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# The Local Economic Impacts of a Marine Technology Institute in Pentwater

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## Executive Summary

The Michigan SeaGrant has been conducting an interdisciplinary project intended to develop a sustainable small harbor management strategy for Michigan's coastal communities. The team is hosting charrettes (facilitated community planning sessions) in New Baltimore, Au Gres, Ontonagon and Pentwater. These communities were selected based on several considerations, including broad geographic representation across Michigan and variety in type of harbor, community population size and type of adjacent water body.

The evaluation conducted for Pentwater, Michigan resulted in two major observations. The first is that an over-riding concern regarding economic sustainability arises from harbor access. Pentwater has historically relied on federal funding to keep the passage to its harbor open. The recent loss of that funding has resulted in a precarious situation with respect to long-run harbor access. No satisfactory approaches for funding the approximately \$25,000 per year that is required to maintain the passage have been identified. The second observation concerns the character of Pentwater. Pentwater is a summer tourist town of unique and particular character. The residents and leadership of Pentwater are not generally supportive of development that would lead to larger summer crowds. An implication is that enhancing economic sustainability through development and traditional tax increment financing (to support dredging) is not a socially desirable solution.

Conducting the charrette process for Pentwater resulted in a "Preferred Alternative" identified as "Pentwater 2035." This alternative includes developing a Pentwater Marine Technology Institute (PMTI), expanding marina facilities, and several redevelopment opportunities downtown and along the lakefront. The Pentwater 2035 results include a number of alternatives that are either not feasible in the near-term or do not improve sustainability. As described previously, downtown development that would lead to larger summer crowds is not socially desirable. Park and lake improvements would improve the quality of local recreation, but would not improve economic sustainability. The concept of a destination restaurant could support year round visits and tax increment financing, however logistics of land ownership, zoning, permitting and investment capital make a new large scale destination restaurant difficult at this time.

Pentwater leadership is interested in further evaluating the PMTI concept independent of other Pentwater 2035 features. Although the PMTI remains conceptual, one concept is that the institute would focus on three-dimensional design and automated manufacture of wooden boats. It would coordinate with higher educational institutions, utilize local engineering and fabricating

skills, and attract both students and faculty. The PMTI is consistent with the character of Pentwater, and it would provide year round economic activity. It would offer the possibility of enhancing sustainability both through its existence, the skills of its graduates, and by funding harbor maintenance activities (dredging).

This report evaluates the economic impacts of potential PMTI capital, operations and maintenance (O&M) expenditures, and employee and student expenditures on the economies of Pentwater and Oceana County. The underlying approach is the economic technique of Input/Output (I/O) Analysis. Outcomes evaluated include the contribution to the market value of goods and services and employment.

## 1. Introduction

This report presents the methods and results of an economic impact analysis for building and operating a marine technology institute (the Pentwater Marine Technology Institute or PMTI) in the town of Pentwater in Oceana County, Michigan. The analysis uses the economic technique of Input/Output (I/O) Analysis. This technique is commonly employed to evaluate the economic implications of changes to a local economy such as building a new sports stadium, or closing a military base. Factors considered include the contribution that PMTI's expenditures make to the market value of goods and services and employment

The remaining sections of this report describe the methods, data, and results of evaluating economic impacts attributable to PMTI. Sections 2 and 3 describe the model and inputs. Section 4 presents the results of the analysis. Section 5 concludes with a discussion of implications.

## 2. Approach Overview

The contribution that PMTI would make to economic activity in Pentwater and Oceana County was evaluated using a predictive modeling approach known as Input/Output Analysis (Leontief 1986). Input/Output models incorporate relationships between changes in demand for one industry and changes in demand for other industries within a specific economic area. As one industry is *directly* affected, other industries experience what are known as *indirect* and *induced* effects.

- *Direct effects* occur to the industry being evaluated (e.g., wages paid to employees working at the institute).
- *Indirect effects* result from transactions between the directly affected industries and supplying industries (e.g., production and sale of raw materials for boat building).
- *Induced effects* which reflect the local spending from the directly and indirectly affected industry sectors (e.g., purchases at local restaurants and grocery stores by construction workers, PMTI employees and PMTI students).

The parameters that link demand changes across industries are called multipliers.

