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Shipping on the Great Lakes and St. Lawrence Seaway: An Update

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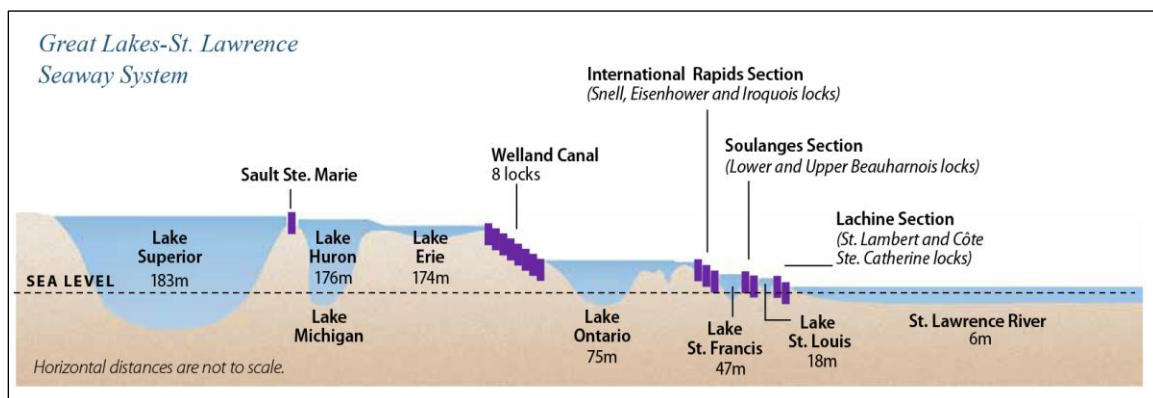
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Introduction

For decades, the Great Lakes and St. Lawrence Seaway navigation system (**Figure 1**) has provided efficient shipping for the raw materials that support the steel industry and other heavy industries located in the region.¹ However, shipping volumes have been in a long-term decline, and many port wharfs remain vacant. Congress recently authorized substantial spending to support the navigation system, including building a new lock at Sault Ste. Marie, constructing a second U.S. Coast Guard heavy icebreaker, and rehabilitating several port facilities. In addition to these capital improvements, the federal government operates and maintains the system by keeping locks in good repair and dredging shipping channels and harbors. Given recent seaway traffic trends and investments, this report provides an update and activity summary to CRS Report R44664, *The Great Lakes-St. Lawrence Seaway Navigation System: Options for Growth*, by John Frittelli (2016 CRS report).

Figure 1. Cross Section of Navigation System



Source: Figure created by CRS using St. Lawrence Seaway Management Corporation diagram.

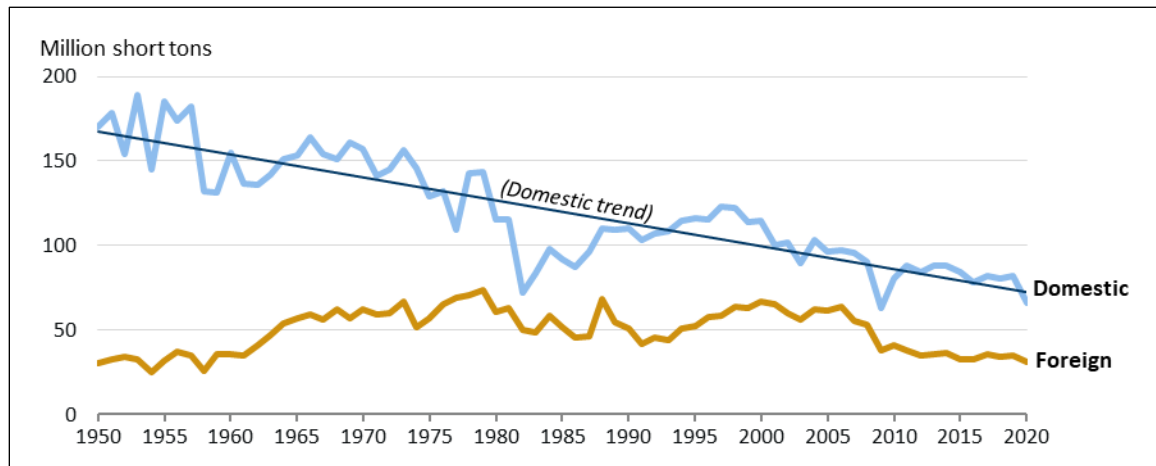
Notes: The figures in meters are lake elevations above sea level. Lake Michigan is at the same elevation as Lake Huron.

