STATE OF MICHIGAN
DEPARTMENT OF ATTORNEY GENERAL

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BILL SCHUETTE
ATTORNEY GENERAL

March 31, 2014

The Honorable Jo-Ellen Darcy
Assistant Secretary of the Army
for Civil Works
108 Army Pentagon
Washington, DC 20310-0108

Dear Secretary Darcy:

This is in response to the U.S. Army Corps of Engineers' request for comments on the Great Lakes Mississippi River Interbasin Study (GLMRIS) Report released on January 6, 2014. As you know, the long-awaited Report was first authorized in 2007, initially funded in 2009, and in July 2012,[1] mandated for completion within 18 months. Despite the years consumed to prepare it, and its considerable length – over 10,000 pages with appendices – the Report is both incomplete, and as discussed below, seriously flawed.

Most important, the Report is incomplete. It does identify and compare eight alternatives for addressing the Congressionally stated goal of "prevent[ing] the spread of aquatic nuisance species between the Great Lakes and Mississippi River Basins through the Chicago Sanitary and Ship Canal . . ."[2] But the Report does *not* recommend any alternative and fails to propose *any* concrete plan of action. That failure is particularly disappointing. While the Corps takes years to study the problem, and now proposes still more studies, the threat that Asian carp will invade the Great Lakes through the Chicago Area Waterway System continues to mount. And, the Corps has rejected Congress's specific authorization in 2012, to "proceed directly to project preconstruction engineering and design."[3]

Nevertheless, the Report contains a key finding that can and should form the basis for developing and implementing an action plan as soon as possible.

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[1] Section 1538 of Moving Ahead for Progress in the 21st Century Act, Pub. L. No. 112-141.

[2] Section 3061(d) of the Water Resources Development Act of 2007, Pub. L. No. 110-114.

[3] Progress Act, § 1538(b)(1)(B).

Permanent hydrologic separation is the most effective means of preventing the transfer of Asian carp and other aquatic nuisance species through the Chicago Waterway.[4] That conclusion is consistent with the views of experts[5] and key stakeholders.[6] And, as you know, that solution has been consistently advocated by Michigan and other Great Lakes States since 2009, as well as the Attorneys General of 17 states since 2011.[7]

Unfortunately, the Report's remaining analysis of the best identified alternative – Mid-System Hydrologic Separation[8] – is seriously flawed. The Report wildly exaggerates both the costs and the time needed to implement a mid-system separation alternative. The actual cost of such permanent hydrologic separation need not be anywhere near, as the Corps suggests, $15.5 billion.[9] As discussed in the enclosed summary prepared by my staff, the vast bulk of the costs projected by the Corps – more than $12 billion in "water quality mitigation measures" – are not actually costs of hydrologic separation. Instead, they involve wastewater treatment, stormwater control and sediment remediation measures that relate to pre-existing environmental conditions that need to be addressed even if hydrologic separation

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[4] Report, Table E S.1.

[5] See, e.g., Rasmussen, *et al.*, "Dividing the waters: The case for hydrologic separation of the North American Great Lakes and Mississippi River basins," Journal of Great Lakes Research, Volume 37, No. 3, pp. 588-592, (2011) www.researchgate.net/.../79e415140739b84169.pdf; Wittmann, *et al.*,"Using Structured Expert Judgment to Assess Invasive Species Prevention: Asian Carp and the Mississippi-Great Lakes Hydrologic Connection," *Environ. Sci. Technol.*, 2014, *48* (4), pp 2150–2156 (January 27, 2014) http://pubs.acs.org/doi/ipdf/10.1021/es4043098.

[6] Great Lakes Commission, Resolution: Actions to Address the Threat to the Great Lakes from Asian Carp (February 23, 2010) http://glc.org/files/main/resolutions/20100223-FINAL-asiancarp.pdf.

[7] Letter from Attorneys General of Arizona and 16 other states to Congressional Committee Chairs, September 26, 2011.

[8] Identified as Alternative 6 in the Report, mid-system hydrologic separation involves the construction of two physical barriers to water and invasive species movement several miles inland from Lake Michigan: one on the Chicago Sanitary and Ship Canal, the other on the Cal-Sag Waterway. While the Corps proposes to place them at specified locations near Stickney and Alsip, Illinois, respectively (Report, p. 153, Figure 3.14), some other analyses suggest that mid-system barriers be located somewhat further east. See n. 11.

[9] Report, Table E S.1.

does not occur. The costs of addressing these conditions cannot be properly attributed to implementing hydrologic separation.

Nor, as the Report suggests, does hydrologic separation require 25 years to implement.[10] Much of the Corps' projected timeline stems from unjustified assumptions, such as designing a stormwater conveyance system to meet a flood event that occurs once every 500 years. And, the Report ignores the ability to implement hydrologic separation in a phased basis. As previous studies have suggested,[11] hydrologic barriers could be built within a short time, to initially operate as "one-way" barriers to the "upstream" movement of Asian carp and other harmful aquatic species. On an interim basis, water above the barriers could be diverted over or around them as needed to address stormwater and wastewater flows until any infrastructure needed to permanently manage those flows above the barriers is put in place, and full "two-way" separation is established.

The Report also grossly overstates – by a factor of about two and one-half times – increased commercial cargo transportation costs resulting from mid-system hydrologic separation. The GLMRIS Report projects $251 million in lost transportation cost savings each year. But, as explained in the enclosed March 2014 Report prepared by Dr. John C. Taylor and Mr. James L. Roach, the Corps' analysis is fundamentally flawed. Among other things, the Corps over-estimates the volume of future barge traffic in portions of the Waterway, traffic that is in long-term decline. The Corps also unrealistically assumes that any interruption in existing barge traffic close to its ultimate destination will cause shippers to shift their cargoes entirely to rail or truck. Even using the Corps' overly optimistic assumption of future barge traffic, Dr. Taylor and Mr. Roach conservatively estimate increased transportation costs of approximately $100 million. Such costs pale in comparison to the harm Asian carp would cause to the ecology of the Great lakes and the multi-billion dollar fishing, boating and tourism industries they support. Finally, the Corps mistakenly assumes that impacts on transportation caused by mid-system separation cannot be mitigated.

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[10] Report, Table E S.1.

[11] See, e.g., "Restoring the Natural Divide: Separating the Great Lakes and the Mississippi River Basins in the Chicago Area Waterway System" Great Lakes Commission, Great Lakes and St. Lawrence Cities Initiative (January, 2012) http://projects.glc.org/caws//#reports; "Re-Envisioning the Chicago River: Adopting Comprehensive Regional Solutions to the Invasive Species Crisis," Natural Resources Defense Council (September, 2010) see http://www.nrdc.org/water/Chicagoriver/files/Chicago%20River.pdf and Technical Report (October, 2010) at http://docs.nrdc.org/water/files/wat_10102001a.pdf.

Instead of proposing further studies as suggested at page 20 of the Report, the Corps should focus immediately on designing and building the essential elements of best alternative: mid-system hydrologic separation. And, to permanently prevent the passage of Asian carp through the CAWS as soon as possible, that hydrologic separation should be implemented on a phased basis, beginning with "one-way" separation. The Corps can use its existing statutory authority to proceed directly to pre-construction design and engineering of that alternative.

Finally, the Corps should:

- Promptly seek Congressional authorization to implement mid-system hydrologic separation; and
- Implement interim measures, such as those recently recommended by the Great Lakes Commission[12] needed to minimize the risk of Asian carp invasion of the Great Lakes until an effective permanent solution is in place.

Thank you for considering our comments.

Sincerely,

Bill Schuette
Attorney General

Encs.

ENRA/AC/Cases/2009/Asian Carp/Comments-GLMRIS Report of 01.06.14

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[12] Great Lakes Commission, Resolution: Preventing the interbasin transfer of Asian carp and other invasive species (March 5, 2014) http://glc.org/files/main/resolutions/FINAL-GLC-Resolution-GLMRIS-20140305.pdf.

SUMMARY OF KEY COMMENTS ON GREAT LAKES MISSISSIPPI RIVER INTERBASIN STUDY (GLMRIS) REPORT (U.S. ARMY CORPS OF ENGINEERS, JANUARY 2014)

By
Environment, Natural Resources, and
Agriculture Division
Michigan Department Of Attorney General

I. The Corps should now focus on design and phased construction of a mid-system hydrologic separation alternative.

A. Hydrologic separation is essential.

As the GLMRIS Report recognizes,[1] hydrologic separation is the most effective means of achieving the Congressionally mandated goal of "prevent[ing] the spread of aquatic nuisance species between the Great Lakes and Mississippi River Basins . . . through the Chicago Area Waterway System."[2] That conclusion is also supported by a wide range of expert opinion. For example, in a recently published report of a survey of eleven independent experts, who considered 17 different strategies for deterring Asian carp movement through the Chicago Area Waterway System (CAWS), permanent hydrologic separation was scored as the most effective, and an electric barrier – the only method currently in place – was found to be less

[1] Report, Table E S.1.