- *Output multipliers* relate the changes in sales by one industry to changes in output (gross sales) by all industries within a local area.
- *Income and employment multipliers* relate changes in direct income and employment to changes in total income and total employment within the local economy.
- *Value added multipliers* relate changes in value added in the industry experiencing direct effect to total changes in value added for the local economy.

The evaluation was conducted using IMPLAN, which is a popular software platform for conducting input/output analysis. IMPLAN contains detailed input/output information on more than 500 economic sectors. The module of IMPLAN that was applied for this evaluation contains the input/output relationships for Oceana County at the ZIP Code level.

Impacts evaluated for affected sectors include Industry Change, Industry Spending Pattern, and Labor Income Change. Goods and services that PMTI purchases for capital projects are specified as an Industry Change. An Industry Change includes effects of adding the PMTI to Pentwater and changes due to the PMTI's output, retail expenditures, and construction. The capital expenditures are direct effects from the industry being evaluated. The indirect and induced effects of these expenditures are calculated within IMPLAN.

The goods and services that PMTI purchases for operation and maintenance purposes are specified as in an Industry Spending Pattern. The Industry Spending Pattern estimates the

indirect and induced effects of PMTI's operation and maintenance expenditures. The input/output relationships within IMPLAN quantify the interrelationships between industries and other sectors within each economy. For example, expenditures on electricity to run the facility are included in the operations and maintenance costs in the Industry Spending Pattern. These are not direct impacts, as "other educational services" (not electricity generation/distribution) is the sector being evaluated. IMPLAN calculates the impacts of the expenditures on the electricity generation/distribution sector as indirect impacts (i.e., the inter-industry transactions between the supplying industries and the directly affected industries). The induced impacts include purchases at local restaurants and grocery stores by employees of indirectly impacted electricity sector employees.

The Labor Income Change includes wages or compensation that an employer is paying to an employee. The impacts resulting from labor income are induced effects because the money received by an industry's employees is re-circulated through household spending patterns, causing additional economic activity. Labor Income Change is used for all of PMTI's direct employees as well as for contracted employees (e.g., contractors working on the building of the facility and people employed to perform janitorial services).

Three types of economic impacts considered include value added, output, and employment. Value added impacts are similar to gross domestic product (GDP) and are the difference between the industry's total output and the cost of its intermediate inputs. It includes the following four components:

1. *Employee Compensation* – The sum of workers' wages and salaries as well as benefits, including health and life insurance, gratuities, bonuses and retirement payments.
2. *Proprietary Income* – Also referred to as business income, this is the income received by local businesses and the self employed.
3. *Other Income* – These are payments to individuals in the form of rents received on properties, royalties from contracts, dividends paid by corporations, and profits earned by corporations.
4. *Business taxes* – Federal, State and local excise, property, and sales taxes as well as taxes on other business-related activities or equipment, such as taxes related to motor vehicles.

Output represents the value of industry production. Output represents the value of production for *all* of the evaluated economy's industry sectors (by comparison Total Value Added like GDP is just the value of final goods and services). Output is the most aggregate



measure of economic activity because it sums the value of all intermediate goods and services, wages, business income, other income, and indirect business taxes.

Output is the broadest measure of economic activity in an area. Since many intermediate goods are produced locally for local businesses, input/output analysis includes the value of these goods in addition to the traditional definition of economic activity (Value Added) to achieve this encompassing picture of activity.

Employment impacts represent the number of jobs that the industry contributes to the local economy. This includes employees of the industry and job impacts in related sectors. Direct employment impacts are the employees the PMTI employs. The indirect employment impacts result from increases or decreases in the evaluated sector's production, and the induced employment impacts are from the specific industry's employees' spending money in the local economy.

### 3. Inputs

The evaluation employs the baseline and counterfactual framework. This section summarizes baseline conditions and data that reflect potential capital, operations and maintenance (O&M), and employee compensation expenditures for PMTI.

#### 3.1 Baseline

The baseline economic conditions are collected as the most recent IMPLAN data (2015) for Pentwater and Oceana County. IMPLAN does not contain information by town; to adjust for this, baseline conditions for Pentwater are specified as being the IMPLAN data from ZIP Code 49449. Figure 3.1 depicts the geographic area of ZIP Code 49449.

