Comprehensive market study 2020
for a container-on-barge port facility in Brunswick, MO

December 2020

Contents

1. Cover letter for MARAD

William K. Paape, PPM
Associate Administrator for the Office of Ports & Waterways
U.S. DOT/Maritime Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Mr. Paape:

In partnership with AGRIServices of Brunswick (ASB), the Missouri Department of Transportation (MoDOT) is pleased to submit the following request for Project Designation for starting a container-on-barge (COB) service at ASB Port Facilities located at 40135 US-24 in De Witt, MO.

The ASB Project includes the provision of terminal and marine infrastructure necessaries to initiate COB service at ASB's port facilities. This COB operation would extend along the Missouri River, marine highway 70 (M-70), to connect with inland marine terminals along M-29, M-70, and M-55, and further with ocean terminals along the Gulf and Marine Highway M-10.

In 2008, ASB began a concerted effort to increase efficiencies within their transportation system by promoting the use of barges to its clients. In 2008, ASB handled 8 barges at its dock. Ten years later, ASB handled 237 barges. These barges are generally of the standard type used on the Mississippi River (35 ft wide by 200 ft long) and built in the United States (U.S.).

Given the profile of the current and prospective key beneficial cargo owners (BCOs) and shippers in the region, as well as barge operators along the Mississippi and Missouri rivers, it is expected that once implemented, the COB operation at ASB will be enhance multimodal connectivity for import and export freight. The Port has successfully demonstrated the cost effectiveness and reliability of using barge service to move agribulk and drybulk cargoes. Based upon the success of the COB model in other similar marine terminals, there is additional interest in COB service to the U.S. Gulf Coast because of traffic congestion in the state freight transportation network. COB service to ocean container terminals can be utilized by industries and distribution centers importing cargo into the region, and by exporters seeking to take advantage of lower transportation backhaul rates generated by ocean carriers aiming to reposition empty containers bay to the ocean gateways.

Additionally, the ASB Project Designation will allow the Port to compete for Federal funding to support short sea shipping activities along M-70 and M-55. The federal funding would be part of the $5.24 million capital investments needed for gantry cranes, other container handling equipment, civil works, and similar dedicated infrastructure necessary to start the COB service.

We respectfully request your consideration of our application for a Project Designation.

Sincerely,

Cheryl Ball, IMPM, JD
Freight & Waterways Administrator
Missouri Department of Transportation (MoDOT)

2. Designated project name and background information

2.1 Applicant

AGRIServices of Brunswick (ASB), located at 40135 US-24 in De Witt, MO, traces its roots to as far back as 1870 in Mendon, MO. In the mid 1970's, Walker C. Fletcher and William P. Jackson discovered a mutual interest in developing a barge facility in central Missouri to move agricultural inputs, especially fertilizer, into the region and take advantage of the backhaul to move grain to the New Orleans export gateway. The location of ASB was chosen because of its access to all modes of transportation. Using the Norfolk Southern rail, US-24 highway, and its inland waterway system, ASB provides wholesale and retail customers a logistical advantage that translates into the ability to purchase agricultural inputs and sell grain not only at more competitive prices but using a more environmentally friendly transportation mode. ASB's inland waterway system remains one of the most cost-effective mode of transportation for high bulk, low value products and has been the backbone of the regional transportation system continuously since 1978. ASB's inland waterway system is illustrated in Figure 1.

Figure 1. ASB location and inland waterway system served

With a large and increasing share of trade moving via container, MoDOT and ASB desire to explore the option of offering a container-on-barge (COB) service in Brunswick, MO in addition to the bulk handling capability they have provided for nearly fifty years. Moreover, there is additional interest in COB service to the ports in the Gulf because of truck traffic congestion in the State of Missouri. Based upon the success of the COB model in other regions (e.g. the integration of the regional Port of Everett with the international gateways served by the transpacific ocean carriers) COB service to a terminal in Brunswick can also be utilized by the manufacturers and industries in the region that currently rely on trucks or rail and that are increasingly being impacted by the growing congestion on highways and high capacity levels on rail corridors. A successful "Project Designation" from the Maritime Administration (MARAD) will allow the Port to compete for Federal funding to support marine navigation along the Missouri and Mississippi rivers, expand the COB service, and ultimately short sea shipping activities in the Gulf.

2.2 Project participants

The primary participant is ASB, who is being sponsored by MoDOT. Many other entities will be partners with the ASB Port in operating and using the marine highways that are part of the envisioned operation; including shipping lines, barge service providers, local unions, port operations and maintenance staff and local governments. Confirmed project participants include:

- AGRIServices of Brunswick
- America's Central Port
- Central Missouri AgriServices
- Far West Logistics
- Heartland Port Authority of Central Missouri
- Howard Cooper Regional Port
- Inland Rivers Ports & Terminals
- Missouri Department of Transportation
- Missouri River Towing
- PortKC
- SEACOR
- St. Joseph Port Authority

2.3 Marine highways and ports served

The ASB Project is served by the M-29 and M-70 along the Missouri River, providing access to 256 mi of navigational inland waterways between ASB and St. Louis, where it connects with M-55 along the Mississippi, and more than 1,190 mi between St. Louis and the U.S. Gulf Coast. These three marine highways are already designated routes by MARAD. The four marine highways designated in Missouri are shown in Table 1.

ASB currently supports barge services for non-containerized cargo on the M-70 and M-55 designated routes that are used by its existing customers. With the outcomes of this study, ASB intends to obtain a Project Designation from MARAD to provide COB service for relevant commodities originating or terminating within its potential hinterland markets in Central Missouri. In addition, a COB service to/from ASB will provide access to more than 100 public and private river terminals located along M-70 and M-55 between ASB and NOLA opening more opportunities to exchange containers among terminals located along the inland waterway network.

Table 1. Designated Marine Highways in Missouri

Marine highway	Waterway	From	To
M-29	Upper Missouri River	Kansas City, MO	Sioux City, Iowa
M-70	Missouri River	Kansas City, MO	St. Louis
M-55	Mississippi River	St. Louis	Gulf of Mexico
M-35	Upper Mississippi River	Twin Cities, MN	St. Louis

2.4 Objective

AGRIServices of Brunswick (ASB) intends to use the outcomes of this study to request a Project Designation[1] for a container-on-barge (COB) service at its port facilities located at 40135 US-24 in De Witt, MO. The ASB Project includes the provision of terminal and marine infrastructure—such as cargo laydown area, container handling equipment (CHE), intermodal connections, waterside access, berth, bulk-to-container transfer areas, etc—necessaries to initiate COB service at ASB's port facilities. As a consequence of enabling COB service at its existing port facilities, the COB operation would extend along the Missouri River (marine highway M-70) to connect with inland marine terminals along M-29, M-70, and M-55, and further with ocean terminals along the Gulf and Marine Highway M-10.

2.5 Timing of project designation submission

MoDOT intends to apply for Project Designation on January 31, 2021.

2.6 Structure of the report

The structure of the remainder of this report is presented according to the following major sections:

- Section 3, Minimum requirements met for a MARAD project designation
- Section 4, Market analysis
- Section 5, Route economics and key target markets
- Section 6, Conceptual operational model, project site, and terminal layout
- Section 7, Benefit-cost analysis
- Section 8, Economic impact analysis
- Section 9, Environmental regulatory requirements
- Appendices

[1] AAPA and USDOT-MARAD, Aug 2020. *Port Planning and Investment Toolkit Marine Highway Projects Module*, pg.6. Project Designation– New or expanded marine highway services that use U.S. documented vessels on an AMH route and mitigate land congestion or promote shortsea shipping are designated as AMH Projects.

3. Minimum requirements met for a MARAD project designation

This section begins with a description of the project location and the study area, along with a discussion of how the ASB COB project satisfies the requirements for receiving Marine Highways Project Designation by MARAD. This includes a description of the barge fleets currently providing COB service along the Mississippi River, how the ASB Project and the start of a COB service along the Missouri and Mississippi rivers can assist in mitigating landside congestion, and how the designated routes that the ASB Project is expected to provide direct connection from ASB to major ocean gateways, other marine terminals, and the short sea transportation network in the U.S. Gulf Coast (USGC) region.

3.1 Project location and study area

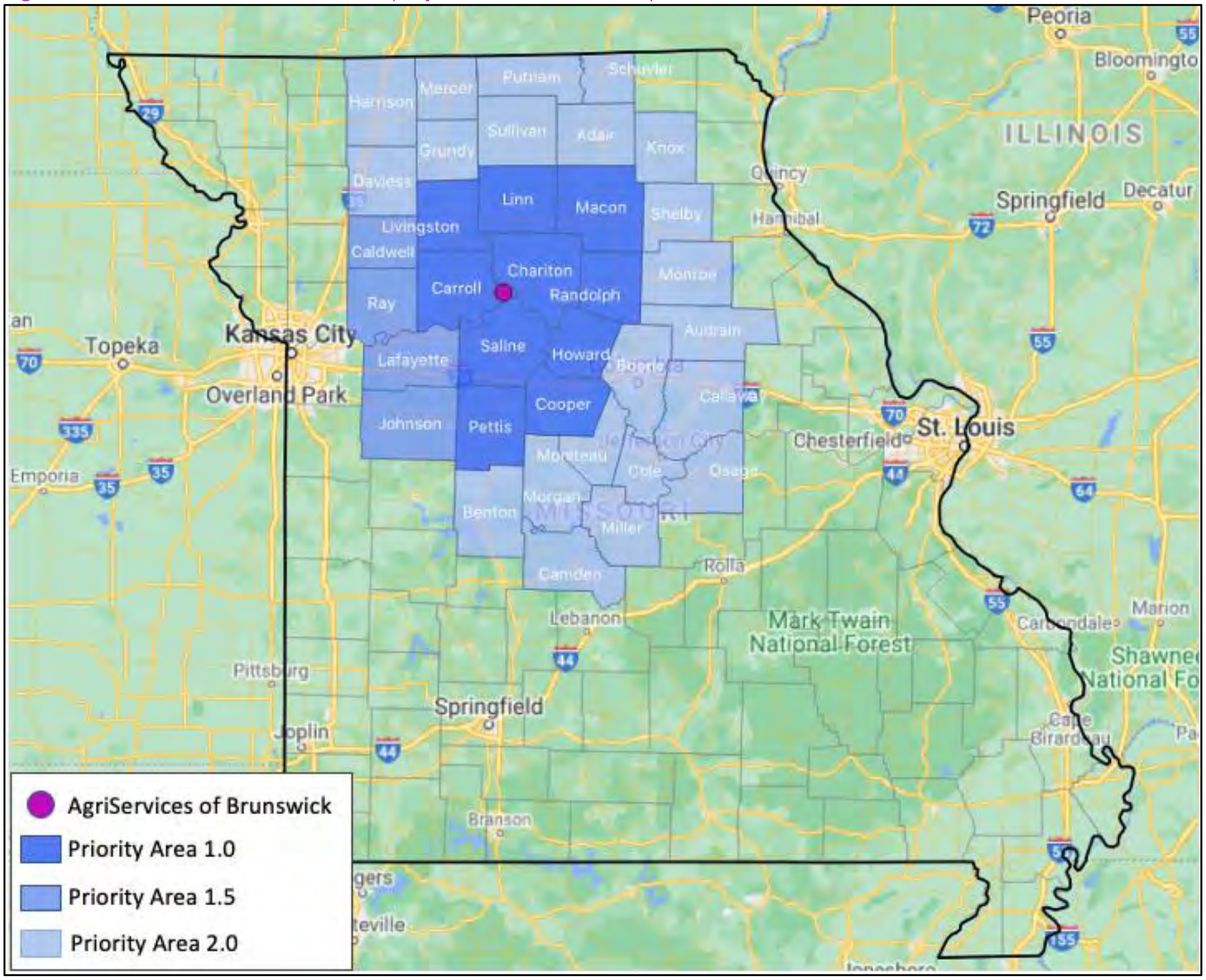
ASB is a 236-acre facility located at the 256-mile marker of the Missouri River. Due to its geographic location, ASB enjoys good multimodal connectivity and accessibility: by barge on the Missouri River, by rail via Norfolk Southern (NS), with connections to Kansas City, Chicago, and St. Louis, and by truck via U.S. Route 24, which provides fast access to I-70 over a four-lane divided highway.

To facilitate our assessment of the market potential in the hinterland of ASB, our team identified three priority areas. This structure was used for estimating foreign imports and exports by commodity and industry for each priority area as a share of the state totals. The project location and the definition of the study area depicting the three priority areas, which overall encompass 35 counties, are detailed in the next bullets and illustrated in Figure 2.

- **Priority Area 1.0**—includes *10 counties* in the trade area in closer proximity to ASB: Carroll, Chariton, Cooper, Howard, Linn, Livingston, Macon, Pettis, Randolph and Saline. This is the hinterland area within a 50-mile radius of Brunswick, which could best take advantage of transportation services at ASB.
- **Priority Area 1.5**—includes *4 counties* in the trade area between ASB and Kansas City: Caldwell, Johnson, Lafayette, and Ray. These counties were segregated from Area 1 because, although close to ASB, they are close to and well-served by the existing transportation networks at Kansas City, so Kansas City might provide a more attractive routing alternative.
- **Priority Area 2.0**—includes *21 counties* in the outer trade area: Adair, Audrain, Benton, Boone, Callaway, Camden, Cole, Daviess, Grundy, Harrison, Knox, Mercer, Miller, Moniteau, Monroe, Morgan, Osage, Putnam, Schuyler, Shelby, and Sullivan. These counties are within about 50-100 miles of Brunswick and could possibly be well served through ASB.

The balance of Missouri's 114 counties (i.e. 79) are more than about 75 miles from Brunswick, and often closer to Kansas City or St. Louis. These areas are therefore less likely to benefit from a new ASB operation, and so are classified as a Non-Priority Area and excluded from the analysis.

Figure 2. AGRIServices of Brunswick—project location and study area



Source: Mercator International.

3.2 Documented vessels

In 2008, ASB began a concerted effort to increase efficiencies within their transportation system by increasing the use of barges within its supply chain. In 2008, ASB handled 8 barges at its dock. Ten years later, ASB handled 237 barges. These barges are generally of the standard type used on the Mississippi River (35 ft wide by 200 ft long) and built in the U.S. SCF, a subsidiary within Seacor Holdings Inc, operates a COB service between St. Louis and the Port of New Orleans, which uses U.S. Documented Vessels.[2] Similarly, American Patriot Holdings LLC (APH), a relatively new company, is in the process of finalizing plans to construct self-propelled container vessels which will be operated along M-55 and M-70 (see Figure 3). Given the profile of the current and prospective key barge operators along the Mississippi and Missouri rivers, it is expected that once implemented, the COB operation at ASB will be served by U.S. Documented Vessels.

[2] SCF owns and operate towboats, inland terminals and loading facilities, warehousing, storage and distribution centers, fleeting operations and shipyard and dock services. https://scf.us/our-services/logistics-services.

3.3 Carries cargo in short sea shipping

Once fully operational, the ASB Project will enable the movement of commodities in containers between ASB and the U.S. Gulf Coast (USGC). For the outbound direction, the COB service could provide a viable transportation option for agricultural commodities moving from Central Missouri to the Port of New Orleans (NOLA) for onward shipment by regularly scheduled international container liner services with cargo loaded in "backhaul" containers that otherwise would have to be repositioned empty. For the inbound direction, the COB service could provide a viable service for containers delivered to USGC terminals by international ocean-going vessels, and subsequently loaded by cranes onto barges or river vessels (primarily at New Orleans or other ports and terminal on the lower Mississippi River), and then moved to ASB via the M-70 and M-55 inland waterways (see Figure 3).

3.4 Mitigates landside congestion

Numerous studies have compared the fuel efficiencies of barge, railroad, and truck and most conclude that movement of freight by barge is the most fuel-efficient transport mode and the lowest cost option for shipments moving over medium to long distances.[3] From this perspective, a fundamental premise underpinning the ASB Project is that the cost savings from transporting goods by barge will be large enough to attract beneficial cargo owners (BCO) to use this mode as opposed to truck or rail. This would be relevant and beneficial in light of increasing capacity constraints and rising greenhouse gas emissions (GHGE) associated with inland corridors in the state, as reported in the *2017 Freight Plan*.[4, 5]

3.5 Short sea transportation

By enabling the provision of COB service for the movement of commodities between ASB and the U.S. Gulf Coast, the ASB Project meets the USDOT definition of Short Sea shipping.[6] The ASB Project will provide access to BCO's and shippers in Central Missouri to Lower Mississippi ports offering international shipping services and to the Gulf Intracoastal Waterway (M-10) via the Missouri and Mississippi Rivers. M-10 stretches from Brownsville, TX to Jacksonville, FL, including other ports in Texas, Louisiana, Mississippi, Alabama, and Florida. This marine highway also connects to M-49 in Morgan City, LA, M-65 in Mobile, AL, and M-55 in New Orleans, LA.

3.6 New and expanded services

The ASB Project Designation, and any associated funding or financing in the future, will provide the foundation for the project sponsors to develop and market a new COB service that would provide service to BCO's and shippers located in the 35 counties that comprise the study area. ASB has identified potential

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[3] *Environmental Advantages of Inland Barge Transportation*, U.S. Department of Transportation, Maritime Administration. Final Report, August 1994 http://www.uppermon.org/visions/DOT_environ_barge.htm

[4] Missouri Department of Transportation (MoDOT), *2017 Freight Plan*. Rail Condition and Performance, pp 4-9 (60). https://www.modot.org/sites/default/files/documents/Chapters1-10nov2017%5B1%5D.pdf

[5] *AMH offsets carbon emissions from container on barge service*. SCF Seacor Holdings, press release, Jun 24, 2020. https://seacorholdings.com/news/amh-offsets-carbon-emissions-from-container-on-barge-service

[6] According to the USDOT, short sea transportation means the carriage of cargo by a U.S. documented vessel that meets the following criteria: **(1)** That is—(i) Contained in intermodal cargo containers and loaded by crane on the vessel; (ii) Loaded on the vessel by means of wheeled technology; (iii) Shipped in discrete units handled individually, palletized, or unitized; or (iv) Freight vehicles carried aboard commuter ferry boats; and **(2)** That is—(i) Loaded at a port in the U.S. and unloaded either at another port in the U.S. or at a port in Canada located in the Great Lakes-Saint Lawrence Seaway System; or, (ii) Loaded at a port in Canada located in the Great Lakes- St Lawrence Seaway System and unloaded at a port in the United States [see 46 CFR sections 393.1(k)].

market opportunities to expand short-sea shipping service for a variety of cargoes as detailed in *Section 4* of this report.

3.7 Designated routes

With the intention of shifting cargo from trucks into the more environmentally friendly water mode, the USDOT designated several marine highways in 2009. Marine highways are eligible to receive federal assistance from the Maritime Administration (MARAD). The ASB Project is served by the M-29 and M-70 along the Missouri River, providing access to 256 mi of navigational inland waterways between ASB and St. Louis, where it connects with M-55 along the Mississippi, and more than 1,190 mi between St. Louis and the U.S. Gulf Coast. These three marine highways are already designated routes by MARAD. The four marine highways designated in Missouri are shown in Table 2.

ASB currently supports barge services for non-containerized cargo on the M-70 and M-55 designated routes that are used by its existing customers. With the outcomes of this study, ASB intends to obtain a Project Designation from MARAD to provide COB service for relevant commodities originating or terminating within its potential hinterland markets in Central Missouri. In addition, a COB service to/from ASB will provide access to more than 100 public and private river terminals located along M-70 and M-55 between ASB and NOLA opening more opportunities to exchange containers among terminals located along the inland waterway network.

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M-55	Mississippi River	St. Louis	Gulf of Mexico
M-35	Upper Mississippi River	Twin Cities, MN	St. Louis

3.8 Route designation submission

The ASB Project is on an already designated route, M-70, with its operational plan including navigating along M-55, which is also already a designated route, en route to New Orleans. ASB does not intend to submit any additional route designation requests.

3.9 Direct connection

With the implementation of the ASB Project, the associated COB service would establish a direct connection between ports in the State of Missouri, including those upriver from ASB, and the ports along the Mississippi River en-route to NOLA (e.g. ports along M-29, M-70, and M-55), and further with ocean terminals along the Gulf and Marine Highway M-10, as shown in Figure 3.

Figure 3. America's Marine Highway system

Source: MARAD, USDOT, June 2020.

4. Market analysis

This section presents the outputs of the comprehensive market study. The objective is to identify all companies that could potentially utilize a COB facility at ASB for outbound and inbound shipments of commodities, final products, and raw materials. This section aims to understand how freight flows from producers to markets and how producers receive their components for production. To achieve this, first, historical imports and exports to/from the study area are analyzed. Next, this section presents the identification of freight generators (exporters) and attractors (importers), which was based on the following four-step methodology: (i) industry outreach, (ii) visual inspection of aerial imagery and business addresses, (iii) analysis of state-level public international trade data[7] disaggregated to the county level using the IMPLAN[8] modeling system, and (iv) use of Datamyne data to crosscheck import volumes. With geographic and industrial scope determined, this section summarizes the main findings from a survey conducted among potential users of containerized shipping, aiming to identify the industries with high potential to use containerized shipping through a COB facility at ASB.

4.1 Historical imports and exports to study area

The data for this section came from state level public international trade data (U.S. Census (i.e. USA Trade) data), brought down to the county level (and subsequently back up to priority/study areas) using the IMPLAN modeling system (see *Sections 5.5*, *5.6* and *5.7*). Data were originally expressed in kilograms. Conversion to Twenty-foot Equivalent Units (TEUs) assumes 7.5 metric-tons (MT[9]) per TEU for imports and 12 MT/TEU for exports.

4.1.1 Historical containerized imports

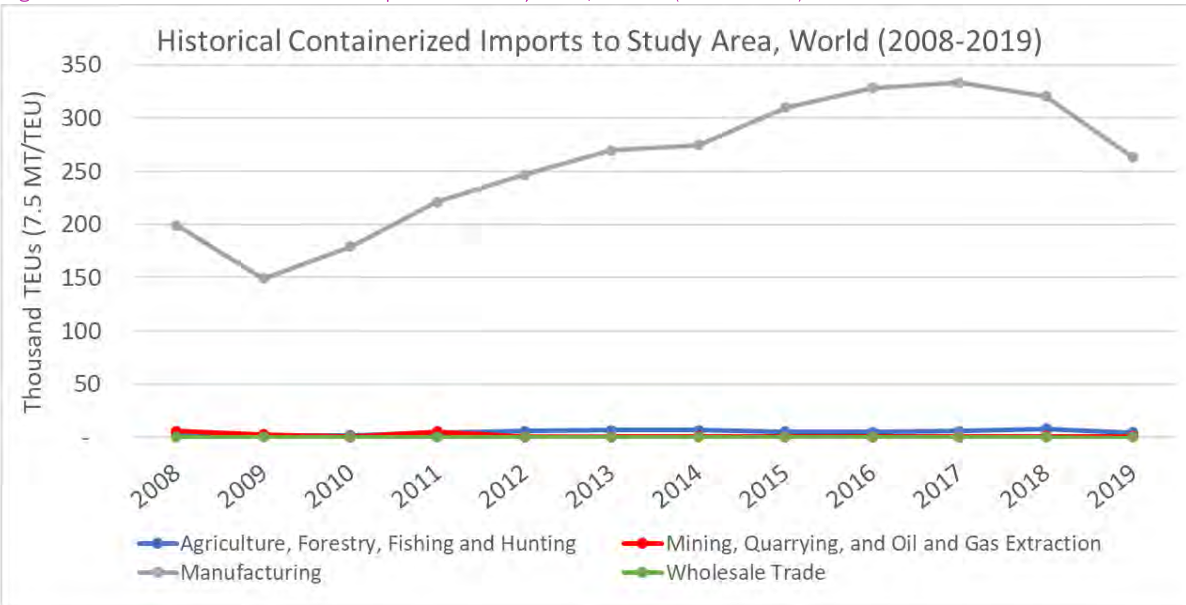
When considering the world as the origin, containerized imports since 2008 have been dominated by "Manufacturing", recently peaking at more than 325,000 TEUs in 2017 (see Figure 4). "Agriculture, Forestry, Fishing and Hunting" has been the second most imported class of containerized imports, recently ranging between about 5,000 and 8,000 TEUs per year.

[7] USATrade Online, https://usatrade.census.gov/

[8] IMPLAN Economic Analysis https://www.implan.com/

[9] 1 metric-ton (MT) = 1,000 kilograms.

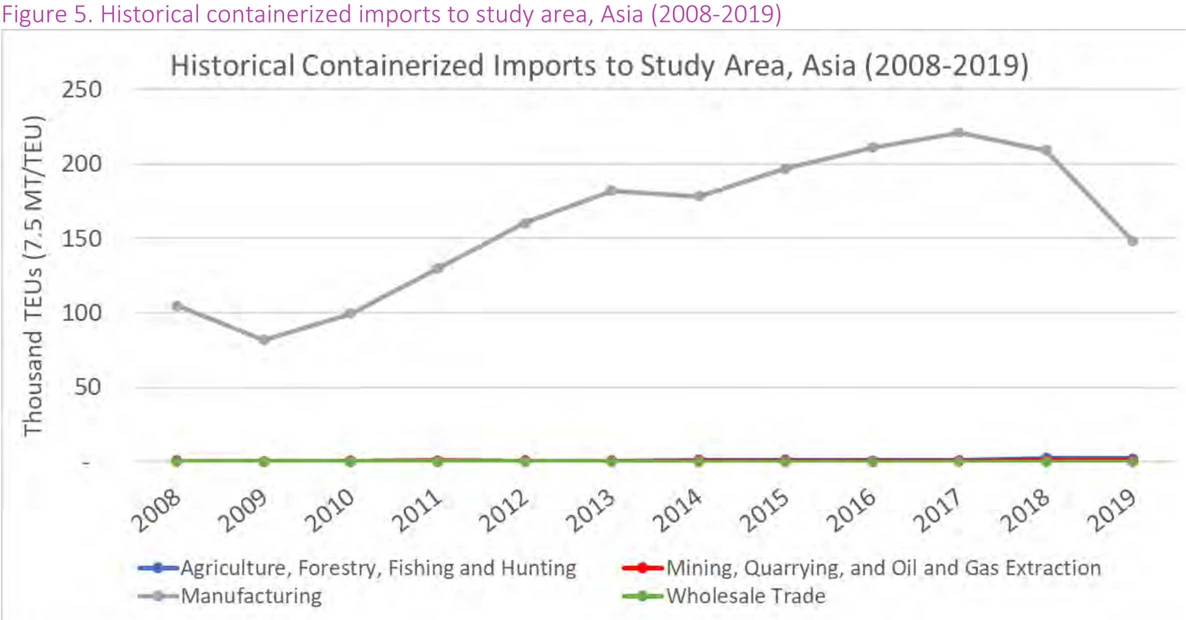
Figure 4. Historical containerized imports to study area, World (2008-2019)



Source: U.S. Census, IMPLAN and DIS.

Figure 5 shows containerized imports to the study area from Asia from 2008-2019. As shown Manufacturing dominates the imports to the study area from that region. Over the last five years, approximately 24%, 66% and 63% of world containerized imports to the study area of "Agriculture, Forestry, Fishing and Hunting", "Mining, Quarrying, and Oil and Gas Extraction" and "Manufacturing", respectively, come from Asia. Because of the large volumes coming from Asia, trends follow the same trends as shown for the world in Figure 4.

Figure 5. Historical containerized imports to study area, Asia (2008-2019)

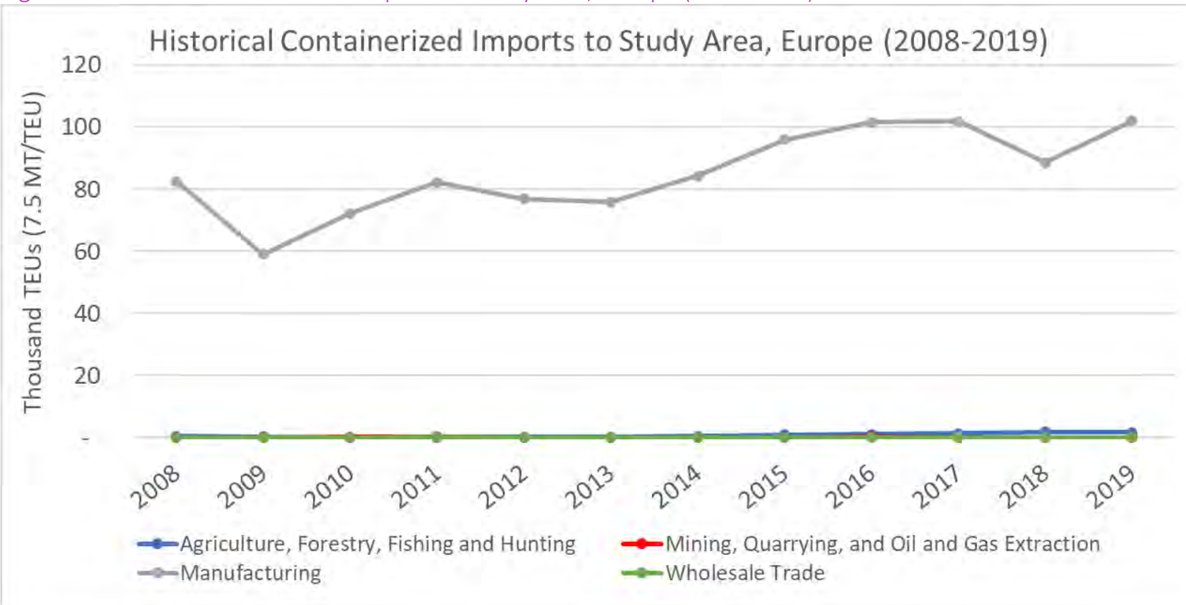


Source: U.S. Census, IMPLAN and DIS.

Figure 6 shows containerized imports to the study area from Europe from 2008-2019. Manufacturing dominates the imports to the study area from that region. Over the last five years, approximately 24%, 15%, 32% and 36% of world containerized imports to the study area of "Agriculture, Forestry, Fishing and

Hunting", "Mining, Quarrying, and Oil and Gas Extraction", "Manufacturing" and "Wholesale Trade", respectively, come from Europe. A relatively lower share of manufacturing goods coming from Europe causes trends to diverge slightly when compared to the world as previously shown in Figure 4.

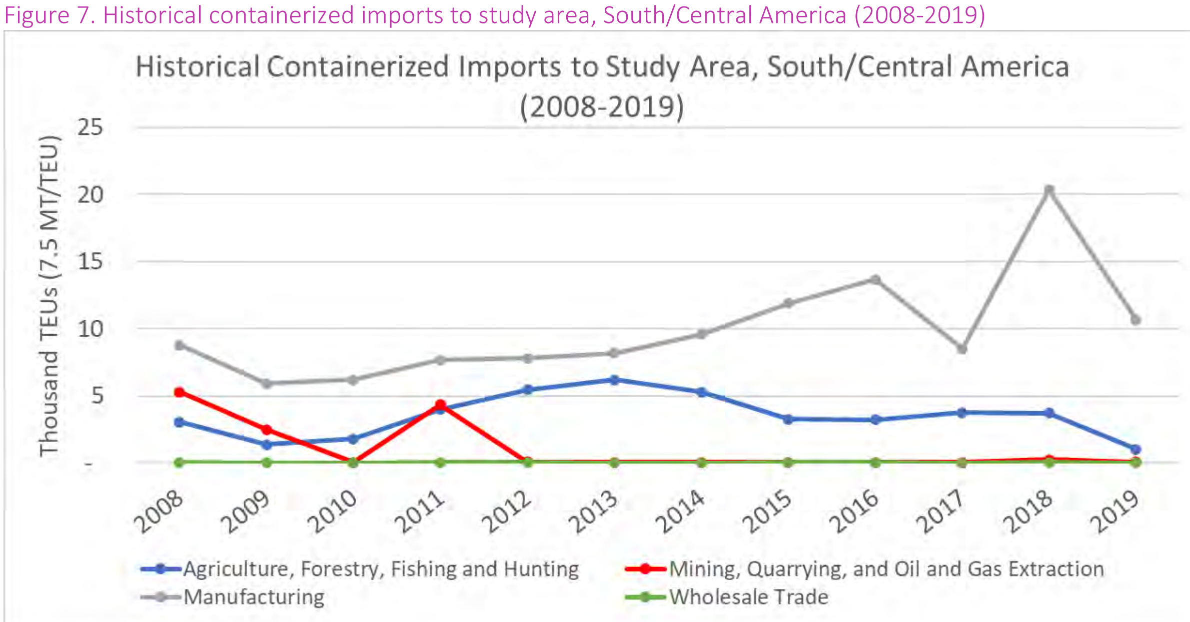
Figure 6. Historical containerized imports to study area, Europe (2008-2019)



Source: U.S. Census, IMPLAN and DIS.

Figure 7 shows containerized imports to the study area from South and Central America from 2008-2019. "Agriculture, Forestry, Fishing and Hunting" dominates the imports to the study area from that region. This is because of the interconnectedness of the two country's agricultural industries. Over the last five years, approximately 51%, 8%, 4% and 23% of world containerized imports to the study area of "Agriculture, Forestry, Fishing and Hunting", "Mining, Quarrying, and Oil and Gas Extraction", "Manufacturing" and "Wholesale Trade", respectively, come from South and Central America.

Figure 7. Historical containerized imports to study area, South/Central America (2008-2019)

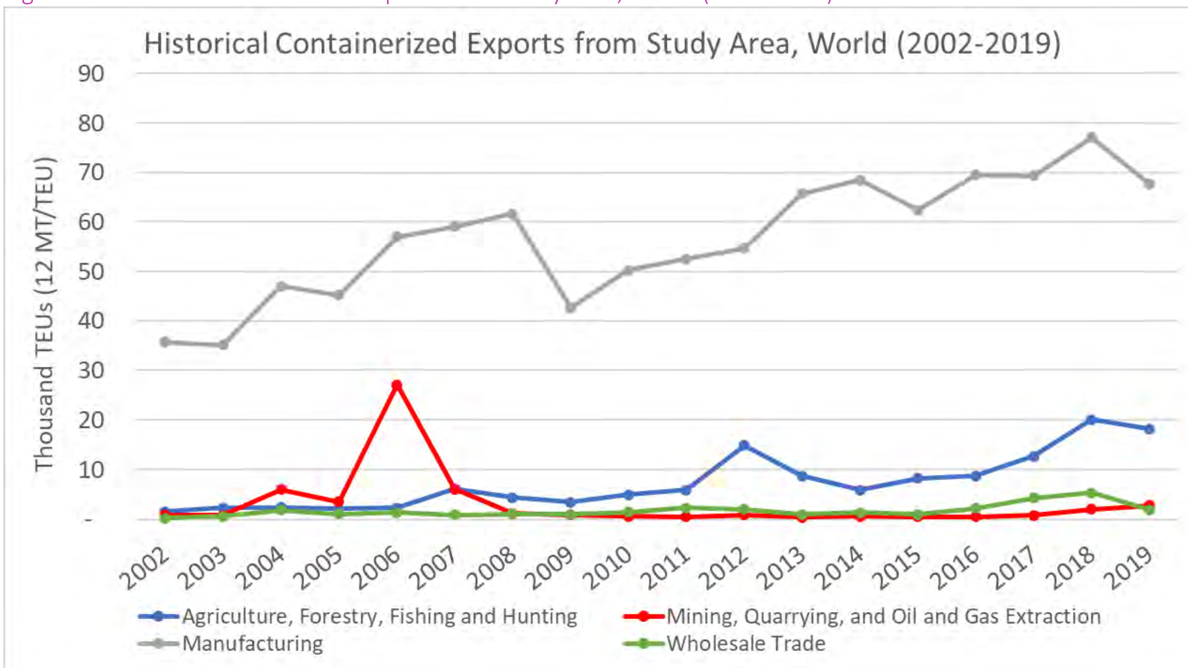


Source: U.S. Census, IMPLAN and DIS.

4.1.2 Historical containerized exports

When considering the world as the destination, containerized exports since 2002 have been dominated by "Manufacturing", recently peaking at more than 77,000 TEUs in 2018 (see Figure 8). "Agriculture, Forestry, Fishing and Hunting" has been the second most exported class of containerized exports, recently ranging between about 8,000 and 20,000 TEUs per year.