[2] § 1538(b)(2), Moving ahead for Progress in the 21st Century Act, Pub. L. No. 112-141.

effective than hydrologic separation.[3] In addition, the authors of the study also observed that in contrast to other alternative strategies, hydrologic separation would be effective in preventing the movement of other aquatic species, in both directions, through the CAWS.[4]

Furthermore, the most recent information publicly disclosed by the Corps and the U.S. Fish and Wildlife Service regarding the efficacy of electric barriers showed that the electric barriers are not stopping the movement of all fish.[5] In a series of underwater sonar recordings, "61% revealed at least one school of fish passing through the barrier."[6] Moreover, the report indicated that "all barge configurations were capable of transporting live fish beyond the barrier to various degrees," including in spaces between barges.[7]

And recent risk assessments by independent scientists show there is a scant margin for error or failure in measures designed to deter the passage of Asian carp through the CAWS. For example, a recent bi-national risk assessment conducted by

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[3] Wittmann, *et al.,* "Using Structured Expert Judgment to Assess Invasive Species Prevention: Asian Carp and the Mississippi-Great Lakes Hydrologic Connection," *Environ. Sci. Technol.*, 2014, *48* (4), pp 2150–2156 (January 27, 2014) http://pubs.acs.org/doi/ipdf/10.1021/es4043098.

[4] *Id.*

[5] Summary of Fish-Barge Interaction Research and Fixed Dual Frequency Identification Sonar (DIDSON) Sampling at the Electric Dispersal Barrier in Chicago Sanitary and Ship Canal U.S. Army Corps of Engineers (December 2013) http://www.lrc.usace.army.mil/Portals/36/docs/projects/ans/docs/Fish-Barge%20Interaction%20and%20DIDSON%20at%20electric%20barriers%20-%2012202013.pdf,

[6] *Id.*

[7] *Id.*

Canadian and U.S. scientists concluded that the CAWS was the most likely path through which Asian carp would arrive in the Great Lakes, and that as few as 10 adult female and 10 adult male bighead carp could lead to successful spawning in suitable rivers in the Great Lakes.[8] Thus, implementing the most effective method – hydrologic separation – as soon as possible, is crucial.

B. Mid-System hydrologic separation is the best identified alternative.

Well before the GLMRIS Report was issued, a series of independent analyses in 2008,[9] 2010,[10] and 2012[11] each preliminarily evaluated three hydrologic separation scenarios, broadly referred to as "lakefront/or near lake," "mid-system," and "down river," respectively. Those scenarios generally refer to physical barriers at (1) multiple locations along the connection points of the CAWS and Lake

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[8] Cudmore, *et al.,* Binational ecological risk assessment of the bigheaded carps (Hypophthalmichthys spp.) for the Great Lakes basin, Fisheries and Oceans Canada Science Advisory Report 2011/071 (2012) http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2011/2011_071-eng.pdf.

[9] Brammier, *et al.,* Preliminary Feasibility of Ecological Separation of the Mississippi River and the Great Lakes to Prevent the Transfer of Aquatic Invasive Species, Great Lakes Fishery Commission, (November 2008) http://www.greatlakes.org/Document.Doc?id=473.

[10] "Re-Envisioning the Chicago River: Adopting Comprehensive Regional Solutions to the Invasive Species Crisis," Natural Resources Defense Council (September 2010) see http://www.nrdc.org/water/Chicagoriver/files/Chicago%20River.pdf and Technical Report (October, 2010) at http://docs.nrdc.org/water/files/wat_10102001a.pdf.

[11] "Restoring the Natural Divide: Separating the Great Lakes and the Mississippi River Basins in the Chicago Area Waterway System" Great Lakes Commission, Great Lakes and St. Lawrence Cities Initiative, (January 2012) http://projects.glc.org/caws//#reports.

Michigan, (2) multiple locations on the Chicago Sanitary and Ship Canal or Chicago River, and on the Cal-Sag Channel or Calumet River several miles inland at or near the historic divide between the Great Lakes and Mississippi River basins, and (3) the vicinity of Lockpoint Lock. The Great Lakes Fisheries Commission and NRDC Reports focused on mid-system separation for various reasons, including relatively lower impacts on existing commercial and non-commercial navigation, as well as stormwater and flood management. Although the 2012 Great Lakes Commission Report did not expressly recommend mid-system separation as the preferred alternative, it was identified as the most viable.[12]

The GLMRIS apparently screened out a "downriver" separation scenarios, and the Report identified and retained only two hydrologic separation alternatives for evaluation: Alternative 5, Lakefront Hydrologic Separation, and Alternative 6, Mid-System Hydrologic Separation.[13] Of those two alternatives, the essential elements, which the Corps refers to as "ANS Controls,"[14] of Alternative 6 – Mid-System Hydrologic Separation – presents the best option. Factors supporting that conclusion include:

- Placement of hydrologic barriers at such mid-system locations would have:

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[12] *Id.,* at p 5.

[13] Table E S.1.

[14] Report, at p 151, Table 3.13.

- No documented adverse impact on existing operations of police, fire, or tour vessels at or near the Chicago lakefront or downtown Chicago.
- Only minimal impact on other existing recreational navigation in the area.[15]
- No adverse impact on commercial navigation by lakers or other vessels between Lake Michigan, the Calumet River, and Lake Calumet, the only area of the CAWS where commercial navigation is growing instead of declining.

- If mid-system hydrologic separation is implemented on a phased basis as described below, with far less elaborate and expensive mitigation measures than those proposed by the Corps, it should not increase existing flooding, water quality, or combined sewer overflow problems in the area.

C. Mid-system hydrologic separation can be implemented on phased basis.

Both the 2010 NRDC[16] and 2012 Great Lakes Commission Reports[17] described the possibility of implementing hydrologic separation on a phased basis. That is, physical structures would initially be operated on a "one-way" barriers, to

[15] This topic is further discussed in § V, below.

[16] Natural Resources Defense Council Technical Report (2010), at p 29.

[17] "Restoring the Natural Divide" at p 12.

prevent the movement of Asian carp or other ANS northward toward the Lake. During that initial, interim period, water above (i.e., on the lakeward side of the barrier) would be diverted or pumped over or around the barrier as needed to prevent flooding or exacerbation of water quality. Once any necessary improvements in infrastructure are made to address the already existing wastewater treatment and stormwater management problems, the structures could then operate as "two-way" hydrologic barriers.

II. Mid-system hydrologic separation can be achieved at a fraction of the $15.5 billion cost projected by the Corps.

The vast bulk of the Corps' established cost for Alternative 6 – more than $12 billion – is comprised of various water quality mitigation measures[18] that the Corps assumes are (a) properly considered part of the cost of hydrologic separation, (b) are necessary to protect water quality, and (c) are the most cost-effective measures of doing so. These measures include an elaborate network of new tunnels and reservoirs to convey and contain water, as well as "Aquatic Nuisance Species treatment plants" all intended to manage water destined for the Mississippi River side of the physical barriers.

The Corps' analysis is fundamentally flawed in several respects. First, the cost of improving the quality of water discharged from the wastewater treatment plants operated by the Metropolitan Water Reclamation District to meet applicable water quality standards is the legal responsibility of the District, not a cost properly

[18] GLMRIS Report, Table E S.1., at pp 156-158.

attributed to implementing hydrologic separation. The fact that until very recently, the District has avoided and externalized costs borne by other Great Lakes cities' municipal wastewater treatment plants, i.e., full treatment and disinfection of its sewage, does not make that a "cost" of hydrologic separation.

Second, the Corps mistakenly assumes that any new discharge of treated wastewater, or continuing discharges of combined sewer overflows (which already occur) must be entirely avoided, and that until such a condition is achieved, hydrologic separation cannot lawfully occur. While the District and the City of Chicago, like all other dischargers of pollutants from point sources are required to meet applicable water quality standards and treatment requirements, they are not necessarily obligated to treat their discharges to drinking water quality at the point of discharge. Ironically, the Corps' extreme assumptions about the degree of treatment required to protect Lake Michigan from the discharge of pollutants apparently does not extend to recognizing that invasive fish, such as Asian carp, are biological pollutants within the meaning of the Clean Water Act[19] and the likelihood that in the absence of hydrologic separation, the Lake will be subjected to serious and irreversible harm from reproducing biological "pollutants," i.e., Asian carp.[20]

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[19] 33 U.S.C. § 1362(6).

[20] See Dan Egan, "Bulk of $15 billion plan not directly tied to stopping Asian carp: Army Corps' plan includes billions in water quality improvements." *Milwaukee Journal Sentinel* (February 8, 2014). http://www.jsonline.com/watchdog/watchdogreports/bulk-of-15-billion-plan-not-directly-tied-to-stopping-asian-carp-b99198589z1-244565881.html.

Third, in scaling "mitigation measures" to protect water quality and prevent flooding by conveying flows downstream" toward the Mississippi, the Corps uses a 500-year storm event as a basis for its conceptual design.[21] Planning to contain combined sewer overflows for a 500-year storm event is far above the design standard generally used for wastewater and stormwater systems.[22] As a result, the conditions proposed by the Corps far exceed the typical standard of care and any applicable legal requirement.

Fourth, the water quality mitigation measures assumed by the Corps as costs of mid-system separation include remediating miles of existing contaminated sediments in the CAWS.[23] But again, the environmental contamination exists independent of the proposed hydrologic separation. The cost of remediating that sediment contamination will exist, regardless of whether hydrologic separation occurs. Accordingly, such costs are not properly attributable to the mid-system hydrologic separation project.

III. Mid-system hydrologic separation can be implemented in far less time than the 25-year period projected by the Corps.

The Corps' 25-year timeline for mid-system hydrologic separation is based on the premise that "[t]he mitigation measures must be implemented prior to completion of the ANS control measures , such as physical barriers, to minimize

[21] GLMRIS Report, at p 86.

[22] By contrast, the GLC Report planned for a 100-year storm event.