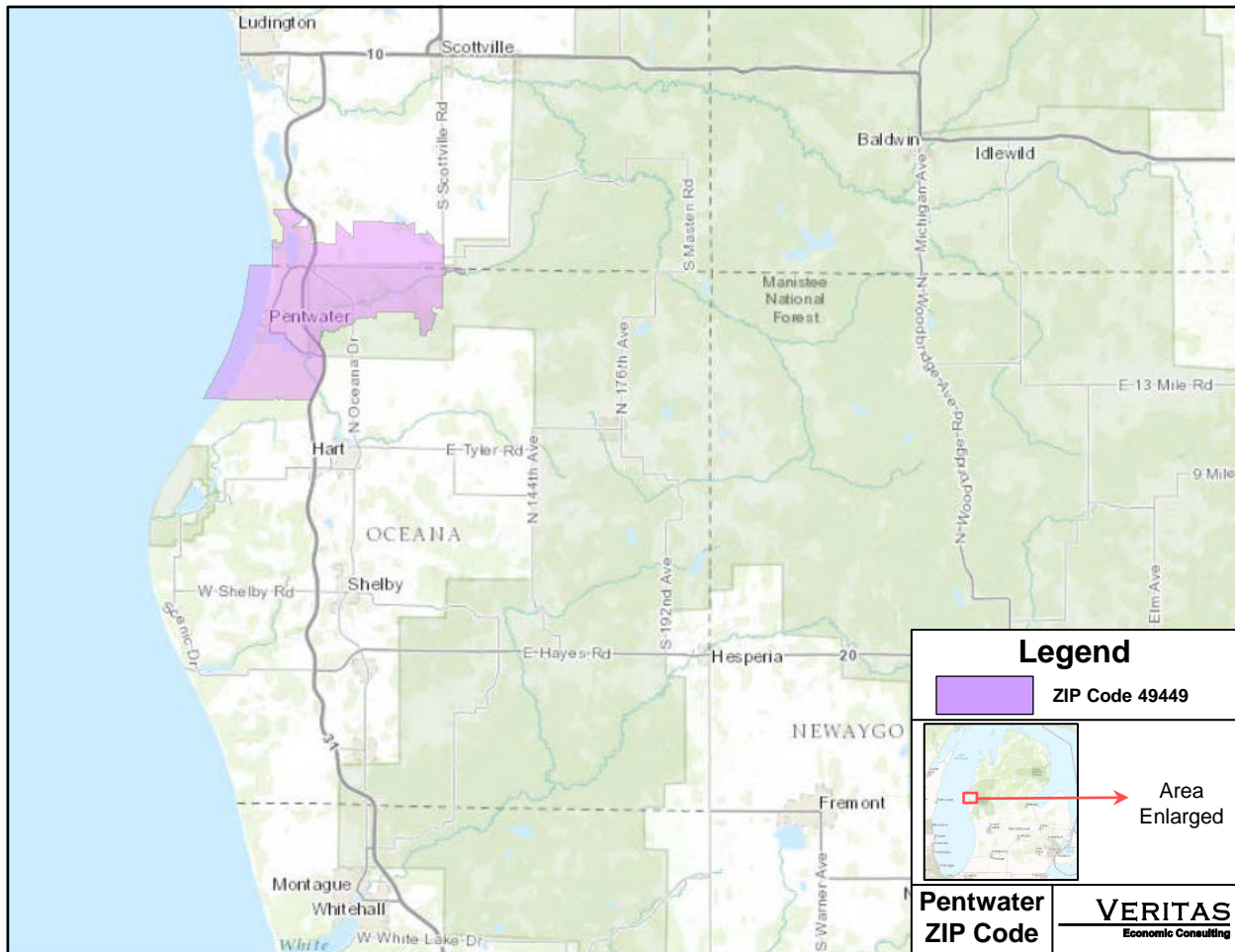


Figure 3.1: Location of ZIP Code 49449

As this figure indicates, the 49449 ZIP Code has substantial geographic overlap with Pentwater. ZIP Code 49449 has a year round population of about 2,364 people. The baseline

economic conditions for 49449 are depicted below. Pentwater is within this ZIP Code and has a year-round population of 850. Economic information specific to Pentwater is not available; the information for 49449 is expected to be representative although it does include almost three times as many people.

