes	Yes
3720233	Active	Sentinel Peak Resources California, LLC	11,572	3,709	60,919	49,807	Yes	Yes	Yes	Yes	No	No
3721457	Active	Southern California Gas Company	100	105	743,945	460,538	No	No	No	No	No	No
3726910	Active	Warren E & P, Inc.	3,314	-	462	-	Yes	Yes	Yes	Yes	Yes	Yes
3721458	Active	Southern California Gas Company	-	52	-	175,505	No	No	No	No	No	No
3726911	Active	Warren E & P, Inc.	12,830	8,751	1,919	1,229	Yes	Yes	Yes	Yes	Yes	Yes
3726912	Active	Warren E & P, Inc.	16,844	11,395	2,504	1,603	Yes	Yes	Yes	Yes	Yes	Yes
3720252	Active	Pacific Coast Energy Company LP	6,094	2,918	9,366	6,029	Yes	Yes	No	No	No	No
3726913	Active	Warren E & P, Inc.	10,278	11,071	1,524	1,553	Yes	Yes	Yes	Yes	Yes	Yes
3720255	Active	Brea Canon Oil Co.	7,199	6,561	1,106	1,289	Yes	Yes	Yes	Yes	No	No
3726914	Active	Warren E & P, Inc.	10,220	8,290	1,526	1,164	Yes	Yes	Yes	Yes	Yes	Yes
3726917	Inactive	Warren E & P, Inc.	252	-	45	-	Yes	Yes	Yes	Yes	Yes	Yes
3726919	Inactive	Warren E & P, Inc.	173	-	30	-	Yes	Yes	Yes	Yes	Yes	Yes
3720285	Active	Brea Canon Oil Co.	4,310	4,825	345	398	Yes	Yes	Yes	Yes	No	No
3726920	Active	Warren E & P, Inc.	235	-	36	-	Yes	Yes	Yes	Yes	Yes	Yes
3726928	Active	Warren E & P, Inc.	50	-	7	-	Yes	Yes	Yes	Yes	Yes	Yes
3720300	Active	Brea Canon Oil Co.	85	-	874	-	Yes	Yes	No	Yes	No	No
3726930	Inactive	Warren E & P, Inc.	329	-	56	-	Yes	Yes	Yes	Yes	Yes	Yes
3720301	Active	Brea Canon Oil Co.	6,200	5,116	1,269	1,490	Yes	Yes	No	Yes	No	No
3726942	Active	Tidelands Oil Prod. Co.	3,380	3,453	875	970	No	No	No	No	No	No
3726943	Active	Tidelands Oil Prod. Co.	3,104	4,107	630	838	No	No	No	No	No	No
3725177	Active	Warren E & P, Inc.	3,562	2,884	524	404	Yes	Yes	Yes	Yes	Yes	Yes
3721803	Active	DCOR, LLC	1,356	1,298	372	401	Yes	Yes	No	No	No	No
3726946	Active	Warren E & P, Inc.	1,707	2,604	251	368	Yes	Yes	Yes	Yes	Yes	Yes
3725178	Inactive	Warren E & P, Inc.	375	-	64	-	Yes	Yes	Yes	Yes	Yes	Yes
3725183	Active	Warren E & P, Inc.	14,637	10,953	2,181	1,542	Yes	Yes	Yes	Yes	Yes	Yes
3726956	Active	Sentinel Peak Resources California, LLC	5,658	7,369	6,536	6,437	Yes	Yes	Yes	Yes	Yes	Yes
3727454	Active	Warren E & P, Inc.	5,327	3,183	785	451	Yes	Yes	Yes	Yes	Yes	Yes
3726961	Active	Warren E & P, Inc.	13,769	10,085	2,018	1,412	Yes	Yes	Yes	Yes	Yes	Yes
3726963	Active	Warren E & P, Inc.	7,479	9,208	1,111	1,291	Yes	Yes	Yes	Yes	Yes	Yes
3726964	Active	Warren E & P, Inc.	5,404	6,737	788	945	Yes	Yes	Yes	Yes	Yes	Yes
3720382	Active	Pacific Coast Energy Company LP	691	63	6,263	1,020	Yes	Yes	No	No	No	No
3726965	Active	Warren E & P, Inc.	15,701	14,554	2,344	2,036	Yes	Yes	Yes	Yes	Yes	Yes
3726967	Active	Warren E & P, Inc.	739	57	126	9	Yes	Yes	Yes	Yes	Yes	Yes
3725238	Active	Sentinel Peak Resources California, LLC	8,236	10,063	4,061	5,058	Yes	Yes	No	No	No	No
3725244	Active	Sentinel Peak Resources California, LLC	1,001	644	4,423	3,786	Yes	Yes	No	No	No	No

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3726973	Active	Warren E & P, Inc.	252	-	39	-	Yes	Yes	Yes	Yes	Yes	Yes
3730122	Active	Warren E & P, Inc.	5,718	5,646	849	794	Yes	Yes	Yes	Yes	Yes	Yes
3726975	Inactive	Warren E & P, Inc.	307	-	50	-	Yes	Yes	Yes	Yes	Yes	Yes
3720434	Active	Pacific Coast Energy Company LP	2,975	6,317	6,614	8,289	Yes	Yes	No	No	No	No
3726977	Inactive	Warren E & P, Inc.	30	-	5	-	Yes	Yes	Yes	Yes	Yes	Yes
3726987	Active	Warren E & P, Inc.	16,017	13,008	2,359	1,833	Yes	Yes	Yes	Yes	Yes	Yes
3726988	Active	Warren E & P, Inc.	8,867	6,908	1,311	971	Yes	Yes	Yes	Yes	Yes	Yes
3726989	Active	Warren E & P, Inc.	61	-	9	-	Yes	Yes	Yes	Yes	Yes	Yes
3726990	Inactive	Warren E & P, Inc.	711	-	118	-	Yes	Yes	Yes	Yes	Yes	Yes
3720480	Active	Southern California Gas Company	1,861	951	67,667	43,507	Yes	Yes	No	No	No	No
3726999	Active	Southern California Gas Company	10	-	2,483	581	Yes	Yes	No	No	No	No
3721872	Active	Southern California Gas Company	115	152	553,655	461,593	No	No	No	No	No	No
3727000	Active	Southern California Gas Company	-	-	76,437	28,804	Yes	Yes	No	No	No	No
3720481	Active	Southern California Gas Company	859	1,706	10,779	11,857	Yes	Yes	No	No	No	No
3727002	Active	Warren E & P, Inc.	7,690	2,167	1,169	309	Yes	Yes	Yes	Yes	Yes	Yes
3720482	Active	Southern California Gas Company	1,099	2,406	12,094	8,296	Yes	Yes	No	No	No	No
3721891	Inactive	Southern California Gas Company	26	58	102,665	201,834	Yes	Yes	No	No	No	No
3727005	Active	Warren E & P, Inc.	2,928	1,706	436	239	Yes	Yes	Yes	Yes	Yes	Yes
3721892	Inactive	Southern California Gas Company	54	39	297,247	197,538	Yes	Yes	No	No	No	No
3727006	Active	Warren E & P, Inc.	9,976	7,173	1,464	1,007	Yes	Yes	Yes	Yes	Yes	Yes
3722044	Active	Southern California Gas Company	260	83	911,285	327,489	No	Yes	No	No	No	No
3727007	Active	Sentinel Peak Resources California, LLC	6,295	4,524	2,044	1,129	Yes	Yes	Yes	Yes	Yes	Yes
3727008	Active	Warren E & P, Inc.	163	-	25	-	Yes	Yes	Yes	Yes	Yes	Yes
3720510	Active	Pacific Coast Energy Company LP	2,820	248	6,701	3,160	Yes	Yes	No	No	No	No
3727011	Active	Warren E & P, Inc.	5,785	6,698	855	940	Yes	Yes	Yes	Yes	Yes	Yes
3727012	Active	Warren E & P, Inc.	8,423	7,465	1,240	1,051	Yes	Yes	Yes	Yes	Yes	Yes
3720552	Active	Pacific Coast Energy Company LP	3,854	2,203	9,361	5,508	Yes	Yes	No	No	No	No
3727014	Active	Warren E & P, Inc.	2,945	3,738	436	528	Yes	Yes	Yes	Yes	Yes	Yes
3720554	Active	Pacific Coast Energy Company LP	9,688	5,628	8,119	4,349	Yes	Yes	No	No	No	No
3727015	Active	Warren E & P, Inc.	4,717	4,290	694	607	Yes	Yes	Yes	Yes	Yes	Yes
3727016	Active	Warren E & P, Inc.	454	-	62	-	Yes	Yes	Yes	Yes	Yes	Yes
3707203	Active	Cooper & Brain Inc.	4,423	4,530	4,904	4,729	Yes	Yes	No	No	No	No
3727117	Active	Warren E & P, Inc.	6,321	7,770	1,105	1,145	Yes	Yes	Yes	Yes	Yes	Yes
3722301	Active	DCOR, LLC	2,476	2,057	683	633	Yes	Yes	No	No	No	No
3727125	Active	Warren E & P, Inc.	11,775	8,045	1,748	1,124	Yes	Yes	Yes	Yes	Yes	Yes
3722302	Inactive	Southern California Gas Company	172	146	682,035	373,773	No	Yes	No	No	No	No
3727127	Active	Warren E & P, Inc.	5,013	5,386	734	760	Yes	Yes	Yes	Yes	Yes	Yes
3727128	Active	Warren E & P, Inc.	656	-	88	-	Yes	Yes	Yes	Yes	Yes	Yes
3727130	Active	Warren E & P, Inc.	12,504	10,450	1,849	1,472	Yes	Yes	Yes	Yes	Yes	Yes
3727131	Active	Warren E & P, Inc.	2,072	1,708	306	240	Yes	Yes	Yes	Yes	Yes	Yes
3730310	Active	Warren E & P, Inc.	7,986	6,407	1,184	899	Yes	Yes	Yes	Yes	Yes	Yes
3730268	Active	Warren E & P, Inc.	1,198	-	161	-	Yes	Yes	Yes	Yes	Yes	Yes
3727133	Active	Pacific Coast Energy Company LP	1,534	1	5,576	29	Yes	Yes	No	No	No	No
3727153	Active	Tidelands Oil Prod. Co.	7,438	8,071	1,502	1,637	No	No	No	No	No	No
3727154	Active	Tidelands Oil Prod. Co.	13,663	11,684	2,761	2,439	No	No	No	Yes	No	Yes
3720755	Active	Cooper & Brain Inc.	2,877	2,684	2,618	2,501	Yes	Yes	Yes	Yes	Yes	Yes
3727167	Active	Tidelands Oil Prod. Co.	225	444	63	120	No	No	No	No	No	No
3727168	Active	Tidelands Oil Prod. Co.	34	29	10	8	No	No	No	Yes	No	Yes
3727184	Active	Warren E & P, Inc.	20,082	17,928	2,904	2,517	Yes	Yes	Yes	Yes	Yes	Yes
3727185	Active	Warren E & P, Inc.	7,467	1,775	1,125	258	Yes	Yes	Yes	Yes	Yes	Yes
3727186	Active	Warren E & P, Inc.	17,556	11,093	2,613	1,562	Yes	Yes	Yes	Yes	Yes	Yes
3730331	Active	Warren E & P, Inc.	9,363	6,109	1,404	859	Yes	Yes	Yes	Yes	Yes	Yes
3727187	Active	Warren E & P, Inc.	2,319	-	312	-	Yes	Yes	Yes	Yes	Yes	Yes
3727211	Active	Tidelands Oil Prod. Co.	11,721	9,536	2,404	2,035	No	No	No	No	No	No

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3727215	Active	Tidelands Oil Prod. Co.	11,952	11,027	2,238	2,154	No	No	No	No	No	No
3720833	Active	Nasco Petroleum, LLC	5,808	5,578	5,772	6,025	Yes	Yes	Yes	Yes	Yes	Yes
3727222	Inactive	Warren E & P, Inc.	11,320	-	1,547	-	Yes	Yes	Yes	Yes	Yes	Yes
3727223	Active	Warren E & P, Inc.	1,882	-	264	-	Yes	Yes	Yes	Yes	Yes	Yes
3727229	Active	Tidelands Oil Prod. Co.	3,556	3,850	698	794	No	No	No	No	No	No
3720886	Active	Pacific Coast Energy Company LP	3,449	2,020	8,380	5,095	Yes	Yes	No	No	No	No
3727233	Active	Tidelands Oil Prod. Co.	472	328	92	63	No	No	No	No	No	No
3720895	Active	Pacific Coast Energy Company LP	1,822	79	8,847	1,587	Yes	Yes	No	No	No	No
3727244	Active	Tidelands Oil Prod. Co.	4,478	3,833	883	853	No	No	No	Yes	No	Yes
3727245	Active	Warren E & P, Inc.	12,039	7,519	1,783	1,060	Yes	Yes	Yes	Yes	Yes	Yes
3727251	Active	Tidelands Oil Prod. Co.	8,713	-	1,774	-	No	No	No	Yes	No	Yes
3700035	Active	Southern California Gas Company	3,129	-	2,239	-	No	No	No	No	No	No
3700037	Active	Southern California Gas Company	2,405	3,244	3,590	1,425	No	No	No	No	No	No
3720923	Active	Nasco Petroleum, LLC	8,878	7,351	3,237	2,197	Yes	Yes	Yes	Yes	Yes	Yes
3727261	Active	Warren E & P, Inc.	4,245	-	623	-	Yes	Yes	Yes	Yes	Yes	Yes
3727262	Active	Warren E & P, Inc.	4,865	4,793	708	674	Yes	Yes	Yes	Yes	Yes	Yes
3724036	Active	DCOR, LLC	4,198	3,618	4,744	6,625	Yes	Yes	No	No	No	No
3727263	Active	Warren E & P, Inc.	4,010	-	584	-	Yes	Yes	Yes	Yes	Yes	Yes
3724071	Active	DCOR, LLC	2,219	1,732	2,511	2,217	Yes	Yes	No	No	No	No
3724072	Active	DCOR, LLC	1,397	1,222	1,464	1,184	Yes	Yes	No	No	No	No
3727270	Active	Warren E & P, Inc.	14,192	10,433	2,120	1,466	Yes	Yes	Yes	Yes	Yes	Yes
3720955	Active	Sentinel Peak Resources California, LLC	311	-	270	-	Yes	Yes	Yes	Yes	Yes	Yes
3727271	Active	Warren E & P, Inc.	10,545	4,600	1,574	658	Yes	Yes	Yes	Yes	Yes	Yes
3720967	Active	Sentinel Peak Resources California, LLC	9,506	10,087	3,399	3,454	Yes	Yes	Yes	Yes	Yes	Yes
3700686	Active	Southern California Gas Company	167	211	897,570	447,303	No	No	No	No	No	No
3700687	Active	Southern California Gas Company	9,735	2	2,746,912	467	No	Yes	No	No	No	No
3721006	Active	Pacific Coast Energy Company LP	2,176	910	6,392	943	Yes	Yes	No	No	No	No
3700693	Inactive	Southern California Gas Company	-	10	-	1,946	Yes	Yes	No	No	No	No
3721050	Active	Pacific Coast Energy Company LP	6,919	5,559	11,639	7,913	Yes	Yes	No	No	No	No
3727272	Active	Warren E & P, Inc.	4,791	118	719	17	Yes	Yes	Yes	Yes	Yes	Yes
3721061	Active	Pacific Coast Energy Company LP	11,789	6,201	10,192	6,710	Yes	Yes	No	No	No	No
3721072	Active	Sentinel Peak Resources California, LLC	3,602	1,405	1,391	485	Yes	Yes	Yes	Yes	Yes	Yes
3724125	Active	DCOR, LLC	3,203	2,507	11,726	10,423	Yes	Yes	No	No	No	No
3701177	Active	DCOR, LLC	4,030	3,222	1,106	994	Yes	Yes	No	No	No	No
3701183	Active	DCOR, LLC	1,953	1,465	528	439	Yes	Yes	No	No	No	No
3701184	Active	DCOR, LLC	2,548	1,804	694	560	Yes	Yes	No	No	No	No
3727276	Active	Tidelands Oil Prod. Co.	3,668	3,710	703	756	No	No	No	No	No	No
3721087	Active	Pacific Coast Energy Company LP	4,535	1,734	5,801	2,938	Yes	Yes	No	No	No	No
3727279	Active	Tidelands Oil Prod. Co.	11,833	9,579	2,280	1,895	No	No	No	No	No	No
3727280	Active	Tidelands Oil Prod. Co.	93	91	17	16	No	No	No	No	No	No
3721121	Active	Pacific Coast Energy Company LP	1,424	5	6,131	37	Yes	Yes	No	No	No	No
3727284	Active	Tidelands Oil Prod. Co.	9,528	10,753	1,849	2,204	No	No	No	No	No	No
3727325	Active	Warren E & P, Inc.	16,191	14,911	2,447	2,103	Yes	Yes	Yes	Yes	Yes	Yes
3721169	Active	Pacific Coast Energy Company LP	8,139	5,057	12,290	6,393	Yes	Yes	No	No	No	No
3721181	Active	Pacific Coast Energy Company LP	2,198	210	7,394	672	Yes	Yes	No	No	No	No
3721188	Active	Pacific Coast Energy Company LP	441	529	5,016	1,386	Yes	Yes	No	No	No	No
3721211	Active	Pacific Coast Energy Company LP	3,141	308	8,444	2,254	Yes	Yes	No	No	No	No
3721221	Active	Sentinel Peak Resources California, LLC	8,548	7,426	592	501	Yes	Yes	Yes	Yes	Yes	Yes
3721223	Active	Sentinel Peak Resources California, LLC	2,783	464	379	79	Yes	Yes	Yes	Yes	Yes	Yes
3721235	Active	Pacific Coast Energy Company LP	5,729	3,352	9,288	6,616	Yes	Yes	No	No	No	No
3721273	Active	Pacific Coast Energy Company LP	8,050	8,126	7,317	7,739	Yes	Yes	No	No	No	No
3724221	Active	DCOR, LLC	11,281	10,439	26,679	22,845	Yes	Yes	No	No	No	No
3721284	Active	Pacific Coast Energy Company LP	21,696	11,910	11,893	8,493	Yes	Yes	No	No	No	No
3721324	Active	Pacific Coast Energy Company LP	3,902	1,888	6,018	5,644	Yes	Yes	No	No	No	No