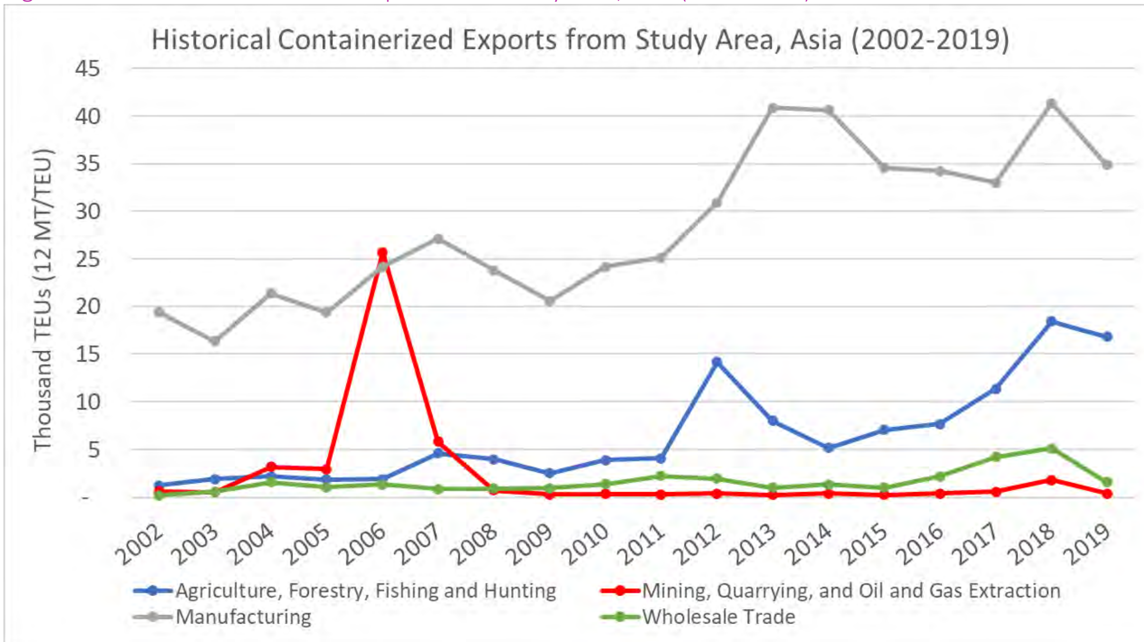
Figure 8. Historical containerized exports from study area, World (2002-2019)



Source: U.S. Census, IMPLAN and DIS.

Figure 9 shows containerized exports from the study area to Asia from 2002-2019. As shown, Manufacturing dominates the exports from the study area to that region. Over the last five years, approximately 90%, 51%, 52% and 96% of world containerized exports of "Agriculture, Forestry, Fishing and Hunting", "Mining, Quarrying, and Oil and Gas Extraction", "Manufacturing" and "Wholesale Trade", respectively, are exported from the study area to Asia. Because of the large volumes of "Manufacturing" and "Agriculture, Forestry, Fishing and Hunting" being exported to Asia, trends for these two classes of containerized exports follow the same trends as previously shown for the world in Figure 8. Total containerized exports of Agriculture, Forestry, Fishing and Hunting is about half that of Manufacturing in recent years. Total containerized exports from the study area were about 54,000 TEUs in 2019.

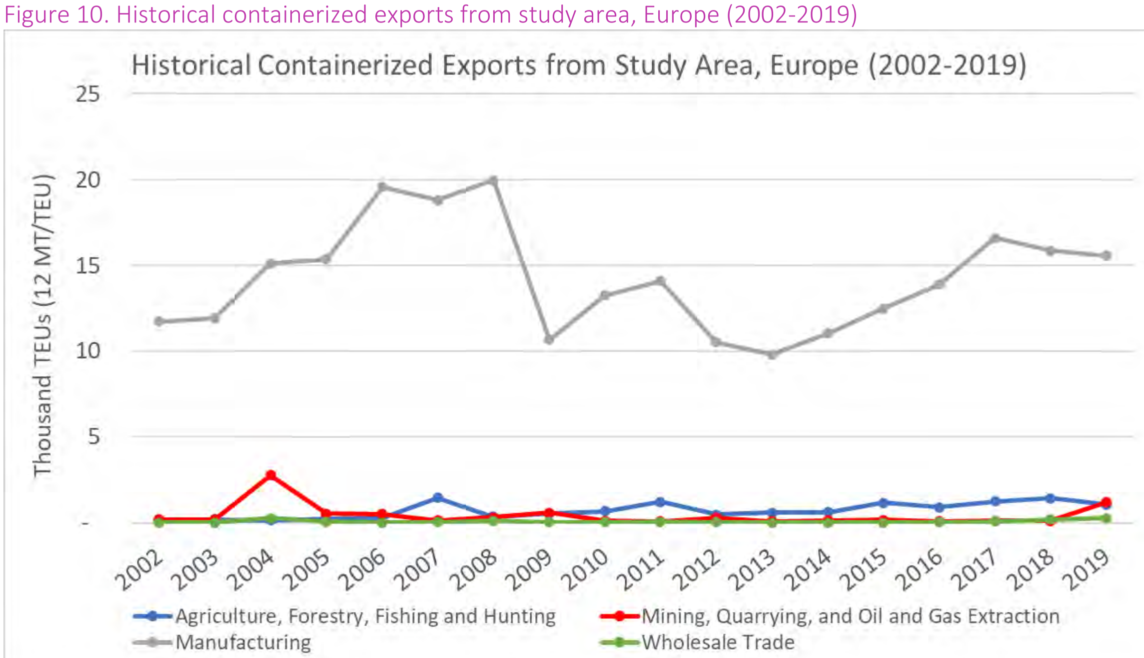
Figure 9. Historical containerized exports from study area, Asia (2002-2019)



Source: U.S. Census, IMPLAN and DIS

Figure 10 shows containerized exports from the study area to Europe from 2002-2019. As shown, Manufacturing dominates the exports from the study area to that region. Over the last five years, approximately 8%, 26%, 22% and 3% of world containerized exports of "Agriculture, Forestry, Fishing and Hunting", "Mining, Quarrying, and Oil and Gas Extraction", "Manufacturing" and "Wholesale Trade", respectively, are exported from the study area to Europe. Because of modest shares of "Manufacturing" and ""Mining, Quarrying, and Oil and Gas Extraction"" being exported to Europe, trends for these two classes of containerized exports more loosely follow the trends previously shown for the world in Figure 8. Total containerized exports from the study area were about 18,000 TEUs in 2019.

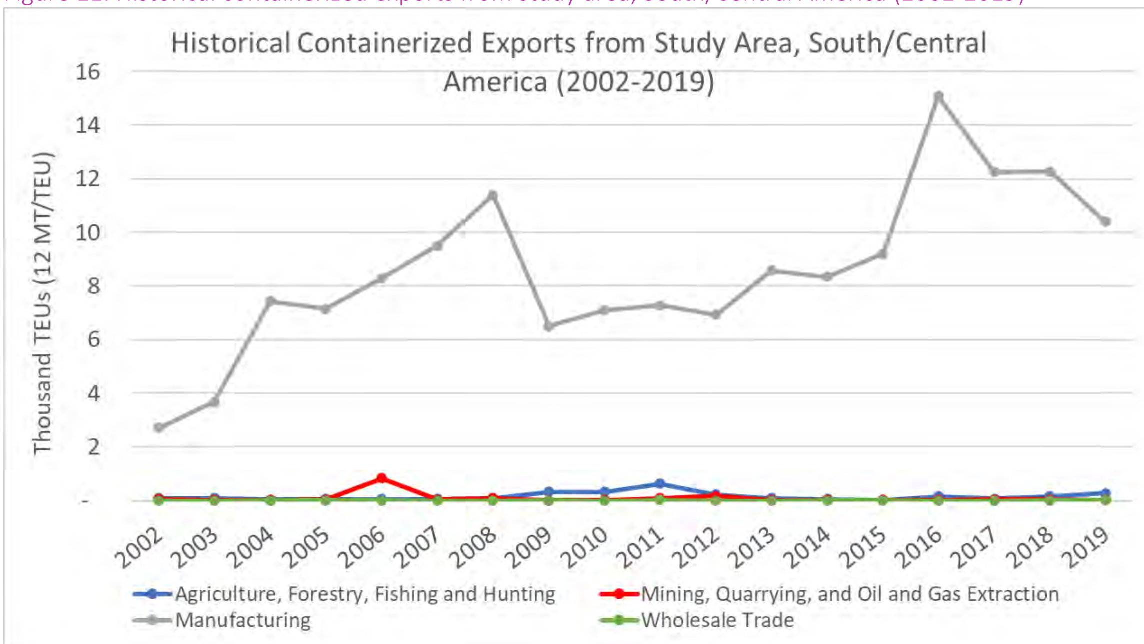
Figure 10. Historical containerized exports from study area, Europe (2002-2019)



Source: U.S. Census, IMPLAN and DIS.

Figure 11 shows containerized exports from the study area to South and Central America from 2002-2019. As shown, Manufacturing dominates the exports from the study area to that region. Over the last five years, approximately 1%, 2%, 17% and 0.2% of world containerized exports of “Agriculture, Forestry, Fishing and Hunting”, “Mining, Quarrying, and Oil and Gas Extraction”, “Manufacturing” and “Wholesale Trade”, respectively, are exported from the study area to Europe. Because of modest shares of “Manufacturing” being exported to Europe, trends for this class of containerized exports more loosely follow the trends shown for the world in Figure 8. Total containerized exports from the study area were about 11,000 TEUs in 2019.

Figure 11. Historical containerized exports from study area, South/Central America (2002-2019)



Source: U.S. Census, IMPLAN and DIS.

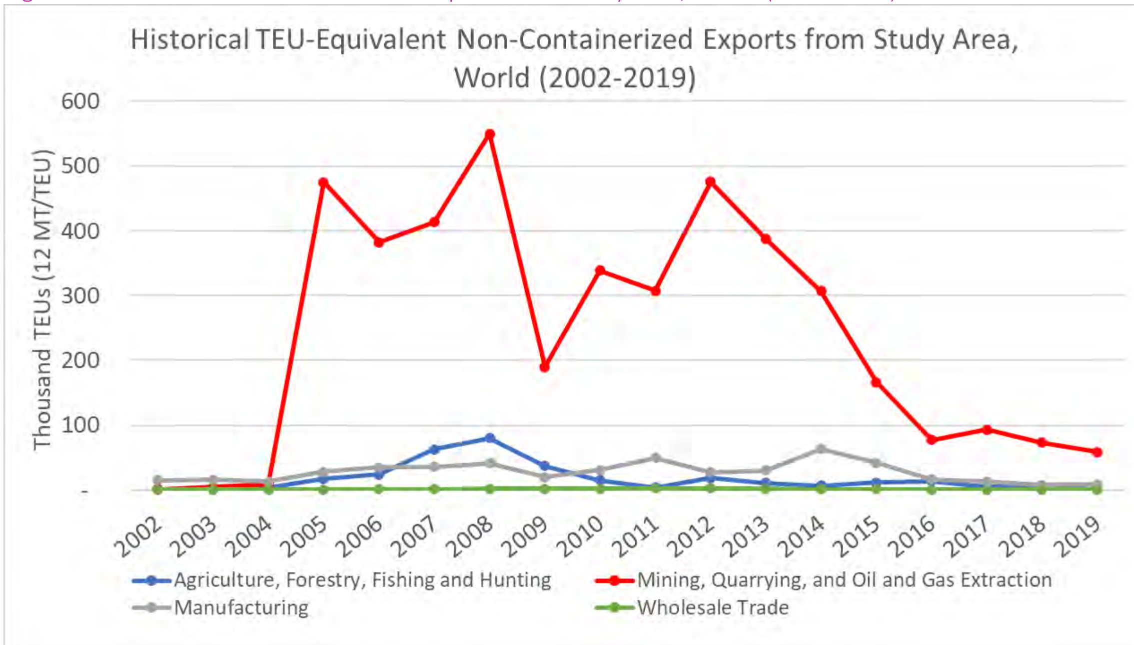
4.1.3 Historical non-containerized exports

Using the same data source for non-containerized exports as for containerized imports and exports (U.S. Census and IMPLAN), we express data here as if it were to have been exported in containers. While conversion of bulk to container for all commodities currently shipped in bulk is unlikely to happen (even if the ability to load bulk commodities at ASB is offered), we do so to allow comparison of data for all cargo entering or leaving the study area.

When considering the world as the destination, non-containerized exports since 2002 have been dominated by “Mining, Quarrying, and Oil and Gas Extraction”, peaking at about 550,000 TEUs in 2008 (see Figure 12). Given the nature of study area being primarily agricultural in nature, one would have expected “Agriculture, Forestry, Fishing and Hunting” to have been higher. Because the U.S. Census classifies shipments as being from the international port from which it was inspected, most grains produced in Missouri destined for international export is not “officially” credited to Missouri, but instead goes to Louisiana since that is where most oceangoing vessels carrying Missouri grain leave from. The same could be said for any Missouri grain leaving by rail through the Pacific Northwest.

Because ASB currently is a large bulk commodity shipper (and receiver) they know, for their draw area, how much grain leaves the immediate study area (more specifically Priority Area 1) for international destinations. These historical bulk commodity estimates can be seen later in this section and in Figure 17.

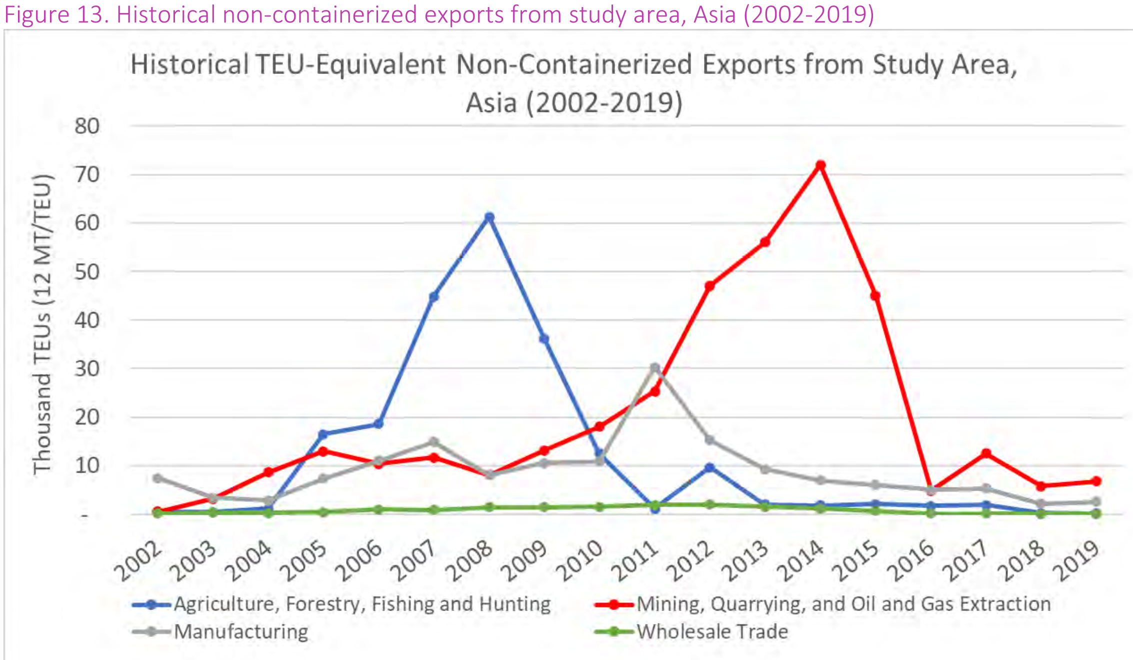
Figure 12. Historical non-containerized exports from study area, World (2002-2019)



Source: U.S. Census, IMPLAN and DIS

Since 2002, non-containerized shipments from the study area to Asia have varied among the four broad categories of trade. Most recently, "Mining, Quarrying, and Oil and Gas Extraction" has been the largest class of non-containerized cargo to leave the study area. As shown in Figure 13, the most recent peak for this class of cargo was in 2014 when it was approximately 72,000 TEUs. Since then, however, exports of all non-containerized bulk commodities have fallen to a total of about 9,500 TEUs in 2019. Over the last five years, approximately 17%, 16%, 25% and 99% of world non-containerized exports of "Agriculture, Forestry, Fishing and Hunting", "Mining, Quarrying, and Oil and Gas Extraction", "Manufacturing" and "Wholesale Trade", respectively, are exported from the study area to Asia.

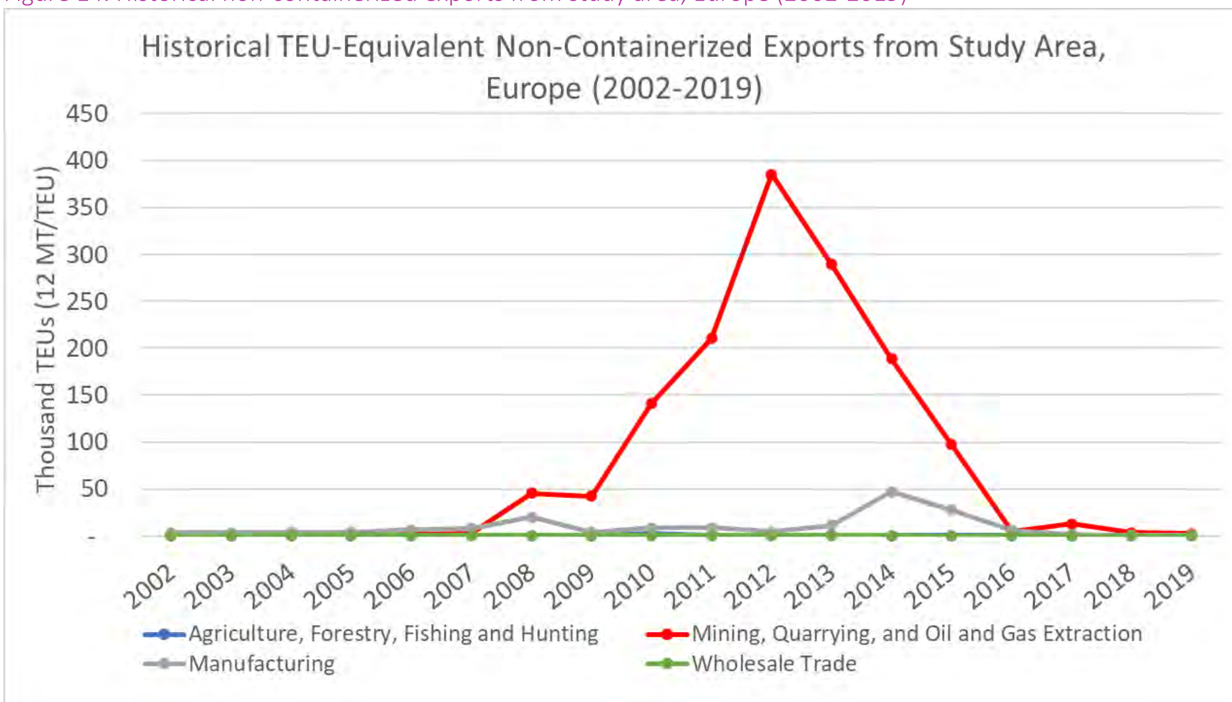
Figure 13. Historical non-containerized exports from study area, Asia (2002-2019)



Source: U.S. Census, IMPLAN and DIS

Since 2002, non-containerized shipments from the study area to Europe have varied among the four broad categories of trade. Most recently, "Mining, Quarrying, and Oil and Gas Extraction" has been the largest class of non-containerized cargo to leave the study area. As shown in Figure 14, the most recent peak for this class of cargo was in 2012 when it was more than 385,000 TEUs. Since then, however, exports of all non-containerized bulk commodities from the study area have fallen to a total of just 3,100 TEUs in 2019. Over the last five years, approximately 2%, 26%, 42% and 0.2% of world non-containerized exports of "Agriculture, Forestry, Fishing and Hunting", "Mining, Quarrying, and Oil and Gas Extraction", "Manufacturing" and "Wholesale Trade", respectively, are exported from the study area to Europe.

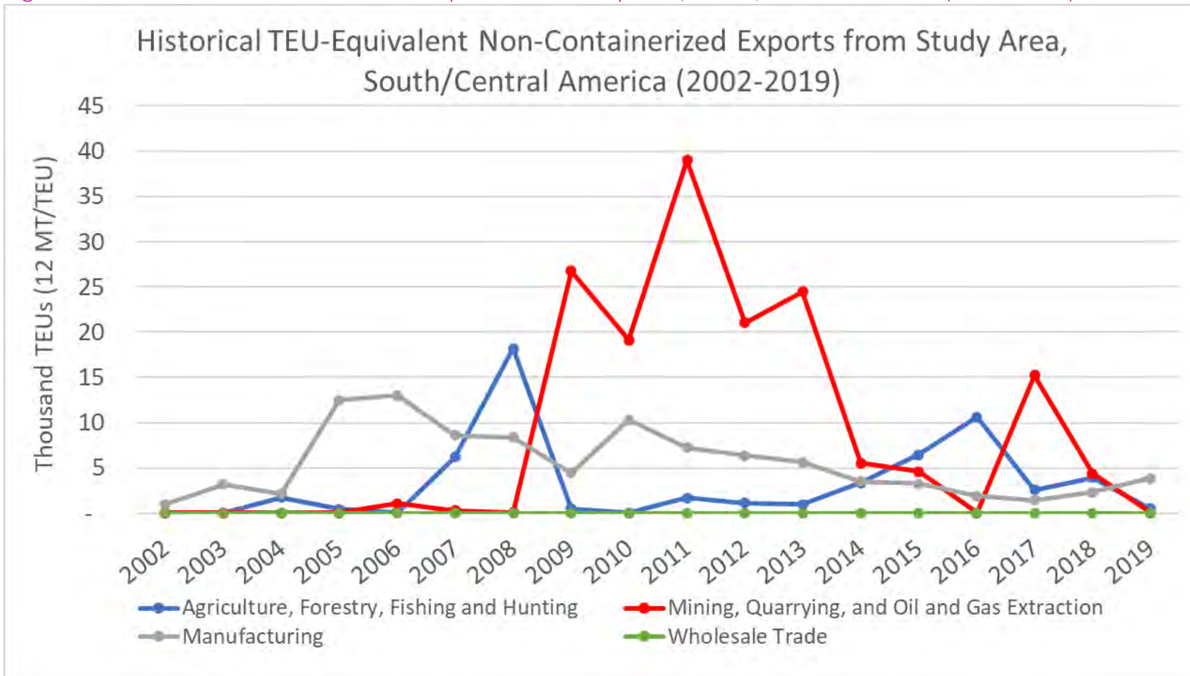
Figure 14. Historical non-containerized exports from study area, Europe (2002-2019)



Source: U.S. Census, IMPLAN and DIS

Since 2002, non-containerized shipments from the study area to South and Central America have varied among the four broad categories of trade (see Figure 15). Between 2009 and 2013, exports of non-containerized "Mining, Quarrying, and Oil and Gas Extraction" was quite significant, ranging from 19,000 to 39,000 TEUs. Most recently, however, exports of all non-containerized bulk commodities from the study area have fallen to a total of just 4,400 TEUs in 2019. Over the last five years, approximately 67%, 5% and 15% of world non-containerized exports of "Agriculture, Forestry, Fishing and Hunting", "Mining, Quarrying, and Oil and Gas Extraction" and "Manufacturing", respectively, are exported from the study area to South and Central America.

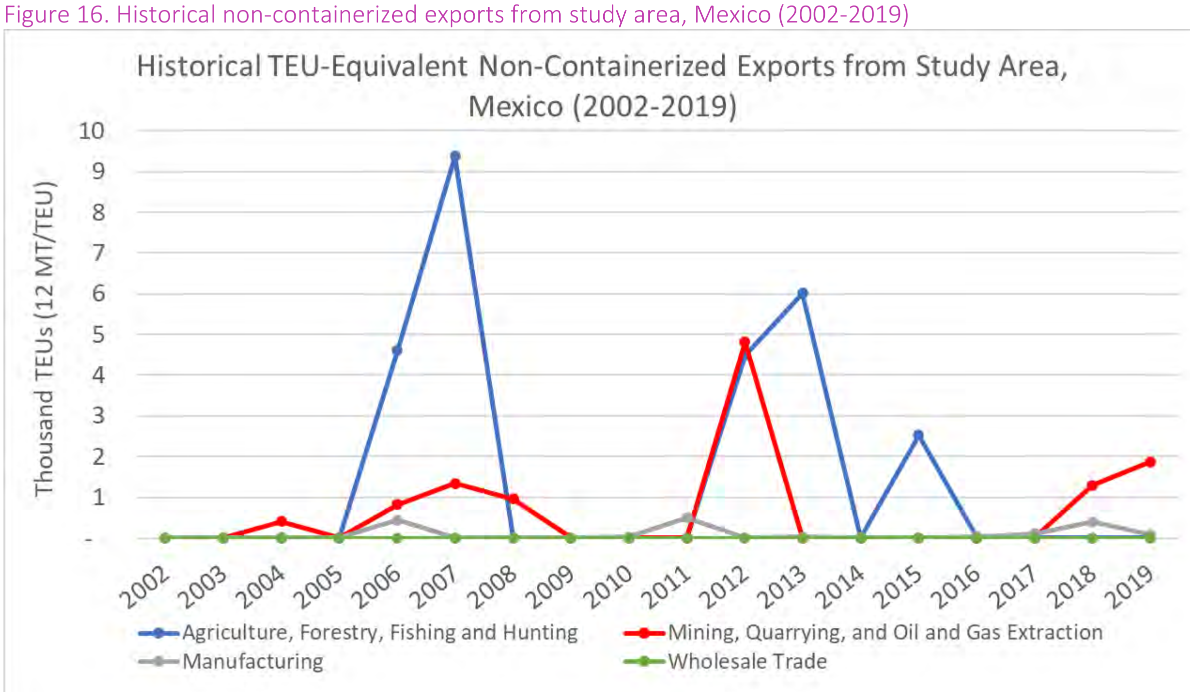
Figure 15. Historical non-containerized exports from study area, South/Central America (2002-2019)



Source: U.S. Census, IMPLAN and DIS.

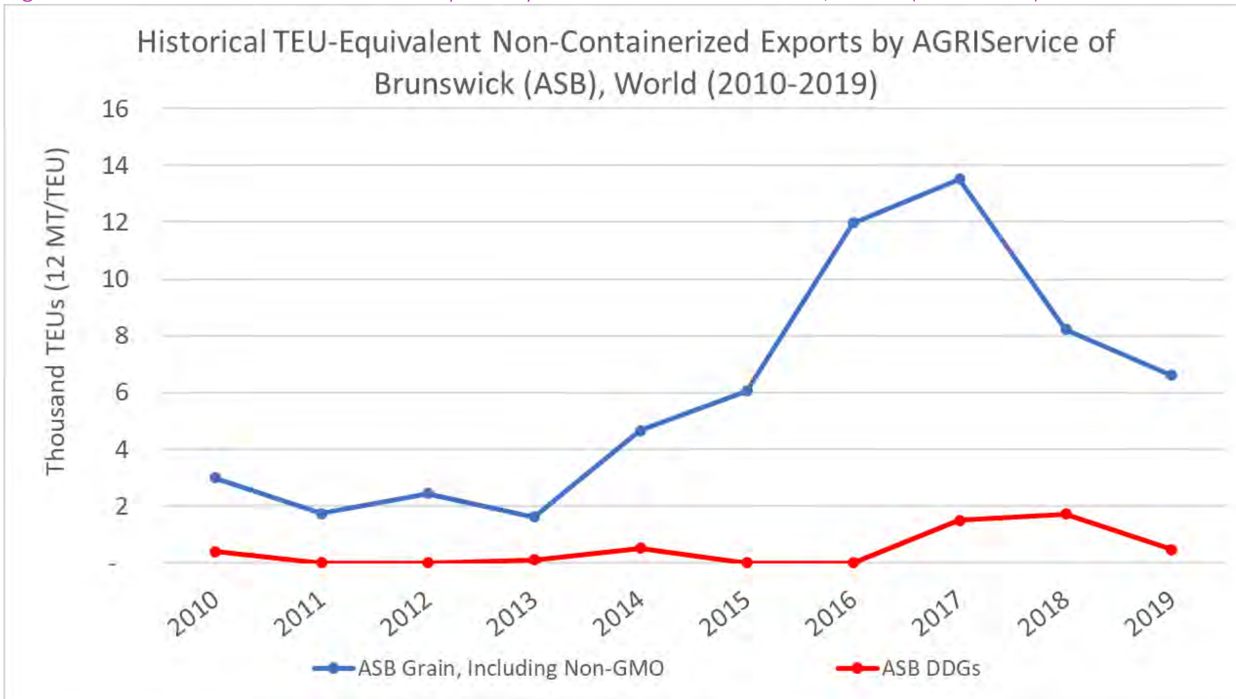
Since 2002, non-containerized shipments from the study area to Mexico have varied among the four broad categories of trade (see Figure 15). Most recently, exports of all non-containerized bulk commodities from the study area are at nearly 2,000 TEUs in 2019. Over the last five years, approximately 7%, 1%, 1% and 0.2% of world non-containerized exports of "Agriculture, Forestry, Fishing and Hunting", "Mining, Quarrying, and Oil and Gas Extraction", "Manufacturing" and "Wholesale Trade", respectively, are exported from the study area to Mexico.

Figure 16. Historical non-containerized exports from study area, Mexico (2002-2019)



Source: U.S. Census, IMPLAN and DIS.

Figure 17. Historical non-containerized exports by AGRIServices of Brunswick, World (2010-2019)



Source: AGRIServces of Brunswick and DIS.

4.2 Visual depiction of freight generators and attractors

Having presented historical context related to containerized imports and exports and non-containerized exports in *Section 4.1*, DIS conducted geospatial analyses to identify the location of key freight generators and attractors for the study area. These include, among the most relevant, commercial grain storage sites, renewable fuels production plants, local livestock and poultry production sites and distribution centers. To present this a variety of tools and methods have been utilized.

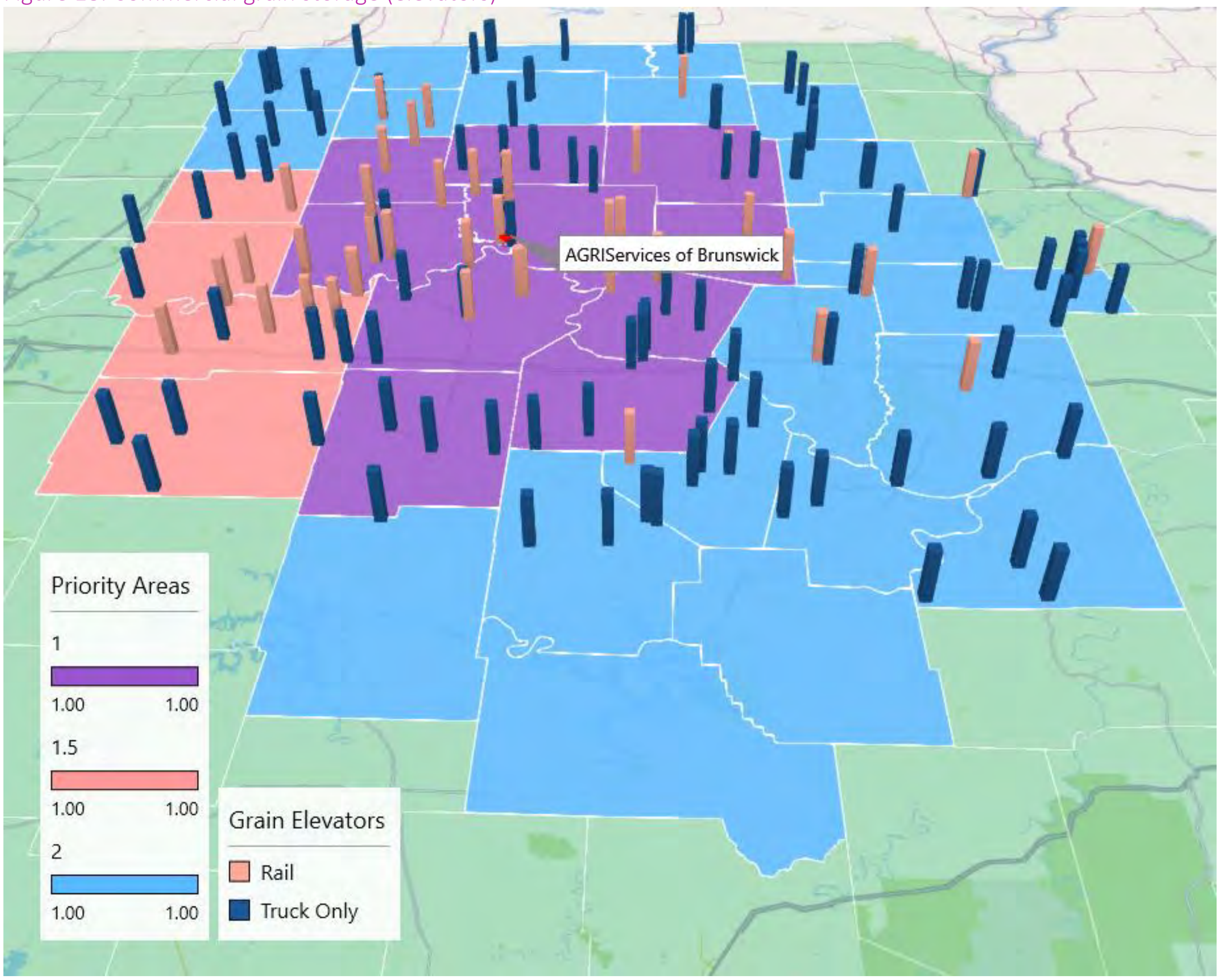
4.2.1 Commercial grain storage and renewable fuels sites

In combination with the relevant transportation infrastructure and equipment, the location of grain elevators is important for farmers getting the grain to the elevator and unloading it in a timely manner during harvest season. As observed in Figure 18, there are an estimated 152 grain elevators in the study area. Of these, 42 have access to "rail only". As shown, the availability of barge-rail intermodal connections is extremely limited in the study area. However, upriver (and out of the study area) in Blencoe, IA, Western Iowa Co-op recently completed work to enable barge loading there. There is also the ability to load barges in St. Joseph, MO, also out of the study area.

While there is currently limited availability of barge-rail intermodal connections in the study area, assuming logistics and economics warrant it, the presence of this capability, along with the ability to load containers, in Brunswick may change the flow of grain in the study area to the point that bulk commodities currently on truck or rail could be loaded into containers at ASB.

In our research for this report, opportunities for containerizing organic and/or non-genetically modified commodities exist. For example, Premium Ag Products Co-op in Clarence, MO (Shelby County) currently ships two to four 40' food grade containers containing food grade milo and soybeans per month (primarily to Japan and Korea). They currently locate them from multiple sources in Kansas City, MO. The containers are currently trucked up from Kansas City, loaded on site and then trucked back to Kansas City. This company has expressed interest in a COB service at ASB.

