



June 18, 2014

7500400

Mr. Jason Anderson, President
CleanTech San Diego
9191 Towne Centre Drive, Suite 410
San Diego, CA 92122

Dear Mr. Anderson:

SUBJECT: Economic Impact of Algae Biotechnology Research and Manufacturing

As requested, the SANDAG Service Bureau has estimated the economic impact of algae biotechnology research and manufacturing on the San Diego regional economy. Overall, the economic impact of algae biotechnology research and manufacturing generates approximately 1,020 total jobs, \$80 million dollars of wages, and over \$175 million of economic output to the San Diego regional economy in 2014. This analysis is based upon the reported employment and current funding levels for 395 employees engaged in private sector algae biotechnology research and manufacturing and 110 academic faculty and research assistants for a total of 505 workers. The analysis is conducted using the 2012 IMPLAN economic impact model and focuses on the work occurring in the San Diego region, which is concentrated in research and development. The analysis reflects the most recent employment figures reported by algae biotechnology companies. Dollar values are reported in 2014 dollars.

The future production of biotechnology from algae has the potential to produce additional economic benefits for the region that are not measured in this analysis. For example, algae can provide a sustainable fuel source, which could result in advantages such as a cleaner environment and lower fuel costs.

This analysis describes the direct, indirect, and induced impacts of algae biotechnology research and manufacturing on the San Diego regional economy. The direct impacts reflect jobs and expenditures that are directly related to manufacturing and research and development in algae biotechnology. The indirect impacts are the numerous business products, materials, and services required and supplied locally to support the direct activities of algae biotechnology. The induced impacts are from the local household expenditures of employees working in research and manufacturing and at supplier companies. The overall or total economic impacts are the sum of the direct, indirect, and induced spending on algae biotechnology research and manufacturing on the San Diego Region.

Algae biotechnology continues to show a strong economic presence in the San Diego region. Based on reported employment and current funding levels, algae biotechnology research and manufacturing in the region employs 505 workers directly, provide about \$51.5 million in payroll, and contribute \$102.8 million in economic activity to the San Diego region in 2014. Additionally, algae biotechnology employment continues to show consistent growth in the region. Direct



employment in algae biotechnology-related manufacturing and research has nearly doubled since 2009. The summary of algae biotechnology's economic impact is shown below:

**Economic Impact of Algae Biotechnology Research and Manufacturing
San Diego Region**

	Direct	Indirect	Induced	TOTAL
Employment ¹	505	218	297	1,020
Wages ²	\$51,524,000	\$13,925,000	\$14,574,000	\$80,023,000
Economic Output ²	\$102,793,000	\$32,402,000	\$39,969,000	\$175,164,000

¹ Employment is rounded to the nearest job

² Wages and economic output are rounded to the nearest thousand dollars. Wages are a part of economic output.

The \$102.8 million of economic activity in algae biotechnology manufacturing and research supports other local industries, generating additional indirect economic impacts. Economic activities in support industries are expected to generate nearly \$13.9 million in annual payroll and approximately \$32.4 million in additional economic activity at other local companies. This \$32.4 million is the result of the goods and services that companies engaged in algae biotechnology purchase from local vendors. Additionally, these support industries are anticipated to generate 218 indirect jobs in industries such as services to buildings and dwellings, employment services, and the maintenance and repair construction of nonresidential structures. The top indirect industries affected by algae biotechnology research and manufacturing shown in the table below.

**Indirect Jobs Generated through Algae Biotechnology Research and Manufacturing
San Diego Region**

Industry	Jobs Generated
Services to buildings and dwellings	25
Employment services	22
Maintenance and repair construction of nonresidential structures	15
Real estate establishments	13
Food services and drinking places	11
Management, scientific, and technical consulting services	11
Management of companies and enterprises	10
Wholesale trade businesses	8
Architectural, engineering, and related services	8
Scientific research and development services	7

In addition to these economic impacts, algae biotechnology also has an influence on the region through the expenditures of its employees and the employees of local supplier companies. These induced economic impacts generate an additional \$14.6 million in payroll and \$40.0 million in total economic activity in the region. This induced spending is anticipated to generate 297 jobs in industries such as food services and drinking places; offices of physicians, dentists, and other health practitioners; and real estate establishments. The top industries affected by the expenditures of employees engaged in algae biotechnology research and manufacturing and employees of local supplier companies are shown in the following table.

**Induced Jobs Generated through Algae Biotechnology Research and Manufacturing
San Diego Region**

Industry	Jobs Generated
Food services and drinking places	39
Offices of physicians, dentists, and other health practitioners	19
Real estate establishments	12
Retail Stores - General merchandise	10
Retail Stores - Food and beverage	10
Private hospitals	10
Nursing and residential care facilities	10
Securities, commodity contracts, investments, and related activities	9
Private household operations	8
Wholesale trade businesses	8

Furthermore, additional investment of funding sources, such as venture capital or grants from the National Science Foundation, into algae biotechnology research has the ability to generate even greater economic impacts on the regional economy. For example, for every \$1 million dollars of funding invested in algae biotechnology research and manufacturing in the region, an average of seven direct jobs and \$537,000 of wages are created. During the year the investment is spent, a total impact of 12 jobs, \$803,000 of wages, and \$1,694,000 of economic activity is generated, as shown in the table below.

**Economic Impact of \$1 Million Investment in Algae Biotechnology Research and
Manufacturing¹ San Diego Region**

	Direct	Indirect	Induced	TOTAL
Employment ²	7	2	3	12
Wages ³	\$537,000	\$120,000	\$146,000	\$803,000
Economic Output ³	\$1,000,000	\$293,000	\$401,000	\$1,694,000


¹ Assumed \$1 million in Venture Capital investment is equivalent to \$1 million of industry sales

² Employment is rounded to the nearest job

³ Wages and economic output are rounded to the nearest thousand dollars. Wages are a part of economic output.

Sincerely,


JIM MILLER
Senior Economist


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