

Soo Locks Asset Renewal Plan

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Project Description

The Soo Locks facility is located on the St. Marys River at Sault Ste. Marie, Michigan, on the international border with Canada. The locks assist ships navigating the 21 foot drop from Lake Superior to the St. Marys River. There are two operating locks at the Soo, the MacArthur Lock, (circa 1943) and the Poe Lock (circa 1969), and two hydropower plants.



Soo Locks Winter Work

Re-capitalizing Infrastructure

The Corps has developed a detailed Soo Locks Asset Renewal Plan that defines the project requirements needed to maximize reliability and reduce the risk of catastrophic failure at the Soo Locks. This plan outlines the work necessary over the next five years to prevent unscheduled closures and provide reliable infrastructure at the Soo Locks through the year 2035. Although construction of a new lock would provide the desired redundancy, a new lock would not be operational for a minimum of 10 years from now. In the meantime, the Corps must implement Asset Renewal on the existing infrastructure at the Soo to reduce risks of unscheduled closures even if the new lock were under construction.

The Critical Need

The St. Marys River is a water bridge connecting Lake Superior with Lake Huron and serves as a critical link in the Great Lakes/St. Lawrence Seaway System. Over 80 million tons of commercial commodities pass through the Soo Locks annually. However, only the Poe Lock has the necessary dimensions to pass all Great Lakes vessels currently in operation. In the event that the Poe Lock is out of service, approximately 65 percent of the Great Lakes fleet carrying capacity would be unable to transit the facility. The Lake Carriers' Association has described the Poe Lock as the "single point of failure that can cripple Great Lakes shipping."

Economic Impacts

A recent study estimated that a 30-day unscheduled closure of the Soo Locks would have an economic impact to industry of \$160 million. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. traverses through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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Soo Locks Asset Renewal Plan

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The table below summarizes the Soo Locks Asset Renewal funding received to date, and lists the major work initiated and/or completed in years 2007 through 2012.

Fiscal Year	Funding (\$1,000's)	Major Work Initiated and/or Completed
2007 -2008	3,100	-MacArthur Lock Gate Clutches and Brakes Replacement -Poe Lock Full Flow Gate Latches Replacement -Poe Lock Pintle Socket Replacement -Poe Lock Stop Logs Initiate Procurement -Communications System Upgrade -Assembly A Pump Switchgear Replacement *
2009	16,500	-Poe Lock Stop Logs Complete Procurement -Unit 10 Powerhouse Runner Repair * -Poe Lock Hydraulics System Equipment Procurement -Sandblast & Paint Mac Lock Gate 6 & Two Cranes -Utility & Steam Line Replacement -New Power Plant Headrace & Tailrace Gate Blasting & Coating * -Poe Lock Service Gallery/Crossover Stairway Replacement
2010	5,580	-Compressed Air System Design -MacArthur Lock Modernization Design -New Power Plant Crib Dam Repair
2011	2,370	-Poe Lock Gate Anchorages Replacement -MacArthur Lock Gate Anchorages Replacement (4 sets)
2012	5,250	-Poe and MacArthur Lock Compressed Air Lines Replacement -MacArthur Lock Gate Anchorages Replacement (2 sets) -MacArthur Lock Bevel Gear Replacement
Total	32,800	

* Included in Hydropower Business Line

The table below summarizes estimated costs of the Soo Locks Asset Renewal Plan through 2016.

Fiscal Year	Estimated Costs of Soo Locks Asset Renewal (\$1,000's)
2012	15,722
2013	21,655
2014	11,380
2015	17,800
2016	20,000
Total	86,557

A detailed project information fact sheet for each major work item is enclosed.

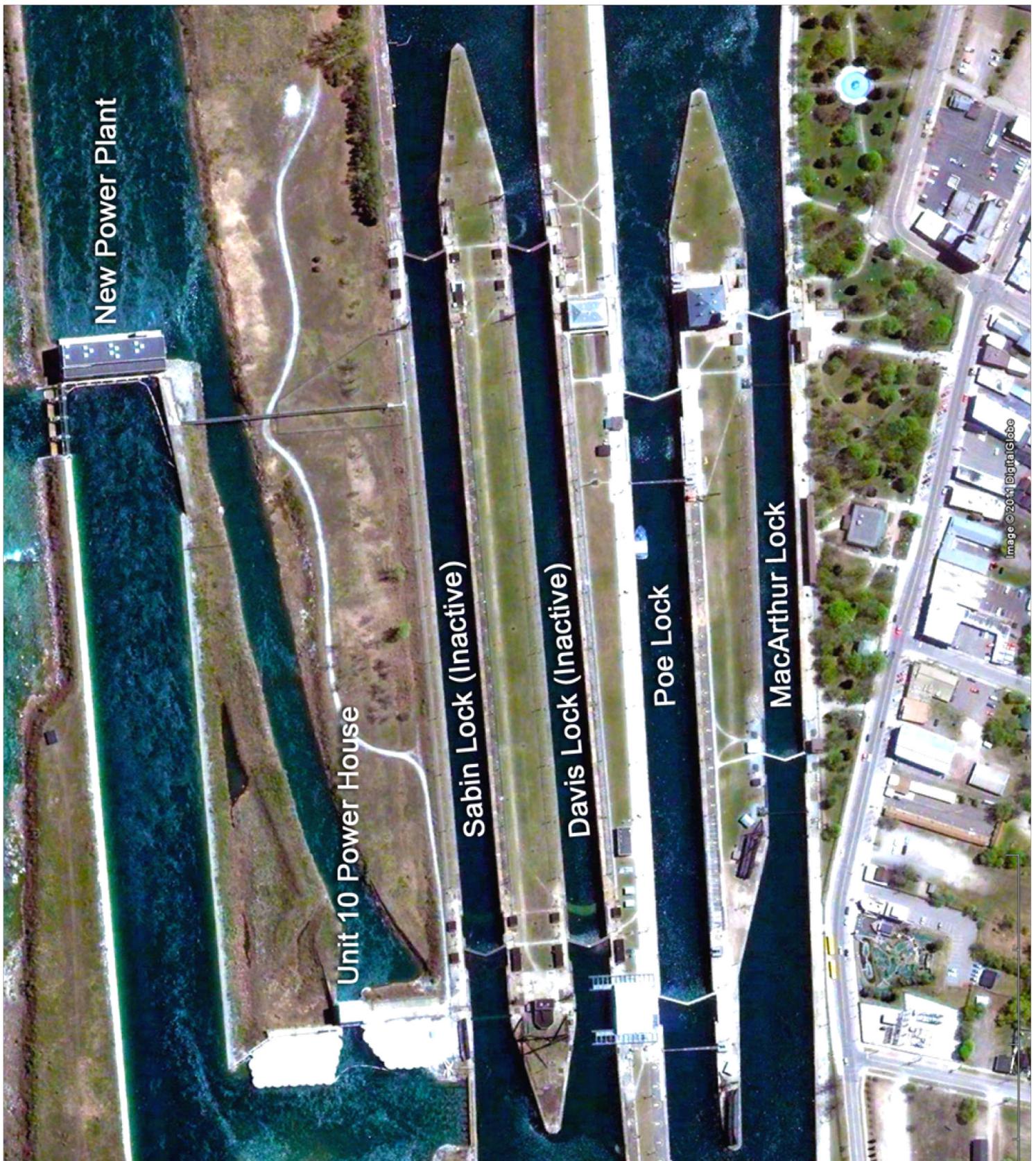
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Soo Locks Facility Map

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Sault Ste. Marie, MI



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Poe and MacArthur Lock Compressed Air System

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

A/E design in progress, completion expected February 2012. Construction of the compressed air lines would begin in FY12. Construction of the compressed air building, compressors and controls could be initiated as soon as funds are available.



Poe Lock Ice Clearing Operations

Project Description

This project replaces the 1970s era compressed air system which is a critical component for winter operations of the Poe Lock. The system keeps ice from forming at the gates and moves ice from the gate area through the use of an air bubbler piping system in the bottom of the gate recesses and point source bubblers. Without adequate ice control measures vessels can become trapped in the lock in heavy ice conditions which puts excessive loads on the downstream miter gates. The original piping system is undersized, has interior scale accumulation due to the system's lack of air driers, and has dead ends which decrease system efficiency and reliability. Additionally, the compressors are undersized and nearing the end of their useful life, and the compressor building is too small. The new system is sized for current requirements but is designed to allow for expansion in the future, is a closed loop system, and is equipped with air driers.