API	Status	Operator Name	Oil 2015 (bbl)	Oil 2016 (bbl)	Gas 2015 (mcf)	Gas 2016 (mcf)	Within 2500 ft of SCAG LU	Within 1500 ft of SCAG LU	Within 2500 ft of CES3-90 pct	Within 1500 ft of CES3-90 pct	Within 2500 ft of CES3-75 pct	Within 1500 ft of CES3-75 pct
3721392	Active	Pacific Coast Energy Company LP	6,913	8,065	8,442	6,970	Yes	Yes	No	No	No	No
3724227	Active	DCOR, LLC	1,756	2,064	4,864	5,065	Yes	Yes	No	No	No	No
3724230	Active	Southern California Gas Company	186	93	1,183,628	476,577	No	No	No	No	No	No
3721534	Active	Cooper & Brain Inc.	4,644	4,802	656	687	Yes	Yes	Yes	Yes	Yes	Yes
3724231	Active	Southern California Gas Company	176	109	1,136,345	447,483	No	No	No	No	No	No
3721538	Active	Brea Canon Oil Co.	5,015	6,523	1,222	1,508	Yes	Yes	Yes	Yes	No	No
3724232	Active	Southern California Gas Company	251	121	1,158,928	388,633	No	No	No	No	No	No
3721555	Active	Tidelands Oil Prod. Co.	6,492	5,872	1,322	1,235	No	No	No	No	No	No
3730341	Active	Warren E & P, Inc.	13,877	7,094	2,125	1,001	Yes	Yes	Yes	Yes	Yes	Yes
3700110	Active	Hillcrest Beverly Oil Corp.	6,315	6,207	1,794	3,120	Yes	Yes	No	No	No	No
3700111	Active	Hillcrest Beverly Oil Corp.	2,124	4,119	601	1,844	Yes	Yes	No	No	No	No
3721579	Active	Warren E & P, Inc.	1,361	2,096	145	178	No	No	Yes	Yes	Yes	Yes
3721580	Active	Warren E & P, Inc.	1,259	1,807	134	154	No	No	No	Yes	No	Yes
3700149	Active	Hillcrest Beverly Oil Corp.	1,302	121	755	69	Yes	Yes	No	No	No	No
3721587	Active	Warren E & P, Inc.	1,814	2,614	189	222	No	No	No	Yes	No	Yes
3724248	Active	DCOR, LLC	14,010	12,115	27,016	24,780	Yes	Yes	No	No	No	No
3724249	Active	DCOR, LLC	14,174	13,538	27,043	27,475	Yes	Yes	No	No	No	No
3700274	Active	Sentinel Peak Resources California, LLC	5,612	5,869	12,354	3,785	Yes	Yes	Yes	Yes	No	No
3700275	Active	Sentinel Peak Resources California, LLC	3,398	2,176	5,189	4,825	Yes	Yes	Yes	Yes	No	No
3700276	Active	Sentinel Peak Resources California, LLC	5,447	5,021	2,729	1,757	Yes	Yes	Yes	Yes	No	No
3700277	Active	Sentinel Peak Resources California, LLC	2,287	1,802	4,579	5,229	Yes	Yes	Yes	Yes	No	No
3700279	Active	Sentinel Peak Resources California, LLC	1,250	870	1,920	1,356	Yes	Yes	Yes	Yes	No	No
3700281	Active	Sentinel Peak Resources California, LLC	9,109	7,921	3,479	3,531	Yes	Yes	Yes	Yes	No	No

Appendix B

Selected land use definitions from the Southern California Association of Governments (SCAG)

The following land use classifications and definitions, developed by the Southern California Assocation of Governments, correspond to those identified as "sensitive" land uses in the Health, Mental Health and Education Committee Report 17-0447. Setbacks of 2,500 feet and 1,500 feet were drawn around the sensitive land uses within the City of Los Angeles to identify those oil and gas wells that would need to cease operations under the proposed amendment (refer to Section 3: The Geography of Oil and Gas Production in the City of Los Angeles, for more details).

1000 URBAN OR BUILT-UP

Areas of built-up land characterized by intensive land use, where most of the land is covered by man-made structures because of human activity.

1100 RESIDENTIAL

The residential category includes areas of single family residences, multi unit dwellings, and mobile homes. Also included is a mixed residential category that consists of two or more of the aforementioned groups. The units/acre listed can be used as an indicator of relative density to aid in analysis when using the land use study.

1110 SINGLE FAMILY RESIDENTIAL

These residential areas are typically made up of detached dwellings, where each structure houses a single family, located in an urban or suburban setting. (Single family residential units located in a rural setting are classified as code 1151 or code 1152 under Rural Residential.) These single family residences are usually served by all utilities, are on paved streets, and are provided with or have access to all urban facilities such as schools, parks, police, and fire stations.

Single family residential neighborhoods are normally large contiguous areas of residential lots. Some areas have subdivisions or tracts of homes with similar size or architectural design. In these areas the roofs may be similar in shape or color when viewed on the aerial photo. Typically, single family lots contain landscaped front and back yards, one driveway, and one walkway either to the sidewalk or to the driveway. The house usually contains one chimney, and one air-conditioning unit. Some lots may have swimming pools in the back yards. High or low density is determined by the size of the lot on which the residence is located. If an area is under construction, and the residential lots or pads are easily identifiable, then the unit may be coded with the appropriate density category.

1111 High Density Single Family Residential

This category contains single family detached residential units with a unit density of >2 units/acre. These units are typically found in modern urban and suburban subdivisions.

1112 Low Density Single Family Residential

This category contains single family detached residential units with a unit density of <2 units/acre. These units may include areas of urban ranch homes or estates. Also included are urban areas where single family lots have been established but houses have not been built on all of them and are not likely to be built in the near future. The homes are spaced at a density of <2 units/acre. In some situations, a low density area may be rural in appearance because it was once a rural area but is now within the urban setting or a transitional area.

1120 MULTI-FAMILY RESIDENTIAL

Multi-family units are attached residences, apartments, condominiums, and townhouses. Multi-family residences are usually served by all utilities, are on paved streets, and are provided with or have access to all urban facilities such as schools, parks, police and fire stations. Senior citizen apartment buildings are included in these classes. Also included are off-campus university owned housing and off-campus fraternity/sorority houses.

1121 Mixed Multi-Family Residential

This category is used when there is a mixture of multi-family uses (duplexes, triplexes, apartments, condominiums, and/or townhouses of any type), none of which is over 2.5 acres in size, and no one type dominates. This situation may occur in older neighborhoods.

1122 Duplexes, Triplexes, and 2- or 3-Unit Condominiums and Townhouses

This category is composed of duplexes, triplexes, and 2- or 3-unit condominiums and townhouses that are attached multi-family structures.

Duplex and triplex residences may occur together or mixed with single family houses in some older neighborhoods (see code 1121 and 1140). Typically the multi-unit structure is one story located on a lot approximately the same size as nearby single family residential lots. There may be minimal landscaping or yard space. On the aerial photo, one may be able to count the driveways, sidewalks, entryway overhangs, chimneys, or air conditioning units corresponding to the number of units in the structure. Some newer duplexes and triplexes occur as 2- or 3-unit structures in complexes as condominiums and townhouses, with common grounds.

1123 Low-Rise Apartments, Condominiums, and Townhouses

This category includes multi-family structures of one to two stories and approximately 10 to 18 units/acre. The area consists of either a large single structure or a group of structures, of four or more units each, in a complex with associated common grounds, facilities and parking areas.

Typically low-rise apartments, condominiums, and townhouses occur together in large contiguous areas since land use is restricted to multi-family zoned areas. However, in some areas one to a few buildings may occur on individual lots in single family residential neighborhoods. In newer neighborhoods they may appear as a large complex composed of many structures of similar architecture with common grounds and facilities. Some older structures are U-shaped or O-shaped with a swimming pool in the middle. A parking level may be located underneath the living area, in which case it is not counted as a story. Parking for larger complexes may include garages or carports along the periphery of the complex. Low-rise apartments and condominiums are the most common types of multi-family structures in the study area. Also included are off-campus fraternity/sorority houses and senior citizen apartments. Residential units located above first floor commercial in buildings along a

commercial strip are considered commercial use (1223, 1224). An area mapped as Low-Rise Apartments, Condominiums, and Townhouses may contain an occasional Medium-Rise building.

1124 Medium-Rise Apartments and Condominiums

This category includes multi-family structures of three to four stories and >18 units/acre. The area consists of a large single structure or a group of structures, of four or more units each, in a complex with associated common grounds, facilities and parking areas.

Many medium-rise apartments and condominiums occur in older areas as hotel/apartments. Several may be located next to each other in compact areas. Some may occur as large complexes, composed of many structures of similar architecture, with common grounds and facilities. Medium-rise apartments and condominiums are not as common as low-rise. Senior citizen apartments are included. If an area contains commercial use on the first floor and multi-family residential use on the upper floors, then the area is considered strip commercial (codes 1223, 1224). Some older urban core cities contain apartment and condominium buildings predominantly of three, four, or more stories. An area mapped as Medium-Rise may contain occasional Low-Rise or High-Rise buildings. Use of stereoscopic viewing of aerial photos is essential in determining relative height in relation to other structures in the area.

1125 High-Rise Apartments and Condominiums

This category includes multi-family structures of five stories or greater and >18 units/acre. The area consists of either a single large structure or a group of adjacent structures with common grounds, facilities and parking areas.

Many high-rise apartments and condominiums occur as single or groups of high residential towers. Parking may be underground or in an adjacent parking structure. Smaller high-rise structures may contain only residential units with no other uses. High-rise residential structures are configured to maximize availability of window access to each individual residential unit. Thus the building may be long and narrow, or contain narrow lateral wings that provide window access. Senior citizen apartments are included. If an area contains commercial use on the first floor and multi-family residential use on the upper floors, then it is considered High-Rise Apartments and Condominiums.

1130 MOBILE HOMES AND TRAILER PARKS

These residential units are composed of mobile homes, trailers and pre-fabricated housing that are either stationary with foundations or that is on wheels and capable of being moved. Included are vacant and occupied spaces, and associated storage facilities for the complex. Mobile homes and trailer parks are usually served by all utilities, are on paved streets, and are provided with or have access to all urban facilities, such as schools, parks, police, and fire stations. This category does not include transient facilities such as recreational vehicle parks or campgrounds (see code 1880).

Mobile homes are typically long, narrow, and rectangular in shape. Most have a white signature when represented on an aerial photo, although some modern mobile homes may have a less reflective or colored roofing material. Some newer modular home or mobile home courts and subdivisions contain homes with false facades, giving the impression of an apartment or condominium complex, or single family houses.

1131 Trailer Parks and Mobile Home Courts, High Density

This category includes typical mobile home or trailer parks and pre-fabricated homes (>6 units per acre) that are in a contiguous area with trailer or mobile home spaces and associated facilities.

Trailer courts and mobile home parks normally have a high, closely spaced density of units within the lot with very limited landscaping. The mobile homes are parked side by side in parallel rows with an access drive along the front of the row. Also included are associated recreational vehicle storage lots within or next to the mobile home park.

1132 Mobile Home Courts and Subdivisions, Low Density

This category includes typical mobile and pre-fabricated homes located in lower density mobile home park or in a single family residential subdivision pattern on curbed named streets (<6 units per acre).

Individual mobile homes appear as in the description above (1131), although there may be additional architectural modification associated with it. Units are more widely spaced, with landscaping as in front and back yard areas of a normal subdivision. Each lot has its own driveway or walkway, similar to single family residential areas. Also included are associated recreational vehicle storage lots within or next to the mobile home park.

1140 MIXED RESIDENTIAL

1140 Mixed Residential

This category includes areas where there is a combination of single family detached and multi-family dwellings of any type occurring together. Each individual residential type does not meet the 2.5-acre minimum mapping resolution and neither dominates. Typically these are located in older neighborhoods, where duplexes, triplexes, and apartment buildings occur among single family houses.

1150 RURAL RESIDENTIAL

Rural Residential units include ranches, farmsteads, single mobile homes, and residences located in a rural setting. Typically these areas have limited urban services.

1151 Rural Residential High Density

This category is composed of a group of homes in a rural setting at a density of >2 units/acre. Units may contain backyard animal shelters or pens for non-commercial livestock. This class does not include commercial agricultural land, but does include backyard non-commercial agricultural activity, including field crops, groves, horse facilities, barns, and other agricultural uses. Backyard agricultural is mapped as part of the 1151 polygon.

1152 Rural Residential Low Density

This category includes homes located in a rural setting at a density of <2 units/acre. Included are backyard animal shelters or pens for non-commercial livestock. This class does not include commercial agricultural land, but does include backyard non-commercial agricultural type activity including improved pastureland, field crops, groves, horse facilities, barns, and other agricultural uses. If the back-lot agricultural use meets the MMU (2.5 acres), it will be mapped as a separate polygon and coded with the appropriate land use class.

1244 Major Medical Health Care Facilities

This category includes public and private general medical health care facilities (hospitals) that give short- term care.

Larger hospitals are normally multi-storied, with split-level recessed/tiered upper floors that may form long and narrow lateral wings in order to maximize availability of window access for patient rooms. The area may contain other associated buildings, parking structures, parking areas, and landscaping. Smaller hospitals are one to two stories in height, with parking areas and landscaping. In both cases there may be circular drives with covered main entrances. Some facilities contain a number of buildings forming a complex. Medical offices are often located in close proximity to medical health care facilities. Some medical school facilities may be included as part of a major medical health care facility complex.

1245 Religious Facilities

This category includes churches, mosques, synagogues, temples, tabernacles, and other places of worship or religious pursuit. Religious monasteries, convents, etc. are also included in this category. Not included are schools (see 1262 through 1264), communication (see code 1420) and mass media facilities (see code 1211 and 1212) associated with a religious denomination.

Worship facilities are normally below the 2.5-acre minimum mapping resolution. They appear as one main building with landscaping and parking areas. Some facilities have a grass play area, or other smaller buildings. Monasteries and convents may appear as large office-type or apartment-type buildings in a closed compound with parking areas and substantial landscaping. Religious facilities may be identified on the topographic base maps, but that source may not be current. Small cemeteries, less than 2.5 acres, that are associated with an adjacent church are included with the church. Religious camps are mapped as code 1880. Retreat or conference centers are mapped as code 1253.

1260 EDUCATIONAL INSTITUTIONS

All levels of public and private schools, colleges, universities, seminaries, and training centers are covered by this category. Includes buildings, open space, dormitories, and parking areas. Also included are all athletic facilities, such as ball fields, stadiums, soccer fields, swimming pools, and tennis courts.

1261 Pre-Schools/Day Care Centers

This category includes public and private pre-schools, nursery schools, and day care centers. Facilities associated with other educational institutions or religious facilities are not included in this category.

Most pre-schools/day care centers are below the 2.5-acre minimum mapping resolution. Typically, pre-schools and day care centers are located in commercial areas within close proximity to residential neighborhoods. The facility can appear similar to any commercial type use, however, it will usually contain playground equipment within a fenced lot.

1262 Elementary Schools

This category includes public and private schools, kindergarten through sixth grade, kindergarten through eighth grade, or other beginning grade levels, depending on local school board or administration policy.

Normally buildings are one or two stories in height, though some higher storied buildings may be present. The area contains landscaping and walkways. Buildings are either long and rectangular or have long narrow wings to maximize availability of window access. The play area can be a gray photo signature of asphalt, or a green signature of grass, or both. Elementary schools are usually much smaller than the other types of schools, normally less than 10 acres in size. The parking lot is very small, and may contain a bus loading curb or area. Because this class is a critical land use, any schools that are below the 2.5-acre minimum mapping resolution will be mapped at their actual size, or at a one-acre minimum. If a school serves a narrower or wider range of grade levels, then the school is assigned the class that the facility typically resembles.

1263 Junior High Schools

This category includes public and private schools for grades seven through eight, seven through nine, or other intermediate grade levels, depending on local school board or administration policy. Intermediate and Middle Schools may be included in this category.

Normally buildings are one or two stories in height, though some higher storied buildings may be present. The area contains landscaping and walkways. The buildings are either long and rectangular or have long narrow wings to maximize availability of window access. The athletic area may have a gray photo signature representing asphalt and a larger area of grass which is used as the soccer field/baseball diamond/track. Some schools will have a swimming pool or tennis courts. A parking lot with bus loading curb area may be visible. Junior high schools appear similar to high schools, but have smaller parking and athletic facilities. A junior high school lot is normally about 10 to 20 acres in size. Because this class is a critical land use, any schools that are below the 2.5-acre minimum mapping resolution will be mapped at their actual size or at a one acre minimum. If a school serves a narrower or wider range of grade levels, then the school is assigned the class that the facility typically resembles.

1264 Senior High Schools

This category includes public or private schools for grades ten through twelve, nine through twelve, or other upper grade levels, which are authorized to grant a high school diploma. Both regular, alternative, and extended day or adult education campuses are included. Seminary high schools are also included.

Normally buildings are one or two stories in height, though three- or four-story buildings may be present. The area contains landscaping, walkways, and glades. Buildings are either long and rectangular or have long narrow wings to maximize availability of window access. The athletic area may be a gray signature of asphalt, with a larger area of grass for a soccer field. There are also separate baseball diamond/fields, football fields/stadiums, and track ovals.

Some schools will have a swimming pool and tennis courts. A parking lot with bus loading curb area may be visible. One may find a series of buses parked there. A senior high school lot is normally about 20 to 50 acres in size. However some private high schools may be below the 2.5-acre minimum mapping resolution and will be mapped as a one acre polygon at minimum in order to be included in the data base. If the school serves a narrower or wider range of grade levels, then the school is assigned the class that the facility typically resembles.

1265 Colleges and Universities

This category includes all public or private schools that offer courses at grade level 13 or higher, conferring either professional or academic degrees. Post-high school seminaries are also included.

Normally buildings are one to four stories in height, though higher storied buildings may be present. Buildings are either long and rectangular or have long narrow lateral wings to maximize availability of window access. Some buildings, such as libraries, auditoriums, and gymnasiums, may be rectangular in shape. Many buildings have architectural design in their shapes and features. Areas within the school may be well landscaped, containing walkways, glades, quads, squares, large lawn areas, greens, or malls. Athletic areas may be separate from the main school area. Asphalt areas for basketball may be present. There are also separate baseball fields, football stadiums, track ovals, tennis courts, and swimming pools. Small streets and parking areas may be located throughout the complex. Dormitories and on-campus fraternity/sorority houses are included. Off-campus university-owned housing and off-campus fraternity/sorority houses may be mapped as a multi-family or single-family residential category.

1266 Trade Schools

This category includes all schools which provide technical, vocational, occupational, or professional training (e.g. vocational schools, occupational training centers, police academies, secretarial schools, nursing academies, technical institutes, or art institutes).

These facilities are normally smaller than and may identify themselves as, a college or university. Most facilities will be smaller than a high school and without the athletic facilities normally associated with other schools. Buildings may be any size, but normally one to two stories in height, resembling office buildings. Some buildings may be long and narrow to maximize availability of window access. The facility will have an adjacent parking area.

1800 OPEN SPACE AND RECREATION

Developed open areas within urban settings, and urban and non-urban open areas developed for recreational activities.

1810 Golf Courses

This category includes public and private courses including driving ranges, greens, fairways, links, hazards, buildings, and parking areas.

Golf courses appear on the photo as areas containing long green grass areas lined with trees. The greens have hazard ponds and white sand traps adjacent to them. There can be nine or eighteen fairways/greens. Typically there is a main building serving as the clubhouse-/office/restaurant. Driving ranges not associated with a golf course are mapped as Other Open Space and Recreation (code 1880). Most golf courses are identified on the collateral data. Residential areas within golf courses are mapped separately as their residential type. Water bodies that are greater than 2.5 acres are mapped as 4100.

