Chicago Area Waterway System Evaluation

Final Report

prepared for
Natural Resources Defense Council

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Overview

The Chicago Area Waterway System (CAWS) is strategic both locally and nationally, forming the only physical link between the Mississippi River System (MRS), the Gulf Coast and the Great Lakes. Through the Great Lakes, greater Chicago can access the Atlantic Ocean via the St. Lawrence Seaway. The region’s access to the Mississippi River is provided through the Illinois Waterway, which flows over 300 miles from Chicago to the Mississippi River at Grafton, Illinois. Critical infrastructure deficiencies in inland waterway infrastructure have recently been brought to light through the unfolding of the Asian Carp crisis, and the data analysis in this report suggests that the link between the MRS and Great Lakes is not utilized in the majority of CAWS movements. These factors not only present a challenge, but also an opportunity to re-imagine the way the CAWS may function as an economic, environmental and cultural asset for the region.

This report evaluated the CAWS through the lenses of goods movement, infrastructure condition, and the plans of CAWS stakeholders. The findings of this evaluation provide insight into the future use and viability of the CAWS for industry. The data confirms well documented economic trends and the impacts they will have on how goods are shipped. While the marine system is expected to maintain its modal share between today and 2040, data specific to the CAWS shows that use of these inland waterways is in decline. In the last several decades tonnage carried on the CAWS has declined. As manufacturing declined in the U.S., so too did the need for the heavy, bulk raw materials that characterized the majority of waterborne commerce on the CAWS. This decline appears to more pronounced on the CAWS, as compared to other portions of the inland waterway system.

Furthermore, changes in the composition of Chicago’s economic engine are resulting in movement away from industries once dependent on the CAWS towards more high-value based industries. The Bureau of Economic Analysis notes that between 2008 and 2011 greater Chicago’s Gross Domestic Product (GDP) grew some 1.4 percent, primarily driven by professional and business services; at the same time, there were declines in natural resources, mining and construction, industries which have been historically dependent on the inland waterway transportation system.

However, while traffic is declining, the CAWS remains an important transportation route for certain types of materials, such as crude materials, that are used in the local market and scrap which is exported from the Chicago region to Eastern Asia. Today some of these key commodity businesses and users of bulk products, like Ozinga and Morton Salt, use the CAWS and will continue to need some form of access to the waterway system in order to connect to their supply chains and serve their local customers at a reasonable cost. While it is clear that the tonnages that travel on the CAWS are relatively small, it is unclear what the effects
of changing goods movement on the inland waterways would be on these industries and their supply chains, due to the complexity of materials sourcing decisions. When assessing alternatives for preventing movement of carp and other aquatic nuisance species (ANS) through the CAWS, there is a need to understand more precisely than has been done in the past the impacts to industry, supply chains, the local economy, and local communities. The data analysis undertaken in this report is the first step towards this understanding.

Crumbling infrastructure and a lack of resiliency on the inland waterway system also hampers goods movement on the CAWS, as well as nationally. The five locks reviewed along the CAWS, have ages ranging from 53 to nearly 80 years old, and the condition of these locks has led to increasing delay and unreliability for users. Yet investment in the inland waterway system has lagged. While major investments are being made at the local and national level on the road and railway systems, investments in the inland waterway system are not following the same trends. A recent study by the Congressional Research service has noted that the national U.S. Army Corps of Engineers (USACE) construction backlog could be up to $62 billion.¹

As noted in AASHTO’s Waterborne Freight Transportation Bottom Line Report, the U.S. marine system is a “collection of competitors,” as there is no “master plan” for the system and each stakeholder operates independently. While that reference is directed toward the marine system, in general, it can also be specifically applied to the CAWS. A number of studies and plans were reviewed for this report, yet no single document or entity was found that provides a voice or forum for the collection of interests on the CAWS. Individual entities have established their own plans, and although many have focused on the waterway as a recreational or scenic feature, there is no unifying vision for the CAWS. This vacuum has resulted in both redundant efforts and languishing progress for any development of the waterway system.

This report is to provide a technically sound, unbiased foundation for NRDC as it evaluates its position and options to prevent movement of aquatic nuisance species through the CAWS, and its resultant impacts. This evaluation, and the findings presented herein, have been developed in a manner to emphasize what is known about the inland waterway goods movement system and the CAWS, describe what may be inferred from freight commodity flow data, and clearly state what is not known nor can be attributed to the data. Physically changing the CAWS is not only a challenge for the inland waterway industry and public- and private-sector stakeholders that have concern over the potentially devastating movement of carp and other ANS - it is also an opportunity for the City and region to re-imagine the way the CAWS may function as an economic, environmental and cultural asset for a broader set of interests.

1.0 Introduction

The Chicago Area Waterway System (CAWS) is a local, regional, and national strategic resource, forming the only physical link between the Mississippi River System (MRS), the Gulf Coast and the Great Lakes. The CAWS has played an important role in the industrial and commercial development of the region, serving as a conduit for high volume, bulk materials such as coal, agricultural products, minerals, and scrap. Through the Great Lakes, greater Chicago can access the Atlantic Ocean via the St. Lawrence Seaway. The region’s access to the Mississippi River is provided through the Illinois Waterway, which flows over 300 miles from the T.J. O’Brien and Chicago Locks in Chicago to the Mississippi River at Grafton, Illinois. The CAWS is shown in Figure 1.1, including the location of the five locks reviewed in this evaluation: Chicago, T.J. O’Brien, Lockport, Brandon Road and Dresden Island.

While the location of the CAWS is certainly central to greater Chicago, its use as a conduit for goods movement has declined in recent years (as described later in this report). Nevertheless, the function of this inland waterway has recently been brought into the spotlight by a wide array of stakeholders ranging from Federal and State governments, trade associations, advocacy groups, and others as the Asian carp crisis has surfaced, and continues to grow. Asian carp, a group of voracious, aquatic nuisance species, are gradually making their way north along the Mississippi River System and could potentially enter the Great Lakes system via the CAWS. At the same time, a number of other ANS are heading from the Great Lakes towards the Mississippi. Options are available to minimize the environmental threat that the carp and other ANS pose to the Great Lakes and Mississippi River’s ecological systems by modifying portions of the CAWS, primary among them returning the Chicago River to its original flow towards Lake Michigan. However, there are implications to current uses of the CAWS (among other impacts) that must be considered prior to taking such steps.

Modifying the CAWS for carp control is not only a challenge for the inland waterway industry and public- and private-sector stakeholders that have concern over the potential Great Lakes invasion of Asian carp. It is also an opportunity for the City of Chicago and its residents, as well as stakeholders throughout the region, to re-imagine the way the CAWS may function as an improved economic, environmental and cultural asset for a broader set of interests. Many agencies have studied options for modifying the CAWS to prevent ANS movement, including the U.S. Army Corps of Engineers’ (USACE or Corps) Great Lakes and Mississippi River Interbasin Study, and a 2012 report from the Great Lakes

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Commission and Great Lakes and St. Lawrence Cities Initiative\textsuperscript{3}. These and other studies have been reviewed as part of this analysis.

The objective of this study is to provide an analysis of historical, current, and future goods movement trends and forecasts along the CAWS, as well as to characterize the state of CAWS infrastructure and stakeholder visions for the waterways. It is intended to serve as a technically sound, unbiased foundation for NRDC as it evaluates its position and options related to the potential permanent separation of the CAWS, and its resultant impacts. This evaluation, and the findings presented herein, have been developed in a manner to emphasize what is known about the inland waterway goods movement system and the CAWS, describe what may be inferred from freight commodity flow data, and clearly state what is not known nor can be attributed to the data. Along with analysis of the goods movement data, this evaluation looks at the condition of locks and other infrastructure on the CAWS, and surveys plans by entities with interests in the CAWS for purposes other than or in addition to goods movement.

1.1 STUDY METHODOLOGY

This report presents an evaluation primarily based on commodity flow data, lock use, infrastructure condition, and other published information pertaining to the CAWS. In addition, reports produced by several Federal, State and regional stakeholders regarding goods movement, the CAWS, and the potential for ANS control have been reviewed. This report incorporates that information and summarizes select areas where this report is similar to those efforts, or may have slightly different findings. These stakeholder reports are summarized in Appendix A.

\textsuperscript{3} GLC & GLSLCI, \textit{Evaluation of Physical Separation Alternatives for the Great Lakes and Mississippi River Basins in the Chicago Area Waterway System}, 2012
Figure 1.1  Chicago Area Waterway System and Lock Locations
1.2 **Organization of This Report**

This report investigates infrastructure condition, use and investment related to the CAWS and is divided into the following key sections:

- **Section 1.0 – Introduction.** Provides an overview of the study area, how the inland waterway system is used, and outlines the variety of stakeholders who have also explored issues related to the CAWS.

- **Section 2.0 – Goods Movement on the CAWS.** Provides detailed information on National, State and local trends related to goods movement, in general, and specifically to the CAWS and its systems place in the goods movement “big picture.”

- **Section 3.0 – CAWS Condition and Needs.** Provides a detailed review of the five locks on the CAWS, their condition and their investment needs. This section also puts overall inland waterway system needs and funding availability in context.

- **Section 4.0 – Future Plans for the CAWS.** Provides a high-level survey of the variety of published stakeholder plans related to the CAWS.

- **Section 5.0 – Findings.** The evaluations in the previous sections are summarized in six key findings, which include:
  - The Changing U.S. and Greater Chicago Economy is Impacting Maritime Trade;
  - CAWS System Use is Declining;
  - Inland Waterway System Lacks Resiliency;
  - Inland Waterway System Investment Lags;
  - Land Use and Development Visions Abutting the CAWS are Changing; and
  - The CAWS Lacks a Unified Voice.

- **Appendices**
  - A. Data Sources Consulted and Assessment of Related Studies
  - B. Description of Freight Data
  - C. Greater Chicago Trade Activity and Forecasts
  - D. Additional CAWS and Inland Waterway Infrastructure Needs
  - E. USACE CAWS Proposed Capital Program
1.3 **ABOUT THE INLAND WATERWAY SYSTEM**

The multimodal freight system plays an important role in regional, national and international commerce. Roads, rails, water, and airport infrastructure each play key, distinct roles in the conveying goods, yet must work together to create a system that drives the economy. These modal systems interface most often at intermodal transfer points where the roadway system provides first- or last-mile connectivity from rail, water, or air to a business. Figure 1.2 provides an overview of the goods movement continuum with respect to cost and service. This figure illustrates, from left to right, the spectrum of transportation modes. Water transport, being on the far right of the continuum, is the least costly, yet slowest and least reliable mode. It serves industries such as mining, agriculture, and construction, which transport large quantities of goods that are not as time sensitive as other materials or products.

**Figure 1.2   Goods Movement Service Spectrum**

<table>
<thead>
<tr>
<th>Space</th>
<th>Air Cargo</th>
<th>Truck</th>
<th>Rail Intermodal</th>
<th>Rail Carload</th>
<th>Rail Unit</th>
<th>Water</th>
</tr>
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<tr>
<td>$10K/lb</td>
<td>$1.50/lb</td>
<td>5-10¢/lb</td>
<td>3¢/lb</td>
<td>1¢/lb</td>
<td>½¢/lb</td>
<td>½¢/lb</td>
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</tbody>
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Fastest, most reliable, most visible  
Lowest weight, highest value,  
most time-sensitive cargo

Fastest, reliable, visible  
Range of weight and value  
Rail intermodal competitive with truck over long distances

Slower, less reliable, less visible  
Highest weight, lowest value,  
least time-sensitive cargo

Source: AASHTO Rail Freight Bottom Line Report, 2002

Waterborne commerce in the U.S. involves a wide variety of vessels moving through the sea and inland waterway systems, making calls at ocean, lake, and river ports. These ports and related infrastructure and services have developed and evolved independently, and each is intended to pursue its own business mission. The U.S. marine transportation system was described in the AASHTO Waterborne Freight Transportation Bottom Line Report as a “collection of competitors,” as there is no “master plan” for the system and each stakeholder operates independently. This is in contrast to the road and rail systems in the U.S., in which there is significant amount of emphasis on system condition and connectivity, and subsequently greater shared planning and funding roles at both the State and National level. Although the aviation freight system functions somewhat similarly to the water system, as it is organized around a collection of
semi-independent ports, it has the advantage of not needing to maintain a physical system to provide connectivity.

In theory, there is a significant Federal role for the marine transportation system. In particular, the maintenance and improvement of Federal waterways is the responsibility of the USACE, and is funded from the Harbor Maintenance Trust Fund, the Inland Waterways Trust Fund (collected as a fuel tax on inland waterway traffic), and other appropriations and cost-sharing structures. Major waterway projects require extensive environmental studies and regulatory approvals at the Federal, state, and local levels. These requirements and funding availability often serve as either a facilitator or limiting factor to port and waterway infrastructure development. Funding for the inland waterway system is further discussed in Section 3.0.

1.4 **Non-Industrial Users of the CAWS**

Although this report focuses primarily on industrial users of the CAWS, i.e. barge traffic, it is important to note that a large percentage of traffic served by Chicago area waterway facilities is non-industrial. Other vessel types include personal boats for recreational purposes and commercial boats, like those used for tours. These users may also be impacted by ANS controls, although the impacts for these users are outside of the scope of this study. The percentage of recreational vehicles at the Lockport, Brandon Road, Dresden Island and Marseilles Locks all vary between 13 percent and 17 percent of total vessel counts. These statistics indicate the locks on the Illinois River primarily serve commercial traffic, whereas in the vicinity of the Port of Chicago, traffic is primarily recreational. The T.J. O’Brien Lock predominantly serves non-barge traffic, with recreational vessels comprising over 84-percent of the vessels using the lock.

1.5 **Potential Separation of the CAWS**

Stakeholders have identified a number of alternatives for preventing the movement of ANS between the Great Lakes and Mississippi River Basin, including returning the Chicago River to its original flow towards Lake Michigan in order to hydrologically separate the Basins. The USACE has identified hydrologic separation as the most effective option for two-way prevention of ANS movement.

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5 Annual counts of lock traversals vary between WCS and LPMS datasets; however, general trends of high levels of recreational use and declining levels of commercial cargo remain. See also GLMRIS, *Baseline Assessment of Cargo Traffic on the Chicago Area Waterway System*, 2011, Table 19.
Among the groups investigating options for preventing movement of ANS between the Basins are the Great Lakes Commission (GLC) and the Great Lakes and St. Lawrence Cities Initiative (GLSLCI). These entities led an initiative to develop and evaluate scenarios for separating the Mississippi River and Great Lakes watersheds to prevent the transfer of ANS, focused on the CAWS. As a part of this effort, the organizations commissioned a technical a report entitled *Evaluation of Physical Separation Alternatives for the Great Lakes and Mississippi River Basins in the Chicago Area Waterway System*, which examined the impacts of several separation and investment alternatives. As part of the report, several separation alternatives were proposed, including “Down River”, “Mid-System” and “Near Lake” alternatives, illustrated in Figure 1.3.

**Figure 1.3 Proposed Separation Alternatives**

![Map of proposed separation alternatives](image)

Source: Great Lakes Commission and Great Lakes and St. Lawrence Cities Initiative

In the following sections of this report, these separation alternatives are used as a convenient proxy for discussing control of ANS through modification of the CAWS, however it should be noted that there may exist other effective and feasible control alternatives. No alternative is specifically analyzed or supported as part of this document.

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2.0 Goods Movement on the CAWS

The Chicago Area Waterway System has long strengthened the economic vitality of the region by serving as a conduit for trade and commerce. In its early days, the CAWS was a primary contributor to Chicago’s growth into the region’s economic hub, moving all types of commodities and supporting industries from the fur trade to agriculture, though its primacy was soon overtaken by rail. After settling into a more consistent and smaller role as mover of bulk commodities to industrial interests along its banks by the early 20th century, in recent years use of the CAWS as a goods movement conduit has been declining. In particular, the Lake Calumet area was “grain out and steel in,” due to the steel and heavy manufacturing industry that surrounded the Port of Chicago. This was also due to a Board of Trade requirement that grain traded in the Chicago market be held locally. The local steel industry has since been transformed, and the Board of Trade requirement was removed some 40 years ago, diminishing the Port’s role in the movement and storage of grain. While these commodities are still present in the system, they are in a significantly smaller volume than in the past.7

By 2011, movements on the inland waterway and Great Lakes combined accounted for only 3.7 percent (37 million) of freight tonnage and 0.3 percent ($3.6 billion) of freight value in greater Chicago. The recent closure of the Fisk and Crawford power plants and the greater shift away from coal based power have also led to recent significant reductions in waterway traffic, and the City of Chicago’s recent adoption of limits on the handling and storing of coke and coal may further reduce movement of these goods on the CAWS.8 Nevertheless, the CAWS remains a vital resource for certain industries, and is used to transport construction materials, minerals, and scrap, among other products, throughout the Chicago area.

The objective of this section is to describe the historical, current, and projected future commodity flows on the CAWS.9 Data was gathered from a number of

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9 Future projections presented in this report have been taken from the Federal Highway Administration’s (FHWA) Freight Analysis Framework (FAF), version 3.4, a
publicly available sources, each which provides a unique lens into the inland waterway system. A number of recent studies were also reviewed as part of this approach. Together, this section uses these reviews and data analysis to document overall trends in waterborne freight in the U.S., Illinois, and along the CAWS.

2.1 **NATIONAL AND STATE LEVEL FREIGHT MOVEMENT TRENDS**

This section describes trends in multimodal and waterborne goods movement for the U.S. and Illinois. As there is no single data source that provides a complete picture of freight movements, a number of data sources were analyzed to provide different “lenses” in which to view goods movement. Taken together, these data sources can lead to a number of insights into goods movement. The primary data source is the Federal Highway Administration’s (FHWA) Freight Analysis Framework (FAF), a multimodal freight database that integrates data from a variety of sources to create a comprehensive picture of freight movements among states and major metropolitan area. Other data sources, in particular the U.S. Army Corps of Engineers’ (USACE) Waterborne Commerce Statistics (WCS) were used, as noted. Details about each data source are found in Appendix B.

**U.S. Waterway Trends**

According to FAF,\(^{10}\) in 2011 the U.S. freight system moved 48 million tons of goods worth $46 billion each day. The Federal Highway Administration projects that U.S. freight tonnage will increase 1.7 percent per year from 2011 to 2040, for an additional 29.9 million tons on the system each day in 2040. The value of freight moved is expected to increase faster than the weight, from $954 per ton in 2011 to $1,376 per ton in 2040.