Estimated Cost

Construction of compressed air lines	\$2,100,000
Construction of compressed air building	\$3,400,000
Construction of compressors and controls	\$1,500,000
Total estimated cost	\$7,000,000

Risk & Reliability

Latest Operational Condition Assessment Rating



A - Excellent



B - Good



C - Poor



D - Inadequate



F - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

The Soo Locks typically experience ice conditions that require the use of the compressed air system from December through January and March through May. A failure of the compressed air system during these months would trap vessels in Lake Superior and cause a 14 day lock closure, resulting in an economic impact to industry of \$60 million. The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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Poe Lock Electrical Rehabilitation

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design could be initiated as soon as funds are available; construction could begin one year following design initiation.

Project Description

This project will modernize operations of the Poe Lock by upgrading the electrical infrastructure of the lock for the first time since it was constructed in 1968. Upgrades will reduce risk of prolonged lock outages due to scarcity of replacement parts caused by the system's age. Major components of the project include the removal and replacement of all electrical equipment associated with switchboards, transformers, and the 480 V power loop. The hydraulic operating equipment and their controls are currently being updated. Upgrading the electrical supply equipment to the lock will complete the electrical/mechanical rehabilitation of the lock increasing the safety, reliability, and availability of replacement parts, and decreasing the likelihood and duration of unscheduled lock outages.



Estimated Cost

A/E design	\$600,000
Construction contract	\$4,000,000
Total estimated cost	\$4,600,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

While the Poe Lock electrical system's latest OCA rating was a "B", the scarcity of spare parts due to age of the system greatly increases the likelihood and duration of unscheduled lock outages resulting in a downgrade of the condition ranking.

Economic Impacts of Unscheduled Lock Outages

The Poe Lock is one of two navigation locks used by commercial vessels to traverse the St Marys Falls Canal. It is the larger of the two, and the only lock capable of handling the thousand foot Great Lakes vessels. A failure in the lock's electrical system could lead to a 7 day unscheduled lock outage which would result in an economic impact to industry of \$30 million. An electrical system overhaul would reduce the duration of an unscheduled outage due to availability of replacement parts. Approximately 65% of the tonnage flowing through the Soo Locks is restricted to the Poe Lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Poe Lock Gate Coating Replacement

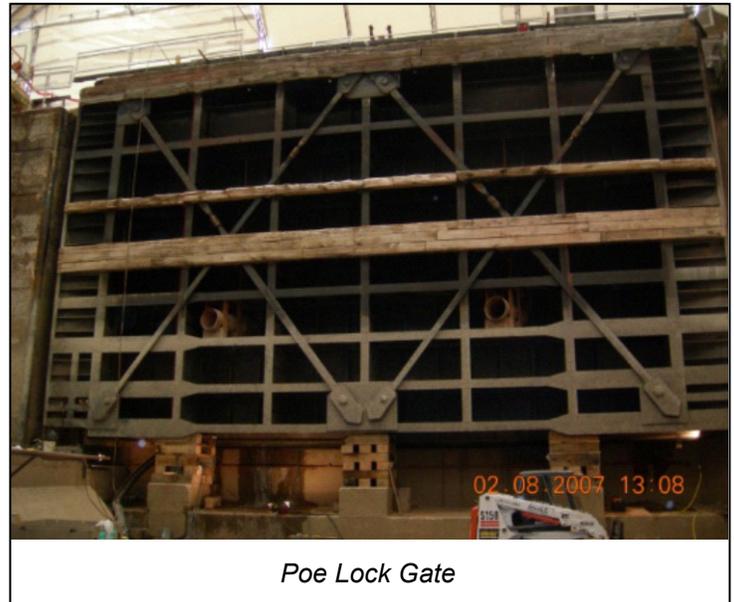
Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

This project would include blasting and painting Gates 1 through 4 on the Poe Lock. The coatings on these gates are in the beginning stages of failure and need to be replaced before corrosion occurs and causes structural damage. If coatings are not replaced and corrosion is allowed to occur, the lock could be taken out of service due to structural problems. Previous coating replacement on Gates 2 and 5 on the MacArthur Lock showed that portions of the structural steel on those gates had corroded to the failed state. Comparable corrosion of steel on the Poe Lock gates is anticipated. The Poe Lock must remain in service to meet the navigation industry's capacity requirements. Without replacement of the coating on the Poe Lock gates, they will need to be replaced at an estimated cost of \$6 million per set of gate leaves.



Estimated Cost

In-house design	\$75,000
Gate coating construction contract	\$4,000,000
Total estimated cost	\$4,075,000

Risk & Reliability

Latest Operational Condition Assessment Rating



A - Excellent



B - Good



C - Poor



D - Inadequate



F - Failing or Failed

Impacts of Unscheduled Lock Outages

The national impact due to a forced outage of the Poe Lock would be significant as approximately 65% of the tonnage flowing through the Soo Locks is restricted to this lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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Poe Lock Gate 1 Replacement

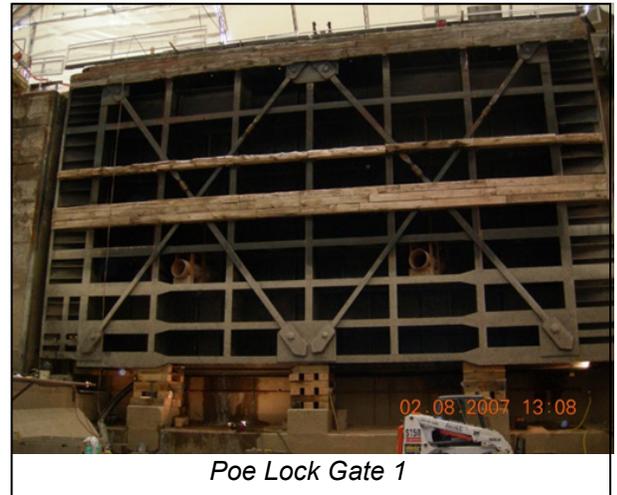
Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design could be initiated as soon as funds are available.

Project Description

The project consists of replacing Gate 1 on the Poe Lock, which is the upstream gate set for the lock. Due to vessel impacts, the framing girders on Gate 1 travel one cm vertically during the mitering cycle, which makes mitering very difficult. The existing set of gates would be refurbished and retained as a spare set for use in case of an emergency. The likelihood of a gate leaf being taken out of service is greatly increased due to the damage the gate girders have sustained. Because Gate 1 is the only set of gate leaves on the upper end of the Poe Lock, it is imperative that this gate is in proper working order.



Estimated Cost

Design – by LRH	\$300,000
Construction contract	\$6,000,000
Total estimated cost	\$6,300,000

Risk & Reliability

Latest Operational Condition Assessment Rating

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

If a gate leaf were to be taken out of service from Gate 1 of the Poe Lock, it would temporarily be replaced with a gate from the Poe's spare set of downstream dewatering gates. This maneuvering of gates would result in a 75 day unscheduled closure of the Poe Lock which would have an economic impact to industry of \$320 million. Sixty-five percent of the Soo Lock's tonnage goes through the Poe Lock. The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Poe Lock South Canal Air Curtain for Upper Approach

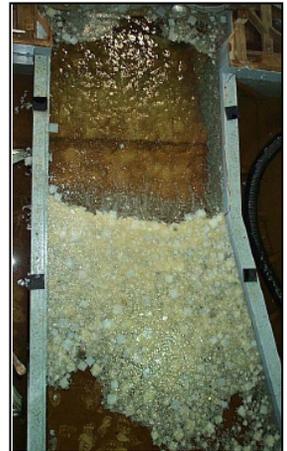
Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

This project includes the installation of an air curtain upstream of the Poe and MacArthur Locks in the South Canal. The Poe Lock is required to remain in service during periods of heavy ice cover, which coincide with the USCG Operation Taconite. When locking downstream in heavy ice, vessels are frequently trapped in ice from the upper river, which places an excessive force on the downstream miter gates. Additionally, extra gate and valve cycles are run during heavy ice conditions in order to flush trapped ice through the system, which puts extra wear on the gates and valves and can increase the length of the lock cycle by two hours. The installation of an air curtain in the south canal would deflect ice from the Poe Lock and allow for the use of the MacArthur Lock to pass the ice downstream into the lower river. An air curtain system would both reduce ice related lockage delays and decrease the number of ice related gate and valve cycles. The use of a high-flow air curtain system to deflect ice at the Soo Locks facility was tested using hydraulic modeling and found to be feasible by the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL).



