



Hardy Dam Economic Contribution Study

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**PUBLIC SECTOR
CONSULTANTS**

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Executive Summary

Consumers Energy (Consumers) engaged Public Sector Consultants (PSC) to analyze the economic contributions of its 13 hydroelectric dams and their associated impoundments. This work complements PSC's ongoing efforts to assist Consumers in collecting feedback from individuals, organizations, and businesses that would be affected by dam decommissioning.

This economic contribution analysis differs from a related approach called economic impact analysis. While both approaches use the same models to simulate the economic effects of a resource, they differ in some basic assumptions. Economic contribution analyses are a current-state snapshot of the overall market and make no assumptions about future changes in the underlying economy. Rather, they measure the economy-wide effects of the current level of activity of a business or industry, or for this study, the activity generated from recreational assets. Economic impact analyses, on the other hand, are commonly used to measure the economic effect of a business or industry being added to, or lost from, the local economy. It accounts for the differences in economic activity that will result from the gain or loss.

Regional Economic and Employment Contributions

IMPLAN, a widely used, reputable economic modeling software, allows PSC to estimate the direct economic effects of pond visitor spending, as well as model supply chain purchases, worker spending, and other indirect effects the dam and impoundment have on the regional economy. For more information on IMPLAN methodology and terminology, please see Appendix A. Using IMPLAN, as well as data collected from local and state sources, PSC estimates that the Hardy Dam Pond supports 499 jobs in the region and about \$21 million in value added to the region's economy annually (Exhibit 1).

EXHIBIT 1. Economic Contribution Analysis Results

Contribution Type	Employment	Labor Income	Value-added
Direct	425	\$9,475,806	\$15,831,079
Indirect/induced	74	\$3,091,489	\$5,212,628
Total	499	\$12,567,295	\$21,043,707

Source: PSC analysis

Hardy Dam Pond recreational activity contributes to \$6.18 million in total annual tax revenue, with more than \$4 million at the local, county, and state levels (Exhibit 2).

EXHIBIT 2. Tax Contributions

Contribution Type	Local	County	State	Federal	Total
Direct	\$1,000,625	\$299,813	\$2,337,440	\$1,333,039	\$4,970,917
Indirect/induced	\$173,549	\$51,995	\$439,335	\$546,578	\$1,211,457
Total	\$1,174,174	\$351,808	\$2,776,775	\$1,879,617	\$6,182,374

Source: PSC analysis

Property Value Analysis

PSC compiled assessed and taxable values from the Newaygo County Equalization Department and the Mecosta County Equalization Department for the tax (calendar) year 2022. Pond- and river-adjacent properties represent \$3.66 million of assessed value and \$2.63 million of taxable value in Mecosta County. These figures total \$2.03 million and about \$792,000, respectively, for the portion of adjacent properties of the study area located in Newaygo County. The assessed value of pond- and river-adjacent properties classified for industrial use comprises 1.18 percent of all industrial properties in Mecosta County and 3.61 percent of all industrial properties in Newaygo County. All adjacent industrial properties are owned by Consumers Energy.

EXHIBIT 3. Assessed and Taxable Values of Pond- and River-adjacent Properties (Real Property Only)

Mecosta County

	Assessed Value			Taxable Values		
	Adjacent Properties (Value)	All County Properties (Value)	Adjacent Properties (Share of Total Value)	Adjacent Properties (Value)	All County Properties (Value)	Adjacent Properties (Share of Total Value)
Commercial	\$791,400	\$177,454,000	0.45%	\$731,584	\$151,900,211	0.48%
Industrial	\$682,100	\$57,583,700	1.18%	\$410,657	\$55,957,289	0.73%
Residential—improved	\$1,679,200	\$1,327,932,100	0.13%	\$1,200,170	\$1,022,042,363	0.12%
Residential—vacant	\$358,400	\$126,332,100	0.28%	\$1,184,249	\$79,421,456	1.5%
Other	\$144,200	\$233,541,170	0.06%	\$101,999	\$134,241,869	0.08%
Total	\$3,655,300	\$1,922,843,070	0.19%	\$2,628,659	\$1,443,563,188	0.18%

Newaygo County

	Assessed Value			Taxable Values		
	Adjacent Properties (Value)	All County Properties (Value)	Adjacent Properties (Share of Total Value)	Adjacent Properties (Value)	All County Properties (Value)	Adjacent Properties (Share of Total Value)
Commercial	\$0	\$128,100,900	0.00%	\$0	\$116,708,327	0.00%
Industrial	\$2,026,900	\$56,090,600	3.61%	\$792,068	\$51,433,924	1.54%
Residential—improved	\$0	\$1,718,312,158	0.00%	\$0	\$1,243,646,469	0.00%
Residential—vacant	\$0	\$149,676,900	0.00%	\$0	\$97,086,151	0.00%
Other	\$0	\$256,528,560	0.00%	\$0	\$142,103,000	0.00%
Total	\$2,026,900	\$2,308,709,118	0.09%	\$792,068	\$1,650,977,871	0.05%