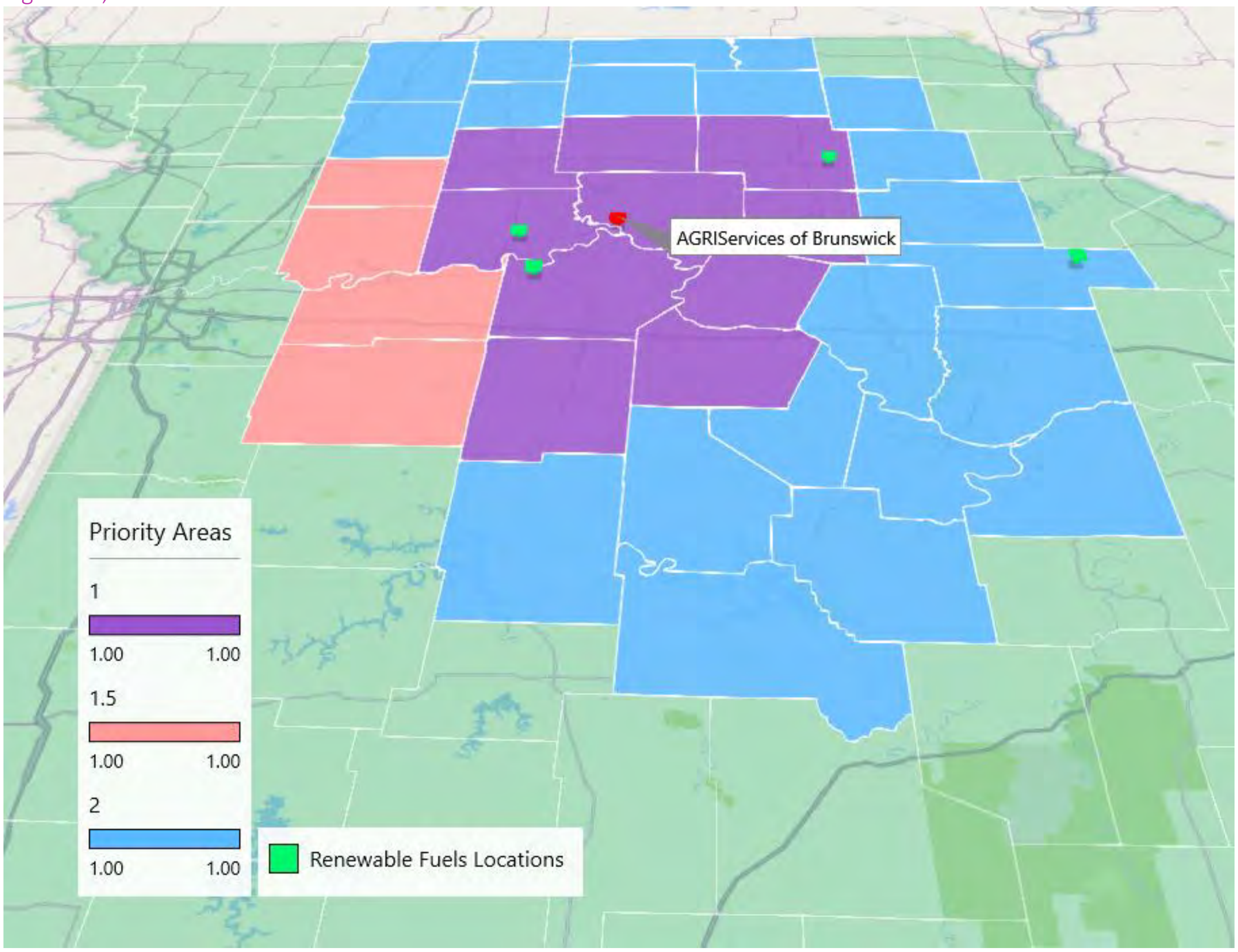
Figure 18. Commercial grain storage (elevators)



Source: DIS.

Missouri currently has ethanol production plants in four counties in the study area: Audrain, Carroll, Macon and Saline. Combined, these plants use approximately 82.5 million bushels (2.1 million MT) of corn annually and produce approximately 231 million gallons of ethanol and 636,000 MT of dried distillers' grains (DDG). Figure 19 shows the locations of the three counties with the ethanol plants.

Figure 19, Renewable Fuels Locations



Source: DIS.

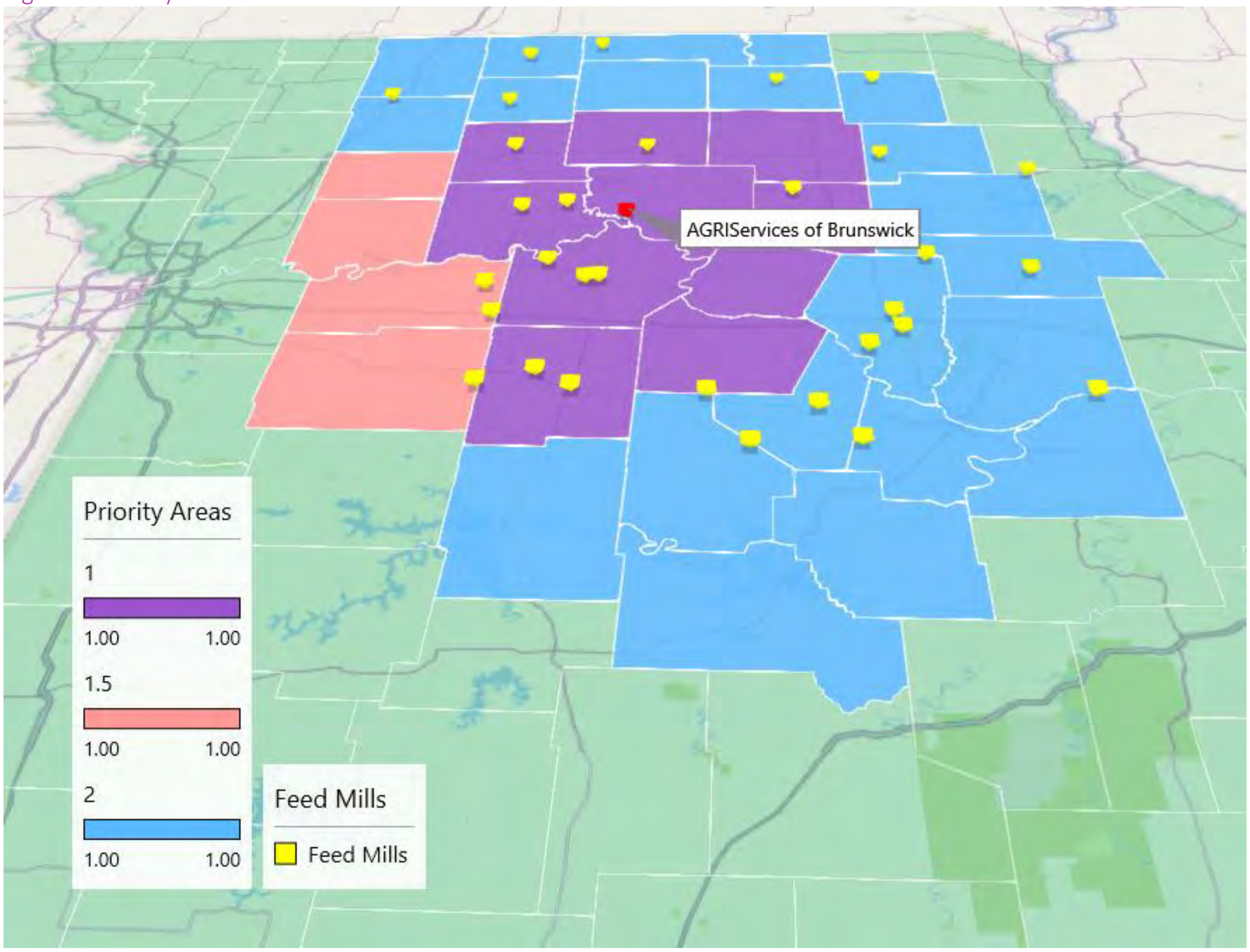
4.2.2 Local livestock and poultry production sites

Feed demand is spread across every county in Missouri, although there are some high-use areas where there is an increased concentration of livestock and poultry production. Corn is the primary feed grain and is supplemented by soybean meal as the primary protein feed. Corn is converted to feed in both commercial feed mills and on-farm processing.

Figure 20 shows where feed mills in the study area are located. The location of feed mills is used as a proxy for livestock and poultry for two reason: 1) some larger feed mills will import vitamins and minerals and 2) consumption of corn and soybeans by livestock is drawn from bulk commodities that could otherwise be candidates for export.

Larger feed mills are more likely to import vitamin and minerals, many of which come from China. Depending on source, recent biosecurity protocols due to African Swine Fever (ASF) being present in China requires vitamin/minerals to be stored for approximately one year prior to use. This means that those feed mills importing vitamins and minerals from places where ASF is a concern would need to import larger quantities for storing while the pathogen viability period expires. Vitamins and minerals are quite likely to be imported in containers.

Figure 20. Study area feed mill locations



Source: DIS.

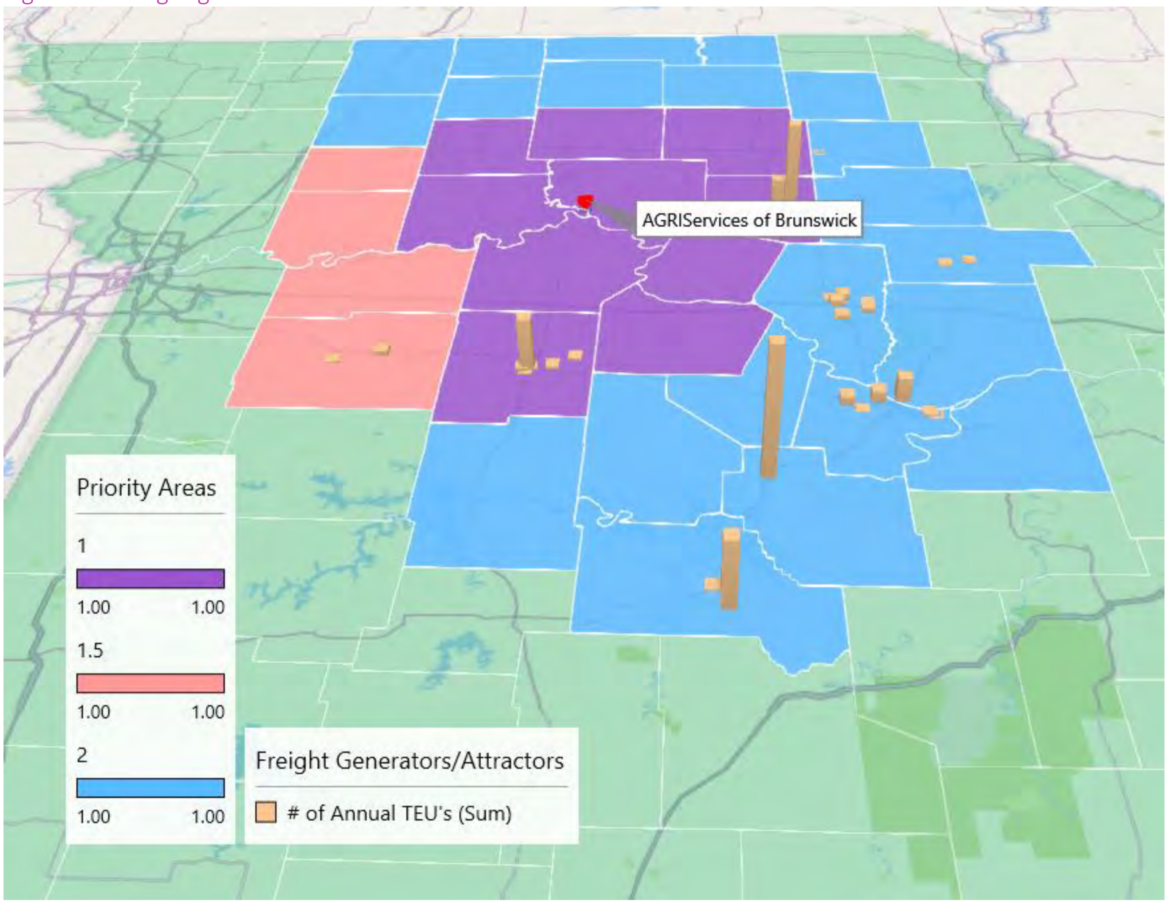
4.2.3 Distribution centers

To estimate the freight generators and attractors for the study area a few approaches were taken. These were:

- Industry outreach
- Visual inspection of aerial (i.e., Google) images
- State level public international trade data (U.S. Census (i.e. USA Trade) data), brought down to the county level (and subsequently back up to priority/study areas) using the IMPLAN modeling system.
  - See *Sections 5.5, 5.6* and *5.7*
- Use of Datamyne data

Using all the above approaches we have identified approximately 37 locations most likely to be importing and/or exporting shipping containers; Figure 21 first shows their location and second, using the Datamyne data, quantities were able to be determined for imported TEUs by company. Some exporting companies shared TEU quantities with the team, but the coverage was not as complete as it was for imports; these results can be found in *Section 4.3*.

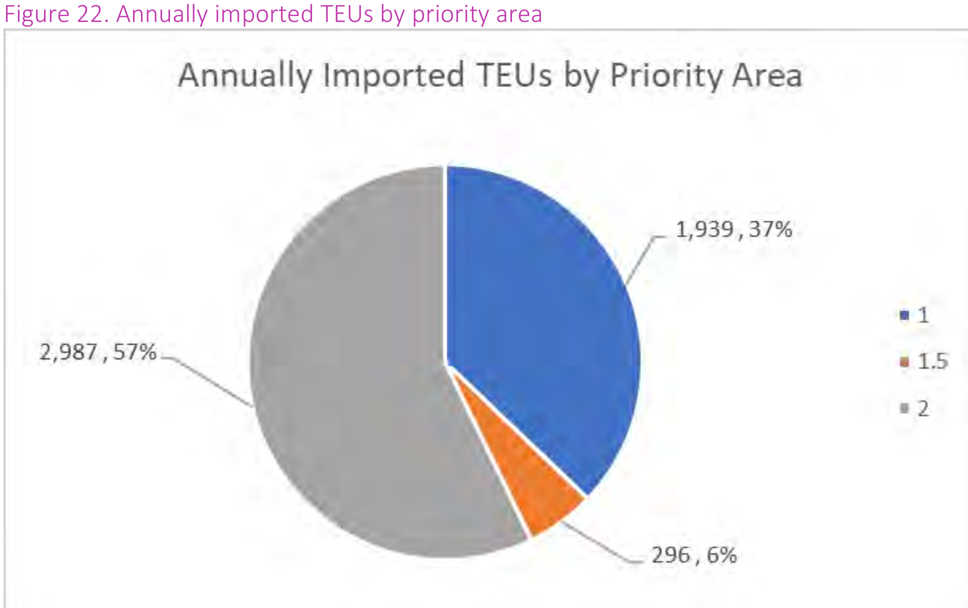
Figure 21. Freight generators and attractors



Source: DIS.

Figure 22 shows the estimated number of imported TEUs (on an annual basis) to the study area by priority area. As shown, a total 5,222 TEUs are estimated to come into the study area. The bulk (2,987, 57%) of these TEUs were to Priority Area 2, 37% (1,939) to Priority Area 1 and 6% (296) to Priority Area 1.5.

Figure 22. Annually imported TEUs by priority area



4.3 Industry outreach

The initial research component of the market study (i.e. a set of questions in a survey) was sent to businesses in the study area. Data was collected about the content and volume of the inbound and outbound shipments, the transportation mode utilized for inbound and outbound shipments, routing determinations, the location for receiving or tendering shipments, and whether a COB facility at ASB would save shipping costs.[10]

4.3.1 Survey methodology

A list of businesses within the study area with industry classifications[11] indicating a likelihood that they would ship or receive cargo was initially created by DIS. Thereafter, Klingner added to the list of target businesses, mainly by its familiarity with businesses in the study area and referrals by other businesses targeted. Mercator added to the list of businesses to be evaluated and utilized Google Earth mapping and images and other criteria to determine the capability of businesses to ship and receive international shipping containers. Ultimately, DIS, Klingner, and Mercator, filtered the list by geographic location and perceived containerized shipping capabilities. The final list contained 53 businesses.

The survey process involved personal contact with an onsite visit or telephone call requesting participation and the completion of an online survey. For companies that could not be reached, a survey was sent through the U.S. Postal Service. Additionally, a follow-up letter was sent to all companies that did not respond to the first survey. Most companies responding to the survey elected to do so online due to limitations for onsite visits resulting from the coronavirus. Thus far, the online survey produced a 32% response rate. Some companies did not want to participate in the survey, but nonetheless did provide information about their utilization of containerized shipping. If those companies are included, a 38% response rate was achieved.

With geographic and industrial scope determined, a series of questions was asked through a survey of potential users of COB. These questions and answers inform Phase 2 of the project. A significant portion of the data for this phase was gathered through direct contacts and the completion of online surveys (primary research) with producers, manufacturers, and businesses of exporting and incoming commodities, manufactured goods, and raw materials.

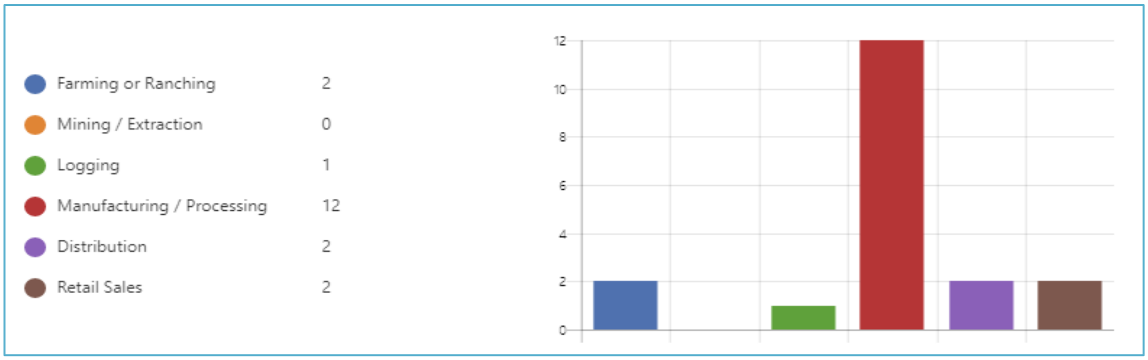
4.3.2 Market survey and interviews with potential users—key findings

Description of responding business types

The survey included six choices for business types: Farming or Ranching, Mining / Extraction, Logging, Manufacturing / Processing, Distribution, and Retail Sales. Participants that completed the survey ranged from chief executive officers, vice-presidents, senior merchandisers, operations managers, sales and logistics managers to facilities managers. The responses by business type are shown in Figure 23.

[10] A copy of the survey instrument utilized with the questions was provided to ASB and can be provided upon request.
[11] Classifications were based on the NAICS (North American Industry Classification System) codes associated with each business.

Figure 23 Business type description



Source: Survey Results.

Respondents were asked to provide a description of the principal products produced, processed or handled. This question helps the research team in determining the type of commodities or products produced or consumed in the study area that may be candidates for COB shipments.

- Automobile & Diesel Components
- Timber Products
- Rubber Goods
- Building Supplies,
- Farm & Home Merchandise
- Industrial Fans
- Food Service Equipment
- Dried Distillers Grain, Ethanol
- Hot Dogs

International and domestic shipping

Survey participants were asked whether their business imports or exports international cargo. Businesses that export only need to find containers. Those that import only need to dispose of containers. A business that imports and exports may be able to balance the utilization of containers.

The number of respondents indicating they import and/or export internationally is shown in Table 3. Over half of the survey respondents indicated handling international shipments or receipts. Eight companies are currently using containers and seven indicated an interest in container on barge shipments.

Table 3 Import/Export summary

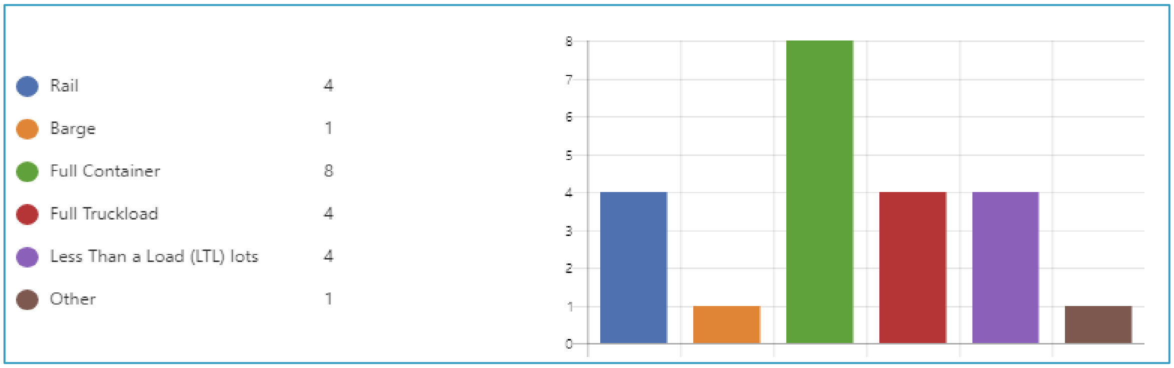
Industry Type	Import/Export	Import Only	Export Only	Uses Containers	COB Interest
Manufacturing / Processing	3	2	2	4	3
Farming or Ranching			2	2	2
Retail Sales	2			1	1
Distribution		1		1	1
Totals	5	3	4	8	7

Source: Results from survey by DIS and Klingner.

Modes of shipping

Respondents were allowed to choose multiple modes of transportation for their international exports and imports shipments. As shown in Figure 24 below, Full Container, Rail and Full Truck Load are the most frequently used modes of shipping. In all cases, the full containers imported come into the area via transload facilities in or near Kansas City by rail and then trucked directly to the business or separate unloading area. Exports by container are currently trucked to a transload facility and then moved by rail.

Figure 24 Mode of international shipments

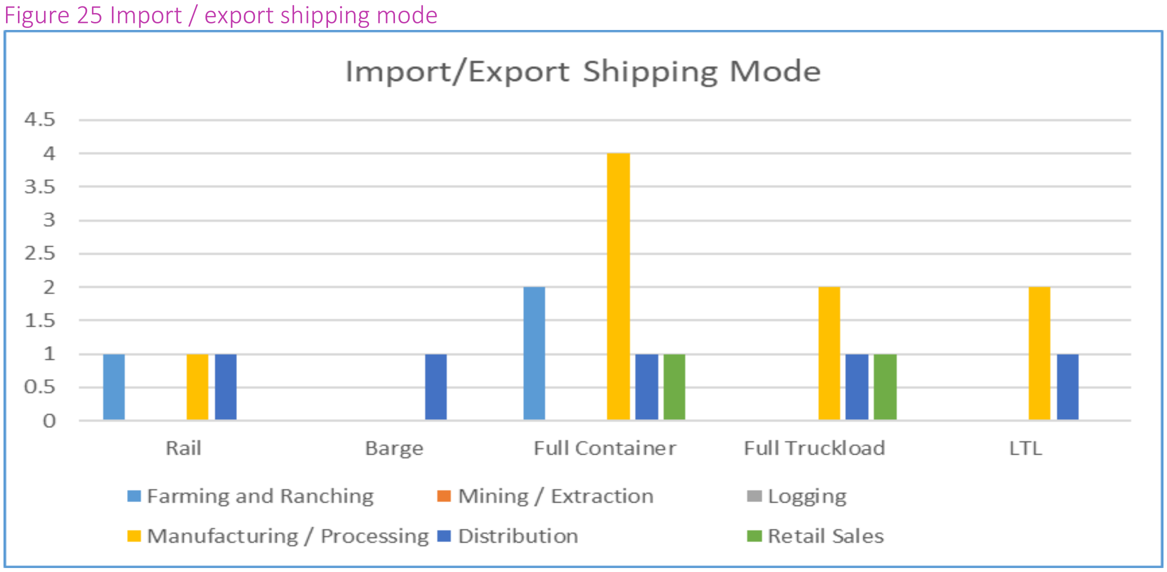


Source: Survey Results.

The distribution of shipping modes for imports and exports by business type are shown in Figure 25. Four of the business types use Full Containers for shipping and/or receiving. The Manufacturing / Processing business type produced the most responses, transporting various goods such as food service equipment, DDGs, oils, sorghum, industrial fans, identity preserved grain production and storage, farm goods, agriculture, hardware, clothing, and manufacturing products.

Business types that specified shipments through rail, described their shipments as DDGS products, automotive products, farm goods, agriculture, hardware, clothing, and manufacturing products. The distribution company that transports goods through barge specified farm goods, agriculture, hardware, clothing, and manufacturing products. Business types that transfer goods in truck transportation specified products such as doors, door jambs, mouldings, windows, cabinets, rubber, diesel truck parts for sales or repair, industrial fans, farm goods, agriculture, hardware, clothing, manufacturing projects, ethanol, and oils.

Figure 25 Import / export shipping mode



Source: Survey Results.

From responses received on international shipment origins of receipt, mentioned specifically were Japan, Australia, and China.

Shipping volumes

Significant domestic shipment volumes were indicated by industries of distribution, farming or ranching, manufacturing / processing, and retail sales participants. These shipment volumes included a variety of products or commodities that include doors, cabinets, DDG's, corn, shipping identity preserved grain, white or red milo, soybeans, sorghum, aluminum industrial fans, hot dogs, meats, ethanol and oils, food service equipment, polymers and chemicals.

Respondents reporting domestic shipment volumes; listed origins of shipment and receipt all across the United States. Specifically mentioned by one respondent were Texas, Oklahoma, Louisiana, Florida, California, and Illinois.

Reported volumes of shipments and receipt

Survey respondents were asked to provide annual volume and destination or origin of shipments and receipts. Of the respondents that answered this question, most provided annual volumes. The responses for Ethanol were consistent with units of measure. The nature of the other categories implied a variety of units of measure. The data from the responses was used in conjunction with other industry sources to estimate the potential use of a COB facility at ASB. The estimates on annual shipments and destination or origin reported in the survey are documented in Table 4.

Table 4. Reported volumes

Business Type	Responses	Volume	Destination or Origin
Farming or Ranching	1	960,000 tons/annually	Worldwide (Export)
Farming or Ranching	1	36-Containers Annually	Japan, Korea
Manufacturing/Processing	13	10,036 Containers/annually	Worldwide (Export)
Retail Sales	2	Unknown	Worldwide (Import/Export)
Distribution	2	4 Containers/annually	Worldwide (Export)
Logging	1	Unknown	domestic
Mining/Extraction	0	n/a	n/a

Source: DIS and Klingner & Associates.

Commodities & goods receipt and shipping procedures

If moving products, commodities, and goods by way of container, survey participants were asked if containers were stuffed or stripped at their facilities or elsewhere. This information assists the team in determining if containers needed for exporting might be available within the study area. Over half of the respondents using containers responded that stuffing and/or stripping was completed at their facility - Table 5. Those industries that said "other" stated it was handled by vendors at other locations.

Table 5 Container handling

Location	Stuffed/ stripped	Distribution center/ Transload facility
At Facility	7	4
Transload	2	1
Elsewhere	3	

The respondent with the highest volume indicated their containers were stuffed at a transload site. This respondent expressed interest in a COB service becoming available.

4.3.3 Industries with higher potential to generate traffic for the port

Most responses came from a broad range of manufacturing business types. Agriculture responded positively for a need for containerized shipping for corn, soybeans, red and white sorghum and Identity Preserved Grains. The Logging interview revealed that containerized shipping is needed for some products (walnut), but buyers typically come to the business and truck products directly to their chosen destination.

In general, eight businesses that ship and receive international shipments, in business categories of manufacturing / processing, distribution companies, farming or ranching industries and retail sales, all indicated COB service would probably be worthwhile for them, if a cost saving could be achieved. In addition, seven other companies from similar business categories stated they were unsure at this time. Results have proven a very encouraging sign for a COB facility at ASB.

Current and prospective users of containerized shipments will continue to be challenged in balancing the disposal of unneeded empty containers from receipts and locating empty containers, when needed, for shipments. Most businesses contacted that are currently receiving and shipping containers are trucking them to and from a transloading facility. The introduction of a container on barge service will likely face resistance from current systems, primarily rail, to alternative movements of full and empty containers. It may be necessary to establish alternative distribution facilities to assist in diverting container flows from the railroads.

4.4 Supplemental research to validate Datamyne import data

In order confirm the Datamyne data was an accurate representation of containerized imports into the study area, a sample set of 26 businesses listed in the Datamyne data were selected for validation contacts. These businesses had relatively high volumes of TEU's.

The businesses contacted were asked to verify the Datamyne import data and indicate the location where incoming containers were emptied. They were also asked if their business exported by container as well and, if so, where those containers were filled. Multiple attempts were made to contact each of the 26 businesses and 10 businesses were contacted. A summary of the results is shown in Table 6.

Table 6 Container Import Data Validation

Businesses Responding	Refused Verification	Verfied Volume	Modified Volume	Unloaded on Site	Exports by Container
10	3	5	2	7	5

Of the 10 businesses contacted, 3 refused to discuss their shipments. The rest of the businesses contacted were very cooperative. The TEU count was confirmed by 4 businesses and 3 modified the reported count.

All 7 of the businesses who confirmed they import by container said their containers are trucked in and unloaded on site (one in a separate facility across the street). Of the 7 businesses who import, 5 indicated they also export by container and the containers are filled on site and then trucked to Kansas City or St. Louis.

Based on the sample set contacted, the Datamyne data appears to be an accurate representation of the volume of imports received by container into the study area. It is also encouraging to find a high percentage of those cooperating importers also export by container. This indicates a potential for routing incoming containers via COB and then trucking to the business site and possibly filling some of the incoming containers for exports out of the area.

5. Route economics and key target markets

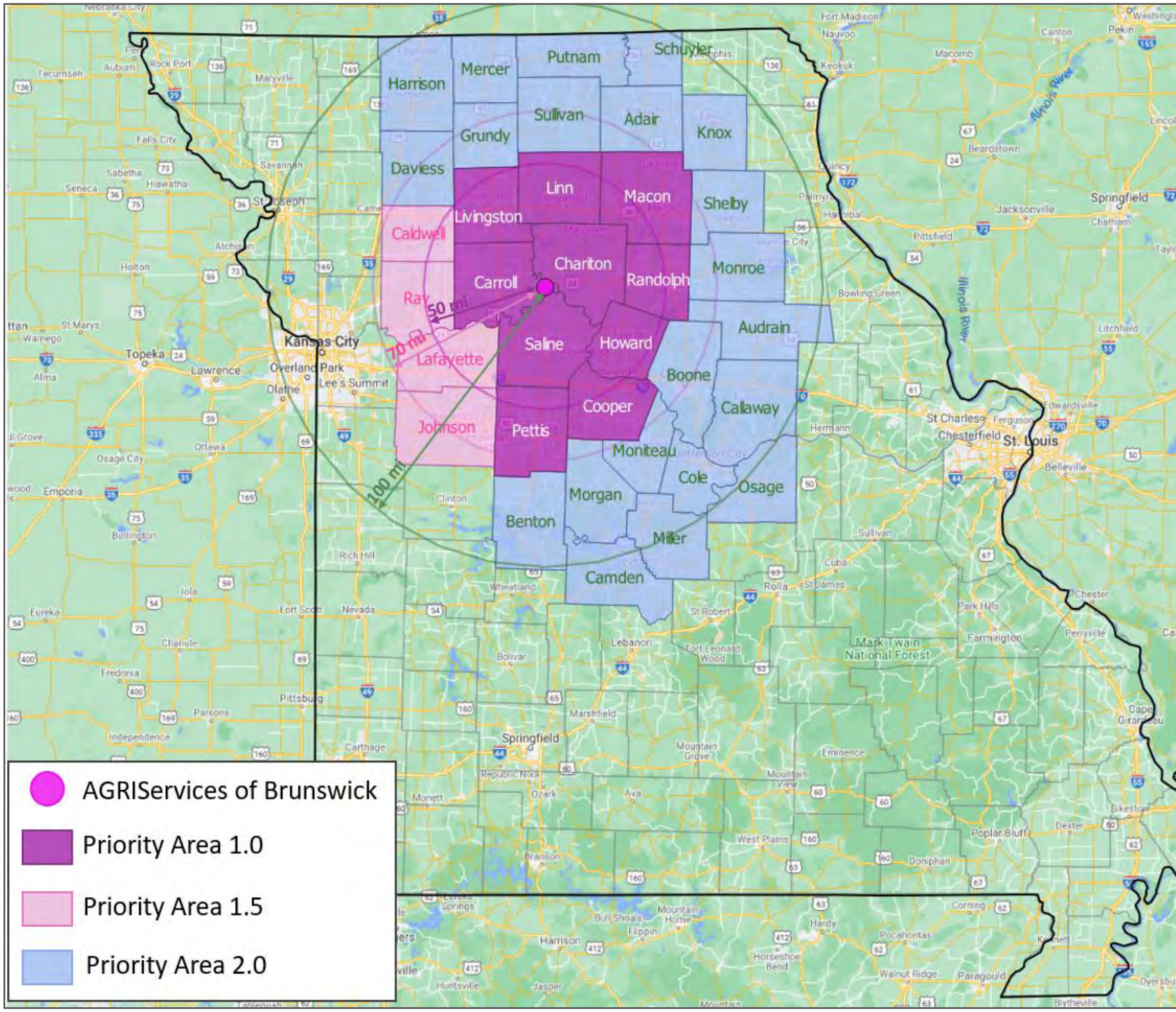
This section presents an analysis of the logistic routes serving the main target markets of the ASB Project and compare the costs for key incumbent routes against new alternate routes, which would substitute barge shipping to a USGC ocean port in place of rail shipping to U.S. west or east coasts and do so by taking advantage of a new COB capability at ASB. These analyses are done for cargoes that are already containerized, or which could be containerized, because container shipments are the objective of this study. To assess the prospects of serving the potential markets via barge, we enumerate the incumbent routes, analyze their route economics, and identify potential cost savings that could drive cargo to the ASB Project. We identify the commodities with the highest volumes moving in and out of the 35-county ASB hinterland area, and based on the logistical cost advantages of the project, we estimate the potential cargo capture for the ASB Project.

5.1 General assumptions

Mercator analyzed route costs for the key containerized cargoes being exported from and imported into the ASB Port's market region by first segmenting the region into three target priority areas, as depicted in Figure 26. Taken together, the three priority areas are composed of 35 counties as detailed next:

- **Priority Area 1.0 (PA1)**—includes *10 counties* in the trade area in closer proximity to ASB (< 50 miles): Carroll, Chariton, Saline, Livingston, Linn, Macon, Randolph, Howard, Copper, and Petties.
- **Priority Area 1.5 (PA1.5)**—includes *4 counties* in the trade area between ASB and Kansas City (< 70 miles): Caldwell, Ray, Lafayette, and Johnson, but which, because of their close proximity to Kansas City will likely make it more challenging than for other parts of the state for ASB to provide a service improvement.
- **Priority Area 2.0 (PA2)**—includes *21 counties* in the outer trade area to the north, east, and south, within about 100 miles of ASB: Daviess, Harrison, Grundy, Sullivan, Putnam, Adair, Schuyler, Knox, Shelby, Mercer, Monroe, Audrain, Boone, Callaway, Moniteau, Cole, Osage, Morgan, Miller, Benton, and Camden.

Figure 26. AGRIServices of Brunswick Project target markets—trade areas by distance to/from the Project



MO County / Priority area	Driving distance (miles) Kansas City	AGRIServices of Brunswick
AGRIServices of Brunswick	**88**	**-**
Priority Area 1 (avg)	**122**	**57**
Carroll	86	18
Chariton	156	52
Saline	105	35
Livingston	100	58
Linn	178	133
Macon	147	63
Randolph	130	43
Howard	121	45
Copper	107	65
Petties	86	59
Priority Area 1.5 (avg)	**51**	**69**
Caldwell	60	75
Ray	45	52
Lafayette	34	66
Johnson	64	84
Priority Area 2 (avg)	**144**	**96**
Adair	168	84
Audrain	167	88
Benton	106	78
Boone	133	77
Callaway	151	109
Camden	154	122
Cole	164	119
Daviess	74	83
Grundy	106	76
Harrison	97	108
Knox	191	107
Mercer	88	95
Miller	169	126
Moniteau	134	92
Monroe	183	72
Morgan	134	92
Osage	179	135
Putnam	151	91
Schuyler	182	111
Shelby	174	90
Sullivan	123	69
Mean	127	82
Max	191	135
Min	34	18
Std. Dev	43	28

Source: Mercator International.