Hydraulic model of Soo Locks air curtain

Estimated Cost

In-house design	\$50,000
Construction contract	\$1,050,000
Total estimated cost	\$1,100,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

This project would be considered a betterment, so it does not have a formal operational condition assessment. However, based on expert judgment the current ice management system is poor.

Impacts of Unscheduled Lock Outages

The Soo Locks experience ice conditions from December through January and March through May. A loss of service or degradation of service during these months can trap vessels in Lake Superior and potentially affect the flow of approximately 24,000,000 tons of cargo. The national impact due to an outage of the locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other commodities include coal, grain, stone, and fuel.



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MacArthur Lock Gates 3 and 4 Coating Replacement

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

The project includes the sandblasting and painting of gates 3 and 4 on the MacArthur Lock. The coating on the gates is failing and must be replaced prior to corrosion significantly damaging the structural steel. Deterioration of the gates is occurring due to the age of the MacArthur Lock gate coatings. If allowed to continue, the lock could be taken out of service due to structural problems. Previous coating replacements on Gates 2 and 5 showed that portions of the structural steel on those gates had corroded to the failed state. Comparable corrosion of steel on the remaining gates is anticipated.



Estimated Cost

In-house design	\$50,000
Construction contract	\$1,500,000
Total estimated cost	\$1,550,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

<input type="checkbox"/> A - Excellent	<input type="checkbox"/> B - Good	<input type="checkbox"/> C - Poor	<input checked="" type="checkbox"/> D - Inadequate	<input type="checkbox"/> F - Failing or Failed
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While the latest OCA ratings for gates 3 & 4 of the MacArthur Lock was a "B", the OCA ratings encompass the entire gate, not just the coating. Gates 3 & 4 are in fair condition, but the coating on the gates is inadequate and must be replaced prior to corrosion significantly damaging structural steel. When isolated, the expert condition ranking of the gate coatings is lower than the overall OCA rating for the gates.

Economic Impacts of Unscheduled Lock Outages

A closure of the MacArthur Lock would increase traffic through the Poe Lock and result in vessel delays. For every four hours a thousand foot vessel is delayed, a loss of \$10,000 is incurred by shippers. The national impact due to a forced outage of the MacArthur Lock would be significant as approximately 40% of the tonnage through the Soo Locks passes through the MacArthur Lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Mac Arthur Lock Modernization

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

A/E design complete. Construction could be initiated as soon as funds are available.

Project Description

This project will modernize operations of the MacArthur Lock by upgrading the electrical infrastructure and controls system, which was originally constructed in 1943. Upgrades will: (1) provide valve to gate interlocks (lock currently has none), (2) replace 460 V controls for the gate valves and fender booms, which currently pose a life safety hazard, (3) update all electrical equipment associated with switchboards, transformers, and 460 V power loop, and (4) replace control benchboards. Upgrades will consist of modern components lending to increased safety, reliability, and supportability for facility staff and equipment. The problems with the electrical infrastructure of the MacArthur Lock increase each year and are multi-faceted. Finding replacement parts is nearly impossible, and the risk of prolonged outages has increased due to this supportability issue.



Estimated Cost

Construction of power and controls	\$5,500,000
Construction of mechanical system	\$180,000
Construction of lighting system	\$171,000
Construction of fire alarm system	\$130,000
Total estimated cost	\$5,981,000

Risk & Reliability

Latest Operational Condition Assessment Rating

<input type="checkbox"/> A - Excellent	<input type="checkbox"/> B - Good	<input type="checkbox"/> C - Poor	<input type="checkbox"/> D - Inadequate	<input checked="" type="checkbox"/> F - Failing or Failed
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Economic Impacts of Unscheduled Lock Outages

The MacArthur Lock Modernization project includes the installation of interlocks, which the lock currently lacks. Without interlocks it is possible that a gate could be lost, which would result in a 6 month outage of the MacArthur Lock, increase traffic through the Poe Lock, and lead to extensive vessel delays. For every four hours a thousand foot vessel is delayed, a loss of \$10,000 is incurred by shippers. The national impact due to a forced outage of the MacArthur Lock would also be significant as approximately 40% of the tonnage through the Soo Locks passes through the MacArthur Lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



MacArthur Lock Tainter Valve Bulkheads

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

The existing MacArthur Lock tainter valve bulkheads are over 60 years old and leak due to the system's original inadequate seal design. The valve bulkheads are a critical part of maintenance efforts on the MacArthur Lock. If tainter valve repairs are needed, there is no way to isolate the valves from the water without dewatering the entire lock. Therefore, the bulkheads need to be modified or replaced to provide the capability of dewatering just the valves. Without replacement of or modifications to the bulkhead system, tainter valve repairs will result in unscheduled lock outages while the lock chamber is dewatered in order to make necessary repairs.



Estimated Cost

A/E design	\$100,000
Construction contract	\$800,000
Total estimated cost	\$900,000

Risk & Reliability

Latest Operational Condition Assessment Rating

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

Due to the age and design of the current valve bulkhead system it is necessary to upgrade the design for proper sealing. Without properly sealing bulkheads the tainter valves cannot be repaired without completely dewatering the MacArthur Lock. A closure of the MacArthur Lock would increase traffic through the Poe Lock and result in vessel delays. For every four hours a thousand foot vessel is delayed, a loss of \$10,000 is incurred by shippers. The national impact due to a forced outage of the MacArthur Lock would also be significant as approximately 40% of the tonnage through the Soo Locks passes through the MacArthur Lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Poe and MacArthur Lock Gate Anchorages Replacement

Army Corps of Engineers, St. Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

IN PROGRESS

Poe Lock: Supply contract awarded for ten anchorages in FY11.

MacArthur Lock: Supply contract for eight anchorages awarded in FY11. Supply contract for four anchorages to be awarded in FY12.

Project Description

Non-destructive testing performed on the Poe and MacArthur Lock anchor bars led to the discovery of fatigue cracks in the anchorage link welds. Ten Poe Lock and twelve Mac Lock anchorage assemblies must be replaced because of these fatigue cracks. The recent failure of a gate anchorage at another Corps lock facility due to an improper weld has shown that the consequences can be very costly. The fatigue cracks discovered in the Poe and MacArthur Lock anchorage links could lead to a catastrophic failure and result in a gate being dropped which would result in an unscheduled lock outage.



Poe Gate Anchorage Link

Estimated Cost

Poe Anchorage Assemblies	\$1,400,000
Mac Anchorage Assemblies	\$1,470,000
Total estimated cost	\$2,870,000

Risk & Reliability

Latest Operational Condition Assessment Rating



A - Excellent



B - Good



C - Poor



D - Inadequate



F - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

Failure of a Poe anchorage assembly could lead to the loss of a gate, causing a 75 day unscheduled closure of the Poe Lock which would have an economic impact to industry of \$320 million. In addition, proactively replacing the anchorages would save the federal government millions in maintenance costs as the cost to replace each of the ten Poe Lock gate anchorages is \$140,000 whereas the cost to repair and re-install a dropped gate is \$3M. The national impact due to a forced outage of the Poe Lock would be significant as approximately 65% of the tonnage flowing through the Soo Locks is restricted to this lock. The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product; other major commodities include coal, grain, stone, and fuel.