Note: Totals may not sum due to rounding. The “residential—improved” category includes residential condominiums.
 Source: Newaygo County Equalization Department, Mecosta County Equalization Department, PSC analysis

PSC also conducted a hedonic analysis, which is an analytical approach intended to assess the contribution of various characteristics to property values. For the purposes of this report, this analysis was designed to estimate the pond’s contribution to residential property values, with results in Exhibit 4.

EXHIBIT 4. Hedonic Analysis Results for Assessed Value and Tax Revenue

	Number of Properties	Average Assessed Value	Net Effect on Assessed Value	Total Estimated Market Value Enhancement	Average Taxable Value	Net Effect on Taxable Value	Total Estimated Tax Revenue Enhancement
Adjacent	21	\$105,207	\$59,284	\$2,489,925	\$67,349	\$34,813	\$26,182
Two-mile buffer	2,291	\$45,923	\$0	\$0	\$32,535	\$0	\$0
Total	2,312			\$2,489,925			\$26,182

Source: Newaygo County Equalization Department, Mecosta County Equalization Department, PSC analysis

Background

Consumers Energy is developing a long-term strategy for its 13 hydroelectric dams. This work is in anticipation of an upcoming relicensing decision, compounded with significant infrastructure upgrades needed to remain in compliance with the Federal Energy Regulatory Commission licensing requirements for each dam. While Consumers is handling much of the work internally, the firm engaged PSC in 2022 to assist with gathering input from the communities where the dams are located as well as more broadly across the state.

In fall 2022, PSC conducted more than 20 meetings with local officials, the public, and key stakeholders. At the meetings, PSC provided the communities with preliminary information on the process for dam removal and collected feedback to assist Consumers in developing its strategy. As part of the feedback collection process, PSC also surveyed more than 3,000 landowners with property abutting Consumers-owned land and created a website to solicit feedback and provide more context on long-term strategy development. Consumers also engaged PSC to determine how much local economic activity can be attributed to dam-related industries. Additionally, PSC will analyze the potential economic effects associated with undertaking the dams' decommissioning and removal in a future phase. To complete the assessments, PSC conducted interviews, collected economic data, and utilized IMPLAN. IMPLAN allows PSC to estimate the direct economic effects of pond visitor spending, as well as model supply chain purchases, worker spending, and other indirect effects. All these effects are modeled in the following three categories on an annual basis:

- **Employment:** The number of full- and part-time jobs associated with an industry.
- **Labor income:** The dollar total of employee compensation and proprietor income; the latter is associated with self-employed individuals.
- **Value-added:** The gross regional product, which includes labor income, other property income (e.g., rents and profits), and indirect business taxes (e.g., excise and sales taxes).

The analyses focus on tourism and related industries benefiting from the dams and their impoundments and model the industries' economic contributions—and levels of production—supported by the dams. The results include direct, indirect, and induced effects on employment, labor income, and economic output. For more detailed information on IMPLAN methodology and terminology, please see Appendix A.

Hardy Dam

Hardy Dam is the tallest and most powerful of Consumers' 13 hydroelectric dams, and was among the last to be built. Construction was completed in 1931. Hardy Dam is the largest earthen dam in North America east of the Mississippi River. The dam is 100 feet in height and 2,580 feet in length and currently averages 1187 megawatt hours of electricity. Located in Big Prairie Township, Newaygo County, Hardy Dam is northwest of Croton Dam and southeast of Rogers Dam on the Muskegon River. Nearby communities include White Cloud in Newaygo County to the west and Stanwood and Morley in Mecosta County to the east. The population of Big Prairie Township is approximately 2,600 individuals. The dam creates the impoundment known as Hardy Dam Pond, which is over twice the size of the next-largest Consumers impoundments at approximately 3,900 acres. Consumers estimates the total operation and maintenance costs of Hardy Dam to be approximately \$6.35 million from 2023–2027.

Economic Contribution Analysis

PSC gathered recreational visitor data and applied national spending patterns to estimate Hardy Dam Pond’s economic contribution to the surrounding region (Newaygo County). To maximize research accuracy and comprehensiveness, PSC spoke with local government officials, economic development staff, and other community stakeholders to identify existing reports and collect data on the number and types of visitors to the recreational facilities surrounding the pond, including Newaygo State Park and the parks and campgrounds at Big Bend, Brower, Davis Bridge, Hardy Dam Marina, Oxbow, Sandy Beach, and Sarn’s Resort. PSC was also able to use data on usage of the currently open sections of the Dragon Trail. Finally, PSC included surveys of angler trips from the most recent angler survey of the Hardy Impoundment produced by the Michigan Department of Natural Resources. These visitor trip counts are highlighted in Exhibit 5.