1820 Local Parks and Recreation

This category includes neighborhood, city, town, or community parks, and sports fields, and their associated parking facilities. Beach parks are not included (see code 1870).

Local parks are typically small, up to several city blocks in size, but basically serve the immediately surrounding community. The photo signature shows a green grass area with trees scattered throughout, though trees are not a requirement of this class. The park may contain limited sports facilities. Parking is usually on the street, though there may be one or more parking lots. The sports fields are usually softball fields, basketball courts, tennis courts, or soccer fields, though some parks also contain swimming pools. Some parks also contain a recreational building or multi-purpose building, with offices and indoor sports facilities. Private parks serving a development or subdivision are included. Most parks are identified from collateral sources. In some cities, school athletic field/playground areas are also considered parks, therefore these areas were mapped as parks.

1830 Regional Parks and Recreation

This category includes developed land within parks designed to serve a regional area. All facilities within the park, such as campgrounds, marinas, or boat launching facilities, are included in this class.

Regional parks are typically large, and may include undeveloped areas. The undeveloped portions of parks are mapped as vacant (see code 3100). The photo signature shows green grass areas, as well as tree-covered areas. The park may have one or more roads winding through it, depending on the size of the park. The park usually contains a number of sports facilities, such as basketball courts, tennis courts, softball fields, soccer fields, and swimming facilities. Water bodies within regional parks that are above mapping resolution are coded 4100. Beach parks are not included (see code 1870). Where multiple uses occur within a regional park, for example golf course, agriculture, flood control, etc., the use other than Regional Park takes precedence. Most regional parks are identified on collateral sources.

1840 Cemeteries

This category includes public and private cemeteries, memorial parks, mausoleums, and other burial grounds. Included are associated facilities and parking areas.

Cemeteries appear on the photo as green grass areas, similar to local parks. Cemeteries, however, contain roads configured as a grid network or with a center oval. The interpreter may be able to see subtle lineation representing the tombstones, plaques, and flowers at each grave. One or more buildings are found on the lot which may include a mortuary, chapel, office, or crematory. A line of cars may be seen on the photo if a funeral was in progress at the time of exposure.

1850 Wildlife Preserves and Sanctuaries

This category includes public and private facilities, and developed areas devoted to the preservation of wildlife species and habitats. This class includes such uses as zoos, wild animal parks, duck ponds, exotic animal farms, etc.

Zoos appear as large areas with many buildings and much vegetation in a confined area, with numerous walkways. A large parking lot is adjacent to the facility. Other wild animal facilities are typically located outside the urban area in canyons and are not open to the general public. Most wildlife preserves and sanctuaries will be identified on collateral data. Undeveloped areas within national and state preserves and sanctuaries are mapped as 3100.

1860 Specimen Gardens and Arboreta

This category includes botanical gardens or arboreta devoted to preserving living specimens of vegetation for scientific or cultural purposes.

These facilities are identified on collateral data. The photo signature will show a well manicured, highly vegetated area, with numerous walkways, buildings, and greenhouses, with an adjacent parking area. Arboreta associated with colleges or universities are mapped as 1860.

1870 Beach Parks

This category includes all public and private beach parks. The facilities include bathhouses, barbecue pits, parking areas, sports areas, as well as the beach area.

Beach parks are identified on the collateral data. The aerial photo signature shows a white to tan color for the sand area, and a gray signature for parking areas. Some buildings may be located adjacent to the parking lots.

1880 Other Open Space and Recreation

This category includes developed portions of public and private recreational facilities that are not described in the other open space and recreational categories above. Included are camps, campgrounds (unless within a regional park (1830)), outdoor shooting ranges, ski areas, marinas, and driving ranges not associated with a golf course. Also included are maintained grass areas not used or designated as a local park.

Most of these facilities are identified on the collateral data. Marinas are located adjacent to harbors, and contain small piers, with numerous boats. The water portion of a marina, where the boats are moored, is mapped in the Water category (see code 4300). Ski areas are typically

located in mountains above 5000 feet. The area contains a series of wide linear clearings that may braid with each other. A series of towers representing the chairlift system can be seen on the aerial photo. Campgrounds appear as an area with narrow roads circling within, with offshoot segments representing each campsite area. Campgrounds are also identified on collateral sources.

Appendix C

Overview of Input-Output Analysis

Introduction

Input-output analysis is a framework designed to examine the inter-industry flows of commodities throughout an economy (Leontieff, 1966; Yan 1969; Miller and Blair 1985). The input-output method divides an economy into a series of sectors, or industries, and measures the flow of goods and services between them. An industry is conventionally defined as a group of firms producing the same, or a similar mix of, outputs. The technique of input-output recognizes that to engage in production an industry consumes a variety of inputs including raw materials, semi-finished or intermediate goods, capital equipment and labor. These materials must be purchased within the economy or imported from outside. Input-output analysis provides a structured accounting system that records the purchases and sales of inputs within each industry in an economy over a set period of time, usually a year. In addition, input-output analysis also records the sales by each industry to all other sectors within the economy, including sales to consumers and the government, as well as exports (sales to parties outside a nation or region of interest). Non-industry sales within the input-output framework represents consumption by final demand.

The foundation of input-output analysis is the transactions table, a matrix that records the sales and purchases made between all sectors within the economy. An example of a transactions table is provided in Figure C1. The heart of the transactions table is the inter-industry portion of the matrix, the shaded area in Figure C1, that illustrates the flow of goods and services between the "producing" sectors of the economy. Each row of the transactions table shows how the output of a particular industry is distributed across other producing sectors as well as elements of final demand. The sum of the elements along any row for a producing sector in the transactions table records the total value of output of the corresponding row industry for the stated time period. The columns of the transactions table record the inputs used by industries in the production of their output. The sum of the values in a producing industry column equals the total value of inputs purchased by an industry in a given period.

As well as illustrating flows between producing sectors of the economy, the transactions table also records the non-industrial inputs to production, chiefly payments to labor and other inputs such as government services. In addition, the transactions table keeps track of sales made outside the producing sectors of the economy, to elements of what is referred to as final demand. Final demand is defined as purchases made for consumption rather than the further processing of commodities, and includes personal consumption expenditure, purchases by government, and purchases for investment and exports.

Assumptions of Input-Output Analysis

The techniques of input-output analysis rest upon a number of critical assumptions regarding the nature of technology in an economy, the capacity of the system to produce different quantities of output and the nature of industrial linkages. The first, and perhaps most important, assumption is that production technology is one of fixed proportions (Leontieff technology), or that there are constant returns to scale in production. Thus, in an input-output world, an industry would have to

Table C1. An Input-Output Transactions Table

	Input to sectors				Intermediate output O	Final demand F	Total output X
Output from sectors	1	2	3	n			
1	X_{11}	X_{12}	X_{13}	X_{1n}	O_1	F_1	X_1
2	X_{21}	X_{22}	X_{23}	X_{2n}	O_2	F_2	X_2
3	X_{31}	X_{32}	X_{33}	X_{3n}	O_3	F_3	X_3
n	X_{n1}	X_{n2}	X_{n3}	X_{nn}	O_n	F_n	X_n
Intermediate input I	I_1	I_2	I_3	I_n			
Value added V	V_1	V_2	V_3	V_n		GDP	
Total input X	X_1	X_2	X_3	X_n			

double its use of all inputs in order to double its output. The fixed proportions assumption ensures that the flow of goods between two sectors of the economy depends on the nature of production technology and the volume of output of the receiving industry. Production technology is defined by a series of input-output coefficients that report how much input from sector *i* is required to produce a unit of output of sector *j*. It is assumed that production technology remains constant for the period of investigation. Of course, techniques of production do change over time and these changes can be captured by altering the values of input-output coefficients, including the labor input coefficient (the inverse of labor productivity).

A second assumption of input-output analysis is that production is completely divisible and free of capacity constraints or minimum efficient scale thresholds. Thus, if demand for an industry's output increases by any amount, the industry is assumed to be able to meet this demand by scaling production, without running-up against any bottlenecks in the supply process. This assumption actually goes a little further as we assume also that supply adjusts automatically to demand to allow markets to clear with no impact on commodity prices.

A third assumption has more to do with data issues, though it is built into the methodology of input-output analysis as researchers focus on smaller regions within a national economy. The data that underpins input-output analysis is usually gathered at the national level. We know that production technologies vary over space as well as time, but without region-specific data, we are forced to assume that the production techniques found in particular regions reflect those at the national level. In some cases, we can use data for local regions to adjust national production coefficients. Similarly, as we calculate economic impacts within the input-output framework, we usually need to know how much of the inputs to an economy are produced within the study region or imported from outside (this is the value of regional purchase coefficients). This is not much of a problem at the national level for which aggregate data are available, but as focal regions shrink in size from states to cities, so we have to assume that intra-regional purchasing patterns remain constant or change in some specified fashion.

The assumptions outlined above imply a certain cost. We know that production functions in most parts of the economy are not of the fixed coefficients variety and that increasing returns are significant in today's economy. Furthermore, we know that the production process is not seamless, free of minimum efficient scaling considerations or capacity constraints. We also suspect that as focal economies get smaller, regional purchasing coefficients, the volume of inputs sourced within the study region rather

than imported from outside will decline. However, with limited information on the variable nature of production technology and purchasing behaviors, and with the limited ability of the input-output method to incorporate such information, the assumptions above are necessary to examine the interactions between the different components of the economy.

Applications of Input-Output Analysis and Multipliers

The transactions table, illustrated above, describes an economy in equilibrium, it maps the final demand for goods and services and the inter-industry transactions that are required to satisfy that demand. More than simply describing the nature of production in an economy, input-output analysis can be used to examine a number of important questions. Thus, input-output methods have been used to predict the impacts of changes in taxes on economic activity, or changes in tariffs or trade duties, to examine the consequences of reductions in federal defense spending, to investigate the income and employment effects of downsizing industries, and to analyze industrial and regional linkages (Miernyck, 1967; Hewings, 1985). Input-output also provides a useful framework for industrial ecology and for tracing energy use and the production and trade of environmental pollutants and greenhouse gases resulting from industrial activity (Suh and Kagawa, 2005; David and Caldeira, 2010). Miller and Blair (1985) provide a more detailed overview of input-output analysis and applications. For environmental applications, the environmental input-output life-cycle assessment (EIOLCA) framework developed at Carnegie Mellon University is particularly useful (www.eiolca.net), and see Hendrickson et al. (2006).

A vital ingredient in input-output investigations is the multiplier. The concept of the multiplier may be illustrated with reference to inter-industry flows of commodities. An increase in the final demand for the output of one industry, say industry A, will cause a **direct** increase in output within industry A. However, this does not represent the total additional output required to satisfy the original change in final demand. The additional output of commodity A will result in additional purchases by industry A of the inputs required in production. Thus, industry A will demand additional inputs from industries B and C, for example. These additional demands necessitate an increase in output of industries B and C which in turn place greater demands on their supply sectors, possibly including sector A. These **indirect** effects will spread throughout the processing sector of the economy. This is not the end of the story of course, for greater volumes of output in the economy mean increased employment, wages and purchases by households. These **induced** effects necessitate further increases in industry output. In a general sense, the multiplier measures the ratio of the combined change in economic activity (the sum of direct, indirect and induced effects) to the direct effect. The multiplier thus provides a measure of the degree of economic interdependence of any sector. Sectors with higher multipliers are more closely integrated with the economy as a whole than sectors with relatively small multipliers. Also, note that multipliers tend to decline as the size of the economy examined decreases. This reflects the simple fact that smaller economies tend to be less diverse and rely increasingly on other regions to source inputs.

Finally, it is important to bear in mind that these multiplier effects do not reflect opportunity costs. The input-output model explores the impacts of different kinds of economic stimuli, such as an increase in consumer spending, without explicitly noting that the additional spending by consumers is generated at the expense of less consumption or investment somewhere else in the economy.

Input-Output Data

The input-output data employed in this report were provided by IMPLAN, (Impact Analysis for PLANning). IMPLAN provides an input-output modeling framework and input-output data at the zip-code, county, state and national levels. 2015 IMPLAN data for the state of California, for Los Angeles county and the city of Los Angeles (built from zip code data) were used for the impact analysis conducted in this report. Our input-output analysis also draws upon economic data from the California Employment Development Department, from the Quarterly Census of Employment and Wages of the Bureau of Labor Statistics, from the County Business patterns of the U.S. Bureau of the Census. Additional data sources are noted in the text.

The data in input-output tables are either of a physical, say tons, or a monetary dimension. Because of the difficulty of consistently measuring the heterogeneous outputs of some industries in physical terms, transactions table information is increasingly of the monetary kind. In this study, the transactions between sectors of the economy are measured in U.S. dollars. Further, the transactions are all measured in terms of producer prices, or 'free-on- board' (f.o.b.) prices, rather than wholesale or retail prices and thus ignore wholesale and retail trade margins as well as transport costs.

The input-output data provided by IMPLAN includes information on inter-industry transactions, components of value added, final demand, the gross output of each industry and industry employment. The data are relatively disaggregated: in total 536 sectors of the economy are distinguished, including over 400 manufacturing industries, at roughly the five-digit level of the North American Industrial Classification System (NAICS). Input-output tables assign establishments to an industry according to their primary product. However, many firms produce several different types of output. In this case, the establishment is classified according to its dominant output, the remaining commodities produced being referred to as secondary products. Because secondary products now constitute such a large proportion of U.S. industrial output, input-output tables are constructed on the basis of the flows of specific commodity types between industrial sectors. Prior to the analysis conducted below, the input-output data were converted to an industry by industry base rather than a commodity by industry base.

Input-output data are gathered at the national level from surveys conducted by the Bureau of Economic Analysis. These data track purchases and sales between different sectors of the economy. As we move to consider the input-output structure of states, counties and individual cities, it is important to note that the purchasing and sales patterns of sectors will vary. As the area being studied gets smaller, so firms within that area may be unable to supply another industry within the same area with the inputs it requires. In this case, the inputs must be imported from outside the study region. IMPLAN estimates what share of industry to industry flows can be met by production within the study area (regional purchasing coefficients) and what share of such flows must be imported. As well as imports of goods to a study region there may also be imports of workers in the form of commuters. IMPLAN uses available data to estimate worker flows across study region borders, but for smaller regions such estimates carry greater uncertainty. Some concerns in using input-output data for small regions, particularly the data generated by IMPLAN, are noted by Lazarus et al. (2002). However, to be fair, there are no survey data available at the local level to replace the estimates generated by IMPLAN and related firms. As usual, some caution in interpreting results is always required.

Simple Mathematics of Input-Output Analysis

Armed with the caveats noted above, the input-output model is usually developed in the following manner. Let the monetary value of commodity flows from industry *i* to industry *j* be T_{ij}. Also, let the output of sector *i* be X_i and the total final demand for sector *i* be Y_i. Then, the total output of industry *i* may be written as

$$X_i = T_{i1} + T_{i2} + \ldots + T_{in} + Y_i \qquad (1)$$

for all industries *i = 1,…,n*.
We can write a similar series of equations for all producing sectors within the economy

$$\begin{aligned} X_1 &= T_{11} + T_{12} + \ldots + T_{1n} + Y_1 \\ X_2 &= T_{21} + T_{22} + \ldots + T_{2n} + Y_2 \\ \vdots \quad & \quad \vdots \quad \vdots \qquad\qquad \vdots \quad \vdots \\ X_n &= T_{n1} + T_{n2} + \ldots + T_{nn} + Y_n \end{aligned} \qquad (2)$$

Together these equations represent the purchases and sales made between all producing sectors of the economy. Dividing the flows of commodities to industry *j* by the monetary value of output of industry *j* yields the commodity inputs required to produce one dollar of output of good *j*. Thus,

$$a_{ij} = T_{ij} / X_j \qquad (3)$$

where a_{ij} is known as the direct input or input-output coefficient measuring the amount of commodity *i* required to produce one dollar of output of commodity *j*. Once again, the entire series of transactions in our economy may be written in the form of equation (3) as

$$\begin{aligned} X_1 &= a_{11}X_1 + a_{12}X_2 + \ldots + a_{1n}X_n + Y_1 \\ X_2 &= a_{21}X_1 + a_{22}X_2 + \ldots + a_{2n}X_n + Y_2 \\ \vdots \quad & \quad \vdots \quad \vdots \qquad\qquad \vdots \quad \vdots \\ X_n &= a_{n1}X_1 + a_{n2}X_2 + \ldots + a_{nn}X_n + Y_n \end{aligned} \qquad (4)$$

For ease of exposition, the series of equations (4) may be rewritten in matrix form as

$$\mathbf{X} = \mathbf{AX} + \mathbf{Y} \qquad (5)$$

where **X** is an *n* element column vector of industry output
A is an *n x n* matrix of direct input-output coefficients
Y is an *n* element column vector of final demand.

Letting **I** represent an *n x n* identity matrix and rearranging equation (5) we have

$$\mathbf{X} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{Y} \qquad (6)$$

where $(\mathbf{I}-\mathbf{A})^{-1}$ is known as the Leontieff inverse matrix. Each column of this matrix indicates the gross output required from each producing sector in the economy in order to meet $1 of final demand for the output of the column industry. Given the technology of the economy (specified by the **A** matrix of direct input coefficients) and given the vector of final demand (**Y**), equation 6 provides the scale of production in all sectors of the economy sufficient to meet the needs of intermediate and final uses. If the matrix (**I-A**) is singular then a unique solution to equation (6) exists. The multipliers discussed in the main body of the report are taken directly from the Leontieff inverse matrix, augmented by output or employment data. Note that it is the direct input or input-output coefficients that vary across regions according to the size and the mix of economic activity that they contain.