IMPLAN contains spending patterns for nine different household income categories. In the baseline economy in IMPLAN, each household income category spends a different amount on goods and services. Table 3.1 presents the number of household in each category and their annual expenditures on a set of commodities. The first column presents the household income categories as defined by IMPLAN. The second column presents the number of households in each income category in ZIP Code 49449 (totaling 1,112 households).

The third through sixth columns present the 2015 per household expenditures for commodities of interest. Water transportation includes (but is not limited to) activities such as river passenger transportation and Great Lakes passenger transportation. Scenic transportation includes (but is not limited to) activities such as boat fishing charter operation, docking facility operations, and harbor operations. Marinas includes (but is not limited to) activities such as marinas and recreational fishing clubs. Multiplying the number of households by the per-household expenditures will return the total expenditures on that commodity for each household income category. Summing across the nine income categories results in the total expenditures on that commodity.

**Table 3.1**  
**ZIP Code 49449 – Baseline Expenditures by Household Income Category**

Household Income Category	Number of Households	Annual Per Household Expenditures					
		Full-Service Restaurants	Limited-Service Restaurants	Gas Stations	Water Transport	Scenic Transport	Marinas
Households Less than \$15k	127	\$660	\$1,098	\$8	\$40	\$32	\$74
Households \$15k-\$30k	167	\$824	\$1,369	\$31	\$58	\$48	\$95
Households \$30k-\$40k	143	\$1,029	\$1,710	\$50	\$66	\$56	\$208
Households \$40k-\$50k	126	\$1,121	\$1,863	\$16	\$85	\$67	\$166
Households \$50k-\$70k	226	\$1,469	\$2,442	\$40	\$113	\$82	\$186
Households \$70k-\$100k	151	\$2,120	\$3,523	\$66	\$148	\$90	\$304
Households \$100k-\$150k	129	\$2,642	\$4,391	\$121	\$204	\$126	\$496
Households \$150k-\$200k	14	\$3,687	\$6,128	\$310	\$292	\$161	\$756
Households More than \$200k	29	\$4,426	\$7,356	\$163	\$459	\$219	\$1,289

The expenditures presented in Table 3.1 may not occur solely in ZIP Code 49449. For example, a resident may travel outside of his or her ZIP Code to eat at a full-service restaurant in the ZIP Code to the south. To accommodate for this fact, IMPLAN includes the Local Purchase Percentage (LPP). The LPP is the percentage of the impact that occurs in the evaluated economy. The analysis uses the Social Accounting Matrix (SAM) values for the LPP as presented in Table 3.2. The last column in Table 3.2 presents the household expenditures spent in ZIP Code 49449. To calculate this number, total household expenditures by are multiplied by each sector's LPP.

**Table 3.2**  
**ZIP Code 49449 – Local Purchase Percentage**

<b>Sector</b>	<b>LPP (%)</b>	<b>Expenditures Spent in 49449</b>
Full-service restaurants	89.01	\$1.50M
Limited-service restaurants	33.89	\$0.95M
Gas stations	52.39	\$0.21M
Water transportation	0.00	\$0.00M
Scenic transportation	0.00	\$0.00M
Marinas	83.79	\$0.23M

As described above, Pentwater is a tourist town, whose population increases to 5,000 in the summer. Table 3.3 presents the total output (i.e., gross sales) for the sectors presented in the table above. The first column presents the sector. The second and third columns present the total output and number of employees in each sector. The fourth column presents the total household income expenditures spent by residents on the commodities as presented in the table above, and the last column presents the difference. This difference is specified to be expenditures by tourists.

**Table 3.3**  
**ZIP Code 49449 – Output by Sector**

<b>Sector</b>	<b>Total Output</b>	<b>Number of Employees</b>	<b>Expenditures Spent in 49449</b>	<b>Difference in Expenditures</b>
Full-service restaurants	\$2.18M	25	\$1.50M	\$0.68M
Limited-service restaurants	\$1.03M	14	\$0.95M	\$0.08M
Gas stations	\$0.25M	5	\$0.21M	\$0.04M
Water transportation	\$0.00M	0	\$0.00M	\$0.00M
Scenic transportation	\$0.00M	0	\$0.00M	\$0.00M
Marinas	\$1.04M	16	\$0.23M	\$0.81M

Pentwater is within Oceana County. Economic effects would spill-over into Oceana County. Baseline conditions for Oceana County are below. Table 3.4 presents households and expenditures for Oceana County as they are presented in Table 3.1.