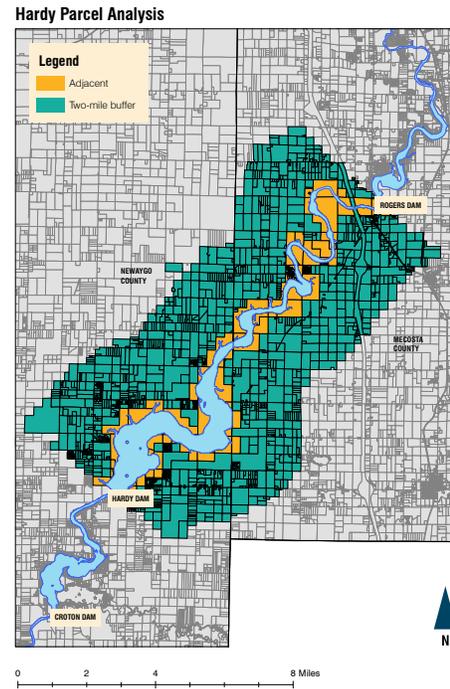


EXHIBIT 5. Expenditure Profiles—Spending per Party Trip or Season

Facility	Visitor Party Trip Count
Park and campground (seasonal and nonseasonal)	155,611
Dragon Trail	8,621
Anglers	23,111
Total	187,343

Sources: Newaygo Parks Department data; O’Neal & Kolb 2014

PSC then applied nationally recognized, inflation-adjusted recreation expenditure profiles to these trip counts to create the inputs for the IMPLAN analysis, including the Newaygo County Parks Dragon Trail-specific expenditure profile (Exhibit 6).

EXHIBIT 6. Expenditure Profiles—Spending per Trip or Season

Spending Category	Nonseasonal Campers	Seasonal Campers May 1–October 1	Anglers	Dragon Trail
Accommodations	\$65.24	\$0.00	\$14.38	\$111.37
Camping	\$8.66	\$3,125.00	\$1.91	\$0.00
Restaurant	\$52.07	\$1,000.00	\$11.48	\$139.05

Spending Category	Nonseasonal Campers	Seasonal Campers May 1–October 1	Anglers	Dragon Trail
Groceries	\$36.70	\$2,000.00	\$8.09	\$80.67
Gas and oil	\$32.09	\$580.00	\$7.07	\$129.91
Other transport	\$1.60	\$0.00	\$0.35	\$16.55
Entry fees	\$6.27	\$0.00	\$1.38	\$29.52
Recreation and entertainment	\$11.34	\$1,400.00	\$2.50	\$36.37
Sporting goods	\$8.00	\$0.00	\$1.76	\$0.00
Souvenirs and other expenses	\$10.42	\$500.00	\$2.30	\$53.04
Total	\$232.40	\$8,605.00	\$51.23	\$596.48

Note: Totals may not sum due to rounding.
Source: White 2017, Newaygo Parks Department data

The results of the IMPLAN analysis highlighted in Exhibit 7 indicate that the Hardy Dam Pond supports 499 jobs in the region and more than \$21 million in value-added to the region’s annual economy. This includes the 62 jobs and \$2.35 million in value added associated with the impoundment’s contribution to the Dragon Trail.

EXHIBIT 7. Economic Contributions by Type

Contribution Type	Employment	Labor Income	Value-added
Direct	425	\$9,475,806	\$15,831,079
Indirect/induced	74	\$3,091,489	\$5,212,628
Total	499	\$12,567,295	\$21,043,707

Source: PSC analysis

The Hardy Dam Pond recreational activity contributes to \$6.18 million in total annual tax revenue, with more than \$4 million at the local, county, and state levels (Exhibit 8).

EXHIBIT 8. Tax Contributions

Contribution Type	Local	County	State	Federal	Total
Direct	\$1,000,625	\$299,813	\$2,337,440	\$1,333,039	\$4,970,917
Indirect/induced	\$173,549	\$51,995	\$439,335	\$546,578	\$1,211,457
Total	\$1,174,174	\$351,808	\$2,776,775	\$1,879,617	\$6,182,374

Note: Totals may not sum due to rounding.
Source: PSC analysis

Property Value Impacts

Property values along water bodies are often assumed to be higher than nonwaterfront properties because of their scenic and recreational attributes. Due to this assumed correlation, local officials and residents have expressed concerns regarding the potential impacts on property values should the pond be altered due to dam removal or modifications. Understanding these impacts is critical for local leaders and residents. PSC has gathered property values to quantify the current value of pond and riverfront properties relative to all other properties. In addition, PSC has undertaken a hedonic analysis to model the property value differential between waterfront-adjacent properties, nearby properties, and those further beyond the Hardy Dam Pond and Muskegon River.