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Appendix D
Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
0	Total	343.7731	105.7152	237.1221	686.6103
1	Oilseed farming	0.0000	0.0000	0.0000	0.0000
2	Grain farming	0.0000	0.0000	0.0000	0.0000
3	Vegetable and melon farming	0.0000	0.0001	0.0547	0.0548
4	Fruit farming	0.0000	0.0000	0.0137	0.0137
5	Tree nut farming	0.0000	0.0000	0.0034	0.0034
6	Greenhouse, nursery, and floriculture production	0.0000	0.0015	0.0538	0.0553
7	Tobacco farming	0.0000	0.0000	0.0000	0.0000
8	Cotton farming	0.0000	0.0000	0.0000	0.0000
9	Sugarcane and sugar beet farming	0.0000	0.0000	0.0000	0.0000
10	All other crop farming	0.0000	0.0011	0.0013	0.0023
11	purpose ranching and farming	0.0000	0.0000	0.0003	0.0003
12	Dairy cattle and milk production	0.0000	0.0000	0.0004	0.0004
13	Poultry and egg production	0.0000	0.0000	0.0000	0.0000
14	Animal production, except cattle and poultry and eggs	0.0000	0.0000	0.0001	0.0001
15	Forestry, forest products, and timber tract production	0.0000	0.0000	0.0000	0.0000
16	Commercial logging	0.0000	0.0015	0.0008	0.0022
17	Commercial fishing	0.0000	0.0000	0.0006	0.0006
18	Commercial hunting and trapping	0.0000	0.0000	0.0000	0.0000
19	Support activities for agriculture and forestry	0.0000	0.0000	0.0002	0.0003
20	Extraction of natural gas and crude petroleum	343.7731	1.2132	0.0138	345.0000
21	Extraction of natural gas liquids	0.0000	0.0035	0.0000	0.0036
22	Coal mining	0.0000	0.0000	0.0000	0.0000
23	Iron ore mining	0.0000	0.0000	0.0000	0.0000
24	Gold ore mining	0.0000	0.0000	0.0000	0.0000
25	Silver ore mining	0.0000	0.0000	0.0000	0.0000
26	Lead and zinc ore mining	0.0000	0.0000	0.0000	0.0000
27	Copper ore mining	0.0000	0.0000	0.0000	0.0000
28	Uranium-radium-vanadium ore mining	0.0000	0.0000	0.0000	0.0000
29	Other metal ore mining	0.0000	0.0000	0.0000	0.0000
30	Stone mining and quarrying	0.0000	0.0000	0.0000	0.0000
31	Sand and gravel mining	0.0000	0.0001	0.0000	0.0001
32	Other clay, ceramic, refractory minerals mining	0.0000	0.0000	0.0000	0.0000
33	Potash, soda, and borate mineral mining	0.0000	0.0000	0.0000	0.0000
34	Phosphate rock mining	0.0000	0.0000	0.0000	0.0000
35	Other chemical and fertilizer mineral mining	0.0000	0.0000	0.0000	0.0000
36	Other nonmetallic minerals	0.0000	0.0000	0.0000	0.0000
37	Drilling oil and gas wells	0.0000	0.0513	0.0000	0.0513
38	Support activities for oil and gas operations	0.0000	1.8780	0.0002	1.8782
39	Metal mining services	0.0000	0.0000	0.0000	0.0000
40	Other nonmetallic minerals services	0.0000	0.0002	0.0000	0.0002
41	Electric power generation - Hydroelectric	0.0000	0.0000	0.0000	0.0000
42	Electric power generation - Fossil fuel	0.0000	0.0539	0.0398	0.0937
43	Electric power generation - Nuclear	0.0000	0.0350	0.0259	0.0609
44	Electric power generation - Solar	0.0000	0.0024	0.0017	0.0041

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
45	Electric power generation - Wind	0.0000	0.0024	0.0018	0.0042
46	Electric power generation - Geothermal	0.0000	0.0000	0.0000	0.0000
47	Electric power generation - Biomass	0.0000	0.0028	0.0021	0.0049
48	Electric power generation - All other	0.0000	0.0002	0.0002	0.0004
49	Electric power transmission and distribution	0.0000	0.0002	0.0001	0.0003
50	Natural gas distribution	0.0000	0.6491	0.1296	0.7787
51	Water, sewage and other systems	0.0000	0.0085	0.0035	0.0121
52	Construction of new health care structures	0.0000	0.0000	0.0000	0.0000
53	Construction of new manufacturing structures	0.0000	0.0000	0.0000	0.0000
54	Construction of new power and communication structures	0.0000	0.0000	0.0000	0.0000
55	Construction of new educational and vocational structures	0.0000	0.0000	0.0000	0.0000
56	Construction of new highways and streets	0.0000	0.0000	0.0000	0.0000
57	Construction of new commercial structures, including farm structures	0.0000	0.0000	0.0000	0.0000
58	Construction of other new nonresidential structures	0.0000	0.0000	0.0000	0.0000
59	Construction of new single-family residential structures	0.0000	0.0000	0.0000	0.0000
60	Construction of new multifamily residential structures	0.0000	0.0000	0.0000	0.0000
61	Construction of other new residential structures	0.0000	0.0000	0.0000	0.0000
62	Maintenance and repair construction of nonresidential structures	0.0000	27.7083	0.8757	28.5840
63	Maintenance and repair construction of residential structures	0.0000	0.0539	0.6728	0.7266
64	Maintenance and repair construction of highways, streets, bridges, and tunnels	0.0000	0.0000	0.0000	0.0000
65	Dog and cat food manufacturing	0.0000	0.0000	0.0010	0.0010
66	Other animal food manufacturing	0.0000	0.0000	0.0001	0.0001
67	Flour milling	0.0000	0.0000	0.0015	0.0015
68	Rice milling	0.0000	0.0000	0.0000	0.0000
69	Malt manufacturing	0.0000	0.0000	0.0000	0.0000
70	Wet corn milling	0.0000	0.0000	0.0000	0.0000
71	Soybean and other oilseed processing	0.0000	0.0000	0.0001	0.0001
72	Fats and oils refining and blending	0.0000	0.0000	0.0000	0.0000
73	Breakfast cereal manufacturing	0.0000	0.0000	0.0002	0.0002
74	Beet sugar manufacturing	0.0000	0.0000	0.0000	0.0000
75	Sugar cane mills and refining	0.0000	0.0000	0.0000	0.0000
76	Nonchocolate confectionery manufacturing	0.0000	0.0000	0.0056	0.0056
77	Chocolate and confectionery manufacturing from cacao beans	0.0000	0.0000	0.0000	0.0000
78	Confectionery manufacturing from purchased chocolate	0.0000	0.0000	0.0096	0.0096
79	Frozen fruits, juices and vegetables manufacturing	0.0000	0.0000	0.0002	0.0002
80	Frozen specialties manufacturing	0.0000	0.0000	0.0026	0.0026
81	Canned fruits and vegetables manufacturing	0.0000	0.0000	0.0009	0.0009
82	Canned specialties	0.0000	0.0000	0.0031	0.0031
83	Dehydrated food products manufacturing	0.0000	0.0000	0.0000	0.0000
84	Fluid milk manufacturing	0.0000	0.0001	0.0541	0.0542
85	Creamery butter manufacturing	0.0000	0.0000	0.0004	0.0004
86	Cheese manufacturing	0.0000	0.0000	0.0020	0.0020

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Sector	Description	Employment Direct	Indirect	Induced	Total
87	Dry, condensed, and evaporated dairy product manufacturing	0.0000	0.0000	0.0016	0.0016
88	Ice cream and frozen dessert manufacturing	0.0000	0.0002	0.0090	0.0091
89	Animal, except poultry, slaughtering	0.0000	0.0001	0.0062	0.0063
90	Meat processed from carcasses	0.0000	0.0000	0.0457	0.0457
91	Rendering and meat byproduct processing	0.0000	0.0005	0.0113	0.0118
92	Poultry processing	0.0000	0.0002	0.0240	0.0242
93	Seafood product preparation and packaging	0.0000	0.0003	0.0156	0.0159
94	Bread and bakery product, except frozen, manufacturing	0.0000	0.0046	0.9769	0.9815
95	Frozen cakes and other pastries manufacturing	0.0000	0.0000	0.0026	0.0026
96	Cookie and cracker manufacturing	0.0000	0.0002	0.1034	0.1037
97	Dry pasta, mixes, and dough manufacturing	0.0000	0.0000	0.0078	0.0079
98	Tortilla manufacturing	0.0000	0.0001	0.0517	0.0518
99	Roasted nuts and peanut butter manufacturing	0.0000	0.0000	0.0020	0.0020
100	Other snack food manufacturing	0.0000	0.0000	0.0037	0.0037
101	Coffee and tea manufacturing	0.0000	0.0004	0.0386	0.0390
102	Flavoring syrup and concentrate manufacturing	0.0000	0.0002	0.0065	0.0067
103	Mayonnaise, dressing, and sauce manufacturing	0.0000	0.0002	0.0306	0.0308
104	Spice and extract manufacturing	0.0000	0.0002	0.0239	0.0241
105	All other food manufacturing	0.0000	0.0003	0.1485	0.1488
106	Bottled and canned soft drinks & water	0.0000	0.0001	0.0093	0.0094
107	Manufactured ice	0.0000	0.0000	0.0005	0.0005
108	Breweries	0.0000	0.0000	0.0069	0.0069
109	Wineries	0.0000	0.0000	0.0037	0.0037
110	Distilleries	0.0000	0.0000	0.0001	0.0001
111	Tobacco product manufacturing	0.0000	0.0000	0.0000	0.0000
112	Fiber, yarn, and thread mills	0.0000	0.0000	0.0000	0.0000
113	Broadwoven fabric mills	0.0000	0.0000	0.0006	0.0006
114	Narrow fabric mills and schiffli machine embroidery	0.0000	0.0000	0.0002	0.0002
115	Nonwoven fabric mills	0.0000	0.0000	0.0000	0.0000
116	Knit fabric mills	0.0000	0.0000	0.0008	0.0009
117	Textile and fabric finishing mills	0.0000	0.0020	0.0065	0.0085
118	Fabric coating mills	0.0000	0.0001	0.0003	0.0003
119	Carpet and rug mills	0.0000	0.0000	0.0001	0.0001
120	Curtain and linen mills	0.0000	0.0000	0.0048	0.0048
121	Textile bag and canvas mills	0.0000	0.0011	0.0035	0.0046
122	Rope, cordage, twine, tire cord and tire fabric mills	0.0000	0.0000	0.0001	0.0002
123	Other textile product mills	0.0000	0.0007	0.0029	0.0036
124	Hosiery and sock mills	0.0000	0.0000	0.0000	0.0000
125	Other apparel knitting mills	0.0000	0.0000	0.0007	0.0007
126	Cut and sew apparel contractors	0.0000	0.0127	0.0534	0.0662
127	Mens and boys cut and sew apparel manufacturing	0.0000	0.0001	0.0260	0.0261
128	Womens and girls cut and sew apparel manufacturing	0.0000	0.0002	0.1128	0.1130
129	Other cut and sew apparel manufacturing	0.0000	0.0000	0.0317	0.0318
130	Apparel accessories and other apparel manufacturing	0.0000	0.0002	0.0305	0.0306
131	Leather and hide tanning and finishing	0.0000	0.0000	0.0001	0.0001
132	Footwear manufacturing	0.0000	0.0000	0.0204	0.0204

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
133	Other leather and allied product manufacturing	0.0000	0.0002	0.0109	0.0110
134	Sawmills	0.0000	0.0027	0.0006	0.0032
135	Wood preservation	0.0000	0.0100	0.0022	0.0122
136	Veneer and plywood manufacturing	0.0000	0.0020	0.0005	0.0025
137	Engineered wood member and truss manufacturing	0.0000	0.0000	0.0000	0.0000
138	Reconstituted wood product manufacturing	0.0000	0.0000	0.0000	0.0000
139	Wood windows and door manufacturing	0.0000	0.0148	0.0054	0.0201
140	Cut stock, resawing lumber, and planing	0.0000	0.0133	0.0053	0.0186
141	Other millwork, including flooring	0.0000	0.0467	0.0115	0.0582
142	Wood container and pallet manufacturing	0.0000	0.0054	0.0280	0.0333
143	Manufactured home (mobile home) manufacturing	0.0000	0.0000	0.0000	0.0000
144	Prefabricated wood building manufacturing	0.0000	0.0001	0.0000	0.0001
145	All other miscellaneous wood product manufacturing	0.0000	0.0071	0.0119	0.0190
146	Pulp mills	0.0000	0.0000	0.0000	0.0000
147	Paper mills	0.0000	0.0000	0.0000	0.0000
148	Paperboard mills	0.0000	0.0000	0.0000	0.0000
149	Paperboard container manufacturing	0.0000	0.0003	0.0003	0.0006
150	Paper bag and coated and treated paper manufacturing	0.0000	0.0000	0.0001	0.0001
151	Stationery product manufacturing	0.0000	0.0000	0.0000	0.0000
152	Sanitary paper product manufacturing	0.0000	0.0000	0.0000	0.0000
153	All other converted paper product manufacturing	0.0000	0.0000	0.0000	0.0000
154	Printing	0.0000	0.0761	0.1297	0.2058
155	Support activities for printing	0.0000	0.0068	0.0048	0.0116
156	Petroleum refineries	0.0000	0.5124	0.0764	0.5888
157	Asphalt paving mixture and block manufacturing	0.0000	0.0031	0.0004	0.0035
158	Asphalt shingle and coating materials manufacturing	0.0000	0.0226	0.0041	0.0267
159	Petroleum lubricating oil and grease manufacturing	0.0000	0.1653	0.0062	0.1715
160	All other petroleum and coal products manufacturing	0.0000	0.0071	0.0020	0.0091
161	Petrochemical manufacturing	0.0000	0.0000	0.0000	0.0000
162	Industrial gas manufacturing	0.0000	0.1900	0.0054	0.1953
163	Synthetic dye and pigment manufacturing	0.0000	0.0015	0.0014	0.0029
164	Other basic inorganic chemical manufacturing	0.0000	0.0451	0.0058	0.0509
165	Other basic organic chemical manufacturing	0.0000	0.0023	0.0003	0.0026
166	Plastics material and resin manufacturing	0.0000	0.0430	0.0025	0.0454
167	Synthetic rubber manufacturing	0.0000	0.0001	0.0000	0.0001
168	Artificial and synthetic fibers and filaments manufacturing	0.0000	0.0000	0.0000	0.0000
169	Nitrogenous fertilizer manufacturing	0.0000	0.0000	0.0000	0.0000
170	Phosphatic fertilizer manufacturing	0.0000	0.0000	0.0000	0.0000
171	Fertilizer mixing	0.0000	0.0001	0.0001	0.0002
172	Pesticide and other agricultural chemical manufacturing	0.0000	0.0001	0.0007	0.0009
173	Medicinal and botanical manufacturing	0.0000	0.0004	0.0324	0.0328
174	Pharmaceutical preparation manufacturing	0.0000	0.0006	0.2710	0.2716
175	In-vitro diagnostic substance manufacturing	0.0000	0.0018	0.0144	0.0162
176	Biological product (except diagnostic) manufacturing	0.0000	0.0028	0.0276	0.0304
177	Paint and coating manufacturing	0.0000	0.0002	0.0001	0.0002
178	Adhesive manufacturing	0.0000	0.0104	0.0089	0.0193

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
179	Soap and other detergent manufacturing	0.0000	0.0095	0.0290	0.0385
180	Polish and other sanitation good manufacturing	0.0000	0.0171	0.0226	0.0397
181	Surface active agent manufacturing	0.0000	0.0005	0.0003	0.0008
182	Toilet preparation manufacturing	0.0000	0.0102	0.1538	0.1640
183	Printing ink manufacturing	0.0000	0.0011	0.0018	0.0029
184	Explosives manufacturing	0.0000	0.0000	0.0000	0.0000
185	Custom compounding of purchased resins	0.0000	0.0083	0.0007	0.0090
186	Photographic film and chemical manufacturing	0.0000	0.0017	0.0061	0.0078
187	Other miscellaneous chemical product manufacturing	0.0000	0.3751	0.0107	0.3859
188	Plastics packaging materials and unlaminated film and sheet manufacturing	0.0000	0.0165	0.0376	0.0541
189	Unlaminated plastics profile shape manufacturing	0.0000	0.0002	0.0002	0.0004
190	Plastics pipe and pipe fitting manufacturing	0.0000	0.0280	0.0125	0.0405
191	Laminated plastics plate, sheet (except packaging), and shape manufacturing	0.0000	0.0043	0.0036	0.0079
192	Polystyrene foam product manufacturing	0.0000	0.0014	0.0020	0.0035
193	Urethane and other foam product (except polystyrene) manufacturing	0.0000	0.0224	0.0383	0.0607
194	Plastics bottle manufacturing	0.0000	0.0008	0.0019	0.0027
195	Other plastics product manufacturing	0.0000	0.1479	0.1312	0.2791
196	Tire manufacturing	0.0000	0.0000	0.0000	0.0000
197	Rubber and plastics hoses and belting manufacturing	0.0000	0.0000	0.0000	0.0000
198	Other rubber product manufacturing	0.0000	0.0009	0.0009	0.0018
199	Pottery, ceramics, and plumbing fixture manufacturing	0.0000	0.0003	0.0002	0.0005
200	Brick, tile, and other structural clay product manufacturing	0.0000	0.0000	0.0000	0.0000
201	Flat glass manufacturing	0.0000	0.0000	0.0000	0.0000
202	Other pressed and blown glass and glassware manufacturing	0.0000	0.0022	0.0048	0.0070
203	Glass container manufacturing	0.0000	0.0000	0.0000	0.0000
204	Glass product manufacturing made of purchased glass	0.0000	0.0221	0.0465	0.0686
205	Cement manufacturing	0.0000	0.0000	0.0000	0.0000
206	Ready-mix concrete manufacturing	0.0000	0.0000	0.0000	0.0001
207	Concrete block and brick manufacturing	0.0000	0.0000	0.0000	0.0000
208	Concrete pipe manufacturing	0.0000	0.0000	0.0000	0.0000
209	Other concrete product manufacturing	0.0000	0.0000	0.0000	0.0000
210	Lime manufacturing	0.0000	0.0000	0.0000	0.0000
211	Gypsum product manufacturing	0.0000	0.0000	0.0000	0.0000
212	Abrasive product manufacturing	0.0000	0.0000	0.0000	0.0001
213	Cut stone and stone product manufacturing	0.0000	0.0004	0.0003	0.0007
214	Ground or treated mineral and earth manufacturing	0.0000	0.0000	0.0000	0.0000
215	Mineral wool manufacturing	0.0000	0.0000	0.0000	0.0000
216	Miscellaneous nonmetallic mineral products manufacturing	0.0000	0.0000	0.0000	0.0000
217	Iron and steel mills and ferroalloy manufacturing	0.0000	0.0013	0.0000	0.0013
218	Iron, steel pipe and tube manufacturing from purchased steel	0.0000	0.0000	0.0000	0.0000
219	Rolled steel shape manufacturing	0.0000	0.0093	0.0002	0.0096
220	Steel wire drawing	0.0000	0.0032	0.0000	0.0032