In 2011, the U.S. marine transportation system (including both sea and inland waterway traffic) handled more than 2.3 billion tons of cargo, the majority at Gulf and San Pedro Bay ports. Of this, almost 900 million tons of cargo was domestic, worth more than $150 billion dollars. Twenty-seven states and territories handled in excess of 10 million tons of domestic waterborne cargo, each - the equivalent of 500,000 fully-loaded tractor trailers. The top 10 states handled around 55 percent of all domestic tonnage, with Illinois ranking as the number three state with 6 percent of this tonnage.

\(^{10}\) FHWA, “Key Statistics from FAF3.” http://fafornl.gov/fafweb/Highlights.aspx

FAF3.4 reports all 2040 values in 2007 constant dollars.
A subset of domestic tonnage is “internal” tons - those movements using the inland rivers and waterways. In 2011, internal tonnage accounted for 62 percent of domestic tonnage, or just over 550 million tons. Since 1971, domestic tonnage of waterborne commerce has been relatively flat, and the recent recession has added to this decreasing trend, although there has been some recovery of domestic tonnage from the 2009 low of 857 million tons.¹¹

As reported by the American Association of State Highway and Transportation Officials (AASHTO), overall tonnage was lower than it has been since the 1970s, while import tonnage was at near record levels, rising from 360 million tons in 1971 to 869 million tons in 2011 and reaching its peak of 1.13 billion tons in 2006. Imports have historically been the most volatile type of shipments, declining sharply during recessions followed by gradual recoveries. Export tonnage similarly reached a near record, of 610 million tons in 2011. Unlike import volumes, export volumes grew at a relatively steady pace, and were somewhat coincident with the change in the U.S. dollar value.

One of the most dramatic metrics of the recent recession was the decline in U.S. container traffic. Prior to 2007 nearly every forecast anticipated that growth in container traffic would continue unabated.¹² However, as the total marine transportation system tonnage declined during the recent recession, container growth also declined, dropping over 15 percent between 2008 and 2009.¹³ Containerization of freight has rebounded to some degree in recent years. From 2010 to 2011 container volumes increased slightly (42.2 million twenty-foot equivalent units, or TEUs, to 42.7 million TEUs), and show signs of resuming a more typical growth trajectory.

Illinois Trends

According to the Illinois Freight Mobility Plan,¹⁴ in the year 2010, 1.26 billion tons of goods moved from, to and within the State of Illinois via its roads, railroads,

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¹¹ AASHTO, Waterborne Freight Transportation Bottom Line Report, 2013, Figure 3-3. Based on USACE data. http://water.transportation.org/Pages/water_reports.aspx

¹² As an example, the San Pedro Bay Ports December 2007 base case demand container forecast called for 36.7 million TEUs in 2020. When revisited in 2009, during the recession, it was acknowledged that level would not be reached until after 2030. San Pedro Bay Container Forecast Update, The Tioga Group, Inc. and IHS Global Insight for the Ports of Los Angeles and Long Beach, June 2009. http://www.portoflosangeles.org/pdf/SPB_Container_Forecast_Update_073109.pdf.


waterways and air freight facilities. In 2010, 11 percent of freight movement was via waterway. Over the next 30 years overall freight tonnage in Illinois is expected to grow 34 percent, while water freight is expected to grow at a more moderate 10 percent annually, reducing water’s mode share.

Just under half of the freight moving in Illinois in 2010 (535 million tons) stayed within the state. These short to medium length hauls were principally completed by truck (93.5 percent). Water carried 2.6 percent, or 14 million tons. Most of the intrastate tonnage by water was stone, ore, or mineral products and coal. Eighty-two percent (11.6 million tons) of these 14 million tons moving within the state originated or were destined for the Chicago Business Economic Area (BEA)\textsuperscript{15}, which includes parts of Wisconsin and Indiana.

The \textit{Illinois Freight Mobility Plan} reports that in 2010, 22 million tons, or 18 percent of all Illinois inbound and outbound waterway traffic, moved in the “Illinois River/Lake” region (including the CAWS).\textsuperscript{16} Traffic in this region is forecast to increase to 27 million tons by 2040, representing a small gain in market share to 19 percent of all Illinois inbound and outbound waterway traffic.\textsuperscript{17}

Analysis of Illinois freight flows by BEA region show that waterborne commodity flows in Illinois are overwhelmingly outbound, with 104 million tons leaving Illinois for other states in 2010, while 17 million tons entered Illinois from other states and another 13 million tons moved within the state. About 28 percent of outbound tonnage from Illinois moved on the waterways. Of the 104 million outbound tons originating in Illinois in 2010, including transshipments, 82 percent of these movements originated in the St. Louis BEA economic area. A much smaller portion (nine percent) originated in the Chicago BEA economic area. Of

\textsuperscript{15} The Chicago BEA includes all counties within the CMAP region (Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will) as well as the following Illinois counties: Kankakee, Iroquois, Boone, Winnebago, Stephenson, Grundy, DeKalb, Ogle, Lee, Carroll, Bureau, LaSalle, Putnam, Livingston, Mclean and DeWitt; the following Indiana counties: Lake, Porter, LaPorte, Newton, and Jasper; and Kenosha County, Wisconsin.

\textsuperscript{16} For freight moving to and from Illinois and other states, freight flows were broken down by waterway. Flows moving on the CAWS were included in the “Illinois River/Lake” group, which is an aggregation of traffic moving on these two waterways. Due to the methods in which freight flows are determined, (primarily based on origins and destinations at the city, county, or broader level) it is challenging to determine the traffic moving on and between the CAWS and Lake Michigan, as freight flow data is generally not at a level fine enough to distinguish the exact origins, destinations, or routes of freight flowing through the system.

\textsuperscript{17} IDOT, \textit{Illinois Freight Mobility Plan}, 2012, Table 2.17 and 2.18.
the 104 million tons originating, 95 percent of outbound tons move from Illinois to southern destinations over the Mississippi River, and include destinations such as Memphis, Baton Rouge, and New Orleans. Lake traffic in this outbound commodity flow is not substantial. New Orleans and Baton Rouge are major destinations for grain and bulk staple commodities for processing and transfer to ocean-going vessels.

Nearly three quarters of the freight tonnage carried by water in Illinois in 2010 was grouped as either coal (49 percent); cereal grains (14 percent); and stone, ore, or mineral products. The largest two groups are strongly outbound in their directional orientation, with 89 percent of coal and 99 percent of cereal grains destined for outside of Illinois. The vast majority of coal moving over the waterway originates in the St. Louis area, which serves the downstate coal fields and railroad transshipment terminals for trains arriving from Wyoming mines. The 2010 data show that coal is the main commodity moving in the Chicago area, constituting a third of freight moving in the region, a trend that is expected to change in the future (discussed later in Section 2.0).

By 2040, the total tonnage of waterborne freight is expected to increase from 135 million tons to 149 million tons, a gain of 10 percent in three decades. With outbound traffic still driven by coal and grain exports, water shipments will maintain a strong directional orientation, with 75 percent of tonnage outbound, 16 percent inbound, and nine percent local in 2040. However there will also be an increase in inbound trade driven by growth in the inbound traffic of construction aggregates in the stone, ore or mineral products group.

2.2 GREATER CHICAGO’S MULTIMODAL FREIGHT MOVEMENTS

This section drills down from national trends to present a picture of goods movement in the greater Chicago region and to give context to the following section, which focuses on goods movement on the CAWS. Again, data in these sections are primarily based on the FAF. However, due to the geographical definitions in the FAF, the region including Chicago, shown in Figure 2.1, captures the activity of the Chicago, T.J. O’Brien, Lockport, Brandon Road and Dresden Island Locks.

It is important to note that the study area defined by FAF includes inland waterway freight flows that use the CAWS at the locks mentioned above, and thus

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20 In the FAF3.4 database, the greater Chicago region is divided in two sections representing urbanized portions of northeast Illinois and northwest Indiana. For this analysis, directly tied to the CAWS, the Illinois and Indiana portions of the database were both reviewed in detail.
have the potential to cross over the proposed points of permanent separation shown in Figure 1.3. This area also captures additional inland waterway movements that will not traverse these points. For example, movements from the Port of Chicago to Canada, the Port of Indiana – Burns Harbor to Michigan (or any other Great Lakes port), and movements along the inland waterway system that originate west of the points of proposed separation in cities such as Peoria and St. Louis (and points further south) would not be impacted by any of the control point alternatives described in this report. The FAF data is not able to distinguish individual movements within any FAF zones, meaning that identification of the movements that could potentially cross over the control points (e.g. from the Port of Chicago to Lockport Lock) cannot be identified from this data set.

To mitigate these limitations, when able this section presents data from the U.S. Army Corps of Engineers (USACE) Waterborne Commerce Statistics (WCS) Center and Lock Performance Monitoring System (LPMS) data to compliment the FAF analysis, and provide an account of actual data at CAWS locks to indicate the level of freight activity at various points along the CAWS.

Figure 2.1  Map of the Chicago Region as Defined in FAF

Source: FHWA FAF documentation
Greater Chicago’s freight transportation system underpins the area’s $548 billion economy.\textsuperscript{21} In 2011, the greater Chicago freight system handled 1 billion tons worth $1.25 trillion. FHWA estimates that the system will grow considerably by 2040, to 1.8 billion tons worth $3.2 trillion.\textsuperscript{22} While the total system tonnage is predicted to grow by 76 percent between 2011 and 2040, the total value of the goods carried is predicted to grow even faster by 160 percent over that same period.\textsuperscript{23} This growth trend in greater Chicago is similar to U.S. trends of more and more freight traveling on the system to meet population consumption demands.

As shown in Figures 2.2 and 2.3, by far the dominant freight mode in greater Chicago is truck. In 2011 trucks carried 69 percent of freight tonnage and 72 percent of freight value.

In 2011, inland waterway movements accounted for 3.7 percent (37 million) of all freight tonnage and 0.3 percent ($3.6 billion) of freight value in greater Chicago. By 2040, inland waterway movements are expected to account for 4.9 percent (85 million) of all freight tonnage and 0.3 percent ($8 billion) of value in this region. From a tonnage perspective, inland waterway movements have the second highest annual projected growth rate between 2011 and 2040, yet are expected to grow by only 48 million tons in total - a fraction of the growth of 534 million tons carried by truck by during that same time period. By value, the goods carried by water have the third lowest projected growth rate, higher only than rail and pipeline. This growth projection is driven primarily by the movement of cereal grains and non-metallic minerals.

Similar trends of freight movement and expected growth are seen through analysis of other datasets. For the CMAP Regional Freight System Planning Recommendations Study, freight movements in the Chicago BEA were reported in 2007 through analysis of the TRANSEARCH database; water carried 5 percent of 1.5 billion tons and less than 1 percent of $2.8 trillion dollars of freight, with water freight growing at a rate that reduces its overall share of freight movements by 2040. The CMAP study (which was developed “pre-recession”) reports 73 million tons of waterborne freight moved in the Chicago BEA in 2007, of which more than 60 percent (45 million tons) was inbound, 26 percent was outbound, and 12 percent moved within the area. The CMAP report further stated that between 2007 and

\textsuperscript{22} FAF3.4 reports all 2040 values in 2007 constant dollars.
\textsuperscript{23} The FAF3.4 growth projections for 2040 have been revised from previous versions due to the effects of the economic recession and adjusted economic forecasts. Additionally, the use of rail and inland waterway modes has been increased and the use of truck and air has been decreased, compared to previous forecasts. However, the overall modal trends remain similar, with truck retaining the dominant position for freight transportation.
2040, inbound tonnage is projected to decline by approximately 25 percent, outbound tonnage is expected to grow by 70 percent, and local movements are expected to grow slowly over this period, climbing 24 percent. Note that these figures are representative of the Chicago BEA24, which is a larger study area than the FAF region25 and thus includes a greater amount of down river and Great Lakes traffic beyond the CAWS.

Figure 2.2 Greater Chicago Freight Flows by Tonnage (2011, 2040)

![Graph showing freight flows by mode and tonnage for 2011 and 2040](source: FAF3.4, Greater Chicago Region – IL and IN portions.)

Source: FAF3.4, Greater Chicago Region – IL and IN portions.

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24 See footnote 15 for the Illinois, Indiana and Wisconsin counties included in the Chicago BEA.

25 See Figure 2.1
2.3 Greater Chicago’s Inland Waterway Freight Movements: Historical Trends and Forecasts

This section presents an analysis of waterway movements in greater Chicago, again utilizing FAF data. As mentioned in the previous section, unless noted, due to the dataset limitations, the results in this section include not only river traffic, but also traffic at the Ports of Chicago and Indiana – Burns Harbor, as well as industries that are directly served on Lake Michigan in the FAF area (Figure 2.1). In general, the following figures are not specific to the CAWS, and the freight figures provided include both movements on the CAWS that would be impacted by hydrologic separation and movements that would not. USACE WCS and LPMS data is presented where noted, to supplement the FAF analysis, and to provide a clearer sense of what movements might be impacted by hydrologic separation.

As noted previously, inland waterway flows comprise a very small proportion of the total tonnage and value of goods moved in the greater Chicago region (37 million tons and $3.6 billion) in 2011.\textsuperscript{26} The majority of these flows are domestic, but with a growing export market that likely reflects increased agricultural commodities traveling downstream of the CAWS. These agricultural commodities...

\textsuperscript{26} This is significantly less than the 73 million tons in 2007 reported in the CMAP 2010 Regional Freight System Planning Recommendations Study, which was based on the Chicago area BEA and not the FAF region designations.
largely originate and terminate at locations downstream of the proposed control points. In general, inland waterway flows are expected to grow by 86 million tons to comprise 4.9 percent of total freight, worth $8.3 billion in 2040, as shown in Figure 2.4 and Figure 2.5.

Figure 2.4  Inland Waterway Flows by Tonnage (2011, 2040)

Source: FAF3.4, Greater Chicago Region – IL and IN portions. Inland waterway freight, only.

Figure 2.5  Inland Waterway Flows by Value (2011, 2040)

Source: FAF3.4, Greater Chicago Region – IL and IN portions. Inland waterway freight, only.
Although tonnage and value of water shipments on the greater Chicago freight system is predicted to grow, the total tonnage and value of goods shipped remains proportionally small. Of this small portion, even less would be impacted by hydrologic separation (see Figure 1.3). Moreover, the impact of separation on goods movement moving forward is likely to decline proportionally as well, as the downward trend of use at the locks on the CAWS is in opposition to the more general growth in inland waterway traffic illustrated above.

According to USACE lock data, tonnages are higher at the Lockport, Brandon Road, and Dresden Island locks, which are located westward towards the Des Plaines and Illinois Rivers and lead to the MRS. Tonnages are lower at the O’Brien and Chicago locks, in the vicinity of Lake Michigan and Calumet Harbor, as shown in Figure 2.6. The T.J. O’Brien Lock, the lock through which traffic traveling to and from the Great Lakes and the CAWS traverses, has the lowest tonnage on the CAWS at just over 5 million tons.

**Figure 2.6  Historical Lock Tonnage (1993-2013)**

![Historical Lock Tonnage Graph](image)

Source: USACE Navigation Data Center Lock Performance Monitoring System. Note that barge traffic no longer utilizes the Chicago lock and must traverse the O’Brien lock to transition between the CAWS and Lake Michigan.

Since control point strategies are unlikely to impact the CAWS west of the Lockport lock, goods could continue to move through the Illinois and Mississippi River systems. Conduits to the MRS not impacted by separation also include the locks of Marseilles, Starved Rock, Peoria and LaGrange. These centers are growing markets for agricultural barge traffic moving downstream to the Gulf of
Mexico for export. The data show a substantial amount of activity in this portion of the river, including tonnage of over 19 million at Peoria in 2013 (not shown).

Along with illustrating declining use of the waterway system, the USACE WCS data includes historical volumes along distinct segments of the river. This dataset allows analysis of historical trends, as well as understanding where on the river and in which direction traffic is flowing. Currently, the vast majority of movements in the immediate Chicago region on the CAWS are inbound, with the exception of the Calumet Harbor and River region, the connection between Lake Calumet and Lake Michigan. This is in opposition to the rest of the Illinois River system, where outbound shipments, including agriculture bound for export, are the majority of the traffic. Figure 2.8 shows the direction of movements on the CAWS in 2012. Again, tonnages are highest in the western part of the CAWS on the Illinois River, the Chicago Sanitary and Ship Canal, and lower towards the Lake.

**Figure 2.7 CAWS Usage by Segment (1992 – 2012)**

![CAWS Usage by Segment (1992 – 2012)](image)


Figure 2.7 shows the historical trend of tonnage on each segment of the CAWS from 1992 to 2012. While the lock data showed a relatively steady usage between 1995 and 2006, this data shows that there was a significant drop off in usage in 2002, before rebounding to the highs seen in 2005. Use of the CAWS is currently at its lowest level since 1992 for nearly every segment except Calumet Harbor. The segments in Figure 2.7 are defined as follows:

- **Chicago River (Main and North Branch)** - Main River from Rush Street to the junction of the North and South Branch; North Branch to North Avenue. Project Depth: 21 feet from Rush Street in the Main River to North Avenue in...
the North Branch, including the North Branch Canal and the North Turning Branch Basin.

- Chicago River (South Branch) – From Damen Avenue to Lake Street. Maintained Depth: 9 feet at low water stages.

- Lake Calumet - Entrance channel from the Calumet River to a harbor area at the south end of the lake with a channel extending northward for a distance of 3,000 feet and a width of 1,000 feet. Project Depth: 27 feet.

- Calumet Harbor and River - Calumet Harbor and River to Turning Basin No. 5 (130th Street Bridge). Project Depth: 29 feet in approach channel, 28 feet in outer harbor anchorage area, 27 feet in river entrance channel to E. J. & E. R. R. Bridge, and 27 feet in river to and including Basin No. 5.

- CAWS – Includes the Chicago Harbor, Chicago River, Main and North Branch, Chicago River, South Branch, Chicago Sanitary and Ship Canal, Calumet-Sag Channel and Lake Calumet, and the Calumet Harbor and River.

- Calumet-Sag Channel - From the junction with the Chicago Sanitary and Ship Canal to Blue Island, Little Calumet and Calumet Rivers to Turning Basin No. 5 (130th Street Bridge). Maintained Depth: 9 feet.

- Chicago Sanitary and Ship Canal – From Damen Avenue, Chicago to Lockport, IL. Maintained Depth: 9 feet at low water stages.

Figure 2.9 illustrates the ten-year change in movement on the waterway using the same data from Figure 2.7 by plotting the movement on the waterway in 2003 and 2012.