Assessed and Taxable Values

PSC compiled assessed and taxable values from the Newaygo County and Mecosta County Equalization Departments for the tax (calendar) year 2022. Assessed values should be determined by local assessors to be 50 percent of market price or true cash value of the property. Taxable value is used to determine tax liability and is always equal to or lower than assessed value. Taxable values are frequently lower than assessed values due to legislative restrictions on inflationary growth.

Exhibit 9 shows the total taxable value of properties adjacent to Hardy Dam Pond and running north along the Muskegon River. Pond- and river-adjacent properties, also referred to as “adjacent,” represent \$3.7 million of assessed value and \$2.6 million of taxable value. These values represent the properties in both Newaygo and Mecosta Counties. For Mecosta County, the total value of adjacent properties represents 0.19 percent of total county-assessed value and 0.18 percent of the county’s taxable property. For Newaygo County, the total value of adjacent properties represents 0.09 percent of the county’s assessed value and 0.05 percent of the county’s taxable property values. The taxable value of pond- and river-adjacent properties classified for industrial use comprises 1.54 percent of all industrial properties in Newaygo County and 0.73 percent of all industrial properties in Mecosta County.

EXHIBIT 9. Assessed and Taxable Values of Pond- and River-adjacent Properties (Real Property Only)

Mecosta County

	Assessed Value			Taxable Values		
	Adjacent Properties (Value)	All County Properties (Value)	Adjacent Properties (Share of Total Value)	Adjacent Properties (Value)	All County Properties (Value)	Adjacent Properties (Share of Total Value)
Commercial	\$791,400	\$177,454,000	0.45%	\$731,584	\$151,900,211	0.48%
Industrial	\$682,100	\$57,583,700	1.18%	\$410,657	\$55,957,289	0.73%
Residential—improved	\$1,679,200	\$1,327,932,100	0.13%	\$1,200,170	\$1,022,042,363	0.12%
Residential—vacant	\$358,400	\$126,332,100	0.28%	\$1,184,249	\$79,421,456	1.5%
Other	\$144,200	\$233,541,170	0.06%	\$101,999	\$134,241,869	0.08%
Total	\$3,655,300	\$1,922,843,070	0.19%	\$2,628,659	\$1,443,563,188	0.18%

Newaygo County

	Assessed Value			Taxable Values		
	Adjacent Properties (Value)	All County Properties (Value)	Adjacent Properties (Share of Total Value)	Adjacent Properties (Value)	All County Properties (Value)	Adjacent Properties (Share of Total Value)
Commercial	\$0	\$128,100,900	0.00%	\$0	\$116,708,327	0.00%
Industrial	\$2,026,900	\$56,090,600	3.61%	\$792,068	\$51,433,924	1.54%
Residential—improved	\$0	\$1,718,312,158	0.00%	\$0	\$1,243,646,469	0.00%
Residential—vacant	\$0	\$149,676,900	0.00%	\$0	\$97,086,151	0.00%
Other	\$0	\$256,528,560	0.00%	\$0	\$142,103,000	0.00%
Total	\$2,026,900	\$2,308,709,118	0.09%	\$792,068	\$1,650,977,871	0.05%

Note: Totals may not sum due to rounding. The “residential—improved” category includes residential condominiums.
 Source: Newaygo County Equalization Department, Mecosta County Equalization Department, PSC analysis

Exhibit 10 shows the taxable value for townships in the study area that contain pond- and river-adjacent properties. Big Prairie Township is located in Newaygo County, while the remaining two townships are in Mecosta County.

EXHIBIT 10. Taxable Values of Pond- and River-adjacent Properties (Real Property Only), By Township

	Total All Property Types	Commercial	Industrial	Residential —Improved	Residential —Vacant	Other
Aetna Township						
Adjacent	\$122,452	\$0	\$85,718	\$0	\$36,734	\$0
All township properties	\$52,766,740	\$2,475,251	\$358,378	\$38,454,728	\$4,466,905	\$7,011,478
Percentage value adjacent	0.23%	0.00%	23.9%	0.00%	0.82%	0.00%
Big Prairie Township						
Adjacent	\$792,068	\$0	\$792,068	\$0	\$0	\$0
All township properties	\$71,494,369	\$1,633,225	\$10,869,929	\$52,718,483	\$6,272,732	\$0
Percentage value adjacent	1.11%	0.00%	0.00%	0.00%	0.00%	0.00%
Mecosta Township						
Adjacent	\$2,506,207	\$731,584	\$324,939	\$1,200,170	\$147,515	\$101,999
All township properties	\$119,098,094	\$5,197,413	\$31,992,041	\$67,854,478	\$649,481	\$7,404,681
Percentage value adjacent	2.1%	14.08%	0.01%	0.02%	22.7%	1.38%