Traffic Trends

Steel plants located on the Great Lakes (the lakes) continue to be the prime movers for U.S. shipping activity, with iron ore, the raw material for steelmaking, leading all other commodities in shipping volume. In 2020, iron ore accounted for 42% of tonnage shipped on the lakes.² However, as **Figure 2** indicates, total U.S. shipping volumes have continued their downward trend.

¹ The Great Lakes consist of Lake Superior, Lake Michigan, Lake Huron, Lake Erie, and Lake Ontario. The St. Lawrence Seaway connects these lakes to the Atlantic Ocean.

² U.S. Army Corps of Engineers (USACE), *Waterborne Commerce of the United States, Calendar Year 2020*, at <https://www.iwr.usace.army.mil/About/Technical-Centers/WCSC-Waterborne-Commerce-Statistics-Center-2/WCSC-Waterborne-Commerce/>.

Figure 2. Annual U.S. Tonnage on the Great Lakes

Source: U.S. Army Corps of Engineers (USACE), *Waterborne Commerce Statistics*.

Note: Foreign is U.S. imports and exports to/from Canada and overseas countries.

Figure 3 shows the shipped tonnage over the last decade for the three leading commodities shipped on the lakes: iron ore, limestone, and coal. A significant development since the 2016 CRS report is the closure of the Escanaba, MI, iron ore dock. Because this dock was located on the southern shore of Michigan’s Upper Peninsula, shipments did not need to pass through the Soo Locks at Sault Ste. Marie, MI. The Escanaba docks remained open past the Soo Lock’s winter closure (January 15 to March 25) and opened earlier than the locks in the spring. During its last full year of operation in 2016, the Escanaba dock accounted for about 9% of iron ore shipped on the Great Lakes. The dock closed after one of two iron ore mines to the north closed; the other mine ships its iron ore from Marquette, MI, on the peninsula’s north shore.

Limestone, the second leading commodity shipped on the lakes in tons, is also a raw material of steel manufacturing. It is used in blast furnaces to convert iron ore into pig iron. Limestone shipping volumes are generally dependent on the steel market, although the construction industry also uses limestone.

Coal shipping volumes are declining due to closures of coal-fired power plants or their conversion to natural gas plants, a development not unique to the Great Lakes region. This decline has affected the amount of thermal coal loaded at the Port of Duluth in Minnesota that arrives by rail from Wyoming’s Powder River Basin.³ A lesser amount of metallurgical coal from Appalachia is loaded at Sandusky, OH, and shipped to steel mills.⁴ According to the Lake Carriers’ Association, which has compiled data for U.S.-flag carriers through 2022, coal shipping volumes have rebounded somewhat from their low in 2020 but remain below their levels prior to the Coronavirus Disease 2019 (COVID-19) pandemic.⁵

While foreign trade volumes have remained relatively stable compared with U.S. domestic cargo (**Figure 2**), nearly all such foreign trade is with Canada. In 2020, only 17% of U.S. foreign trade on the lakes was overseas trade, which necessarily would utilize the St. Lawrence Seaway. U.S.

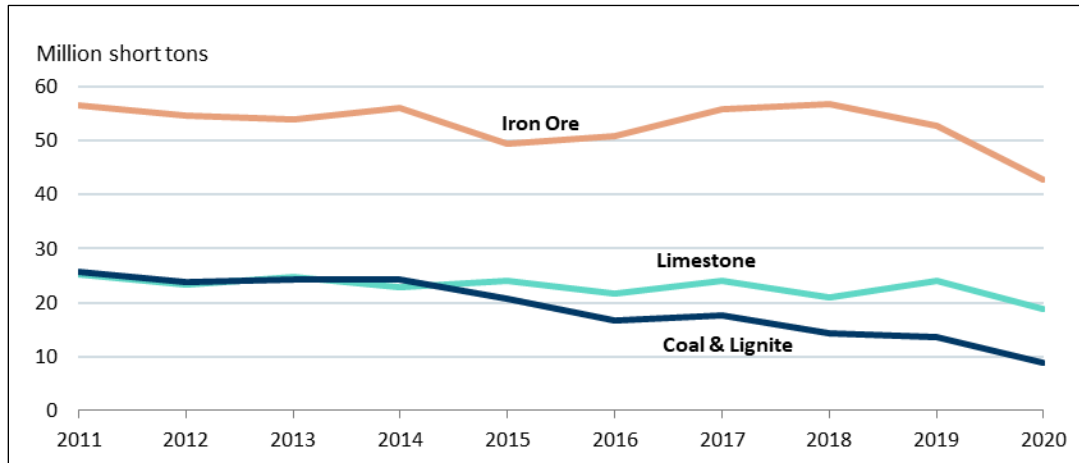
³ Pulitzer Center, “As Energy Use Changes in the Great Lakes, So Too Does the Port of Duluth-Superior,” April 28, 2020, at <https://pulitzercenter.org/stories/energy-use-changes-great-lakes-so-too-does-port-duluth-superior>.