[23] GLMRIS Report, at p 155.

impacts to CAWS uses and users."[24] But that premise is mistaken. First, the underlying assumptions are that a vast network of new tunnels, reservoirs, and ANS treatment plants, as well as the extensive sediment remediation measures proposed by the Corps as mitigation measures are needed to protect water quality and are properly considered costs of separation.

However, as discussed above, those assumptions are themselves incorrect. If, as suggested here, and in prior analyses by the Great Lakes Commission and the Natural Resources Defense Council, mid-system separation is implemented in stages (i.e., initially as a "one-way" separation), any necessary mitigation measures would be considerably simpler and easier to construct. For example, it would not take the more than 37 miles of new tunnels proposed by the Corps[25] to convey water on the lakeside of the barriers over or around them during the initial "one-way" separation period as needed to avoid deterioration of water quality (e.g., stagnation) and flood control. Instead, a series of pumps and relatively short pipes or tunnels could presumably be used for by-passing floodwater and augmenting flows.[26] Such facilities would at most take a few years, but certainly not decades to design and build. And, if the physical barriers are strategically located in relation to existing

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[24] Report, Figure 3.17, at p 162.

[25] Report, at p 158.

[26] See, e.g., "Restoring the Divide," at p 17; NRDC Technical Report, at p 29.

wastewater treatment plants and pumping stations, the need for new infrastructure to convey water across or near the physical barriers may be minimized. [27]

IV. The Corps grossly overstates the costs to commercial cargo transportation associated with mid-system hydrologic separation.

As discussed in the March 2014 Report, "Review of U.S. Army Corps of Engineers Great Lakes Mississippi River Interbasin Study Commercial Cargo Navigation Report" by Dr. John C. Taylor of Wayne State University and Mr. James L. Roach, the Corps' estimate of $251 million in annual lost transportation costs resulting from Alternative 6 is fundamentally flawed and likely overstated by a factor of two and one-half times. A copy of that Report is submitted in conjunction with these comments and incorporated here by reference.

V. The Corps also overstates the impact of mid-system hydrologic separation on non-commercial navigation.

The Corps ranks the impact of Alternative 6 on non-cargo navigation as "medium."[28] But close examination of the Corps' supporting rationale[29] reflects only minimal, if any, impact on such navigation as a result of mid-system hydrologic separation.

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[27] So, for example, it may be preferable to move the location of the northern physical barrier from the location proposed by the Corps on the Chicago Sanitary Ship Canal near Stickney to a location closer to the confluence of the Chicago River and Bubbly Creek, and to move the southern physical barrier from the location proposed by the Corps on the Cal-Sag Channel near Alsip, closer to the Calumet Water Reclamation Plant. The latter change would require a third hydrologic barrier in the Little Calumet River.

[28] Table E S.1., Report, at pp 159-160.

[29] Report, Appendix D, Attachment 7, at pp D-729-853.

First, the Report does not document that mid-system separation would have any actual adverse impact on existing navigation related to public safety. The Report describes the baseline conditions, including the deployment and operation of Chicago Police Department, Chicago Fire Department, and the U.S. Coast Guard vessels at the Chicago Marine Safety Station adjacent to the Chicago Locks and for the Coast Guard at Station Calumet Harbor.[30] The Report notes that *if* the Chicago Locks were closed, some of those operations, as well as operations of the Illinois Department of Natural Resources[31] would be disrupted. But, under the mid-system separation alternative, both the Chicago and O'Brien Locks would not be closed. While the Report suggests that "*some* government agencies *may* have to duplicate *some* services, *if* their jurisdictions extend beyond the barriers,"[32] the Report contains no facts demonstrating that any of those conditions actually exist.

Second, the Report suggests that "[p]assenger vessels and government vessels *may be* affected by additional high-water events."[33] However, apart from this naked conjecture, the Report presents no documentation of the likelihood that mid-system separation would cause such "additional high-water events," and the extent of any actual impact on non-cargo navigation. The Report states that as a baseline condition, high water levels in the CAWS that reduce bridge clearances below acceptable levels for commercial passenger vessels occur "once or twice a

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[30] Report, Appendix D, Attachment 7, at pp D-794-801.

[31] Report, Appendix D, Attachment 7, at p D-802.

[32] Report, at p 160 (emphasis added); D-848-849.

[33] Report, at p 160 (emphasis added).

year."[34] There is no evidence that implementing mid-system hydrologic separation would significantly, or even appreciably, increase the incidence of such events. And, as noted above, mid-system hydrologic separation could be implemented with reasonable mitigation measures to bypass floodwaters over or around the physical barriers, thereby reducing the potential for high-water level events.

Finally, the Report cites, "impacts to vessels attempting to do the 'loop' around North America."[35] This apparently refers to an extended recreational boat tour route around the Eastern United States, which includes passage between Lake Michigan and the Mississippi River Basin through the CAWS.[36] The Report does not specify the magnitude of this "impact." But the number of vessels even attempting such a "loop" passage is clearly very small in comparison to recreational vessel use of the Chicago and O'Brien Locks.[37] While no official statistics on the number of "loop" trips are available, it appears that only about 100-200 such trips are attempted each year.[38] Whatever the precise number of such trips, they should

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[34] Report, at p 160 (emphasis added).

[35] Report, at p 160, D-849.

[36] The Great Loop: Circumnavigating Eastern North America by Boat, NOAA http://oceanservice.noaa.gov/news/features/sep13/great-loop.html.

[37] Any such "loop" vessels would have to pass through both the Lockport and Chicago or O'Brien Locks. According to the Report, Lockport has an annual average of only 1,000 non-commercial trips in comparison to 41,000 for Chicago and 19,000 for O'Brien. GLMRIS Report, at p D-26.

[38] See, e.g., http://www.vanderbilt.edu/magazines/vanderbilt-magazine/2012/03/dispatches-from-the-great-loop/ ; http://en.wikipedia.org/wiki/Great_Loop.

not reasonably be considered a significant factor in evaluating the merits and aspects of mid-system hydrologic separation.

Review of U.S. Army Corps of Engineers

Great Lakes and Mississippi River Interbasin Study

Commercial Cargo Navigation Report

(Appendix D - Attachment 6)

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And

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For

The State of Michigan

Department of Attorney General

Lansing, Michigan

March 28, 2014

1. Introduction

In January 2014, the U.S. Army Corps of Engineers issued its Report on the "Great Lakes and Mississippi River Interbasin Study (GLMRIS)." This study was authorized by the United States Congress and presents a range of options and technologies to prevent the transfer of aquatic nuisance species (ANS) between the Great Lakes and Mississippi River basins through aquatic pathways in the Chicago Area Waterway System ("CAWS"). Eight alternatives are presented and various impacts associated with each alternative are evaluated.

Dr. Taylor and Mr. Roach have been retained by the Michigan Department of Attorney General to review pertinent portions of the GLMRIS Report related to commercial cargo navigation impacts, particularly the estimated impacts of what the Corps designated as Alternative 6- "Mid-System Hydrologic Separation." This review follows and builds upon the authors' previous involvement in this issue which began in late 2009[1].

2. GLMRIS Alternatives

The GLMRIS Report[2] identifies eight alternative approaches to prevent the spread of ANS species through the CAWS. These range from no new federal actions to the

[1] See John C. Taylor and James L. Roach, Chicago Area Waterway System: The Logistics and Transportation Related Cost Impact of Waterway Barriers, July 14, 2010.

[2] The GLMRIS Report, U.S. Army Corps of Engineers, January 6, 2014, available at: http://glmris.anl.gov/documents/docs/glmrisreport/GLMRIS_Report.pdf. The "GLMRIS Report" is an extensive work with many parts. These include the GLMRIS Report, the GLMRIS Summary Report, and many appendices with many subparts. There are thousands of pages in the appendices. The authors concentrated on Appendix D, Economic Analyses, Attachment 6—Commercial Cargo Navigation. Most of the references in this review document refer to the Commercial Cargo Navigation Section.

construction of physical barriers which would prevent the movement of water, ANS, and consequently commercial cargo on the waterway system at certain locations. Table 1 lists the alternatives and the Corps' estimates of cargo navigation impacts for each alternative as well as the total estimated cost for each alternative. Flood risk and water quality mitigation typically make up the majority of the costs especially for the more expensive alternatives.