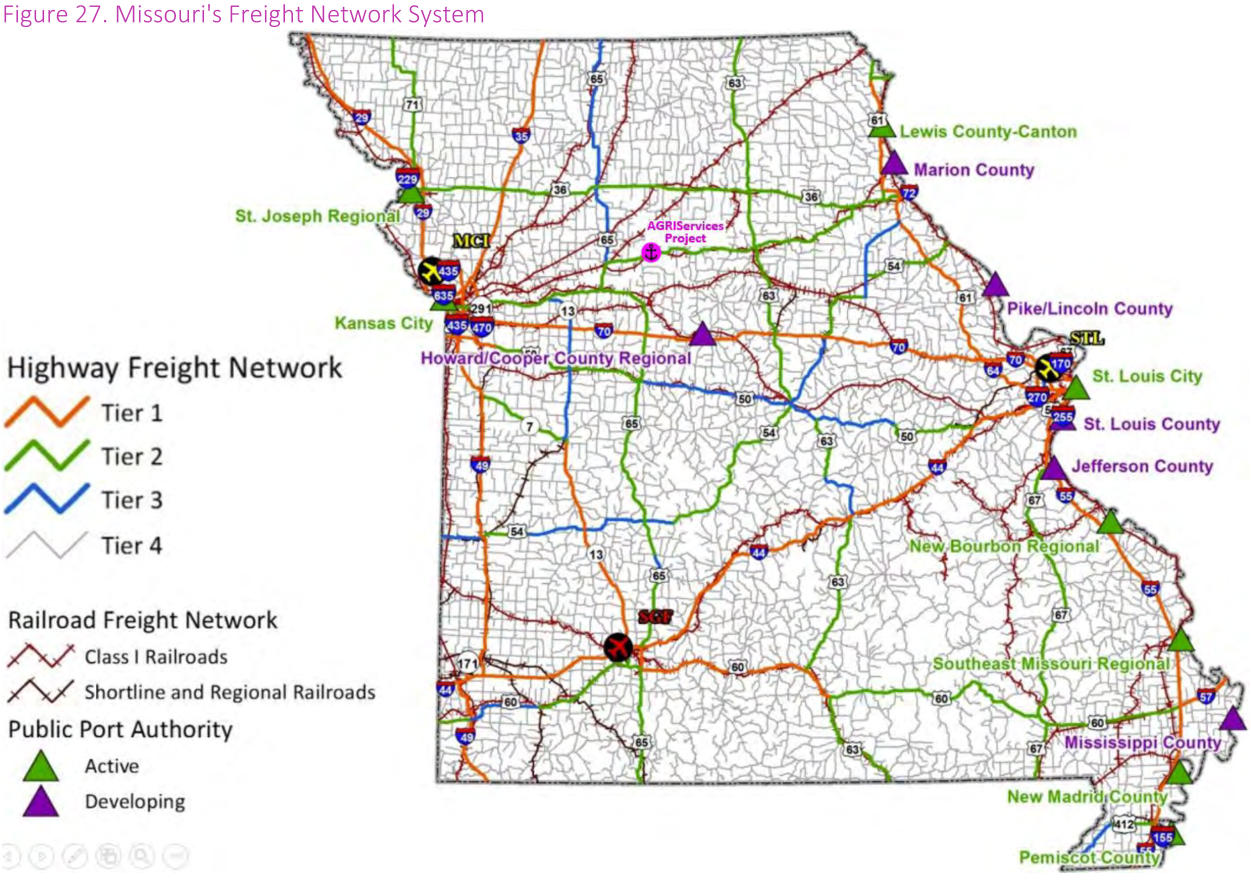
5.2 Review critical freight transportation infrastructure in Missouri

To attract volumes, the ASB Project must demonstrate to current and potential customers that substituting barge transportation on the Missouri and Mississippi rivers in their international supply chains will be superior to intermodal rail, not only in terms of lower inland costs, but also without adversely compromising transit-time and reliability. To explore the efficiency of the ASB Project as a transportation alternative, this section provides an overview of the freight network in the state and it assesses the connectivity of the ASB Project to the rest of the state's freight system.

5.2.1 Missouri's freight network

MoDOT defined the freight network for the first time in 2017. This network is comprised of highways, rail facilities, ports, airports, pipelines, and intermodal facilities. Any proposed improvement project must be located on or adjacent to the existing freight network to be considered in the prioritization process for state funding. The ASB Project is located on the state's freight network, enjoying rapid access to highways, railroads, and ports, as illustrated in Figure 27.

Figure 27. Missouri's Freight Network System



Source: MoDOT 2017 Freight Plan. Adapted by Mercator.

5.2.2 Highways

The ASB Project enjoys excellent connectivity between major markets and cargo entry/exit points in all principal directions of travel. Inbound and outbound trucks can reach the I-70 corridor in less than one hour either traveling east towards St. Louis or west towards Kansas. The I-70 corridor is the backbone of east-west freight trade and is located 34 miles south from the ASB Project site. State Highway 24 also serves as an alternative route between ASB and Kansas City.[12] Missouri's highway system, which includes the state's freight network, and the main freight corridors for truck traffic are illustrated in Figure 28a.

5.2.3 Railroads

The ASB site straddles a rail line owned and operated by NS, a Class I railroad. Between Brunswick and Kansas City, the NS rail line connects to the two Class I railroads that serve the U.S. west (BNSF and UP). Towards the east, the NS rail line connects to tracks of KCS and BNSF, all of which converge in St. Louis. In Kansas City, the UP-line connects with the BNSF, CP, NS, and KCS. In St. Louis, interchanges are available with the BNSF, NS, and KCS.

According to MoDOT's *2017 Freight Plan*, most of the major rail lines in the state are already operating at or near capacity. This includes the UP line that connects Kansas City with St. Louis (parallel to I-70) and the NS line that runs across the ASB Project site.[13] In addition to congestion on the main rail lines due to operations being at near capacity, another concern is the volume of traffic using at-grade rail crossings, which can represent potential roadway safety and delay issues. The major rail corridors in Missouri are illustrated in Figure 28b.

5.2.4 Public and private ports, marine terminals, and docks

Missouri is traversed by 550 miles of the Missouri River, while about 500 miles of the Mississippi River form the State's eastern boundary. The Missouri converges into the Mississippi at St. Louis and provides uninterrupted flow southbound into New Orleans' ports on the Gulf of Mexico.[14] There are more than 200 public and private river ports and marine terminals in the state.

Public Port Authorities

As of early 2020, there are 15 public port authorities in the state.[15] Mercator identified three public port authorities that present potential competitive risks and opportunities to the ASB Project because of their geographic position in relation to the project and within the overall waterway network, as well as their current or prospective physical infrastructure, cargo handling equipment, and types of commodities handled. One is active (Port of Kansas City) and two are developing (Howard/Cooper County Regional Port Authority and the Heartland Port Authority). Although the City of St. Louis Port Authority is located too far away from the ASB Project, recent developments in this port can have some significance in generating barge traffic along M-55 and M-70.[16]

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[12] MoDOT's *2017 Freight Plan* reports that about 18% of the total truck traffic is inbound (i.e. coming into the state) primarily from Wyoming, Illinois, Kansas, Iowa, Arkansas, and Texas; 15% is outbound (i.e. departing from the state) to Illinois, Texas, Kansas, California, Arkansas, and Iowa; 21% is intrastate (moving between points within Missouri); and about 46% are trucks just passing through the state. A portion of these flows are international imports and exports.

[13] Missouri Department of Transportation (MoDOT), *2017 Freight Plan*. Rail Condition and Performance, pp 4-9 (60). https://www.modot.org/sites/default/files/documents/Chapters1-10nov2017%5B1%5D.pdf
Missouri has significant rail infrastructure with six Class I freight railroads operating on 4,218 miles of main track and 2,500 miles of yard tracks. Five short-line railroads own and operate a combined 426 miles of track.

[14] From the Mouth of Missouri, there is one set of locks on the Mississippi River (Chain of Rocks).

[15] The *MoDOT 2017 Freight Plan* classifies the public port authorities as active or developing ports. There are eight 'active' port authorities in Missouri and the remaining seven are 'developing,' that is, they currently do not have a public port facility or are in the process of building one, such as the Heartland Port Authority.

[16] In 2015, the Port Authority leased operations of the Municipal River Terminal to **SCF Lewis and Clark Terminals LLC,** a division of **SEACOR Holdings Inc** until 2040. On early March 2020, SCF started a container-on-barge service to/from the Port of New Orleans for Hapag-Lloyd. **DNJ Intermodal Services** also provides near-dock movements of containers by truck.

- **Port of Kansas City (PortKC)**—111 miles upriver from the ASB Project, PortKC is located on the confluence of the Missouri and Kansas rivers at the intersection of six Class I railroads and numerous interstates (i.e. I-70, I-35, I-29, and Hwy 71). Some of its intermodal yards are near the dense central business district. The facility's capabilities include transfer between barge, rail, and truck. Top commodities include fertilizer, structural steel, shredded scrap, and coal slag. It also handles grain, corn, meal, barley, bark, rock clinker, salt, rolled and coiled steel, and petroleum coke. In August 2015, PortKC welcomed its first barge since 2007. Since reopening, annual throughput has been about 110,000 tons (99,790 MT). The port advertises that its potential annual capacity is 800,000 tons (725,747 MT). A rail spur was completed in 2017, connecting the port to the UP rail line. As part of the effort to grow waterborne commerce, PortKC is planning the redevelopment of a former 415-acre steel mill site into an intermodal hub using a public-private partnership (P3).[17] Key attributes are listed in Table 7.

Table 7. Port of Kansas City (PortKC)—terminal characteristics

Facility area	Cargo type	Equipment, capabilities, or capacity
Receiving Infrastructure and inbound conveyance (marine leg)	▪ Agribulk ▪ Breakbulk ▪ Drybulk/Fert	▪ 3 load cells and docking structures for 14 barges (on 900-feet of shoreline) ▪ 3 cranes (25-ton) ▪ 8 front-end loaders ▪ Portable conveyor systems
Storage	▪ Agribulk	▪ 60,000 tons of covered storage ▪ Open storage space
	▪ Breakbulk	▪ Open storage space
	▪ Drybulk/Fert	▪ Open storage space ▪ 145 acres of vacant land available for expansion
Outbound conveyance or outload capabilities	▪ Agribulk ▪ Breakbulk ▪ Drybulk/Fert	▪ Loaders, dump trucks, conveyors ▪ On-site truck scale ▪ Connects to the main UP branch on-dock

- **Howard/Cooper County Regional Port Authority**—Located in Boonville County at Missouri River mile 197, about 59 miles downriver from the ASB Project, and situated on 35 acres, this is the only public facility between Kansas City and St. Louis in addition to the planned Heartland facility. The local media reports that the last outbound barge left port in 2016.[18] MoDOT provided funding to construct a new dock 100 yards east of the current port on 18 acres; some parts of the existing port will continue being used.[19] This port has the characteristics described in Table 8.

[17] *Port KC advances Missouri River Terminal work with selection of KPMG*. PortKC, July 10, 2019. https://portkc.com/port-kc-advances-missouri-river-terminal-work-with-selection-of-kpmg/

Due to reduced volumes, the port closed its Woodswether Terminal in 2007, when it was handling about 600,000 tons (544,310 MT) per annum. The Kansas City Port Authority took over responsibility for the port and reopened it for commercial use in August 2012. In 2019, the port handled its first rail cars loaded with salt for roads.

[18] *Boonville port has become focal point of talk about proposed Jefferson City port.* News Tribune, Aug. 19 2018: https://www.newstribune.com/news/local/story/2018/aug/19/boonville-port-has-become-focal-point-of-talk-about-proposed-jefferson-city-port/739510/

[19] *Port authority to construct whole new port*. Boonville Daily New, Oct 12, 2015: https://www.boonvilledailynews.com/article/20151012/NEWS/151019871

Table 8. Howard/Cooper County Regional Port Authority —terminal characteristics.

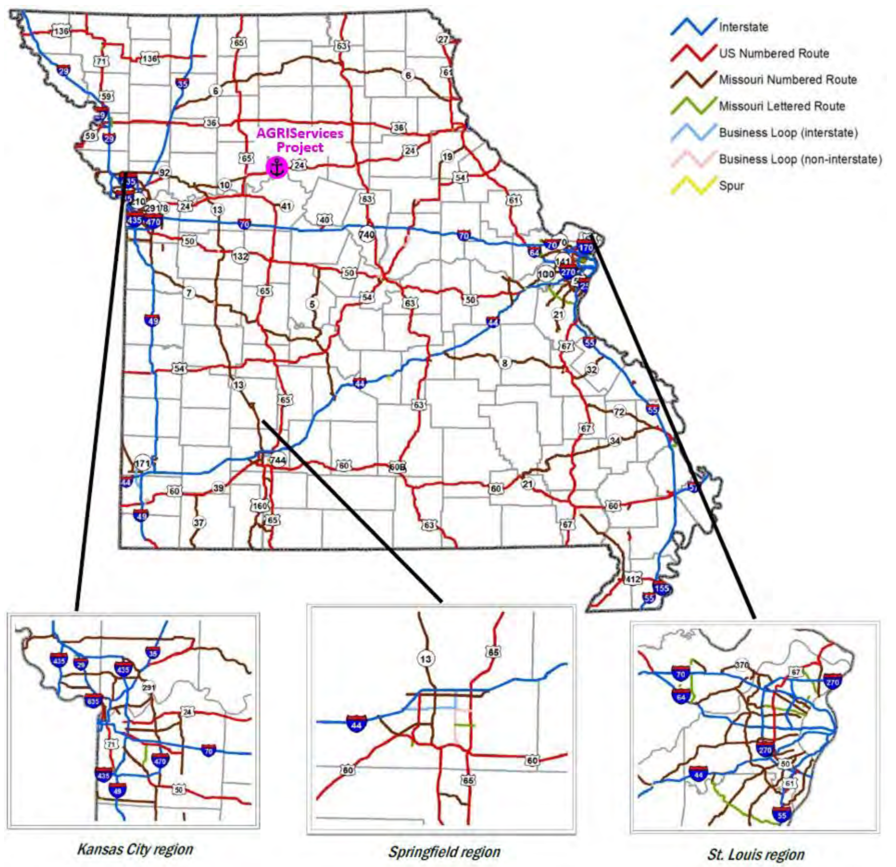
Facility area	Cargo type	Equipment, capabilities, or capacity
Receiving Infrastructure and inbound conveyance (marine leg)	▪ Agribulk ▪ Liquid-bulk ▪ Breakbulk ▪ Drybulk/Fert	▪ General cargo dock with liquid cargo capabilities ▪ A 50-ton crane, and ▪ A 25-ton crane (all located on a floating dock)
Storage	▪ Agribulk	▪ 250,000 bushels of grain (about 6,800 MT)
	▪ Liquid-bulk	▪ 4 million gallons of liquid chemicals
	▪ Breakbulk ▪ Drybulk/Fert	▪ 2 dry storage buildings and a 15,000-ton outside storage pad available.
Outbound conveyance or outload capabilities	▪ Agribulk ▪ Liquid-bulk ▪ Breakbulk ▪ Drybulk/Fert	▪ Loaders, dump trucks, conveyors and repair equipment available ▪ Within one mile of the Missouri Pacific Railroad, which connects to the main UP branch

- **Heartland Port Authority**—Located in the Jefferson City area, at the intersection of the Callaway and Cole counties, this planned project is about 117 miles downriver from the ASB Project. The South Site is about 125 acres total and is located south of the Missouri River at River Mile 137 (RM 137). Access to the site is via U.S. Highway 63 and Militia Drive. A future rail spur would connect to the UP Jefferson City Subdivision Mainline. The rail spur provides access to a rail yard containing storage for about 60 railcars. On June 16, 2020, the Heartland Port Authority signed a MOU document and a Non-Disclosure Agreement with American Patriot Holdings and the Plaquemines Port.[20] This proposed port is expected to handle non-containerized and containerized cargoes.

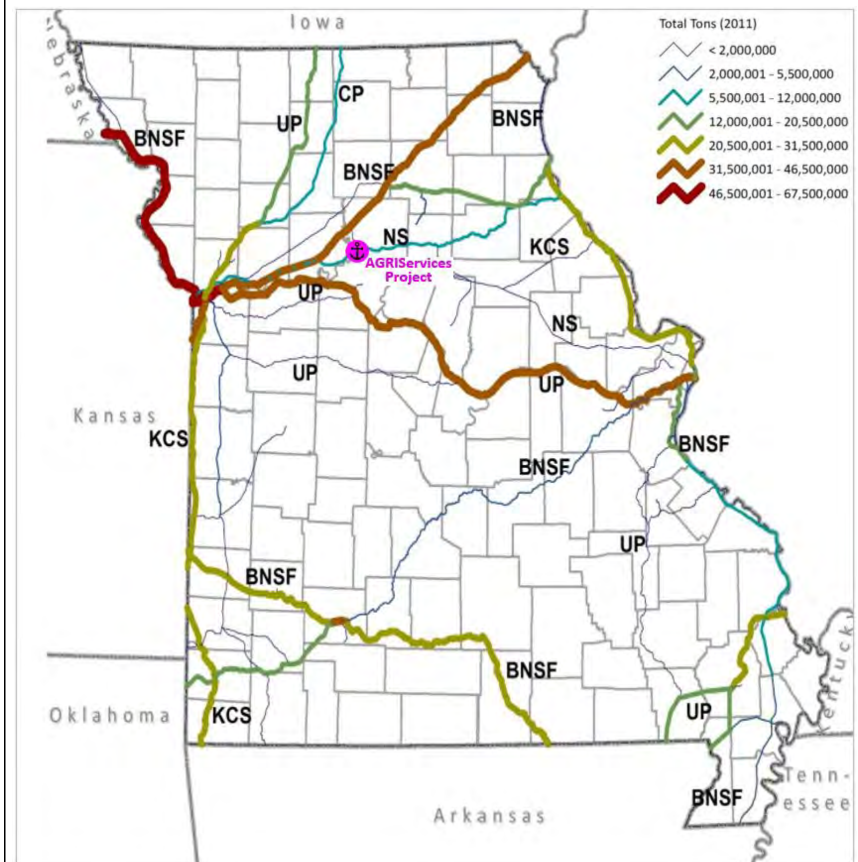
[20] Heartland Port Authority of Central Missouri. Minutes of Board of Commissioners Meeting. June 16, 2020. https://www.jcchamber.org/clientuploads/Economic_Development/Port%20Authority/Heartland_Port_Authority_Board_Minutes_06-16-20.pdf

Figure 28. Freight network serving the movement of freight in Missouri

a) Highway system



b) Main freight rail corridors in Missouri

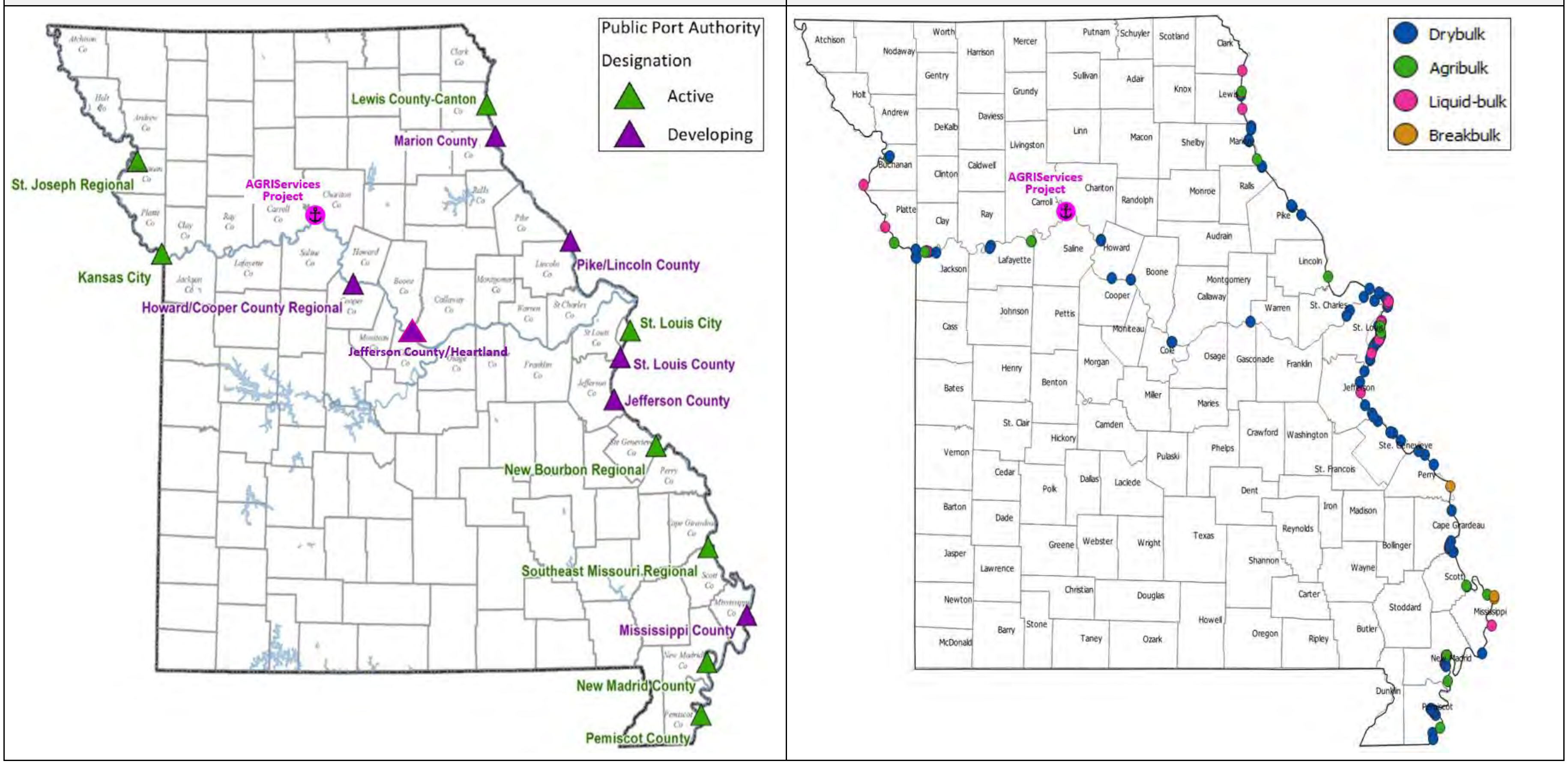


Source: MoDOT 2017 Freight Plan. Adapted by Mercator.

A more comprehensive inventory for the private ports, river terminals, and docks, including some of their physical and operational characteristics can be found in *Appendix A* of the *Heartland Port Project, Comprehensive Market Study 2020.*[21]

Figure 29. Public and private ports, terminals, and docks

a) Public Port Authorities in Missouri | b) Private river terminals and docks



Source: MoDOT 2017 Freight Plan. Adapted by Mercator.

[21] *Heartland Port Project, Comprehensive Market Study 2020.* Decision Innovation Solutions and Mercator International. May 2020. https://www.jcchamber.org/clientuploads/Economic_Development/Port%20Authority/200506_HPACM_Comprehensive_Market_Study,_Final_Report.pdf

5.3 Containerized cargoes—route economics

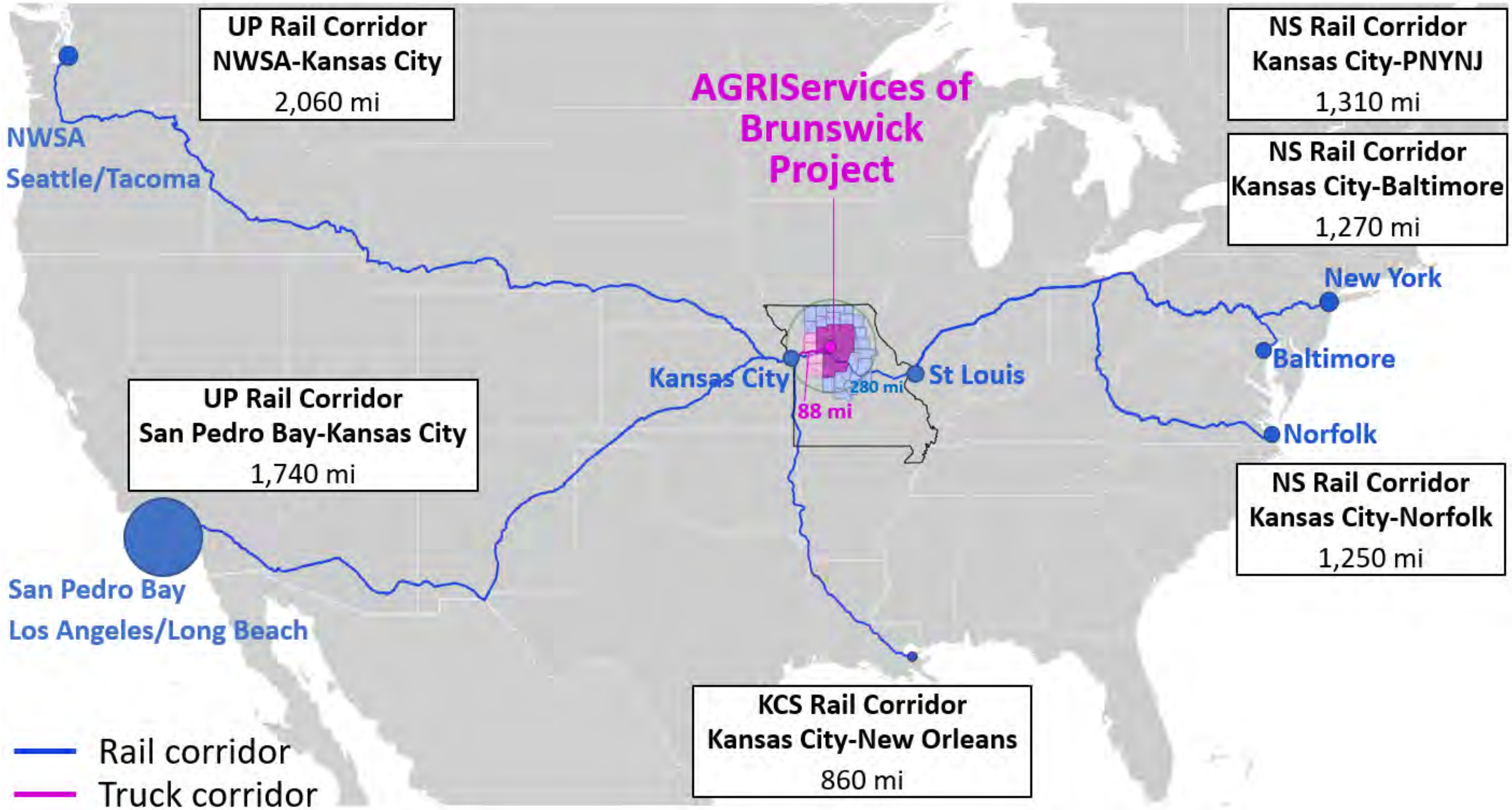
Shippers and receivers looking to import or export containerized cargoes into the 35-county study area have two primary gateway alternatives through which containers can be routed: (i) San Pedro Bay on the West Coast (SPB) and (ii) New York-New Jersey on the East Coast (NYNJ). Secondary corridors go through the ports of the Northwest Seaport Alliance (NWSA), Seattle and Tacoma, for the Asia tradelane and through Baltimore and Norfolk for the Europe tradelane. NOLA also serves as a gateway for some traffic to or from Asia, Europe, and South America, and is the only alternative providing connection to a marine highway (M-55). Presently, these corridors utilize intermodal rail between the gateway ports and an inland hub in Kansas City. These incumbent routes, defined and named after their gateway ports for this report, are explained in detail in the following bullets and displayed in Figure 30.

- NYNJ—This is the primary corridor for containerized imports/exports via the Atlantic Coast. This 1,310 mi long corridor is served by NS from Kansas City to New York. This corridor is suitable for double-stack trains. Containers are railed between NYNJ and Kansas City (1,310 mi) and trucked up to 200 mi to/from destinations in the ASB Project priority areas.[22]
- San Pedro Bay (SPB)—This is the main route for containerized imports from Asia via the Pacific Coast. This rail corridor is 1,740 mi long and is served by the Union Pacific (UP). Marine containers on double-stack trains dominate this route. Although the tracks on this corridor extend beyond Kansas City all the way to St. Louis, almost parallel to the river, there are no intermediate intermodal ramps. Hence, this indicates that import containers are railed from the Ports of Los Angeles and Long Beach to Kansas City (1,740 mi), where we believe the majority are emptied, with cargo held in regional warehouses before being trucked (about 50-100 miles) to the destinations in ASB's priority areas.
- NWSA—This is a second alternative for containerized imports via the Pacific Coast. It is 2,060 mi and it is served by UP from Kansas City to Portland and then northbound to the Seattle/Tacoma area where it connects to container terminals part of the NWSA. This corridor is also suitable for double-stack trains.
- NOLA—This is an alternative for containerized cargo handled via the USGC potentially competing with a COB service via the Mississippi River (M-55). It is 860 mi and it is served by KCS from Kansas City to Shreveport southbound to the Port of New Orleans. This corridor is also suitable for double-stack trains.

[22] Baltimore—This gateway port is an alternative to NY/NJ. The route is 1,270 mi, and is also served by NS from Kansas City through Fort Wayne, Cleveland, Pittsburgh, and Harrisburg where it diverts southbound towards Baltimore. Although this corridor offers a slightly shorter distance to Kansas City, it is dwarfed by traffic generated by the container terminals in NYNJ. Moreover, this corridor is not presently suitable for double-stack trains due to tunnel restrictions near the Port of Baltimore.

Norfolk—This is a third alternative gateway for containerized imports via the Atlantic Coast. The route is 1,250 mi, served by NS from Kansas City via Fort Wayne to Bellevue, where it diverts southbound towards Columbus, Roanoke, and onwards to the Norfolk port. This corridor is also suitable for double-stack trains and offers numerous interchanges with CSXT.

Figure 30. Incumbent routes—main rail corridors for containerized movements of cargo via the ASB Project.



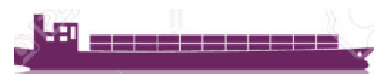
Source: Mercator International.

5.3.1 Route costs for containerized *imports*

The cost competitiveness for handling containerized imports to central Missouri through ASB was assessed by comparing the intermodal route cost chains from representative origin ports in Asia and Europe (e.g. Shanghai and Rotterdam) through the major gateways and corresponding routes. This was done, first, for the incumbent routes (i.e. via SPB, NWSA, and NYNJ), and, second, for the new proposed route enabled by the ASB Project (i.e. via NOLA), as detailed in the next section.

Mercator calculated the route costs for containerized cargo by leg and by mode—ocean, truck, rail, and barge—for the primary incumbent routes for imports, and then compared them to the routes that cargo would follow if using the proposed ASB Project. This cost analysis was done from the perspective of on ocean carrier, essentially assessing the carrier's cost to provide service to the study area. Once cost inputs were obtained or calculated for each cost component of each route, all costs were converted to dollars per 40 ft container ($/FEU). The capacities assumed by mode for import flows are illustrated in Figure 31.

Figure 31. Unit capacity by assumed mode of transport for import flows: in metric tons and 40 ft containers

a) 40 ft container by rail	b) 40 ft container by truck	c) River barge
		
15 metric tons (33,069 lb)	**15 metric tons** (33,069 lb)	**36 containers** per barge

Incumbent import routes (without project)

The route cost chains for intact intermodal containers imported to the target markets (i.e. PA1, PA1.5, and PA2) were divided into the following categories for analysis:

- **Ocean transport costs.** Ocean transport costs represent the first leg of the import trip, either from Asia to SPB/NWSA or from Europe to NYNJ. For Asian imports, Mercator estimated ocean transport costs considering that the inbound load is charged for the return voyage of the vessel service back to Asia.[23] This is due to the empty imbalances generated by the U.S. trade deficit with China and other Asian countries. For European import, headhaul and backhaul shipping rates, validated with third-party sources and based on historical trends, were applied to the initial ocean transport costs to calculate and differentiate between headhaul and backhaul ocean transport costs.
- **Transfer costs at the gateway (ship unloading and rail loading).** These costs are incurred at the gateway port, and paid primarily by the ocean carrier. They include discharging the ocean vessel, transferring the container to an intermodal rail facility, which can be on-dock or off-dock, and loading the container onto the railcar for transportation into the inland market. There may also be local fees incurred for infrastructure use, such as the Alameda Corridor fee at the ports of Los Angeles and Long Beach.
- **Inland rail transportation and discharging costs.** Long-haul rail movements represent the next leg of the trip from either SPB or NYNJ to Kansas City. These costs include the railcar-to-yard-to-truck discharging costs.
- **Trucking (drayage).** Trucking is used for the last leg of each trip, from the nearest long-haul intermodal platform (i.e. Kansas City). For imports, we assume empty containers are returned to the inland intermodal hub (the rail terminal or, conversely, the ASB barge terminal).

[23] Cost typically passed on to the cargo owners as a Container Imbalance Surcharge (CIS) by the ocean carriers.

Mercator ensured that transfer costs between modes (e.g. ship-to-shore, loading to a railcar, railcar-to-yard-to-truck) were properly accounted for as indicated by our industry sources. A simplified structure of the 2020 route costs assumed for containerized cargoes using incumbent routes (i.e. without the ASB Project) via Kansas City into PA1 is illustrated in Figure 32.

Figure 32. Route cost components via incumbent intermodal routes (via Kansas City) for containerized *imports* ($/FEU)

Incumbent routes	Ocean transport costs	Transfer cost ship unloading	Rail loading	Intermodal rail transportation	Rail discharging	Trucking	Total cost
(Asia to) San Pedro Bay to KC Priority Area 1	$740	$660 @San Pedro Bay		$1,630 @Kansas City		$700	$3,730
(Europe to) NY-NJ to KC Priority Area 1	$430	$520 @NYNJ		$860 @Kansas City		$700	$2,510

Import route costs via the ASB Port Project (with project)

For the route costs via the ASB Port (with project), the cost chains for intact intermodal containers imported to inland markets (i.e. PA1, PA1.5, and PA2) were divided into the following categories for analysis:

- **Ocean transport costs.** The representative origin ports in Asia and Europe (e.g. Shanghai and Rotterdam) for imports and its associated ocean transportation costs remained unchanged. The major gateways and corresponding routes for the incumbent routes (i.e. via SPB, NWSA, and NYNJ) were replaced with the new proposed route enabled by the ASB Project (i.e. via NOLA) connecting to the ASB Project via M-55 and M-70.
- **Transfer costs at the gateway (ship unloading and barge loading).** For imports, these are costs that are incurred at the gateway port (i.e. NOLA), and they include discharging the ship, transferring the container to the COB service.
- **Barge transport costs.** Regarding COB service, presently, there is one barge operator providing service between NOLA and St. Louis using standard Mississippi barges.[24] To estimate the costs associated with the barge operator, including transporting, loading, and discharging, Mercator conducted interviews with the barge operators.
    - *Barge loading*. These are costs that are incurred also at the gateway port (i.e. NOLA), but that are charged by the barge operator for transferring the container to the barge.
    - *Barge discharging*. These are costs that are also incurred by the barge operator associated with discharging the box from the barge into the ASB Project site.
- **Trucking (drayage).** Trucking is used for the last leg of each trip, from the nearest long-haul intermodal platform (i.e. Kansas City). For imports, we assume empty containers are returned to the inland intermodal hub (rail terminal or barge terminal).

[24] Interview with SFC. The current COB service operates standard Mississippi barges able to each accommodate 36 (40 ft) containers (3-high) if loaded and 48 (4-high) if empty.

The route costs developed for containerized cargoes using the ASB Port, which involve river transport via the New Orleans Gateway, into PA1 are illustrated in Figure 33. The detailed build-up of the route costs is included in *Appendix 2*.

Figure 33. Route cost components via the M-70 and M-55 route (via the ASB Project) for containerized *imports* ($/FEU)

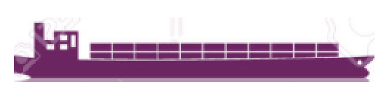
Alternative ASB routes	Ocean transport costs	Transfer cost ship unloading	Barge loading	Barge transportation	Barge discharging	Trucking	Total cost
(Asia to) New Orleans to ASB Priority Area 1	$1,600	$400 @ New Orleans	$200	$635	$125 @ASB	$340	$3,300
(Europe to) New Orleans to ASB Priority Area 1	$640	$400 @ New Orleans	$200	$635	$125 @ASB	$340	$2,340

5.3.2 Route costs for containerized *exports*

The cost competitiveness for containerized export flows was assessed by comparing the intermodal route cost chains from the target inland markets to representative destination ports in Asia and Europe (e.g. Shanghai and Rotterdam) through the major gateways and corresponding routes. As with the import analysis, this was done, first, for the incumbent routes (i.e. via SPB, NWSA, and NYNJ), and, second, for the new proposed route enabled by the ASB Project (i.e. via NOLA), as detailed in the next section.

Mercator calculated the route costs for containerized cargo by leg and by mode—ocean, truck, rail, and barge—for the primary incumbent export routes, and then compared them to the routes that cargo would follow if using the proposed ASB Project. Once cost inputs were obtained or calculated for each cost component of each route, all costs were converted to dollars per FEUs. The capacities assumed by mode for export flows are illustrated in Figure 34.

Figure 34. Unit capacity by assumed mode of transport for export flows, in metric tons and 40 ft containers

a) 40 ft container by rail	b) 40 ft container by truck	c) River barge
		
24 metric tons (52,910 lb)	**24 metric tons** (52,910 lb)	**36 containers** per barge

Incumbent export routes (without project)

The route cost chains for intact intermodal container exports were divided into the following categories:

- **Trucking (drayage).** The first leg of an export trip begins with the movement of an empty container from Kansas City, the nearest empty depot, to the BCO site where the cargo is originated and the containers are stuffed. For the incumbent routes (without the ASB Project), we assume stuffed containers are trucked to the nearest long-haul intermodal platform (i.e. Kansas City).