⁴ *Star Beacon*, “Norfolk Southern Closing Ashtabula Docks,” December 24, 2015, at https://www.starbeacon.com/news/local_news/norfolk-southern-closing-ashtabula-docks/article_37d4f173-bc9b-5caf-86bb-58b2d4143cc7.html.

⁵ Lake Carriers’ Association, “U.S.-Flag Great Lakes Shipping Down in 2022,” at <https://lcaships.com/cargo-reports-year-in-review-2022-u-s-flag-vessels/>.

exports of wheat and soybeans distinguish U.S. overseas trade using the seaway, but coal and steel scrap exports, as well as steel product imports, also use this route. As measured by cargo value, steel and aluminum products and machinery are the leading U.S. imports.⁶

Figure 3. Leading U.S. Commodities Shipped on the Great Lakes



Source: USACE, *Waterborne Commerce Statistics*.

Note: A short ton equals 2,000 lbs.

A second tier of commodities, identified in millions of tons rather than tens of millions, encompasses several commodities shown in **Figure 4**. Sand/gravel shows an increasing trend over the last decade. Salt is mostly rock salt shipped from Canada that is used for deicing roads in the winter and for which volumes fluctuate from year to year. Asphalt is shipped primarily from BP’s Whiting oil refinery in Gary, IN. BP states that this is the largest refinery in the Midwest, producing 7% of U.S. asphalt.⁷ It appears most of the asphalt is shipped a relatively short distance to Chicago. The Gary, IN, refinery appears to be the only U.S. refinery located on the lakes that makes extensive use of waterborne shipping (there are six other refineries and several Canadian refineries). Slag is the product left over after iron is extracted from ore. Some of it is used as construction aggregate.⁸ Petroleum coke is a by-product of oil refining that steel mills can use for fuel.⁹ Wheat is exported mostly to overseas markets from the Port of Duluth. Although gasoline and diesel are shipped throughout the lakes, it does not appear that these products are shipped directly from any refinery in significant quantity.¹⁰ No crude oil is shipped on the lakes.

⁶ U.S. Census Bureau, Economic Indicators Division USA Trade Online, U.S. Import and Export Merchandise trade statistics.

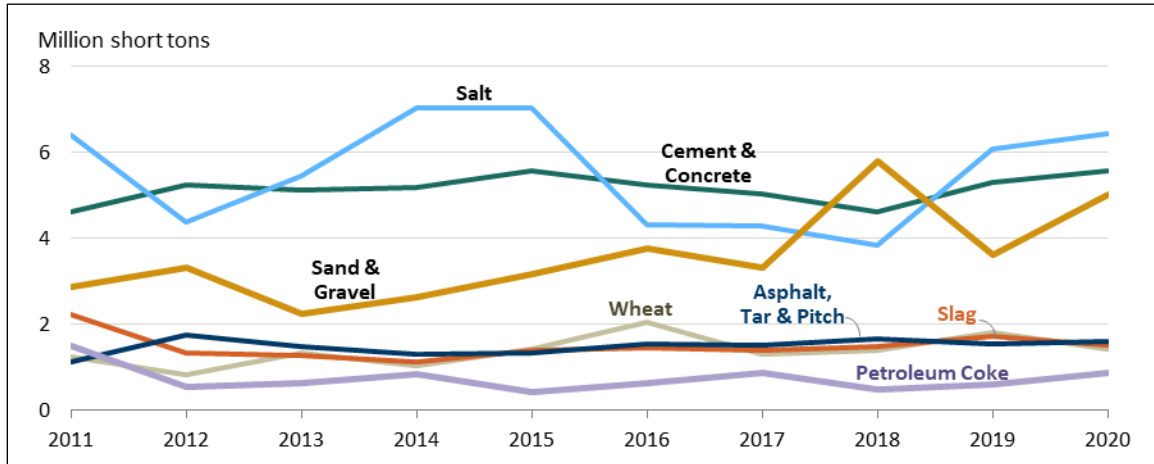
⁷ BP, “Where We Operate,” at https://www.bp.com/en_us/united-states/home/where-we-operate.html. The refinery also produces gasoline, diesel, and jet fuel.