Looking at both waterway and lock usage statistics presented in this section, it is clear that the total tonnage and value of goods shipped in the Chicago area waterway is declining, with the exception of goods moving in the Calumet Harbor and River region, between Lake Calumet and Lake Michigan. This change is in part due to changes in the composition of Chicago’s economic base, with movement away from industries once dependent on the CAWS towards more high-value based industries. The Bureau of Economic Analysis notes that between 2008 and 2011 greater Chicago’s GDP grew some 1.4 percent, primarily driven by professional and business services; at the same time, there were declines in natural resources, mining and construction, industries which have been historically dependent on the inland waterway transportation system. Nevertheless, certain industries still rely heavily on the CAWS to connect to their supply chains and customers. Much of the raw material used in concrete for downtown Chicago construction projects is shipped via the CAWS. Scrap metal travels outbound from Chicago to reach export markets in East Asia. These users of bulk products are dependent on the CAWS and will continue to require some waterway connections, both now and in the future.
Figure 2.8  Direction of Goods Movement on the CAWS, 2012

Source: USACE Waterborne Commerce Statistics. Analysis by Cambridge Systematics, 2014. Line thicknesses are representative of total volume on a particular waterway segment, including originating, terminating, and through traffic.
Figure 2.9  Change in CAWS Usage from 2003 to 2012

Source: USACE Waterborne Commerce Statistics. Analysis by Cambridge Systematics, 2014. Line thicknesses are representative of total volume on a particular waterway segment, including originating, terminating, and through traffic.
2.4 **COMMODITY MOVEMENTS ON THE CAWS: HISTORICAL TRENDS AND FORECASTS**

Nationwide, certain types of commodities are more likely to use the waterway system. In general, low cost bulk goods, without restrictive delivery windows, are more suited for waterway travel via barge. These goods are often high weight, low value commodities such as construction materials or scrap. Table 2.1 illustrates types of commodities typically traveling on the inland waterway system.

**Table 2.1 CAWS Primary Industries and Commodities**

<table>
<thead>
<tr>
<th>Primary Industry</th>
<th>Commodity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Fertilizers, Chemical Products</td>
</tr>
<tr>
<td>Construction</td>
<td>Natural Sands, Gravel and Crushed Stone, Nonmetallic Minerals-n.e.c., Logs and Other Wood in the Rough, Wood Products, Nonmetal Mineral Products</td>
</tr>
<tr>
<td>Food Processing</td>
<td>Cereal Grains, Other Agricultural Products, Animal Feed, Milled Grain Products and Preparations, and Bakery Products, Other Prepared Foodstuffs, and Fats and Oils</td>
</tr>
<tr>
<td>Power Generation</td>
<td>Coal, Gasoline, Coal and Petroleum Products-n.e.c.</td>
</tr>
<tr>
<td>Printing</td>
<td>Pulp, Newsprint, Paper, and Paperboard</td>
</tr>
<tr>
<td>Recycling</td>
<td>Waste/Scrap</td>
</tr>
<tr>
<td>Retail</td>
<td>Alcoholic Beverages, Wood Products, Furniture</td>
</tr>
<tr>
<td>Various</td>
<td>Basic Chemicals</td>
</tr>
</tbody>
</table>

Source: FAF 3.4 N.e.c. – not elsewhere classified.

Figure 2.10 and Figure 2.11 show the marine flows by commodity for the Greater Chicago FAF region in 2011 and projected to 2040. It should be noted again that these trends encompass a broader region, and are not necessarily representative of the CAWS. Gravel and coal products dominated flows by tonnage, comprising more tons than all other commodities combined in 2011. Chemicals and coal dominated the movements by value in 2011. In the future, nonmetallic minerals and cereal grains are projected to dominate the traffic on the waterway system in the region; however, the latter of these generally remains downstream of the CAWS.
Figure 2.10  Marine Flows by Commodity, Tons (2011, 2040)

Source:  FAF3.4, Greater Chicago Region – IL and IN portions.  Inland waterway freight, only.

Figure 2.11  Marine Flows by Commodity, Value (2011, 2040)

Source:  FAF3.4, Greater Chicago Region – IL and IN portions.  Inland waterway freight, only.
Two commodities that were previously high volume goods moving on the CAWS, coal and agricultural products, are discussed in brief case studies below. Although once a primary user of the CAWS, recent events have dictated that coal shipments are likely to decrease faster and more dramatically than predicted. Cereal grains are a quickly growing market due to the increased U.S. export economy, yet these products are currently being loaded on the Illinois River system west of Lockport and travel downstream to the Gulf of Mexico.

**Commodity Movements on the CAWS: Coal**

While FHWA projects that gravel volumes will increase significantly by 2040, nearly 40 percent, coal is anticipated to decrease about 3 percent over the same period. Recent trends, however, suggest that coal trade will decrease even faster than indicated by FAF analysis. A report by the Lake Carriers Association shows significant decreases in coal moved on the Great Lakes over the past 6 years, with an 8.2 percent decrease between 2011 and 2012, resulting in a 2012 value 25 percent less than the prior five-year average.27 Similarly, a review of commodity data at locks within the study area show that coal tonnage has been in gradual decline on the inland waterway system for the past two decades, as shown in Figure 2.12.

The reduction in demand can be at least partially attributable to Chicago’s decision to phase out coal power generation. In 2012, the Fisk and Crawford coal-fired power plants, serviced by the CAWS, were closed, decreasing the demand for coal on the waterway.28 The previous year the State Line Power Station on Lake Michigan closed. These plants are all located east of the proposed separation points; with their closure, coal deliveries to them (reflected in earlier data sets) no longer exist to be potentially impacted by separation.

Of the coal movement still present on the waterway system, the majority is upbound on the CAWS. As seen in Figure 2.13, the only portion of waterway that does not follow this trend is the Calumet Harbor and River. This area not only is the sole section with larger downbound movement than upbound, but also carries the highest volume of coal. Waterways in the northern part of the city were not reported to carry any coal movements at all.

Petroleum coke, or “pet coke,” a byproduct of the oil refining process, is also reflected in the coal-n.e.c (not elsewhere classified) data. Pet coke had been stored in piles along the Calumet River and then transported via barge for export. In

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recent years these piles have been under scrutiny for the risk they place on neighboring communities. As a result of the City of Chicago’s crackdown to ensure that facilities that store and handle petcoke take measures to prevent the offsite dispersion of dust, one company has shutdown.\(^{29}\) The two remaining terminals on the Calumet River are still operational as transfer points between rail cars to barges or other shipping vessels, not as storage. The company that operates these facilities is evaluating whether or not they will be able to remain in business.\(^{30}\)

**Figure 2.12** Historical Lock Tonnage – Coal (1993-2013)

![Graph showing historical lock tonnage for different locations (Chicago, O'Brien, Lockport, Brandon Road, Dresden Island) from CY1993 to CY2013.](source: USACE Navigation Data Center Lock Performance Monitoring System.)


Figure 2.13  Coal Movements by Direction on the CAWS, 2012

Source:  USACE Waterborne Commerce Statistics.  Analysis by Cambridge Systematics, 2014.  Line thicknesses are representative of total volume on a particular waterway segment, including originating, terminating, and through traffic.
Commodity Movements on the CAWS: Cereal Grains / Food and Farm Products

Cereal grains are projected to account for the most tons on the waterway system in the Chicago Region by 2040, according to FAF. Nevertheless, most of this traffic will remain outside of the CAWS – traveling from the Illinois River System south towards the Gulf of Mexico for export. Indeed, recent studies of new Container-on-Barge (COB) markets for agricultural products focus on movements from the Joliet and Peoria region to the Mississippi River system downstream, which do not utilize the portion of the CAWS near Lake Michigan.31,32

Historical trends show that, within the CAWS itself, shipments of agriculture products are declining. USACE lock tonnage for all food and farm products (a category similar to cereal grains, but also inclusive of other grains and fertilizers), indicates that the volumes on the CAWS are substantially lower at the CAWS area locks and increase traveling away from Lake Michigan, as shown in Figure 2.14. While the T.J. O’Brien Lock had 137 thousand tons of this product locked in 2011, the Dresden Lock locked nearly 300 thousand tons, showing that there is greater demand further downstream and cereal grains likely are not transferring between lakers and barges.


2.5 TRADING PARTNERS

Chicago is the only location where the MRS connects to the Great Lakes and the Saint Lawrence Seaway system. As such, there exists the potential of the region to have domestic and international freight flows that utilize both the Great Lakes and the inland waterway system. However, as illustrated by the previous sections, the data indicate that most waterway traffic moving in the region does not move between the Mississippi River and Great Lakes and Saint Lawrence Seaway systems. This section looks at the Chicago regions trading partners for goods moving on the waterway system.

FAF can be used to analyze trade between regions. Exports and imports are captured under the region that serves as an intermediate stop. For example New Orleans is an intermediate stop for grain that travels on the inland waterway via barge, and then is transferred to a larger vessel for export to an international destination. As shown in Figure 2.15, the “Remainder of Michigan” zone is the single largest trading partner for the greater Chicago Region by tons today and in the future. Much of this traffic is potentially movements across Lake Michigan, and may not represent movements on the CAWS. However, the next five highest trading partners by tons all use the inland waterway system and account for a greater portion of the total trade tonnage. New Orleans is the second highest trade partner and includes many international exports and imports to the Chicago region. This river trade is driven primarily by the increasing business of exporting...
cereal grains and coal and petroleum products, along with other smaller, but still significant volumes of basic chemicals, base metals, and other agriculture products. Chicago is noted as a top trading partner as well, and trends indicate there is intra-regional trade via water of petroleum products, milled grain products, and other foodstuffs. Finally, the “Remainder of Illinois” is a top trade partner.

As shown in Figure 2.16, New Orleans is the regions’ largest trading partner by value. This is true today and will continue to be in the future. However, by value, other trading partners will be important contributors in 2040, one of which is Eastern Asia. This represents growing international import/export activity and includes transport of nonmetallic minerals, metallic ore, coal, basic chemicals, logs, nonmetal mineral products, base metals, cereal grain, animal feed and other agriculture products.

While the vast majority of trade on the greater Chicago inland waterway system is domestic in nature, a significant portion of activity is linked either directly or indirectly to international markets. An analysis of overall trade import and export flows using FAF data is included in Appendix C. From a value perspective, most marine trade using the greater Chicago inland waterway system occurs over the MRS and not the Great Lakes, as indicated by the majority of flows directed to New Orleans. It cannot be assumed, moreover, that these flows require traversing the proposed ANS control points. In fact, many of these flows likely do not traverse these points as, previously noted, the inland waterway system is more heavily used west of these points along the Des Plaines and Illinois Rivers.

One topic arising in ANS control point discussions has been whether the expansion of the Panama Canal will bring significant new freight to Illinois and the Greater Chicago inland waterway systems. In 2011, cereal grain movements originating in the greater Chicago FAF zones were 67 percent domestic to New Orleans and 31 percent exports to Eastern Asia (primarily through New Orleans), accounting for 1.8 million tons. The FHWA predicted growth in tonnage in 2040 could be a reflection of increasing trade prompted by the expansion of the Panama Canal; however while many have predicted sweeping changes to supply chains with the expansion of the canal, it is difficult to say with certainty what the true impacts will be until the expanded canal is open and operational. Experts agree that uncertainty remains as to the economic impacts of the canal on container and bulk shipments, and especially the effect to a specific port or market.33 34


previously noted, opportunities for containerized grain may exist on the inland waterway system, but are downstream of the proposed ANS control points, along the waterway in areas adjacent to Joliet and Peoria.

**Figure 2.15  Marine Flows by Trading Partner (Tons, 2011, 2040)**

[Graph showing marine flows by trading partner (2011, 2040)]

Source: FAF3.4, Greater Chicago Region – IL and IN portions. Inland waterway freight, only.

Note: New Orleans and other ports serve as an intermediate stop/point of transfer for some international goods, which are included in the FAF flows for each port.
Figure 2.16  Marine Flows by Trading Partner (Value, 2011, 2040)

Source: FAF3.4, Greater Chicago Region – IL and IN portions. Inland waterway freight, only.

Note: New Orleans and other ports serve as an intermediate stop/point of transfer for some international goods, which are included in the FAF flows for each port.
3.0 CAWS Condition and Costs

Maintaining the U.S. inland waterways for goods movement will require significant investment, due to the deteriorating state of infrastructure across the country. During 2014, there were 73 lock facilities that resulted in closures for a total of 2,380 days and more than 52-thousand hours. While the majority of these closures were on other parts of the inland waterway system, the CAWS has experienced similar conditions. Along the CAWS, the primary waterway infrastructure is the system of five locks and dams that connect the Illinois River and MRS to the Great Lakes, via the CAWS. The five locks on the CAWS reviewed in this report are the Chicago, T.J. O’Brien, Lockport, Brandon Road and Dresden Island Locks. These locks are shown in Figure 1.1. The locks range in age from 53 to nearly 80 years old, and like many in the nation, show significant deterioration. Infrastructure condition is a key factor in when and how the CAWS is used for goods movement, and how efficiently it serves its users.

This section documents the condition and suitability of the CAWS infrastructure for goods movement. Existing and potential impediments and barriers to efficient goods movement, such as lock delays, lock size, navigable channel depth and width, overhead clearances, and others, are identified. Additionally investments identified by the USACE to mitigate current conditions and improve barge transport efficiencies in the future are noted.

The USACE has developed a prioritized plan for investment at locks along the CAWS. Unfortunately, few of these projects are actually funded, and the list does not fully address the scope of the potential projects along the CAWS. Overall, the implications of the lack of investment in CAWS goods movement infrastructure are currently being seen through increased travel times, unreliability, and other costs paid by users of the systems. Without investment, these costs are likely to continue to grow, further reducing the efficiency of the system and use of the CAWS for goods movement an increasingly uncertain prospect.

3.1 LOCK DIMENSIONS

The locks on the CAWS have significant infrastructure challenges, including less-than-optimal length of chamber, usable length of chamber, width of chamber, and usable width of chamber. Chamber length is an issue for all of the CAWS locks - none has the ability to accommodate a typical 3-barge by 5-barge configuration powered by a single tow that is 105 feet wide and 1,200 feet long. Width is also important for safety and efficiency reasons, both in the lock and waterway, as sufficient width is needed to ensure that barges can safely pass each other. At

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35 Inland Waterways Users Board, 27th Annual Report to the Secretary of the Army and the U.S. Congress, December 2014
most locations the waterway widens in the vicinity of the locks to accommodate traffic entering and exiting. However, the Brandon Road Lock has a 160-foot channel width that makes it extremely difficult to operate vessels in two directions, and is one of many chokepoints in the CAWS region between the MRS and the Great Lakes. Additionally, much of the CAWS itself is also too narrow to handle multiple barge configurations. These narrow passages and locks serve to limit barge configurations, inhibiting seamless barge operation between the CAWS and the MRS for the subset of goods that actually traverse between these two parts of the inland waterway system. Additional information about specific limitations related to lock dimensions is found in Appendix D.

3.2 LOCK CONDITION AND USAGE

Section 2.0 presented a review of goods movement on the CAWS and through the locks. Over one-third of the barges traversing the CAWS locks experience delay due to a combination of factors. This delay can be quantified using a variety of statistics, including vessel processing time, number of lockages, and unavailable time.

- **Vessel Processing Time.** Each of the CAWS locks experiences an average delay of nearly an hour or more per tow. In addition to delay, the average processing time for these locks was up to an hour, with the highest average processing time (1.02 hours) and delays (2.41 hours/tow) at the Lockport Lock. As each lock is only 600 feet in length, each passage requires a double-lockage for barges over 600 feet long.

- **Number of Lockages.** Today, the Chicago area locks on-paper are only handling one-third or less of their designed tonnage capacity. While a portion of this underutilization is likely due to the changing economy of the upper CAWS, unavailable time and structural limitations of the waterway contribute to reducing the amount of lockages that can be realistically achieved.

- **Unavailable Time.** Unavailable time, defined as the amount of time in which barge traffic is not allowed to pass through the lock, is high and generally on the rise at the CAWS locks, in large part due to increasing maintenance needs. The T.J. O’Brien Lock is the only lock that experienced a decrease in overall unavailable time due to a large reduction in scheduled unavailabilities in 2013. Unavailable time can be either unscheduled or scheduled. The Brandon Road Lock had the highest number of unavailable times in 2013, with 72 scheduled and 71 unscheduled unavailable times.

Detailed statistics by lock are found in Appendix D.
3.3 **OTHER CAWS-AREA INFRASTRUCTURE CONDITIONS**

Lock usage and condition may contribute to system bottlenecks (e.g., time to fill/empty, double-lockage, waiting in queue). Features of the waterway itself also present barriers to efficient operations, as summarized below. These findings were first provided in the *Great Lakes Navigation System Review Study* in 2002\(^{36}\), and were reiterated in the *2010 Regional Freight System Planning Recommendations Study*\(^{37}\), nearly a decade later. Investments have not yet been made to mitigate these barriers.

- **Overhead structures.** Low overhead structures along the CAWS, including the Lemont rail bridge over the Chicago Sanitary and Ship Canal, are barriers to barge traffic. Because of the severe vertical clearance limitation of 19.1 feet, larger line tows that are typically 30 feet out of water at the top of the pilot house are prevented from upstream navigation, and harbor tows must have telescoping pilothouses to navigate the barrier. Another impact from this vertical constraint is that light barges and stacked covered barges may need to be ballasted or have their covers reconfigured in order to clear the bridge. In addition, on a number of occasions each year, commercial vessels such as USACE heavy crane barges and large passenger vessels (e.g. tour boats) are prevented passage between the MRS and the Great Lakes because of the overhead structures. In some cases, where feasible, large equipment is rerouted along next best watercourse or transit options. Additional low structures found on the Chicago Sanitary and Ship Canal, north of the Cal-Sag Channel in the City of Chicago, can also be barriers to navigation. Reports also indicate an increase in the number of bridges that do not open in Chicago, partially to reduce roadway congestion. These bridges place further restrictions on industry. More detail on bridges is provided in Appendix D.

- **Congested, narrow portions.** The portion of the Chicago Sanitary and Ship Canal between the Lockport Lock and the confluence with the Cal-Sag Channel is difficult and dangerous to navigate. This portion of the waterway is a rock cut channel, only 160 feet wide. Additionally, in this segment there is a large bend in the waterway where intense tug and barge mooring, fleeting, docking and servicing activity occurs. This concentration of activity adds to the congestion; the waterway segment was cited in the USACE report as having insufficient fleeting to accommodate traffic adequately. Figure 3.1 illustrates the narrow channel and the inability for lashed barges to operate in two-directions, harmoniously.

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• **Mooring, fleeting and docking.** Due to its narrow width, the Chicago Sanitary and Ship Canal is primarily used for navigation; space for mooring of boats is insufficient. Often, barges and tows are moored in the channel on one bank or the other, frequently two abreast (as shown in Figure 3.1). If two abreast, the remaining channel width is reduced to 90 feet, limiting any tow to two conventional 35-foot barge widths wide. In Lemont there are 6-7 fleeting areas, but no other fleeting areas exist north of Lemont.