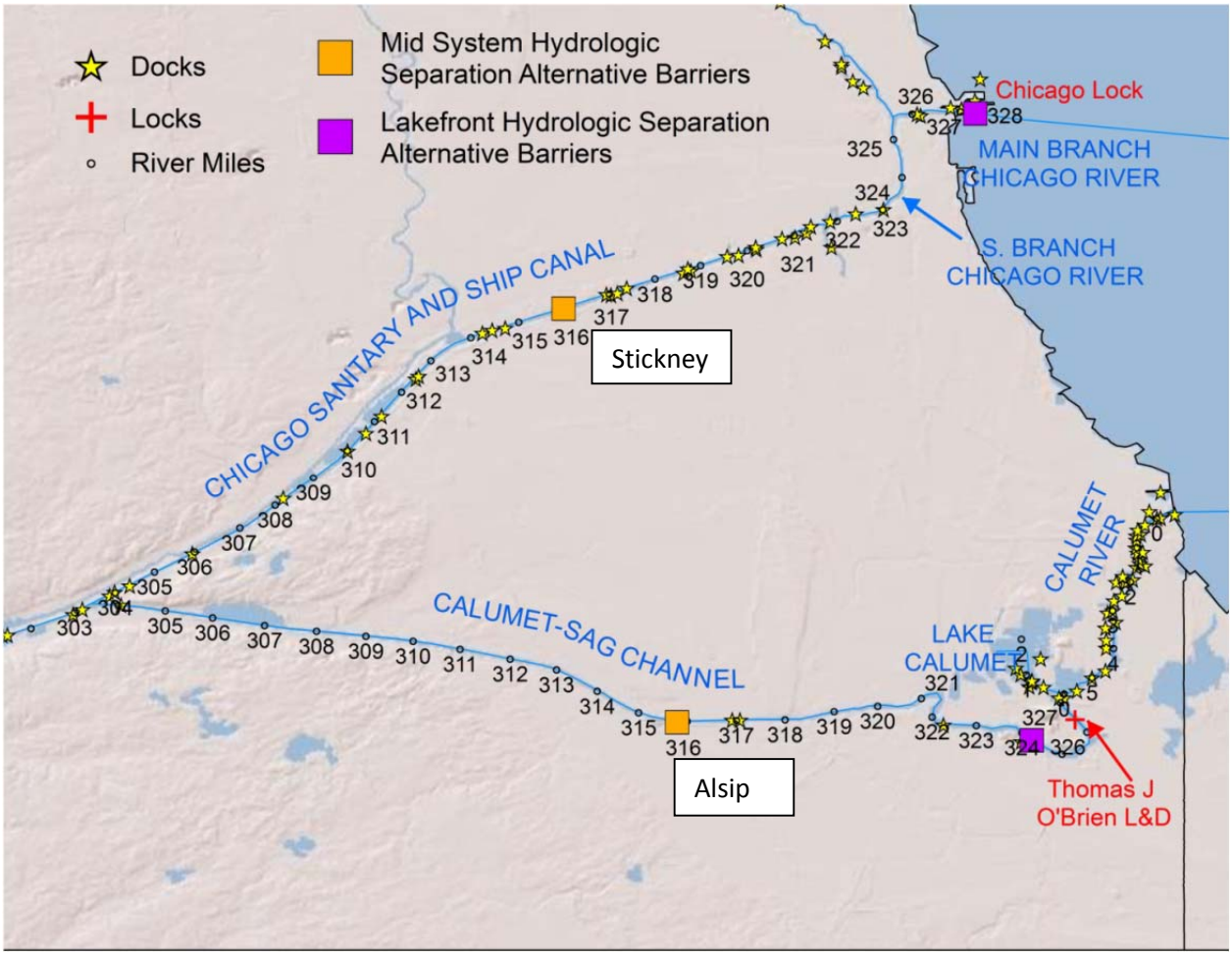
Table 1
GLMRIS Alternatives
Cargo Impacts and Total Estimated Costs

Alternatives	**Cargo Impacts (Million $'s in 2020)**	**Total Estimated Cost (2014 $'s)**
1. No New Federal Action	$0	$0
2. Non-Structural	Minimal	$68 million
3. Control Technology without a Buffer Zone—Flow Bypass	$0.75	$15.543 billion
4. Control Technology with a Buffer Zone	$0.50	$7.806 billion
5. Lakefront Hydraulic separation	$211.29	$18.389 billion
6. Mid-System Hydrologic Separation	$251.15	$15.512 billion
7. Mid-System Separation—Cal Sag Open	$7.30	$15.097 billion
8. Mid-System Separation—CSSC Open	$8.79	$8.333 billion

Source: Alternatives and estimated costs from "Summary of the GLMRIS Report" and cargo impacts from "Attachment 6 (Commercial Cargo Navigation)." Pgs. D702-705.

The authors have previously evaluated the logistics and transportation related cost impacts of physical barrier alternatives.[3] Our earlier analysis focused on a barrier on the Chicago River in the downtown area and a barrier in the vicinity of the O'Brien Lock. Alternative 6, Mid-System Hydrologic Separation, is generally consistent with our previous analysis although the locations are a bit more downstream and impact more traffic. The Mid-System Hydrologic Separation entails a physical barrier at Stickney on the Chicago Sanitary and Ship Canal (CSSC) and a physical barrier at Alsip on the Calumet-Sag Channel (Cal-Sag). The barrier locations proposed by the Corps are shown in the map below (adapted from Appendix D, Attachment 6, Figure 8):

[3] See Taylor and Roach, n.1



Both our analyses and the GLMRIS Report support the conclusion that hydrologic barriers at such "mid-system" locations have the following advantages for the movement of goods and passengers on the waterways system in comparison to a "lakefront" hydrologic separation alternative:

- Tour boat and recreational traffic would be largely unaffected by these barriers and there would be continued access through the Chicago Lock between Lake Michigan, downtown Chicago and other locations on the Chicago River. Recreational traffic

would also be able to utilize the Calumet River and marinas on the Cal-Sag Channel downstream of the O'Brien Locks.[4]

- Deep draft laker and ocean vessels to and from Lake Michigan would be unaffected and would have continued access to the Calumet River and Lake Calumet.
- Shallow draft vessels would continue to be able to serve portions of the Chicago River, the CSSC, the Calumet River, and Lake Calumet.
- Only about one-third of Chicago Area Waterway System (CAWS) traffic would be affected by the barriers. The remaining two-thirds would continue to be able to use the system including the growing deep draft portion of the traffic base.

But the mid-system hydrologic separation alternative would impact shallow draft barge traffic currently moving between upstream and downstream locations of the proposed barriers at Alsip and Stickney. This traffic could be transloaded to or from truck, rail or pipeline at a terminal downstream of the barrier. Alternatively, the commodity could move entirely by rail or truck from origin to destination or be resourced from other suppliers. The GLMRIS Report indicates that 8,979,000 tons of traffic would be impacted in 2010, 10,481,000 tons in 2012, and 9,913,000 tons in 2020.

As discussed below, the Corps' estimates of future CAWS traffic, its assumptions about the amount of that traffic that would be affected by Alternative 6, and its estimates of the economic impact are each flawed in several respects.

[4] See Non-Cargo Navigation Impact Section, pgs. D-29-30.

3. Existing and Future CAWS Traffic Forecasts

The GLMRIS Report presents statistics showing that total CAWS tonnage declined from 28.8 million tons in 1994 to 22.0 million tons in 2011—an annual decrease of 1.56 percent. These statistics mask the fact that the shallow draft barge component of CAWS traffic decreased from 25.1 million tons in 1994 to 13.7 million tons in 2011--an annual decline of 3.51 percent. By contrast, deep draft laker and ocean vessel traffic grew from 3.7 million tons to 8.4 million tons--almost 5 percent annually. Again, it is noted that the Mid-System Hydrologic Separation would not impact this growing component of the traffic base--laker and ocean vessels would be unimpeded in their use of the Calumet River and Lake Calumet.

The declining use of barge traffic is evident in any survey of the waterway system. Many former terminals and businesses adjacent to the waterway are closed, abandoned, or converted to other uses. The authors made three on-site visits[5] to survey the waterway system, including two visits by boat. All segments of the system were surveyed. In both 2006 and 2010, we utilized 1998 charts of the Illinois Waterway System published by the U.S. Army Corps of Engineers. One striking observation was the fact that many of the 1998 shippers listed as receiving cargo on the waterway were no longer in business. Many former shipping sites are now vacant lots or converted to other non-industrial uses. This was especially evident on the North Branch of the Chicago River where only

[5] Surveys by boat over the entire CAWS in 2006, by car in January 2010, and by boat in summer 2010 (primarily the O'Brien Lock area, Lake Calumet and the Calumet River).

3-5 active shippers remained. The North Chicago area is becoming gentrified and the long-term future for heavy industrial use is questionable. Other portions of the waterway similarly contained vacant plots of land where there were former shippers, or large vacant or abandoned steel mills, elevators or other industrial structures.

The GLMRIS Report contains traffic forecasts to year 2065. These forecasts project overall CAWS traffic growing from 19.3 million tons in 2011 to 26.4 million tons in 2020. Traffic is forecast to remain flat for the years between 2020 and 2065. Even with growth in deep draft shipping, forecasted total traffic in year 2065 is forecasted to be less than it was in 1994.

But even these forecasts appear overly optimistic given recent past trends. Moreover, use and transport of certain commodities such as coal[6] will be hard pressed to maintain market share given environmental and cost pressures related especially to natural gas.[7]

The overly optimistic nature of the Report's forecasts is evidenced by newly released data from the USACE Lock Performance Monitoring System[8] showing that traffic at the O'Brien Lock decreased from 6.5 million tons in 2011 to 5.9 million tons in 2012 to 5.3

[6] As the Report notes, use of coal in the CAWS area has already sharply declined with the closure of two local coal-fired power stations in 2012, pgs. D-653-654.
[7] http://www.eia.gov/todayinenergy/detail.cfm?id=15491.
[8] The USACE Lock Performance Monitoring System provides the most current indication of traffic trends and 2013 data is available. The USACE Waterborne Commerce Data Base is only available for year 2011 at this time. Much of the analysis undertaken by the USACE in the Report was based on the Waterborne Commerce Data Base.

million tons in 2013--a decrease of 18.5 percent over the last two years. This is significant because the Report appeared to use 2011 as a base year for much of the forecast work. The Lock Performance Monitoring System recorded 13.3 million tons of traffic in 1994 compared to 5.3 million tons in 2013--thus, current traffic at the O'Brien Lock is only about 40 percent of 1994 levels.

The Report's forecast for tonnage affected by the Mid-System Hydrologic Separation Alternative is shown in Table 2. This indicates that in year 2020, about 37 percent of all CAWS traffic would be impacted. The other 63 percent of the traffic base would be largely unaffected by the barriers. Table 2 also shows USACE projections that about 10 million tons of traffic annually would be impacted by the proposed barriers during the 2012-2020 time period. However, the average traffic at these locations was only 7.97 million tons for the 2007-2011 period.[9] This again shows the overly optimistic approach to traffic projections when other indicators, including the most recent data from the Lock Performance Monitoring System, show a continuing decline.