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Poe Lock Hydraulics System Replacement

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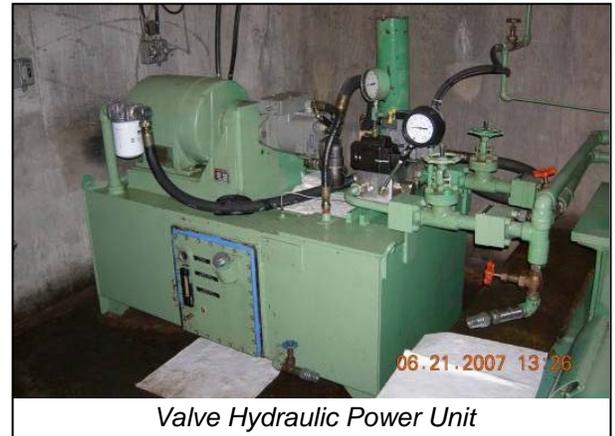
Status

IN PROGRESS

Parts procured, installation scheduled for winter work periods for 2011 through 2013.

Project Description

This project will replace the 40+ year old Poe Lock hydraulic system. Many unscheduled outages of the Poe Lock in the past few years were attributable to problems with the hydraulic system due to a combination of the system's lack of redundancy and the difficulty finding spare parts caused by the system's age. This project will replace the twenty four separate hydraulic power units with four units, each equipped with a redundant pump and motor, thus reducing probability of loss of service. Among other things, the hydraulic system operates the miter gates, miter gate latches and tainter valves. The outdated system requires the opening of a filling or emptying valve to supply the necessary force to perform gate closings. Using valves to perform gate closings results in gates slamming during closures, requires that the lock be operated without a safety interlock system, and increases the risk of losing a gate. Loss of a gate or a failure of the hydraulic system would cause immediate impact to the vessels using the facility. The Poe Lock must remain in service to meet the minimum critical needs of the Great Lakes fleet.



Valve Hydraulic Power Unit

Estimated Cost

Procurement of major parts	\$3,000,000
Procurement of miscellaneous parts	\$50,000
Total estimated cost	\$3,050,000

Risk & Reliability

Latest Operational Condition Assessment Rating

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

Replacement of the Poe Lock hydraulics system includes the installation of interlocks, which the lock currently lacks. Without interlocks it is possible that a gate could be lost which would lead to a 75 day outage of the Poe Lock and result in an economic impact to industry of \$320 million. The national impact due to a forced outage of the Poe Lock would be significant as approximately 65% of the tonnage flowing through the Soo Locks is restricted to this lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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MacArthur Lock Bevel Gear Replacement

Army Corps of Engineers, St. Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

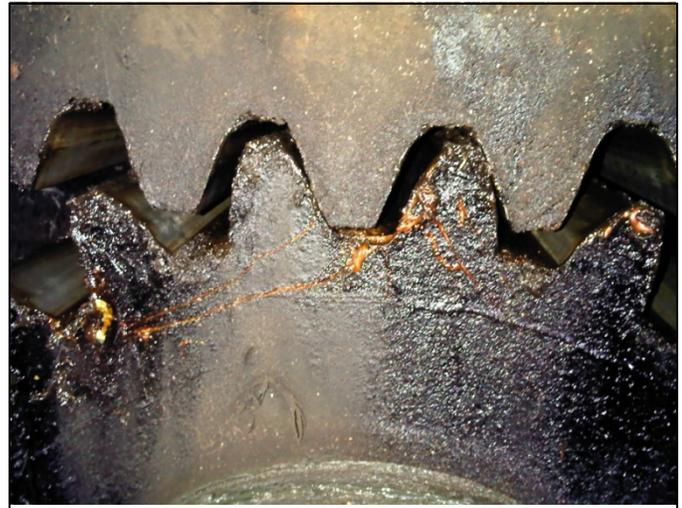
Status

IN PROGRESS

Procurement of bevel gears to be initiated in FY12.

Project Description

The MacArthur Lock bevel gears work in combination with other gears to transmit power from an electric motor in order to move the lock's miter gates. Without these gears the lock could not function. Due to the excessive wear on the gear teeth, all 8 gear sets must be replaced. This wear has caused extreme movement in the shaft that drives the bevel gear. This movement has directly resulted in damage to seals and housings in other gear sets. If not addressed, further costly damage to the other gear sets will result.



Worn Teeth on a MacArthur Lock Bevel Gear

Estimated Cost

Supply contract	\$500,000
Total estimated cost	\$500,000

Risk & Reliability

Latest Operational Condition Assessment Rating



A - Excellent



B - Good



C - Poor



D - Inadequate



F - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

Failure of a bevel gear would lead to longer lockage cycles and failure of multiple gears could lead to an outage of the MacArthur Lock. A closure of the MacArthur Lock would increase traffic through the Poe Lock and result in vessel delays. For every four hours a thousand foot vessel is delayed, a loss of \$10,000 is incurred by shippers. The national impact due to a forced outage of the MacArthur Lock would also be significant as approximately 40% of the tonnage through the Soo Locks passes through the MacArthur Lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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Poe and MacArthur Lock Utility Lines and Steam System Replacement

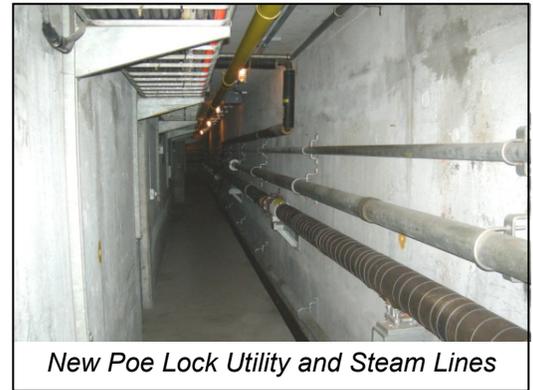
Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

COMPLETED

Project Description

Due to the safety, age, and new demands being placed on the Poe and MacArthur Lock's steam system it was essential that it be replaced and upgraded. The steam lines are primarily used for de-icing gates and equipment, winter work heat, and heat for the Administration and Davis Buildings. The Poe steam lines were of late 60's vintage and the MacArthur lines were of WW2 era. The lines in the system had issues such as improper trapping, line corrosion, incorrect line sizing, deteriorated or non-existent insulation, and lack of redundancy in areas. These factors led to unsafe line "blowouts" in certain areas of the system, causing excessive 'emergency' maintenance. Additionally, the system's boilers were being strained more than ever by the heating requirements of the fabric structure used for maintenance work during the annual winter shut down of the locks. In addition to replacing the existing lines, new lines were incorporated into the steam system to accommodate the heating requirements of the fabric structure used for winter work. The repair and replacement of these lines has increased the reliability of lock operations during winter months and has decreased the risk of halting maintenance work during the winter shut down period due to lack of steam.



Project Cost

Design-build contract	\$6,750,000
Total cost	\$6,750,000

Risk & Reliability

Operational Condition Assessment Rating Prior to Completion of Project

A - Excellent B - Good C - Poor D - Inadequate - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

Failure of the steam system could have led to a 30 day unscheduled closure of the Soo Locks which would have resulted in an economic impact to industry of \$160 million. The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Poe Lock Full Flow Gate Latches

Army Corps of Engineers, St. Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

COMPLETED

Project Description

The Poe Lock's "light duty" gate latches, which were installed on the lock shortly after it was put into operation in 1968, were replaced with full flow gate latches in 2008. The "light duty" latches did not function in cold weather and had a low rate of reliability. In the event that an uncontrolled flow was experienced in the lock chamber, the gates would have been torn from their anchorages and lost despite the use of the "light duty" latches. The new full flow gate latches were required to protect the miter gates in the event of an uncontrolled full flow. In addition, a reliable gate latching system is required to ensure safety to miter gates when flushing ice from the chamber; ice flushing is typically required during three months of the navigation season. The lack of full flow gate latches at another Corps lock facility recently resulted in a miter gate failure during ice flushing operations.