- **Inland rail transportation and loading costs.** Long-haul rail movements represent the next leg of the trip to either SPB or NYNJ from Kansas City. These costs include the truck-to-rail transfer and loading costs.
- **Transfer costs at the ocean gateway (rail unloading and ship loading).** These costs are incurred at the gateway port, and they include discharging the container at the rail facility, which can be on-dock or off-dock, transfer to the marine terminal, and loading the container onto the ocean vessel for transportation to destination ports in Asia and Europe.
- **Ocean transport costs.** Mercator estimated ocean transport costs from SPB/NWSA to Asia or from NYNJ to Europe. For exports to Asia, the return voyage of the vessel back to Asia is charged for in the inbound load (due to the empty imbalances generated by the U.S. trade deficit with China). For exports to Europe, headhaul and backhaul shipping rates, validated with third-party sources and based on historical trends, were applied to the ocean transport costs to calculate and differentiate between headhaul and backhaul ocean transport costs.

A simplified structure of the 2020 route costs assumed for containerized exports from PA1 using incumbent routes (i.e. without the ASB Project) via Kansas City is illustrated in Figure 35.

Figure 35. Route cost components via *incumbent* routes thru KC (*w/o the project*) for containerized *exports* ($/FEU)

Incumbent routes (laden)	Trucking	Rail loading	Rail transportation	Rail discharging	Transfer cost ship loading	Ocean transport costs	Ship unloading	UT / Perdiem*	Total cost
Priority Area 1 KC to San Pedro Bay (to Asia)	$700	$750 @Kansas City		$570 @San Pedro Bay		$0	$220 @Shanghai	$100	$2,340
Priority Area 1 KC to NY-NJ (to Europe)	$700	$600 @Kansas City		$430 @NYNJ		$290	$250 @Rotterdam	$100	$2,370

*Assumes $220 related to foreign gateway costs (ship unloading) and $100 related to unloading time (UT) associated with unstuffing the containers at the final destination (e.g. perdiem charges).

Export route costs via the ASB Port Project (with project)

The cost competitiveness of containerized exports was assessed by comparing the intermodal route cost chains from the target markets (PA1, PA1.5, and PA2) to representative destination ports in Asia and Europe through the ASB Project and its associated marine highways (i.e. M-70 and M-55). The cost chains for intact intermodal container exports were divided into the following categories:

- **Trucking (drayage).** The first leg of an export trip begins with the movement of an empty container from Kansas City to the BCO site where the cargo is originated and the containers are stuffed. With the ASB Project, we assume stuffed containers are trucked to the ASB Project site.
- **Barge transport costs.** Long-haul barge movements represent the next leg of the trip from ASB to NOLA. These costs include loading and discharging costs incurred by the barge operator.
    - *Barge loading*. These costs are incurred at the ASB Port, and paid by the barge operator.

   - *Barge discharging*. These costs are for discharging the box from the barge into the container yard at the export gateway (e.g. NOLA), and as with the loading operation, are paid by the barge operator.
- **Transfer costs (ship loading) at the gateway.** These are costs that are incurred at the gateway port for loading the container onto the ocean vessel for transportation to destination ports in Asia and Europe.
- **Ocean transport costs.** The representative destination ports in Asia and Europe (e.g. Shanghai and Rotterdam) for exports and its associated ocean transportation costs remained unchanged. The major gateways and corresponding routes for the incumbent routes (i.e. via SPB, NWSA, and NYNJ) are replaced with the new proposed route enabled by the ASB Project (i.e. via NOLA).

The route costs developed for containerized exports from PA1 via the ASB Project (i.e. with the ASB Project) and the New Orleans gateway port are is illustrated in Figure 36. The detailed build-up of the route costs is included in *Appendix 2*.

Figure 36. Route cost components via M-70 and M-55 (*with the ASB Project*) for containerized *exports* ($/FEU)

Alternative ASB routes (laden)	Trucking	Barge loading	Barge transportation	Barge discharging	Transfer cost ship loading	Ocean transport costs	Ship unloading	UT / Perdiem*	Total cost
Priority Area 1 ASB to New Orleans (to Asia)	$520	$125 @ASB	$635	$200	$310 @New Orleans	$0	$220 @Shanghai	$100	$2,110
Priority Area 1 ASB to New Orleans (to Europe)	$520	$125 @ASB	$635	$200	$310 @New Orleans	$430	$250 @Rotterdam	$100	$2,570

*Assumes $220 related to foreign gateway costs (ship unloading) and $100 related to unloading time (UT) associated with unstuffing the containers at the final destination (e.g. perdiem charges).

Incumbent route costs for repositioning empties

To test the degree of attractiveness from an ocean carrier perspective, we developed a cost chain where the empty containers are simply returned from inland markets (i.e. Kansas City) to gateway ports in SPB for the empty containers returning to Asia and in NYNJ for those going back to Europe. Currently, this represents the incumbent route for ocean carriers repositioning empty containers back to Asia and Europe. For this cost chain, we assume the empty container starts its trip at an "empties depot" located in Kansas City, where is loaded into intermodal rail and routed to either SPB or NYNJ, where they are loaded on ocean vessels. This cost chain is illustrated in Figure 37.

Figure 37. Route cost components via *incumbent* routes thru KC (*w/o the project*) for repositioning empties ($/FEU)

Incumbent routes for empties	Rail loading	Intermodal rail transportation	Rail discharging	Ship loading	Ocean transport costs	Ship unloading	Total cost
KC to San Pedro Bay (to Asia)	$560 @Kansas City		$570 @San Pedro Bay		$0	$220 @Shanghai	$1,350
KC to NY-NJ (to Europe)	$450 @Kansas City		$430 @NYNJ		$0	$250 @Rotterdam	$1,130

*Assumes $220 related to foreign gateway costs (ship unloading).

5.3.3 Route cost savings offered by the ASB Port Project for containerized cargo

Based on the analyses of route costs for the incumbent versus the new routes enabled by the ASB Project, Mercator constructed route cost comparison tables for the two principal tradelanes potentially served by the ASB project (i.e. Asia and Europe). These route cost comparisons include a breakdown for each cost component and the total route costs for shippers or receivers in areas PA1, PA1.5, and PA2, as detailed next.

Imports

For imports from Asia, the ASB Port route offers potential savings when compared to the incumbent intermodal rail routes via Kansas City. The ASB Project river route can be about $430 cheaper than the incumbent route for containers being imported into PA1 from Asia via SPB and $150 cheaper for those imported into PA2. However, for PA1.5, the additional costs related to local drayage for the ASB alternative (with project) offset any cost savings associated with the barge leg; hence, the barge service does not provide a cost advantage when the entire cost chain is considered. The SPB route has lower costs than the NWSA route, so ASB costs versus the better SPB alternative is the most relevant comparison. For imports from Europe, the ASB route offers potential savings only for those destined to PA1. The route costs and the comparison of incumbent routes versus the new ASB Project route is illustrated in Table 9.

Table 9. Potential benefits offered by the ASB Project for imports ($/FEU).

Route costs without project ($/FEU)			Ocean &			Total w/o
Origin	**Gateway**	**Destination**	**Gateway**	**Rail**	**Drayage**	**project**
		PA1			$700	**$3,730**
Asia	**SPB**	PA1.5	$1,400	$1,630	$460	**$3,490**
		PA2			$220	**$3,250**
		PA1			$700	**$4,010**
Asia	**NWSA**	PA1.5	$1,340	$1,970	$460	**$3,770**
		PA2			$220	**$3,530**
		PA1			$700	**$2,510**
N. Europe	**NYNJ**	PA1.5	$950	$860	$460	**$2,270**
		PA2			$220	**$2,030**
Route costs with project via ASB ($/FEU)			**Ocean &**			**Total with**
Origin	**Gateway**	**Destination**	**Gateway**	**Barge**	**Drayage**	**project**
		PA1			$340	**$3,300**
Asia	**ASB**	PA1.5	$2,000	$960	$620	**$3,580**
		PA2			$140	**$3,100**
		PA1			$340	**$2,340**
N. Europe	**ASB**	PA1.5	$1,040	$960	$620	**$2,620**
		PA2			$140	**$2,140**
Potential benefits (disbenefits)			**Without minus With project**			**TOTAL**
from the project:			**Ocean diff.**	**Barge diff.**	**Drayage diff.**	**(w/o - with)**
		PA1			$360	**$430**
Asia	**ASB v. SPB**	PA1.5	($600)	$670	($160)	**($90)**
		PA2			$80	**$150**
		PA1			$360	**$710**
Asia	**ASB v. NWSA**	PA1.5	($660)	$1,010	($160)	**$190**
		PA2			$80	**$430**
		PA1			$360	**$170**
N. Europe	**ASB v. NYNJ**	PA1.5	($90)	($100)	($160)	**($350)**
		PA2			$80	**($110)**

*Ocean and rail costs for PA1s and PA2s are omitted for brevity, but they are the same than those for the respective PA1.5 for each tradelane. Ocean and rail costs include all associated transfer costs.

Exports

The potential savings offered to exports by the ASB Port route are smaller than for imports when compared to the incumbent intermodal rail routes via Kansas City. For exports to Asia, the ASB Port route costs are about $230 less per FEU for cargo originating in PA1 and about $90 per FEU cheaper for cargo originating in PA2, as compared to the incumbent Kansas City-SPB route. For exports to Asia routed via the NWSA, the ASB Port route offers potential savings of about $220 per FEU for cargo originating in PA1 and of about $80 per FEU for cargo originating in PA2. There is no apparent benefit for cargo originating in PA1.5. For exports to Europe, the ASB route offers no potential savings versus any incumbent intermodal route. The route cost comparison of incumbent versus the new ASB Project route is illustrated in Table 10.

Table 10. Potential benefits offered by the ASB Project for exports: *without* minus *with* project route costs ($/FEU).

Route costs without project ($/FEU)			Ocean &			Total w/o
Origin	**Gateway**	**Destination**	**Gateway**	**Rail**	**Drayage**	**project**
PA1					$700	**$2,340**
PA1.5	**SPB**	**Asia**	$890	$750	$460	**$2,100**
PA2					$220	**$1,860**
PA1					$700	**$2,330**
PA1.5	**NWSA**	**Asia**	$830	$800	$460	**$2,090**
PA2					$220	**$1,850**
PA1					$700	**$2,370**
PA1.5	**NYNJ**	**N. Europe**	$1,070	$600	$460	**$2,130**
PA2					$220	**$1,890**
Route costs with project via ASB ($/FEU)			**Ocean &**			**Total with**
Origin	**Gateway**	**Destination**	**Gateway**	**Barge**	**Drayage**	**project**
PA1					$520	**$2,110**
PA1.5	**ASB**	**Asia**	$630	$960	$540	**$2,130**
PA2					$180	**$1,770**
PA1					$520	**$2,570**
PA1.5	**ASB**	**N. Europe**	$1,090	$960	$540	**$2,590**
PA2					$180	**$2,230**
Potential benefits (disbenefits)			**Without minus With project**			**TOTAL**
from the project:			**Ocean diff.**	**Barge diff.**	**Drayage diff.**	**(w/o - with)**
PA1					$180	**$230**
PA1.5	**ASB v. SPB**	**Asia**	$260	($210)	($80)	**($30)**
PA2					$40	**$90**
PA1					$180	**$220**
PA1.5	**ASB v. NWSA**	**Asia**	$200	($160)	($80)	**($40)**
PA2					$40	**$80**
PA1					$180	**($200)**
PA1.5	**ASB v. NYNJ**	**N. Europe**	($20)	($360)	($80)	**($460)**
PA2					$40	**($340)**

*Ocean and rail costs for PA1s and PA2s are omitted for brevity, but they are the same than those for the respective PA1.5 for each tradelane. Ocean and rail costs include all associated transfer costs.

Incumbent route costs for repositioning empties

Mercator analyzed the cost chain of repositioning empty containers back to Asia and Europe using the incumbent route (i.e. without project) as empties and under the ASB (i.e. with project) alternative. For containers returning to Asia, Mercator estimated a cost of $1,350 per empty FEU via the SPB port gateway and of $1,330 via the NWSA. For this cost chain, we assume the empty container starts its trip at an "empties depot" located in Kansas City, where is loaded into intermodal rail and routed to SPB and the NWSA, respectively, where they are loaded on ocean vessels. Similarly, for containers returning to Europe, Mercator estimated a cost of $1,130 per empty FEU via the NYNJ, Baltimore, and Norfolk gateways and of $1,350 via Savannah. Without the project, there is a sunk cost to reposition empties as empties, which can possibly be converted into a benefit by loading the boxes at ASB. Table 11 shows the incumbent route costs for repositioning empty backhauls.

Table 11. Incumbent route costs for repositioning empties (without the ASB Project)

	Exports		
Asia trade	**PA1**	**PA1.5**	**PA2**
Without Project—incumbent cost to reposition empties as empties:			
via KC-SPB	($1,350)	($1,350)	($1,350)
via KC-NWSA	($1,330)	($1,330)	($1,330)
	Exports		
Europe trade	**PA1**	**PA1.5**	**PA2**
Without Project—incumbent cost to reposition empties as empties:			
via KC-NYNJ	($1,130)	($1,130)	($1,130)
via KC-Baltimore	($1,130)	($1,130)	($1,130)
via KC-Norfolk	($1,130)	($1,130)	($1,130)
via KC-Savannah	($1,350)	($1,350)	($1,350)

While using ASB as an alternative for exports is not a magic bullet for saving empty repositioning costs, carriers can achieve incremental export revenue and BCOs can take advantage of cheaper backhaul rates for exports. Nonetheless, the empty repositioning opportunity only exists to the extent that ASB makes it easier, better, and cheaper than positioning with cargo, or without cargo, via Kansas City. Moreover, the opportunity only exists when carriers are willing to commit their containers to the longer return time that is required when the containers are loaded.

5.3.4 Route cost savings—key takeaways

As this route cost analysis demonstrated, there are potential savings that can be generated by replacing the inland rail transportation with COB service, and such savings vary for each of the priority areas and tradelanes. The ASB Port could provide a competitive alternative as a gateway for COB to/from NOLA, particularly for those destined to or originating within PA1 and PA2.

For container imports from Asia, the inland cost savings associated with using a barge or ship from NOLA into the ASB Port are significant, compared to shipping a box by rail more than 1,740 mi from SPB to Kansas City and then trucking it anywhere between 30 to 200 mi to its final destination. The savings from the barge route outweigh any increases in ocean shipping costs for PA1 and PA2.

For container exports to Asia, inland cost savings from using a barge via ASB to NOLA are significant compared to shipping a box by rail more than 1,740 mi from Kansas City to SPB, particularly for those originating in PA1.[25] Table 12 shows the potential route cost benefits for containerized imports and exports for the Asia trade. This computation is done estimating the total route costs first without the project (i.e. for the incumbent route) and then subtracting the route costs with the project.

Table 12. Potential route cost benefits for containerized imports and exports for the Asia trade ($/FEU)

	Imports			Exports		
Asia trade	**PA1**	**PA1.5**	**PA2**	**PA1**	**PA1.5**	**PA2**
Without Project (incumbent)						
via SPB	$3,730	$3,490	$3,250	$2,340	$2,100	$1,860
via NWSA	$4,010	$3,770	$3,530	$2,330	$2,090	$1,850
With Project (proposed)						
via ASB	**$3,300**	**$3,580**	**$3,100**	**$2,110**	**$2,130**	**$1,770**
Potential benefits (disbenefits) from the project:						
ASB vs. SPB	$430	($90)	$150	$230	($30)	$90
ASB vs. NWSA	$710	$190	$430	$220	($40)	$80

For containers imported from Europe, savings are smaller, but still significant. The inland costs of using a barge or ship from NOLA into the ASB Port are slightly lower than those of shipping a box by rail more than 1,310 mi from NYNJ to Kansas City and then trucking it anywhere between 30 to 200 mi to its final destination. Baltimore and Norfolk show similar conclusions. Regarding container exports to Europe, our analysis revealed no potential savings. Table 13 shows the potential route cost benefits for containerized imports and exports for the Europe trade.

Table 13. Potential route cost benefits for containerized imports and exports for the Europe trade ($/FEU)

	Imports			Exports		
Europe trade	**PA1**	**PA1.5**	**PA2**	**PA1**	**PA1.5**	**PA2**
Without Project (incumbent)						
via NYNJ	$2,510	$2,270	$2,030	$2,370	$2,130	$1,890
via Baltimore	$2,470	$2,230	$1,990	$2,370	$2,130	$1,890
via Norfolk	$2,460	$2,220	$1,980	$2,370	$2,130	$1,890
via Savannah	n.a.	n.a.	n.a.	$2,300	$2,060	$1,820
With Project (proposed) via ASB						
via ASB	**$2,340**	**$2,620**	**$2,140**	**$2,570**	**$2,590**	**$2,230**
Potential benefits (disbenefits) from the project:						
ASB vs. NYNJ	$170	($350)	($110)	($200)	($460)	($340)
ASB vs. Baltim	$130	($390)	($150)	($200)	($460)	($340)
ASB vs. Norfoll	$120	($400)	($160)	($200)	($460)	($340)
ASB bs. Savanr	n.a.	n.a.	n.a.	($270)	($530)	($410)

[25] SCF, the only container on barge operator in St. Louis, is currently operating a service on a weekly bases between St. Louis and New Orleans for Hapag-Lloyd. SCF estimated it would require at least about 210 boxes/week (11,200 boxes/year) to establish a dedicated service between the Heartland Port and New Orleans.

5.4 Transit time differentials

Regarding transit times, the ASB Port could provide a competitive alternative as a gateway for COB via NOLA only for exports to Asia. For container imports from Asia, the transit time associated with using a barge or ship from NOLA into the ASB Port are significantly higher than shipping a box by rail more than 1,740 mi from SPB to Kansas City and then trucking it anywhere between 30 to 200 mi to its final destination. This is due primarily to the larger transit times associated with ocean transportation associated with replacing SPB with NOLA.

Table 14 shows the potential transit time differentials for containerized imports and exports for the Asia trade. This computation is done estimating the total transit times first without the project (i.e. for the incumbent route) and then subtracting the transit times with the project. For example, delivering a container from Asia to the study area via the SPB gateway may take 14 days of ocean transit time and 7 days of rail transit time to Kansas City for a total of 21 days in transit. If that same container were to be routed to NOLA via the Panama Canal, the ocean transit will increase to 32 days and the barge to St. Louis will add another five to six days to the transit time. Adding to that, an extra 2 days at the seaport to account not only for offloading the container ship but also loading back to the barge, and we arrive at 19 additional days by shipping via ASB over SBP and 16 over the NWSA. A similar computation is shown for exports with 7 additional days via ASB over SPB and 12 over the NWSA.[26]

Table 14. Potential transit times for containerized imports and exports for Asia trade (**Days**)

Asia trade	Imports			Exports		
Days	**PA1**	**PA1.5**	**PA2**	**PA1**	**PA1.5**	**PA2**
Without Project (incumbent)						
via KC-SPB	21	21	21	31	31	31
via KC-NWSA	24	24	24	26	26	26
With Project (proposed)						
via ASB-NOLA	**40**	**40**	**40**	**38**	**38**	**38**
Potential benefits (disbenefits) from the project:						
ASB vs. SPB	(19)	(19)	(19)	(7)	(7)	(7)
ASB vs. NWSA	(16)	(16)	(16)	(12)	(12)	(12)

For supporting data and a complete build-up of transit times by mode see Appendix 2.5.

Table 15. Potential transit times for containerized imports and exports for Europe trade (**Days**) shows the potential transit time differentials for containerized imports and exports for the Europe trade. For containers imported from Europe, the transit time of using a barge or ship from NOLA into the ASB Port are 13 days higher than those of shipping a box by rail more than 1,310 mi from NYNJ to Kansas City and then trucking it anywhere between 30 to 200 mi to its final destination. Baltimore and Norfolk show 11 and 14 days respectively. For containers exported to Europe, the transit time for the ASB route is 8 days longer than NYNJ, 1 day longer than Baltimore, and 7 days more than Savannah or Norfolk.

[26] For supporting data and a complete build-up of transit times by mode see **Appendix 2.5.**

Table 15. Potential transit times for containerized imports and exports for Europe trade (**Days**)

Europe trade	**Imports**			**Exports**		
Days	**PA1**	**PA1.5**	**PA2**	**PA1**	**PA1.5**	**PA2**
Without Project (incumbent)						
via KC-NYNJ	18	18	18	16	16	16
via KC-Baltimo	20	20	20	23	23	23
via KC-Norfolk	17	17	17	17	17	17
via KC-Savanna	n.a.	n.a.	n.a.	17	17	17
With Project (proposed) via ASB						
via ASB-NOLA	**31**	**31**	**31**	**24**	**24**	**24**
Potential benefits (disbenefits) from the project:						
ASB vs. NYNJ	(13)	(13)	(13)	(8)	(8)	(8)
ASB vs. Baltim	(11)	(11)	(11)	(1)	(1)	(1)
ASB vs. Norfoll	(14)	(14)	(14)	(7)	(7)	(7)
ASB bs. Savanr	n.a.	n.a.	n.a.	(7)	(7)	(7)

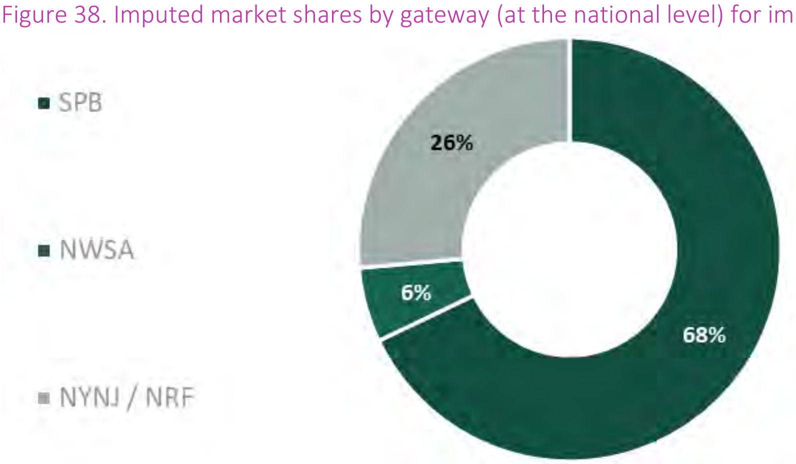
For supporting data and a complete build-up of transit times by mode see Appendix 2.5.

5.5 Imputed market shares by gateway and tradelane

5.5.1 Imports

For the containerized commodities imported into the state of Missouri, we used data from Datamyne at the national level to obtain import volumes by U.S. coastal region for such commodities. This analysis revealed that the Gulf Coast is the most significant for containerized imports from the U.S., capturing 68% of the total, followed by ports in the NWSA (i.e. Seattle, and Tacoma) with a 6% share for ports in the West Coast. For ports in the East Coast, NYNJ captured 17% and Norfolk the remaining 9% for a combined 26% share, as illustrated in Figure 38. With Missouri located in the center of the country, these coastal shares provided reasonable proxies for estimating the shares by coast for the import volumes of containerized cargoes. For Missouri imports by gateway, we assumed the gateway distribution for the state was similar to the country as a whole.

Figure 38. Imputed market shares by gateway (at the national level) for imports



Source: Develop by Mercator International with data from the U.S. Census.

Once the shares by U.S. coastal region were estimated, data at the county level was used to identify those industrial cargos deemed to have the highest potential to be attracted by the ASB Port. Based on the import volumes for these cargos, Mercator identified the shares captured by each U.S. coast by trade region: Asia, Europe, South/Central America, and others as shown in Table 16.

Table 16. Imputed market shares by tradelane for *imports* (at the national level)

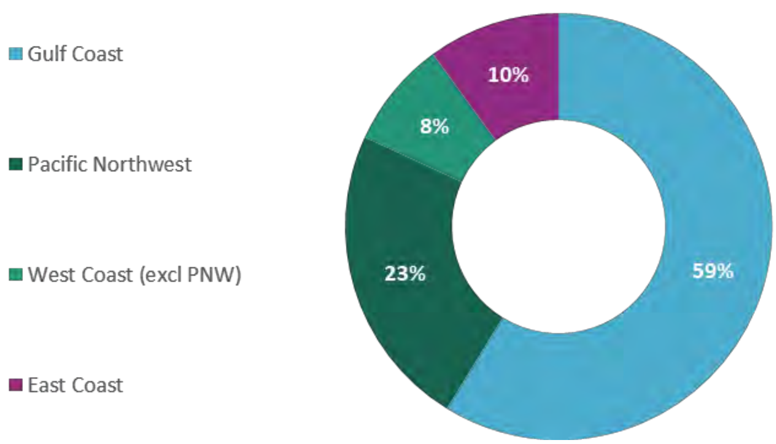
Tradelane	Share (%)	PA1	PA1.5	PA2	Total PAs
Asia	72.2%	28.2%	3.8%	68.0%	100.0%
Europe	26.4%	16.7%	10.2%	73.1%	100.0%
S/C America	1.3%	4.4%	0.0%	95.6%	100.0%
Total tradelanes	100.0%				

Source: Developed by Mercator International and DIS with data from the U.S. Census, Datamyne, and IMPLAN.

5.5.2 Exports

Missouri's principal exports are composed primarily of agribulk commodities. For the five highest volume commodities exported from Missouri (i.e. soybeans, grains, Dried Distillers Grains (DDG), soybean meal, and ethanol), we used data from the U.S. Census at the national level to obtain export volumes by U.S. coastal region for such commodities. This analysis revealed that the Gulf Coast is the most significant for exports from the U.S., capturing 59% of the total, followed by ports in the Pacific Northwest (i.e. Portland, Seattle, and Tacoma) with a 23% share, the remaining ports in the West Coast with 8%, and the East Coast having the remaining 10% share, as illustrated in Figure 39. These coastal shares provided reasonable proxies for estimating the shares by coast for the export volumes from Missouri. For Missouri exports by gateway, we assumed the gateway distribution for the state was similar to the country as a whole.

Figure 39. Imputed market shares by gateway (at the national level) for exports



Source: Developed by Mercator International with data from the U.S. Census.

Once the shares by U.S. coastal region were estimated, data at the county level was used to identify those industrial cargos deemed to have the highest potential to be attracted by the ASB Port. Based on U.S. Census export volume data for these cargos, Mercator identified the shares captured by each U.S. coast by trade region: Asia, Europe, and South/Central America, as shown in Table 17.

Table 17. Imputed market shares by tradelane for *exports* (at the national level)

Tradelane	Share (%)	PA1	PA1.5	PA2	Total PAs
Asia	83.5%	24.3%	0.0%	75.7%	100.0%
Europe	10.1%	17.1%	0.0%	82.9%	100.0%
S/C America	6.4%	0.0%	0.0%	100.0%	100.0%
Total tradelanes	100.0%				

Source: Developed by DIS with data from the U.S. Census and IMPLAN.

5.6 Available volume for the study area

Mercator and DIS estimated the volume of containerized cargo now moving into and out of the study area to establish a basis for estimating the volume that could potentially move on a COB service through ASB. For the purposes of planning and estimating feasibility, three-volume scenarios were defined, based on three different capture rates of potential cargo volumes:

i) **Upper bound—**100% of the PA1, PA1.5, and PA2 cargo, an exceedingly unlikely scenario, considered here only to establish an upper bound.
ii) **Very high—**50% capture - reflecting an exceptionally high re-route capture rate and still a very unlikely result, and
iii) **Good result (base case)—**25% capture, which is considered what might be achievable and would reflect a good result.

These three-volume scenarios were developed first for containerized import flows and then for exports as detailed next.

5.6.1 Available volume for imports

As analyzed in *Sections 4.2* and *4.3* of this report, the points of final consumption are the main drivers of import volumes. Although there is no a data source that provides volume information for such points, data generated from bills of lading can be used to identify pertinent details regarding the volume of intact intermodal rail volumes that are cleared in the Kansas City and St Louis customs ports. To estimate the divertible share of the volume of intact intermodal containers currently associated with demand generated by economic activity in the 35-county hinterland of the ASB Project, flows of intact intermodal moves from each of the four port gateways were analyzed by commodity and weight of shipment.

Two approaches to estimating import volume were taken:

- **U.S. Census/IMPLAN data**—The first approach used U.S. Census data for Missouri and assigned this volume to MO counties on the basis of the county-specific IMPLAN employment and economic activity model. This was done separately for imports and exports.
- **Datamyne**—The second approach was to use the import bill of lading data as collected and provided by Datamyne to extract the flow of import traffic destined for the 35 counties surrounding ASB. Bills of lading allow identification of the port of entry, commodity carried, and the carrier (among other data points including shipper).

Each of these approaches has drawbacks that create uncertainty in the results.[27] Nonetheless, these approaches are based on the best available data and produce results that are at least broadly similar, indicating a total containerized import cargo volume to the counties of PA1, PA1.5, and PA2 between 7,000 and 11,000 TEUs per year. The average of both methodologies results in approximately 9,400 TEUs per year, which are equivalent to the Upper Bound (100%) scenario. Similarly, 4,700 TEUs per year are equivalent to the Very High (50%) scenario, and 2,350 TEUs equivalent to the Good Result (50%) scenario, which represents our Base Case for the volume forecast, as illustrated in Table 18.

Table 18. Volume scenarios for the base year: containerized imports

Imports: totals			Units	2020
N. American imports growth rate			YoY%	-
Total imports study area	PA1+PA1.5+PA2		TEU	9400
Estimated imports scenarios:				
Upper bound		100%	0	9,400
Very high		50%	0	4,700
Good result (basecase)		**25%**	**1**	2,350
Import volumes feeding model			**TEU**	**2,350**

5.6.2 Available volume for exports

Using the U.S. Census/IMPLAN data a similar analysis was made for containerized exports from of PA1, PA1.5, and PA2.[28] This analysis indicated a somewhat smaller volume of containerized export cargo originates in the study area of about 5,960 TEUs per year. Given the importance of agricultural exports in the region and the premise that containerization of some of these commodities is a natural cornerstone for ASB's COB program, we analyzed non-containerized exports with the potential to be transloaded into containers at ASB. This analysis indicated about 13,655 TEUs per year. Combined these two volumes represent our Total Exports volume from the study area, of 19,615 TEUs, which are equivalent to the Upper Bound (100%) scenario. Similarly, 9,807 TEUs per year are equivalent to the Very High (50%) scenario, and 4,904 TEUs equivalent to the Good Result (50%) scenario, which represents our Base Case for the volume forecast, as illustrated in Table 19.

Table 19. Volume scenarios for the base year: containerized exports

Exports: totals			Units	2020
MO grain exports				-
Cont. exports			**TEU**	5,960
Non-cont. to cont. exports			**TEU**	13,655
Total exports study area	**PA1+PA1.5+PA2**		**TEU**	**19,615**
Estimated exports scenarios:				
Upper bound		100%	0	19,615
Very high		50%	0	9,807
Good result (basecase)		**25%**	**1**	4,904
Cont. export volumes feeding model			**TEU**	**4,904**

[27] For example, neither method can establish that the import cargo was actually delivered into the specific county still in the ocean-going import container. A large fraction of cargo is surely discharged from containers at gateway warehouses such as in Kansas City, and delivered to receivers in local trucks / smaller or mixed loads.

[28] Datamyne's export data was not considered reliable, as US Customs do not inspect export shipments; hence, no records are produced for the exports' Bills of Lading.

5.7 Base case volume forecast

The next step involved estimating the potentially divertible volumes and their 30-year forecast to the ASB Port Project. To generate these estimates, the total import and export volumes from the Base Case (Good Result) scenario were each adjusted to eliminate volumes associated with routes for which no potential benefit from using the ASB Route alternative was observed (e.g. volumes to/from South/Central America were excluded, as they were deemed as not potentially divertible volumes to ASB given that the incumbent routes represented cheaper transportation costs). Once the potentially divertible volumes to the ASB Port Project were estimated, the next step was to estimate and apply volume growth rates. Forecasts were prepared separately for imports and then for exports.[29]

For imports, a top-down approach has been taken to grow the initial volume of traffic that was identified as being potentially divertible. In this approach, an econometric model based on the historical relationship between real GDP and non-energy goods imports is used to forecast total non-energy goods imports on a dollar value basis. The 30-year forecast of imports begins with 2,319 TEUs in 2020 and is expected to grow to 4,620 TEUs in 2050, a CAGR of 2.3%.

Regarding exports, agricultural cargoes represent the market with the highest potential for the ASB Port. Export projections through 2029 were obtained from the USDA Long-term Projections data published by USDA in February 2020. National export trends for these commodities were used to project them forward to 2050. The percentage change from 2020 export levels were calculated for national export projections by commodity. These percentages were applied to the exports by commodity category as reported by IMPLAN for 2019 and to forward years to create agribulk export projections through 2050 for the 35-county study area. Based on this analysis, DIS expects the 30-year forecast of exports begins with 1,395 TEUs in 2020 for containerized cargo, plus 3,087 TEUs of agribulk commodities that can become containerized, for a total of 4,482 TEUs of containerized exports. Total exports are expected to grow to 10,071 TEUs in 2050, a 2.7% CAGR. Containerization of agribulk commodities are one of the categories with the highest potential market for the ASB Port Project.

Annual projections for total imports and exports, and exports two sub-categories (containerized and non-containerized transloaded into containers at ASB) are shown first in TEUs and then in FEUs using a 1.68 TEU/FEU conversion factor Table 20.

[29] The most recent period of stability, stretching from 2011 to 2018, was significantly disrupted by the US-China trade war in 2019, and the Covid-19 outbreak has caused a further dislocation in 2020. We assumed that the virus will wane in the summer months, and that a vaccine will be available by the next flu season. Therefore, we expect a return to normalcy after a period of potentially intense but relatively brief disturbance. It is also assumed that the trade war will eventually settle, and the stability witnessed over the 2011 to 2018 period will return.

Table 20. Forecast of potentially divertible volumes to the study area (1.68 TEU/FEU factor)

Containerized imports and exports via ASB Project: 20 ft and 40 ft Equivalent units

Total ASB Project			0	1	2	3	4	5	10	15	20	25	30	30 yr
Volume in TEUs and FEUs		**Units**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR**
Imports		TEU	2,319	2,387	2,454	2,522	2,590	2,658	2,997	3,353	3,741	4,162	4,620	2.3%
Cont. exports		TEU	1,395	1,452	1,509	1,566	1,623	1,680	1,964	2,250	2,535	2,829	3,134	2.7%
Non-cont. to cont. exports		TEU	3,087	3,213	3,339	3,465	3,591	3,717	4,348	4,980	5,611	6,262	6,936	2.7%
Exports		TEU	4,482	4,665	4,848	5,031	5,214	5,397	6,312	7,230	8,147	9,091	10,071	2.7%
Total		**TEU**	**6,801**	**7,052**	**7,302**	**7,553**	**7,804**	**8,054**	**9,309**	**10,583**	**11,888**	**13,253**	**14,691**	**2.6%**
Imports	TEU/FEU	FEU	1,380	1,421	1,461	1,501	1,542	1,582	1,784	1,996	2,227	2,478	2,750	2.3%
Cont. exports	1.68	FEU	830	864	898	932	966	1,000	1,169	1,339	1,509	1,684	1,866	2.7%
Non-cont. to cont. exports		FEU	1,838	1,913	1,988	2,063	2,138	2,213	2,588	2,964	3,340	3,727	4,129	2.7%
Exports		TEU	2,668	2,777	2,886	2,995	3,103	3,212	3,757	4,303	4,849	5,411	5,994	2.7%
Total		**FEU**	**4,048**	**4,197**	**4,347**	**4,496**	**4,645**	**4,794**	**5,541**	**6,299**	**7,076**	**7,889**	**8,744**	**2.6%**
Volume growth rates														
Imports		YoY%	-	2.9%	2.8%	2.8%	2.7%	2.6%	2.3%	2.2%	2.2%	2.1%	2.1%	2.3%
Cont. exports		YoY%	-	4.1%	3.9%	3.8%	3.6%	3.5%	3.0%	2.6%	2.3%	2.2%	2.0%	2.7%
Non-cont. to cont. exports		YoY%	-	4.1%	3.9%	3.8%	3.6%	3.5%	3.0%	2.6%	2.3%	2.2%	2.0%	2.7%
Total		**YoY%**	**-**	**3.7%**	**3.6%**	**3.4%**	**3.3%**	**3.2%**	**2.8%**	**2.5%**	**2.3%**	**2.2%**	**2.0%**	**2.6%**

Containerized cargoes could provide a new market for ASB that is complementary to its existing transportation business activity. With the right infrastructure and cargo handling equipment, COB operations at ASB could facilitate water-born container service along the Missouri and Mississippi Marine Highways and ultimately provide a connection with the Port of New Orleans. A new water-born container service is speculative in nature, however, since it is now non-existent along these marine highways, and any volume in the study area must materialize from modal changes particularly from rail into barge or river vessels, which will only occur if the river service offers BCOs tangible benefits in terms of a cost/value proposition, without unduly increasing transit time and transit reliability. These and other critical factor as well as the financial viability for each of the cargo types discussed throughout this section will be analyzed in more detail in *Sections 6* and *7*.