[9] Page D-717.

Table 2

Total CAWS Traffic and Traffic Impacted by the Mid-System Hydrologic Alternative

Year	Total CAWS Existing and Forecast Traffic (thousands of tons)	Mid-System Hydrologic Alternative Impacted traffic (thousands of tons)
1994	28,760	Data not available
2010	17,313	8,979
2011	19,277	Data not available
2012	Data not available	10,481
2017	Data not available	9,549
2020	26,402	9,913
2065	26,402	Data not available

Source: Historic and forecasted traffic from page D-680. Mid-System Hydrologic Separation traffic from page D-703.

4. Evaluation of Economic Impacts

A key part of the GLMRIS report relates to "transportation rates savings" associated with the use of the waterway system as compared to alternative overland routes. We excerpt some statements from the GLMRIS Report below:

- "Transportation rate savings equal the difference between the cost of transporting the commodities on the waterway and the cost of the least-costly land alternative route, whether it is by truck, rail, or both."[10]
- "Transportation rate savings can most easily be defined as the reduction in economic cost of transporting freight over the waterway compared to

[10] GLMRIS Report, Attachment 6, Commercial Cargo Navigation, p. D-639.

transporting it by land. "[11] The process generally assumes that cargo origins and destination remain the same.

- "This analysis assumes that complete hydrologic separation results in all affected movements leaving the inland waterways, so all NED[12] benefits are lost."[13]
- "CTR[14] estimated transportation cost from ultimate origin to ultimate destination by the current water mode and by the least cost alternative land routing. The differential between water route and least cost alternative routing is the transportation rate savings."[15]

The results of this exercise indicate that that there would be $237 million in "lost transportation rate savings" in year 2012 and $251 million in year 2020. The implication is that shippers would incur additional cost since cargo is shifted from economical barge transportation to more expensive overland modes.

It is important to recognize that lost transportation rate savings does not mean that transportation rates would increase by that amount if water transportation ended or was disrupted in some manner. <u>It only means that shifting from barge transportation to overland transportation for the same cargo origin/destination points would result in</u>

[11] Page D-692.
[12] National Economic Development Benefits.
[13] Page D-698.
[14] USACE contracted with The University of Tennessee, Center for Transportation Research (CTR) to determine transportation cost savings.
[15] Page D-694.

additional cost. The Corps' analytical process assumes that cargo would continue to move to and from existing locations. In fact, this would be unlikely to happen in the real world. Product resourcing and continued use of water transportation with a transload to a different mode of transportation (e.g., truck) at some point in the trip would result in transportation impacts significantly less than the lost transportation rate savings calculation. The Corps' concept of lost transportation rate savings maximizes benefits associated with water transportation but bears very little relationship to before and after transportation costs. This is especially true for medium and longer distance movements.

5. USACE Process Fundamentally Flawed.

We believe the Corps' approach is fundamentally flawed. It assumes that since the barge cannot travel the last few miles in a trip the cargo would be shifted in its entirety to the rail or truck mode for the entire distance of a trip. Thus, a cargo of petroleum products from New Orleans to a point on the Calumet River is assumed to shift to rail for the entire trip from New Orleans. Such an assumption is not economically realistic. We do not believe that the inland waterway industry would just acquiesce to losing large volumes of high revenue traffic. We note that about half of all CAWS barge traffic is to or from points on the Lower Mississippi River or the Gulf of Mexico. A single barge could generate substantial revenues for a 1400-mile[16] trip between Chicago and New

[16] USACE indicates 1408 miles from Damien Street in Chicago to New Orleans.

Orleans. An upward bound barge could get within 2-24[17] miles of its former destination --thus more than 98% of the trip would continue to be by barge. We believe that there are sufficient cost advantages in barge transportation that the longer distance traffic would continue as a water move. These cost advantages appear adequate to support some additional costs for transload handling and movements by other modes. It is possible that some portion of the additional cost would be shared between the barge operator and the company receiving or shipping the cargo. Transportation rates change frequently based on a variety of factors (fuel costs, labor costs, water levels, and, importantly, business decisions related to the overall transportation market). We believe that the majority of the longer distance traffic will continue to move by barge, but acknowledge that some of the shorter and intermediate distance traffic will shift to truck or rail.

This USACE exercise and the resultant findings of "lost transportation rate savings" in the Report bear little relationship to the real world of commodity buyers and sellers and transportation providers. Relationships of buyers and sellers change frequently based on price and many other factors. Major changes in transportation costs would result in different purchasing scenarios. Sourcing and transportation options would be assessed to determine the most competitive delivered price for a product. For example, salt (included in the ore category) is shipped to the Chicago area by laker vessel from Canada

[17] It is a maximum of 18 water miles from the proposed Alsip Barrier to Lake Michigan. It is a maximum of 24 highway miles to Whiting, Indiana from the Alsip Barrier. Most shippers would be less distant from the proposed barriers.

and by rail from other locations in the Midwest. It is also shipped upstream by barge into the Chicago area. The delivered price of about $25-40/ton is about the same given market based pricing. Yet the Corps' approach implies that the loss of direct barge service would result in additional "ore" costs of $60.90/ton. That would never happen because the salt buyers and suppliers could simply shift to more product delivered by laker vessel or rail at little or no additional cost.

Table 3

Summary of GLMRIS Report Tonnage and Lost Transportation Rate Savings

Commodity	Average per Ton NED Savings	2010 Tons	2010 Lost Rate Savings $000's	2020 Tons	2020 Lost Rate Savings $000's
Aggregates	$9.34	984	$7,192	2,533	$17,373
All Other	$26.06	789	$54,085	813	$55,643
Chemicals	$34.11	272	$10,795	265	$10,535
Coal and Coke	$16.05	3,774	$40,739	1,365	$22,924
Grain	$25.31	412	$110,661	602	$15,684
Iron and Steel	$33.67	1,447	$43,881	2,859	$86,364
Ore and Minerals	$60.90	622	$22,468	739	$26,712
Petroleum Fuels	$19.83	680	$13,023	738	$15,879
Total	**$26.30**	**8,979**	**$203,248**	**9,913**	**$251,115**

Source: GLMRIS Report, Pages D-675 & D-703.

The results of the Corps' analysis process as shown in Table 3 imply that water transportation costs are $26.30 per ton less on average than an overland transportation mode. This is an extraordinarily high number, especially since many cargo movements are local in nature and many are very low value cargoes. Coal transportation costs are calculated to increase by $16.05 per ton in the absence of the water mode.[18] However, a review of coal transportation statistics from the U.S. Energy Information Agency indicates that the average price of coal transportation by rail in the US was $15.54 per ton in 2010.[19] The movement of coal by rail from the Powder River Basin in Wyoming to Illinois, a rail distance of about 1,200 miles, was $14.84 per ton in 2009.[20] The water related savings of $16.05 per ton suggested by the USACE is more than the entire cost of the rail move from Wyoming to Illinois. This indicates that the Report's savings estimate is simply not plausible.

Grain is another commodity where transportation rates are readily available from the U.S. Department of Agriculture. Their weekly Grain Transportation report[21] gives rate information for both rail and inland water transportation. Information from November 2013 indicates that rail rates from the Minneapolis area to the Gulf of Mexico were about $36 per ton and from Champaign, Illinois to New Orleans they were slightly less.

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[18] We note that the earlier analysis done by the TVA for the USACE calculated that coal transportation rates would increase by over $30/ton.

[19] U.S. Department of Energy, Energy Information Agency, Coal Transportation Rates to Electric Power Sector, Table 1 (Rail) & Table 2 (Barge). http://www.eia.gov/coal/transportationrates/pdf/table1_US_averages.pdf.

[20] http://www.eia.gov/coal/transportationrates/pdf/tables.pdf. Table 9." Estimated Coal Transportation Rates from Coal Basin to States."

[21] U.S. Department of Agriculture, Weekly Grain Transportation Reports, September and November 2013. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5106782.

Barge moves from the Lower Illinois River to the Gulf were about $28/ton and from Minneapolis to the Gulf they were about $32 per ton. Clearly barge movement is less expensive than rail but the difference is not as pronounced as the USACE suggests--thus, the lost rate savings of $25.31 for grain is greatly overstated.

The Report includes a Commercial Cargo Report Appendix 1 "Transportation Rate and Social Cost Analysis" prepared by the University of Tennessee Center For Transportation Research (CTR).[22] The CTR analysis implies that the movement of ores and minerals by barge results in a savings of $60.90 compared to overland modes. This is an astounding number given the low values associated with "salt, clays, and other related commodities" in this group. As stated previously, the delivered price of salt typically ranges from $25-40 per ton.[23] There are many sources for these commodities which could be utilized at little or no additional cost through the use of laker vessels or rail as the transport mode.

The Report indicates that the overland costs for aggregates would be an additional $9.34 per ton.[24] Again, this far exceeds the typical cost for things like sand and gravel which typically may cost only $5-10 per ton for the raw material.[25]

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[22] It appears immediately following p. D-728, but is separately numbered.
[23] Michigan Department of Transportation paid $25.17/ton in 2013 and $23.81/ton in 2011 for road deicing salt including delivery. Source: Lansing State Journal, February 12, 2014. Ingham County (Michigan) Road Commission paid $40.12/ton in 2014. Source: Lansing State Journal, February 11, 2014. MDOT purchased 235,000 tons compared to the 6421 tons for the ICRC which is a reason for the difference.
[24] Page D-675.
[25] U.S.Geological Survey, Mineral Commodities, 2014. Average delivered price for construction sand and gravel is $7.80/ton; average delivered price for crushed stone is $9.75/ton.