⁸ U.S. Geological Survey, “Slag – What is it Good For?,” June 29, 2017, at <https://www.usgs.gov/news/science-snippet/slag-what-it-good>.

⁹ CRS In Focus IF10507, *Petroleum Coke: Industry, Health, and Environmental Issues*, by Richard K. Lattanzio.

¹⁰ A federally funded research center on oil spill cleanup in freshwater bodies has been established at Lake Superior State University in Michigan.

Figure 4. “Second-tier” Commodities Shipped on the Great Lakes
U.S. volumes



Source: USACE, *Waterborne Commerce Statistics*.

Figure 5 shows the U.S. locations handling 1 million or more tons of the selected commodity indicated in 2020. Most of the ports handling these commodities consist of a terminal or terminals that are privately owned and/or completely utilized by a single shipper that is a vertically integrated corporation. For example, Cleveland-Cliffs Inc. owns both iron ore and coal mines as well as steel mills. Large agricultural trading firms or construction aggregate firms own other ports or terminals. Ashtabula and Conneaut, OH, are transfer points for iron ore shipped by rail to Pittsburgh area steel mills.

Figure 5. Selected U.S. Shipping Docks on the Great Lakes

Locations handling roughly 1 million tons or more of commodity indicated (2020)



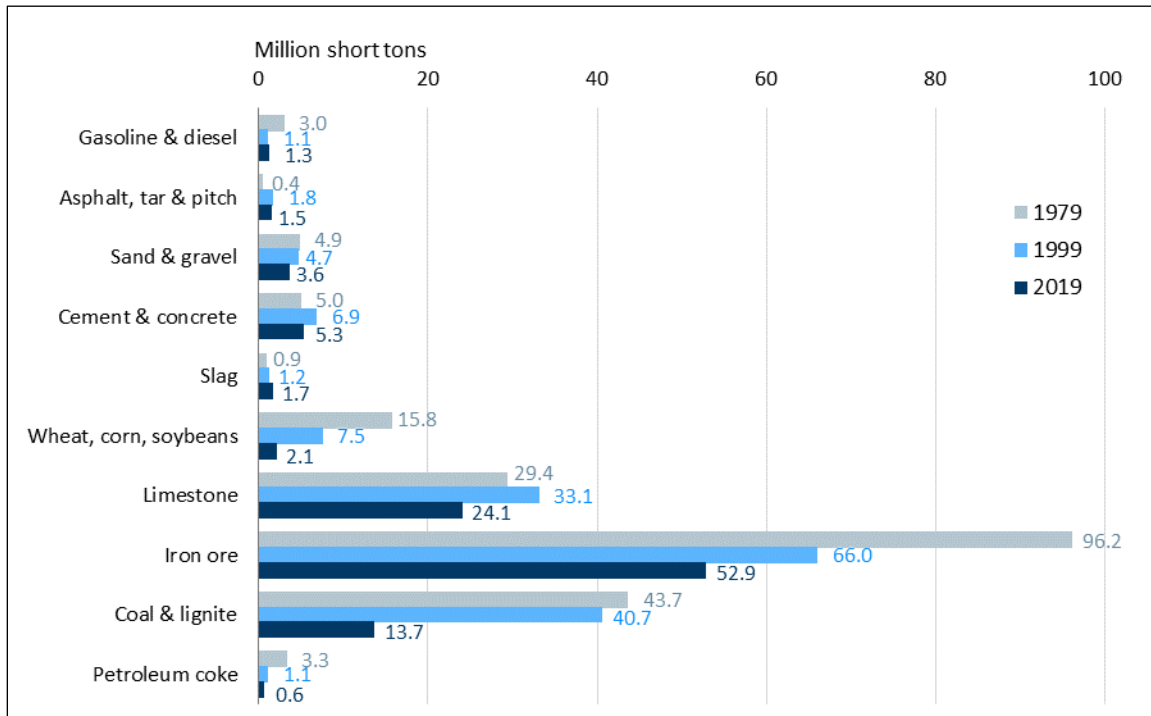
Source: Figure created by CRS with commodity data from USACE, *Waterborne Commerce Statistics*.