Source: Newaygo County Equalization Department, Mecosta County Equalization Department, PSC analysis

Hedonic Analysis

A hedonic analysis model provides estimates of the pond’s contribution to residential property values. The analysis model is used to determine how proximity to the dam’s pond is reflected in average residential property values. As property taxes are levied, the estimates have implications on expected contributions to local area tax revenue.

In the hedonic analysis, properties are assigned as either adjacent to the impoundment or within two miles of the impoundment shoreline. The anticipation is that if the impoundment provides amenity value to homeowners, adjacent lots will exhibit a price premium over comparative lots not adjacent to Hardy Dam Pond. The comparison, or baseline, properties were limited to those within two miles of the impoundment so as to create a basis for comparison that shares close geographic proximity to the properties in question to reflect the values the community places on residential properties.

The hedonic analysis uses assessed values to provide estimates of the impoundment’s contribution to property wealth in the surrounding community and taxable value. Taxable value, along with the 2022 township/school district-level millage rate and properties’ designation as homestead or nonhomestead, determines the impoundment’s impact on the overall estimated tax revenue contribution.

Exhibit 11 shows the resulting hedonic analysis estimates of homeowner value generated by proximity to Hardy Dam Pond. Holding all other factors constant, the 41 properties that share property lines with the impoundment have averaged assessed values of \$105,207, compared to peer properties in the baseline group with \$45,923. That is, the assessed value of adjacent properties is \$59,284 higher on average. Multiplying the net effect of lakefront properties to the lake by the number of properties and a multiplier of two provides the impoundment’s expected contribution to regional property values. In total, the region benefits in property values that are approximately \$2.49 million higher than would be expected in the impoundment’s absence. This represents less than 1 percent of all assessed value within Newaygo County.

EXHIBIT 11. Hedonic Analysis Results for Assessed Value

	Number of Properties	Average Assessed Value	Net Effect on Assessed Value	Total Estimated Market Value Enhancement
Adjacent properties	21	\$105,207	\$59,284	\$2,489,925
Baseline	2,291	\$45,923	\$0	\$0
Total Value	2,312			\$2,489,925

Source: Newaygo County Equalization Department, Mecosta County Equalization Department, PSC analysis

The residential properties in this analysis largely exist in Big Prairie Township across the school districts of Newaygo and White Cloud. Accordingly, the effective residential millage rates applied represent a weighted average of those across the two school districts, resulting in 32.5205 for homestead properties and 50.3906 for nonhomestead properties (Michigan Department of Treasury n.d.b). Exhibit 12 shows the estimated taxable value contributions of proximity to the impoundment. The estimated taxable values differ slightly from the assessed values, reflecting the impact of the Headlee Amendment. Of the 21 residential parcels adjacent to the impoundment, seven were homestead, while 13 were nonhomestead. One parcel was listed as a mix of homestead and secondary home. The proportion of nonhomestead properties was greater for adjacent properties than for those within the two-mile band. By applying the appropriate millage rate by taxable status and summing over all properties for each of the proximity categories, PSC estimated the net tax revenue contribution of proximity to the impoundment is approximately \$26,182 per year.¹

EXHIBIT 12. Hedonic Analysis Results for Tax Revenue

	Number of Properties	Average Taxable Value	Net Effect on Taxable Value	Total Estimated Tax Revenue Enhancement
Adjacent properties	21	\$67,349	\$34,813	\$26,182
Baseline	2,291	\$32,535	\$0	\$0
Total Value	2,312			\$26,182

Source: Newaygo County Equalization Department, Mecosta County Equalization Department, PSC analysis

¹ All partial homestead properties were assigned a midpoint millage rate between homestead and nonhomestead rates.

Dam Removal Scenarios

PSC's analysis is a current-state assessment of the dam's economic contributions—a summary of today's economic value as the pond and river are currently configured. PSC's initial study did not consider how the economic contributions may shift under dam removal/modification scenarios. PSC will evaluate those scenarios in a phase two study using a conceptual decommissioning scenario. This analysis will require certain details about the pond and river changes to determine what corresponding economic impacts may result.