• **Flood Control Water Diversions.** The Metropolitan Water Reclamation District of Greater Chicago (MWRD) has some control over the Chicago Sanitary and Ship Canal water levels in order to prevent catastrophic flooding in downtown Chicago. On average, about 15 times a year the Lockport pool is drawn down in anticipation of heavy rains to provide additional floodwater storage within the waterway banks. During these drawdowns river navigation is slowed or halted, depending on how near to the open gates or operating controlling works the tow is located. The closer to the lock, the greater the threat to navigation. At times, the drawdown is so great that tows near the lock touch bottom and safety maneuvers must be taken to prevent releasing any barges from the tow.

The entire inland waterway system has struggled with both record high and low water levels. Major flooding occurred on the Mississippi River system in 2008, 2011 and 2014. These levels cause significant problems for business and navigation. In the case of high water levels, grain elevators may not be able to load grain barges because the vessels may be unable to fit under the loading
spout, and navigation may be ceased as the USACE must remove critical lock operating equipment. Low water levels can put barges at risk for running aground. In the case of both high and low water levels, it is difficult to develop reliable forecasts for returning waterways back to use, as weather is ever changing and unpredictable.

As part of the Regional Freight System Planning Recommendations Study, Chicago area inland waterway stakeholders operating on inland waterways as well as Lake Michigan were interviewed to determine their assessment of the inland waterway system. Overall, the respondents replied that poor lock reliability, inadequate dredging, and restrictive land use ordinances are the key challenges facing their industry. When asked about the state of the Chicago multimodal freight system, 20 public sector and 30 private sector respondents rated the waterway system lowest in terms of meeting their needs. Marine system reliability and maintenance, improvements to ports, and connection between port and rail services were ranked as their highest priorities for the water freight system. While respondents noted significant concern over the electric ANS barrier on the Chicago Sanitary and Ship Canal, they would also like to see greater modal connectivity to take advantage of available inland waterway capacity.

### 3.4 CAWS CAPITAL PROGRAM

The USACE has developed a prioritized plan for investment at locks along the CAWS. Unfortunately, few of these projects are actually funded, and the list does not fully address the scope of the shortcomings along the CAWS noted in the previous subsection. In the last few years, American Recovery and Reinvestment Act of 2009 (ARRA) funds have been applied to projects that may otherwise not have moved forward. The prioritized plan is described below, and included in a detailed table format in Appendix E.

- **Chicago Lock.** The Chicago Lock is one of two locks located at the entrance to Lake Michigan in Chicago. The Chicago Lock is currently closed to barge traffic. Research was unable to locate a prioritized capital plan for the Chicago Lock. However, it was found that the Chicago Lock Sector Gate Replacement was completed in April 2011. Up until the point these gates were replaced, the following infrastructure failures and shutdowns (expressed in days) occurred during the gates’ 75-year life:\(^{38}\)
  - West Gate track machining, new gate rollers, new gate seals, refurbished upper hinges - 179 days (11/19/97 – 3/20/98)
  - East Gate track machining, new gate rollers, new gate seals, refurbished upper hinges - 106 days (12/15/98 – 3/30/99)
  - Gate roller bushing repairs - 43 days (3/10/04 – 4/21/04)

- Gate strut arm rupture due to ice in recess - 10 days (12/19/09)

The Chicago Lock’s sector gate was replaced in 2011 for an approximate cost of $15 million, 25 years after the end of the locks useful life. This project was funded by the one-time ARRA funds.

- **T.J. O’Brien Lock.** The T.J. O’Brien Lock and Dam is one of two locks located at the entrance to Lake Michigan in Chicago. The closure of the Chicago Lock to barge traffic has resulted in rerouted barge traffic from the Chicago Lock to the T.J. O’Brien Lock. The T.J. O’Brien Lock is the only commercial access from the Illinois Waterway to Lake Michigan. Table E.1 in Appendix E notes that investment of over $48.4 million was required for major rehabilitation at this location.

The existing lock mechanical and electrical systems are original equipment installed in the 1960s. In 1998, the electric power utility service was upgraded, but all other components have been in operation since the original construction of the lock. An electrical component failure of the lock electrical distribution system or the sector gate electrical system could result in lock failure, which could cause delays to navigation traffic. The sheet piling for the lock land wall and river walls have also been in service since the original construction of the lock.

High usage at this lock, combined with frequent flooding and temperature extremes, has significantly deteriorated the lock concrete, as well as the mechanical and electrical systems. Sections of the lock wall have periodically been removed, but hazards still remain to lock personnel, barges, and barge personnel due to the condition of the concrete. An evaluation report on this lock (June 2003) estimated that if one of the sheet pile cells rupture, the T.J. O’Brien Lock would have an unscheduled closure to navigation for a minimum of 60-days. The transportation impacts associated with a 60-day closure could approach $18.3 million dollars. In November 2014, this lock was closed for 47 days beginning on the third of the month to begin maintenance on this facility. A second closure occurred for an additional 47 days from January 29, 2015 through March 6, 2016. During this time, barge traffic was permitted to use the Chicago Lock.

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39 While barge traffic at this lock is lower in comparison to downstream locks of Lockport, Brandon Road and Dresden Island, 66 percent of the T.J. O’Brien lockages in 2013 were recreational.


• **Lockport Lock.** The Lockport Lock is located southwest of the city of Chicago, two miles southwest of the city of Lockport, Illinois. A rehabilitation of the lock was completed in 1989 at a cost of nearly $23 million, and another significant maintenance project is underway. As indicated in Table E.1 in Appendix E, almost $40 million was still required for maintenance projects in 2012. The Lockport Pool Approach Dike and Walls were ranked in 2005 as a Category DSAC II\(^{42}\), which is defined as a dam that has confirmed (unsafe) or unconfirmed (potentially unsafe) dam safety issues. DSAC I and DSAC II projects were given national priority for funding by the USACE, while all other ratings were deferred work. A 6-stage rehabilitation project was underway, in part funded through the ARRA funding. The project was broken into multiple stages, many of which are completed: Stage 1 Approach Dike; Stage 1-C Forebay Wall; Stage 2 Controlling Works; Stage 3 Canal Wall; Stage 4 Powerhouse Repair and Embankment Clearing.\(^{43}\)

• **Brandon Road Lock.** The Brandon Road Lock is located 27 miles southwest of Chicago, near Rockdale, Illinois. Improvements identified in the vicinity of the Brandon Road Lock totaled over $48 million in 2012. From the city of Joliet to Brandon Road Lock, the Illinois Waterway is contained between concrete walls that range from 15 to 40-feet high. These walls extend for three miles upstream from the lock and dam, and failure could result in flooding Joliet. In 2007, the USACE began a multi-million dollar, multi-year program to repair and reinforce the walls to ensure their continued integrity.\(^{44}\) It is unclear whether this improvement is fully funded. A separate study\(^{45}\) found that Brandon Road Lock and Dam replacement could cost $60 million ($40 million for lock and $20 million for dam). These projects are not funded.

• **Dresden Island Lock.** The Dresden Island Lock is located 15 miles southwest of Joliet, Illinois. The lock requires improvements estimated in 2012 to cost $80 million. Records show that repairs of the downstream scour have been recently undertaken.\(^{46}\) This project was completed in April 2010 for a cost of

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\(^{42}\) Dam Safety Action Classification ratings include: DSAC I – URGENT AND COMPELLING (Unsafe), DSAC II – URGENT (Unsafe or Potentially Unsafe), DSAC III – HIGH PRIORITY (Conditionally Unsafe), DSAC IV – PRIORITY (Marginally Safe), and DSAC V – NORMAL (Safe)


$3 million. It is unclear if this relates to the Table E.1 priority list. A separate study\textsuperscript{47} found that Dresden Island Lock and Dam replacement could cost $60 million ($40 million for lock and $20 million for dam). These projects are not funded.

Other improvements were deemed necessary by the USACE in the Calumet-Sag Channel. Deferred maintenance along this channel has resulted in the 225’ authorized channel narrowing to the minimally acceptable width of 160’ seen today. Emergency maintenance dredging is expected to be necessary in the near future.\textsuperscript{48} However, the sediments in the canal are contaminated and require placement in a confined disposal facility (CDF). Samples of these sediments have been collected for the Environmental Research and Development Center (ERDC) in order to conduct an environmental analysis during 2015 to help guide the design of placement facilities.\textsuperscript{49} In support of this effort, the USACE Rock Island and Chicago Districts are considering a regional Dredged Material Management Plan (DMMP) for dredged material placement. The long term capacity of this plan would serve both the Illinois Waterway and the Mississippi River.\textsuperscript{50}

In addition to the improvements at, and adjacent to, locks, in 2002 the USACE explored alternatives to widening the channel to solve the congestion and mooring issues on the Chicago Sanitary and Ship Canal as part of the \textit{Great Lakes Navigation System Review Study}.\textsuperscript{51} Three alternatives were developed, as described below. It is unclear from publicly available sources that any of these identified projects has been acted upon within the decade since the report was published.

- **Provide Additional Mooring/Anchorages Areas.** Providing additional mooring/anchorages areas would address capacity issues that result from the narrow channel and mooring needs along the canal banks. These could be configured in three ways:
  - **Three-Mile Wall.** The 3-mile wall, on the north bank of the Cal-Sag Channel directly upstream of the juncture, could be used for


\textsuperscript{48} Calumet-Sag Channel and Chicago Sanitary and Ship Canal, Cook County, IL, September 2014, http://www2.mvr.usace.army.mil/projects/pubFactsheet/Calumet-SagChannelandChicagoSanitaryandShipCanalCookCountyIL.pdf


mooring/anchorage. The land use for this property is designated “corporate use channel maintenance & access” by MWRD, the owner. The land in the vicinity immediately off the bank is Cook County Park District, Forest Preserve land. The forest preserve extends for nearly three miles upstream from the junction. For a three-mile length, this reach would have an estimated capacity for 75 standard 200-foot length barges allowing for 10 foot spacing between each.

- **Widen the Chicago Sanitary and Ship Canal.** Areas along the banks of the Chicago Sanitary and Ship Canal proximate to the narrow areas of the channel that could be widened by 50 to 60 feet from the Lemont railroad bridge to the Romeo Highway Bridge. This would allow for fleeting outside the channel, or potentially accommodate a barge passing zone. There are two areas in the vicinity of this zone that are shown as vacant and owned by MWRD. One location is a half-mile stretch just downstream of the restrictive railroad bridge in Lemont. The second location is a 1.2-mile section at the downstream bend in the canal. The two sites could provide 1.7 miles of mooring potential for 42 barges at single width and 84 barges at double width.

- **Quarry Utilization.** An abandoned quarry located approximately three-quarters-mile upstream of the restrictive Lemont railroad bridge has been identified as a possible site for opening up for commercial navigation. This quarry site consists of a group of eight abandoned and flooded quarry sites. A number of the smaller quarry sites are under consideration by the Village of Lemont for recreational or/and conservation use. The quarry site is approximately 2,000 feet long and 800 feet wide, covering approximately 37 acres. The utilization capacity of the quarry site is estimated to be approximately 140 standard size barges. Alternatively, a portion of the quarry site could be used for a turning basis or a passing notch. The land bridge separating the quarry from the Chicago Sanitary and Ship Canal is approximately 175 feet in width.

- **Provide Additional Turning Basin or Passing Cut.** If proceeding with such mooring/anchorage areas is not pursued, the same three areas could improve the navigation environment in the bottleneck area through their use as a maneuvering basin or a passing notch.

- **Remove the BNSF Rail Bridge (Lemont).** Removing this bridge would allow all tows and commercial/tour vessels requiring no more than 24.4 feet vertical clearance to navigate clear through the Cal-Sag Channel to the Great Lakes. This would be a 5-foot improvement over the existing vertical clearance. However, removing this bridge would not allow taller vessels to travel unrestricted north of the Cal-Sag Channel, due to other vertical restrictions. The cost estimate to make the entire bridge operable so that the bridge will swing open and closed is $3M.
3.5 NATIONAL INLAND WATERWAY SYSTEM COSTS AND FUNDING

According to the American Society of Civil Engineers (ASCE) Annual Infrastructure Report Card, the inland waterways in the U.S. received a D- for the condition of the system.\textsuperscript{52} Forty-seven percent of all locks maintained by the USACE were classified as functionally obsolete in 2006. And, assuming that no new locks are built within the next 20 years, by 2020 another 93 existing locks will be obsolete—rendering more than 8 out of every 10 locks now in service outdated.\textsuperscript{53} The 238 lock chambers on the system have an average age of 58 years.

Long-established programs for preventative maintenance of principal lock components have essentially given way to a fix-on-failure policy, with repairs taking weeks or months to complete. Depending on the nature of the lock malfunction, repair time can have major consequences for barge traffic that depends on the facility for timely delivery of cargo. Oftentimes unscheduled outages are more costly than outages planned well in advance. The dire condition and significant rehabilitation and maintenance costs of the U.S. inland waterway system hold true for the CAWS. The locks in the CAWS range in age from 53 to nearly 80 years old.

Clearly, the overall waterway rehabilitation and maintenance costs of the U.S. marine transport system are not being met. In particular, the USACE, who is responsible for maintaining and modernizing locks and dams, has received only a fraction of their requested and required funding amounts. Exacerbating the problem, neither the USACE nor any other agency has been able to produce a comprehensive inventory and accounting of the magnitude of the navigation projects backlog. All that is available is partial and anecdotal information; but even from that information, it is evident that the navigation backlog is well into the billions of dollars, and that it could be growing by a billion or more dollars every year.\textsuperscript{54} A recent study by the Congressional Research service has noted that

\textsuperscript{52} ASCE, Report Card For America’s Infrastructure, 2013. http://www.infrasturctureresportcard.org/a/#p/inland-waterways/overview


\textsuperscript{54} AASHTO, Waterborne Freight Transportation Bottom Line Report, 2013
the USACE construction backlog could be $62 billion (which includes the inland waterway and other USACE capital needs, e.g. harbor dredging).\textsuperscript{55}

The Inland Waterway Trust Fund (IWTF) partially funds USACE construction and major rehabilitation projects on federal inland waterways, including funding for lock and dam construction\textsuperscript{56}, and until recently was derived from revenues generated by a 20 cents per gallon tax on commercial barge fuel. The IWTF balance has been declining over the years - in FY 2001, the fund had a balance of around $400 million; in FY 2011, the balance was roughly $50 million. Much of the declining balance is associated with the high cost of the Olmsted Locks and Dam project on the Ohio River, which was started in 1998 and will continue through 2024. A small step forward for inland waterway funding was taken in December 2014, when the U.S. Congress approved a 9-cent-per gallon increase in the barge diesel fuel user fee, bringing the fee assessed on barge and tow-boat operators to 29 cents per gallon. This increase will take effect April 1, 2015 and is expected to generate approximately $40 million in additional revenues annually that will be deposited into the Inland Waterways Trust Fund for the benefit of priority navigation project construction and major rehabilitation.\textsuperscript{57}

The IWTF receipts do not fund annual maintenance on the inland waterway system. The Federal government appropriates funds to cover both operations and maintenance activities for the USACE. In the Presidents FY15 budget, $2.6 billion


\textsuperscript{56} The Inland Waterways Users Board is a federal advisory board established by Congress to monitor the Inland Waterways Trust Fund, and to make recommendations to the USACE and Congress on investment priorities. Pursuant to the Water Resources Development Act of 1986 (WRDA), funds for construction and major rehabilitation are cost-shared equally between the IWTF and General Revenue funds from the Treasury (i.e. annual appropriations).

was allocated for this purpose (this includes O&M for the inland waterway, as well as all other facilities the USACE oversees).\textsuperscript{58,59}

In 2012 Rep. Ed Whitfield of Kentucky introduced a bill entitled the Waterways Are Vital For the Economy, Energy, Efficiency, and Environment Act, or WAVE-4. This bill called for changes to Federal cost-sharing for inland waterway projects, including provisions that projects less than $100 million would be funded exclusively from the general fund (without IWTF proceeds) while larger projects (except dams) would be funded 50 percent from the general fund and 50 percent from IWTF proceeds.\textsuperscript{60} While if adopted these proposals could ultimately prove sufficient for annual inland waterway maintenance needs, they would clearly not address the maintenance backlog, the construction backlog, or future authorized construction projects.

Due to this lack of funding and deferred maintenance, out-of-service times are increasing every year, costing U.S. shippers millions in delays. According to a report by ASCE, in 2010, delays on the inland waterway system cost users $33 billion. Similarly,

“A total of 90 percent of locks and dams on the U.S. inland waterway system experienced some type of unscheduled delay in 2009. According to the U.S. Army Corps of Engineers, maintaining existing levels of unscheduled delays on inland waterways, and not further exacerbating delays, will require almost $13 billion in cumulative investment needs by 2020...Current funding levels can support only $7 billion by 2020...Roughly 27 percent of these needs entail the construction of new lock and dam facilities, and 73 percent are estimated for the rehabilitation of current facilities.”\textsuperscript{61}

Shippers and carriers have adapted to the decreasing reliability of the waterway system. The Michigan Department of Transportation reports that on the Great Lakes,

“the U.S. Maritime Administration found U.S. flag vessel operators estimate 75 percent of cargos they carried in the past five years have been reduced in volume due to inadequate water depth at either the loading or discharge port or in the


\textsuperscript{59} Alternatively, the Administration proposed a two-tiered user fee structure on top of the existing inland waterway fuel tax.

\textsuperscript{60} AASHTO, Waterborne Freight Transportation Bottom Line Report, 2013.

connecting channels (St. Mary’s, St. Clair, and Detroit rivers)… It is estimated that it will cost more than $200 million just to restore the Great Lakes navigation system to project depth …”

These and other factors have shippers increasingly turning to other transportation modes such as road and rail systems to meet their demand, particularly in markets where these services are widely available or where the waterborne infrastructure issues are present. However, in some markets waterborne shipping remains an inexpensive, greenhouse gas-emission friendly method for shipping goods that minimizes ton-miles on road and rail systems. This is particularly true on the southern portion of the Mississippi River where lock and dam infrastructure does not exist (i.e., south of Lock and Dam #27 in Granite City, Illinois). Although these benefits are expected to remain to some degree, the future of waterborne commerce will be dependent on the ability to maintain and improve the condition of the system, especially in areas experiencing the greatest physical and infrastructural challenges.

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4.0 Future Plans for the CAWS

There are numerous stakeholders that have an interest in the future of the CAWS, whether for goods movement, recreation, sustainable economic development or otherwise utilizing it as a community amenity. Nevertheless, there is not one vision or “voice” for future development of the CAWS and adjacent land. This section outlines the various long-range plans and visions of a sampling of communities abutting the CAWS. The intent of this overview is to understand those unifying (and conflicting) themes between communities. This section also notes the various other government stakeholders that have interest in the CAWS such as the U.S. Maritime Administration (MARAD), USACE, Metropolitan Water Reclamation District (MWRD), and Illinois International Port District.