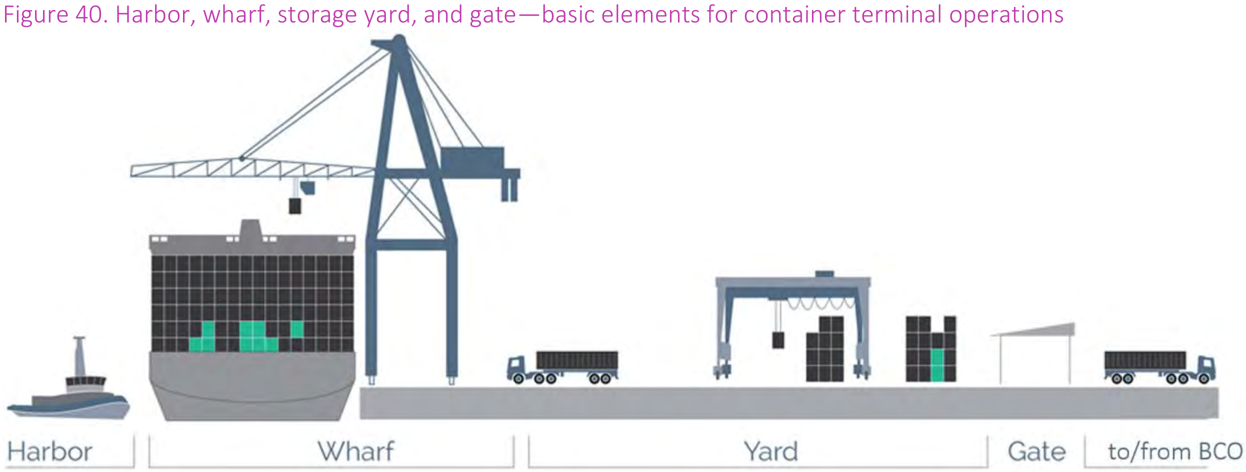
6. Conceptual operational model, project site, and terminal layout

This section aims to provide a basic understanding of the operating procedures typical of marine river terminals as a foundation for COB service. To achieve this, first, this section provides an overview of a conceptual operational model for COB at ASB, including a description of the berth, facility, and equipment, as well as a menu of potential value-added services that could be provided on site. Next, this section provides an overview of the project site conditions, followed by a more detailed description of the terminal layout design and related characteristics. Lastly, this section provides a description of the preliminary construction cost estimates (at the planning level), which will become part of our capital expenditures (capex) estimates in *Section 7*.

6.1 Develop conceptual operational model

Terminal and marine infrastructure, such as the barge or vessel berth, cargo laydown area, barge-to-shore container lifting equipment, in-terminal container handling equipment (CHE), road and possibly rail connections, and bulk-to-container transfer areas, represent critical elements that must be considered in the planning process of a reliable COB terminal. It is too early to provide a comprehensive assessment or description of these elements for the ASB Project, so in this section we provide a general overview of the elements for a container terminal operation. These elements are summarized in Figure 40. These functions are fundamentally the same regardless of the size of the facilities. Hence, these elements provide a general roadmap of the elements that must be considered when developing the infrastructure required to provide COB operations at the ASB Port.

Figure 40. Harbor, wharf, storage yard, and gate—basic elements for container terminal operations



Source: Mercator International.

In addition, some of the diverse value-added services that can be provided on-site are also introduced in this section for consideration in future planning efforts, particularly because some of them directly impact the operational and financial performance of the facility.

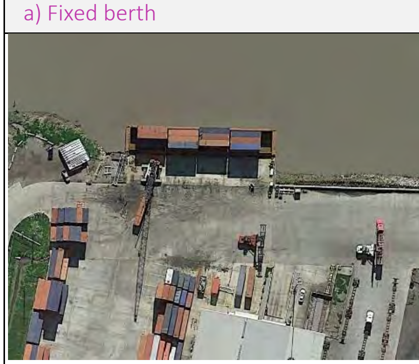
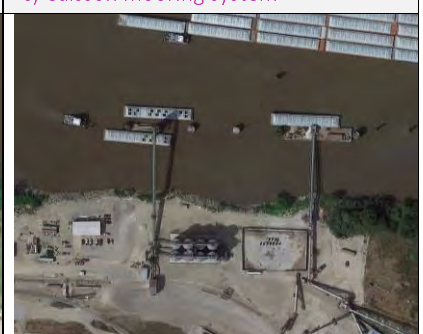
6.1.1 Berth, facility, and equipment

The key elements of a marine river terminal that will influence operations include:

- **Waterside access**. This involves the waterway along the Missouri River (M-70) and the barge fleeting and anchorage sties proposed near the ASB Project. The navigation channels in the Mississippi and Missouri Rivers are maintained by the USACE and subject to their water release program for the river.[30] The USACE is required to allow enough water flow from the dams and reservoirs in the upper basin to support navigation only during the April – November period. Most terminals reporting data have water depths between 12 ft and 10 ft. The design for the ASB Project should provide water depth that is at least comparable to the maintained channel depth. It is reasonable to expect a maximum draft of 10 ft for the COB.

- **Berth.** Mercator identified three variations of berth types along M-70 and M-55: (a) fixed berths, (b) floating dock with either a ramp or a crane, and (c) the Caisson mooring system, as shown in Figure 41. Fixed berths along river systems typically consist of sheet pile structures backfilled to provide the necessary geotechnical support. COB service in mature terminals is typically provided over fixed berths or wharfs. A floating dock with either a ramp or a crane typically consists of a barge alongside a fixed mooring system that may be accessed by ramps from the shoreline. The Caisson system consists of fixed structures such as dolphins or floating cells that connect to walkways and/or loading equipment. The ASB Project is expected to have a berth length of 200 ft with enough water depth alongside. A simple floating dock with either a ramp or a crane can help to minimize capital costs in the early stages of the ASB Project. As more demand materializes in the future, a fixed berth might help to increase operational efficiency.

Figure 41. Variations of berth types along M-70 and M-55

a) Fixed berth	b) Floating dock with a crane	c) Caisson mooring system
		
Secor, Port Allen LA (Jan, 2019).	SCF, Memphis (May, 2020).	L&C, St. Louis (May 2020).

- **Cargo laydown area.** Marine terminals with COB operations typically can follow two formats: (i) grounded and/or (ii) wheeled. Grounded operations can be accommodated in less area, but they require specialized container handling equipment (CHE), such as reach stackers and top-handlers. Wheeled operations involve placing and leaving containers on chassis, and they typically require larger storage areas for the same capacity. Wheeled operations are common in terminals with low volumes. However, it is common for ocean carriers to struggle to provide chassis to service their containers on ocean terminals. Chassis lessors are an alternative to ownership; however, they can become a significant expense. For the ASB Project, it is envisioned that the main yard will operate with primarily grounded operations with a few chassis available to facilitate internal movement of containers.

[30] During drought periods water for agricultural uses has priority over navigational uses. Without dredged waterways, shallow points can be a limiting factor on the size of barges and small river ships that can access the port.

- **Barge loading and unloading equipment.** We expect the ASB container barge loading and discharging to be done with a luffing-type mobile construction crane (adapted for cargo use), or possibly at some point with a faster and more efficient purpose-built mobile harbor crane (MHC) The same crane could also handle occasional movements of breakbulk and project cargoes.
- **Container handling equipment (CHE).** Within the terminal, top-loaders, trucks, and bombcarts are expected to handle the movement between the MHC and the container yard storage areas, and between the storage areas and highway trucks.
- **Intermodal connections**. Since the Port's natural market is considered to be the 35-county area, it is expected that cargo will arrive and depart by truck to and from PA1, PA1.5, and PA2. As analyzed in *Section 5.2*, the ASB Project enjoys substantial highway connections for trucks moving to and from the main yard. Although no railroad service is deemed necessary to serve the 35-county area, the NS main line crosses the ASB Project site and there is sufficient space available for a small rail ramp if, in the future, a need for handling containers to or from rail cars is identified.
- **Bulk-to-container transfer areas.** Over the years, ASB has made significant investments to become a full-service agricultural retailer, grain elevator, feed, and fertilizer supplier. Its infrastructure already includes dry-bulk elevators, bagging plants, barge unloaders, among other infrastructure. We expect that a key capability to support an ASB COB export operation would be the ability to transfer bulk products from storage into containers at the ASB site, so as to avoid the need to move the laden export container on the highway.

An aerial image of Seacor's COB operation at Port Allen, LA showing the typical elements involved in marine river terminal COB operations is shown in Figure 42.

Figure 42. Seacor AMH container-on-barge (COB) operation at Port Allen, LA (Jan, 2019)

Source: Google Earth.

6.1.2 Potential value-added services on-site

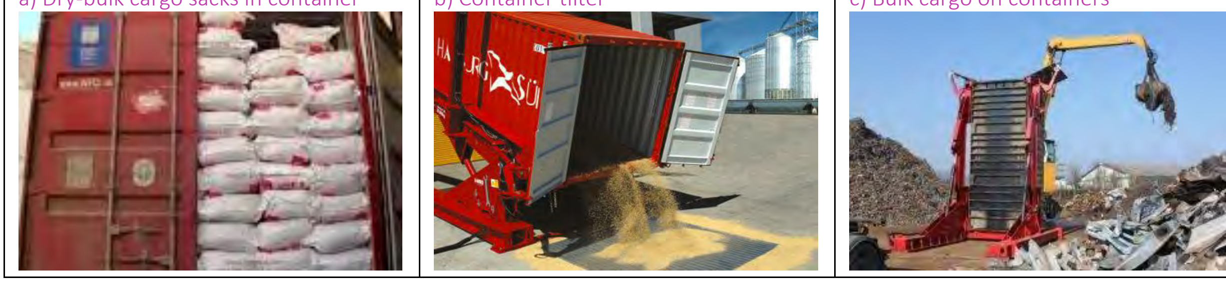
Historically, the majority of cargoes moved along inland rivers have been bulk (e.g. corn, wheat, soy, coal, fertilizer, salt, ores, gravels, among others). Consequently, most existing inland marine terminals in the U.S. are designed to load, unload, and (some) to store non-containerized (bulk) cargoes. Since significant volumes of these commodities are expected to continue moving via ASB, containerization of some of these commodities is a natural cornerstone for ASB's COB program, as well as the value-added services that accompany them. Some examples of potential value-added services that could be provided by ASB include:

- Warehousing, consolidation, cross-docking
- Stuffing
- Labeling, customization, and assembly
- Blending, mixing, and weighing
- Cargo inspections (customs)
- Chassis pool hosting and maintenance
- Trucking and rail support services
- Hazmat

Standard containers can be used to handle and store a wide variety of these commodities. By utilizing a container tilter or other loading device at the COB terminal to facilitate transloading, several types of dry bulk commodities (e.g. grains, ores, scrap steel, non-metallic minerals) can be containerized for shipment by barge. Examples of these commodities and the tilting and transloading processes for different cargo types (e.g. drybulk and breakbulk/scrap metal) are illustrated in Figure 43.

Figure 43. Container loaded with agricultural commodities and container tilter

a) Dry-bulk cargo sacks in container | b) Container tilter | c) Bulk cargo on containers



Source: A-ward.com.

6.1.3 Inland river operations

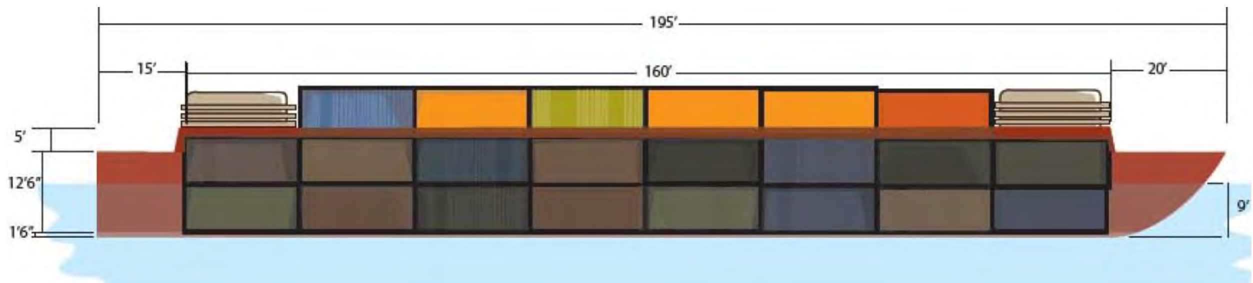
Inland river operations for the ASB Project can be tailored to include a range of reasonable service alternatives, vessel schedules and itineraries, as well as vessel types and sizes. The configuration of vessels that will serve the ASB Project will ultimately reflect the underlying demand for the service, frequency, and price associated with each alternative. In general, services can be classified in two overall categories, (i) conventional tug and barge and (ii) self-powered vessels.

Conventional tug and barge have relatively lower vessel operating costs, travel at slower speeds, and have smaller capacity. The majority of the dry cargo "Mississippi River" barges in service today are either 195 ft or 200 ft box or rake end with covers. These barges have a cargo capacity of 1,450 to 1,540 MT at a loaded draft of 9 ft (the maximum navigable draft provided most of the year on the Missouri River).

For the ASB Project, the initial service is expected to be provided by standard barges similar to those in the SCF fleet). On the standard river barges, 40 ft containers stowed 3-wide by 4-long (12 per layer) times 3 layers high allow for 36 containers (FEUs) per barge, which is the capacity assumed. One single tug can push up to 16 barges. The cargo box dimensions of a typical dry cargo barge are generally 160 ft to 180 ft in length, 28 ft in width and 15 ft to 17.5 ft in depth to the bottom of the covers, as shown in Figure 44. When handling contains, SCF simply removes the covers to eliminate the interference.

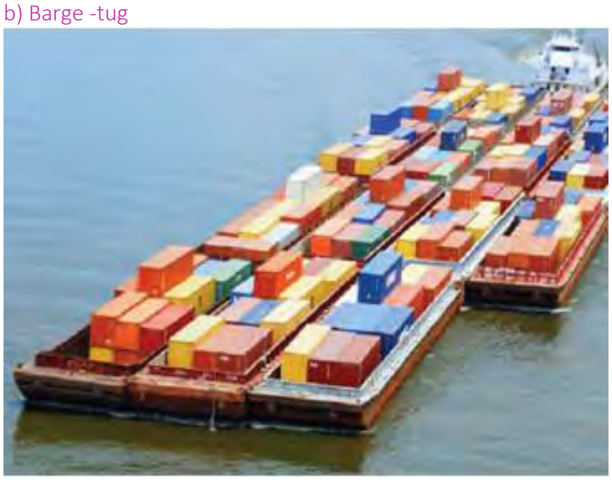
Figure 44. Conventional river barge and container handling on barge

a) Conventional river barge dimensions



Source: COB for Illinois: An Operating Plan and Business Plan (2011).

b) Barge -tug



c) Container-on-barge – terminal handling

Source: International Association of Maritime and Port Executives.

Self-powered riverine container vessels would be more similar to small or medium-sized cellular containerships than to the current river barges. Although not seen now on the rivers of North America, they could offer faster travel speeds and therefore faster delivery of time-sensitive cargos, and provide higher capacity, but would require larger and more highly developed port facilities, with longer berths, multiple high-speed handling cranes, larger container storage capacity, etc. To be economic, they would require a higher density of cargo flows on the river than presently seen, but could be attractive for serving certain higher volume inland points. In order for ASB/Brunswick to become such a high-volume inland hub would require development of considerable infrastructure and service capability both on and around the terminal, including warehousing and distribution capability that presently does not exist.

During the last decade, several designs and prototypes have emerged incorporating innovative engineering concepts such as ultralight hull structures, natural gas or are dual-fuel capable engines, and self-loading/unloading equipment. In the U.S., American Patriot Holdings LLC (APH) has announced an ambitious plan to operate self-propelled container vessels on the Mississippi River, capable of carrying up to 2,300 TEUs between St. Louis and New Orleans.[31] However, we do not expect that such river vessels would serve the ASB Project until later in the stage of the COB service development. Figure 45 shows pictures of some vessel types that could be considered.

[31] American Patriot Holdings LLC (APH) https://www.americanpatriotholdings.com/affiliates1.html

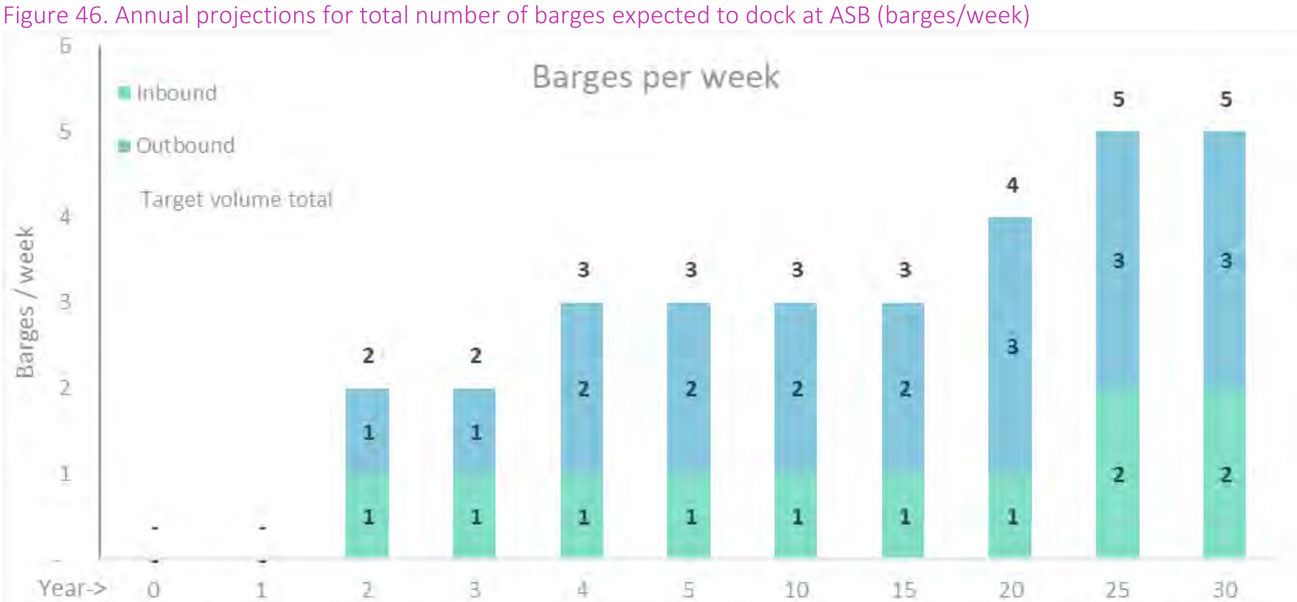
Figure 45. Rendering of American Patriot Holdings (APH)

Source: American Patriot Holdings.

6.1.4 Estimated service frequency

Based on the forecast of potentially divertible volumes estimated in *Section 5.7*, the next step involved estimating the frequency of service that could be expected in the ASB Project. To generate these estimates, the total volumes from the Base Case (Good Result) scenario were each divided by the capacity of a typical Mississippi Barge of 36 FEUs per barge (4 L x 3 W x 3 H). Annual projections for total number of barges per week are shown in Figure 46.

Figure 46. Annual projections for total number of barges expected to dock at ASB (barges/week)



Source: Mercator International.

6.2 Project site conditions

ASB is a 236-acre facility located at the 256-mile marker of the Missouri River. Due to its geographic location, ASB enjoys good multimodal connectivity and accessibility: by barge over the Missouri River, by rail via Norfolk Southern (NS), with connections to Kansas City, Chicago, and St. Louis, and by truck via U.S. Route 24, which provides fast access to I-70 over a four-lane divided highway. The yard for the COB operation must be located in a site that allows for an efficient and fluid flow of truck traffic accounting for the truck traffic growth from dry-bulk operations.

The ASB property boundaries and the project site are shown in Figure 47. Presently, trucks enter the property via an access road that connects the north side of the property with Highway 24. Trucks travel southbound via the access road to load/unload cargo, and exit the premises on the south/central side of the parcel going back on to Highway 24. A rail spur already connects the main NS line to the yard inside the facility. Barge mooring is currently provided using a floating dock with a ramp accessed from the shoreline on the south berth and a barge alongside on the north berth. There is also a barge fleet at the downriver end of the ASB property. The receiving infrastructure for agribulk and drybulk service on the waterside presently consists of a Sennebogan unloader feeding a hopper which is used to feed the elevators on both, the north and south sides.

Figure 47. ASB property boundaries

Source: Google Earth.

Downriver (east in Figure 47), there is a site that already is used to moor barges. Upriver (south in Figure 47), ASB acquired a new parcel (80 acres) of vacant land that is available for future expansions. Both of these sites are available for future development but given the elevations of the ground, significant raising of the land would be required. The whole length of the river adjacent to the ASB property was considered for the COB operations. The USACE has significant stone structures (dikes) upriver & downriver from the present terminal operations. These structures would have to be removed in order for the locations to be considered for future river activities. This did not appear like feasible options given that the adjacent land has a much lower elevation that would have to be elevated significantly to accommodate / survive frequent flood waters. Aside from concerns regarding flooding of the property, there may be wetland issues.

The flood elevations for River Mile 256, the location where the ASB dock is presently located, were provided by ASB and are listed in the following bullets:

- 10 yr - 646.0 ft
- 20 yr - 647.0 ft
- 50 yr - 648.1 ft
- 100 yr - 648.8 ft
- 200 yr - 649.6 ft
- 500 yr - 650.5 ft

Table 21 shows the elevation information from building certificates (green) and other points inside the property (yellow). As observed, most of the land at and surrounding the existing facilities (i.e. the green areas with buildings already developed and next to the dock) are above the 10, 20, 50, and 100 yr flood elevations. The remaining areas are more susceptible to a 10 yr flooding as indicated by the yellow markers. This above provided data was reviewed relative to Missouri River at Miami Missouri data which is approximately 6 miles upriver. Historical high-water data for Miami Missouri is listed in Table 21.[32]

Table 21. High-water data on the Missouri River near the ASB Project site (Miami Missouri)

Top Crest	Elev.	date	Top Crest	Elev.	date	Top Crest	Elev.	date
(1)	653.95	07/30/1993	(11)	649.55	06/07/2015	(21)	646.75	06/26/1947
(2)	652.88	06/01/2019	(12)	648.93	11/04/1998	(22)	646.70	05/29/2020
(3)	650.95	03/26/2019	(13)	648.85	06/30/1999	(23)	646.55	06/20/1943
(4)	650.83	05/11/2007	(14)	648.45	10/12/2018	(24)	646.30	06/08/2001
(5)	650.35	07/16/1951	(15)	648.35	10/06/1998	(25)	646.17	06/22/2001
(6)	650.15	07/10/2011	(16)	648.20	06/01/2013	(26)	646.15	04/25/1944
(7)	649.85	06/19/2010	(17)	648.10	06/14/2008	(27)	645.85	04/29/2016
(8)	649.85	05/29/2016	(18)	648.05	04/17/1999	(28)	645.75	06/26/1996
(9)	649.75	05/20/1995	(19)	647.85	05/29/1996	(29)	645.65	05/18/2015
(10)	649.59	04/01/1998	(20)	647.75	04/25/1952	(30)	645.45	12/17/2015

It was assumed that the majority of the above table's high-water values inundates all but the highest elevations of the terminal, making development in these other areas more costly. As shown in the preliminary layout drawing, we recommend using part of the winter flat storage area for container stacking so as to reduce the need to raise the elevation of additional land and reduce development costs.

Figure 48. Elevations from building certificates (green) and other points inside the property (yellow)

Source: Google Earth.

[32] Data obtained from https://water.weather.gov.

6.3 Terminal layout

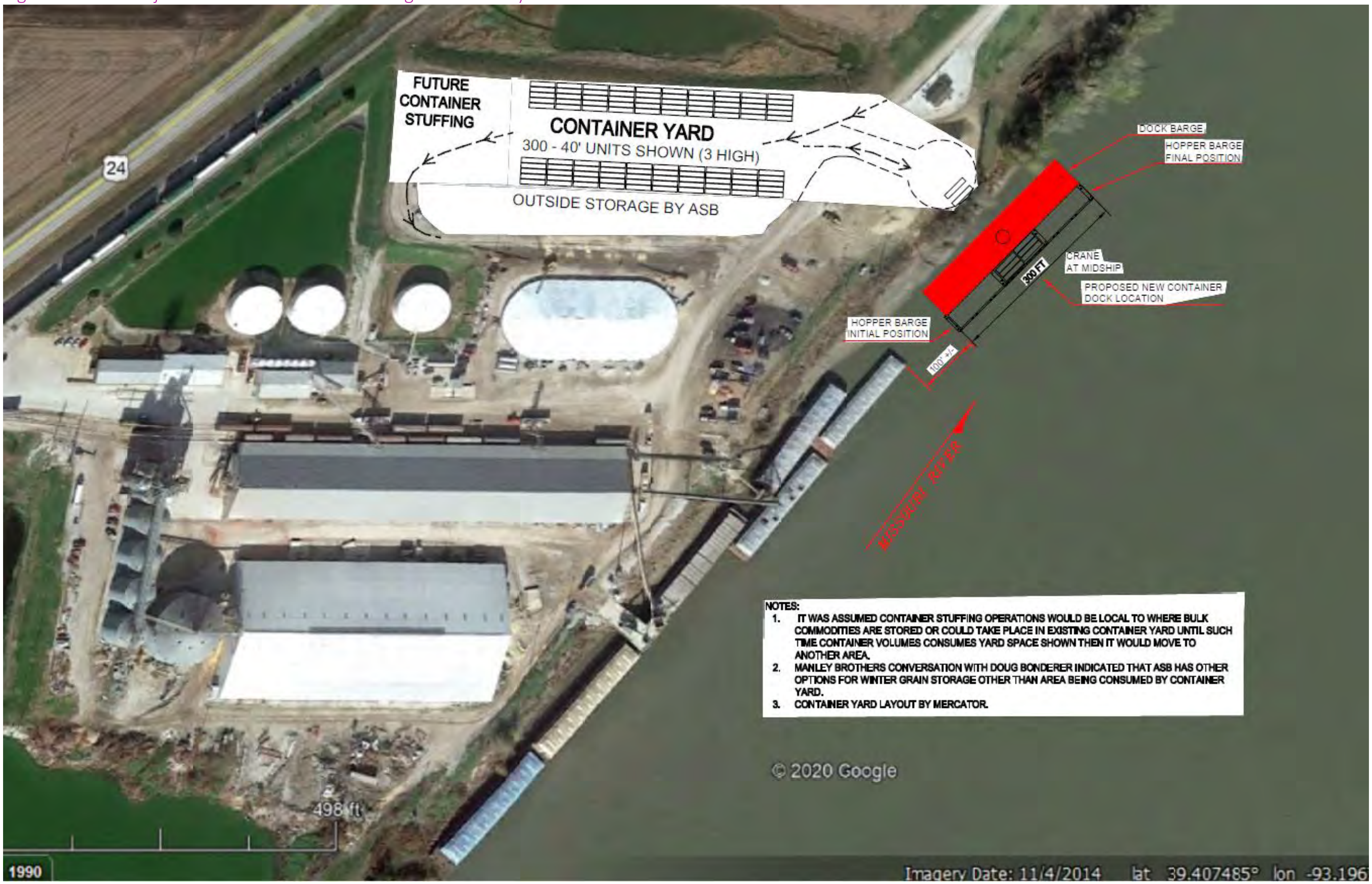
After analyzing a couple of preliminary terminal layout designs, the floating dock was selected due to offering lower initial construction costs. The floating dock concept along with an aerial view of the ASB Project site are shown in Figure 49. In this figure, a 300 ft floating crane barge was spudded down in position adjacent to the downriver end of the grain loading terminal. The crane barge length is nominally 300 ft, more precisely 297 ft as shown in below estimate. This floating platform would be built from a recently retired tank barge (i.e. 30,000 bbl barge). The crane location would be designed and the barge modified to hold a large crane suitable for handling containers from shore.

The dock barge is large enough to serve as berthing for adjacent hopper barges. A barge haul system on the dock barge was specified to allow for hopper barge movement from start to finish of loadout. This COB loading area is adjacent to the area of the terminal where the winter grain flat storage is presently located. Placing the container yard stacking area in the area now used for winter flat storage avoids the need to develop an entirely new area for container handling, and thereby minimizing new development costs.

During the load out process, the crane on the dock barge would routinely rotate 180 degrees to place and retrieve containers from shore. As the barge fills up, the barge haul system would move the barge downriver.[33] The containers on shore (ie. not on a platform), which would be on transfer trucks/bombcarts. These trailers would simply be moved between the dock and the staging area in the yard. Top-loaders will unload/load the containers between the trucks and the storage area. Given the seasonality of the Missouri River navigation, it is expected that the container yard would be nearly empty of containers by the time the last barge is shipped out. The container yard could then be used for the winter storage of grain. At this stage of the project, the container yard was arbitrarily shown along the northern edge of the elevated winter grain storage area. Preliminary layout drawings are shown in Figure 49 through Figure 52.

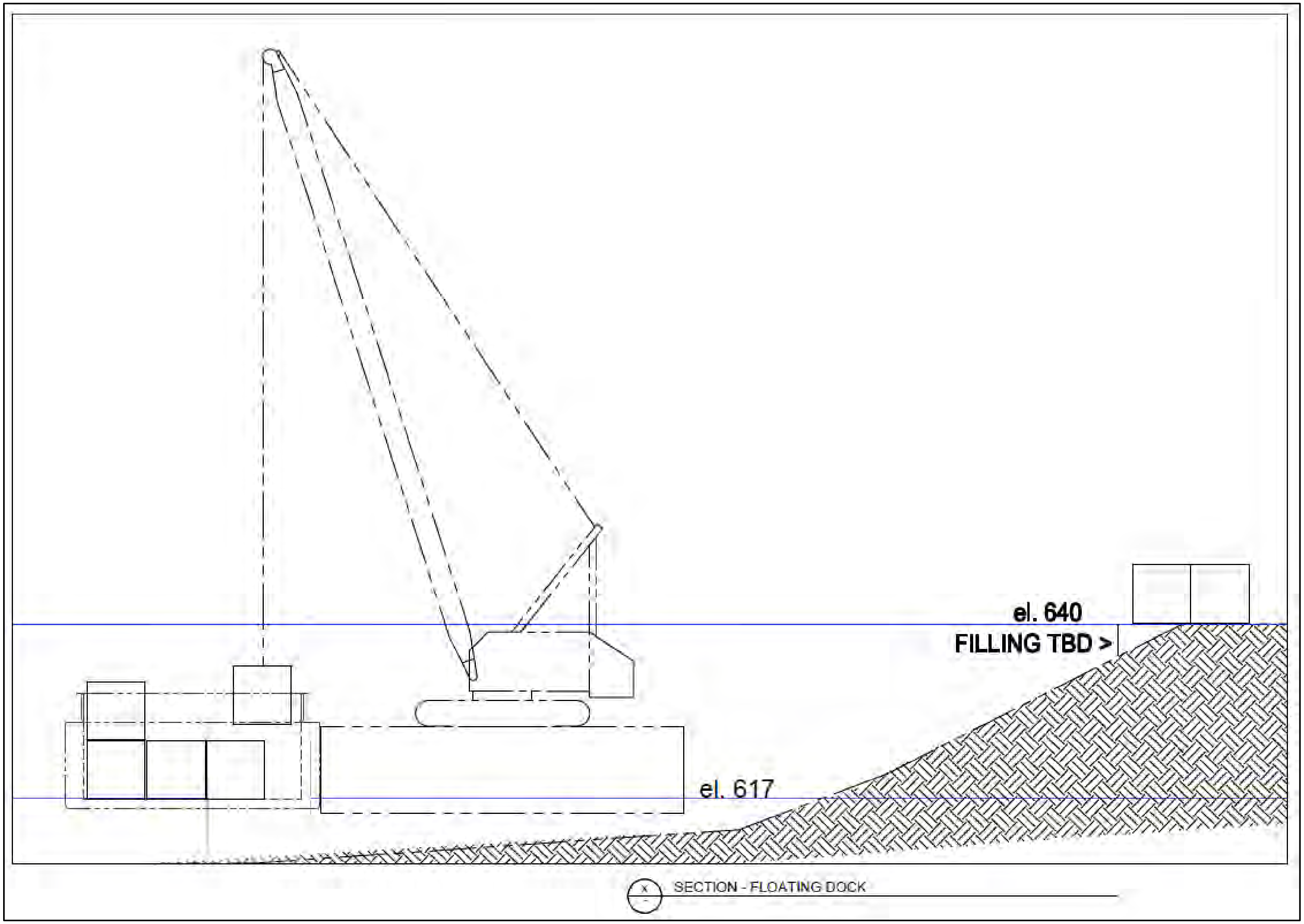
[33] The use of a barge haul positioning system is recommended to minimize startup costs. However, we recommend that ASB considers the acquisition of a barge handling tug for the long-run. A barge handling tug has been included in the budget for our capex estimates. However, we have not added the cost for the tug crew and maintenance, fuel, etc, which could be meaningful because of the degree of uncertainty in the shape of this operation at this stage of the project and it is included as optional or if needed. For example, if there is value for ASB in its other operations, ASB could impose and additional fee for this service and charge it directly to the BCOs or to the barge operator. Alternatively, ASB could lease the right to use the barge to a third-party operator in exchange of a rent payment, or some sort of hybrid approach.

Figure 49. ASB Project: site and container-on-barge terminal layout



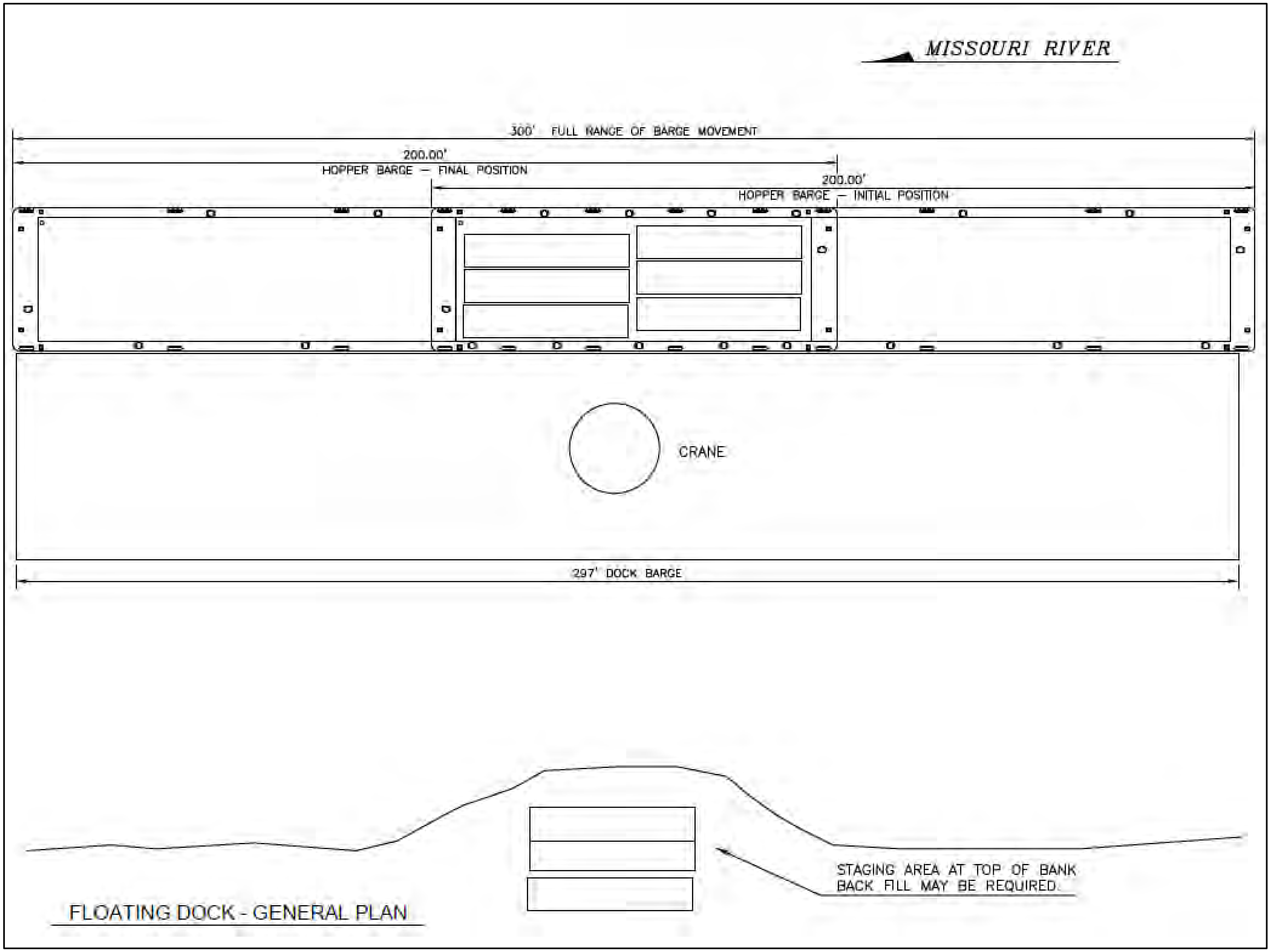
Source: Manley Brothers.