Note: Marblehead, OH (near Sandusky), is the actual loading location for limestone.

Figure 6 shows snapshots of shipping volumes in 20-year intervals to illustrate long-term shipping trends on the lakes and seaway. Because the COVID-19 pandemic distorted 2020 volumes, 2019 is used as the most recent year. The figure shows the mainstay commodities that are shipped on the lakes. Iron ore volumes show a steady decline, as steel is increasingly produced from scrap metal in mini mills that are plentiful and scattered throughout the country. As explained in the 2016 CRS report, scrap metal can be readily transported by overland modes, so location to a waterway and proximity to iron ore mines are not relevant to the mini mills. The so-called integrated steel mills located on the lakes that make steel from iron ore cater to the auto industry, which requires a higher grade of steel.¹¹ Coal also exhibits substantial decline, although the downward inflexion point is more recent (see discussion above). Grain crops show substantial decline as the export destination market has shifted from Europe to Asia. Those commodities associated with construction (asphalt, sand and gravel, cement, and slag) do not show a decline, and some of them show an increase. Limestone is used in steel mills as well as in construction. In sum, the deindustrialization of the Rust Belt is evident, but construction materials are making ready use of lake shipping (as presented in **Figure 6**).

¹¹ CRS Report R47107, *Domestic Steel Manufacturing: Overview and Prospects*, by Christopher D. Watson.

Figure 6. Mainstay Commodities Shipped on the Great Lakes
1979, 1999, 2019



Source: USACE, *Waterborne Commerce Statistics*.

Container Shipping Trying to Gain a Foothold Along the Lakes

As discussed in the 2016 CRS report, the Great Lakes are perceived as an unattractive waterway for container shipping, which has kept the Great Lake ports from participating in a vibrant sector of the shipping market. The unattractiveness of the seaway could be due to the transit time required for passage through 15 locks each way, winter closure, and competition with railroads from/to the ports of New York/New Jersey and Montreal. However, the Port of Cleveland has partnered with a container carrier (Amsterdam-based Spliethoff) that provides service to northern Europe. Import volumes have fluctuated between 13 and 75 TEUs per week on an annual basis from 2014 to 2020,¹² and the service has not been able to generate export volume.¹³ For the 2023 shipping season, the carrier has announced that in addition to calling at the Port of Cleveland once per month, the carrier will add the Port of Duluth to its schedule.¹⁴ With the additional port call, the carrier hopes to attract importers and exporters wishing to bypass Chicago rail congestion. The Port of Duluth saw some new container business as a result of severe coastal port congestion during the COVID-19 pandemic. The ships carrying containers on the lakes are often

¹² TEU = 20-foot-equivalent unit, a measure of container shipping volume.

¹³ USACE, *Waterborne Commerce Statistics*, Waterborne Container Traffic, at <https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/1445>.

¹⁴ Minnesota Public Radio, “Great Lakes Shipping Season Begins with Little Ice, New Cargo,” March 24, 2023, at <https://www.mprnews.org/story/2023/03/24/great-lakes-shipping-season-begins-with-little-ice-new-cargos>.

multipurpose vessels that are designed to also carry breakbulk (e.g., bags of flour on pallets) or project cargo (large, oversized pieces like wind tower segments).¹⁵

A Nascent Cruise Business

In 2023, 170,000 passenger visits by cruise ships are forecasted on the Great Lakes, with 11 cruise ships operating in the region. This is an increase from 150,000 passengers and 9 ships in 2022. The ships on average each have accommodations for fewer than 200 passengers. U.S. Customs and Border Protection has improved its services for processing passengers at certain Great Lakes ports, which is expected to reduce inconveniences and delays at port calls.