4.1 CAWS-Area Stakeholder Plans

To obtain an understanding of where communities and other stakeholders stand related to development of the CAWS, research on visions, long-range plans and other pertinent documents was primarily conducted via web search. Sites were also visited at Lake Calumet and areas adjacent to the Cal-Sag Channel and the Chicago Sanitary and Ship Canal for field verification of conditions. A summary of high-level plan findings is shown in Table 4.1, and supported by the following text. Note that while many consortia and government authorities have concepts for the CAWS, many of them have merely an advocacy role or lack the necessary authority to enact change. Several additional stakeholders have an interest in the continued longevity of the CAWS; however, we were not able to identify publicly available comprehensive plans from these stakeholders regarding the future development of the CAWS. These stakeholders are described in Section 4.2.
# Table 4.1 CAWS-Area Stakeholder Plans

<table>
<thead>
<tr>
<th>Sponsor(s)</th>
<th>Geography</th>
<th>Plan Name (Date)</th>
<th>High Level Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Chicago</td>
<td>Chicago River Main Branch</td>
<td>Chicago Riverwalk Main Branch Framework Plan (2009)</td>
<td>Focused on a redevelopment plan for the Chicago River’s main branch between State and Lake Streets.</td>
</tr>
<tr>
<td>City of Chicago</td>
<td>Central Chicago</td>
<td>Central Area Action Plan (2009)</td>
<td>Focused on enhancing the riverfront and the development of a river walk system.</td>
</tr>
<tr>
<td>City of Chicago</td>
<td>Portions of the CAWS within the City of Chicago</td>
<td>Chicago River Agenda (2005)</td>
<td>Focused on protection and enhancement of riverbank and increased recreational use of the river.</td>
</tr>
<tr>
<td>City of Chicago</td>
<td>Lake Calumet</td>
<td>Calumet Area Land Use Plan (2002)</td>
<td>Focused on enhancing the environmental quality of the area while providing economic opportunity.</td>
</tr>
<tr>
<td>Metropolitan Planning Council</td>
<td>Chicago River</td>
<td>Plan for Prosperity (2011)</td>
<td>Principle of the plan is sustained growth in recreational and tourism uses.</td>
</tr>
<tr>
<td>State of Illinois</td>
<td>Calumet Region</td>
<td>Millennium Reserve Initiative</td>
<td>Focus on a 140,000-acre area that includes portions of the CAWS and the Port of Chicago to create the largest open space area in the country.</td>
</tr>
<tr>
<td>South Suburban Mayors and Managers Association (SSMMA)</td>
<td>Calumet River Corridor</td>
<td>Green River Pattern Book (No date)</td>
<td>Focused on environmentally friendly development and proposes new riverfront trails along the Calumet River Corridor.</td>
</tr>
<tr>
<td>SSMMA and others</td>
<td>Riverdale Area</td>
<td>Lake Riverdale Sustainable Master Plan (2010)</td>
<td>Focused on residential development along the river with retail and logistics development focused inland near the existing rail center.</td>
</tr>
<tr>
<td>SSMMA</td>
<td>South Suburbs</td>
<td>Green TIME Zone (2010)</td>
<td>A strategy for communities in the Southland to use aging infrastructure assets to their benefit.</td>
</tr>
<tr>
<td>SSMMA</td>
<td>Calumet Region</td>
<td>Calumet Area Open Space Initiative (2004)</td>
<td>Highlights unique natural resources of the suburban Calumet region and outlines an open space preservation and restoration plan.</td>
</tr>
</tbody>
</table>
The following is a more detailed summary of the visions and plans outlined by communities. These are organized by sponsoring agency.

**City of Chicago**

Several arms of the City of Chicago have had a role in planning for and conceptualizing the future of the Chicago Area Waterway System. These include the Department of Zoning, Department of Planning and Department, Department of Transportation and the Chicago Plan Commission.

**Chicago Riverwalk Main Branch Framework Plan**

The *Chicago Riverwalk Main Branch Framework Plan*, released by the City’s Department of Zoning and Planning and Department of Transportation in 2009, establishes guidelines for the construction of a continuous walkway from Lake Michigan to Lake Street along the water’s edge to attract people, plants and animals to the river corridor. The plan includes extensive landscaping and creation of retail space along the walk, as well as offering public seating, kayak rentals, floating gardens, fishing piers and more. This project was awarded a $100 million Federal loan in 2013, nearly the full cost of the makeover, and construction is moving forward.

**Central Area Action Plan**

The *Central Area Action Plan*, adopted by the Chicago Plan Commission in 2009, covers the downtown Chicago area of the river and outlines visions for freight and economic development. Though intermodal transportation is mentioned in the freight vision, there is no mention of inland waterway transportation. This likely indicates that they envision intermodal transportation to be via rail and truck.

- **Economic Development and Land Use Vision.** Enhance parks, corridors and waterfronts for residents, workers, students and visitors by implementing the park, waterfront and streetscape/corridor recommendations of the Urban Design Task Force. Prioritize completion of the riverwalk system as an amenity to support central area shopping, employment, and cultural facilities.

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63 Chicago Department of Zoning and Planning and Chicago Department of Transportation, *Chicago Riverwalk Main Branch Framework Plan*, July 2009.

64 The Chicago Plan Commission is a municipal body charged with reviewing a range of activities concerning planning and development in the City of Chicago. It is composed of mayoral appointees and ex-officio members, including the Park District Superintendent, Chicago Transit Authority Board Chairman, and Commissioner of the Chicago Department of Transportation.

- **Freight Related Vision.** Fully support all state and federal initiatives to implement the Chicago Region Environmental and Transportation Efficiency Program (CREATE), a menu of railroad enhancements to maintain Chicago’s global freight competitiveness. Channel freight rail traffic to corridors outside the Central Area. Continue viaduct and roadway improvements to rail, truck and intermodal locations.

**Chicago River Agenda**

The City of Chicago released the *Chicago River Agenda*\(^{65}\) in 2005 toward its vision of the Chicago River as the City’s Second Shoreline. The Agenda outlined the following actions for the riverfront in the City’s jurisdiction:

- **Riverbank Restoration Action.** Update the Chicago River Corridor Design Guidelines to encourage protection and enhancement of riverbank habitat on private land and habitat-friendly rehabilitation of riverbanks and seawalls.

- **Recommendations for Riverfront.** Explore potential to lease publicly owned sites on the river that are unprotected to conservation agencies or organizations that can provide protection and management. Establish river habitat protection districts or zones on the river. Establish riverbank improvement requirements. Secure land and banks of the river where the river widens, along tributaries and canals, and where larger habitat areas are suitable for the construction of riparian habitat.

- **River Use Balance Actions.** Develop a dock policy and use zones for the Chicago River. The City will continue to support and promote a diversified and strong industrial base in the industrial corridors on the Chicago River. The City and the Park District plan to develop over 46 acres of additional river-edge parkland by 2010. In response to increasing recreational use of the river, the City will work with boaters to develop an education campaign about boating safety for recreational users of the river.

**Calumet Area Land Use Plan**

The City of Chicago released the *Calumet Area Land Use Plan*\(^{66}\) in 2002. The plan explains that Lake Calumet is in the unique situation of having industrial business surrounded by a major wildlife habitat. Because of this, the City of Chicago developed a land use plan that took into account the future of both industry and nature in the area. The document outlines a series of goals and actions items. The goals include:

- **Enhance environmental quality of the area while providing economic opportunity.**

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\(^{65}\) City of Chicago, *Chicago River Agenda*, June 2005.

\(^{66}\) City of Chicago Department of Planning and Development, *Calumet Area Land Use Plan*, 2002.
• Retain and enhance existing business in the Calumet area.
• Attract new and industrial business to the area.
• Protect and enhance wetland areas and improve habitat for rare species in the area.

The action objectives include:
• Visualize a plan where large tracts of viable land with good access to transportation can be assembled.
• Create an open space reserve with connected green space.
• Include river-edge and lakeside enhancements and emphasize natural landscaping and storm water management to enhance habitat for native plants and animals.
• Promote energy efficient and environmentally sustainable design and construction techniques.

Regarding the area’s transportation and land assets for industrial development, the Plan notes as follows: “it’s hoped that in the future, bikeways, pedestrian paths and existing train lines will provide transportation for commuting workers as well, making Calumet a truly sustainable and exemplary industrial district.”

**Friends of the Chicago River**

Friends of the Chicago River is a volunteer organization committed to revitalizing the Chicago River. Their work spans the 156-mile Chicago River system and its surrounding watershed with a focus on “a greener river with healthy habitat, an accessible river that people can use and enjoy, and a river cared for by a broad group of supporters.”

**Action Plan for the Chicago River: Getting Specific**

In 2007, the non-profit organization Friends of the Chicago River led the development of the *Action Plan for the Chicago River: Getting Specific*. The goal of this effort was to create a vision for ongoing and future work to improve the quality of both the river itself and the land around it. Friends of the Chicago River employed a detailed charrette process to develop the plan, and received data and information from a wide array of entities. Over 50 experts on a range of subjects participated from City departments, Federal and state agencies, research institutions, and advocacy groups. Topics included riverbank habitat, aquatic habitat, land protection methods, riverbank naturalization, water quality, and public access. The resulting action plan provides guidance for river improvement moving forward, including:

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The developing Chicago River watershed warrants the pursuit of protection of land and open space and protection of public access to the Chicago River. Strategies and partnerships need to be developed in order to accomplish both types of protection.

Efforts should be made to achieve consistency in the type and quality of habitat projects and to link habitat projects all along the river.

The river and its riverbanks should be viewed as a habitat “mosaic” that includes meanders, side channels, backwaters, marshes, ponds, different soil substrates, a variety of plant species, and woody debris to create habitat and increase habitat diversity.

Planning for human activity along the river should always be considered in coexistence with planning for land-based and aquatic habitat.

All river improvement projects should be implemented alongside a commitment to ongoing stewardship, land management, and site maintenance.

The establishment of key partnerships is crucial for implementing projects that achieve multiple objectives and enhance communication between groups working on similar projects.

Strategic priorities for each section of the river should be identified, and site specific projects should be prioritized based on goals for each section.

Metropolitan Planning Council

Plan for Prosperity

In 2011, the Metropolitan Planning Council (MPC) released a Plan for Prosperity in which it proposed charting a new course for the Chicago River in light of the threat of aquatic invasive species. The Plan calls for a regional decision-making process about the future of the Chicago River, highlighting five core principles:

- Improve the water quality and ecosystems of Lake Michigan, Chicago Area Rivers, and the Mississippi Basin, through better treatment and reduced stormwater and combined sewer overflow effects.
- Provide clean drinking water for the growing region, easing reliance on strained aquifers and rivers.
- Enhance the capacity and efficiency of Chicago’s intermodal freight facilities.
- Sustain growth in recreational and tourism uses of the Chicago Area Waterway System.
- Eliminate risk of interbasin species transfer.

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In subsequent years of this annual publication, MPC has emphasized the need to manage the area’s water resources sustainably, and to protect against flooding and waterway contamination, in order to strengthen communities.\(^{69}\)

**State of Illinois**

**Millennium Reserve Initiative**

The Millennium Reserve Initiative\(^{70}\) is a 140,000-acre project to create the largest, urban open space area in the country. This project is Illinois’ contribution to President Obama’s America’s Great Outdoors Initiative to reconnect Americans to America’s rich outdoor treasures; build upon public, private, and tribal priorities for conservation and recreation lands; and use science-based management practices to restore and protect our lands and waters for future generations.\(^{71}\)

The Millennium Reserve Initiative’s goal is to catalyze innovative partnerships and action in the Calumet region that:

- Honor its cultural and industrial past;
- Restore and enhance the natural ecosystems;
- Support healthy and prosperous communities and residents; and
- Stimulate vigorous and sustainable economic growth.

The immediate focus of this effort is the Calumet Core region encompassing numerous neighborhoods on Chicago’s south side, the southeast lakefront, and 35 south suburban municipalities. In aggregate, the Calumet Core includes a collection of over 15,000 acres of open space such as parks, trails, wetlands, and forest preserves. Nearly 6,000 of these acres are considered high-quality natural areas and more than 400,000 residents live in the Calumet Core. The region also includes the Port of Chicago, a barge channel, five interstate highways, five major

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\(^{69}\) Metropolitan Planning Council, *Plan for Prosperity*, various years

\(^{70}\) “Millennium Reserve: Calumet Core” http://www2.illinois.gov/gov/millennium-reserve/Pages/About.aspx

\(^{71}\) U.S. Department of the Interior, “Salazar Announces $1 million for Millennium Reserve Restoration and Conservation Projects,”
railroads and two short-line freight railroads, comprising one of the nation’s largest intermodal transportation centers.

To move this effort forward, in 2013 former Illinois Governor Pat Quinn signed an Executive Order creating a steering committee made up of Federal, State and local partners to oversee the vision for the reserve.\textsuperscript{72} The Steering Committee presented its 14 recommended priorities for transforming the Calumet region in June 2014.\textsuperscript{73} It is unclear what the future of this initiative will be under Governor Bruce Rauner.

**South Suburban Mayors and Managers**

The South Suburban Mayors and Managers (SSMMA), an intergovernmental agency providing technical assistance and joint services to 43 municipalities in Cook and Will Counties.

*Green River Pattern Book*

SSMMA partnered with the Chicago Southland Economic Development Corporation to publish an *Illustrated Guide to Sustainable Urban Planning and Design Principles and Environmental Design / Energy Conservation Best Practices*.\textsuperscript{74}

The first section of the guidebook contains information on various practices and techniques to be used in the Calumet River Corridor when developing and redeveloping land to ensure an environmentally friendly area. The second section of the guidebook selects six specific sites within the Calumet River Corridor and shows how the techniques may be applied. The guidebook also describes how the area has changed over the decades and how this change has led to an increase in vacant lots, brownfield sites, and open space.

**Lake Riverdale Sustainable Master Plan**

The Lake Riverdale Sustainable Master Plan was released in 2010 and centers on residential development along the river; industrial development is primarily


\textsuperscript{73} Illinois Department of Natural Resources, “Millennium Reserve Steering Committee Delivers Recommended Actions to Governor Quinn,” June 23, 2014. http://www.dnr.illinois.gov/news/Pages/MillenniumReserveSteeringCommitteeDeliversRecommendedActionstoGovernorQuinn.aspx

focused inland, near existing rail infrastructure.\textsuperscript{75} This community set the goal of being the environmental model for industry, surrounded by natural areas and recreational opportunities that are accessible to the public. The document lays out the following goals:

- **Enhance Natural Environment.** The plan highlights that the size and diversity of the region’s forest preserves are the driver behind attracting residents, visitors and businesses and that they must be enhanced.

- **Advocate Responsible Development.** The plan advocates for improved stormwater management in the area. At the same time, it notes that there is a need for large, open, hard surfaces to accommodate moving finished goods by rail and truck. There is no mention of inland waterway transportation.

- **Improve Regional Connectivity.** The plan targets specific parcels (open space north/south of 138\textsuperscript{th} Street) owned by the Forest Preserve as requiring enhancement to improve the natural environment.

**Green TIME Zone**

Published in 2010, the *Green TIME Zone*\textsuperscript{76} is a strategy through which older communities in the Southland can translate the value of their established rail infrastructure and manufacturing capacity into desirable neighborhoods, good jobs, and environmental improvement. The strategy is built on three linked mechanisms for sustainable redevelopment:

- Transit-oriented development (TOD) to establish livable communities,

- Cargo-oriented development (COD) to capture the economic benefits of intermodal freight movements, and

- Green manufacturing to build a healthy economy with a bright future.

**Calumet River Corridor Economic Development Vision and Strategy**

The Calumet Rivers Development Project is a planning initiative started in 2005 by the SSMMA to stimulate economic development and investment in the seven south suburban communities that comprise the Calumet River Corridor, including Robbins, Blue Island, Calumet Park, Riverdale, Dolton, Calumet City, and Burnham. In 2007, the Project published the Calumet River Corridor Economic Development Vision and Strategy.\textsuperscript{77} The plan highlights the significant vacant or undeveloped land along the riverfront that should be used for natural recreational

\textsuperscript{75} South Suburban Mayors & Managers Association, *Lake Riverdale Sustainable Master Plan*, October 2010

\textsuperscript{76} Center for Neighborhood Technology, *Chicago Southland’s Green TIME Zone*, 2010.

activities. The plan also lays out visions for different types of development in the area, including:

- **Industrial Vision.** Focus industrial development, including businesses serving a growing market for green services and products, in areas within Calumet City, Dolton, Robbins and Riverdale, following principles and practices of environmental sustainability in the development and operation of the industries. These communities have good intermodal access and alternative energy resources.

- **Commercial and Retail Mix.** Concentrate land use in designated areas along the river, main streets, transit oriented districts, and major arterials. This land use should enhance the river as a central feature of the corridor and reinforce the area’s cultural legacy. The area should have a strong representation of small businesses and local ownership.

- **Open Space and Recreational Vision.** Provide bicycle and pedestrian pathways along the river with connections to Lake Michigan, I&M Canal, the Burnham Trail, commercial and entertainment districts, and neighborhoods in the river corridor. Also desired hosting a high profile, signature festival or event, such as a rowing competition, that involves all of the communities and showcases the river and the surrounding corridor. The corridor should have multiple access points to the river, multi-purpose marinas and a variety of water related activities.

- **Residential Development Vision.** Develop residential neighborhoods with strong connections to the riverfront, commercial clusters, and transportation.

**Calumet Area Open Space Initiative**

The SSMMA began the Calumet Area Open Space Initiative to develop an open space preservation and restoration plan for the Calumet Region. The Initiative was undertaken in collaboration with the non-profit organization Openlands, in cooperation with Burnham, Calumet City, Calumet Park, Dolton, Harvey, Lansing, Riverdale, South Holland, and Thornton. In 2004 the Initiative published a Plan with the goal to enhance the beauty and livability of the area and preserve unique natural resources and lands with recreational value.78 The plan also outlines an organizational structure that could fund and implement an open space vision for the area. The findings of the report highlight the resources of the area, including:

- Sites and Trail Corridors of Statewide and National Significance

- Locally Important Open Space and Recreational Opportunities. The open space characteristics of each community were described in detail and key themes found among the communities were discussed. After reviewing the

78 South Suburban Mayors & Managers Association and Openlands Project, *South Suburban Calumet Area Open Space Initiative*, March 2007.
common themes in the communities, a vision for the region was developed. From the vision outlined in the report, an action plan with recommended preservation and enhancement areas was outlined. Action steps were recommended for specific sites, classified as either short, (1-2 yrs.) medium, (3-5 yrs.) or long (6-10 yrs.) term initiatives and broken into six categories:

- Remnant Natural Areas with High Concentrations of Biodiversity
- Forest Preserve District of Cook County Lands not on the Illinois Natural Areas List
- River and Creek Corridors
- Rail, Road and Utility corridors
- Cultural and Geological Sites
- Bicycle Trail Network

Overall, the action steps outlined in the document focus on increasing open space opportunities, preserving natural habitats, and improving the waterfront. For example, the plan includes acquisition of undeveloped parcels in the region to convert into open space. For the river and creek corridors, the plan focuses on improving the shoreline and expanding water trail opportunities in the area.