Figure 50. ASB Project: container-on-barge floating dock concept layout—cross sectional view



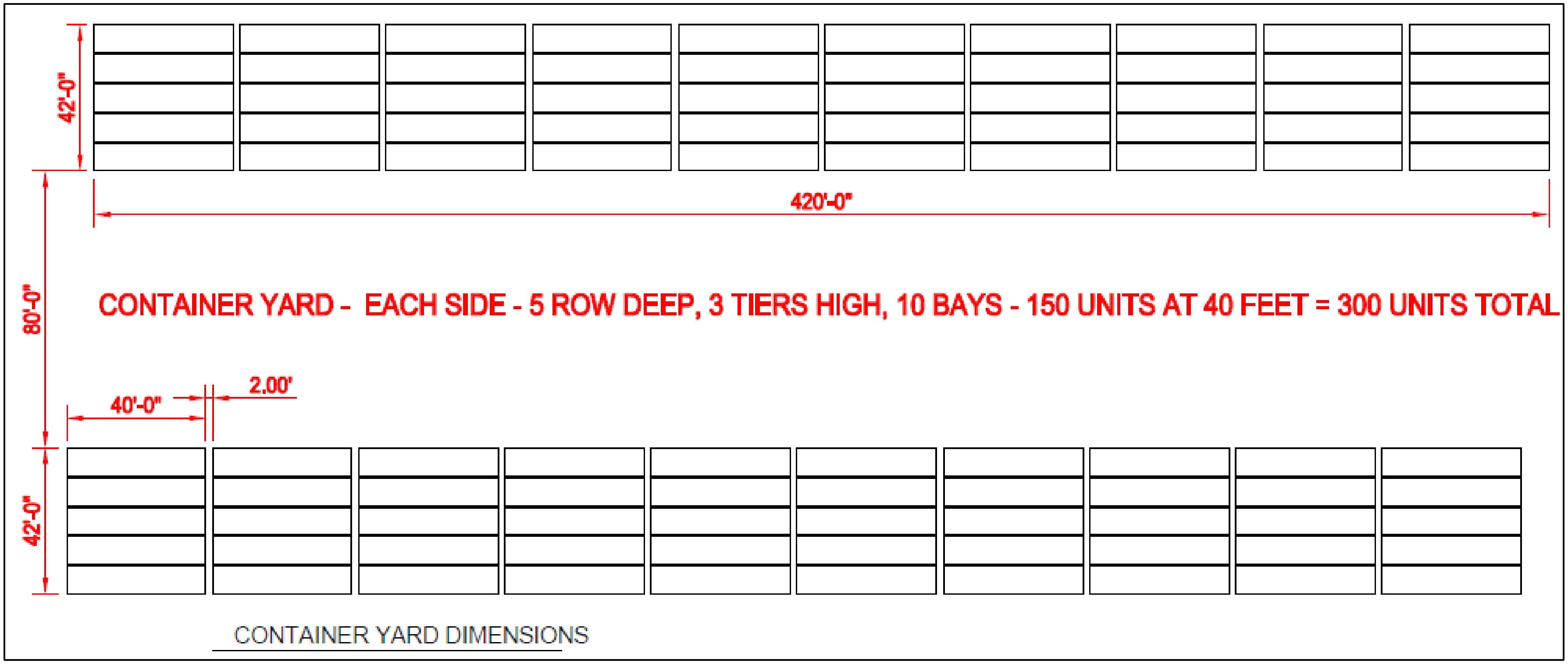
Source: Manley Brothers.

Figure 51. ASB Project: container-on-barge floating dock concept layout—top (plan) view



Source: Manley Brothers.

Figure 52. ASB Project: container-on-barge floating dock concept layout—top (plan) view



Source: Manley Brothers.

6.4 Estimated construction costs

The estimate of probable construction costs for the COB floating dock is provided in Table 22. The total cost is anticipated to be about **$5.24 million**. Infrastructure items under category 1. Floating crane on barge and category 3. Container handling equipment represent about 22% and 31% (a combined 53%) of the total cost, excluding the contingency, making them the most significant items. Category 2e. Barge handling tug represents 10% of the total cost. All other items are less than 6%. While not strictly required, the local tug would provide operational flexibility and could also support the existing barge business.

Table 22. Estimated construction costs

1. Floating crane on barge - Option 1	Item	Qty	Unit	Unit Cost	Cost Total
Dock Barge - 54' by 297' by 12' deep (Retired Tank)	1.A	1	Each	$650,000	$650,000
Dock Barge (Crane Reinforcement)	1.B	1	Each	$85,000	$85,000
Dock Barge (Mooring piles- spuds & wells)	1.C	1	Each	$65,000	$65,000
Crew Access Gangway & Hoisting System	1.D	1	LS	$40,000	$40,000
Crew Break Room	1.E	1	LS	$10,000	$10,000
Marine Contractor Day Rate - Crane / Barge / Crew	1.F	14	Day(s)	$15,000	$210,000
Subtotal					**$1,060,000**
2. Marine construction (barge handling)	**Item**	**Qty**	**Unit**	**Unit Cost**	**Cost Total**
Barge Haul Positioning winches	2.A	1	Each	$163,500	$163,500
Barge Breasting System & Slide Line	2.B	1	Each	$35,000	$35,000
Sales Tax of 8% on Materials / Equipment	2.C	8%	Exempt	$0	$0
Contractor Markup	2.D	15%		$29,775	29,800
Subtotal					**$228,300**
2e. Barge handling tug	**Item**	**Qty**	**Unit**	**Unit Cost**	**Cost Total**
Barge handling tug	2.E	1	LS	$500,000	**$500,000**
Subtotal					**$500,000**
3. Container handling equipment	**Item**	**Qty**	**Unit**	**Unit Cost**	**Cost Total**
Crane - Refurbished (incl. delivery)	3.A	1	Each	$750,000	$750,000
Container Handling Forklift	3.B	2	Each	$350,000	$700,000
Container Spreader Bar for Crane	3.C	1	Each	$40,000	$40,000
Bombcarts	3.D	3	Each	$15,000	$45,000
Tractors	3.E	3	Each	$65,000	$195,000
Container tilter machine	3.F	1	Each	$80,000	$80,000
Subtotal					**$1,810,000**
4. Miscellaneous equipment	**Item**	**Qty**	**Unit**	**Unit Cost**	**Cost Total**
[Electrical] Winches & Crew Break Room	4.A	1	LS	$35,000	$35,000
Misc. safety, equipment	4.B	1	LS	$5,000	$5,000
Subtotal					**$40,000**
4c. Site work	**Item**	**Qty**	**Unit**	**Unit Cost**	**Cost Total**
Road: compact. limestone - 12" of 3/4" Clean	4.C	10,000	SF	$3.35	$34,000
Yard: compact. limestone - 12" of 3/4" Clean	4.C	74,000	SF	$3.35	$247,000
Subtotal		84,000			**$281,000**
5. Engineering & surveying	**Item**	**Qty**	**Unit**	**Unit Cost**	**Cost Total**
Marine Engineering	5.A	1	LS	$80,000	$80,000
Electrical Engineering	5.B	1	LS	$10,000	$10,000
Site Surveying	5.C	1	LS	$15,000.00	$15,000
Subtotal					**$105,000**
Total (before contingency)					**$4,024,300**
6. Contingency		**30%**		$1,207,290	$1,207,290
Grand total					**$5,240,000**

Source: Manley Brothers & Mercator.

7. Benefit-Cost Analysis

This section presents the description of Benefit-Cost Analysis (BCA) framework and the project financial plan for the ASB Project utilized by Mercator. Consistent with the USDOT and MARAD's guidelines and principles, our BCA framework systematically identifies, quantifies, and compares the monetized dollar value of the benefits and costs expected to accrue from the ASB Project. Benefit factors include operating public benefits such as reduction in freight transportation costs (route efficiency), emissions, safety and accidents, and state of good repair. Cost factors include capital costs for construction and equipment, facility maintenance costs, and operating costs. Each of these benefits and costs, their assumptions, and modelling outputs are analyzed in the following sections. Finally, this section presents the results of the BCA, BCA ratios, and overall conclusions of this analysis.

7.1 BCA framework and project financial plan

7.1.1 BCA framework

The construction of our BCA Model and its assumptions are based on guidelines and general principles provided by two main documents:

- *Port Planning and Investment Toolkit: Marine Highway Projects Module (PP&IT)*. U.S. Department of Transportation, MARAD, and AAPA, August 2020.[34]
- *Benefit Cost Analysis (BCA) Guidance for Discretionary Grant Programs*. Office of the Secretary U.S. Department of Transportation, January 2020.[35]

Based on these guidelines, the first step of our BCA framework was to verify that the goals of the ASB Project were aligned with the strategic goals of MARAD's marine highway program (this was done in *Sections 3* and *5)*. The second step analyzed the financial feasibility of the ASB Project to implement a COB service in a realistic, profit-oriented manner (as will be explained in *Section 7.1.2*). The third step involved gathering the data inputs for each of the variables required to quantify the project benefits from the sources recommended by the USDOT and MARAD application guidelines. These variables in combination with the costs savings derived from the traffic volumes diverted from rail to barge comprise the benefits module of our model, which is the fourth step of our approach. These benefits are broken down into the following: freight transportation, freight emissions, safety, and state of good repair, each explained next.

- **Freight transportation cost savings (route cost savings)—**This benefit captures the cost savings from transporting goods over the proposed barge route via ASB as opposed to the incumbent routes via railroad to/from the major import/export gateway ports. The inputs used in the estimation of these benefits were described in *Section 5.3*. Benefits are calculated by multiplying freight volumes over each route by their corresponding unit operating costs for each mode involved on each route (i.e. FEU x $/FEU for ocean, truck, rail, and barge). The transportation costs for the incumbent routes (without project) minus the costs via the ASB route (with project) capture the net reduction in freight transportation costs (i.e. the net benefits from the project).

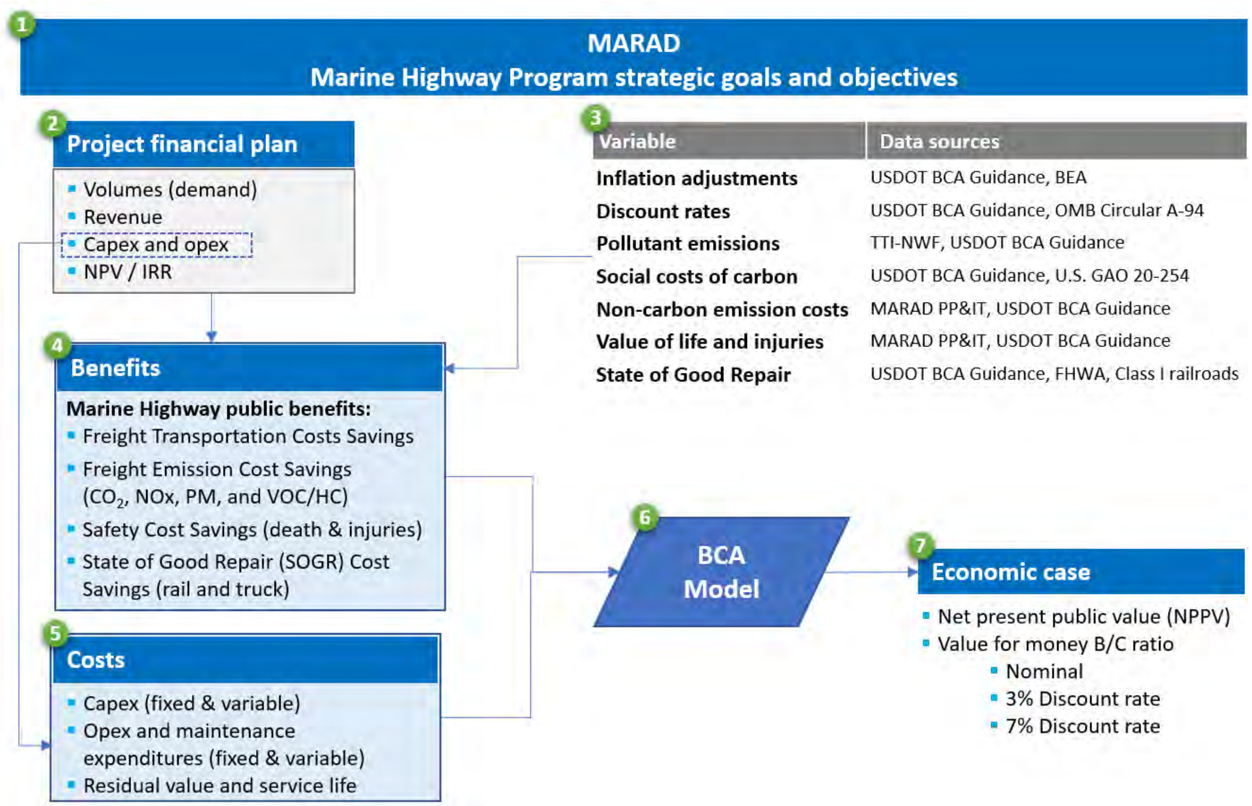
[34] *Port Planning and Investment Toolkit: Marine Highway Projects Module (PP&IT)*. U.S. Department of Transportation, MARAD, and AAPA, August 2020, available online at: https://www.maritime.dot.gov/grants-finances/marine-highways/port-planning-and-investment-toolkit-marine-highway-projects-module.

[35] *Benefit Cost Analysis (BCA) Guidance for Discretionary Grant Programs*. Office of the Secretary U.S. Department of Transportation, January 2020, available online at: https://www.transportation.gov/office-policy/transportation-policy/benefit-cost-analysis-guidance-discretionary-grant-programs-0.

- **Carbon emissions**—This category of project benefits captures the net savings in carbon (CO_2) emissions resulting from ton-miles saved due to freight diversion from the incumbent routes (truck + rail) to the COB service (truck + barge) alternative.
- **Non-carbon emissions**—This category include damage costs associated with hydrocarbons and volatile organic compounds (VOC), nitrogen oxides (NOx), and particulate matter (PM) emissions resulting from ton-miles saved due to freight diversion from the incumbent routes (truck + rail) to the COB service (truck + barge) alternative.
- **Safety**—This category of project benefits captures the net savings in traffic crash costs resulting from ton-miles saved due to freight diversion from the incumbent routes (truck + rail) to the COB service (truck + barge) alternative.
- **State of good repair**—This benefit category captures the net savings in pavement and rail track maintenance costs resulting from ton-miles saved due to freight diversion from the incumbent routes (truck + rail) to the COB service (truck + barge) alternative.

Capex and opex from the project financial model are incorporated into the BCA Model. For the last step of our framework, the BCA Model estimates the net present public value (NPPV) and benefit/cost ratios (B/C). When the B/C ratio is greater than one, viability for the economic case of the project is confirmed (i.e. public benefits/societal value from the project are greater than its costs). The model calculates costs based on the incumbent routes (without project) and cost savings derived from the volume of tons diverted from rail to barge (with project) and the mileage associated with each route and mode. The BCA framework applied to the ASB Project is shown in Figure 53.

Figure 53. Benefit-cost analysis framework for ASB Project



Source: Mercator International.

7.1.2 Project financial plan

Mercator constructed a financial model incorporating the outputs of the market demand projections, the diversion rates to the ASB Project, capex, opex, and potential rates to analyze the financial viability of the project from a private investor perspective. Indicative quotes and estimates were obtained from independent research from online sources and third-party vendors and service providers. A detailed description of the Project Financial Plan and its calculations is included in *Appendix 3*. The capex and opex components that comprise our BCA Model are explained next.

Capex

Mercator developed scenario-based capex calculations utilizing the initial capital costs estimated by Manley Brothers (as described in *Section 6.4*). Given the size of the investment, it is reasonable to assume that the project will be constructed in less than one year; hence, initial capex costs are modeled to occur all in Year 1. Capex related to *handling equipment* consider only the minimum necessary to handle the expected container volumes. Capex related to *construction and civil works* consider only the minimum necessary for the business to operate. Based on the Base Case volumes, our model indicated no need for further expansion capex; hence, the total capex for the 30-year period remained at $5.24 million. Additionally, these are discounted at the 3% and 7% rates for the BCA per USDOT guidelines, as illustrated in Table 23.

Opex

Mercator assumed the minimum operating expenses necessary for the operation and the facility. Opex costs are modelled to begin in Year 2 which is when construction has completed, the facility opens to the public, and traffic volumes begin. Opex are grouped in three main categories according to their operational characteristics:

(i) Direct costs for containers
(ii) Indirect costs
(iii) Selling, General and Administrative (SG&A)

Variable expenses, are calculated as a function of the expected volume for the container flows and transloading—labeled as direct costs for containers. Fixed expenses include indirect/overhead and SG&A and are only adjusted for inflationary changes. Based on the Base Case volumes, our model indicated $22.9 million in total opex for the 30-year period. Additionally, these are discounted at the 3% and 7% rates for the BCA, as illustrated in Table 23.

Table 23. ASB Project financial modeling framework overview

Inputs for the BCA Model	Discount rate	Capex ($)	Opex ($)
Net present value (in 2020$)	0%	5,240,000	22,919,000
Discounted at:	3%	5,090,000	13,570,000
Discounted at:	7%	4,900,000	7,531,000

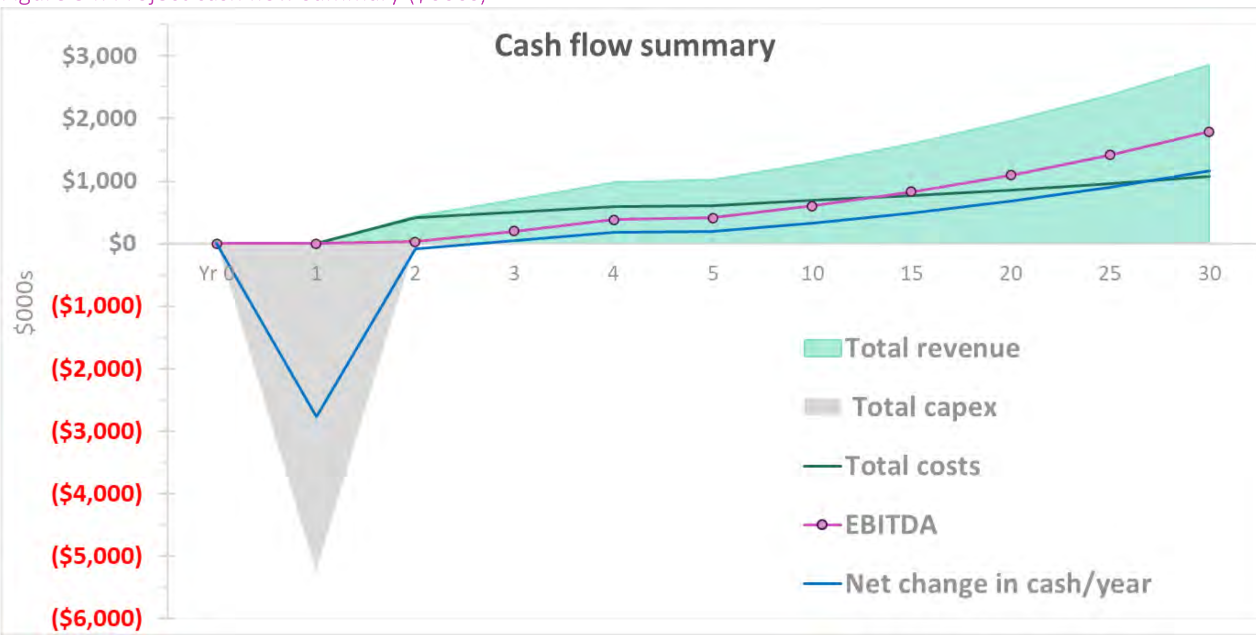
Project financial plan summary

The project produces significant positive earnings by year 3 (EBITDA of $196,000) and a positive net income, after considering interest, taxes, depreciation, and amortization over the life of the project by year 4 (of $38,000). The internal rate of return is 10.8% which is just above the 9.5% WACC used as the discount rate, which would be the minimum return needed to invest in the project. A summary of the key outputs from the financial model is shown in Table 24. The cash flow statement indicates that the project will reach a positive cash flow by year 3, as shown in Figure 54 along with other financial indicators.

Table 24. Project financial plan summary ($000s)

Summary of outputs	Yr 1 2021	Yr 2 2022	Yr 3 2023	Yr 4 2024	Yr 5 2025	Yr 10 2030	Yr 20 2040	Yr 30 2050
Volume (TEUs)	-	3,651	5,665	7,804	8,054	9,309	11,888	14,691
Gross revenue ($000s)	-	439	693	972	1,022	1,290	1,956	2,862
Total costs ($000s)	-	(411)	(497)	(594)	(609)	(687)	(861)	(1071)
EBITDA ($000s)	-	28	196	378	412	603	1,096	1,790
Net Income ($000s)	(114)	(220)	(96)	38	65	214	605	1,168

Figure 54. Project cash flow summary ($000s)



7.2 BCA model assumptions and outputs

7.2.1 Freight transportation costs (routes utilized)

Mercator calculated the route costs for containerized cargo by leg and by mode—ocean, truck, rail, and barge—for the incumbent routes, and then compared them to the routes that cargo would follow via the ASB Project. Once cost inputs were obtained or calculated for each cost component of each route, all costs were converted to dollars per FEUs ($/FEU) and multiplied times the estimated divertible volume (in FEUs) for each tradelane, gateway, and PA combination (as described in *Section 5.3*). The total route costs for the key incumbent routes minus the total route costs via the ASB Project routes capture the net reduction in freight transportation cost from displacing railcars versus the marine highway alternative.

The values and key inputs and sources used in estimation of this benefit category include:

- Freight transportation costs ($/FEU) per mode involved (truck, rail, barge) for each route
- Freight tonnage (in MT, converted to FEUs) diverted to the marine highway via the ASB Project
- Truck, rail, and barge payload factors to convert MT to FEUs (as described in *Section 5.3*).

Total net savings in freight transportation costs resulting from the ASB Project over the 30-year analysis period, account for $46.7 million (in 2020$), equivalent to $27.4 million in benefits at a 3% discount rate, and to $14.9 million at a 7% discount rate, as illustrated in Table 25.

Table 25. Freight transportation cost benefits from the ASB Project

Year	Calendar year	Total freight transportation cost savings (in 2020$, thousands)			NPV of TOTAL freight transportation cost savings ($000)*	
		Imports	Exports	TOTAL	3.0%	7.0%
0	2020	$ -	$ -	$ -	$ -	$ -
1	2021	$ -	$ -	$ -	$ -	$ -
2	2022	$ 141	$ 276	$ 417	$ 393	$ 364
3	2023	$ 221	$ 436	$ 658	$ 602	$ 537
4	2024	$ 308	$ 613	$ 921	$ 818	$ 703
5	2025	$ 321	$ 646	$ 967	$ 834	$ 689
6	2026	$ 335	$ 679	$ 1,014	$ 849	$ 676
7	2027	$ 349	$ 713	$ 1,062	$ 864	$ 662
8	2028	$ 364	$ 748	$ 1,112	$ 878	$ 647
9	2029	$ 379	$ 784	$ 1,163	$ 891	$ 633
10	2030	$ 394	$ 821	$ 1,216	$ 905	$ 618
11	2031	$ 410	$ 860	$ 1,270	$ 917	$ 603
12	2032	$ 427	$ 899	$ 1,326	$ 930	$ 589
13	2033	$ 444	$ 939	$ 1,383	$ 942	$ 574
14	2034	$ 462	$ 981	$ 1,442	$ 954	$ 559
15	2035	$ 480	$ 1,024	$ 1,504	$ 965	$ 545
16	2036	$ 499	$ 1,067	$ 1,566	$ 976	$ 531
17	2037	$ 519	$ 1,112	$ 1,631	$ 987	$ 516
18	2038	$ 539	$ 1,159	$ 1,698	$ 997	$ 502
19	2039	$ 561	$ 1,206	$ 1,767	$ 1,007	$ 488
20	2040	$ 583	$ 1,255	$ 1,837	$ 1,017	$ 475
21	2041	$ 605	$ 1,305	$ 1,910	$ 1,027	$ 461
22	2042	$ 629	$ 1,356	$ 1,985	$ 1,036	$ 448
23	2043	$ 653	$ 1,409	$ 2,063	$ 1,045	$ 435
24	2044	$ 679	$ 1,466	$ 2,144	$ 1,055	$ 423
25	2045	$ 705	$ 1,523	$ 2,228	$ 1,064	$ 411
26	2046	$ 732	$ 1,583	$ 2,315	$ 1,073	$ 399
27	2047	$ 761	$ 1,644	$ 2,404	$ 1,082	$ 387
28	2048	$ 790	$ 1,706	$ 2,496	$ 1,091	$ 375
29	2049	$ 820	$ 1,770	$ 2,590	$ 1,099	$ 364
30	2050	$ 851	$ 1,836	$ 2,687	$ 1,107	$ 353
Totals cumm.	**$000**	**$ 14,962**	**$ 31,815**	**$ 46,777**	**$ 27,407**	**$ 14,967**

*NPV= TOTAL / (1+Disc. Rate)^Yr

7.2.2 Freight emissions cost savings

This category of project benefits captures the net savings in carbon (CO_2) and non-carbon emission damage costs resulting from ton-miles saved due to freight diversion from the incumbent routes (truck + rail) to the COB service (truck + barge) alternative. Non-carbon emissions include hydrocarbons and volatile organic compounds (VOC), nitrogen oxides (NOx), and particulate matter (PM).

To estimate this benefit, the first step involved multiplying ton-miles for each component of the incumbent routes (truck + rail) times the freight emission rates for each mode (see Table 26). Next, the freight emissions were multiplied by the damage costs per unit for each non-carbon air pollutants (see Table 27). The same process was repeated for the COB service (truck + barge) alternative, but accounting instead for the barge emission rates and corresponding ton-miles. The total route costs for the key incumbent routes minus the total route costs via the ASB Project routes capture the net reduction in non-carbon emission costs from displacing railcars versus the marine highway alternative. This estimation involved converting grams to MT for the non-carbon emissions (i.e. HC, NOx, and PM) and updating the non-carbon emission damage costs from 2018$ to 2020$ using the GDP deflator, as recommended by the guidelines.[36]

Table 26. Freight emission rates by mode (grams / ton-mi)

Emission rates by mode	Units	Non-carbon			Carbon
		HC	NOx	PM	CO2
Inland tow (Barge)	gr / ton-mi	0.0094	0.2087	0.0056	15.62
Railroad	gr / ton-mi	0.0128	0.2830	0.0108	21.19
Truck	gr / ton-mi	0.0800	0.9400	0.0500	154.08

Source: Modal Comparison of Domestic Freight Transportation. Prepared for MARAD and NWF by TTI, Jan 2017, Table 8, pg.40.

Table 27. Non-carbon emission damage costs (converted to 2020 $ / metric-ton)

Non-carbon emission costs	$ / ton 2018	$ / ton 2020	$ / MT 2020
HC	$2,100	$2,200	$2,400
NOx	$8,600	$8,900	$9,800
PM	$387,300	$397,800	$438,100

Source: U.S. DOT Benefit-Cost Analysis (BCA) Guidance for Discretionary Grants, Jan 2020, Table A6, pg.33.

Regarding the social cost of carbon (SCC) dioxide (CO_2) emissions, a similar process was followed but utilizing instead the SCC emission costs per unit. Once the ton-miles for each component of the incumbent routes (truck + rail) times the freight emission rates for each mode (in Table 26 above) were calculated, the freight emissions were multiplied by the unit emission damage costs for the SCC (Table 28). The total route costs for the key incumbent routes minus the total route costs via the ASB Project routes capture the net reduction in CO_2 emission costs from displacing railcars versus the marine highway alternative. This estimation involved converting grams to short-tons for the CO_2 emissions.

Table 28. Social cost of carbon (SCC) emissions (in 2020 $ / metric-ton)

Social Cost of Carbon Emissions (SCC CO2)		2020	2025	2030	2035	2040	2045	2050
Current Approach: 2018 ACE Rule (in 2018 dollars)								
3.0% Discount Rate	$/MT	$ 7.00	$ 7.00	$ 8.00	$ 9.00	$ 9.00	$ 10.00	$ 10.00
7.0% Discount Rate	$/MT	$ 1.00	$ 1.00	$ 1.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00
Current Approach: 2018 ACE Rule (in 2020 dollars)								
3.0% Discount Rate	$/MT	$ 7.19	$ 7.19	$ 8.22	$ 9.24	$ 9.24	$ 10.27	$ 10.27
7.0% Discount Rate	$/MT	$ 1.03	$ 1.03	$ 1.03	$ 2.05	$ 2.05	$ 2.05	$ 2.05

Sources: U.S. GAO - Social Cost of Carbon, Jun 2020, Fig. 1, pg.16 https://www.gao.gov/assets/710/707871.pdf.
U.S. DOT Benefit-Cost Analysis (BCA) Guidance for Discretionary Grants, Jan 2020, Table A7, pg.34.

[36] BEA, December 2020. Table 1.1.9. Implicit Price Deflators for Gross Domestic Product.

Non-carbon emissions

Total net savings due to the SCC resulting from the port development project over the 2020-2050 timeframe, account for nearly $51.1 million (in 2020 dollars), equivalent to $30.1 million in benefits at a 3% discount rate, and $18.9 thousand in benefits at a 7% discount rate, as illustrated in Table 29.

Table 29. Non-carbon emissions (HC, NOx, PM) cost benefits from the ASB Project

		Non-carbon emissions (HC, NOx, PM) cost savings (in 2020$, thousands)			NPV of TOTAL non-carbon cost savings ($000)*	
Year	**Calendar year**	**Imports**	**Exports**	**TOTAL**	**3.0%**	**7.0%**
2020	**0**	$ -	$ -	$ -	$ -	$ -
2021	**1**	$ -	$ -	$ -	$ -	$ -
2022	**2**	$ 185	$ 704	$ 889	$ 838	$ 790
2023	**3**	$ 194	$ 743	$ 937	$ 857	$ 784
2024	**4**	$ 202	$ 783	$ 985	$ 875	$ 778
2025	**5**	$ 211	$ 824	$ 1,035	$ 893	$ 770
2026	**6**	$ 220	$ 867	$ 1,087	$ 910	$ 762
2027	**7**	$ 229	$ 911	$ 1,140	$ 927	$ 754
2028	**8**	$ 239	$ 955	$ 1,194	$ 943	$ 744
2029	**9**	$ 249	$ 1,002	$ 1,250	$ 958	$ 734
2030	**10**	$ 259	$ 1,049	$ 1,308	$ 973	$ 724
2031	**11**	$ 269	$ 1,098	$ 1,367	$ 988	$ 714
2032	**12**	$ 280	$ 1,148	$ 1,428	$ 1,002	$ 703
2033	**13**	$ 291	$ 1,200	$ 1,491	$ 1,015	$ 691
2034	**14**	$ 303	$ 1,253	$ 1,556	$ 1,029	$ 680
2035	**15**	$ 315	$ 1,307	$ 1,622	$ 1,041	$ 668
2036	**16**	$ 328	$ 1,363	$ 1,691	$ 1,054	$ 657
2037	**17**	$ 340	$ 1,421	$ 1,761	$ 1,066	$ 645
2038	**18**	$ 354	$ 1,480	$ 1,834	$ 1,077	$ 633
2039	**19**	$ 368	$ 1,540	$ 1,908	$ 1,088	$ 621
2040	**20**	$ 382	$ 1,603	$ 1,985	$ 1,099	$ 609
2041	**21**	$ 397	$ 1,667	$ 2,064	$ 1,109	$ 596
2042	**22**	$ 413	$ 1,732	$ 2,145	$ 1,120	$ 584
2043	**23**	$ 429	$ 1,800	$ 2,229	$ 1,129	$ 572
2044	**24**	$ 446	$ 1,872	$ 2,317	$ 1,140	$ 561
2045	**25**	$ 463	$ 1,946	$ 2,408	$ 1,150	$ 549
2046	**26**	$ 481	$ 2,021	$ 2,502	$ 1,160	$ 538
2047	**27**	$ 499	$ 2,099	$ 2,598	$ 1,170	$ 527
2048	**28**	$ 518	$ 2,179	$ 2,697	$ 1,179	$ 515
2049	**29**	$ 538	$ 2,261	$ 2,799	$ 1,188	$ 504
2050	**30**	$ 559	$ 2,345	$ 2,904	$ 1,196	$ 493
Totals cummulative		**$ 9,960**	**$ 41,174**	**$ 51,135**	**$ 30,176**	**$ 18,901**

*NPV= TOTAL / (1+Disc. Rate)^Yr

Social cost of carbon (SCC) emissions

Total net savings due to the SCC resulting from the port development project over the 2020-2050 timeframe, account for nearly $1 million (in 2020 dollars), equivalent to $572 thousand in benefits at a 3% discount rate, and $318 thousand in benefits at a 7% discount rate, as illustrated in Table 30.

Table 30. Social cost of carbon (SCC) emissions cost benefits from the ASB Project

		Social Cost of Carbon Emissions (SCC) CO2 cost savings (in 2020$, thousands, using 3% SCC)			NPV of TOTAL SCC cost savings ($000)*	
Year	**Calendar year**	**Imports**	**Exports**	**TOTAL**	**3.0%**	**7.0%**
0	**2020**	$ -	$ -	$ -	$ -	$ -
1	**2021**	$ -	$ -	$ -	$ -	$ -
2	**2022**	$ 4	$ 14	$ 18	$ 17	$ 16
3	**2023**	$ 4	$ 14	$ 18	$ 17	$ 15
4	**2024**	$ 4	$ 15	$ 19	$ 17	$ 15
5	**2025**	$ 4	$ 15	$ 20	$ 17	$ 14
6	**2026**	$ 4	$ 16	$ 20	$ 17	$ 14
7	**2027**	$ 5	$ 16	$ 21	$ 17	$ 13
8	**2028**	$ 5	$ 17	$ 22	$ 17	$ 13
9	**2029**	$ 5	$ 17	$ 22	$ 17	$ 12
10	**2030**	$ 6	$ 20	$ 26	$ 19	$ 13
11	**2031**	$ 6	$ 21	$ 27	$ 19	$ 13
12	**2032**	$ 6	$ 22	$ 28	$ 19	$ 12
13	**2033**	$ 6	$ 22	$ 28	$ 19	$ 12
14	**2034**	$ 6	$ 23	$ 29	$ 19	$ 11
15	**2035**	$ 7	$ 26	$ 33	$ 21	$ 12
16	**2036**	$ 7	$ 27	$ 34	$ 21	$ 12
17	**2037**	$ 7	$ 28	$ 35	$ 21	$ 11
18	**2038**	$ 8	$ 28	$ 36	$ 21	$ 11
19	**2039**	$ 8	$ 29	$ 37	$ 21	$ 10
20	**2040**	$ 8	$ 30	$ 38	$ 21	$ 10
21	**2041**	$ 8	$ 30	$ 38	$ 21	$ 9
22	**2042**	$ 8	$ 31	$ 39	$ 21	$ 9
23	**2043**	$ 8	$ 32	$ 40	$ 20	$ 8
24	**2044**	$ 9	$ 32	$ 41	$ 20	$ 8
25	**2045**	$ 10	$ 37	$ 47	$ 22	$ 9
26	**2046**	$ 10	$ 38	$ 48	$ 22	$ 8
27	**2047**	$ 10	$ 38	$ 49	$ 22	$ 8
28	**2048**	$ 10	$ 39	$ 50	$ 22	$ 7
29	**2049**	$ 11	$ 40	$ 51	$ 21	$ 7
30	**2050**	$ 11	$ 41	$ 52	$ 21	$ 7
Totals cummulative		**$ 204**	**$ 760**	**$ 965**	**$ 572**	**$ 318**

*NPV= TOTAL / (1+Disc. Rate)^Yr

7.2.3 Safety cost savings

This category of project benefits captures the net savings in traffic crash costs resulting in fatalities or injuries that could potentially result from ton-miles saved due to freight diversion from the incumbent routes (truck + rail) to the proposed COB (truck + barge) alternative via ASB. The fatality and injury rates assumed for each freight mode and their data sources are shown in Table 31. Rail and truck statistics include incidents involving only vehicular crashes or derailments. Waterborne incidents involve collisions, vessels striking a fixed object, groundings, or capsizings/sinkings. These values account for the average number of fatalities and injuries per fatal crash, as well as the average number of injuries per injury crash.