Conclusion

Local recreational assets are the primary economic activity around Hardy Dam Pond. These assets generate visitor activity resulting in employment opportunities, tax revenue, and economic contributions to the broader economy. On an annual basis, the Hardy Dam Pond recreational and business assets contribute:

- More than \$21 million in gross regional product and support 499 jobs
- More than \$6 million in local, county, state, and federal taxes through direct, indirect, and induced tax effects from recreational and related spending

The presence of the pond and river also positively impact adjoining property values, contributing:

- An additional \$2.5 million in market value to adjacent and nearby properties
- An additional \$26,182 in local and state property tax revenue due to the increased market value

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Appendix A. Methodology

IMPLAN Modeling

To analyze the amount of money visitors and residents spend on recreation related to the dam impoundments, Public Sector Consultants used IMPact for PLANning (IMPLAN), an input-output model to estimate economic impacts and contributions. It is a staple for regional economic analysts.

Economic Impact and Contribution Analyses

There are two major frameworks for input-output simulations. The first is an economic impact analysis, which examines the effect of something that affects the economy—like changes in wages or jobs—in a specific area. In this case, it is the dam impoundment and the recreational activities and expenditures associated with it. Because an economic impact analysis provides a model of what the economy is like with the economic feature being examined—in this case, the dam impoundment—a full accounting of what the economy would be like without the feature is required in modeling the outcomes.

The second framework is called an economic contribution analysis. This framework doesn't take the possible absence of an economic feature into consideration. It only models the value of economic activity that can trace its source back to the existence of the economic feature being modeled.

IMPLAN Terminology and Methodology

Input-output models trace transactions among and between different economic sectors (like households, businesses, and governments) over the course of a year. Tracing these transactions offers a clearer picture of how a change in economic activity in one part of the economy creates changes in other parts of the economy. When a business sells from inventory, it takes a portion of those earnings to pay for other goods and services (for example, to restock its inventory). Some of the wages companies pay to employees will go to local retailers and service providers, continuing the ripple effect throughout the economy. Because of all of these additional transactions, the overall economic effect is greater than the value of all the different direct revenue streams (employer to employee, consumer to business, business to business, etc.), which is called the multiplier effect. The existence of multiplier effects in regional and national economies is well documented in economics literature (Coughlin and Mandelbaum 1991).

Direct Effects

The standard approach to modeling economic impacts with input-output models is to begin by establishing the value of transactions that represent direct expenditures related to the dam and impoundment. For the purposes of this study, these are expenditures by individuals utilizing impoundment, feeder river system, and other adjacent recreational facilities. The direct effects of this spending are organized into various commodity categories. Each commodity type, such as grocery retailing, gasoline, and restaurant meals, have unique economic profiles in the local economy. For example, purchases made at a local grocery store create a different set of secondary transactions than purchases made in other industries.

While recreational expenditures make up the direct effects, they are largely derived from the number of recreational users at facilities around the impoundment. As discussed above, the analysis assumes that these users will spend money in a particular pattern while visiting recreational assets in and around the

dam impoundment. The expenditure profile used for this analysis is an inflation-adjusted version of the one adopted by the United States Department of Agriculture and United States Forest Service (USDA/USFS)(White 2017). Expenditures by recreational users are measured on a per-party basis. To account for the different spending patterns of impound visitor types, party counts were broken out into distinct categories:

- Campground and park visitors (including day, overnight, and season pass visitors)
- Anglers
- Seasonal campers

Campground and Park Visitors

Distinguishing between overnight and day-visitor counts is not always possible, so PSC used a single expenditure profile for both, which is an average of the overnight party and day-trip party expenditures. Counts of day and overnight trips were provided by respective campgrounds, parks, and marinas. These counts are typically derived from entry fees, but when that data was not available, counts were extrapolated from figures at similar sites, measuring cell phone pings within a geofenced area around park boundaries, or using professional estimates from facility management. Facilities issuing seasonal passes cannot account for the number of times the seasonal pass was used for entry. In such cases, assumptions about the number of trips per season and the length of the season were used to produce projected party trips for these visitors.

Anglers

Fishing party counts were provided by the Michigan Department of Natural Resources and creel surveys of fishing activities by location (O'Neal and Kolb 2014). The surveys also entailed fishing day expenditure totals, which were adjusted for inflation and aligned with the distribution of spending exhibited by campground and park users.

Seasonal Campers

Seasonal campers are those that reserve a spot for the entire summer season at a campground. Camping rates for individual sites were used in the seasonal camper expenditure profile and when necessary, PSC averaged the costs of various site types to produce a single lodging amount of the season. For other spending categories, PSC developed professional estimates using information from the USDA/USFS report, as well as monthly spending averages for individuals over the age of 65 produced by the Bureau of Labor Statistics (BLS 2021).