6. An Alternative Approach to Calculating Costs

In 2010, we calculated a range of $63-$69 million in additional transportation costs based on seven million tons of traffic impacted by barriers at more upstream locations. We decided to revisit and update this earlier approach based on the higher traffic levels that the Corps assumes would be impacted by the Mid-System Barriers. For simplicity, we have utilized only 2010 and 2020 traffic volumes and costs contained in the GLMRIS Report. As stated previously, the USACE has assumed that all traffic will switch from movement by barge to movement by an overland mode. They assume the same set of traffic origin-destination points would be used and that some additional handling costs may be incurred for some movements. This could involve some transloading to get from a water terminal to a rail terminal.

The approach utilized in our estimate assumes that shippers and receivers of cargo would respond in the most rational, efficient, and cost effective manner to changes in the waterway system. It recognizes that most of the cargo on the waterway system is "commodity" traffic--that is, most of it is not unique in form or character from like commodities (e.g., corn, wheat, stone, coal, salt, scrap metal, pig iron, most chemicals, and most petroleum products). It recognizes that similar commodities can usually be obtained in most parts of the country at roughly similar prices and that there is a certain market equilibrium for these commodities.

Our updated approach assumes:

a. Continued use of barge transportation to and from the Chicago area with a truck transload for pickup and delivery.

b. Use of trucks for movement of former local barge movements.

c. Use of the rail mode as a partial substitute for the waterborne move.

d. Resourcing of commodity based on competitive pricing.

a. Continued Use of Barge Transportation with a Truck Transload--30% of Traffic

We assume that the cost advantages of barge transportation are such that some cargo will continue to use the waterway system. Barges will stop at or near the physical barriers at existing or new terminals and cargo will be transferred to trucks for local delivery. In many cases, there is no additional handling if cargo was formerly transferred between truck and barge at another location. We assume that 30 percent of all traffic would be transloaded. This would likely be longer distance traffic which represents about half of the barge traffic.

Depending on location, such terminals would be from 2-24 highway miles from existing users.[26] For purposes of this analysis, the authors choose to use 20 one-way miles, meaning that a 40-mile round trip would be required for a truck move from

[26] The highway distance from Alsip to the Whiting, Indiana steel mills is about 24 miles. This would be one of the longest trips--many other existing terminals would be much closer.

a new or existing transload terminal to a user. Again, many or most trips would be much less than this mileage. The generous 20-mile estimate was used to reflect the uncertainties associated with actual transload locations.

In 2010, the authors conducted a number of interviews with existing terminal operators and/or those familiar with costs in the Chicago area. We also observed and timed loading and unloading operations. Some of our 2010 values have been updated slightly to reflect 2011 costs which were utilized by the USACE in their analysis. Our basic assumptions are the following:

- Truck operating costs of $110/hour[27]
- Truck load of 25 tons
- Truck average speed of 25 mph
- Truck delivery cost of $7/ton based on 40-mile round trip (40 miles at 25mph=1.6 hours@ $110/hour/25 tons=$7.04/ton rounded to $7)
- Additional handling costs for transload of $6/ton (includes truck wait time, other equipment, operator time, etc.)[28]

[27] Some sources suggest a significantly lower cost . "An Analysis of the Operational Costs of Trucking in 2012" prepared by the American Transportation Research Institute indicate operating costs of $65.29 per hour and $1.63 per mile. http://www.ccjdigital.com/trucking-costs-fall-in-2012-under-pressure-moving-forward-report-says. Our $110 per hour results in a per mile cost of $2.75/mile. A reason for the difference may be the urban environment in which Chicago area trucks operate.

[28] A review of publicly available sources show hauling charges for a 20-mile trip of $6.50/ton which includes loading the truck. http://www.barrestone.com/price.asp. Other sources show the cost of certain products such as sand or limestone in the $6-20 range. This includes the product and delivery. Another source states local delivery within a 10-mile radius of $35. http://earthnwood.com/delivery/. This does not represent an exhaustive search and may not represent prices in the Chicago area but they provide a general sense of pricing. The values used in our estimate are considerably higher than the examples shown.

We assumed that the average handling cost for transloading would be $6 per ton and built in costs for projected 2010 and 2020 traffic. This assumes truck wait time, equipment and operator time, paperwork time, and other costs for loading the truck and then unloading the truck. This may be somewhat high for certain commodity types such as sand, coal, coke, or grain and somewhat low for steel or other products requiring specialized equipment and careful handling. It is important to understand that many movements will not require any extra handling at all and this is also factored into our weighted average handling cost of $6/ton. For instance, a commodity may be offloaded to a truck at a transload facility and moved directly to an end user (e.g., construction sand or steel). The transloading that formerly occurred at a terminal upstream of the proposed barrier has simply been moved to a transload facility downstream of the proposed barrier. Thus, the $6 per ton handling cost represents a blending of some higher cost transloads, some lower cost transloads, and recognition that some commodities would require no additional transloads at all. There may be additional trucking costs but we have built these into the analysis separately from handling costs.

In developing our handling cost estimates we assumed truck waiting time costs at $100/hour, and equipment costs at $125/hour which we believe to be reasonable. We assumed a generous value of 15 minutes of loading time, plus truck wait time, plus unloading time for the handling costs. By comparison, we observed that for bulk commodities such as salt, that a truck could be loaded every two minutes with

the use of two front-end loaders. So again, our time estimates represent weighted averages, and reflect the fact that some commodities will take longer to load/unload, while others, like salt, will take considerably less time.

In 2010, we discussed transloading costs with a number of experienced transportation professionals and they confirmed that using $5 per ton (updated to $6/ton) as a weighted average was reasonable, and that our load and wait times and cost estimates were reasonable. Sources in 2010 gave us various handling cost estimates including $5-6/ton for hot liquid asphalt; $6-7/ton in general including loading, unloading, and 30 day storage; $3-3.50/ton for coke, $3-4/ton for cement; $9/ton for steel products including 30 days storage but $6/ton without storage; aggregate at $2.50/ton; etc.

Given that a significant portion of the cargo requires no extra handling costs compared to the present operation, we believe a weighted average handling cost of $6/ton is reasonable. Trucks were assumed to carry 25 tons of cargo which is typical given Illinois weight regulations.

Our assessment assumed that transloading would occur in several ways:

• Utilize existing or new terminals downstream of the proposed barriers.[29]

• Utilize private shipper owned facilities elsewhere in the region.[30]

As noted above, there are many existing terminals that could be used and that are currently in operation. Our review of the CAWS revealed a number of existing terminals, and locations on the Cal-Sag and CSSC that are vacant or underutilized and appear to offer availability. Interviews with several knowledgeable sources also supports the view that the market is very dynamic, and that existing and new terminals would rapidly respond and provide needed services.

b. Local trucks as a replacement for short distance barge movements--20% of traffic

There are some very short barge movements in the Chicago area that would be uneconomic if a transload were needed. We assume that 20 percent of this traffic would switch totally to truck and the remainder would involve a different supply chain scenario. The GLMRIS report indicates that about 30 percent of traffic in the area is internal[31]--that is, origins and destinations are within the Chicago Area Waterway System. We assume that additional costs are $7/ton for trucking costs similar to the previous alternative. There should be little, if any, additional transload or handling costs since the cost to load and unload the barge would offset any

[29] Terminals on the Lake Michigan side of the barriers will probably not be required since that cargo would typically be trucked from the shipper the few miles to the downriver terminal.

[30] At least one large shipper/receiver has developed a contingency plan to use existing vacant waterway property downstream on the Illinois River to transload cargo between barge, and truck or rail.

[31] Page D-658.

additional costs to load or unload the truck. That said, we have assumed $3/ton cost for any additional transload or handling costs that might be involved.

c. Use of the rail mode as a partial substitute for the barge movement--20% of traffic

Some longer distance barge traffic is expected to shift to rail. We assume 20 percent which coupled with the 30 percent that continues to use barge results in 50 percent of the traffic. This rail move could include petroleum products, chemicals, iron and steel products, grain, coal, and stone. All of these commodities commonly use the rail mode. In fact, major rail commodities are also typical of cargo moved over the inland waterway system. Table 4 shows the similarity of rail commodities with those carried on barges. We estimate that rail costs would be on the order of $10 per ton greater than barge transportation. This is based on a review of grain, coal, and general freight transportation rates obtained from the USDOT and other sources. For example, the USDOT, Bureau of Transportation Statistics indicates rail rates of 3.76 cents/ton mile and calculated barge rates of 2.93[32] cents/ton mile in 2011, a .83 cent difference.[33] For simplicity, and to be conservative, we have assumed that rail rates would be 1 cent/ton mile higher than barge. This results in a $10/ton difference for a 1,000 mile trip. This distance is about the same or greater than the

[32] The 2.93 cents per ton mile was calculated by the authors since there has been no barge value reported since 2004. Our calculation was that the barge rate remained at 2004's level of 78 percent of the rail rate.

[33] US Department of Transportation, Bureau of Transportation Statistics, Table 3-21, Average Freight Revenue per Ton Mile. http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/index.html#chapter_1.