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
221	Alumina refining and primary aluminum production	0.0000	0.0000	0.0000	0.0000
222	Secondary smelting and alloying of aluminum	0.0000	0.0000	0.0000	0.0000
223	Aluminum sheet, plate, and foil manufacturing	0.0000	0.0001	0.0001	0.0002
224	Other aluminum rolling, drawing and extruding	0.0000	0.0001	0.0001	0.0002
225	Nonferrous metal (exc aluminum) smelting and refining	0.0000	0.0000	0.0000	0.0000
226	Copper rolling, drawing, extruding and alloying	0.0000	0.0009	0.0002	0.0010
227	Nonferrous metal, except copper and aluminum, shaping	0.0000	0.0008	0.0002	0.0010
228	Secondary processing of other nonferrous metals	0.0000	0.0006	0.0001	0.0007
229	Ferrous metal foundries	0.0000	0.0000	0.0000	0.0000
230	Nonferrous metal foundries	0.0000	0.0007	0.0004	0.0011
231	Iron and steel forging	0.0000	0.0001	0.0000	0.0001
232	Nonferrous forging	0.0000	0.0003	0.0001	0.0004
233	Custom roll forming	0.0000	0.0002	0.0001	0.0003
234	Crown and closure manufacturing and metal stamping	0.0000	0.0019	0.0027	0.0046
235	Cutlery, utensil, pot, and pan manufacturing	0.0000	0.0004	0.0009	0.0013
236	Handtool manufacturing	0.0000	0.0191	0.0039	0.0230
237	Prefabricated metal buildings and components manufacturing	0.0000	0.0000	0.0000	0.0000
238	Fabricated structural metal manufacturing	0.0000	0.0028	0.0001	0.0029
239	Plate work manufacturing	0.0000	0.0001	0.0000	0.0001
240	Metal window and door manufacturing	0.0000	0.0020	0.0012	0.0032
241	Sheet metal work manufacturing	0.0000	0.0017	0.0005	0.0022
242	Ornamental and architectural metal work manufacturing	0.0000	0.0021	0.0003	0.0024
243	Power boiler and heat exchanger manufacturing	0.0000	0.0000	0.0000	0.0001
244	Metal tank (heavy gauge) manufacturing	0.0000	0.0001	0.0000	0.0001
245	Metal cans manufacturing	0.0000	0.0005	0.0007	0.0012
246	Metal barrels, drums and pails manufacturing	0.0000	0.0002	0.0002	0.0005
247	Hardware manufacturing	0.0000	0.0062	0.0046	0.0108
248	Spring and wire product manufacturing	0.0000	0.0130	0.0012	0.0142
249	Machine shops	0.0000	0.0401	0.0186	0.0587
250	Turned product and screw, nut, and bolt manufacturing	0.0000	0.0092	0.0033	0.0125
251	Metal heat treating	0.0000	0.0058	0.0021	0.0079
252	Metal coating and nonprecious engraving	0.0000	0.0149	0.0055	0.0205
253	Electroplating, anodizing, and coloring metal	0.0000	0.0207	0.0076	0.0283
254	Valve and fittings, other than plumbing, manufacturing	0.0000	0.2077	0.0037	0.2113
255	Plumbing fixture fitting and trim manufacturing	0.0000	0.0013	0.0003	0.0016
256	Ball and roller bearing manufacturing	0.0000	0.0197	0.0014	0.0211
257	Small arms ammunition manufacturing	0.0000	0.0000	0.0000	0.0000
258	Ammunition, except for small arms, manufacturing	0.0000	0.0000	0.0000	0.0000
259	Small arms, ordnance, and accessories manufacturing	0.0000	0.0001	0.0000	0.0002
260	Fabricated pipe and pipe fitting manufacturing	0.0000	0.0214	0.0025	0.0240
261	Other fabricated metal manufacturing	0.0000	0.0002	0.0003	0.0006
262	Farm machinery and equipment manufacturing	0.0000	0.0001	0.0000	0.0001
263	Lawn and garden equipment manufacturing	0.0000	0.0003	0.0001	0.0004
264	Construction machinery manufacturing	0.0000	0.0020	0.0000	0.0020
265	Mining machinery and equipment manufacturing	0.0000	0.0000	0.0000	0.0000
266	Oil and gas field machinery and equipment manufacturing	0.0000	0.0000	0.0000	0.0000

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
267	Food product machinery manufacturing	0.0000	0.0001	0.0001	0.0002
268	Semiconductor machinery manufacturing	0.0000	0.0000	0.0000	0.0000
269	Sawmill, woodworking, and paper machinery	0.0000	0.0000	0.0000	0.0000
270	Printing machinery and equipment manufacturing	0.0000	0.0001	0.0001	0.0002
271	All other industrial machinery manufacturing	0.0000	0.0049	0.0021	0.0069
272	Optical instrument and lens manufacturing	0.0000	0.0000	0.0000	0.0000
273	Photographic and photocopying equipment manufacturing	0.0000	0.0023	0.0023	0.0046
274	Other commercial service industry machinery manufacturing	0.0000	0.0623	0.0156	0.0779
275	Air purification and ventilation equipment manufacturing	0.0000	0.0000	0.0000	0.0000
276	Heating equipment (except warm air furnaces) manufacturing	0.0000	0.0000	0.0000	0.0000
277	Air conditioning, refrigeration, and warm air heating equipment manufacturing	0.0000	0.0000	0.0000	0.0001
278	Industrial mold manufacturing	0.0000	0.0000	0.0001	0.0001
279	Special tool, die, jig, and fixture manufacturing	0.0000	0.0002	0.0001	0.0003
280	Cutting tool and machine tool accessory manufacturing	0.0000	0.4305	0.0012	0.4318
281	Machine tool manufacturing	0.0000	0.0109	0.0004	0.0113
282	Rolling mill and other metalworking machinery manufacturing	0.0000	0.0000	0.0009	0.0009
283	Turbine and turbine generator set units manufacturing	0.0000	0.0003	0.0001	0.0004
284	Speed changer, industrial high-speed drive, and gear manufacturing	0.0000	0.0014	0.0007	0.0021
285	Mechanical power transmission equipment manufacturing	0.0000	0.0000	0.0000	0.0000
286	Other engine equipment manufacturing	0.0000	0.0021	0.0002	0.0023
287	Pump and pumping equipment manufacturing	0.0000	0.0001	0.0000	0.0001
288	Air and gas compressor manufacturing	0.0000	0.0000	0.0000	0.0000
289	Measuring and dispensing pump manufacturing	0.0000	0.0000	0.0000	0.0000
290	Elevator and moving stairway manufacturing	0.0000	0.0036	0.0002	0.0039
291	Conveyor and conveying equipment manufacturing	0.0000	0.0000	0.0000	0.0000
292	Overhead cranes, hoists, and monorail systems manufacturing	0.0000	0.0009	0.0000	0.0009
293	Industrial truck, trailer, and stacker manufacturing	0.0000	0.0003	0.0001	0.0003
294	Power-driven handtool manufacturing	0.0000	0.0110	0.0004	0.0114
295	Welding and soldering equipment manufacturing	0.0000	0.0039	0.0009	0.0048
296	Packaging machinery manufacturing	0.0000	0.0003	0.0002	0.0006
297	Industrial process furnace and oven manufacturing	0.0000	0.0000	0.0000	0.0000
298	Fluid power cylinder and actuator manufacturing	0.0000	0.0004	0.0000	0.0004
299	Fluid power pump and motor manufacturing	0.0000	0.0007	0.0000	0.0007
300	Scales, balances, and miscellaneous general purpose machinery manufacturing	0.0000	0.0002	0.0001	0.0002
301	Electronic computer manufacturing	0.0000	0.0003	0.0133	0.0136
302	Computer storage device manufacturing	0.0000	0.0006	0.0041	0.0047
303	Computer terminals and other computer peripheral equipment manufacturing	0.0000	0.0011	0.0034	0.0045
304	Telephone apparatus manufacturing	0.0000	0.0281	0.0096	0.0377
305	Broadcast and wireless communications equipment manufacturing	0.0000	0.0012	0.0043	0.0055
306	Other communications equipment manufacturing	0.0000	0.0215	0.0052	0.0267

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
307	Audio and video equipment manufacturing	0.0000	0.0001	0.0199	0.0200
308	Bare printed circuit board manufacturing	0.0000	0.0060	0.0046	0.0107
309	Semiconductor and related device manufacturing	0.0000	0.0248	0.0513	0.0761
310	Capacitor, resistor, coil, transformer, and other inductor manufacturing	0.0000	0.0024	0.0032	0.0056
311	Electronic connector manufacturing	0.0000	0.0010	0.0016	0.0026
312	Printed circuit assembly (electronic assembly) manufacturing	0.0000	0.0117	0.0138	0.0255
313	Other electronic component manufacturing	0.0000	0.0113	0.0111	0.0224
314	Electromedical and electrotherapeutic apparatus manufacturing	0.0000	0.0003	0.0076	0.0079
315	Search, detection, and navigation instruments manufacturing	0.0000	0.0002	0.0013	0.0014
316	Automatic environmental control manufacturing	0.0000	0.0001	0.0000	0.0001
317	Industrial process variable instruments manufacturing	0.0000	0.0036	0.0021	0.0057
318	Totalizing fluid meter and counting device manufacturing	0.0000	0.0000	0.0000	0.0000
319	Electricity and signal testing instruments manufacturing	0.0000	0.0002	0.0004	0.0006
320	Analytical laboratory instrument manufacturing	0.0000	0.0013	0.0019	0.0031
321	Irradiation apparatus manufacturing	0.0000	0.0000	0.0000	0.0000
322	Watch, clock, and other measuring and controlling device manufacturing	0.0000	0.0013	0.0096	0.0109
323	Blank magnetic and optical recording media manufacturing	0.0000	0.0014	0.0040	0.0054
324	Software and other prerecorded and record reproducing	0.0000	0.0031	0.0051	0.0082
325	Electric lamp bulb and part manufacturing	0.0000	0.0000	0.0000	0.0000
326	Lighting fixture manufacturing	0.0000	0.0007	0.0002	0.0008
327	Small electrical appliance manufacturing	0.0000	0.0002	0.0006	0.0008
328	Household cooking appliance manufacturing	0.0000	0.0000	0.0000	0.0000
329	Household refrigerator and home freezer manufacturing	0.0000	0.0000	0.0000	0.0000
330	Household laundry equipment manufacturing	0.0000	0.0000	0.0000	0.0000
331	Other major household appliance manufacturing	0.0000	0.0000	0.0000	0.0000
332	Power, distribution, and specialty transformer manufacturing	0.0000	0.0000	0.0000	0.0001
333	Motor and generator manufacturing	0.0000	0.0138	0.0024	0.0161
334	Switchgear and switchboard apparatus manufacturing	0.0000	0.0108	0.0027	0.0135
335	Relay and industrial control manufacturing	0.0000	0.0021	0.0009	0.0030
336	Storage battery manufacturing	0.0000	0.0000	0.0000	0.0000
337	Primary battery manufacturing	0.0000	0.0000	0.0000	0.0000
338	Fiber optic cable manufacturing	0.0000	0.0269	0.0046	0.0315
339	Other communication and energy wire manufacturing	0.0000	0.0002	0.0001	0.0003
340	Wiring device manufacturing	0.0000	0.0004	0.0001	0.0004
341	Carbon and graphite product manufacturing	0.0000	0.0027	0.0018	0.0045
342	All other miscellaneous electrical equipment and component manufacturing	0.0000	0.0007	0.0010	0.0017
343	Automobile manufacturing	0.0000	0.0001	0.0025	0.0026
344	Light truck and utility vehicle manufacturing	0.0000	0.0000	0.0000	0.0000
345	Heavy duty truck manufacturing	0.0000	0.0000	0.0000	0.0000
346	Motor vehicle body manufacturing	0.0000	0.0000	0.0013	0.0013
347	Truck trailer manufacturing	0.0000	0.0000	0.0002	0.0002

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
348	Motor home manufacturing	0.0000	0.0000	0.0000	0.0000
349	Travel trailer and camper manufacturing	0.0000	0.0007	0.0321	0.0328
350	Motor vehicle gasoline engine and engine parts manufacturing	0.0000	0.0061	0.0062	0.0123
351	Motor vehicle electrical and electronic equipment manufacturing	0.0000	0.0110	0.0114	0.0224
352	Motor vehicle steering, suspension component (except spring), and brake systems manufacturing	0.0000	0.0273	0.0117	0.0390
353	Motor vehicle transmission and power train parts manufacturing	0.0000	0.0104	0.0053	0.0156
354	Motor vehicle seating and interior trim manufacturing	0.0000	0.0002	0.0002	0.0004
355	Motor vehicle metal stamping	0.0000	0.0008	0.0008	0.0015
356	Other motor vehicle parts manufacturing	0.0000	0.0264	0.0268	0.0533
357	Aircraft manufacturing	0.0000	0.0000	0.0005	0.0005
358	Aircraft engine and engine parts manufacturing	0.0000	0.0002	0.0002	0.0004
359	Other aircraft parts and auxiliary equipment manufacturing	0.0000	0.0113	0.0081	0.0195
360	Guided missile and space vehicle manufacturing	0.0000	0.0000	0.0000	0.0000
361	Propulsion units and parts for space vehicles and guided missiles manufacturing	0.0000	0.0004	0.0003	0.0007
362	Railroad rolling stock manufacturing	0.0000	0.0002	0.0000	0.0003
363	Ship building and repairing	0.0000	0.0000	0.0000	0.0000
364	Boat building	0.0000	0.0000	0.0001	0.0001
365	Motorcycle, bicycle, and parts manufacturing	0.0000	0.0000	0.0002	0.0002
366	Military armored vehicle, tank, and tank component manufacturing	0.0000	0.0000	0.0000	0.0000
367	All other transportation equipment manufacturing	0.0000	0.0000	0.0001	0.0001
368	Wood kitchen cabinet and countertop manufacturing	0.0000	0.0934	0.0499	0.1433
369	Upholstered household furniture manufacturing	0.0000	0.0000	0.2129	0.2129
370	Nonupholstered wood household furniture manufacturing	0.0000	0.0000	0.0875	0.0875
371	Other household nonupholstered furniture manufacturing	0.0000	0.0001	0.0333	0.0334
372	Institutional furniture manufacturing	0.0000	0.0001	0.0007	0.0007
373	Wood office furniture manufacturing	0.0000	0.0000	0.0006	0.0006
374	Custom architectural woodwork and millwork	0.0000	0.0008	0.0010	0.0018
375	Office furniture, except wood, manufacturing	0.0000	0.0001	0.0017	0.0017
376	Showcase, partition, shelving, and locker manufacturing	0.0000	0.0037	0.0158	0.0195
377	Mattress manufacturing	0.0000	0.0000	0.0174	0.0174
378	Blind and shade manufacturing	0.0000	0.0004	0.0387	0.0391
379	Surgical and medical instrument manufacturing	0.0000	0.0001	0.0439	0.0440
380	Surgical appliance and supplies manufacturing	0.0000	0.0014	0.0545	0.0559
381	Dental equipment and supplies manufacturing	0.0000	0.0000	0.0223	0.0223
382	Ophthalmic goods manufacturing	0.0000	0.0000	0.0504	0.0504
383	Dental laboratories	0.0000	0.0000	0.0972	0.0972
384	Jewelry and silverware manufacturing	0.0000	0.0000	0.0036	0.0036
385	Sporting and athletic goods manufacturing	0.0000	0.0002	0.0031	0.0034
386	Doll, toy, and game manufacturing	0.0000	0.0008	0.0058	0.0067
387	Office supplies (except paper) manufacturing	0.0000	0.0000	0.0002	0.0003
388	Sign manufacturing	0.0000	0.0043	0.0050	0.0093
389	Gasket, packing, and sealing device manufacturing	0.0000	0.0043	0.0003	0.0046

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
390	Musical instrument manufacturing	0.0000	0.0000	0.0010	0.0010
391	Fasteners, buttons, needles, and pins manufacturing	0.0000	0.0000	0.0005	0.0005
392	Broom, brush, and mop manufacturing	0.0000	0.0000	0.0000	0.0001
393	Burial casket manufacturing	0.0000	0.0000	0.0000	0.0000
394	All other miscellaneous manufacturing	0.0000	0.0036	0.0147	0.0183
395	Wholesale trade	0.0000	6.9550	8.1042	15.0592
396	Retail - Motor vehicle and parts dealers	0.0000	0.1181	3.4726	3.5908
397	Retail - Furniture and home furnishings stores	0.0000	0.2082	1.3552	1.5634
398	Retail - Electronics and appliance stores	0.0000	0.3471	1.0035	1.3506
399	Retail - Building material and garden equipment and supplies stores	0.0000	0.3924	2.2969	2.6893
400	Retail - Food and beverage stores	0.0000	0.0330	7.8687	7.9017
401	Retail - Health and personal care stores	0.0000	0.5764	2.8559	3.4323
402	Retail - Gasoline stores	0.0000	0.1704	1.0314	1.2018
403	Retail - Clothing and clothing accessories stores	0.0000	0.4783	3.6283	4.1066
404	Retail - Sporting goods, hobby, musical instrument and book stores	0.0000	0.2062	1.2868	1.4930
405	Retail - General merchandise stores	0.0000	0.1158	6.0776	6.1934
406	Retail - Miscellaneous store retailers	0.0000	0.0691	0.3907	0.4598
407	Retail - Nonstore retailers	0.0000	0.2242	3.5553	3.7795
408	Air transportation	0.0000	0.0737	0.5028	0.5764
409	Rail transportation	0.0000	0.0000	0.0000	0.0000
410	Water transportation	0.0000	0.2555	0.0817	0.3373
411	Truck transportation	0.0000	1.1465	1.4825	2.6291
412	Transit and ground passenger transportation	0.0000	0.1377	1.6560	1.7937
413	Pipeline transportation	0.0000	3.3538	0.0168	3.3706
414	Scenic and sightseeing transportation and support activities for transportation	0.0000	0.3146	0.5353	0.8499
415	Couriers and messengers	0.0000	0.3419	0.5502	0.8921
416	Warehousing and storage	0.0000	0.0569	0.1698	0.2267
417	Newspaper publishers	0.0000	0.0664	0.1122	0.1785
418	Periodical publishers	0.0000	0.0340	0.0799	0.1138
419	Book publishers	0.0000	0.0013	0.0831	0.0844
420	Directory, mailing list, and other publishers	0.0000	0.0068	0.0149	0.0217
421	Greeting card publishing	0.0000	0.0000	0.0042	0.0042
422	Software publishers	0.0000	0.0270	0.0758	0.1027
423	Motion picture and video industries	0.0000	0.0480	0.3052	0.3532
424	Sound recording industries	0.0000	0.0022	0.0342	0.0364
425	Radio and television broadcasting	0.0000	0.2525	0.2704	0.5229
426	Cable and other subscription programming	0.0000	0.0565	0.0678	0.1243
427	Wired telecommunications carriers	0.0000	0.2409	0.6964	0.9373
428	Wireless telecommunications carriers (except satellite)	0.0000	0.0628	0.2171	0.2799
429	Satellite, telecommunications resellers, and all other telecommunications	0.0000	0.0587	0.1816	0.2403
430	Data processing, hosting, and related services	0.0000	0.0962	0.0672	0.1634
431	News syndicates, libraries, archives and all other information services	0.0000	0.0014	0.0232	0.0246
432	Internet publishing and broadcasting and web search portals	0.0000	0.0672	0.0956	0.1628