Indirect and Induced Effects

These direct effects are then used to estimate the secondary transactions that happen because of the direct effects. The first set of secondary transactions is the indirect effects, which are transactions between business sectors. Indirect effects are the intermediate purchases of goods from one business by another (such as restocking). A business's operational costs—like electricity, rent, and business services—are also indirect effects. Indirect effects ripple throughout the economy as businesses purchase goods and services from other businesses. These transactions cascade throughout the region, reduced only by the extent that inputs are purchased from suppliers outside the region. The second set of secondary transactions are called induced effects. Induced effects measure the value of new transactions by households, governments, and other institutions in response to higher labor income, taxes, and profits. These household and institutional expenditures from earnings generate new rounds of business-to-business

transactions and associated payments to institutions. These expenditures continue throughout the regional economy, hampered only by the extent to which purchases are made for goods, services, and payments to institutions outside the local economy. The direct, indirect, and induced effects are summed together to calculate the total economic effects.

Contribution estimates start with the estimated total value of purchases by category. Standard input-output models examine the economy through the flow of transactions. However, figures for employment, labor income, and total regional income, which are also known as contributions to gross state product, are determined with fixed ratios to the value of sales transactions. For instance, if Industry X employs one employee for every \$1 million in sales, then an increase in sales by \$10 million translates into an increase in employment by ten workers. Similar fixed ratios for labor income and gross state product apply. The IMPLAN model provides 544 expenditure categories, and 11 household types by income group.

Hedonic Analysis

If a dam impoundment is an amenity that adds value to surrounding properties, people will be willing to pay more for a property near the impoundment than they would for a property not near the impoundment. Alternatively, if a dam impoundment is detrimental, people will want to pay less for a property near the impoundment than they would for a property not near the impoundment. The actual value that an amenity adds to a property can overlap with other property attributes, so that determining how much the amenity contributes to a property's value is difficult without a detailed case-by-case analysis of individual properties.

To address this problem, economists created a model approach called hedonic analysis to statistically control for other factors that contribute to property values. Researchers compare the values of properties near the amenity to properties not near the amenity when holding all other factors constant. For example, because there is limited lake-adjacent property, developers usually restrict the lot size of waterfront properties. Because smaller lots are generally considered less desirable than larger lots, holding all other factors constant, waterfront properties should cost less than larger lots away from the water.

If an analysis compares the market value of waterfront lots to the value of lots away from the water without considering the smaller waterfront lot sizes, the analysis will underestimate the value the amenity brings to adjacent properties. Once the analysis acknowledges that smaller lot sizes along the water should suppress waterfront property values, the true relationship between prices and proximity to the water is revealed. Other factors apply, and once accounting for all relevant factors that explain market values, the remaining difference between the expected value and the actual value is then statistically determined as the overall average realized property premiums of properties in proximity to the body of water relative to baseline properties distant from the water (Monson 2009).

For this study, the model limits the impoundment's influence on those properties immediately adjacent to the impoundment. This is a conservative restriction on the expected influence the impoundment has on property values and property tax revenues. The comparison group of properties are lots in a two-mile band around the impoundment to ensure common markets with those properties bordering the impoundment.

There are two measures of residential property values: assessed and taxable values. Property information was provided by the county assessor offices and followed a common construct. The property variables are

lot size and dimensions, address, owner's home mailing address and zip code, city/township jurisdiction, school district, property type, and taxable status. The importance or weight of each factor on the overall assessed value is determined statistically by the hedonic model. The analysis used these variables, including values derived from them, to determine the factors that contribute to the properties' overall assessed and taxable values.

Other factors not represented in the analysis may also contribute to a property's overall value. Typically, there is a fair amount of variation in these other factors—like structure type, size, number of rooms, and presence of a garage—such that excluding them from the analysis is not expected to result in systematic bias in the estimated values.

GIS mapping software was applied to spatially determine lot locations relative to dam impoundments. Adjacent properties are those sharing a border with the impoundment. Comparison properties, up to two miles away, were determined based on the nearest geographic distance of the property centroid to the impoundment edge. Taxing status was both used as a variable to determine property value and to calculate the net expected tax contributions of properties adjacent to the impoundment.

All the comparisons were made on expected values, controlling for other factors. To control for the possibility that any estimated price differences between properties and types of properties was not due to random chance, testing for statistical significance in property price differences was done but is not reported in the narrative. Once significance is established, the average differential can be applied across all corresponding residential properties to derive an overall estimate of the residential property values and property tax revenues that can be attributed to the impoundment.