934 rail miles from Chicago to New Orleans.[34] We also reviewed rail rates compiled by the U.S. Department of Agriculture and published in their Weekly Grain Transportation Report. This indicates rail rates, including fuel surcharges of about $38/ton for rail and $31-35 per ton for barge.[35] We also looked at coal transport costs compiled by the US Department of Energy, Energy Information Administration. This shows 2010 coal transport rates of $15.54/ton for rail, and barge transport costs of $5.77/ton--a difference of $9.77/ton.[36] This large difference in rates is probably related to the longer distances associated with many rail moves such as movements out of the Powder River Basin in Wyoming. That said, allowing a $10/ton additive for rail in lieu of barge seems reasonable.

It is also of interest that the USACE and CTR "observed that, in a few instances, the selection of barge transportation is more costly than the land alternative." The Report speculates on some of the explanations for this "unreasonable behavior."[37] We have two comments to make: the first is that the relative rate difference between rail and barge may not generally be as great as the Report suggests and, the second, for these particular traffic movements, is that there would be no

[34] The rail mileage from Chicago Union Station to New Orleans is 934 miles per January 13, 2014 Amtrak System Timetable. Freight routings may be somewhat different but 1,000 miles seems to be a generous estimate and would represent one of the longer distance trips where rail would be substituted for barge.
[35] US Department of Agriculture, Grain Transportation Report, September and November 2013 issues.
[36] U.S. Department of Energy, Energy Information Agency, Coal Transportation Rates to Electric Power Sector, Table 1 (Rail) & Table 2 (Barge) [http://www.eia.gov/coal/transportationrates/pdf/table1.

[37] Pages D-675-676.

additional costs associated with the barriers and the loss of direct barge service. The selection of the land alternative would actually result in transportation savings.

Table 4

Railroad Commodities

2012

Commodity	Tons Originated (millions)	Percentage of Traffic
Coal	722	41.0%
Chemicals	173	9.9%
Farm Products	139	7.9%
Non-Metallic Minerals	130	7.4%
Miscellaneous (Intermodal)	112	6.4%
Food & Kindred	101	5.8%
Metallic Ores	75	4.3%
Metals & Products	51	2.9%
Petroleum & Coke	44	2.5%
Stone, Glass & Clay	44	2.5%
Waste & Scrap	42	2.4%
Other	127	7.2%
Total	1,760	100.0

Source: Association of American Railroads, Class 1 Railroad Statistics, July 1, 2013.

Other studies based on proprietary rail costing models using U.S. Surface Transportation Board (STB)[38] data show railroad operating costs in the $8/ton range for trips of about 100 miles and $16/ton for 400 miles. These involve single car movements using both a shortline railroad and a Class 1 railroad for the move. Multiple cars or unit train moves would be as much as 1/3 less (i.e., about $11/ton for a 400 mile rail move). Longer distance trips or contract rate high volume recurring moves would cost even less on a per mile basis. These are total operating costs associated with this distance movement--they are not additives but show that many railroad movements are relatively inexpensive and are sometimes less than the additive the authors are using and far less than the lost transportation savings that the USACE assumes.

d. Resourcing of commodity based on competitive pricing--30% of traffic

This assumes that the loss of the inland water transport option will cause commodity suppliers and purchasers to find other competitively priced alternatives. The Chicago area represents one of the largest economies in the world. As such, there is a wide range of buyers and sellers offering goods and services at competitive prices. Sophisticated logistics and transportation services exist to serve this economy. In fact, Chicago has been long been known for being America's transportation center. The system is resilient and competitive alternatives are available to address any changes. Change is a constant with today's supply chains

[38] The U.S. Surface Transportation Board collects a wide variety of data from railroads. Various proprietary models utilize this data to determine rail costs for specific movements.

and logistics personnel regularly deal with worldwide transportation and supplier issues. The GLMRIS Report recognizes that there are alternatives to the waterway beyond just shifting to truck or rail. The report states that: "If commodities are not able to move on the waterway, then shippers would shift to truck or rail*, find alternative sources for input, sell their output in different markets, or shut down*. (Emphasis added.)"[39] There was however, no effort to assess the feasibility of this resourcing or to determine cost impacts. We believe that resourcing is especially significant with respect to very low value cargoes.

None of these alternatives is mutually exclusive. Some traffic could involve combinations of truck, transload, rail and resourcing. Further, some existing suppliers may be willing to reduce commodity costs in order to retain the business. This helps offset higher transportation cost.

Our assessment, as shown in Table 5 (attached to this report), indicates that additional annual transportation-related costs of about $95 million for 2010 traffic levels and $105 million for the Corps'

[39] GLMRIS Report, p. D-692.

projected 2020 traffic levels could be expected.[40] This amounts to an additional $10.60 per ton over existing costs. This implies that the ultimate consumer of the commodity will incur additional costs in this general range. It is quite possible that costs could be lower based on more resourcing then we have assumed in our analysis. Our current estimate of approximately $10.60 per ton over existing costs compares to the average additional costs of $26.30 per ton suggested by the USACE.[41] In other words, the GLMRIS Report may overstate by a factor of two and a half times the commercial transportation cost impacts of the Mid- System Hydrologic Separation alternative described in Alternative 6.

7. Mitigation and Shipper Responses

The GLMRIS Report discusses possible mitigation of impacts of various alternatives, but it assumes that impacts to commercial navigation from Alternative 6, Mid-System Hydrologic Separation, would not be mitigated.[42] In other words, the Corps stated that it did not identify mitigation measures that it would build into its description and evaluation of Alterative 6. But to the extent the Report implies or suggests that impacts

[40] In 2010, the authors estimated that barriers near the Chicago and O'Brien Locks would result in additional transportation costs of $64-69 million. The primary reason for the difference between our current estimate of $95-$105 million is that more traffic is involved in part due to different locations for the proposed barriers. Our earlier estimate was based on 7 million tons of traffic whereas the current USACE projection is that the Mid-System Hydrologic Separation would impact about 10 million tons of traffic. While we believe these projections to be optimistic, we have used them in our estimate of impacts. We have also used a slightly different approach to estimation and have assumed that some of the commodities would be resourced. See John C. Taylor and James L. Roach, Chicago Area Waterway System: The Logistics and Transportation Related Cost Impact of Waterway Barriers, July 14, 2010.
[41] GLMRIS Report. p. D-675.
[42] See, e.g. Report, pgs. ES-8, 86, 159, A-213-214, D-722-723.

to commercial navigation *cannot* be mitigated, that conclusion is not supported. First, the Report broadly asserts that "impacts to commercial navigation would not be mitigated because CAWS operators indicated they would not be likely to use *a multi-modal facility*."[43] The ostensible basis for that statement is apparently a 2011 survey conducted by the Center for Transportation Research under Contract for the Corps in which it surveyed 132 shippers, docks, and vessel operators that use the CAWS and asked them how they would respond to waterway closures of varying durations.[44] The Corps, not the CTR, summarizes the "Shipper Response" as follows:

> "Shipper responses ranged from waiting out the closure, shifting modes to truck or rail, resourcing, or permanent closure of the dock. . . the longer the closure the more likely they were to reduce future traffic, shift to the Great Lakes for shipping, or close the dock. Shippers and terminal operators were asked if they would transfer around a temporary or permanent barrier by *unloading from barge to truck or rail and then reloading to barge* (emphasis added) once past the point of disruption on the CAWS. Almost all docks and shippers responded they would not undertake this option. For many of the shippers, their margins are too slim for them to stay competitive with the additional costs of transloading. Most respondents replied that they would shift modes to either truck or rail. If the additional costs of trucking were too great and they did not have the capacity for rail, many companies replied that they would either resource, i.e. find new sources for production inputs, or shut down permanently."[45]

There are several noteworthy points about this and other aspects of the Corps' dismissal of mitigation. First, there is nothing in the summary provided to document the

[43] Report, ES-8 (emphasis added).
[44] Although Attachment 6 to the Report includes two appendices directly prepared by CTR, neither of them provides any detail about the questions actually asked or the responses.
[45] Pages D-722-723.

assumption that shippers would not use a "multi-modal" facility. Indeed, there is no evidence they were even asked about a multi-modal facility.[46] Instead, they were apparently asked about a very specific and unusual form of cargo movement: transferring cargo from a barge first to truck or rail and then back to a barge on the other side of the barrier. That is quite different from the normal transloading that occurs regularly between truck, barge, and rail modes--indeed, almost all commodities use several modes of transportation to move between origin and destination. Second, for the same reasons, the Corps' suggestion that shippers are "unlikely to use a transloading . . . facility"[47] is also unsupported. Third, the Corps assumes that any new mutli-modal facility would necessarily have to accommodate transfers of liquid cargoes to pipelines, thereby increasing its size and expense.[48] Although some liquids are currently shipped on barges in the CAWS,[49] it does not follow a multi-modal or transload facility accommodating only dry cargoes would not be built or used. It also doesn't follow that a new multi-modal or transload facility requiring 100-500 acres would be needed.[50] As noted previously, there are many existing and former terminal locations that might welcome the additional business. Finally, as summarized in the Report,

[46] As the Corps elsewhere appears to acknowledge, see p. A-214, a multi-modal facility is one at which cargoes are transferred from one mode of transportation (e.g., vessel) to another (e.g., truck or rail) for the remainder of its transport.
[47] Report A-213.
[48] Report A-214.
[49] The Report indicates that the main commodity groups impacted by the proposed mid-system barriers are "(1) iron and steel at 2 million tons, (2) aggregates at 1.7 million tons, and (3) coal and coke at 1.5 million tons." P. D-717. It further indicates that there would be about 1 million tons of petroleum products and chemicals that would be impacted--this would represent about 10 percent of the total traffic that would be impacted by the barriers. Authors' calculation from p. D-718. The authors note that there are large existing tank farms and petroleum processing facilities located between the Lockport Dam and the Lemont area. These locations could potentially be used to process and handle the liquids that currently are moving further upstream.
[50] Page D-724. CTR rough estimate for a multi-modal facility in the Chicago area.

shippers basically state that they would do the kinds of things that we have suggested to respond to the closures. That is, as discussed in our alternative evaluation discussed in section 6, above, shippers would shift to truck or rail or they would resource.