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
433	Monetary authorities and depository credit intermediation	0.0000	0.8173	1.7254	2.5426
434	Nondepository credit intermediation and related activities	0.0000	0.8327	1.3264	2.1591
435	Securities and commodity contracts intermediation and brokerage	0.0000	0.1705	0.3942	0.5647
436	Other financial investment activities	0.0000	0.3429	2.5776	2.9205
437	Insurance carriers	0.0000	0.3940	2.1717	2.5657
438	Insurance agencies, brokerages, and related activities	0.0000	0.4171	1.5598	1.9769
439	Funds, trusts, and other financial vehicles	0.0000	0.0001	0.0118	0.0119
440	Real estate	0.0000	1.5715	6.9984	8.5699
441	Owner-occupied dwellings	0.0000	0.0000	0.0000	0.0000
442	Automotive equipment rental and leasing	0.0000	0.3459	0.5506	0.8965
443	General and consumer goods rental except video tapes and discs	0.0000	0.1636	0.3998	0.5634
444	Video tape and disc rental	0.0000	0.0000	0.0205	0.0205
445	Commercial and industrial machinery and equipment rental and leasing	0.0000	5.1241	0.1488	5.2729
446	Lessors of nonfinancial intangible assets	0.0000	0.0000	0.0000	0.0000
447	Legal services	0.0000	1.7120	2.0808	3.7928
448	Accounting, tax preparation, bookkeeping, and payroll services	0.0000	2.3090	1.4171	3.7261
449	Architectural, engineering, and related services	0.0000	4.8654	0.5249	5.3903
450	Specialized design services	0.0000	0.2113	0.3281	0.5394
451	Custom computer programming services	0.0000	0.5659	0.0130	0.5789
452	Computer systems design services	0.0000	0.3831	0.0919	0.4750
453	Other computer related services, including facilities management	0.0000	0.2493	0.1005	0.3498
454	Management consulting services	0.0000	1.5419	1.3315	2.8734
455	Environmental and other technical consulting services	0.0000	0.7428	0.3816	1.1244
456	Scientific research and development services	0.0000	0.0139	0.0474	0.0613
457	Advertising, public relations, and related services	0.0000	0.5016	0.5430	1.0446
458	Photographic services	0.0000	0.0479	0.4509	0.4987
459	Veterinary services	0.0000	0.0002	0.5482	0.5485
460	Marketing research and all other miscellaneous professional, scientific, and technical services	0.0000	1.6034	0.7131	2.3164
461	Management of companies and enterprises	0.0000	18.1665	1.8237	19.9902
462	Office administrative services	0.0000	0.4723	0.6298	1.1021
463	Facilities support services	0.0000	0.0175	0.0324	0.0499
464	Employment services	0.0000	1.3781	2.3211	3.6993
465	Business support services	0.0000	0.8109	1.1898	2.0007
466	Travel arrangement and reservation services	0.0000	0.1533	0.4980	0.6513
467	Investigation and security services	0.0000	0.6306	1.1442	1.7748
468	Services to buildings	0.0000	1.1724	2.6078	3.7802
469	Landscape and horticultural services	0.0000	0.4630	1.1717	1.6347
470	Other support services	0.0000	0.1966	0.3289	0.5255
471	Waste management and remediation services	0.0000	0.6615	0.2329	0.8945
472	Elementary and secondary schools	0.0000	0.0000	2.9833	2.9833
473	Junior colleges, colleges, universities, and professional schools	0.0000	0.0078	3.6023	3.6101
474	Other educational services	0.0000	0.0148	4.4748	4.4896

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
475	Offices of physicians	0.0000	0.0000	9.7917	9.7917
476	Offices of dentists	0.0000	0.0000	3.3372	3.3372
477	Offices of other health practitioners	0.0000	0.0000	4.2705	4.2705
478	Outpatient care centers	0.0000	0.0000	2.4785	2.4785
479	Medical and diagnostic laboratories	0.0000	0.0000	0.9562	0.9563
480	Home health care services	0.0000	0.0000	5.3258	5.3258
481	Other ambulatory health care services	0.0000	0.0002	0.7100	0.7102
482	Hospitals	0.0000	0.0000	10.3995	10.3995
483	Nursing and community care facilities	0.0000	0.0000	5.1033	5.1033
484	Residential mental retardation, mental health, substance abuse and other facilities	0.0000	0.0000	1.9603	1.9603
485	Individual and family services	0.0000	0.0000	12.3957	12.3957
486	Community food, housing, and other relief services, including rehabilitation services	0.0000	0.0000	1.4765	1.4765
487	Child day care services	0.0000	0.0000	2.4864	2.4864
488	Performing arts companies	0.0000	0.0261	0.2676	0.2937
489	Commercial Sports Except Racing	0.0000	0.0152	0.1037	0.1188
490	Racing and Track Operation	0.0000	0.0000	0.0000	0.0000
491	Promoters of performing arts and sports and agents for public figures	0.0000	0.0547	0.4208	0.4756
492	Independent artists, writers, and performers	0.0000	0.2461	0.6532	0.8993
493	Museums, historical sites, zoos, and parks	0.0000	0.0000	0.3585	0.3585
494	Amusement parks and arcades	0.0000	0.0008	0.0507	0.0515
495	Gambling industries (except casino hotels)	0.0000	0.0003	0.4560	0.4563
496	Other amusement and recreation industries	0.0000	0.0613	0.8545	0.9157
497	Fitness and recreational sports centers	0.0000	0.0541	1.6224	1.6765
498	Bowling centers	0.0000	0.0000	0.1085	0.1085
499	Hotels and motels, including casino hotels	0.0000	0.2211	3.0060	3.2271
500	Other accommodations	0.0000	0.0040	0.2854	0.2895
501	Full-service restaurants	0.0000	0.8065	13.8115	14.6180
502	Limited-service restaurants	0.0000	0.4125	12.5161	12.9286
503	All other food and drinking places	0.0000	0.2860	6.9853	7.2712
504	Automotive repair and maintenance, except car washes	0.0000	0.2115	2.4632	2.6746
505	Car washes	0.0000	0.0337	0.7156	0.7493
506	Electronic and precision equipment repair and maintenance	0.0000	0.1119	0.1572	0.2692
507	Commercial and industrial machinery and equipment repair and maintenance	0.0000	0.0800	0.0794	0.1594
508	Personal and household goods repair and maintenance	0.0000	0.4014	1.1035	1.5049
509	Personal care services	0.0000	0.0000	6.2797	6.2797
510	Death care services	0.0000	0.0000	0.2035	0.2035
511	Dry-cleaning and laundry services	0.0000	0.0234	0.7666	0.7900
512	Other personal services	0.0000	0.1557	5.3718	5.5275
513	Religious organizations	0.0000	0.0000	2.9674	2.9674
514	Grantmaking, giving, and social advocacy organizations	0.0000	0.0010	1.0473	1.0483
515	Business and professional associations	0.0000	0.1211	0.2753	0.3964
516	Labor and civic organizations	0.0000	0.0012	1.3947	1.3960
517	Private households	0.0000	0.0000	3.9684	3.9684

Employment Multipliers (Disaggregated by all economic sectors

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Employment

Sector	Description	Direct	Indirect	Induced	Total
518	Postal service	0.0000	0.2722	0.5494	0.8216
519	Federal electric utilities	0.0000	0.0000	0.0000	0.0000
520	Other federal government enterprises	0.0000	0.0039	0.0232	0.0271
521	State government passenger transit	0.0000	0.0000	0.0000	0.0000
522	State government electric utilities	0.0000	0.0000	0.0000	0.0000
523	Other state government enterprises	0.0000	0.0000	0.0000	0.0000
524	Local government passenger transit	0.0000	0.0175	0.2105	0.2280
525	Local government electric utilities	0.0000	0.8014	0.5913	1.3927
526	Other local government enterprises	0.0000	0.7255	0.8837	1.6092
527	* Not an industry (Used and secondhand goods)	0.0000	0.0000	0.0000	0.0000
528	* Not an industry (Scrap)	0.0000	0.0000	0.0000	0.0000
529	* Not an industry (Rest of world adjustment)	0.0000	0.0000	0.0000	0.0000
530	* Not an industry (Noncomparable foreign imports)	0.0000	0.0000	0.0000	0.0000
531	* Employment and payroll of state govt, non-education	0.0000	0.0000	0.0000	0.0000
532	* Employment and payroll of state govt, education	0.0000	0.0000	0.0000	0.0000
533	* Employment and payroll of local govt, non-education	0.0000	0.0000	0.0000	0.0000
534	* Employment and payroll of local govt, education	0.0000	0.0000	0.0000	0.0000
535	* Employment and payroll of federal govt, non-military	0.0000	0.0000	0.0000	0.0000
536	* Employment and payroll of federal govt, military	0.0000	0.0000	0.0000	0.0000

Appendix E
Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
0	Total	180,876,455.00	27,519,876.92	31,356,035.07	239,752,366.99
1	Oilseed farming	0.00	0.00	0.00	0.00
2	Grain farming	0.00	0.01	0.12	0.13
3	Vegetable and melon farming	0.00	5.67	4,332.19	4,337.86
4	Fruit farming	0.00	1.38	467.18	468.56
5	Tree nut farming	0.00	0.69	217.67	218.35
6	production	0.00	102.93	3,799.58	3,902.50
7	Tobacco farming	0.00	0.00	0.00	0.00
8	Cotton farming	0.00	0.00	0.00	0.00
9	Sugarcane and sugar beet farming	0.00	0.00	0.00	0.00
10	All other crop farming	0.00	24.64	29.05	53.69
11	including feedlots and dual-purpose	0.00	0.18	23.83	24.01
12	Dairy cattle and milk production	0.00	0.30	62.78	63.08
13	Poultry and egg production	0.00	0.01	1.20	1.21
14	poultry and eggs	0.00	0.09	10.22	10.32
15	tract production	0.00	0.07	0.15	0.23
16	Commercial logging	0.00	106.16	57.12	163.28
17	Commercial fishing	0.00	0.77	28.31	29.07
18	Commercial hunting and trapping	0.00	0.00	0.00	0.00
19	forestry	0.00	1.10	15.85	16.94
20	petroleum	180,876,455.00	638,304.44	7,269.37	181,522,028.81
21	Extraction of natural gas liquids	0.00	9,361.79	106.60	9,468.38
22	Coal mining	0.00	0.00	0.00	0.00
23	Iron ore mining	0.00	0.00	0.00	0.00
24	Gold ore mining	0.00	0.00	0.00	0.00
25	Silver ore mining	0.00	0.00	0.00	0.00
26	Lead and zinc ore mining	0.00	0.00	0.00	0.00
27	Copper ore mining	0.00	0.00	0.00	0.00
28	Uranium-radium-vanadium ore mining	0.00	0.00	0.00	0.00
29	Other metal ore mining	0.00	0.00	0.00	0.00
30	Stone mining and quarrying	0.00	3.93	0.46	4.40
31	Sand and gravel mining	0.00	22.37	4.89	27.26
32	Other clay, ceramic, refractory minerals mining	0.00	0.00	0.00	0.00
33	Potash, soda, and borate mineral mining	0.00	0.00	0.00	0.00
34	Phosphate rock mining	0.00	0.00	0.00	0.00
35	Other chemical and fertilizer mineral mining	0.00	0.00	0.00	0.00
36	Other nonmetallic minerals	0.00	0.13	0.03	0.15
37	Drilling oil and gas wells	0.00	18,964.99	2.40	18,967.40
38	Support activities for oil and gas operations	0.00	326,791.92	41.42	326,833.33
39	Metal mining services	0.00	0.00	0.00	0.00
40	Other nonmetallic minerals services	0.00	36.67	0.53	37.20
41	Electric power generation - Hydroelectric	0.00	0.00	0.00	0.00

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
42	Electric power generation - Fossil fuel	0.00	97,055.12	71,610.54	168,665.66
43	Electric power generation - Nuclear	0.00	39,751.96	29,330.34	69,082.31
44	Electric power generation - Solar	0.00	1,671.93	1,233.61	2,905.54
45	Electric power generation - Wind	0.00	7,571.82	5,586.74	13,158.57
46	Electric power generation - Geothermal	0.00	0.00	0.00	0.00
47	Electric power generation - Biomass	0.00	4,932.91	3,639.67	8,572.59
48	Electric power generation - All other	0.00	121.67	89.78	211.45
49	Electric power transmission and distribution	0.00	288.38	212.78	501.16
50	Natural gas distribution	0.00	537,439.71	107,269.61	644,709.32
51	Water, sewage and other systems	0.00	2,937.98	1,223.39	4,161.37
52	Construction of new health care structures	0.00	0.00	0.00	0.00
53	Construction of new manufacturing structures	0.00	0.00	0.00	0.00
54	Construction of new power and communication structures	0.00	0.00	0.00	0.00
55	Construction of new educational and vocational structures	0.00	0.00	0.00	0.00
56	Construction of new highways and streets	0.00	0.00	0.00	0.00
57	Construction of new commercial structures, including farm structures	0.00	0.00	0.00	0.00
58	Construction of other new nonresidential structures	0.00	0.00	0.00	0.00
59	Construction of new single-family residential structures	0.00	0.00	0.00	0.00
60	Construction of new multifamily residential structures	0.00	0.00	0.00	0.00
61	Construction of other new residential structures	0.00	0.00	0.00	0.00
62	Maintenance and repair construction of nonresidential structures	0.00	4,429,043.25	139,978.84	4,569,022.08
63	Maintenance and repair construction of residential structures	0.00	9,218.90	115,095.50	124,314.40
64	Maintenance and repair construction of highways, streets, bridges, and tunnels	0.00	0.00	0.00	0.00
65	Dog and cat food manufacturing	0.00	0.25	1,565.68	1,565.93
66	Other animal food manufacturing	0.00	8.39	169.72	178.11
67	Flour milling	0.00	5.63	2,177.32	2,182.95
68	Rice milling	0.00	0.00	0.00	0.00
69	Malt manufacturing	0.00	0.00	0.00	0.00
70	Wet corn milling	0.00	0.00	0.00	0.00
71	Soybean and other oilseed processing	0.00	92.35	397.86	490.20
72	Fats and oils refining and blending	0.00	0.00	0.00	0.00
73	Breakfast cereal manufacturing	0.00	0.21	199.72	199.93
74	Beet sugar manufacturing	0.00	0.00	0.00	0.00

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
75	Sugar cane mills and refining	0.00	0.00	0.00	0.00
76	Nonchocolate confectionery manufacturing	0.00	4.73	2,222.40	2,227.13
77	Chocolate and confectionery manufacturing from cacao beans	0.00	0.11	35.03	35.14
78	Confectionery manufacturing from purchased chocolate	0.00	6.00	3,139.85	3,145.84
79	Frozen fruits, juices and vegetables manufacturing	0.00	1.24	141.02	142.26
80	Frozen specialties manufacturing	0.00	4.01	952.16	956.17
81	Canned fruits and vegetables manufacturing	0.00	2.24	463.26	465.50
82	Canned specialties	0.00	18.83	2,591.10	2,609.92
83	Dehydrated food products manufacturing	0.00	0.07	18.35	18.41
84	Fluid milk manufacturing	0.00	126.92	50,790.12	50,917.03
85	Creamery butter manufacturing	0.00	2.39	955.94	958.33
86	Cheese manufacturing	0.00	36.27	2,206.67	2,242.95
87	Dry, condensed, and evaporated dairy product manufacturing	0.00	24.17	2,839.95	2,864.11
88	Ice cream and frozen dessert manufacturing	0.00	63.33	3,755.57	3,818.90
89	Animal, except poultry, slaughtering	0.00	43.91	4,636.72	4,680.63
90	Meat processed from carcasses	0.00	10.47	25,233.98	25,244.45
91	Rendering and meat byproduct processing	0.00	297.77	6,943.33	7,241.09
92	Poultry processing	0.00	60.65	7,350.51	7,411.16
93	Seafood product preparation and packaging	0.00	105.17	6,081.83	6,186.99
94	Bread and bakery product, except frozen, manufacturing	0.00	630.64	133,729.19	134,359.84
95	Frozen cakes and other pastries manufacturing	0.00	2.47	524.61	527.08
96	Cookie and cracker manufacturing	0.00	85.32	36,967.92	37,053.23
97	Dry pasta, mixes, and dough manufacturing	0.00	10.41	4,325.87	4,336.28
98	Tortilla manufacturing	0.00	28.74	10,764.87	10,793.61
99	Roasted nuts and peanut butter manufacturing	0.00	6.31	1,571.12	1,577.43
100	Other snack food manufacturing	0.00	10.38	2,597.60	2,607.98
101	Coffee and tea manufacturing	0.00	220.00	22,432.09	22,652.09
102	Flavoring syrup and concentrate manufacturing	0.00	385.79	11,914.61	12,300.39
103	Mayonnaise, dressing, and sauce manufacturing	0.00	148.27	19,473.89	19,622.16
104	Spice and extract manufacturing	0.00	98.76	13,449.14	13,547.90
105	All other food manufacturing	0.00	109.75	51,228.43	51,338.18
106	Bottled and canned soft drinks & water	0.00	75.16	7,446.12	7,521.28
107	Manufactured ice	0.00	0.73	72.91	73.65
108	Breweries	0.00	23.83	7,648.70	7,672.53

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
109	Wineries	0.00	9.15	1,780.27	1,789.42
110	Distilleries	0.00	1.64	164.05	165.69
111	Tobacco product manufacturing	0.00	0.00	0.00	0.00
112	Fiber, yarn, and thread mills	0.00	0.07	0.97	1.04
113	Broadwoven fabric mills	0.00	12.31	141.64	153.95
114	Narrow fabric mills and schiffli machine embroidery	0.00	7.12	28.54	35.66
115	Nonwoven fabric mills	0.00	14.62	5.38	20.00
116	Knit fabric mills	0.00	8.07	168.04	176.11
117	Textile and fabric finishing mills	0.00	501.68	1,655.38	2,157.06
118	Fabric coating mills	0.00	31.11	103.81	134.92
119	Carpet and rug mills	0.00	0.99	18.37	19.36
120	Curtain and linen mills	0.00	4.28	959.77	964.06
121	Textile bag and canvas mills	0.00	189.31	592.83	782.14
122	Rope, cordage, twine, tire cord and tire fabric mills	0.00	13.66	29.40	43.06
123	Other textile product mills	0.00	121.78	466.97	588.75
124	Hosiery and sock mills	0.00	0.00	0.00	0.00
125	Other apparel knitting mills	0.00	1.86	138.65	140.51
126	Cut and sew apparel contractors	0.00	674.58	2,833.84	3,508.42
127	Mens and boys cut and sew apparel manufacturing	0.00	11.25	3,491.42	3,502.67
128	Womens and girls cut and sew apparel manufacturing	0.00	41.45	23,284.25	23,325.70
129	Other cut and sew apparel manufacturing	0.00	6.56	4,440.57	4,447.13
130	Apparel accessories and other apparel manufacturing	0.00	20.37	3,704.16	3,724.53
131	Leather and hide tanning and finishing	0.00	4.08	81.21	85.29
132	Footwear manufacturing	0.00	0.00	3,372.05	3,372.05
133	Other leather and allied product manufacturing	0.00	20.46	1,464.71	1,485.18
134	Sawmills	0.00	798.75	175.68	974.43
135	Wood preservation	0.00	5,208.87	1,126.49	6,335.36
136	Veneer and plywood manufacturing	0.00	546.34	147.68	694.02
137	Engineered wood member and truss manufacturing	0.00	0.00	0.00	0.00
138	Reconstituted wood product manufacturing	0.00	0.00	0.00	0.00
139	Wood windows and door manufacturing	0.00	3,191.01	1,155.09	4,346.11
140	Cut stock, resawing lumber, and planing	0.00	3,782.98	1,521.07	5,304.06
141	Other millwork, including flooring	0.00	10,443.94	2,569.40	13,013.35
142	Wood container and pallet manufacturing	0.00	805.27	4,207.33	5,012.60
143	Manufactured home (mobile home) manufacturing	0.00	0.00	0.00	0.00
144	Prefabricated wood building manufacturing	0.00	22.06	5.81	27.87