Appendix B. Organizational Contacts

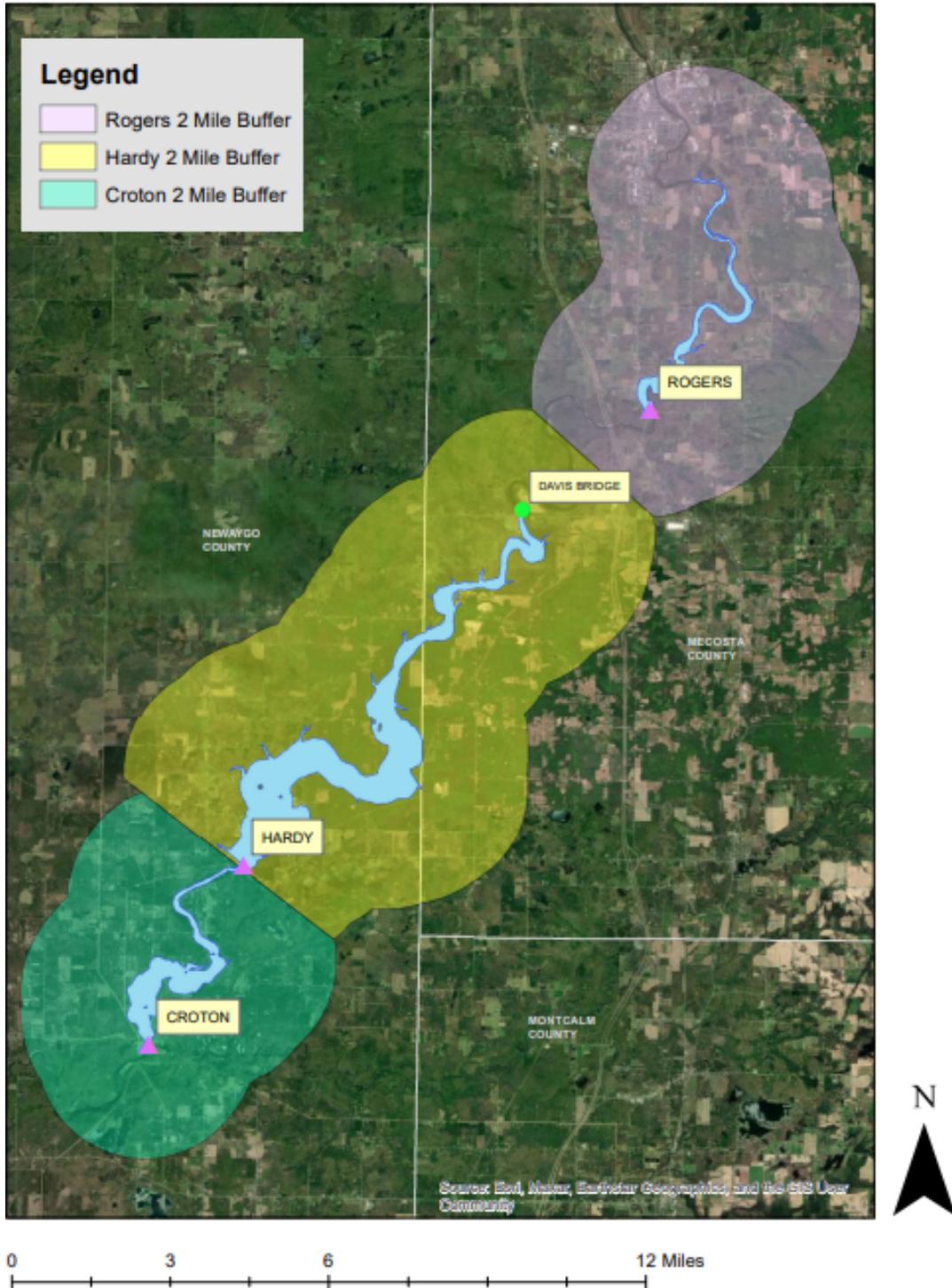
As part of this study, PSC reached out to the following organizations to discuss recreational, industrial, and housing assets and data. While not all these organizations responded, many followed up and spoke with PSC via email, phone, and virtual meetings.

EXHIBIT B1. Organizational Contacts—Hardy Dam Pond

Organization	Outreach Date
Other local campground proprietors	February 2023
Mecosta County Equalization Department	January 2023
Mecosta County Parks	January 2023
Michigan Association of Counties	January 2023
Michigan Department of Natural Resources	January 2023
Newaygo County Parks and Recreation	January 2023
Newaygo County Administration	January 2023
River Country Chamber of Commerce of Newaygo County	January 2023
The Right Place (Newaygo County Economic Development Partnership)	January 2023

Appendix C. Map of Croton, Hardy, and Rogers Dams

EXHIBIT C1. Adjacent and Buffer Parcels Around Croton, Hardy, and Rogers Dams



Source: Newaygo County Equalization Department; PSC analysis



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