4.2 ADDITIONAL CAWS AREA STAKEHOLDERS

The following stakeholders have an interest in the development of the Chicago Area Waterway and surrounding lands. While they did not have comprehensive plans along the lines of the documents and initiatives described above available at the time of this review, the highlighted stakeholders have generated planning documents for their specific areas of authority and other interests related to the CAWS, which are beyond the scope of this study. The below discussion provides a general overview of these stakeholders’ interests as land owners and authorities over aspects of the freight system related to the waterways.

- Illinois International Port District. The Illinois International Port District (IIPD) is a land owner with assets focused in the Lake Calumet area. While primarily centered on facilities that serve the goods movement industry, the Port District also oversees the 36-hole Harborside International Golf Complex constructed on reclaimed land. Facilities include:

  - Iroquois Landing Lakefront Terminus. Located at the mouth of the Calumet River at Lake Michigan, Iroquois Landing is a 100-acre, open paved terminal with 3,000 linear feet of ship and barge berthing space with a navigational depth of 27 feet. There are two 110,000 square-foot transit sheds, with direct truck and rail access. 100 acres of adjacent property is available for lease and development.

79 Illinois International Port District. www.theportofchicago.com
– **Lake Calumet.** Lake Calumet operations and terminals are located at the junction point of the Grand Calumet and Little Calumet Rivers approximately 6 miles inland from Lake Michigan. The southwest quadrant of Lake Calumet consists of three transit sheds totaling over 315,000 square feet adjacent to approximately 3,000 linear feet of ship and barge berthing space.

– **Foreign Trade Zone #22.** The IIPD is the grantee and operator of FTZ#22, which comprises a 60-mile radius from the Chicago city limits. The Port District has two general purpose zones located in Chicago, one at Lake Calumet Harbor and another near O'Hare Airport. The Calumet Zone includes 400,000 square-feet of designated warehouse space and 20 acres of developable land for the storage, handling, processing, manufacturing and/or assembling of foreign goods.

– **Grain and Liquid Bulk Storage.** The IIPD owns two grain elevators at Lake Calumet with a capacity of 14 million bushels, and has liquid bulk storage capacity of 800,000 barrels.

In June 2012, the Port District issued *A Strategic Needs and Capital Study,* which included the following statement on hydrologic separation:

> “Such a barrier restricting inland waterway freight flow between New Orleans and Chicago would require dramatic realignment of freight movement and could substantially lower the value of operating at the Port.”

However, the study included no analysis of actual freight movements and/or impacts on the port to substantiate this statement. The study also characterized hydrologic separation as “a physical closing of the river,” omitting any consideration of how a physical barrier could be combined with lift technologies and other intermodal improvements to keep the flow of goods open and potentially improve service along the CAWS.

In July 2013, the IIPD announced that it had reached a pact with a Denver company to take over operation and management of the Port of Chicago, in a deal expected to yield $500 million in infrastructure investment and 1,000 new jobs within a decade. City of Chicago Mayor Rahm Emanuel noted that the pact “will reinvigorate a critical asset for our city...We are taking what was an underutilized, run-down port and turning it into an engine of opportunity.” However, several months later, the deal fell through, and no new agreement

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has been announced to date. While historically investment in the Port has lagged, if privatization of the Port occurs, the infusion of capital has the potential to increase activity at the Port, as well as generate new traffic that could cross between the Port and the CAWS via the T.J. O’Brien Lock. Such investment also could be directed at creative solutions for moving freight while addressing the aquatic nuisance species threat.

- **Metropolitan Water Reclamation District.** The Metropolitan Water Reclamation District (MRWD) of Greater Chicago is a primary landowner of the banks of the Chicago River and the land surrounding it. The MWRD also owns a significant amount of land adjacent to the other sections of the CAWS. The MWRD has operated under a general policy that land they own along waterways will not be sold, only leased. In addition, as a condition of leasing, the MWRD typically requires the lessee to maintain a 60-foot “green-way” along the edge of the water. The MWRD has leased a large amount of its surplus vacant land along the waterway to various open space agencies for recreational use. If investments were to be made in expanding the Chicago Sanitary and Ship Canal or the Cal-Sag Channel as discussed above regarding limitations of the CAWS, the MWRD and its lessees would likely be impacted.

- **U.S. Maritime Administration.** The U.S. Maritime Administration (MARAD) is the agency within the U.S. Department of Transportation (DOT) that oversees waterborne transportation, including the inland waterway system. MARAD’s programs promote the use of waterborne transportation and its seamless integration with other segments of the transportation system. MARAD recently realigned many of its functions to enhance its role as an industry facilitator and to bring greater focus to the areas of environment and safety. Two initiatives that MARAD has a strong role in, related to this study, include:

  - **Marine Highway System.** In August 2010, former U.S. DOT Secretary LaHood identified 18 marine corridors, 8 projects, and 6 initiatives for further development as part of “America’s Marine Highway Program.” The CAWS is part of the federally designated M-55 Marine Highway Corridor, signifying that it is part of a route that parallels portions of I-55. Funding is being made available for this and other marine highways to understand how they can provide relief to congested roadways and railways, specifically to reduce air emissions, conserve energy, lower

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82 “Port of Chicago deal sunk for now - Talks with Denver firm to privatize languishing South Side district runs aground,” Chicago Tribune, October 1, 2013.


83 See

highway maintenance, costs, and enhance safety.84 This initiative does recognize that key infrastructure, including locks and dams, require modernization in order to maintain or increase usage of the waterways for freight movement. The Missouri DOT has coordinated work on the MARAD M-55 Illinois/Gulf Marine Highway Initiative to study container-on-barge services between Peoria and Gulf Coast seaports, reinforcing that downstream from Chicago there is substantial activity on the inland waterway system.85

- **National Export Initiative.** Each department with the U.S. DOT has a role in supporting President Obama’s National Export Initiative (NEI). Signed into law on March 11, 2010, the NEI has a goal of doubling exports over the next five years, an increase that is expected to support two million American jobs. Goods transported from the Port of Chicago have the potential to contribute to this goal.

- **U.S. Army Corps of Engineers.** The USACE mission is to “provide vital public engineering services in peace and war to strengthen our Nation’s security, energize the economy, and reduce risks from disasters.”86 Central to the USACE mission is protecting the natural environment, where the agency describes itself as “striving to restore ecosystem structure and processes, manage our land, resources and construction activities in a sustainable manner, and support cleanup and protection activities efficiently and effectively, all while leaving the smallest footprint behind.”87 Within the CAWS the USACE is charged with, among other responsibilities, maintaining the locks and the navigable depth of the waterway.88

As previously noted, the USACE conducted the Great Lakes and Mississippi River Interbasin Study to explore options and technologies that could be applied to prevent aquatic nuisance species transfer between the Great Lakes and Mississippi River system.

84 See id.; see also http://www.marad.dot.gov/documents/79_FR_31404_Open_Season_Announcement.pdf


88 The Seventh Circuit Court of Appeals in July 2014 considered the Corps’ duties regarding navigation and concluded that the statutes outlining the Corps’ role do not “add up to a congressional demand to keep the waterway open, no matter what the cost” in the face of the threat from aquatic nuisance species. *Michigan v. Army Corps of Engineers*, 758 F.3d 892 (7th Cir. 2014).
5.0 Findings

This report evaluated CAWS infrastructure condition, use and investment. The findings of this evaluation provide insight into the future use and viability of the CAWS for commerce, specifically:

Finding #1 – The Changing U.S. and Greater Chicago Economy is Impacting Maritime Trade

The data confirms well documented economic trends and the impacts they will have on how goods are shipped. The U.S. economy has been shifting in the last several decades to a service- and consumption-based economy as manufacturing capacity/growth relocates to the Pacific Rim. As a result, more and more goods transported on the U.S. freight system (particularly in large metropolitan areas such as greater Chicago) are driven by consumer demands and less by manufacturing demands. Where transportation networks today provide efficient, “just in time” distribution of goods to consumers, this efficiency is in part due to the mass adoption of the international freight container and improved intermodal connectivity. Neither of these features is a characteristic of the CAWS.

Finding #2 – CAWS System Use is Declining

Data specific to the CAWS shows that use of this portion of the inland waterway system is in decline. Figures 2.6 and 2.8 illustrate that in the last several decades tonnage carried on the CAWS, as well as the Illinois River system, has declined. As manufacturing declines in the U.S., so too does the need for heavy, bulk raw materials that characterize most marine trade. As Figures 2.11 and 2.12 show, coal, historically a top commodity carried on the CAWS, is declining in tonnage, and is expected to decrease even more dramatically due to the announced closing or refueling of numerous coal plants around the Great Lakes since 2012.

However, while traffic is declining, the CAWS remains an important transportation route for certain types of materials, such as construction materials, that are used in the local market and the cereal grains which are increasingly becoming a key U.S. export commodity. While it is clear that relatively small tonnages of these goods travel on the CAWS in general, the data suggests that even lesser amounts travel over points that would be impacted by separation, highlighting the need to determine more precisely the potential impact of separation on these goods. The ability to do so is hampered by a lack of publicly available data.

Finding #3 – Inland Waterway System Lacks Resiliency

According to ASCE, forty-seven percent of all locks maintained by the USACE were classified as functionally obsolete in 2006. Assuming that no new locks are
built within the next 20 years, by 2020 another 93 existing locks will be obsolete—rendering outdated more than 8 out of every 10 locks now in service nationally.\(^8^9\)
The five locks reviewed along the CAWS, have ages ranging from 53 to nearly 80 years old. Long-established programs for preventative maintenance of principal lock components have essentially given way to a fix-on-failure policy, and even then repairs may take weeks or months to complete. Depending on the nature of the lock malfunction, protracted repair time can have major consequences for barge traffic that depends on the facility, and for shippers and manufacturers depending on timely delivery of their cargo. Unscheduled outages are more costly than outages planned well in advance.\(^9^0\) During 2014, there were 73 lock facilities that resulted in closures for a total of 2,380 days and more than 52-thousand hours,\(^9^1\) one the entire inland waterway system.

In addition to locks, there exist other barriers to goods movement on the entire inland waterway system and on the CAWS. Low overhead structures, narrow channel width, lack of sufficient fleeting areas, and low and high water are barriers to mobility.

**Finding #4 – Inland Waterway System Investment Lags**

It is well known that greater Chicago is a national rail hub. Major rail investments are being made by both public- and private-sector partners at the local and national level as part of the CREATE (Chicago Region Environment and Transportation Efficiency) program. This program primarily focuses on the rail system and will also benefit intermodal integration and roadway systems, but does not include any inland waterway system investments. While there remain a number of projects looking to secure funding, significant CREATE projects have been completed, resulting in freight and passenger rail efficiency improvements and other benefits.

In recent years, both Union Pacific and BNSF railroads have completed massive, state-of-the-art intermodal facilities in Chicago’s south suburbs that serve as cornerstones for their national operations. These truck-rail transfer terminals serve both domestic and international traffic, specializing in container traffic. At the same time, local governments are making investments in the supporting roadway networks to ensure their local systems connect intermodal facilities to their community economic engines - industrial/logistics parks. Examples are prevalent in the south suburbs (e.g. Will County), and investments of this type are being made in other parts of greater Chicago and throughout the Midwest.

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89 “President’s Proposed FY 2012 Budget for the Army Corps of Engineers,”, American Society of Civil Engineers.


91 Inland Waterways Users Board, *27th Annual Report to the Secretary of the Army and the U.S. Congress*, December 2014
Investments in the inland waterway system – to the extent that they exist – are not following the same trends as rail and truck. Although barge operators pay a fuel tax that is deposited into the Inland Waterways Trust Fund, the tax revenues are small, and timely investments in maintenance, major rehabilitations, capacity and modernization improvements have not occurred. This is due in part to the fact that, in constant dollar terms, operations and maintenance funding for the USACE civil works infrastructure had been largely flat or declining for decades. A recent study by the Congressional Research service has noted that the USACE construction backlog could be up to $62 billion.92

In the CAWS, the downward trend in goods movement via the waterways, along with this modal discrepancy in planning and investment, has produced a waterway system that continues to fall behind and lack connectivity to the greater freight picture.

**Finding #5 – Land Use and Development Visions Abutting the CAWS are Changing**

When reviewing the visions and long-range plans for the areas surrounding the CAWS, several common themes emerged. All of the stakeholders that have future visions for the land surrounding the waterways had a strong focus on the environment and recreation. The common themes among the communities were the preservation of existing open space and wetlands and the transformation of abandoned or vacant land into new recreational or open space opportunities. There was also a desire among several communities to increase recreational land use along the riverfront by developing nature trails to increase the connectivity of the various open space areas.

In these plans, the focus of any industrial development was on sustainable, environmentally-friendly industry that could coexist with existing natural habitats and residential communities. Moreover, these plans do not contemplate an industrial role for the waterways. For example, two initiatives in the southland, an area that currently has significant freight activity and is adjacent to the Port of Chicago, envision the Calumet River as a recreational and scenic feature, rather than a conduit for goods movement.

**Finding #6 – The CAWS Lacks a Unified Voice**

As noted in AASHTO’s *Waterborne Freight Transportation Bottom Line Report*, the U.S. marine system is a “collection of competitors,” as there is no “master plan” for the system and each stakeholder operates independently. While that reference is directed toward the marine system and goods movement, in general, it can also be specifically applied to the CAWS more broadly speaking. This report highlights the collection of roles and responsibilities of and the studies undertaken by a vast

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array of inland waterway system stakeholders that have interests in planning, funding, construction and use of the system. No single document or entity was found that provides a voice or forum for the collection of interests on the CAWS. As such, individual entities have established their own plans, with minimal regard for impacts to neighbors and other stakeholders. The result is potential for both redundant efforts and languishing progress, as there is no “Champion” to speak for the CAWS.

This evaluation was approached from the perspective of providing a technically sound, unbiased foundation for NRDC as it evaluates its position, the various control point strategies for the CAWS, and their resultant impacts. This evaluation, and the findings presented herein, have been developed in a manner to emphasize what is known about the inland waterway goods movement system and the CAWS, describe what may be inferred from freight commodity flow data, and clearly state what is not known nor can be attributed by the data. Physically modifying the CAWS is not only a challenge for the inland waterway industry and public- and private-sector stakeholders that have concern over the potential Great Lakes invasion of Asian carp, but it is also an opportunity to re-imagine the way the CAWS may function as an economic, environmental and cultural asset for the region.

This report was funded by the Natural Resources Defense Council (NRDC). The views contained herein are those of the author(s) and do not necessarily represent those of NRDC.
A. Data Sources Consulted and Assessment of Related Studies

A.1 Data Sources Consulted

- **United States Army Corps of Engineers (USACE)** - In consultation with other Federal agencies, Native American tribes, state agencies, local governments and non-governmental organizations, the USACE conducted the Great Lakes and Mississippi River Interbasin Study (GLMRIS) to explore options and technologies that could be applied to prevent aquatic nuisance species (ANS) transfer between the Great Lakes and Mississippi River system. The USACE has established a website to house information and their series of ongoing studies related to the CAWS, including an evaluation of goods movement and lock usage in the CAWS in the 2011 report, *Baseline Assessment of Cargo Traffic on the Chicago Area Waterway System*. In January 2014, the USACE released its final GLMRIS report, describing seven alternatives for controlling ANS transfer, including several scenarios with full or partial hydrologic separation. The report includes analysis of current freight movement on the CAWS, as well as estimated tonnage and rate impacts from the various ANS control scenarios. These analyses utilize Waterborne Commerce Statistics and Lock Performance Monitoring System data to represent inland waterway system use.

- **Great Lakes Commission (GLC) and Great Lakes and St. Lawrence Cities Initiative (GLSLCI)** – Formed by the Great Lakes states in 1955, the GLC is an interstate compact agency that “promotes the orderly, integrated and comprehensive development, use and conservation of the water and related natural resources of the Great Lakes basin and St. Lawrence River.” Similarly, the GLSLCI is a coalition of U.S. and Canadian mayors and other local officials “working to advance the protection and restoration of the Great Lakes and St. Lawrence River.” These entities led an initiative to develop and evaluate scenarios for separating the Mississippi River and Great Lakes watersheds to prevent the transfer of ANS, focused on the CAWS. As a part of this effort, the organizations commissioned a technical report entitled *Evaluation of Physical*

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93 USACE, *Great Lakes and Mississippi River Interbasin Study (GLMRIS)*. http://glmris.anl.gov/index.cfm

94 Great Lakes Commission, “About Us.” http://glc.org/about/

95 Great Lakes and St. Lawrence Cities Initiative, “About GLSLCI.” http://www.glslcities.org/aboutus.cfm
Separation Alternatives for the Great Lakes and Mississippi River Basins in the Chicago Area Waterway System, which examined the impacts of several separation and investment alternatives. This study was published in January 2012 along with a summary report, and relied on previous research and analysis, including the CMAP Freight System Planning Recommendations Project and the USACE GLMRIS report, both described here, to represent inland waterway system use.

- **Illinois Department of Transportation (IDOT)** – In December 2012 IDOT published the Illinois Freight Mobility Plan. This report documents commodity flows for all freight modes throughout Illinois, describes future freight trends and needs, and identifies strategies to help ensure the State’s freight system remains vibrant and able to serve the needs of businesses. This study utilized TRANSEARCH data with a base year of 2010 to represent inland waterway system use.

- **Chicago Metropolitan Agency for Planning (CMAP)** – CMAP is the official regional planning organization for the northeastern Illinois counties of Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will. In 2010 CMAP completed the Freight System Planning Recommendations Project, which ultimately became the freight component of the region’s long-range transportation plan, Go To 2040. Cambridge Systematics prepared this report for CMAP. This project documents commodity flows for all freight modes throughout greater Chicago, describes future freight trends and needs, identifies priority freight projects, and proposes policy recommendations. This study utilized TRANSEARCH data with a base year of 2007 to represent inland waterway system use.