Canada's Traffic Remains Steady

Canada utilizes the St. Lawrence Seaway to a greater extent than does the United States and more so for its domestic cargo than its overseas cargo.¹⁶ Canada's commodity mix of products resembles that of the United States, but volumes have remained steady over the last 20 years and do not exhibit the United States' long-term downward trend dating back to the 1960s. One possible reason is that Canadian ships have experienced more balanced trade than U.S. ships have, with outbound grain shipments from Thunder Bay, Ontario, and inbound iron ore from Quebec. Canada exports several times more grain than does the United States out of the Great Lakes, and the volume has been steadily increasing over the last 20 years.

Capital Investments

Great Lakes carriers, especially Canadian carriers, have invested in new ships, and a new U.S. government icebreaker is on order.¹⁷ Shippers, along with federal and local governments, have invested in new port facilities.

New Ships

The summer of 2022 marked the launch of the first large, self-propelled ship to have been built in a U.S. shipyard for service on the Great Lakes in about 40 years.¹⁸ Fincantieri Shipyard in Sturgeon Bay, WI, built the *Mark W. Barker* for the Interlake Steamship Company.¹⁹ It joins a fleet of about 30 vessels of similar size and design called "lakers." The other lakers were all built before 1982, with some dating to the 1950s. Like the rest of the laker fleet, the *Mark W. Barker* is designed to carry dry bulk commodities (e.g., the iron ore, limestone, and coal discussed above). Lakers are "self-unloaders" because they have conveyor belts along the bottom of the hull that extend out to a boom on deck that can swing over a wharf to unload cargo. They require virtually no dockworkers for offloading cargo. The ships are proportionally very long for their width because the locks they pass through are relatively narrow.

¹⁵ BigLift Shipping, a sister company of Spliethoff, has shipped windmill parts into the Great Lakes.

¹⁶ St. Lawrence Seaway Management Corporation, "Traffic Reports," at <https://greatlakes-seaway.com/en/the-seaway/facts-figures/traffic-reports/>.

¹⁷ P.L. 117-263, §11104.

¹⁸ Mike Schuler, "Great Lakes' First New US-Flagged Bulk Carrier in 40 Years Sets Sail on Maiden Voyage," gCaptain, July 27, 2022, at <https://gcaptain.com/great-lakes-bulk-carrier-mark-w-barker-maiden-voyage/>.

¹⁹ The Interlake Steamship Company, "M/V Mark W. Barker," at <http://www.interlake-steamship.com/our-fleet/mark-w-barker/>.

Canada also has a fleet of self-unloaders on the lakes. Unlike in the United States, where the Jones Act (§27 of the Merchant Marine Act of 1920, P.L. 66-261) requires all vessels engaging in domestic commerce to be built in U.S. shipyards, Canada permits foreign-built ships and repealed a 25% tariff on imported ships in 2010.²⁰ Since then, the two Canadian carriers that own lakers have replaced most of their fleet, purchasing 18 vessels, 16 of them from Chinese shipyards and two from Croatian yards.²¹

Coast Guard Icebreaker on Order

The St. Lawrence Seaway closes from about the last week of December to about the end of the third week in March, and the Soo Locks close from January 15 to March 25. Icebreakers are needed to break ice in the days/weeks leading up to the closures (from about mid-December), to aid in reopening the locks in March until about early April, and to extend the season for vessels not using the locks. The U.S. Coast Guard has nine vessels in the Great Lakes capable of breaking ice, and Canada has two.²² While Canada charges fees for its icebreaking services, the United States does not. The *Mackinaw* is the largest Coast Guard icebreaker in the lakes. Congress authorized \$350 million for a second, similar-sized Great Lakes icebreaker in December 2022 (NDAA FY2023, P.L. 117-263, §11104), but it may take up to 10 years to design and build this icebreaker in the United States.

A Parallel Soo Lock in the Works

At the Soo Locks site in Sault Ste. Marie, MI, the Poe Lock is the largest and the only lock that can service the lakers transporting dry bulk commodities.²³ The three other locks at the site are smaller than the Poe Lock. Due to concern for the economic impact from having to close the Poe Lock should a long-term repair be required,²⁴ Congress has funded construction of a second Poe-sized lock that would replace the two smallest locks. The most recent cost estimate of the project is \$3.2 billion, up from an earlier estimate of \$922 million, with completion scheduled for 2030. The U.S. Army Corps of Engineers (USACE) cites labor shortages, supply chain disruptions, and increases in material costs as reasons for the project's cost increase.²⁵ Ships delivering cargo to Canadian ports and U.S. ports do not pay tolls when transiting the locks.