Poe Full Flow Gate Latches

Estimated Cost

Gate latches supply and installation	\$500,000
Total cost	\$500,000

Risk & Reliability

Operational Condition Assessment Rating Prior to Completion of Project

<input type="checkbox"/> A - Excellent	<input type="checkbox"/> B - Good	<input type="checkbox"/> C - Poor	<input checked="" type="checkbox"/> D - Inadequate	<input type="checkbox"/> - Failing or Failed
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Economic Impacts of Delaying Repairs

The absence of full flow gate latches on the Poe Lock could have led to the loss of a gate, causing a 75 day outage of the Poe Lock, resulting in an economic impact to industry of \$320 million. The national impact due to a forced outage of the Poe Lock would be significant as approximately 65% of the tonnage flowing through the Soo Locks is restricted to this lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Poe Lock Stop Logs

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal Plan
Sault Ste. Marie, MI

Status

COMPLETED

Project Description

A second set of stop logs (six stop logs and a lifting beam) was needed for the Poe Lock. This additional set allows for the dewatering of the downstream dewatering gates. The downstream dewatering gates were designed to be used as the spare set of upstream operating gates, but without a second set of stop logs these downstream dewatering gates couldn't be used as spare upstream gates. The second set of stop logs also allows for the dewatering of the upstream end of the lock which is required to adjust miter and quoin blocks and to replace backing material for quoin blocks when undertaking a gate replacement. This undertaking was not possible at the upstream end of the lock without the second set of stop logs.



Delivery of New Poe Lock Stop Logs

Project Cost

Design and initiate fabrication	\$1,400,000
Complete fabrication	\$3,200,000
Total cost	\$4,600,000

Risk & Reliability

Assessment Rating Based on Expert Judgment Prior to Completion of Project

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

This project was a betterment, so it did not have a formal operational condition assessment. However, based on expert judgment the lack of a second set of stop logs was inadequate.

Economic Impacts of Unscheduled Lock Outages

In the event of the need for emergency gate replacement, the lack of a second set of stop logs could lead to a 75 day outage of the Poe Lock and result in an economic impact to industry of \$320 million. The national impact due to a forced outage of the Poe Lock would be significant as approximately 65% of the tonnage flowing through the Soo Locks is restricted to this lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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MacArthur Lock Gate 6 Coating Replacement

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

COMPLETED

Project Description

The project included sandblasting and painting of Gate 6 and the replacement of broken tensioning straps on Gate 6 of the MacArthur Lock. Due to age, the gate coating was failing and in need of replacement before corrosion could significantly damage the structural steel. If allowed to continue, the structural integrity of the gates would have been compromised, which may have led to a shutdown of the lock. The situation that had previously occurred with Gates 2 and 5, where portions of the structural steel corroded to the failed state, was avoided by replacing the coating on Gate 6.



Coating replacement in progress on the MacArthur Lock Gate 6

Project Cost

Construction contract	\$600,000
Total cost	\$600,000

Risk & Reliability

Assessment Rating Based on Expert Judgment Prior to Completion of Project



A - Excellent



B - Good



C - Poor



D - Inadequate



F - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

Failure of Gate 6, a dewatering gate, would result in the use of bulkheads during the planned winter closure of the Mac Lock, thus reducing its operating season by two days each year. The national impact due to a forced outage of the MacArthur Lock would be significant as approximately 40% of the tonnage through the Soo Locks passes through the MacArthur Lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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New Power Plant & Unit 10 Station Service Switchgear Replacement

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

The Station Service Switchgear at the New Power Plant (NPP) and at the Unit 10 Powerhouse is in need of replacement. The switchgear is dated, unreliable, and suppliers no longer carry “off-the-shelf” parts. The switchgear in the NPP was commissioned in 1951 and the switchgear at Unit 10 was commissioned in 1948. This switchgear supplies the power to run the air compressors, sump pumps, oil pumps, cranes, and all other auxiliary equipment associated with hydropower generators. A failure of this equipment would shut down one or more of the five generators, which could result in a shutdown of the NPP or the Unit 10 Powerhouse and would likely damage related equipment. A failure of this equipment would affect the operations of the Soo Locks and impact the availability of power to the surrounding communities and region.



Estimated Cost

A/E design	\$125,000
Construction contract	\$500,000
Total estimated cost	\$625,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

<input type="checkbox"/> A - Excellent	<input type="checkbox"/> B - Good	<input checked="" type="checkbox"/> C - Poor	<input type="checkbox"/> D - Inadequate	<input type="checkbox"/> F - Failing or Failed
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Economic Impacts of Unscheduled Power Plant Outages

The primary mission of the NPP and Unit 10 is to supply electrical power to the Soo Locks. Secondly, the NPP and Unit 10 are important to the surrounding communities and eastern half of the upper peninsula of Michigan. Over 97% of the actual power generated within the NPP and Unit 10 plants goes into the regional grid, equating to nearly 15% of the power consumed for the region. A one month outage of the power supplied by the NPP and Unit 10 would result in a \$700k loss of revenue to industry, and a \$150k loss of revenue to the U.S. Treasury.



New Power Plant Maintain and Bury Power Cables

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal

Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

This project consists of burying high voltage power cables and providing permanent duct vault supports. The cables transmit power generated by the New Power Plant (NPP) and the Unit 10 Powerhouse to the rest of the facility and the regional grid. The power cables are currently suspended beneath the 400 ft footbridge, which was constructed as part of the NPP in 1950 and was intended to be temporary. The duct vault, which supports the north end of the footbridge, is supported on wooden timbers that are in various levels of decay. The wood is part of a temporary wood crib built in the 1950's. The original plan was to expand the NPP, remove the footbridge, wood crib, duct bank, and vault and either bury the power cables or place them within the expanded NPP. Expansion of the NPP never happened. The temporary footbridge and wood crib became permanent, and the 15 kilovolt cables transmitting up to 25 megawatts of energy are still supported by temporary structures. The constant exposure of the power cables to the elements of weather and bridge-related traffic affects the long term reliability of the cables. In addition, the continued deterioration of the wood cribbing beneath the vault threatens the stability of both the footbridge and the power cables. The cables are also vulnerable, security-wise, to threats approaching from the water. A failure of any one power cable could shut down the NPP and Unit 10 with damage to related equipment likely.



Estimated Cost

Plans and specifications	\$250,000
Construction contract	\$1,500,000
Total estimated cost	\$1,750,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

Economic Impacts of Unscheduled Power Outages

The primary mission of the NPP and Unit 10 power plants is to supply electrical power to the Soo Locks. Secondly, the NPP and Unit 10 are important to the surrounding communities and eastern half of the upper peninsula of Michigan. Over 97% of the actual power generated within the NPP and Unit 10 plants goes into the regional grid, equating to nearly 15% of the power consumed for the region. A one month outage of the power supplied by the NPP and Unit 10 would result in a \$700k loss of revenue to industry, and a \$150k loss of revenue to the U.S. Treasury.



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New Power Plant Protective Relays Replacement

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

The project will replace the 50+ year old protective relays located in the New Power Plant (NPP). These relays shut down electrical equipment upon high-energy faults associated with a hydro-electric generator or one of the power feeders connected to the regional power grid. Protective relays protect generator equipment by opening electrical breakers upon detecting an electrical fault. They are extremely important since they react immediately; extensive damage to generator equipment would result if a protective relay fails to trigger.



New Power Plant
Protective Relays

The existing protective relays are of an electro-mechanical design. They are experiencing failures during annual performance testing and require a high degree of maintenance. Some relay types are no longer supported by the manufacturer, General Electric, and are supported by reusing parts from old unused relays on-hand in the plant. If a protective relay fails to trigger, an extended outage could occur and electrical components would likely have to be replaced. Additionally, the potential for costly rewinding of generators is high.

Estimated Cost

A/E design	\$75,000
Construction contract	\$500,000
Total estimated cost	\$575,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

Economic Impacts of Unscheduled Power Plant Outages

The primary mission of the NPP is to supply electrical power to the Soo Locks. Secondly, the NPP is important to the surrounding communities and eastern half of the upper peninsula of Michigan. Over 97% of the actual power generated within the NPP and Unit 10 plants goes into the regional grid, equating to nearly 15% of the power consumed for the region. A one month outage of the power supplied by the NPP and Unit 10 would result in a \$700k loss of revenue to industry, and a \$150k loss of revenue to the U.S. Treasury.