- **American Association of State Highway and Transportation Officials (AASHTO)** – AASHTO is a nonprofit, nonpartisan association representing highway and transportation officials in the 50 states, the District of Columbia, and Puerto Rico. In June 2013 AASHTO released an updated Waterborne Freight Transportation Bottom Line Report. Cambridge Systematics prepared this report for AASHTO. This report presents a picture of the U.S. inland waterway systems assets, performance, benefits and challenges. This study utilized FAF3.4 data with a base year of 2011 to represent inland waterway system use.

Each of these entities conducted the above studies for their own purposes and developed and utilized data to best serve their own needs at the time the studies

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were conducted. In Section 2.0, the USACE and GLC & GLSLCI reports are discussed in greater detail to note differences of information pertaining to the CAWS presented in each. Findings and trends from the remainder of the reports, which focus on regional, state, and national issues beyond the CAWS, are also included in this section as noted.

A.2 Assessment of Related Studies

As noted above, several Federal, State and regional stakeholders have recently produced similar and complimentary information to this report’s presentation and evaluation of commodity flow data, lock use and performance and a variety of other information pertaining to the CAWS. To advance an understanding of the relationship among these reports, this section incorporates information contained in the related reports and summarizes select areas where this report is similar to those efforts, or may have slightly different findings.

Each entity conducted studies for its own purposes and developed and utilized data to best serve its own needs at the time the studies were conducted. These differing needs and the assumptions can produce a variety of interpretations of this data. Further differences can be attributed to how data is collected, processed, and organized. For example, the statistics in this report rely primarily on FAF data, while other reports use datasets such as TRANSEARCH, which has different characteristics as described in Section 2.1. The assumptions used to analyze the data vary even more widely.

A handful of these studies were reviewed to understand what differences exist among their conclusions and why. Some reports focus on broader regional, State, or national trends, and the findings from these reports are incorporated into the analysis within this report as noted. Although some numerical differences do occur, the overall trends of a decreasing focus on inland waterway transportation on the CAWS, for all but a few commodities, are consistent throughout different findings. These reports include the following:

- **Illinois Department of Transportation** - *Illinois Freight Mobility Plan, 2012*
- **Chicago Metropolitan Agency for Planning** - *Freight System Planning Recommendations Project, 2010*
- **American Association of State Highway and Transportation Officials** - *Waterborne Freight Transportation Bottom Line Report, 2013*

Two studies with particular focus on the CAWS region were also reviewed, and notable similarities and differences are summarized in this section. These studies are the following:

- **United States Army Corps of Engineers** - *Great Lakes and Mississippi River Interbasin Study, 2011*
Great Lakes Commission and Great Lakes and St. Lawrence Cities Initiative
- Evaluation of Physical Separation Alternatives for the Great Lakes and Mississippi River Basins in the Chicago Area Waterway System, 2012

Great Lakes and Mississippi River Interbasin Study (2011)

The USACE, in consultation with other governmental and non-governmental organizations, conducted the Great Lakes and Mississippi River Interbasin Study (GLMRIS) for the purpose of evaluating the risk of introducing non-native, aquatic nuisance species (ANS) between the Mississippi River and Great Lakes Basin. The study’s focus areas include evaluating the risk of ANS contamination, potential options and technologies to reduce the spread of ANS, and understanding the consequences of ANS contamination or any control options. This last focus area included an evaluation of the goods movement and lock usage by commercial and other vessels in the CAWS in a 2011 report, Baseline Assessment of Cargo Traffic on the Chicago Area Waterway System, used in preparation of the final 2014 GLMRIS report.

The goods movement and lock usage trends noted previously in this document were compared to those of the 2011 GLMRIS study. The trends in each study were found to be similar. Many of the differences can be attributed to the respective data sources used and analysis method, and not a discrepancy in the trends of statistics between the reports. In particular,

- In the 2011 GLMRIS study, data on CAWS traffic was sourced from the WCS and LPMS, the second of which is a source only available to USACE, while this study relies on the FAF database for goods movement information and on WCS data for some lock movements.

The 2011 GLMRIS study acknowledges that statistics on tonnage numbers and lockages vary due to differences between the WCS and LPMS reporting systems, which

“typically occur because the LPMS tonnages are estimates based on the observations of lock personnel, whereas the WCS tonnages represent the actual loadings as reported by the towing companies...shippers typically load barges beyond their technical specifications.”

- There exist differences in goods classification between the data sources used in each study. FAF uses Standard Classification of Transported Goods (SCTG) codes, while the WCS uses Lock Performance Monitoring System (PMS) codes. The result is that the commodity volumes reported may not be directly comparable between studies, even if the groupings in each study appear


101 Ibid., pg. 21.
similar (e.g. grains, coal). For example, FAF analysis reports about 10 million tons of “coal” movements on the CAWS in 2011, while the GLMRIS study, using WCS data, reports 4.5 million tons of “coal” movements. In each case, “coal” is a group of commodities that are defined differently using the data’s respective classification systems.

- Origins and destinations are also defined differently in each data source. For example, using FAF data, New Orleans is a primary trading partner via the CAWS. In this data set, “New Orleans” is coded as a destination for not only goods traveling to the city itself, but also for goods using New Orleans as an intermediate stop/point of transfer to other destinations. In contrast, the 2011 GLMRIS study identifies shipments by final destination state. The result is that the shipments to Louisiana as a whole appear lower in the GLMRIS report than the shipments to New Orleans indicated by the FAF data.

- Finally, barge count observations differ between the studies. These differences may be partially attributable to possible underreporting in the WCS system due to barges transferred between line haul and local towing companies. Similar underreporting is unlikely in the LPMS system, which bases counts on direct observation.

Great Lakes Commission and Great Lakes and St. Lawrence Cities Initiative Study (2012)

The Great Lakes Commission and the Great Lakes and St. Lawrence Cities Initiative commissioned the *Evaluation of Physical Separation Alternatives for the Great Lakes and Mississippi River Basins in the Chicago Area Waterway System* technical report to identify and evaluate separation alternatives along with plans for implementing those alternatives and installing barriers. The barriers are intended to prevent Asian carp and other ANS from invading the Great Lakes or Mississippi River basins via the CAWS. This study was published in January 2012, and relied on previous research and analysis, including the CMAP and 2011 GLMRIS reports described in this section, to represent inland waterway system use.

The GLC & GLSLCI report includes an economic analysis section, which describes impacts to freight transportation and is based on a set of separation scenarios (see Figure 1.3) that include assumptions of high growth and investment in the waterway system, as taken up below. The report does not provide an analysis of the potential effects of separation based on the system as it operates today. Thus, the discussion of freight transportation in the report should be understood to reflect one of several specific scenarios envisioned by the report authors. In many cases, the conclusions drawn in these scenarios go beyond what can be obtained by analysis of current data, and rely on a number of assumptions. Without the significant investment in the waterway system assumed by the study, it is unlikely
that the impacts and potential benefits of separation to freight transportation will be as great or wide-spread as the study describes.\textsuperscript{102}

As stated, many assumptions were used to develop the freight transportation piece of the economic analysis included in report. These assumptions, in turn, affect the results of the overall economic analysis in the report. Understanding which pieces of the report are based on currently available data and which are based on assumptions is important context when interpreting the study results. A high-level assessment was conducted to identify and describe key assumptions about freight transportation used in the report. These include the following:

- Benefits to transportation from separation, in the form of enhanced goods movement along the CAWS, are largely based on the growth of a Container-On-Barge (COB) service on the CAWS. There is currently no Container-On-Barge market in Chicago; in fact, to develop such a market would take significant infrastructure investment not only in Chicago but also in other ports such as New Orleans\textsuperscript{103} or along the St. Lawrence Seaway. COB service is rarely used in the U.S. and has seen little federal support.\textsuperscript{104} Currently, the most likely place for a COB market near the CAWS region would serve agricultural centers downstream of most separation alternatives.\textsuperscript{105}

Nevertheless, the CAWS container traffic forecasts in the report utilize a USACE report\textsuperscript{106} scenario that projects high amounts of COB traffic beginning in 2015 (labeled “Radical Change COB”) to determine economic impacts to freight transportation. This scenario assumes that current container traffic will triple within 5 years (in part due to the Panama Canal expansion) and continue at a high growth rate. In this scenario, traffic that would have otherwise been

\textsuperscript{102} Note that this analysis only considers the freight transportation components discussed in the report and does not consider or discount the benefits from other effects of separation, including water quality or avoided costs due to eliminating the threat of invasive species.

\textsuperscript{103} As an example, “Sea Point” is a proposed Container-on-Barge development servicing the New Orleans area; however this development is not currently operational and the timeline is unknown. http://sea-point.net/sea-point/


transported by rail or truck will use the COB system. Benefits due to this COB traffic, including decreased transportation costs, emissions levels, accidents, and operations and maintenance costs, are estimated to be about $416 million over the study lifecycle for the primary alternative identified by the study.107

- The economic forecasts included in the study rely on an immediate growth of 8,000 to 20,000 TEUs of container traffic by 2015 and significant increases in following years corresponding to the opening of the Panama Canal.108 However, as set forth above, it is currently unclear what the effects of the Panama Canal expansion will be for an individual port or market109,110, and in particular, for the inland waterway system which does not currently have a large market for COB traffic. The CAWS currently has no container on barge traffic, nor equipment to handle (load/unload) containers on barges.

- The study stated that it “does not reflect the potential for shutting down coal-fired power plants serviced by the CAWS in the future.” In 2012 two power plants directly served by the CAWS, the Fisk and Crawford coal power plants,111 ceased operations. The shutdown of these plants is not included in the study’s economic analysis. These plants are all located east of the proposed separation points; with their closure the amount of coal traveling on the CAWS may be severely reduced, and so the lack of these shipments weighs against enhanced investments in the CAWS to enable better goods movement. As discussed in our report, other factors indicate that coal and petroleum coke movements on the inland waterways and Great Lakes may decrease significantly more than under recent projections, including those that take the Fisk and Crawford closures into account.

- The study relied on aggregate estimation techniques to project future freight demand and mode share; however, little supporting evidence was found for the assumptions of freight demand and mode shift. In particular, the study assumes that all cargo would continue to move to, from, and through the greater Chicago area after separation,112 and that separation would result in a

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108 Ibid; pg. V-14


110 USACE, The Implications of Panama Canal Expansion to U.S. Ports and Coastal Navigation Economic Analysis


112 GLC & GLSLCI, Evaluation of Physical Separation Alternatives for the Great Lakes and Mississippi River Basins in the Chicago Area Waterway System, 2012; pg. V-33
15 percent mode shift away from barge.\textsuperscript{113} However, in addition to shifting modes, it is likely that separation may cause some industries to cease operations, shift their business operations away from the greater Chicago area, or make other changes that will affect freight demand through the CAWS. Such changes were not accounted for in the study. Detailed economic research is necessary to better understand the effects of separation on the transportation system, and mode shift in particular. As noted above, the 2014 GLMRIS study included assessment of economic impacts as well, but the publicly available information on this analysis did not allow for independent assessment of the assumptions and approach.

Although the GLC/GLSLCI study does note that the economic analysis of freight transportation impacts is an “upper bound” on the impacts (in contrast to an expected or average value) and include sensitivity analysis in the appendices, these acknowledgements are not continued throughout the report and do not adequately indicate to the reader the level of uncertainty present in the values represented. Given the overall uncertainty of the analysis, it is not clear that the report establishes an “order of magnitude” of the impacts, which could vary significantly from the figures presented. The report’s findings in regards to the freight transportation sector should be interpreted in context, to represent possible outcomes of particular separation and investment scenarios based on a combination of data and assumptions, including those detailed above.

\textsuperscript{113} The 15 percent was a composite value based on two estimates: that permanent separation would increase barge transportation costs by 10 percent and increase travel time by five percent (totaling a 15 percent change). Each of these costs was assumed to have an elasticity of -1, which indicates that a one percent increase in price will result in a one percent decrease in use, and vice versa. However, this value is subject to significant uncertainty. A review of elasticity literature in the Navigation Economic Technologies Program report, \textit{A Survey of the Freight Transportation Demand Literature and a Comparison of Elasticity Estimates}, (Clark, et. Al., 2005) found that mode shift potential is small when solely based on price changes.
B. Description of Freight Data

This report draws upon a number of data sources to analyze commodity flow information along the CAWS, in the Chicago Region, and nationally. Each data source is described below, including a description of the “lens” provided by and limitations of each source. The data sets used include:

- **The Freight Analysis Framework** - The Freight Analysis Framework (FAF) is a multimodal freight database developed by the Federal Highway Administration (FHWA) that integrates data from a variety of sources to create a picture of freight movement among states and major metropolitan areas by all modes of transportation. Now in the fourth version of its third generation, it is commonly referred to as “FAF3.4.” This database provides estimates of tonnage and value by commodity, mode, origin and destination for 2011, and forecasts through 2040. This data set provides a glimpse into freight activity in major regions, in aggregate, with regions represented as FAF “zones.” Greater Chicago region freight activity is reflected in two FAF zones, one in Illinois, and another in Indiana. The primary source of data for the FAF3.4 is the 2007 Commodity Flow Survey, along with some additional sources, notably the STB’s Carload Waybill Sample, Public Use version, and the Waterborne Commerce Statistics. The FAF data set is free to the public, and available at FHWA’s Freight Management and Operations website.  


- **TRANSEARCH** – This is a privately maintained multimodal commodity flow database, available for purchase via IHS Global Insight. The off-the-shelf product provides commodity flow information similar to the FAF - tonnage and value by commodity, mode, origin and destination for a base year and forecasts – with the advantage of providing detail at the county-level, versus a “zone” that encompasses many counties. This data set utilizes many of the same sources as FAF; however, it may better reflect local freight activity today and in the future as it is developed with a heavy reliance on IHS Global Insight’s proprietary, detailed econometric models that reflect macroeconomic
dynamics as well as industry-specific factors. Because TRANSEARCH data can be developed at more disaggregated level than FAF3.4 data, it is a better source for local freight system analysis.

- **Waterborne Commerce Statistics (WCS)** - The primary function of the Waterborne Commerce Statistics Center, under the authority of the Rivers & Harbors Act of 1922, is to collect, process, distribute, and archive vessel trip and cargo data. Under Federal law, vessel operating companies must report domestic waterborne commercial movements to the USACE. As such, the WCS tonnages and other statistics represent the loadings reported by the operating companies, for both ports and waterways. This data is publicly available via the USACE WCS web portal. This information is one of the primary sources used to develop both FAF and TRANSEARCH databases; however, those database take the WCS data and process it in a manner so that it can be combined with other modal information. As such, there is a chance that some of the data integrity may be lost. The WCS data is a good source of actual data that can be used to vet and validate the FAF and TRANSEARCH databases.

- **Lock Performance Monitoring System (LPMS)** - The LPMS and Lock Characteristics database provides USACE operators, planners, and managers with information on the use, performance, and characteristics of the USACE national system of locks. LPMS consists of data collected at most USACE-owned and/or USACE-operated locks. In contrast to the WCS statistics, LPMS tonnages are estimates at the locks and are based on the observations of lock personnel. Data includes number of vessels and barges locked; type and dates of lockages; durations of, and causes for, periods of lock unavailability; barge type, size, and commodity type; and tonnages carried.

115 USACE, “Waterborne Commerce Statistics Center.”
C. Greater Chicago Trade Activity and Forecasts

While the vast majority of inland waterway trade on the greater Chicago inland waterway system is domestic in nature, a significant portion of activity is linked either directly or indirectly to international markets. While there appears to be a sizeable portion of traffic moving from the lower CAWS to New Orleans, some of these flows are international in nature; due to the fact they are transloaded onto ocean-going vessels at the Port of New Orleans, the transaction is not explicitly captured within the FAF data. Figures C.1 and C.2 illustrate the current and forecast trends for tonnage and value for imports/exports using the greater Chicago inland waterway system. FAF categorizes international trade into eight regions, each of which has some level of inland waterway trade with greater Chicago (note that Southeast Asia and Oceania do have very low levels of trade that are not evident from the figures). Continuing a long-standing trend, future growth in international trade is expected to be led by Eastern Asia, trade which will likely travel via the MRS to New Orleans for export, and likely not pass through the proposed CAWS separation locations.

Figure C.1 Greater Chicago Import/Export Activity (Tons, 2011, 2040)

Source: FAF3.4, Greater Chicago Region – IL and IN portions. Inland waterway freight, only.
Figure C.2  Greater Chicago Import/Export Activity (Value, 2011, 2040)

Source:  FAF3.4, Greater Chicago Region – IL and IN portions.  Inland waterway freight, only.

As a point of comparison for the volume and value of international trade activity for inland waterway goods movement, Figure C.3 presents total import/export tonnage for greater Chicago by mode for 2011 and 2040.  Figure C.4 displays the value of these goods.  For international transport, truck dominates by value, representing over 50 percent of the goods in 2040.

Inland waterway movements comprise 2.8 percent of the international tonnage in 2011 and a projected 5.4 percent of the international tonnage in 2040.  They also represent 0.2 percent of the international value of goods in 2011 and 2040.  Both of these comparison points show that inland waterway transport for international goods, while increasing significantly in volume, are expected to still maintain a low overall value\textsuperscript{116} in greater Chicago trade.

For international trade using other modes, trucking in greater Chicago is predicted to hold a steady mode share in tonnage; 41.8 percent in both 2011 and in 2040.  Rail is predicted to remain relatively flat in tonnage; 27.4 percent in 2011 and 26.6 percent in 2040.  Multiple modes and mail also shows an increase; 17.9 percent in 2011 and 19.8 percent in 2040.  This reflects the increase in intermodal transport for international goods.

\textsuperscript{116} Note: this decline in international maritime transport refers only to flows that have an origin and a destination in greater Chicago and use water transport to connect directly to the region.  This is not a reference to international maritime trade, overall.
Figure C.3  Greater Chicago Import/Exports Tonnage by Mode (2011, 2040)

Source: FAF3.4, Greater Chicago Region – IL and IN portions.

Figure C.4  Greater Chicago Import/Exports Value by Mode (2011, 2040)

Source: FAF3.4, Greater Chicago Region – IL and IN portions.
D. Additional CAWS and Inland Waterway Infrastructure Needs

D.1 Lock Infrastructure

The five locks on the CAWS reviewed in this report are the Chicago, T.J. O’Brien, Lockport, Brandon Road and Dresden Island Locks. These locks are shown in Figure 1.1 and the physical description of each is outlined in Table D.1. Infrastructure elements of particular interest to this analysis include the following, (also summarized in Table D.1).

- **Length of chamber, usable length of chamber; Width of chamber, usable width of chamber.** The dimensions of the CAWS lock chambers are important because they impact the type and configuration of vessels that can use the locks. All but the T.J. O’Brien Lock are 600 feet long; the T.J. O’Brien Lock is 1,000 feet long. Along the CAWS, lock chambers in this study have the same overall length and usable length. Conversely, the usable width of lock chambers is slightly less than the overall width of the chamber in all cases. The usable width of all locks is 108 feet.