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
145	All other miscellaneous wood product manufacturing	0.00	1,388.55	2,329.66	3,718.21
146	Pulp mills	0.00	0.00	0.00	0.00
147	Paper mills	0.00	0.06	0.49	0.55
148	Paperboard mills	0.00	0.00	0.00	0.00
149	Paperboard container manufacturing	0.00	158.74	140.63	299.37
150	Paper bag and coated and treated paper manufacturing	0.00	20.73	47.08	67.81
151	Stationery product manufacturing	0.00	3.60	9.34	12.94
152	Sanitary paper product manufacturing	0.00	0.01	0.28	0.29
153	All other converted paper product manufacturing	0.00	3.35	4.58	7.93
154	Printing	0.00	12,415.83	21,146.59	33,562.42
155	Support activities for printing	0.00	760.74	542.97	1,303.71
156	Petroleum refineries	0.00	2,729,657.14	406,949.20	3,136,606.34
157	Asphalt paving mixture and block manufacturing	0.00	2,472.26	358.30	2,830.56
158	Asphalt shingle and coating materials manufacturing	0.00	21,510.21	3,913.93	25,424.14
159	Petroleum lubricating oil and grease manufacturing	0.00	190,435.76	7,105.64	197,541.40
160	All other petroleum and coal products manufacturing	0.00	7,043.91	1,960.67	9,004.57
161	Petrochemical manufacturing	0.00	0.00	0.00	0.00
162	Industrial gas manufacturing	0.00	203,576.63	5,764.04	209,340.67
163	Synthetic dye and pigment manufacturing	0.00	1,472.46	1,322.14	2,794.60
164	Other basic inorganic chemical manufacturing	0.00	45,349.69	5,818.16	51,167.85
165	Other basic organic chemical manufacturing	0.00	4,363.41	638.78	5,002.20
166	Plastics material and resin manufacturing	0.00	73,225.19	4,208.39	77,433.58
167	Synthetic rubber manufacturing	0.00	137.57	15.62	153.19
168	Artificial and synthetic fibers and filaments manufacturing	0.00	13.54	3.40	16.94
169	Nitrogenous fertilizer manufacturing	0.00	0.00	0.00	0.00
170	Phosphatic fertilizer manufacturing	0.00	0.00	0.00	0.00
171	Fertilizer mixing	0.00	95.49	50.39	145.89
172	Pesticide and other agricultural chemical manufacturing	0.00	209.04	1,186.70	1,395.74
173	Medicinal and botanical manufacturing	0.00	184.35	16,709.16	16,893.50
174	Pharmaceutical preparation manufacturing	0.00	916.37	414,363.78	415,280.15
175	In-vitro diagnostic substance manufacturing	0.00	682.42	5,371.82	6,054.25
176	Biological product (except diagnostic) manufacturing	0.00	1,349.14	13,211.89	14,561.03
177	Paint and coating manufacturing	0.00	149.32	54.49	203.81
178	Adhesive manufacturing	0.00	7,643.63	6,564.49	14,208.12

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
179	Soap and other detergent manufacturing	0.00	10,060.47	30,770.13	40,830.60
180	Polish and other sanitation good manufacturing	0.00	14,806.08	19,515.19	34,321.27
181	Surface active agent manufacturing	0.00	464.37	303.35	767.72
182	Toilet preparation manufacturing	0.00	8,394.72	126,078.76	134,473.48
183	Printing ink manufacturing	0.00	549.09	908.12	1,457.22
184	Explosives manufacturing	0.00	0.00	0.00	0.00
185	Custom compounding of purchased resins	0.00	5,086.47	426.18	5,512.65
186	Photographic film and chemical manufacturing	0.00	1,170.37	4,246.15	5,416.52
187	Other miscellaneous chemical product manufacturing	0.00	256,073.25	7,319.93	263,393.18
188	Plastics packaging materials and unlaminated film and sheet manufacturing	0.00	7,193.86	16,380.99	23,574.85
189	Unlaminated plastics profile shape manufacturing	0.00	71.16	70.23	141.39
190	Plastics pipe and pipe fitting manufacturing	0.00	14,082.84	6,284.17	20,367.01
191	Laminated plastics plate, sheet (except packaging), and shape manufacturing	0.00	1,547.23	1,309.13	2,856.36
192	Polystyrene foam product manufacturing	0.00	508.99	727.39	1,236.38
193	Urethane and other foam product (except polystyrene) manufacturing	0.00	7,716.74	13,166.06	20,882.81
194	Plastics bottle manufacturing	0.00	336.83	827.95	1,164.77
195	Other plastics product manufacturing	0.00	39,605.72	35,130.36	74,736.08
196	Tire manufacturing	0.00	0.00	0.00	0.00
197	Rubber and plastics hoses and belting manufacturing	0.00	0.00	0.00	0.00
198	Other rubber product manufacturing	0.00	269.79	286.58	556.37
199	Pottery, ceramics, and plumbing fixture manufacturing	0.00	41.14	28.91	70.05
200	Brick, tile, and other structural clay product manufacturing	0.00	0.55	0.23	0.78
201	Flat glass manufacturing	0.00	1.20	1.55	2.75
202	Other pressed and blown glass and glassware manufacturing	0.00	485.38	1,064.92	1,550.30
203	Glass container manufacturing	0.00	0.00	0.00	0.00
204	Glass product manufacturing made of purchased glass	0.00	5,344.29	11,222.98	16,567.27
205	Cement manufacturing	0.00	0.00	0.00	0.00
206	Ready-mix concrete manufacturing	0.00	16.71	2.26	18.97
207	Concrete block and brick manufacturing	0.00	3.50	1.10	4.60
208	Concrete pipe manufacturing	0.00	0.03	0.00	0.03
209	Other concrete product manufacturing	0.00	3.48	1.19	4.67

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
210	Lime manufacturing	0.00	0.00	0.00	0.00
211	Gypsum product manufacturing	0.00	17.76	4.91	22.67
212	Abrasive product manufacturing	0.00	4.29	15.28	19.57
213	Cut stone and stone product manufacturing	0.00	51.80	36.73	88.53
214	Ground or treated mineral and earth manufacturing	0.00	0.00	0.00	0.00
215	Mineral wool manufacturing	0.00	0.00	0.00	0.00
216	Miscellaneous nonmetallic mineral products manufacturing	0.00	2.45	0.47	2.92
217	Iron and steel mills and ferroalloy manufacturing	0.00	1,269.26	35.54	1,304.80
218	Iron, steel pipe and tube manufacturing from purchased steel	0.00	0.00	0.00	0.00
219	Rolled steel shape manufacturing	0.00	7,277.36	191.75	7,469.10
220	Steel wire drawing	0.00	1,294.20	7.08	1,301.28
221	Alumina refining and primary aluminum production	0.00	7.94	2.98	10.91
222	Secondary smelting and alloying of aluminum	0.00	23.86	12.22	36.09
223	Aluminum sheet, plate, and foil manufacturing	0.00	105.68	65.85	171.53
224	Other aluminum rolling, drawing and extruding	0.00	53.05	38.67	91.72
225	Nonferrous metal (exc aluminum) smelting and refining	0.00	6.15	0.65	6.80
226	Copper rolling, drawing, extruding and alloying	0.00	796.83	153.87	950.70
227	Nonferrous metal, except copper and aluminum, shaping	0.00	363.76	98.19	461.95
228	Secondary processing of other nonferrous metals	0.00	641.15	102.72	743.88
229	Ferrous metal foundries	0.00	7.02	0.40	7.41
230	Nonferrous metal foundries	0.00	153.83	88.18	242.00
231	Iron and steel forging	0.00	43.31	20.82	64.13
232	Nonferrous forging	0.00	138.41	66.19	204.60
233	Custom roll forming	0.00	131.91	37.86	169.77
234	Crown and closure manufacturing and metal stamping	0.00	446.70	614.56	1,061.27
235	Cutlery, utensil, pot, and pan manufacturing	0.00	205.49	421.33	626.83
236	Handtool manufacturing	0.00	4,213.72	867.85	5,081.56
237	Prefabricated metal buildings and components manufacturing	0.00	0.00	0.00	0.00
238	Fabricated structural metal manufacturing	0.00	888.60	31.70	920.30
239	Plate work manufacturing	0.00	16.16	3.22	19.38
240	Metal window and door manufacturing	0.00	457.21	261.94	719.15
241	Sheet metal work manufacturing	0.00	341.70	108.58	450.28
242	Ornamental and architectural metal work manufacturing	0.00	457.69	74.74	532.43

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
243	Power boiler and heat exchanger manufacturing	0.00	13.85	9.53	23.38
244	Metal tank (heavy gauge) manufacturing	0.00	15.29	7.56	22.84
245	Metal cans manufacturing	0.00	519.30	665.46	1,184.76
246	Metal barrels, drums and pails manufacturing	0.00	95.67	80.21	175.88
247	Hardware manufacturing	0.00	2,178.57	1,595.93	3,774.50
248	Spring and wire product manufacturing	0.00	3,297.72	293.30	3,591.01
249	Machine shops	0.00	6,169.32	2,863.42	9,032.75
250	Turned product and screw, nut, and bolt manufacturing	0.00	2,519.78	915.47	3,435.25
251	Metal heat treating	0.00	1,998.52	705.13	2,703.65
252	Metal coating and nonprecious engraving	0.00	3,833.32	1,422.87	5,256.19
253	Electroplating, anodizing, and coloring metal	0.00	2,851.42	1,045.31	3,896.73
254	Valve and fittings, other than plumbing, manufacturing	0.00	81,107.12	1,429.93	82,537.04
255	Plumbing fixture fitting and trim manufacturing	0.00	695.06	147.72	842.78
256	Ball and roller bearing manufacturing	0.00	7,174.47	517.30	7,691.78
257	Small arms ammunition manufacturing	0.00	0.00	0.00	0.00
258	Ammunition, except for small arms, manufacturing	0.00	0.00	0.00	0.00
259	Small arms, ordnance, and accessories manufacturing	0.00	54.99	2.10	57.09
260	Fabricated pipe and pipe fitting manufacturing	0.00	5,940.16	698.53	6,638.68
261	Other fabricated metal manufacturing	0.00	56.27	77.68	133.94
262	Farm machinery and equipment manufacturing	0.00	34.75	13.51	48.26
263	Lawn and garden equipment manufacturing	0.00	135.48	54.74	190.22
264	Construction machinery manufacturing	0.00	1,472.72	4.06	1,476.78
265	Mining machinery and equipment manufacturing	0.00	0.00	0.00	0.00
266	Oil and gas field machinery and equipment manufacturing	0.00	0.00	0.00	0.00
267	Food product machinery manufacturing	0.00	35.41	25.18	60.59
268	Semiconductor machinery manufacturing	0.00	0.00	0.00	0.00
269	Sawmill, woodworking, and paper machinery	0.00	0.00	0.00	0.00
270	Printing machinery and equipment manufacturing	0.00	16.04	25.27	41.31
271	All other industrial machinery manufacturing	0.00	1,483.51	628.10	2,111.61

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
272	Optical instrument and lens manufacturing	0.00	3.86	5.05	8.91
273	Photographic and photocopying equipment manufacturing	0.00	892.45	907.38	1,799.83
274	Other commercial service industry machinery manufacturing	0.00	27,450.57	6,858.47	34,309.04
275	Air purification and ventilation equipment manufacturing	0.00	6.29	2.46	8.76
276	Heating equipment (except warm air furnaces) manufacturing	0.00	7.78	2.88	10.66
277	Air conditioning, refrigeration, and warm air heating equipment manufacturing	0.00	12.01	10.64	22.64
278	Industrial mold manufacturing	0.00	2.45	20.79	23.24
279	Special tool, die, jig, and fixture manufacturing	0.00	31.18	18.59	49.77
280	Cutting tool and machine tool accessory manufacturing	0.00	75,235.89	218.21	75,454.09
281	Machine tool manufacturing	0.00	3,004.36	97.32	3,101.67
282	Rolling mill and other metalworking machinery manufacturing	0.00	6.54	191.25	197.80
283	Turbine and turbine generator set units manufacturing	0.00	196.48	33.16	229.65
284	Speed changer, industrial high-speed drive, and gear manufacturing	0.00	505.64	241.00	746.64
285	Mechanical power transmission equipment manufacturing	0.00	0.00	0.00	0.00
286	Other engine equipment manufacturing	0.00	1,993.21	205.93	2,199.14
287	Pump and pumping equipment manufacturing	0.00	41.52	21.16	62.68
288	Air and gas compressor manufacturing	0.00	0.00	0.00	0.00
289	Measuring and dispensing pump manufacturing	0.00	0.34	0.01	0.35
290	Elevator and moving stairway manufacturing	0.00	1,390.86	93.02	1,483.89
291	Conveyor and conveying equipment manufacturing	0.00	0.00	0.00	0.00
292	Overhead cranes, hoists, and monorail systems manufacturing	0.00	405.15	8.78	413.93
293	Industrial truck, trailer, and stacker manufacturing	0.00	109.24	20.90	130.15
294	Power-driven handtool manufacturing	0.00	6,439.70	221.00	6,660.70
295	Welding and soldering equipment manufacturing	0.00	1,357.17	315.31	1,672.48
296	Packaging machinery manufacturing	0.00	107.03	76.12	183.15
297	Industrial process furnace and oven manufacturing	0.00	0.00	0.00	0.00
298	Fluid power cylinder and actuator manufacturing	0.00	114.23	3.70	117.93

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
299	Fluid power pump and motor manufacturing	0.00	290.35	7.90	298.25
300	Scales, balances, and miscellaneous general purpose machinery manufacturing	0.00	60.90	17.40	78.29
301	Electronic computer manufacturing	0.00	406.31	16,918.16	17,324.47
302	Computer storage device manufacturing	0.00	811.04	5,902.29	6,713.34
303	Computer terminals and other computer peripheral equipment manufacturing	0.00	615.64	1,942.38	2,558.03
304	Telephone apparatus manufacturing	0.00	22,809.83	7,767.52	30,577.35
305	Broadcast and wireless communications equipment manufacturing	0.00	491.87	1,761.84	2,253.71
306	Other communications equipment manufacturing	0.00	8,424.18	2,017.42	10,441.59
307	Audio and video equipment manufacturing	0.00	49.74	8,567.07	8,616.80
308	Bare printed circuit board manufacturing	0.00	1,317.22	1,013.63	2,330.85
309	Semiconductor and related device manufacturing	0.00	14,002.15	28,994.92	42,997.08
310	Capacitor, resistor, coil, transformer, and other inductor manufacturing	0.00	441.10	581.68	1,022.78
311	Electronic connector manufacturing	0.00	279.54	426.90	706.45
312	Printed circuit assembly (electronic assembly) manufacturing	0.00	3,749.79	4,428.02	8,177.81
313	Other electronic component manufacturing	0.00	2,720.85	2,660.97	5,381.82
314	Electromedical and electrotherapeutic apparatus manufacturing	0.00	141.40	4,023.19	4,164.59
315	Search, detection, and navigation instruments manufacturing	0.00	72.49	567.29	639.78
316	Automatic environmental control manufacturing	0.00	26.32	5.19	31.50
317	Industrial process variable instruments manufacturing	0.00	1,114.84	658.02	1,772.86
318	Totalizing fluid meter and counting device manufacturing	0.00	0.00	0.00	0.00
319	Electricity and signal testing instruments manufacturing	0.00	78.07	155.44	233.51
320	Analytical laboratory instrument manufacturing	0.00	427.96	630.35	1,058.31
321	Irradiation apparatus manufacturing	0.00	0.00	0.00	0.00
322	Watch, clock, and other measuring and controlling device manufacturing	0.00	405.85	3,118.25	3,524.10
323	Blank magnetic and optical recording media manufacturing	0.00	587.99	1,658.82	2,246.80
324	Software and other prerecorded and record reproducing	0.00	887.85	1,435.81	2,323.66

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
325	Electric lamp bulb and part manufacturing	0.00	4.81	9.61	14.41
326	Lighting fixture manufacturing	0.00	197.99	46.72	244.71
327	Small electrical appliance manufacturing	0.00	77.06	220.37	297.43
328	Household cooking appliance manufacturing	0.00	0.00	0.00	0.00
329	Household refrigerator and home freezer manufacturing	0.00	0.00	0.00	0.00
330	Household laundry equipment manufacturing	0.00	0.00	0.00	0.00
331	Other major household appliance manufacturing	0.00	0.00	0.00	0.00
332	Power, distribution, and specialty transformer manufacturing	0.00	15.29	15.26	30.55
333	Motor and generator manufacturing	0.00	5,028.01	858.16	5,886.17
334	Switchgear and switchboard apparatus manufacturing	0.00	3,687.16	930.34	4,617.51
335	Relay and industrial control manufacturing	0.00	631.04	285.50	916.53
336	Storage battery manufacturing	0.00	0.00	0.00	0.00
337	Primary battery manufacturing	0.00	0.00	0.00	0.00
338	Fiber optic cable manufacturing	0.00	13,605.62	2,322.76	15,928.38
339	Other communication and energy wire manufacturing	0.00	95.18	61.26	156.43
340	Wiring device manufacturing	0.00	138.01	20.76	158.77
341	Carbon and graphite product manufacturing	0.00	1,066.89	690.98	1,757.87
342	All other miscellaneous electrical equipment and component manufacturing	0.00	179.98	265.28	445.26
343	Automobile manufacturing	0.00	230.97	4,880.15	5,111.12
344	Light truck and utility vehicle manufacturing	0.00	0.00	0.00	0.00
345	Heavy duty truck manufacturing	0.00	10.14	20.65	30.79
346	Motor vehicle body manufacturing	0.00	15.44	413.09	428.53
347	Truck trailer manufacturing	0.00	3.59	80.71	84.29
348	Motor home manufacturing	0.00	0.00	0.00	0.00
349	Travel trailer and camper manufacturing	0.00	188.90	8,899.69	9,088.59
350	Motor vehicle gasoline engine and engine parts manufacturing	0.00	3,741.26	3,839.21	7,580.47
351	Motor vehicle electrical and electronic equipment manufacturing	0.00	4,957.58	5,137.00	10,094.58
352	Motor vehicle steering, suspension component (except spring), and brake systems manufacturing	0.00	13,219.32	5,648.15	18,867.47
353	Motor vehicle transmission and power train parts manufacturing	0.00	6,719.61	3,406.03	10,125.64
354	Motor vehicle seating and interior trim manufacturing	0.00	86.34	113.21	199.55
355	Motor vehicle metal stamping	0.00	298.89	303.99	602.89