New Power Plant Repair Spalling of Spiral Cases of Main Turbines

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal

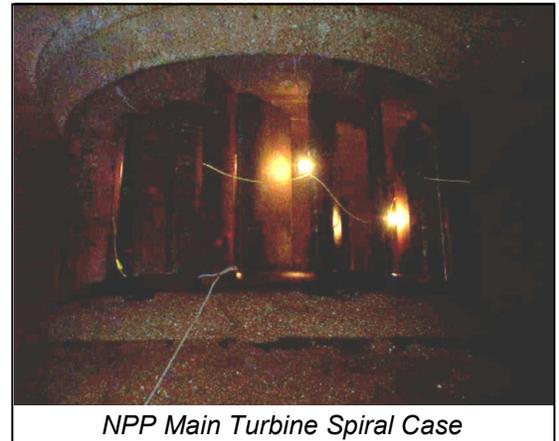
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

This project would repair concrete located in the turbine spiral case of the three main hydro generators within the new power plant (NPP). Each spiral case consists of curved surfaces constructed of concrete which directs water through the wicket gates and onto the turbine wheel. The three main hydro generator units, Units 1 through 3, have been operated under 24 hour a day, 7 day a week conditions since they were commissioned in 1951, with the exception of 30 to 50 hours of annual maintenance. The constant water flow for the past 60 years has deteriorated the concrete in the turbine spiral cases which is demonstrated by the number of cavities, velocity and volume of water spray from the cold-joints, and wide-spread spalling. One cavity extends over 10 inches into the ceiling and several side-walls leak with water entering from the adjacent hydro unit. Spalling, which is under-mining the steel structure for the wicket gates and extends from floor to ceiling on the surrounding walls, is evident on all surfaces located near the spiral case. The cavities and leaks are causing permanent, un-repairable damage since they extend into the inner concrete structure. If this deterioration is not addressed, the deterioration rate of the concrete will increase and eventually long-term outages could occur resulting in expensive repairs. Spalling is easily mitigated by the application of a polymer coating. This was done successfully to Unit 3A in 1997.



Estimated Cost

In-house design	\$150,000
Construction contract	\$1,000,000
Total estimated cost	\$1,150,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

<input type="checkbox"/> A - Excellent	<input type="checkbox"/> B - Good	<input type="checkbox"/> C - Poor	<input checked="" type="checkbox"/> D - Inadequate	<input type="checkbox"/> F - Failing or Failed
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Economic Impacts of Unscheduled Power Plant Outages

The primary mission of the NPP is to supply electrical power to the Soo Locks. Secondly, the NPP is important to the surrounding communities and eastern half of the upper peninsula of Michigan. Over 97% of the actual power generated within the NPP goes into the regional grid, equating to nearly 15% of the power consumed for the region. A one month outage of the power supplied by the NPP would result in a \$700k loss of revenue to industry, and a \$150k loss of revenue to the U.S. Treasury.



Unit 10 Transformer Replacement

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

The project will replace the transformer that connects the Unit 10 Powerhouse with the New Power Plant (NPP). The transformer is rated for indoor usage, but is installed in a tightly spaced, outdoor shelter that lacks environmental controls. The excessive heat, moisture, and dust to which it is exposed have led to the deterioration of the transformer's insulation and laminate core. Additionally, these conditions affect the manufacturer supplied electronics that report temperatures and alarms and have led to the need for frequent replacement of cooling fans. Deterioration of the transformer would lead to a 13,800 V electrical fault resulting in severe damage to the NPP and to the Unit 10 powerhouse, affecting the primary source of power for the Soo Locks.



Estimated Cost

A/E design	\$125,000
Construction contract	\$500,000
Total estimated cost	\$625,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

Economic Impacts of Unscheduled Power Plant Outages

A principle mission of Unit 10 is to supply electrical power to the Soo Locks. Secondly, Unit 10 is important to the surrounding communities and eastern half of the upper peninsula of Michigan. Over 97% of the power generated within the Unit 10 powerhouse goes into the regional grid, equating to nearly 2% of the power consumed for the region.



New Power Plant Crib Dam Repair

Army Corps of Engineers, St. Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

IN PROGRESS

Construction contract awarded in FY10, contract completion expected May 2012.

Project Description

The Crib Dam was constructed in 1950 when the New Power Plant (NPP) was built. The Crib Dam provides a barrier between the headrace of the NPP and the tailrace of the old power plant, a water elevation difference of 21 feet. Sixty years ago when the Crib Dam was constructed, it was intended to be a temporary structure. The plan was to tear down the old plant once the NPP was online, remove the crib dam and expand the NPP. However, the NPP was never expanded and the “temporary” crib dam has become permanent. The structure consists of a decaying wood frame, which is backfilled with stone. The gradual movement of the crib dam is an issue due to the extremely sensitive large power cable duct bank that runs through the structure. Failure of the Crib Dam would be catastrophic as it serves as a portion of the containment structure separating Lake Superior from the lower lakes. Without the Crib Dam, the flow in the St. Marys River would significantly increase and affect the regulation of Lake Superior pool elevation. Additionally, a failure of the Crib Dam would make the NPP inaccessible or may cause severe structural damage or failure of the building.



Construction of New Power Plant Crib Dam

Estimated Cost

In-house design	\$112,000
construction contract	\$4,284,000
Total estimated cost	\$4,396,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

A - Excellent
 B - Good
 C - Poor
 D - Inadequate
 F - Failing or Failed

While the Crib Dam received an OCA rating of “B”, it received a “Probably Inadequate” DSAC feature engineer rating due to concerns over potential structure movement and settlement.

Economic Impacts of Unscheduled Power Plant Outages

A structural failure of the Crib Dam would force a shutdown of the NPP and make it inaccessible. A failure of this magnitude would affect the operations of the locks and impact the availability of power to the surrounding communities and region. The primary mission of the NPP is to supply electrical power to the Soo Locks. Secondly, the NPP is important to the surrounding communities and eastern half of the upper peninsula of Michigan. Over 97% of the actual power generated within the NPP and Unit 10 plants goes into the regional grid, equating to nearly 15% of the power consumed for the region. A one month outage of the power supplied by the NPP and Unit 10 would result in a \$700k loss of revenue to industry, and a \$150k loss of revenue to the U.S. Treasury.



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Heavy Lift Equipment Replacement

Army Corps of Engineers, St. Marys River, Soo Locks Asset Renewal

Sault Ste. Marie, MI

Status

Design could be initiated as soon as funds are available.

Project Description

The existing heavy lift crane (GL PAUL BUNYAN) is over 70 years old, cannot lift miter gates clear of the water, and is in need of replacement. The GL PAUL BUNYAN is mechanically unreliable, the base metal and existing welds do not meet modern standards and have been stressed beyond appropriate limits. A PDT determined that a modern barge mounted crawler crane would provide the best solution for gate lifting needs, would replace three stiff leg derricks, and could be made available as government owned contractor operated equipment for new lock construction. Design would be done by Marine Design Center in Philadelphia.



Soo Locks Existing Heavy Lift Crane
(GL PAUL BUNYAN)

Estimated Cost

Design – USACE Marine Design Center	\$500,000
Crawler crane procurement	\$5,000,000
Barge procurement	\$20,000,000
Total estimated cost	\$25,500,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

A - Excellent
 B - Good
 C - Poor
 D - Inadequate
 F - Failing or Failed

Impacts of Unscheduled Lock Outages

If the GL BUNYAN was out of service and heavy lift capability was required it would take a minimum of 30 days to rent a crane, transport, assemble, and certify the crane. A 30 day unscheduled closure of the Poe Lock would have an economic impact to industry of \$130 million. If the heavy lift equipment were needed to replace a gate leaf from Gate 1 of the Poe Lock, the Poe Lock would be closed for an additional 75 days which would have an additional economic impact to industry of \$320 million. The national impact due to a forced outage of the Poe Lock would be significant as sixty-five percent of the Soo Lock's tonnage passes through the Poe Lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Intrusion System Refurbishment

Army Corps of Engineers, St. Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

The Soo Locks facility's intrusion system is in need of major repairs and upgrades in order to ensure the overall security of the facility. With an area of 180 acres and nearly 5 miles of perimeter that must be secured, it is imperative that the facility's intrusion system be reliable and that it be monitored remotely. By investing in the following four components, the integrity of the facility's intrusion system would be greatly increased:

(1) repairing motion sensors along the south perimeter fence line, (2) upgrading existing identification card readers, (3) replacing 25 of the 31 existing closed circuit TV security cameras and (4) adding 3 new cameras, including towers, associated cabling and fiber optic runs, in order to eliminate blind spots along the perimeter fence line. Due to the system's current state, recent intrusions have occurred and security has been compromised. It is crucial that the Soo Locks facility, including the Poe Lock which according to the Lake Carrier's Association is the "single point of failure that can cripple Great Lakes shipping", be adequately secured through a modern, reliable intrusion system.