**Table 3.4**  
**Oceana County – Baseline Expenditures by Household Income Category**

Household Income Category	Number of Households	Annual Per Household Expenditures					
		Full-Service Restaurants	Limited-Service Restaurants	Gas Stations	Water Transport	Scenic Transport	Marinas
Households Less than \$15k	1,428	\$661	\$1,099	\$8	\$40	\$32	\$74
Households \$15k-\$30k	2,220	\$825	\$1,371	\$31	\$58	\$48	\$95
Households \$30k-\$40k	1,204	\$1,033	\$1,716	\$50	\$66	\$56	\$208
Households \$40k-\$50k	1,069	\$1,123	\$1,866	\$16	\$85	\$67	\$166
Households \$50k-\$70k	1,727	\$1,470	\$2,443	\$40	\$113	\$82	\$187
Households \$70k-\$100k	1,334	\$2,124	\$3,530	\$66	\$148	\$90	\$305
Households \$100k-\$150k	803	\$2,642	\$4,391	\$121	\$204	\$126	\$496
Households \$150k-\$200k	80	\$3,670	\$6,099	\$309	\$290	\$160	\$752
Households More than \$200k	108	\$4,385	\$7,288	\$162	\$455	\$217	\$1,277

Just as some of the expenditures presented in Table 3.1 would occur outside of Pentwater, some of the expenditures in Table 3.5 would occur outside of Oceana County. Table 3.5 presents the Oceana County LPPs and total household expenditures by sector.

**Table 3.5**  
**Oceana County – Local Purchase Percentage**

Sector	LPP (%)	Expenditures Spent in 49449
Full-service restaurants	88.47	\$11.93M
Limited-service restaurants	34.90	\$7.82M
Gas stations	99.65	\$3.82M
Water transportation	0.00	\$0.00M
Scenic transportation	27.63	\$0.19M
Marinas	93.87	\$1.94M

Table 3.6 presents the total output (i.e., gross sales) for the sectors presented in the table above. Similar to Pentwater, gross sales exceed expenditures for Oceana County.

**Table 3.6**  
**Oceana County – Output by Sector**

<b>Sector</b>	<b>Total Output</b>	<b>Number of Employees</b>	<b>Expenditures Spent in 49449</b>	<b>Difference in Expenditures</b>
Full-service restaurants	\$13.97M	341	\$11.93M	\$2.04M
Limited-service restaurants	\$9.14M	128	\$7.82M	\$1.32M
Gas stations	\$7.60M	135	\$3.28M	\$4.32M
Water transportation	\$0.00M	0	\$0.00M	\$0.00M
Scenic transportation	\$1.32M	10	\$0.19M	\$1.13M
Marinas	\$5.22M	78	\$1.94M	\$3.28M

### 3.2 With PMTI

The counterfactual to the existing baseline is the addition of PMTI to the local economy. Once the PMTI is constructed, there will be annual costs associated with operating and maintaining it. The Institute is specified to be 16,000 square feet with a cost of \$127 per sq ft for construction (RSMMeans 2009)

For this effort, we have presumed a not-for-profit organization (potentially an accredited community college branch) with the primary operating revenue source being tuition from 30 students at \$14,000 per year. The formation of not-for-profit also provides fund-raising opportunities where benefactors could aid in initial construction costs. Tuitions payments would lead to total revenues of \$420,000 per year. These revenues are specified to support two administrators and support staff and four instructors at an average salary of \$40,000. The remaining \$180,000 is allocated to campus operations and maintenance (\$37,000), boat building materials (\$75,000), fund raising activities (\$18,000), and a marina dredging fee (\$25,000), and miscellaneous expenses (\$25,000).

Economic impacts would occur as the PMTI was constructed and due to ongoing operations.