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
356	Other motor vehicle parts manufacturing	0.00	13,165.69	13,367.41	26,533.10
357	Aircraft manufacturing	0.00	26.52	418.75	445.27
358	Aircraft engine and engine parts manufacturing	0.00	85.29	113.42	198.71
359	Other aircraft parts and auxiliary equipment manufacturing	0.00	3,633.66	2,601.63	6,235.29
360	Guided missile and space vehicle manufacturing	0.00	0.00	0.00	0.00
361	Propulsion units and parts for space vehicles and guided missiles manufacturing	0.00	135.24	122.08	257.32
362	Railroad rolling stock manufacturing	0.00	190.59	21.40	211.99
363	Ship building and repairing	0.00	7.78	2.52	10.30
364	Boat building	0.00	0.76	17.11	17.88
365	Motorcycle, bicycle, and parts manufacturing	0.00	2.50	119.48	121.98
366	Military armored vehicle, tank, and tank component manufacturing	0.00	0.00	0.00	0.00
367	All other transportation equipment manufacturing	0.00	0.55	49.30	49.85
368	Wood kitchen cabinet and countertop manufacturing	0.00	12,942.90	6,907.55	19,850.45
369	Upholstered household furniture manufacturing	0.00	1.68	41,785.84	41,787.52
370	Nonupholstered wood household furniture manufacturing	0.00	5.32	11,047.71	11,053.02
371	Other household nonupholstered furniture manufacturing	0.00	26.44	7,934.85	7,961.28
372	Institutional furniture manufacturing	0.00	10.44	124.33	134.77
373	Wood office furniture manufacturing	0.00	1.13	115.63	116.76
374	Custom architectural woodwork and millwork	0.00	128.01	164.07	292.08
375	Office furniture, except wood, manufacturing	0.00	20.32	570.87	591.20
376	Showcase, partition, shelving, and locker manufacturing	0.00	758.18	3,257.03	4,015.21
377	Mattress manufacturing	0.00	13.39	7,741.13	7,754.53
378	Blind and shade manufacturing	0.00	63.04	6,096.53	6,159.57
379	Surgical and medical instrument manufacturing	0.00	53.61	20,518.96	20,572.57
380	Surgical appliance and supplies manufacturing	0.00	647.94	24,695.64	25,343.58
381	Dental equipment and supplies manufacturing	0.00	6.65	8,495.76	8,502.41
382	Ophthalmic goods manufacturing	0.00	10.90	13,434.61	13,445.50
383	Dental laboratories	0.00	0.16	9,374.02	9,374.17
384	Jewelry and silverware manufacturing	0.00	1.83	846.66	848.49
385	Sporting and athletic goods manufacturing	0.00	69.96	872.86	942.83
386	Doll, toy, and game manufacturing	0.00	359.91	2,547.82	2,907.74

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
387	Office supplies (except paper) manufacturing	0.00	7.35	47.34	54.68
388	Sign manufacturing	0.00	521.93	596.90	1,118.83
389	Gasket, packing, and sealing device manufacturing	0.00	1,099.16	65.75	1,164.91
390	Musical instrument manufacturing	0.00	4.06	156.10	160.16
391	Fasteners, buttons, needles, and pins manufacturing	0.00	1.32	89.59	90.90
392	Broom, brush, and mop manufacturing	0.00	10.16	7.65	17.81
393	Burial casket manufacturing	0.00	0.00	1.50	1.50
394	All other miscellaneous manufacturing	0.00	632.62	2,582.02	3,214.64
395	Wholesale trade	0.00	1,733,497.43	2,019,904.78	3,753,402.22
396	Retail - Motor vehicle and parts dealers	0.00	16,069.19	472,320.55	488,389.74
397	Retail - Furniture and home furnishings stores	0.00	23,131.31	150,560.33	173,691.65
398	Retail - Electronics and appliance stores	0.00	29,171.25	84,333.52	113,504.77
399	Retail - Building material and garden equipment and supplies stores	0.00	41,399.14	242,322.98	283,722.12
400	Retail - Food and beverage stores	0.00	2,648.78	631,679.23	634,328.01
401	Retail - Health and personal care stores	0.00	55,576.46	275,363.01	330,939.47
402	Retail - Gasoline stores	0.00	17,605.56	106,535.69	124,141.25
403	Retail - Clothing and clothing accessories stores	0.00	47,651.03	361,452.62	409,103.65
404	Retail - Sporting goods, hobby, musical instrument and book stores	0.00	13,013.74	81,194.20	94,207.94
405	Retail - General merchandise stores	0.00	9,512.75	499,216.65	508,729.40
406	Retail - Miscellaneous store retailers	0.00	3,267.40	18,473.25	21,740.64
407	Retail - Nonstore retailers	0.00	29,242.08	463,624.71	492,866.79
408	Air transportation	0.00	32,238.55	220,041.93	252,280.49
409	Rail transportation	0.00	0.00	0.00	0.00
410	Water transportation	0.00	201,588.98	64,471.59	266,060.57
411	Truck transportation	0.00	184,499.54	238,574.09	423,073.63
412	Transit and ground passenger transportation	0.00	10,277.50	123,598.96	133,876.46
413	Pipeline transportation	0.00	3,059,986.30	15,312.40	3,075,298.71
414	Scenic and sightseeing transportation and support activities for transportation	0.00	59,541.65	101,315.10	160,856.75
415	Couriers and messengers	0.00	38,634.96	62,179.70	100,814.66
416	Warehousing and storage	0.00	5,870.05	17,534.22	23,404.27
417	Newspaper publishers	0.00	8,755.49	14,799.37	23,554.86
418	Periodical publishers	0.00	10,696.80	25,136.58	35,833.38
419	Book publishers	0.00	319.45	20,568.79	20,888.24
420	Directory, mailing list, and other publishers	0.00	2,111.96	4,622.67	6,734.63
421	Greeting card publishing	0.00	1.35	475.28	476.64

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
422	Software publishers	0.00	13,703.44	38,502.73	52,206.17
423	Motion picture and video industries	0.00	22,502.07	142,989.94	165,492.00
424	Sound recording industries	0.00	1,712.61	26,157.10	27,869.71
425	Radio and television broadcasting	0.00	143,549.98	153,679.18	297,229.16
426	Cable and other subscription programming	0.00	91,185.57	109,273.91	200,459.48
427	Wired telecommunications carriers	0.00	120,544.29	348,523.58	469,067.88
428	Wireless telecommunications carriers (except satellite)	0.00	108,337.94	374,303.79	482,641.73
429	Satellite, telecommunications resellers, and all other telecommunications	0.00	5,937.88	18,366.55	24,304.42
430	Data processing, hosting, and related services	0.00	26,085.83	18,217.01	44,302.84
431	News syndicates, libraries, archives and all other information services	0.00	1,158.31	19,185.84	20,344.15
432	Internet publishing and broadcasting and web search portals	0.00	34,455.31	48,985.58	83,440.89
433	Monetary authorities and depository credit intermediation	0.00	332,471.31	701,904.94	1,034,376.25
434	Nondepository credit intermediation and related activities	0.00	147,501.75	234,949.68	382,451.42
435	Securities and commodity contracts intermediation and brokerage	0.00	29,506.37	68,233.77	97,740.14
436	Other financial investment activities	0.00	63,201.26	475,118.39	538,319.65
437	Insurance carriers	0.00	178,117.96	981,661.73	1,159,779.69
438	Insurance agencies, brokerages, and related activities	0.00	77,920.76	291,415.17	369,335.92
439	Funds, trusts, and other financial vehicles	0.00	18.28	3,082.44	3,100.71
440	Real estate	0.00	376,540.77	1,676,906.79	2,053,447.57
441	Owner-occupied dwellings	0.00	0.00	1,758,636.48	1,758,636.48
442	Automotive equipment rental and leasing	0.00	90,541.07	144,106.48	234,647.56
443	General and consumer goods rental except video tapes and discs	0.00	18,115.67	44,275.43	62,391.10
444	Video tape and disc rental	0.00	0.00	11,648.83	11,648.83
445	Commercial and industrial machinery and equipment rental and leasing	0.00	1,461,886.56	42,450.35	1,504,336.91
446	Lessors of nonfinancial intangible assets	0.00	0.00	0.00	0.00
447	Legal services	0.00	374,256.49	454,899.55	829,156.04
448	Accounting, tax preparation, bookkeeping, and payroll services	0.00	303,523.43	186,289.05	489,812.48
449	Architectural, engineering, and related services	0.00	969,027.87	104,542.08	1,073,569.95
450	Specialized design services	0.00	22,191.76	34,458.35	56,650.10
451	Custom computer programming services	0.00	115,318.29	2,644.03	117,962.32
452	Computer systems design services	0.00	49,086.14	11,776.28	60,862.42
453	Other computer related services, including facilities management	0.00	44,804.40	18,060.26	62,864.66

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
454	Management consulting services	0.00	201,058.62	173,630.32	374,688.94
455	Environmental and other technical consulting services	0.00	64,304.08	33,033.39	97,337.47
456	Scientific research and development services	0.00	3,950.84	13,483.96	17,434.80
457	Advertising, public relations, and related services	0.00	139,929.47	151,460.12	291,389.59
458	Photographic services	0.00	3,248.65	30,591.45	33,840.10
459	Veterinary services	0.00	25.32	60,574.46	60,599.78
460	Marketing research and all other miscellaneous professional, scientific, and technical services	0.00	131,343.88	58,412.66	189,756.54
461	Management of companies and enterprises	0.00	4,266,742.89	428,323.34	4,695,066.24
462	Office administrative services	0.00	41,796.52	55,728.54	97,525.06
463	Facilities support services	0.00	2,104.50	3,903.73	6,008.23
464	Employment services	0.00	98,049.66	165,137.68	263,187.34
465	Business support services	0.00	41,149.62	60,371.49	101,521.11
466	Travel arrangement and reservation services	0.00	27,167.98	88,269.17	115,437.15
467	Investigation and security services	0.00	30,809.92	55,907.74	86,717.66
468	Services to buildings	0.00	47,328.10	105,276.54	152,604.63
469	Landscape and horticultural services	0.00	24,038.69	60,834.70	84,873.39
470	Other support services	0.00	15,420.84	25,791.75	41,212.59
471	Waste management and remediation services	0.00	144,115.49	50,742.62	194,858.10
472	Elementary and secondary schools	0.00	0.00	199,067.87	199,067.87
473	Junior colleges, colleges, universities, and professional schools	0.00	1,055.65	486,016.67	487,072.32
474	Other educational services	0.00	583.03	176,101.24	176,684.27
475	Offices of physicians	0.00	0.00	1,332,711.59	1,332,711.59
476	Offices of dentists	0.00	0.00	365,715.76	365,715.76
477	Offices of other health practitioners	0.00	0.00	359,852.29	359,852.29
478	Outpatient care centers	0.00	0.00	447,405.66	447,405.66
479	Medical and diagnostic laboratories	0.00	2.66	105,847.26	105,849.93
480	Home health care services	0.00	0.00	275,894.30	275,894.30
481	Other ambulatory health care services	0.00	19.20	69,668.94	69,688.14
482	Hospitals	0.00	0.00	1,786,708.86	1,786,708.86
483	Nursing and community care facilities	0.00	0.00	357,612.54	357,612.54
484	Residential mental retardation, mental health, substance abuse and other facilities	0.00	0.00	100,890.22	100,890.22
485	Individual and family services	0.00	0.00	351,530.49	351,530.49
486	Community food, housing, and other relief services, including rehabilitation services	0.00	0.00	152,291.10	152,291.10
487	Child day care services	0.00	0.00	134,781.56	134,781.56

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
488	Performing arts companies	0.00	8,411.24	86,097.47	94,508.71
489	Commercial Sports Except Racing	0.00	3,089.76	21,126.24	24,216.00
490	Racing and Track Operation	0.00	0.00	0.00	0.00
491	Promoters of performing arts and sports and agents for public figures	0.00	11,688.94	89,876.43	101,565.36
492	Independent artists, writers, and performers	0.00	15,937.26	42,296.28	58,233.55
493	Museums, historical sites, zoos, and parks	0.00	0.00	34,827.57	34,827.57
494	Amusement parks and arcades	0.00	82.80	5,427.82	5,510.61
495	Gambling industries (except casino hotels)	0.00	50.86	77,388.88	77,439.74
496	Other amusement and recreation industries	0.00	3,133.43	43,704.81	46,838.24
497	Fitness and recreational sports centers	0.00	2,115.22	63,432.27	65,547.49
498	Bowling centers	0.00	0.82	5,856.78	5,857.60
499	Hotels and motels, including casino hotels	0.00	25,997.08	353,496.96	379,494.04
500	Other accommodations	0.00	203.79	14,465.05	14,668.83
501	Full-service restaurants	0.00	41,715.63	714,400.56	756,116.19
502	Limited-service restaurants	0.00	36,914.33	1,120,044.54	1,156,958.86
503	All other food and drinking places	0.00	12,415.65	303,279.37	315,695.02
504	Automotive repair and maintenance, except car washes	0.00	20,797.16	242,236.15	263,033.31
505	Car washes	0.00	2,090.13	44,344.44	46,434.57
506	Electronic and precision equipment repair and maintenance	0.00	15,711.34	22,064.89	37,776.24
507	Commercial and industrial machinery and equipment repair and maintenance	0.00	12,684.82	12,591.84	25,276.66
508	Personal and household goods repair and maintenance	0.00	32,657.30	89,789.35	122,446.65
509	Personal care services	0.00	0.00	209,618.14	209,618.14
510	Death care services	0.00	0.00	26,367.35	26,367.35
511	Dry-cleaning and laundry services	0.00	1,553.59	50,812.18	52,365.77
512	Other personal services	0.00	4,467.29	154,106.34	158,573.64
513	Religious organizations	0.00	0.00	539,212.54	539,212.54
514	Grantmaking, giving, and social advocacy organizations	0.00	163.11	170,660.52	170,823.63
515	Business and professional associations	0.00	27,569.06	62,687.67	90,256.72
516	Labor and civic organizations	0.00	120.86	135,517.73	135,638.58
517	Private households	0.00	0.00	79,714.53	79,714.53
518	Postal service	0.00	30,526.55	61,613.26	92,139.81
519	Federal electric utilities	0.00	0.00	0.00	0.00
520	Other federal government enterprises	0.00	894.57	5,336.73	6,231.31
521	State government passenger transit	0.00	0.00	0.00	0.00
522	State government electric utilities	0.00	0.00	0.00	0.00
523	Other state government enterprises	0.00	0.00	0.00	0.00

Output Multipliers (Disaggregated by all economic sectors)

Based on EDD+NES employment estimates for the city of Los Angeles in 2015

Output Sector	Description	Direct	Indirect	Induced	Total
524	Local government passenger transit	0.00	382.50	4,599.95	4,982.45
525	Local government electric utilities	0.00	544,102.84	401,457.43	945,560.27
526	Other local government enterprises	0.00	279,067.50	339,890.47	618,957.97
527	* Not an industry (Used and secondhand goods)	0.00	0.00	0.00	0.00
528	* Not an industry (Scrap)	0.00	0.00	0.00	0.00
529	* Not an industry (Rest of world adjustment)	0.00	0.00	0.00	0.00
530	* Not an industry (Noncomparable foreign imports)	0.00	0.00	0.00	0.00
531	* Employment and payroll of state govt, non-education	0.00	0.00	0.00	0.00
532	* Employment and payroll of state govt, education	0.00	0.00	0.00	0.00
533	* Employment and payroll of local govt, non-education	0.00	0.00	0.00	0.00
534	* Employment and payroll of local govt, education	0.00	0.00	0.00	0.00
535	* Employment and payroll of federal govt, non-military	0.00	0.00	0.00	0.00
536	* Employment and payroll of federal govt, military	0.00	0.00	0.00	0.00

Appendix F

Input-Output Results

This appendix includes detailed tables in support of the material presented in Section 4 of the report. The main report uses our best estimate of employment in the Los Angeles economy, constructed from aggregating EDD data and the non-employer survey data. The tables below provide alternative estimates of impacts of the proposed city ordinance using EDD+NES data and BEA/IMPLAN data.

Tables A4.1 EDD and A4.1 BEA/IMPLAN provide summary output and employment multipliers generated from IMPLAN using EDD+NES data as an estimate of employment and then using BEA/IMPLAN data as an estimate of total jobs. For both model runs, we assume that direct output in the oil and gas extraction sector within the City of Los Angeles is approximately $181.3 million. Note that because employment data vary between these estimates, the multipliers are also a little different. The differences in multipliers also reflects the fact that in the analysis using the EDD+NES data, employment figures for all IMPLAN sectors are adjusted to EDD+NES totals. The output multipliers are relatively similar across the different methods, but the BEA/IMPLAN employment multiplier is a little lower than the other estimate. These difference reflect the employment figures and productivity levels that are used in the input-output accounts.

Table A4.1a: Input-Output Multipliers – EDD+NES Data

	Direct	Indirect	Induced	Multiplier
Output	1.0	0.152147	0.173356	1.325503
Employment	1.0	0.307515	0.689764	1.997279

Source: IMPLAN analysis based on EDD+NES employment data

Table A4.1b: Input-Output Multipliers - BEA/IMPLAN Data

	Direct	Indirect	Induced	Multiplier
Output	1.0	0.047338	0.338270	1.385609
Employment	1.0	0.062087	0.745941	1.808207

Source: IMPLAN analysis based on BEA/IMPLAN jobs data

Tables A4.2a and A4.2b show overall impacts of oil and gas extraction across the Los Angeles economy in terms of output and employment using EDD data alone and then using BEA/IMPLAN data. The EDD results can be thought of as a lower bound on our estimation and the BEA/IMPLAN data an upper bound. For the reasons stated in the text, most importantly the fact that the EDD data are survey data rather than imputations, we favor use of the EDD+NES employment figures.

Table A4.2a: Overall Impacts of Oil and Gas Extraction Industry on the Los Angeles Economy, 2015 – EDD+NES Data

	Direct	Indirect	Induced	Total
Output	$181,290,553	$27,519,877	$31,356,035	$239,752,367
Employment	343.8	105.7	237.1	686.6

Source: IMPLAN analysis based on EDD+NES employment data

Table A4.2b: Overall Impacts of Oil and Gas Extraction Industry on the Los Angeles Economy, 2015 – BEA/IMPLAN Data

	Direct	Indirect	Induced	Total
Output	$181,290,553	$8,581,938	$61,325,320	$251,197,811
Employment	560.5	34.8	418.1	1,013.5

Source: IMPLAN analysis based on BEA/IMPLAN jobs data

Note that there are no Tables A4.4 corresponding to the estimates of employment lost through reductions in oil and gas extraction associated with specific setback distances using different employment figures for the industry and city, as above. The reason for this is that such estimation requires physical output data of oil and gas that can be linked to output data in IMPLAN. While this is possible for the EDD data alone, assuming the same physical output as used in the main body of the report, it is not possible for the IMPLAN data because there are no physical oil and gas production volumes for the city that support anything like the industry output values assumed by IMPLAN.