The 180 Acre Soo Locks Facility has nearly 5 miles of perimeter that must be secured

Estimated Cost

Motion Sensor Repairs	\$135,000
Card Reader Upgrades	\$30,000
Replacement Security Cameras	\$100,000
Additional Security Cameras	\$220,000
Total estimated cost	\$485,000

Risk & Reliability

Latest Operational Condition Assessment Rating

A - Excellent

B - Good

C - Poor

D - Inadequate

F - Failing or Failed

Impacts of Unscheduled Lock Outages

Vulnerabilities in the current intrusion system could result in damage to the locks which could affect lock operability. The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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Potable Water System Replacement

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

A design-build contract could be initiated as soon as funds are available.

Project Description

This project would replace the deteriorated existing potable water line which provides water to much of the facility. The exterior surface of the potable water line shows signs of significant rust and corrosion. It is assumed that the line's interior has been impacted as well, resulting in reduced flow rates. The existing water line crosses below the Mac Lock through the deep-service tunnel and provides water to areas of the facility located north of the Mac Lock. The main structures on the facility served by this potable water line are the lock operating shelters, which house lock operators and the Administration and Davis Buildings, which house engineering and support staff. Each of these structures is equipped with restrooms including wash basins and drinking fountains requiring potable water. The water line also services drinking fountains throughout the Upper and Lower Canal Parks.



MacArthur Lock Gallery

Estimated Cost

Design-Build Contract	\$1,000,000
Total estimated cost	\$1,000,000

Risk & Reliability

Latest Operational Condition Assessment Rating

<input type="checkbox"/> A - Excellent	<input type="checkbox"/> B - Good	<input type="checkbox"/> C - Poor	<input checked="" type="checkbox"/> D - Inadequate	<input type="checkbox"/> F - Failing or Failed
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Impacts of Potable Water System Failure

Failure of the potable water line would greatly impact the operations of Soo Locks as staff would not be able to perform their required duties without access to restrooms. The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Southwest and Southeast Piers Mooring Bollard Reinforcement

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

This project will reinforce the existing mooring bollards on the Southeast and Southwest Piers, which serve as the approach piers for the MacArthur and Poe Locks. The original bollards were designed for much smaller vessels and do not meet current design and loading criteria. The Southeast and Southwest Piers are frequently used as a mooring area for vessels waiting their turn to pass through the locks and for vessels idled when fog closes the river to navigation. Additionally, the Southwest Pier is the preferred location for vessels being boarded and inspected by US Coast Guard personnel. Failure of the bollards could cause structural damage to the pier and/or release a moored vessel when subjected to heavy, dynamic loads.



Estimated Cost

In-house design	\$50,000
Construction contract	\$500,000
Total estimated cost	\$550,000

Risk & Reliability

Latest Operational Condition Assessment Rating

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

Impacts of Unscheduled Lock Outages

Failure of the mooring bollards could cause a wide range of impacts depending on the location of the failed bollard, and the length of affected pier. If a bollard within 2,000 feet of the lock chamber failed it would likely result in a two week outage of the MacArthur Lock in order to assess the structural integrity of the pier and clear debris. A two week unscheduled closure of the MacArthur Lock would increase traffic through the Poe Lock and result in vessel delays. For every four hours a thousand foot vessel is delayed, a loss of \$10,000 is incurred by shippers. The national impact due to a forced outage of the MacArthur Lock would also be significant as approximately 40% of the tonnage through the Soo Locks passes through the MacArthur Lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Southwest Pier Lighting Replacement

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design-build contract could be initiated as soon as funds are available.

Project Description

The existing light fixtures on the Southwest Pier do not provide adequate illumination for security or safety, they do not meet current standards, and are in need of replacement. The existing fixtures and underground wire must be removed and replaced. The Southwest Pier forms the south side of the approach channel to both the Poe Lock and the MacArthur Lock. It is used by down-bound vessels to offload line-handlers to assist with mooring in the event of an emergency.

These line-handlers walk extremely close to their ship, near the pier edge with rope in-hand to quickly act if called upon and inadequate lighting could compromise their safety. Additionally, poor lighting impacts the effectiveness of security and operations cameras used to monitor the perimeter fence line, guide vessels into the lock approach, and document accidents. The Southwest Pier is also used by vessels as an extended mooring area while waiting their turn to pass through the locks, by the Coast Guard for inspections, and by ships idled due to inclement weather.



Estimated Cost

Design-build contract \$1,000,000

Total estimated cost \$1,000,000

Risk & Reliability

Latest Operational Condition Assessment Rating

A - Excellent

B - Good

C - Poor

D - Inadequate

F - Failing or Failed

While the latest OCA rating for the Southwest Pier lighting was a "B", the OCA rating reflects only the operability of the lighting. The current lighting conditions pose a safety risk to line-handlers and vessels and a security risk to the facility.

Impacts of Inadequate Pier Lighting

Inadequate illumination of the Southwest Pier is a safety hazard for line-handlers and it puts the lock at risk of critical damage due to vessel impacts. Additionally, insufficient lighting poses a threat to the security of the facility; the Southwest Pier is a narrow piece of land with a publically accessible road to its south and for 6,200 feet vessels and the public are separated by only a fence. The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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Southwest Pier Repairs

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

This project will repair a portion of the Southwest Pier, which serves as the south upstream approach pier for the MacArthur and Poe Locks. The Southwest Pier is frequently used as a mooring area for vessels waiting their turn to pass through the locks and for vessels idled when fog closes the river to navigation. Additionally, the Southwest Pier is the preferred location for vessels being boarded and inspected by US Coast Guard personnel. Undermining of the structure has resulted in cavities under the concrete cap, reducing the structure's capacity to resist the dynamic loading imparted by moored vessels. Cavities under the concrete cap must be filled, the pier face must be lined with steel sheet pile, and lines and grades must be restored. Further improvements to the safety and functionality of the pier will be achieved by replacing undersized mooring bollards. Structural failure of portions of the pier could result in the release of a moored vessel and would interrupt shipping.



Soo Locks Southwest Pier

Estimated Cost

In-house design	\$200,000
Construction contract	\$3,000,000
Total estimated cost	\$3,200,000

Risk & Reliability

Latest Operational Condition Assessment Rating

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

Failure of the Southwest Pier would cause a wide range of impacts depending on the location and length of the affected pier. Failure of a bollard within 2,000 feet of the lock chamber would likely result in a two week shut down of the MacArthur Lock in order to assess the structural integrity of the pier and clear debris. A closure of the MacArthur Lock would increase traffic through the Poe Lock and result in vessel delays. For every four hours a thousand foot vessel is delayed, a loss of \$10,000 is incurred by shippers. The national impact due to a forced outage of the MacArthur Lock would be significant as approximately 40% of the tonnage through the Soo Locks passes through the MacArthur Lock. Half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Switchgear Assembly B Dewatering Pump Motor Controllers Replacement

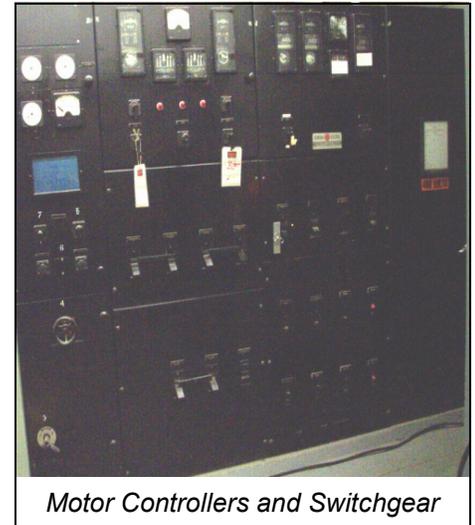
Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

The 60+ year old motor controllers and related 440 VAC equipment within Switchgear Assembly B must be replaced with modern components, increasing safety, reliability, and supportability for facility staff and equipment. The motor controllers and related equipment are critical to maintenance efforts at the Soo Locks and are used to operate the pumps that dewater the lock for major scheduled maintenance activities and for emergency repairs. Major maintenance of the locks occurs during the non-navigation season, in January through March. It is critical that a lock is de-watered as rapidly as possible otherwise significant ice will build up on the surfaces of the lock chamber. Ice that forms during dewatering must be removed prior to the start of time-critical maintenance efforts. Due to the age of the pump controllers and related equipment many components are unreliable and no longer available, requiring the use of reconditioned or custom made components. Custom made components are costly and much slower to acquire. Failure of this equipment during dewatering impacts the start of time-critical maintenance efforts and could result in the delay of the locks opening for the new navigation season.