**Table 3.7**  
**Timing**

<b>Year</b>	<b>Activity</b>
2018	Go-ahead determination
2018-2020	Site-specific engineering activities, Permitting, startup and site-development, construction management
2020	Project completion
2020+	Ongoing operations

Based on input from the engineering team, the PMTI is specified to be 16,000 square feet with a cost of \$127 per square foot. This would be a total of \$2,032,000 in construction costs. These costs are assigned to Sector 55: Construction of new educational and vocational structures. The percentage of the Local Purchase Percentage uses the Social Accounting Matrix (SAM) values. For Construction of new educational and vocational structures, 99.95 of the marginal value goes to the Oceana County economy.

There would be expenditures associated with ongoing operations and maintenance costs. The evaluation includes expenditures and employment occurring in Pentwater and Oceana County and excludes expenditures occurring outside Oceana County. The two administrators and support staff and four instructors making an average of \$40,000 could include part-time and volunteer staff. These are evaluated as a labor income change in ZIP Code 49449 (the staff is specified to reside in Pentwater). The analysis specifies that the employees spend 50% of their labor income in ZIP Code 49449 and 80% of their labor income in Ocean County.

The \$37,000 in ongoing Campus operations and maintenance and \$25,000 in miscellaneous expenses are evaluated using the Institution Spending Pattern of Sector 474 – other educational services in Oceana County. The top expenditures in this Institution Spending Pattern include real estate (e.g., buying, selling, leasing, and managing), insurance agencies, and wholesale trade. Other expenditures include water and sewage. Annual boat building materials of \$75,000 are assigned to Sector 395 – Wholesale trade in Oceana County. Fund raising activities are assigned to Sector 465 – Business support services in Oceana County. The \$25,000 marina dredging fee is assigned to Sector 455 -- Environmental and other technical consulting services in Oceana County.

The geographic classification of students is specified based on the student residence breakdown from the NorthWest School of Wooden Boat Building in Port Townsend, Washington (NSWBB 2015). Based on this information, the analysis classifies students into two different categories:

1. Non-traveling students: Students who temporarily move to Pentwater for the duration of their classes (27 students)
2. Traveling students: Students who live in Michigan, but permanently reside outside of Oceana County (3 students)

Non-traveling students living in Pentwater spend their income in the same way that the Household Income Category \$15k-\$30k spends their income.

Traveling students spend their income in Pentwater in a different way because they do not permanently live in Pentwater. Traveling students are to spend \$50 in food each week for 36 weeks (totaling \$1,800 per student annually in food).



## 4. Results

Contributing to continued access to Lake Michigan is consistent with the concept of the PMTI. This characterization specifies that \$25,000 per year from the PMTI's revenues would go toward funding dredging activities. This condition would be specified in the formation of the school. The mechanism for obtaining initial funding was not identified as part of this effort. Although tax increment financing may be possible, the educational nature of the PMTI may have implications for this approach. Funding related to educational institutions would be available and an ongoing cost of \$18,000 per year is specified to support related fund raising activities. With the caveat that funding for construction could be implemented successfully, the PMTI would contribute directly to the sustainability of Pentwater by serving as an ongoing source of dredging funds.

The PMTI would contribute to sustainability in other ways. Increasing the year-round population of Pentwater with students and staff would add to the community's diversity and robustness and increase the local economic base. Table 4.1 summarizes the results of each year for the two evaluated economies. PTMI construction is the only activity occurring in 2019. Employment and value added impacts in 2020+ represent the operation of the PTMI that are expected to continue indefinitely. Employment and value added impacts in ZIP Code 49449 are included in the Oceana County employment and value added impacts.

**Table 4.1**  
**Total Annual Economic Impact of PMTI's Expenditures by Year and Economy**

<b>Economy</b>	<b>Units</b>	<b>Impact Type</b>	<b>2019</b>	<b>2020+</b>
ZIP Code 49449	\$ thousands	Value-added	\$0	\$313
		Employee compensation	\$0	\$192
		Proprietors' income	\$0	\$15
		Other property type income	\$0	\$73
		Business taxes	\$0	\$34
	Jobs	Employment	0	10
Oceana County	\$ thousands	Value-added	\$714	\$432
		Employee compensation	\$303	\$282
		Proprietors' income	\$180	\$23
		Other property type income	\$190	\$86
		Business taxes	\$41	\$41
	Jobs	Employment	16	11

Note: Total may not reflect detail due to rounding.