8. Summary and Conclusions

We have two fundamental objections to the latest Corps' report relating to commercial navigation. The first relates to the assumption that cargo traffic will increase until 2020 when it will stabilize at that level through 2065. This flies in the face of dramatic declines in traffic which has resulted in the loss of half of the shallow draft barge traffic since 1994 This decline continues and the USACE Lock Performance Monitoring System for the O'Brien Lock shows an 18 percent decline in the two years since 2011--a significant loss even in the face of a recovering economy. The second major objection relates to the analytical process which assumes that any barrier to barge service, even for the last few miles in a long journey, requires the cargo to move by an overland alternative for the entire journey. That is not the case and the kinds of additional costs suggested by the USACE would not occur in the marketplace. Nobody will pay an additional $10-60/ton in transportation costs for commodities that are worth as little as $5-10 per ton for sand or a $40 per ton for coal or salt. There are other suppliers that would be able to supply these commodities at little additional cost. The USACE is hamstrung by its own guidelines which apparently require them to base cost impacts on the continuation of traffic to and from existing locations by an overland mode. This results in a confusing and misleading number called "lost transportation rate savings"

that some believe represents the additional costs associated with the loss of barge service. This is not reflective of a competitive supplier and transportation marketplace. We believe that many commodities could be made available at little additional costs from those being experienced today. Our estimate of additional transportation costs associated with the barriers is in the $100 million range. This is only an estimate as there cannot be a precise answer as to how much additional transportation cost would be incurred. In the end the answer will be determined by commodity buyers and sellers who will solicit or respond to bids and who will consider transportation costs as one component of their process to get the most competitive price.

9. Key Facts and Findings

In summary, we have updated and presented key facts and findings from this and our earlier work:

a. As the Report acknowledges, Alternative 6, the Mid-System Hydrologic Barrier offers the highest level of effectiveness to prevent the spread of ANS.[51] This involves the construction of physical barriers on the CSSC near Stickney, Illinois and on the Cal Sag near Alsip, Illinois. These barriers would prevent the movement of barges between upstream and downstream locations.
b. This alternative also provides advantages for navigation:

[51] Report, p. ES-11.

- Tour boat and recreational traffic[52] would be largely unaffected by the proposed barriers and there would be continued free access from Lake Michigan into downtown Chicago and upstream portions of the Chicago River and the CSSC.
- Deep draft laker and ocean vessels to and from Lake Michigan would be unaffected and would have continued access to the Calumet River and Lake Calumet.
- Shallow draft vessels would continue to be able to serve portions of the Chicago River, the CSSC, the Cal-Sag, the Calumet River, and Lake Calumet.
- Only about one-third of expected CAWS traffic would be affected by the barriers. The remaining two-thirds would continue to be able to use the system including the growing deep draft portion of the waterway.

c. The USACE estimates that about 10 million tons of cargo per year would be affected by the barriers. We believe this is a high number given the continued decline in shallow draft barge traffic. For example, traffic at the O'Brien Lock decreased by 18 percent in the two year period from 2011 to 2013.

d. The affected volume represents about one percent of all the freight traffic in the Chicago Region.[53]

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[52] Tour boat and recreational boat traffic is largely confined to the upstream portions of the Chicago River. However, some recreational traffic, including cruisers and "loopers" could be accommodated by some type of straddle lift or other type of lift device to move the vessel across the barrier.

[53] Taylor and Roach, *Chicago Area Waterway System, The Logistics and Transportation Related Cost Impact of Waterway Barriers,* July 14, 2010, pgs. 18-19. This earlier report determined from various sources that approximately one billion tons of freight traffic had origins or destinations in the Chicago area in 2007-2008.

e. The affected barge traffic is the equivalent of three daily loaded unit trains in a region that has approximately 500 daily freight trains.

f. Much of the forecasted cargo would continue to move on the inland waterway system, through the Lockport Locks, but would have to stop a few miles short of its former destination.

g. Some of the affected cargo may require transfer to another mode of transportation such as rail or truck at transload locations. This could occur at points downstream of the physical barriers at existing or new terminal facilities. Such transloads are the norm in an intermodal transportation system (e.g., grain moves by truck to an elevator, by rail to a port, and by barge to an end user at an export terminal). Indeed much of the traffic on the inland waterway system already uses several modes.

h. Virtually all of the major shippers have direct or proximity access to both rail and highway. Rail lines and highways are generally located on both sides of the Cal-Sag and CSSC and they are regularly used by shippers.

i. Inland waterway traffic has declined significantly in recent years. During the 1994-2008 period, railroads increased their ton miles by 42 percent, trucking increased by 33 percent, and the inland waterway system decreased by 12 percent.[54] Shallow draft barge traffic declined by 47 percent between 1994-2011 on the Chicago Waterway System.[55]

[54] USDOT, Bureau of Transportation Statistics, Table 1-50, US Ton-Miles of Freight.
[55] GLMRIS Report, Attachment 6, p. 19, Table 2: Tonnages for CAWS Shallow Draft, CAWS Deep Draft, and Illinois Waterway, 1994-2011.

j. Land along the Chicago Waterway System has many vacant and converted sites formerly occupied by waterway users. This is consistent with the overall shift in the local economy toward high value service production and away from freight-laden manufacturing.

k. In sum, the construction of physical barriers on the Cal-Sag and CSSC would have a localized impact on already declining commercial cargo traffic that comprises only a tiny fraction of economic activity in the Chicago Metropolitan area. The conservatively estimated additional transportation and logistical costs of shifting a portion of the existing barge traffic to other modes of transportation along a small portion of its route, of shifting some traffic to rail, and, importantly, buying or selling commodities from other suppliers is far less than the Corps has suggested, and is orders of magnitude less than the estimated impacts of sport and commercial fishing in the Great Lakes.

l. We fundamentally reject the USACE approach to estimating the cost impacts associated with the physical barriers. The claim that their planning guidelines require them to estimate costs based on the least cost overland alternative in no way reflects the existing transportation marketplace in an economy like Chicago's where many alternative sources of commodities and transportation options exists.

m. Our assessment indicates that additional transportation costs in the $100 million range could be expected. These are conservative estimates and it is quite possible that costs could be lower if more resourcing occurs.

TABLE 5

Table 5
Chicago Waterway System
Post-Barrier Cost Impacts (Year 2010 and 2020 Traffic)
Alternative to USACE Estimates

							Comment												
2010 Total Tonnage (000's)					**8,970**		Represents USACE estimated 2010 Traffic Affected by Mid-System Hydrologic Separation Alternative												
2020 Total Tonnage (000's)					**9,913**		Represents USACE estimated 2020 Traffic Affected by Mid-System Hydrologic Separation Alternative												
Costing parameters																			
Truck delivery costs for 40-mile RT					$176		40-mile RT @ 25mph urban =1.6 hours @ $110/hour												
Maximum load in tons					25		80,000# truck limit in Illinois. Assume 50,000# cargo												
Truck delivery cost (Drive time only)					$7/ton	$7	$176/25 tons=$7.04 round to $7/ton												
Add'l handling costs for transload (Includes truck wait, equip. etc tim					$6/ton	$6	Bulk is $6 or less. Some cargo higher. Some cargo would have no add'l handling cost---it is already transloadec												
Additional costs for rail					$10/ton	$10	BTS indicates rail cost/ton mile at 3.76 cents/ton mile in 2011 & barge calculated at 2.93 cent/ ton mile=.83 cents												
							difference. Assume 1.0 cent add'l per ton mile for rail for assumed 1000 mile trip.												
Additional handling costs for local truck and rail					$3/ton	$3	Assume half of transload costs above. There are offsetting costs since barges have to be loaded & unloaded and this is not required here.												
Additional costs to resource or other					$7/ton	$7	Assume some addl handling & higher costs in general. Considerable variance here. Logic is resource cost must be less than other options												
				2010	Add'l handlin	Total add'l	Add'l transpo	Total transport	Total add'l		Add'l		2020	Total					
			%	Tonnage	cost/ton	handling costs	cost/ton	costs	costs		cost/ton		Tonnage	add'l costs					
				(000's)		(000's)		(000's)	(000's)										
Barge &Truck Transload---30 %			0.3	2691	$6.00	$16,146	$7	$ 18,837	$34,983		$13		3965	51548					
Local truck in lieu of local barg---20%			0.2	1794	$3.00	$5,382	$7	$ 12,558	$17,940		$10		991	9913					
Rail Mode---20%			0.2	1794	3.00	$5,382	$10	$ 17,940	$23,322		$13		1983	25774					
Resource---30%			0.3	2691			$7	$ 18,837	$18,837		$7		2974	20817					
Total Additional Transportation Costs				**8970**		**$26,910**		**$ 68,172**	**$95,082**		**$11**		**9,913**	**$ 105,078**					
Additional Cost/Ton									**$10.60**					**$ 10.60**					
3/28/2014		Prepared by JLRoach and John C. Taylor																	