²⁰ The Globe and Mail, "Ottawa to waive tariff on foreign ship purchases," October 1, 2010, at <https://www.theglobeandmail.com/news/national/ottawa-to-waive-tariff-on-foreign-ship-purchases/article4327716/>.

²¹ Algoma Central Corporation, "Domestic Dry-Bulk," at <https://www.algonet.com/business-units/domestic-dry-bulk/>; and CSL Group, "Fleet Renewal," at <https://www.cslships.com/en/our-operations/fleet-renewal>.

²² CRS Report RL34391, *Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress*, by Ronald O'Rourke.

²³ The Poe Lock is about a third larger than the next largest lock, the MacArthur Lock.

²⁴ U.S. Department of Homeland Security, National Protection and Programs Directorate, Office of Cyber and Infrastructure Analysis, *The Perils of Efficiency: An Analysis of an Unexpected Closure of the Poe Lock and Its Impact*, October 2015, at <https://www.remi.com/wp-content/uploads/2021/08/DHS-OCIA-The-Perils-of-Efficiency-An-Analysis-of-an-Unexpected-Closure-of-the-Poe-Lock-and-Its-Impact.pdf>.

²⁵ USACE, Detroit District, "New Lock at the Soo reauthorized in WRDA 2022 at \$3.219 billion," December 27, 2022, at <https://www.lre.usace.army.mil/DesktopModules/ArticleCS/Print.aspx?PortalId=69&ModuleId=29374&Article=3254946>.

Port Facility Improvements

The federal government has provided grants to Great Lakes ports to rehabilitate wharfs and docks.²⁶ In some cases, improvements were made with a specific shipper committed to using the facilities; in other cases, facilities were rehabilitated in hopes of attracting new port tenants. For example, at the Port of Milwaukee, a new grain elevator was constructed that will be used by DeLong Company to export animal feed. Lafarge's cement loading dock at Alpena, MI, was upgraded as was a facility at Monroe, MI, for handling wind energy components. Other ports have received grants to purchase or repair basic port infrastructure, such as wharfs and cranes, to be more attractive in advertising for a tenant. Given the amount of dormant property zoned for industrial use at many Great Lakes ports, some shippers are acquiring port land for commercial purposes without an intention of using waterborne transport. Komatsu, an earth-moving equipment manufacturer, purchased Milwaukee port property and built a factory and office headquarters even though it appears that it is planning to use rail and trucks to move product in and out of the factory.

Canada is rehabilitating vacant wharfs and land along the Welland Canal to increase room for cruise ships and in hopes of attracting other waterway users.²⁷

Seaway Maintenance

In addition to the Soo Locks, which USACE directly operates and maintains, the federal government operates and maintains two locks on the St. Lawrence Seaway. (Canada is responsible for 13 other locks on the seaway). The Great Lakes St. Lawrence Seaway Development Corporation administers the U.S. portion of the seaway.²⁸ USACE performs the actual work of repairing the locks and dredging the channels in the seaway. The development corporation's expenses are funded out of the federal Harbor Maintenance Trust Fund, which is supported by a tax on imported and domestic waterborne cargo at coastal and Great Lakes ports. Lock repairs are scheduled habitually in the winter when the seaway is closed to navigation.

²⁶ These grants include two programs administered by the Maritime Administration within the Department of Transportation: the Port Infrastructure Development Program (<https://www.maritime.dot.gov/PIDPgrants>) and the Marine Highway Program (<https://www.maritime.dot.gov/grants-finances/marine-highways/grants>). The BUILD grant program (now RAISE grant program) also awarded a grant to Sault Ste. Marie for dock rehabilitation (<https://ops.fhwa.dot.gov/freight/infrastructure/tiger/>).

²⁷ *Welland Tribune*, "\$45.3million (Can.) Invested into Welland Canal; Three Wharfs to be Reconstructed and Put Back Into Use in Port Colborne with Federal Funding," January 14, 2023.

²⁸ Great Lakes St. Lawrence Seaway Development Corporation, at <https://www.seaway.dot.gov/>.

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