  Length and width dimensions of lock chambers are important in understanding waterway throughput and ease of operation. The most efficient way to move barges is to lash them together, so that up to 15 barges can be powered by a single tow. Typical barges are 200 feet long by 35 feet wide. Tows are up to 200 feet long and 45 feet wide. Lashed together, this results in a 3-barge by 5-barge configuration that is powered by a single tow. The width of this vessel is 105 feet wide, and up to 1,200 feet long.

  None of the CAWS locks reviewed in this study have the ability to accommodate a vessel 105 feet wide and 1,200 feet long. The T.J. O’Brien, Lockport, Brandon Road and Dresden Island Locks are each wide enough to accommodate the 105-foot width. However, neither the 1,000-foot long T.J. O’Brien Lock, nor the 600-foot long Lockport, Brandon Road or Dresden Island Locks have the capacity to accommodate the 1,200-foot length. In the case of a barge tow longer than the 600-foot chamber length, a double lockage is required to allow half the barge to traverse the lock, and wait for the second half to pass afterwards, requiring a second lockage.

  The Chicago Lock is neither long enough, nor wide enough to accommodate a 15-tow barge. However, it has been noted that barge traffic is no longer able to use the Chicago Lock, and must use the T.J. O’Brien Lock for passage to/from Lake Michigan instead.
• **Channel depth above/below lock.** A minimum navigable depth of 9 feet within the CAWS is maintained by the USACE. This depth is sufficient to handle barge traffic, and all segments of the CAWS meet the 9-foot threshold. To maintain the 9-foot depth, each year the USACE must dredge at 5 to 15 sites, removing approximately 250,000 cubic yards per year. Several segments are much deeper. The Chicago Lock, which no longer serves barge traffic but focuses primarily on recreational and commercial activities, has a 21-foot navigable depth. Additionally, though not noted in Table 3.1, the Calumet River, connecting Lake Calumet and Lake Michigan, has a navigable depth of 27 feet, the minimum depth required to handle international cargo.

• **Channel width above/below lock.** The width of the waterway is important to ensure that barges can safely pass each other. Prior to the widening of the Cal-Sag Channel to 225 feet (from 160 feet), barge sizes were limited on the waterway due to the winding nature of the route. Today, the width of the Cal-Sag Channel has once again narrowed to the minimally acceptable width of 160 feet due to deferred maintenance. Plans had been laid to expand the Chicago Sanitary and Ship Canal to 225 feet as well, but the vision never was achieved, and the navigable width today remains 160 feet. At most locations the canal widens in the vicinity of the locks to accommodate traffic entering and exiting. The exception to this is the Brandon Road Lock. The 160-foot channel width makes it extremely difficult to operate vessels in two-directions. As previously noted, 15-tow barges may be up to 105 feet wide. A 160-foot channel width does not allow sufficient space for passing, thus limiting the practical barge configuration that may operate on the CAWS.

• **Time to fill/empty lock.** This field relates to the amount of time required to pass through a lock. In the case of the three locks on the Illinois River, the lock fill/empty time can range from between 26 to nearly 38 minutes. This is due to the “lift” required to transport a vessel from above/below the lock, which ranges from 22 to 39 feet. In the case of barges that may need to be split to traverse a lock, requiring a double lockage, the time can increase from 38 minutes to 75 minutes at the Lockport Lock – this does not account for any time for waiting in queue for lock availability.

Similar data on the time to fill and empty locks for the Chicago and T.J. O’Brien Locks was not found; however, it is expected that the time to fill/empty the locks would be shorter than those on the Illinois River, as the lifts are only 4 feet.

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118 “Lift” refers to the vertical distance that water needs to be raised/lowered in order for vessels to traverse the lock.
<table>
<thead>
<tr>
<th>Table D.1  CAWS Lock Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>River name</strong></td>
</tr>
<tr>
<td>Chicago River</td>
</tr>
<tr>
<td>Calumet</td>
</tr>
<tr>
<td>River mile point of structure</td>
</tr>
<tr>
<td>Year structure opened</td>
</tr>
<tr>
<td>Lock location (L or R river bank)</td>
</tr>
<tr>
<td>Type of gate</td>
</tr>
<tr>
<td>Time to fill lock (min)</td>
</tr>
<tr>
<td>Time to empty lock (min)</td>
</tr>
<tr>
<td>Lift, Dist. from empty to full (ft.)</td>
</tr>
<tr>
<td>Length of chamber (ft.), Chamber useable length(ft.)</td>
</tr>
<tr>
<td>Width of chamber (ft.)</td>
</tr>
<tr>
<td>Chamber useable width (ft.)</td>
</tr>
<tr>
<td>Channel depth (above) (ft.)</td>
</tr>
<tr>
<td>Channel depth (below) (ft.)</td>
</tr>
<tr>
<td>Channel width (above) (ft.)</td>
</tr>
<tr>
<td>Channel width (below) (ft.)</td>
</tr>
<tr>
<td>Mooring devices (Y or N)</td>
</tr>
<tr>
<td>Multi use of structure¹</td>
</tr>
</tbody>
</table>

Source: USACE

¹(N) Navigation, (P) Power, (R) Recreation, (F) Flood Control, (C) Commercial, (I) Irrigation
D.2  Lock Condition and Usage

Section 2.0 presented a review of tonnages, value and commodities transported on the CAWS and through the locks. This subsection builds on that information and further examines the usage of the system locks. Over one-third of the barges traversing the CAWS locks experience delay due to a combination of factors. Detailed statistics by lock related to tons locked, vessel processing time, number of barges and vessels, number of lockages, and unavailable time are found in Table D.2 and described, below.

- **Tons Locked.** Lock tonnages increase traveling west on the CAWS, with the highest tonnages in the study, 13.6 million tons, at the Dresden Island Lock. The lowest recorded tonnages used to be at the Chicago Lock, which since 2008 has had barge traffic curtailed, and today barges instead use the T.J. O’Brien Lock for access to Lake Michigan. The lowest recorded tonnage now occurs at the T.J. O’Brien Lock with 5.3 million tons.
The length of a lock is a primary determinant of the lock’s tonnage capacity. A 2010 study on proposed lock improvements presented information on the capacity of locks on the Mississippi River System outside of the CAWS. It states,

“The existing 600-foot locks at Locks and Dams 20-25, Peoria, and La Grange are designed for a nominal 50 million tons in annual barge traffic, and the three existing 1,200-foot locks at Dam 19, Melvin Price Dam, and the Chain of Rocks Channel (Lock 27) near St. Louis are designed for approximately a nominal capacity of 100 million tons annually.”

Considering these measurements and comparing them to the locks in the CAWS study area, which are 600 feet long with annual tonnages under 14 million, it can be inferred that the CAWS locks are operating significantly under capacity. For example, the 600 foot Dresden Island Lock with 13.6 million annual tons is operating at 30 percent capacity, and the 1,000 foot T.J. O’Brien Lock with 5.3 million annual tons is operating at 6 percent capacity.

- **Vessel Processing Time.** The longest vessel processing times are shown at the Illinois River locks of Lockport, Brandon Road and Dresden Island, which also report the highest tonnages. Each of these locks experiences an average delay of at least 50 minutes per tow. In addition to delay, the average processing time for these locks was up to an hour, with the highest average processing time at the Lockport Lock. As shown in Table D.2, this lock has the longest fill time required to cover the 39-foot lift. Each of these locks is also only 600 feet in length, requiring a double-lockage for barges over 600 feet long. This results in over one-third of the barges traversing these locks experiencing delay.

- **Number of Barges and Vessels.** Vessel counts include not only barges carrying freight but also personal boats for recreational purposes and commercial boats, like those used for tours. The percentage of recreational vehicles at the Lockport, Brandon Road, and Dresden Island Locks all vary between 13 percent and 17 percent of total vessel counts. These statistics indicate the locks on the Illinois River primarily serve commercial traffic, whereas in the vicinity of the Port of Chicago, traffic is primarily recreational. Again, the heaviest barge activity is located on the Illinois River at the Lockport, Brandon Road and Dresden Island Locks. As previously noted, this part of the river is also only 160 feet, and is the narrowest and most heavily used for goods movement within the CAWS study area. While T.J. O’Brien Lock appears to have noteworthy vessel volumes, these volumes reflect a

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120 Annual counts of lock traversals vary between WCS and LPMS datasets; however general trends of high levels of recreational use and declining levels of commercial cargo remain. See also GLMRIS, *Baseline Assessment of Cargo Traffic on the Chicago Area Waterway System*, 2011, Table 19.
significant number of recreational trips. The T.J. O’Brien Lock predominantly serves non-barge traffic, with recreational vessels comprising over 84-percent of the vessels using the lock.

- **Number of Lockages.** Table D.2 indicates that not only is barge activity greatest at the Lockport, Brandon Road and Dresden Island Locks, but that barges are lashed together for lockage. If maximum allowable configuration were used to lock the 11,447 barges at the Dresden Island Lock (9 barges at a time), 1,272 lockages would occur. The lock statistics indicate that maximum barge configuration was not used for each lockage, as the total commercial locks at this location are just over 2,700. The same is true for all other locks - that maximum throughput was not used for each barge/commercial lockage. Taken together, these statistics indicate that the locks are underutilized. As previously noted, these locks are handling only one-third or less of their designed tonnage capacity.

- **Unavailable Time.** The 2013 statistics for unavailable time are a marked decline over previous years with each lock recording unavailable time in 2013. The T.J. O’Brien Lock is the only lock which experienced a decrease in overall unavailable time due to a large reduction in scheduled unavailabilities.
### Table D.2  CAWS Lock Usage (2013)

<table>
<thead>
<tr>
<th></th>
<th>T.J. O’Brien Lock</th>
<th>Lockport Lock</th>
<th>Brandon Road Lock</th>
<th>Dresden Island Lock</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tons Locked</strong></td>
<td>5,257,864</td>
<td>9,889,403</td>
<td>10,427,098</td>
<td>13,579,738</td>
</tr>
<tr>
<td><strong>Vessel Processing Time</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Delay (Tows) (Hrs.)</td>
<td>0.04</td>
<td>2.41</td>
<td>0.88</td>
<td>1.00</td>
</tr>
<tr>
<td>Average Processing Time (Hrs.)</td>
<td>0.21</td>
<td>1.02</td>
<td>0.81</td>
<td>0.84</td>
</tr>
<tr>
<td>Percent Vessels Delayed (%)</td>
<td>1</td>
<td>44</td>
<td>36</td>
<td>39</td>
</tr>
<tr>
<td><strong>Number of Barges and Vessels</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barges Empty (#)</td>
<td>1,716</td>
<td>3,689</td>
<td>3,870</td>
<td>3,849</td>
</tr>
<tr>
<td>Barges Loaded (#)</td>
<td>3,195</td>
<td>5,845</td>
<td>6,193</td>
<td>7,598</td>
</tr>
<tr>
<td>Total Barges (#)</td>
<td>4,911</td>
<td>9,534</td>
<td>10,063</td>
<td>11,447</td>
</tr>
<tr>
<td>Commercial Vessels (#)</td>
<td>1,732</td>
<td>2,772</td>
<td>3,066</td>
<td>2,370</td>
</tr>
<tr>
<td>Non-Commercial Vessels (#)</td>
<td>55</td>
<td>8</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Recreational Vessels (#)</td>
<td>9,822</td>
<td>422</td>
<td>555</td>
<td>483</td>
</tr>
<tr>
<td>Total Vessels (#)</td>
<td>11,609</td>
<td>3,202</td>
<td>3,633</td>
<td>2,878</td>
</tr>
<tr>
<td><strong>Number of Lockages</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Lockages (#)</td>
<td>1,648</td>
<td>2,775</td>
<td>2,976</td>
<td>2,758</td>
</tr>
<tr>
<td>Non-Commercial Lockages (#)</td>
<td>53</td>
<td>8</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>Recreational Lockages (#)</td>
<td>3,300</td>
<td>302</td>
<td>321</td>
<td>265</td>
</tr>
<tr>
<td>Non-Vessel Lockages (#)</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total Lockages (#)</td>
<td>5,001</td>
<td>3,085</td>
<td>3,633</td>
<td>3,048</td>
</tr>
<tr>
<td><strong>Unavailable Time</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scheduled Unavailabilities (#)</td>
<td>36</td>
<td>17</td>
<td>72</td>
<td>2</td>
</tr>
<tr>
<td>Scheduled Unavailable Time (Hrs.)</td>
<td>12.22</td>
<td>8.32</td>
<td>63.17</td>
<td>3.98</td>
</tr>
<tr>
<td>Unscheduled Unavailabilities (#)</td>
<td>3</td>
<td>39</td>
<td>71</td>
<td>10</td>
</tr>
<tr>
<td>Unscheduled Unavailable Time (Hrs.)</td>
<td>74.65</td>
<td>23.27</td>
<td>59.45</td>
<td>88.65</td>
</tr>
<tr>
<td>Unavailabilities (#)</td>
<td>39</td>
<td>56</td>
<td>143</td>
<td>12</td>
</tr>
<tr>
<td>Unavailable Time (Hrs.)</td>
<td>86.87</td>
<td>31.58</td>
<td>122.62</td>
<td>92.63</td>
</tr>
</tbody>
</table>

*Source: USACE*

*Note: The Chicago Lock is not included in this table as it is no longer serves as a primary barge lock.*
D.3 Other CAWS-Area Infrastructure Conditions

As noted in subsection 3.2, lock usage and condition may contribute to system bottlenecks (e.g. time to fill/empty, double-lockage, waiting in queue). Features of the waterway itself also present barriers to efficient operations, as described below.¹²¹

- **Overhead structures.** During review of overhead structures, several low clearance railroad bridges along the CAWS were identified. Along with the Lemont Railroad Bridge noted in subsection 3.3, these bridges include:¹²²

  - Chessie System Railroad Bridge, river mile (RM) 312. Vertical clearance is 19.5 feet. This is on the Chicago Sanitary and Chip Canal, 1 mile south of Archer Avenue.
  
  - BNSF Railroad Bridge, RM 314. Vertical clearance is 19.5 feet. Does not open for navigation. This is on the Chicago Sanitary and Chip Canal, 1 mile north of Harlem Avenue.
  
  - Belt Railway Chicago Railroad Bridge, RM 317. Vertical clearance is 18.6 feet. Does not open for navigation. This is on the Chicago Sanitary and Chip Canal, just north of Cicero Avenue.
  
  - BNSF Railroad Bridge, RM 318. Vertical clearance is 19.5 feet. Does not open for navigation. This is on the Chicago Sanitary and Chip Canal, between Kedzie and Pulaski Avenues.
  
  - Illinois Railway Railroad Bridge, RM 319. Vertical clearance is 20.1 feet. Does not open for navigation. This is on the Chicago Sanitary and Chip Canal, just north of Kedzie Avenue.
  
  - South California Avenue Bridge, RM 320. Vertical clearance is 19.1 feet. This is on the Chicago Sanitary and Chip Canal, at California Avenue.
  
  - CSX Chessie System/Conrail Railroad Bridge, RM 320. Vertical clearance is 17.6 feet. This is on the Chicago Sanitary and Chip Canal, just north of California Avenue.

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## E. USACE CAWS Proposed Capital Program

### Table E.1 CAWS Proposed Capital Program - Locks

<table>
<thead>
<tr>
<th>Lock</th>
<th>Items (USACE Critical rank Order)</th>
<th>Estimated Cost (2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago Lock</td>
<td>Lock Replacement (completed 2011)</td>
<td>$14,750,000 *</td>
</tr>
</tbody>
</table>
| T.J. O'Brien Lock | Lock - Major Rehabilitation  
|                 | Lock & Dam - Major Maintenance  
|                 | Install New High Mast Lighting  
|                 | Systemic Filling Valve Replacement  
|                 | New Maintenance Building  
|                 | Scour Repair                                                                        | $48,400,000           |
| Lockport Lock   | Channel Concrete Wall - Major Rehabilitation (ongoing, 90% complete)  
|                 | Lock Emergency Gate Hydraulic System Rehabilitation  
|                 | Lock Emergency Gate Replacement  
|                 | Systemic Miter Gate Replacement  
|                 | Systemic Miter Gate Machinery Replacement  
|                 | Bulkhead - Vertical Gate  
|                 | Systemic Filling Valve Replacement  
|                 | Replace Lock Controlling Works (40% complete)  
|                 | Major Maintenance - Spillway Design & Construction  
|                 | Power House Guide Wall Rehabilitation  
|                 | New Maintenance Building                                                             | $39,000,000**         |
## Chicago Area Waterway System Evaluation

### Appendix

<table>
<thead>
<tr>
<th>Lock</th>
<th>Items (USACE Critical rank Order)</th>
<th>Estimated Cost (2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brandon Road Lock</strong></td>
<td>Rehabilitation Evaluation Report&lt;br&gt;Tainter Gate Concrete Repairs&lt;br&gt;Systemic Miter Gate Replacement&lt;br&gt;Systemic Control Stand Replacement&lt;br&gt;Paint/Repair Service Bridge, Tainter Gate Section&lt;br&gt;Systemic Dam Machinery Replacement&lt;br&gt;Systemic Filling Valve Replacement&lt;br&gt;Concrete Repairs Downstream I-Wall and Land Wall&lt;br&gt;Install Traveling Keel and Remove Pier&lt;br&gt;New Maintenance Building&lt;br&gt;Repair Joliet Channel Wall</td>
<td>$48,500,000</td>
</tr>
<tr>
<td><strong>Dresden Island Lock</strong></td>
<td>Rehabilitation Evaluation Report&lt;br&gt;Rehabilitate Lock - I-wall Electrical Gallery&lt;br&gt;Replace Dam Gates&lt;br&gt;Replace Dam Steam System&lt;br&gt;Systemic Miter Gate Replacement&lt;br&gt;Emergency Miter Gates for District Use&lt;br&gt;Systemic Miter Gate Machinery Replacement&lt;br&gt;Rehabilitate Tainter Gate Piers 6 and 7 (Engineering &amp; Design)&lt;br&gt;Systemic Control Stand Replacement&lt;br&gt;Systemic Dam Machinery Replacement (Engineering &amp; Design)&lt;br&gt;Systemic Filling Valve Replacement&lt;br&gt;Replace Standby Generator&lt;br&gt;Repair Upstream Guidewall and Mooring Cell&lt;br&gt;New Maintenance Building</td>
<td>$80,000,000</td>
</tr>
</tbody>
</table>


* Actual cost. **Several of these projects have been completed since the 2012 capital program was funded.