Estimated Cost

A/E design	\$75,000
Construction contract	\$500,000
Total estimated cost	\$575,000

Risk & Reliability

Latest Operational Condition Assessment Rating

<input type="checkbox"/> A - Excellent	<input type="checkbox"/> B - Good	<input type="checkbox"/> C - Poor	<input checked="" type="checkbox"/> D - Inadequate	<input type="checkbox"/> F - Failing or Failed
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Impacts of Unscheduled Lock Outages

The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Vessel Self-Spotting System

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

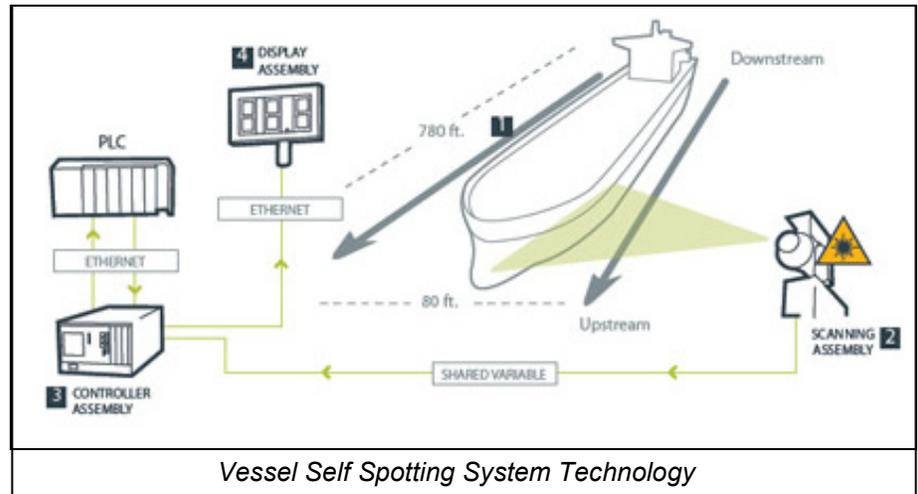
Status

Design, purchase and installation could be initiated as soon as funds are available.

Project Description

This project would install a Vessel Self-Spotting System (VSSS) on both the MacArthur and Poe Locks. Currently vessels are spotted using hand signals given by Government Lock & Dam Operators. This system

would be similar to the system installed and undergoing testing on the St. Lawrence Seaway. A video of the system in operation can be found at the following link: http://www.youtube.com/watch?v=s_kTvnFcae0. The VSSS would provide vessel captains/pilots with precise distances to the vessel's resting position via large screen displays on the lock wall instead of relying on hand signals from lock personnel. This system provides information to vessels regarding positioning during the lockage process with the intent to increase consistency, improve operational safety, and reduce the risk of vessel impacts.



Estimated Cost

In-house design, purchase & installation	\$500,000
Total estimated cost	\$500,000

Risk & Reliability

Condition Assessment Rating Based on Expert Judgment

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

This project would be considered a betterment, so it does not have a formal operational condition assessment. However, based on expert judgment the current vessel spotting practices could be improved.

Impacts of Unscheduled Lock Outages

Failure to make this upgrade increases the risk of significant gate & lock sill damage from improperly positioned vessels which could cause a lock outage. The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



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West Center Pier Repairs

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal
Sault Ste. Marie, MI

Status

Design and subsequent construction could be initiated as soon as funds are available.

Project Description

This project would repair a portion of the West Center Pier which forms the north side of the approach channel to both the Poe and MacArthur Locks. The West Center Pier is frequently used as a mooring area for vessels waiting their turn to pass through the locks and for vessels idled when fog closes the river to navigation. It is the preferred location for making winter landings. Undermining of the structure has caused cavities to form

under the concrete cap, and reduced the structure's capacity to resist the dynamic loading imparted by moored vessels. Cavities under the concrete cap must be filled, the pier face must be lined with steel sheet pile, and lines and grades must be restored. Additionally, the original bollards do not meet current design and loading criteria because they were designed for much smaller vessels and need to be replaced. Failure of mooring bollards and/or structural failure of portions of the pier could result in the release of a moored vessel and would interrupt shipping.



Estimated Cost

In-house design	\$50,000
Construction contract	\$3,000,000
Total estimated cost	\$3,050,000

Risk & Reliability

Latest Operational Condition Assessment Rating

A - Excellent B - Good C - Poor D - Inadequate F - Failing or Failed

Economic Impacts of Unscheduled Lock Outages

Failure of the West Center Pier would cause a wide range of impacts depending on the location and length of the affected pier. Failure would likely result in a two week shut down of the Poe Lock in order to assess the structural integrity of the pier and clear debris. A two week unscheduled closure of the Poe Lock would have an economic impact to industry of \$60 million. The national impact due to a forced outage of the Soo Locks would be significant as half of all steel produced in the U.S. is manufactured with domestically mined ore and over 92% of the iron ore mined in the U.S. passes through the Soo Locks. Steel-dependant industries contribute more than 10% to the total U.S. Gross Domestic Product. Iron ore accounts for approximately two thirds of the commodities passing through the locks; other major commodities include coal, grain, stone, and fuel.



Rock Cut Wall Stabilization

Army Corps of Engineers, St Marys River, Soo Locks Asset Renewal Sault Ste. Marie, MI

Status

Design was initiated in FY11 and will be completed in FY12. Government plant will be partially addressing failed portions in summer 2012. Remainder of construction could be initiated as soon as funds are available.



Rock Cut Stacked Stone

Project Description

The Rock Cut is a critical hard-bottom channel, accommodating down bound traffic in the St. Marys River, where the steep banks are in need of stabilization. The Rock Cut was created by quarrying the bedrock to construct a 300' wide channel equivalent to seaway depths. The quarried stone was stacked on either side of this channel and after 40 years has become unstable with stones up to 10 ton in size falling into the channel. Due to the age of the Rock Cut, the stacked stone on either side of the channel has become unstable and the channel walls are in the process of failing. If allowed to continue, the Rock Cut could be taken out of service due to the lack of a safe channel.

Estimated Cost

In-house design	\$150,000
Construction – phase 1	\$4,000,000
Construction – phase 2	\$3,000,000
Construction – phase 3	\$3,000,000
 Total estimated cost	 \$10,150,000

Risk & Reliability

Breakwater Assessment Team Condition Assessment Rating				
<input type="checkbox"/> A - Excellent	<input type="checkbox"/> B - Good	<input type="checkbox"/> C - Poor	<input type="checkbox"/> D - Inadequate	<input checked="" type="checkbox"/> F - Failing or Failed

Economic Impacts of Rock Cut Closure

If the Rock Cut were to close, commercial vessel traffic would suffer immense economic impacts as down bound vessel traffic would be diverted through the Middle Neebish Channel (MNC) which has 1.5' less draft than the Rock Cut and would require light loading. A loss of 1.5' of channel depth would result in an increase in transportation costs of \$19.5M annually. Additionally, the MNC is the route taken by up bound vessels and it only has the capacity for one-way traffic. Accommodating both up bound and down bound traffic would lead to delays while vessels waited for traffic in the opposing direction to clear this 19-1/2 mile channel. Loaded vessels also have a difficult time navigating the MNC, which puts them at a greater risk for damage.