The top five sectors that will see an increase in employment from construction of the PTMI are construction of new educational and vocational structures, wholesale trade, truck transportation, full-services restaurants, and real estate (e.g., property managers' office leasing, real estate offices for renting or leasing residential properties). The top five sectors impacted by the ongoing operations and maintenance include environmental and other technical consulting services, wholesale trade, real estate, other educational services, and office administration services. The top five sectors with employment impacts from PTMI employee and student spending are full-service restaurants, grocery stores, real estate, other food and drink establishments (e.g., coffee shops, bagel shops) , and other educational services.

The length of employment effects is an important consideration in identifying the importance of this consideration. In the current context, construction activities would result in temporary employment improvements and ongoing operations and employee and student spending would occur into the future.

The top five sectors that will see an increase in value-added impacts from construction of the PTMI are construction of new educational and vocational structures, wholesale trade, owner-occupied dwellings, truck transportation, and real estate. The top five sectors impacted by the ongoing operations and maintenance include wholesale trade, environmental and other technical consulting services, real estate, owner-occupied dwellings, and insurance agencies. The top five sectors with value-added impacts from PMTI employee and student spending are owner-occupied dwellings, wholesale trade, grocery stores, full service restaurants, and real estate.

Table 4.2 places these estimates in the context of selected characteristics of the ZIP Code 49449. The table also shows the characteristics of Oceana County relative to the State of Michigan and the United States. The penultimate row in Table 4.2 presents the current market value of final goods and services produced in each geographic region. For ZIP Code 49449 and Oceana County, the unit of this metric is referred to as Value Added, which reflects the market value of final goods and services produced in a specific geographic area.

In addition, because Value Added represents the value of all final products and services, it is the metric that is most comparable to Michigan's Gross State Product (\$468.3 billion in 2015). Gross State Product (GSP) is the value of final goods and services at the state level, and Gross Domestic Product (GDP) is the value of final goods and services at the national level. The last row of Table 4.2 places the total market value of PMTI's expenditures in the context of the total market value of final goods and services produced in each economy. As the table

shows, PMTI's expenditures will increase the value of final goods and services between approximately 0.07% and 0.1% (approximately \$432,000 and \$714,000, respectively) of the total market value of Oceana County's final goods and services, and approximately 0.8% (approximately \$313,000) of ZIP Code 49449 final goods and services.

**Table 4.2**  
**Selected Demographics and Economic Values for ZIP Code 49449, Oceana County, Michigan, and the U.S.**

		<b>49449</b>	<b>Oceana County</b>	<b>Michigan</b>	<b>United States</b>
Population <sup>a</sup>		2,513	26,229	9,900,571	316,515,021
Number of households <sup>b</sup>		1,175	9,822	3,841,148	116,926,305
Median household income <sup>c</sup>		\$47,663	\$41,617	\$49,576	\$53,889
Percent of population below poverty level <sup>d</sup>		10.3%	16.9%	14.7%	13.5%
Unemployment rate <sup>e</sup>		6.0%	6.0%	4.9%	4.7%
Value of Final Goods and Services <sup>f</sup>		\$40.5 million	\$633.9 million	\$468.3 billion	\$18.7 trillion
Percentage that PMTI's Expenditures Increase the Value of Final Goods and Services	2024	0%	0.1%	—	—
	2025	0.8%	0.07%	—	—

<sup>a</sup> Population numbers are given as of 2015 (U.S. Census Bureau 2017a).

<sup>b</sup> Number of households is given as of 2015 (U.S. Census Bureau 2017a).

<sup>c</sup> Median household income is given as of 2015 (U.S. Census Bureau 2017b).

<sup>d</sup> Percent of population below poverty level is given as of 2015 for all people 18 years and older (US Census Bureau 2017b).

<sup>e</sup> Unemployment rate is given as of November 2016 for ZIP Code 49449, Oceana County and Michigan, and December 2016 for the U.S. (U.S. Bureau of Labor Statistics 2017a, 2017b, 2017c).

<sup>f</sup> The value of final goods and services produced (Value Added for 49449 and Oceana County, Gross State Product for Michigan, and Gross Domestic Product for the U.S.) is given as of 2015 for 49449 and Oceana County (IMPLAN Group LLC 2016). 2015 GSP and 2016 GDP are used for Michigan and the United States (U.S. Bureau of Economic Analysis 2016a, 2016b).

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