Table 31. Fatality and injury rates by mode (persons / Million ton-mi)

Freight mode	Units*	Annual Ton-mi (millions)	Total fatalities		Total injuries	
			Avg annual	Rate*	Avg annual	Rate*
Barge	pers / M ton-mi	272,600	6	0.000022	16	0.000059
Railroad	pers / M ton-mi	1,677,800	807	0.000481	7,962	0.004746
Truck	pers / M ton-mi	2,552,197	4,452	0.001744	104,286	0.040861

Source: Modal Comparison of Domestic Freight Transportation. Prepared for MARAD and NWF by TTI Jan 2017, Tables 13-14, pp. 50-51. *Rates are per Million ton-miles.

U.S. DOT-recommended values for monetizing fatalities and injuries were used in this analysis. The analysis was conservative and only looked at fatalities (K) and injuries (U). The inclusion of injuries at a more disaggregated level will only show the project as being even more beneficial. The average costs for fatalities and injuries are shown in Table 32. This estimation involved updating the monetized values from 2018$ to 2020$ using the GDP deflator, as recommended by the U.S. DOT guidelines.[37]

Table 32. Average cost of fatalities and injuries ($ / person)

Accident severity	Units	Monetized Value (in 2018$)	Monetized Value (in 2020$)
Fatal accident (K-killed)	$ / person	9,600,000	10,290,000
Severity unknown (U-injured)	$ / person	174,000	187,000

Source: U.S. DOT Benefit-Cost Analysis (BCA) Guidance for Discretionary Grants, Jan 2020, Table A1, pg.30.

Total net savings due to the resulting from the port development project over the 2020-2050 timeframe, account for about $64.8 million (in 2020 dollars), equivalent to $38.2 million in benefits at a 3% discount rate, and $23.9 million at a 7% discount rate, as illustrated in Table 33.

[37] BEA, December 2020. Table 1.1.9. Implicit Price Deflators for Gross Domestic Product.

Table 33. Safety cost benefits (fatalities and injuries) from the ASB Project

		Total safety (K-killed + U-injured) cost savings (in 2020$, thousands)			NPV of TOTAL safety cost savings ($000)*	
Year	**Calendar year**	**Imports**	**Exports**	**TOTAL**	**3.0%**	**7.0%**
2020	**0**	$ -	$ -	$ -	$ -	$ -
2021	**1**	$ -	$ -	$ -	$ -	$ -
2022	**2**	$ 232	$ 896	$ 1,127	$ 1,063	$ 1,002
2023	**3**	$ 242	$ 945	$ 1,187	$ 1,087	$ 994
2024	**4**	$ 253	$ 996	$ 1,249	$ 1,110	$ 986
2025	**5**	$ 264	$ 1,049	$ 1,313	$ 1,132	$ 977
2026	**6**	$ 275	$ 1,103	$ 1,378	$ 1,154	$ 966
2027	**7**	$ 287	$ 1,158	$ 1,445	$ 1,175	$ 955
2028	**8**	$ 299	$ 1,215	$ 1,514	$ 1,195	$ 944
2029	**9**	$ 311	$ 1,274	$ 1,585	$ 1,215	$ 931
2030	**10**	$ 324	$ 1,334	$ 1,658	$ 1,234	$ 918
2031	**11**	$ 337	$ 1,397	$ 1,733	$ 1,252	$ 905
2032	**12**	$ 350	$ 1,460	$ 1,811	$ 1,270	$ 891
2033	**13**	$ 364	$ 1,526	$ 1,890	$ 1,287	$ 877
2034	**14**	$ 379	$ 1,594	$ 1,973	$ 1,304	$ 862
2035	**15**	$ 394	$ 1,663	$ 2,057	$ 1,320	$ 847
2036	**16**	$ 410	$ 1,734	$ 2,144	$ 1,336	$ 832
2037	**17**	$ 426	$ 1,807	$ 2,233	$ 1,351	$ 817
2038	**18**	$ 443	$ 1,882	$ 2,325	$ 1,366	$ 802
2039	**19**	$ 460	$ 1,959	$ 2,420	$ 1,380	$ 787
2040	**20**	$ 478	$ 2,039	$ 2,517	$ 1,394	$ 772
2041	**21**	$ 497	$ 2,120	$ 2,617	$ 1,407	$ 756
2042	**22**	$ 516	$ 2,203	$ 2,720	$ 1,419	$ 741
2043	**23**	$ 537	$ 2,290	$ 2,826	$ 1,432	$ 726
2044	**24**	$ 557	$ 2,381	$ 2,938	$ 1,445	$ 711
2045	**25**	$ 579	$ 2,475	$ 3,054	$ 1,458	$ 697
2046	**26**	$ 601	$ 2,571	$ 3,172	$ 1,471	$ 682
2047	**27**	$ 624	$ 2,670	$ 3,294	$ 1,483	$ 668
2048	**28**	$ 648	$ 2,772	$ 3,420	$ 1,495	$ 653
2049	**29**	$ 673	$ 2,876	$ 3,549	$ 1,506	$ 639
2050	**30**	$ 699	$ 2,983	$ 3,682	$ 1,517	$ 625
Totals cummulative		**$ 12,461**	**$ 52,371**	**$ 64,832**	**$ 38,258**	**$ 23,963**

*NPV= TOTAL / (1+Disc. Rate)^Yr

7.2.4 State of good repair cost savings

This benefit category captures the net savings in landside freight infrastructure maintenance that could potentially result from ton-miles saved due to freight diversion from the incumbent routes (truck + rail) to the proposed COB (truck + barge) alternative via ASB. Over the course of the 30-year forecast period, over 184,000 FEUs will be removed from the highways and railways into barge. This reduction will directly reduce the impact that trucks have on the condition of the roadway pavement, and railroads will also enjoy a lower generalized maintenance cost.

The cost of pavement maintenance was estimated per truck-mile and is estimated by multiplying the total number of reduced truck miles traveled by the annual cost savings in pavement maintenance due to diversion. We assumed diverted truck loads are split 10%/90% for 60 kip and 80 kip loads respectively, and diverted miles are 35% urban / 65% rural, as recommended by the guidelines. Estimates used to monetize benefits are based on FHWA's Federal Cost Allocation Study from 1997.[38] This estimation involved updating the monetized values from 2001$ to 2020$ using the GDP deflator, as recommended by the U.S. DOT guidelines.[39] This resulted on $0.20/truck-mi, which when converted to ton-miles resulted in $0.012/ton-mi for import trucks and $0.008/ton-mi for export trucks (using the corresponding payload factors of 15 MT/ FEU for imports and 24 MT/FEU for exports assumed in *Section 5*).

Regarding railroads, M&R Way & Structures expenditures and their corresponding ton-miles of operation were obtained from the Class I financials submitted to the Surface Transportation Board. Based on these data, an average expenditure of $0.0025/ton-mile for maintenance and repair of way and structures was estimated. A conservative generalized cost savings of $0.0008/ton-mile was used for the analysis. Any additional savings will only add to the overall benefit of the project. Lastly, the

Regarding railroads, M&R Way & Structures expenditures and their corresponding ton-miles of operation were obtained from the Class I financials submitted to the Surface Transportation Board. Based on these data, an average expenditure of $0.0025/ton-mile for maintenance and repair of way and structures was estimated. A conservative generalized cost savings of $0.0008/ton-mile was used for the analysis, which is about half of the lowest value reported by a Class I railroad. Any additional savings will only add to the overall benefit of the project. Lastly, the state of good repair costs were estimated for the incumbent routes (truck + rail) and for the proposed COB (truck + barge) alternative via ASB and the difference estimated to compute the net benefits, which are shown in Table 34.

[38] 1997 Federal Highway Cost Allocation Study, Final Report. FHWA, May 2000, Table 13.

[39] BEA, December 2020. Table 1.1.9. Implicit Price Deflators for Gross Domestic Product.

Table 34. State of good repair cost benefits from the ASB Project

		Surface maint. (state of good repair) cost savings (in 2020$, thousands)			NPV of Surface maint. (SOGR) cost savings ($000)*	
Year	Calendar year	Imports	Exports	TOTAL	3.0%	7.0%
0	2020	$ -	$ -	$ -	$ -	$ -
1	2021	$ -	$ -	$ -	$ -	$ -
2	2022	$ 61	$ 135	$ 197	$ 185	$ 172
3	2023	$ 63	$ 141	$ 204	$ 186	$ 166
4	2024	$ 65	$ 146	$ 210	$ 187	$ 160
5	2025	$ 66	$ 151	$ 217	$ 187	$ 155
6	2026	$ 68	$ 156	$ 224	$ 188	$ 149
7	2027	$ 70	$ 161	$ 231	$ 188	$ 144
8	2028	$ 71	$ 166	$ 238	$ 188	$ 138
9	2029	$ 73	$ 171	$ 244	$ 187	$ 133
10	2030	$ 75	$ 176	$ 251	$ 187	$ 128
11	2031	$ 76	$ 182	$ 258	$ 186	$ 123
12	2032	$ 78	$ 187	$ 265	$ 186	$ 118
13	2033	$ 80	$ 192	$ 272	$ 185	$ 113
14	2034	$ 82	$ 197	$ 279	$ 184	$ 108
15	2035	$ 84	$ 202	$ 286	$ 183	$ 104
16	2036	$ 86	$ 207	$ 293	$ 182	$ 99
17	2037	$ 87	$ 212	$ 300	$ 181	$ 95
18	2038	$ 89	$ 217	$ 307	$ 180	$ 91
19	2039	$ 91	$ 223	$ 314	$ 179	$ 87
20	2040	$ 93	$ 228	$ 321	$ 178	$ 83
21	2041	$ 95	$ 233	$ 328	$ 176	$ 79
22	2042	$ 97	$ 238	$ 335	$ 175	$ 76
23	2043	$ 100	$ 243	$ 343	$ 174	$ 72
24	2044	$ 102	$ 249	$ 350	$ 172	$ 69
25	2045	$ 104	$ 254	$ 358	$ 171	$ 66
26	2046	$ 106	$ 260	$ 366	$ 170	$ 63
27	2047	$ 108	$ 265	$ 373	$ 168	$ 60
28	2048	$ 111	$ 270	$ 381	$ 167	$ 57
29	2049	$ 113	$ 276	$ 389	$ 165	$ 55
30	2050	$ 115	$ 281	$ 397	$ 163	$ 52
Totals cummulative		**$ 2,510**	**$ 6,018**	**$ 8,528**	**$ 5,209**	**$ 3,013**

*NPV= TOTAL / (1+Disc. Rate)^Yr

7.2.5 Safety resiliency and redundancy

Given the lack of available data, it was not possible to quantify the resiliency and redundancy benefits. However, a proposed Marine Highway Project offers a resilient route or service that can benefit the public by providing an additional alternative transportation mode and route. This will offer the region potential benefits when other incumbent routes are interrupted as a result of natural or man-made incidents.

7.3 Total monetized benefits (overall net public benefits)

The analysis quantifies the expected economic benefits generated by the potential rail-to-barge freight diversion in terms of reduced pavement maintenance cost and net reductions in freight operating costs, emissions and accidents arising from transporting goods via barge as opposed to truck or railroad carrier. Table 35 summarizes the benefit-cost analysis findings for the ASB Project. Annual costs and benefits are computed over the lifecycle of the project (30 years).

The project has a benefit-cost (B/C) ratio of **6.1** using 2020$. At a real discount rate of 3%, the B/C ratio of the project is **5.4** and at a rate of 7% further to **4.9**. In any case, findings from the BCA demonstrate that there are significant long-term economic benefits associated with the project, primarily associated with potential savings in the number of fatalities and injuries, non-carbon emissions, and freight transportation cost savings. These savings would be generated by transporting goods over the proposed barge route via ASB (with project) as opposed to the incumbent routes via railroad (without project) to/from the major import/export gateway ports, as has been demonstrated throughout this report.

Table 35. Summary of Benefit-Cost Analysis

Description	USDOT categories	2020 $	Discount rate	Discount rate
Project benefits		**0%**	**3%**	**7%**
Freight transportation cost savings	1.EconComp.	$ 46,777	$ 27,407	$ 14,967
Social cost of carbon (SCC) savings	2.Emissions benefits	$ 965	$ 572	$ 318
Non-carbon emission cost savings	2.Emissions benefits	$ 51,135	$ 30,176	$ 18,901
Safety cost savings	3.Safety improvements	$ 64,832	$ 38,258	$ 23,963
State of good repair	4.Maint. savings	$ 8,528	$ 5,209	$ 3,013
Total Benefits (B)		**$ 172,236**	**$ 101,621**	**$ 61,161**
Project costs				
Capital costs	5.Capital costs	$ 5,240	$ 5,090	$ 4,900
O&M costs	6.O&M costs	$ 22,919	$ 13,570	$ 7,531
Total Costs (C)		**$ 28,159**	**$ 18,660**	**$ 12,431**
Benefit-Cost ratio = (B) / (C)		**6.1**	**5.4**	**4.9**

8. Economic Impact Study

8.1 Methodology

The term "economic impact study" implies a change has taken place within a defined local economy. The change in an economy typically comes from one of the following sources:

- Entrance/departure of a business or industry
- Expansion/contraction of an existing business or industry

In the case of ASB, we are dealing with an increase in economic activity (i.e., a new COB service). This increase in activity can be broken down into two categories: 1) economic activity generated from capital expenditures for adding COB service at ASB and 2) the operation of the COB service once constructed. The magnitude of these economic activities are largely related to the presence and size of supplemental businesses in the area that support the expansion and operations of the COB service. Examples include businesses such as equipment manufacturers, construction crews, professional services (finance, accounting, insurance, etc.), hotels, restaurants, convenience stores, etc.

8.1.1 Data Sources

Data sources for this analysis consist of primary data (interaction with the ASB, Manley Brothers and Mercator teams) and secondary data (purchased from a third party). Each type of data source is critical to understanding the implications related to the effort to meet the demand for a COB service in central Missouri.

8.1.1.1 Primary Data Sources

There are several areas of subject matter expertise within the overall project team that have been instrumental in gathering data specifically related to the project. These subject matter experts fall into the following categories:

- ASB Operations
- ASB Management
- Site Design and Cost Estimation
- Resource Development
- Project Management

8.1.1.2 Secondary Data Sources

The main secondary data source for this analysis comes from the 2019 IMPLAN state data packages for Missouri. This dataset is in turn heavily reliant upon data from the U.S. Bureau of Economic Analysis (BEA), the U.S. Bureau of Labor Statistics (BLS), the U.S. Census Bureau (Census), the United States Department of Agriculture (USDA), among others. The IMPLAN modeling system and associated data is a widely accepted system for capturing the direct and "ripple" effects of economic changes in a given economy.

8.1.1.3 Year of Analysis

All results for the entire analysis are reported in 2021 dollars. The economic impacts from construction projects are considered a one-time expense and incorporate the total cost of each construction project. Operations are considered ongoing or annual economic impacts of a typical operating year of the COB service.

8.1.2 Analysis Tools

The IMPLAN modeling system was used as the primary tool for conducting this analysis. The IMPLAN Group combines data from the sources identified previously with their expertise to create an input-output model that estimates the economic relationships between all industries and other entities (e.g., governments and households) in a specific study area. This provides a means for understanding the impact of pre-defined scenarios taking place. The results from estimating this impact are generally presented in terms of:

- **Output (Sales),** or the total revenue for a given industry.
- **Employment (Jobs),** or number of positions filled without regard to whether they are full- or part-time or held by the same individual (those working more than one job).
- **Labor Income**, or total of income for those who work for hire or are self-employed. Labor income is a portion of Value-Added.
- **Value-Added**, or the difference between sales and the cost of goods purchased to support those sales.
- **Taxes Paid at All Jurisdictions,** which includes federal, state and local jurisdictions. A partial list includes the following:
    - Sales
    - Property
    - Motor Vehicle
    - Excise
    - Payroll taxes (i.e., FUTA/SUTA, FICA, OASDI, etc.)
    - Income (federal and state)

Each of the above economic measures captures the economic activity and can be expressed in terms of whether it is direct, indirect or induced. For example, vendors offer services or goods to the facility. The direct purchase of supplies and equipment are known as *direct effects*. The suppliers and services used by the vendor then purchase inputs to supply the vendor; these are known as *indirect effects*. Those who work for the vendor, and those who work for the vendor's suppliers then use their additional income to make household purchases; these are known as household, or *induced effects*. Taken together, the sum of direct, indirect and induced effects are known as *total effects* and accounts for the total multiplier effect present from the economic activity of the facility and the economic activity generated by individuals associated with the facility.

Of note, the IMPLAN modeling system is a fixed model, which means that it does not provide a way to understand how production functions or sales figures could or would change in response to a change in the study area economy. For example, IMPLAN cannot solve for market equilibrium (as computable general equilibrium models can), which is the point at which all goods and services are purchased by consumers. In the short run, changes in an economy may not change behavior, but as these changes endure, behaviors will tend to change and/or adapt. The degree to which behaviors change is largely determined by the size and duration of the change.

To overcome some of the limits of being a fixed model, IMPLAN software is highly customizable in that production functions, consumption patterns, trade, local use of locally produced goods and services, production levels, and other key variables can be changed when better information is known. Some default model characterizations have been adjusted because better information was learned from conducting other portions of the analysis. For example, we know from the broader project team that the direct employment for operations of the COB service is 13 persons and so adjusted the model for this.

IMPLAN models use the forward and backward linkages between sectors to be able to determine the economic impacts of an activity. Forward linkages are when the output from one sector is used by another sector for their activities. Using the example of the construction and operation of a COB service, a forward linkage from that would be shippers using the COB service. Backward linkages are the purchases of inputs made by a firm to be able to produce their own output. Using the COB example this would be purchases of equipment manufacturers and other inputs. This can be seen below in Figure 55.

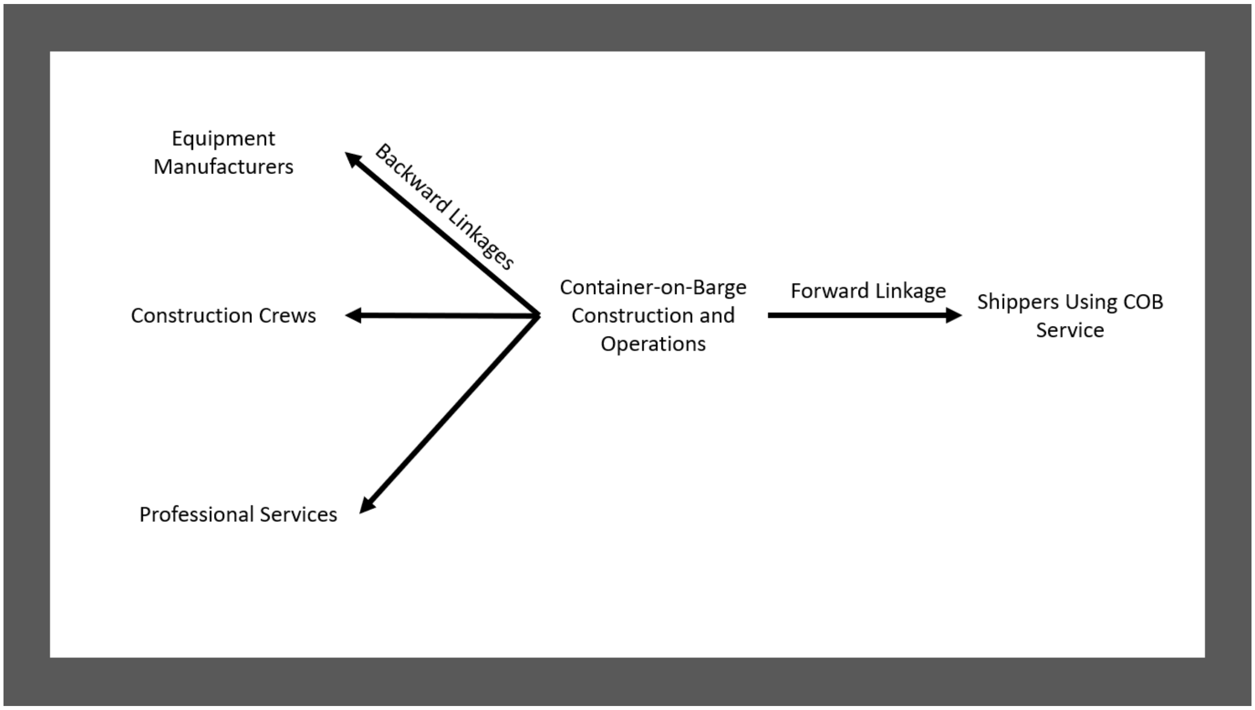


Figure 55. Backward and Forward Linkages

8.1.3 Model Inputs

For this study, economic impacts of the COB service were analyzed in terms of one geographic region and two categories of economic impact activities as elaborated upon below.

8.1.3.1 Geography

The primary geographic scope of this project is the State of Missouri, which is defined as the “local” economy. The impact of these economic activities have been quantified, and their direct, indirect and induced effects are estimated for the State of Missouri.

8.1.3.2 Scenarios

Two scenarios have been estimated: 1) construction and 2) annual average operations.

Construction Projects

The construction of the new COB service was analyzed to show its economic impact. Data from the Manley Brothers and Mercator teams are the primary source of inputs. We assume construction takes place in year one of the planning horizon. Impacts are shown in 2021 dollars. The direct construction values shown in Table 36 were entered as displayed into the IMPLAN model created for the new COB service at ASB.

Table 36[40]. IMPLAN entries, construction impacts

IMPLAN Code	IMPLAN Description	Total
28	Stone mining and quarrying	$ 365,300
235	Prefabricated metal buildings and components manufacturing	$ 13,000
269	All other industrial machinery manufacturing	$ 6,500
289	Overhead cranes, hoists, and monorail systems manufacturing	$ 1,564,290
290	Industrial truck, trailer, and stacker manufacturing	$ 1,163,500
344	Truck trailer manufacturing	$ 58,500
360	Ship building and repairing	$ 1,651,000
457	Architectural, engineering, and related services	$ 136,500
	Labor Income Event	$ 273,000
	Grand Total	**$ 5,231,590**

Full-Year Operations

Once constructed, the COB service will begin operations. Using an "average" year we bring the results back to 2021 dollars using deflators available within the IMPLAN modeling system. As shown in Table 23, we use the undiscounted operation expenditures for years 2-30 ($22,919,000) and divide by twenty-nine to estimate an annual average amount ($790,310), as shown in Table 37. The direct value for average annual operations was entered into the IMPLAN model created for the new COB service at ASB.

Table 37. IMPLAN entries, operations impacts

IMPLAN Code	IMPLAN Description	Total
416	Water transportation	$ 790,310
	Grand Total	**$ 790,310**

8.2 Benefits from project spending on construction

Contained in this section are results which show the economic benefits from constructing a COB service at ASB. Results are shown in terms of direct, indirect and induced effects, as defined previously. Table 38 shows a high-level summary of the economic impact from constructing a COB service at ASB. From a total impact standpoint, an estimated 35 jobs, $2.2 million in labor income, $3.4 million in value-added and $8.4 million in output (sales) would be expected from the construction of a COB service at ASB.

Table 38. High-level construction impacts

Impact Type	Employment	Labor Income	Value-Added	Output
Direct	15	$ 1,105,248	$ 1,566,837	$ 4,958,590
Indirect	9	$ 614,914	$ 941,922	$ 1,805,903
Induced	11	$ 517,235	$ 917,590	$ 1,629,076
Total	35	$ 2,237,397	$ 3,426,349	$ 8,393,568

[40] **Notes:** 1) there is a slight difference between the total in Table 36 and Table 47. This is because of rounding in Table 47; 2) the 30% contingency is assumed to be fully used and is allocated proportionally to all budget categories; and 3) the "Labor Income Event" captures the effects of paying the day rate to marine contractors.

Table 39 shows the tax impact from constructing a COB service at ASB. An estimated $667,407 in total tax revenue is expected to be generated from this portion of the project. $217,131 and $450,276 would be estimated at the state/county and federal levels, respectively.

Table 39. Construction tax impacts

Impact Type	State/County	Federal	Total
Direct	$ 67,007	$ 217,864	$ 284,872
Indirect	$ 65,510	$ 123,298	$ 188,808
Induced	$ 84,614	$ 109,114	$ 193,728
Total	$ 217,131	$ 450,276	$ 667,407

From a total value-added standpoint, Table 40 shows the Missouri industries most impacted by constructing a new COB service at ASB. The top industry impacted is ship building and repairing with a total value-added impact of $484,420 during the construction period. The increase in value-added demonstrates that the project has the ability to put real dollars (not just being spent on supplies) in the pockets of those who would take part in constructing the COB service.

Table 40. Top five industries impacted by construction, total value-added

Industry	Direct	Indirect	Induced	Total Value-Added Impact
360 - Ship building and repairing	$ 483,850	$ 568	$ 2	$ 484,420
289 - Overhead cranes, hoists, and monorail systems manufacturing	$ 473,435	$ 102	$ 0	$ 473,537
290 - Industrial truck, trailer, and stacker manufacturing	$ 311,122	$ 1	$ 0	$ 311,123
28 - Stone mining and quarrying	$ 196,683	$ 7,418	$ 170	$ 204,271
449 - Owner-occupied dwellings	$ -	$ -	$ 135,690	$ 135,690
	$ 1,566,837	$ 941,922	$ 917,590	$ 3,426,349

8.3 Benefits from project spending on operations & maintenance

Contained in this section are results which show the ongoing annual economic benefits from operating a COB service at ASB. Table 41 shows a high-level summary of the economic impact from operating a COB service at ASB. From a total impact standpoint, an estimated 18 jobs, $423,830 in labor income, $660,921 in value-added and $1.6 million in output (sales) would be expected from the annual operation of a COB service at ASB.

Table 41. High-level operations impacts

Impact Type	Employment	Labor Income	Value-Added	Output
Direct	13	$ 138,736	$ 238,686	$ 790,310
Indirect	3	$ 196,161	$ 264,618	$ 493,390
Induced	2	$ 88,933	$ 157,617	$ 279,796
Total	18	$ 423,830	$ 660,921	$ 1,563,496

Table 42 shows the tax impact from annually operating a COB service at ASB. An estimated $157,865 in total tax revenue is expected to be generated from this portion of the project. $73,621 and $84,245 would be estimated at the state/county and federal levels, respectively.

Table 42. Operations tax impacts

Impact Type	State/County	Federal	Total
Direct	$ 33,283	$ 27,224	$ 60,507
Indirect	$ 25,817	$ 38,267	$ 64,084
Induced	$ 14,521	$ 18,754	$ 33,275
Total	$ 73,621	$ 84,245	$ 157,865

From a total value-added standpoint, Table 43 shows the Missouri industries most impacted by annually operating a new COB service at ASB. The top industry impacted is water transportation with a total value-added impact of $238,760 during the construction period. This increase in value-added demonstrates that movement of freight in containers has a consistent ability to add income to those in Missouri, particularly those near ASB.

Table 43. Top five industries impacted by operations, total value-added

Industry	Direct	Indirect	Induced	Total Value-
416 - Water transportation	$ 238,686	$ 17	$ 56	$ 238,760
420 - Support activities for transportation	$ -	$ 37,133	$ 450	$ 37,583
440 - Securities and commodity contracts intermediation and brokerag	$ -	$ 35,164	$ 2,025	$ 37,189
526 - Postal service	$ -	$ 25,064	$ 549	$ 25,612
449 - Owner-occupied dwellings	$ -	$ -	$ 23,398	$ 23,398
	$ 238,686	$ 264,618	$ 157,617	$ 660,921

8.4 Total economic benefits

Contained in this section are results which show the total economic benefits from constructing and operating a COB service at ASB. Table 44 shows a high-level summary of the economic impact from operating and constructing a COB service at ASB. From a total impact standpoint, an estimated 53 jobs, $2.7 million in labor income, $4.1 million in value-added and $10.0 million in output (sales) would be expected from the construction and annual operation of a COB service at ASB.

Table 44. High-level impacts

Impact Type	Employment	Labor Income	Value-Added	Output
Direct	28	$ 1,243,984	$ 1,805,523	$ 5,748,900
Indirect	12	$ 811,075	$ 1,206,540	$ 2,299,293
Induced	12	$ 606,168	$ 1,075,207	$ 1,908,871
Total	53	$ 2,661,227	$ 4,087,270	$ 9,957,064

Table 45 shows the tax impact from constructing and operating a COB service at ASB. An estimated $825,273 in total tax revenue is expected to be generated from this portion of the project. $290,752 and $534,521 would be estimated at the state/county and federal levels, respectively.

Table 45. Total tax impacts

Impact Type	State/County	Federal	Total
Direct	$ 100,290	$ 245,089	$ 345,379
Indirect	$ 91,327	$ 161,564	$ 252,892
Induced	$ 99,135	$ 127,868	$ 227,002
Total	$ 290,752	$ 534,521	$ 825,273

From a total value-added standpoint, Table 46 shows the Missouri industries most impacted by constructing and operating a new COB service at ASB. The top industry impacted is ship building and repairing with a total value-added impact of $485,657 during the construction period. The increase in value-added demonstrates that the project has the ability to put real dollars (not just being spent on supplies) in those who would take part in constructing the COB service.

Table 46. Top five industries impacted, total value-added

Industry	Direct	Indirect	Induced	Total Value-Added Impact
360 - Ship building and repairing	$ 483,850	$ 1,805	$ 3	$ 485,657
289 - Overhead cranes, hoists, and monorail systems manufacturing	$ 473,435	$ 102	$ 0	$ 473,537
290 - Industrial truck, trailer, and stacker manufacturing	$ 311,122	$ 1	$ 0	$ 311,123
416 - Water transportation	$ 238,686	$ 134	$ 380	$ 239,200
28 - Stone mining and quarrying	$ 196,683	$ 7,468	$ 199	$ 204,350
	$ 1,805,523	$ 1,206,540	$ 1,075,207	$ 4,087,270

9. Conclusion

This report illustrates strong reasons as to why MoDOT has chosen to sponsor ASB's efforts to offer a COB services. As demonstrated throughout this report, there are potential benefits that can be generated by replacing the inland rail transportation with COB service. This report documented how the ASB Project meets the requirements for a MARAD project designation. Our route economics analysis concluded that potential cost savings can be generated by the COB service, and that such benefits vary by tradelane and priority area. The research component of the market study specified the existence of several businesses (freight generators and attractors) in the project study area. The companies that responded to the survey indicated interest to use containerized shipping through a COB facility at ASB if it would reduce their shipping costs. In addition to the freight transportation cost savings, this study evaluated and quantified the benefits stemming from the ASB Project, identifying among the main ones: safety improvements, emissions savings, and strong economic impacts that can be capitalized by the region.

9.1 The ASB Project meets the requirements for a MARAD project designation

The ASB Project will serve as an extension of the surface freight network and promote inland waterways to relieve landside congestion enhancing multimodal connectivity in the region. Findings from our research indicated that fleets of current and prospective operators along the Mississippi and Missouri rivers are comprised of U.S. Documented Vessels and can be expected to continue operating such vessels. The ASB Project will provide direct access to BCOs and shippers by extending COB service through M-70, connecting with inland terminals along M-29, M-70, and M-55, and with ocean terminals along the Gulf and M-10. These marine highways are all already designated routes. Hence, our findings indicate that the ASB Project meets the minimum requirements for MARAD designation.

9.2 Enjoys access to an extensive market catchment area of potential users

Our market research revealed the presence of more than 160 companies in the manufacturing industries, distribution companies, farming or ranching industries and retail sectors, some of which indicated potential interest in using a COB facility at ASB. With this mix of companies, ASB enjoys access to a potential market driven by a diversified mix of cargo flows. This also increases the attractiveness of providing value-added services on-site to serve such flows (for example, transloading grains from bulk to containers taking advantage of cheaper backhaul flows). Assuming that the necessary condition for supporting containerized cargo flows are in place (i.e. local distribution center capacity is established and a low-cost and frequent container ship or barge service is operating), the ASB Project has the potential to attract enough COB customers from the study area for a sustainable operation in the long-term.

9.3 Generates favorable public benefits and economic impacts to the region

Because moving freight by water is the least expensive and more environmentally friendly of all transportation modes, there are societal benefits that can stem for the ASB Project that cannot be captured by a private investor. As presently conceived, the ASB Project struggles to meet financial viability criteria from private investor perspective (very low NPV and IRR lower than the WACC).[41] However, this project might be attractive to ASB or other strategic player who could capture non-financial benefits, making it an

[41] Based on a 50/50 debt/equity ratio.

ideal candidate for a public-private partnership (P3) structure. Changes in the capital structure and further capex refinements, based on an actual engineering design, are worthy of consideration for further analysis.

Our BCA systematically quantified the public benefits that could accrue over the 30-year lifecycle of the ASB Project. Findings from our analysis indicated that significant benefits can be generated by transporting goods over the proposed barge route via ASB (with project) as opposed to the incumbent routes via railroad (without project) to/from the major import/export gateway ports. The project indicated strongly positive B/C ratios, in excess of **5.0** under all scenarios analyzed, demonstrating that there are significant long-term economic benefits associated with the project generated primarily from: safety improvements, emissions savings, and freight transportation costs from transporting goods via barge as opposed to truck or railroad carrier. Similarly, strong economic impacts can be capitalized by the region. The results from our EIA indicated an estimated 53 jobs, $2.7 million in labor income, $4.1 million in value-added and $10.0 million in output (sales) would be expected from the construction and annual operation of a COB service at ASB.

9.4 Strong support from private and public stakeholders

The MoDOT, MARAD, and other USDOT agencies have established various mechanisms for successful P3s. These expand financing options for transportation projects that serve a public purpose. The benefits to a project assisted by these partnerships may include: inflation cost savings, early economic and public benefits, financing tailored to the project's needs, and a reduced cost of project financing. One example is the Port Capital Improvement Program, which provides capital grants to public port authorities to assist with capital expenditures, such as dock construction, mooring dolphins, access improvements (e.g. rail connectors, road access improvements), utility extensions, and general site development. Other resources include federal grants (BUILD and INFRA) and loans (TIFIA and RRIF), transportation development districts, cost-sharing programs, among others.[42] Along these lines, the ASB Project Designation will allow the Port to compete for Federal funding to support short sea shipping activities along M-70 and M-55 ultimately contributing to the economic development of the region and the state. The ASB Project already enjoys strong support from the ASB owners, the private sector, and other public stakeholders in the region. Letters of support from these stakeholders are included in *Appendix 4*.

[42] https://www.modot.org/partnership-development
https://maritime.dot.gov/grants/marine-highways/marine-highway

Appendices: for program background only

Appendix 1: Public benefits supporting material

Input Name	Unit	Input	Source/Comment
Discount Rate - Option 1	%	7%	USDOT BCA Guidelines
Discount Rate - Option 2	%	3%	USDOT BCA Guidelines
Study Base Year	year	2020	
First Year of Benefits	year	2024	Year of Rail Yard Completion
Year of Benefits	%	10%	Assumed
Yearly Diversion Rate Increase	%	1%	Assumed
Max Diversion Rate from Trucks to Rail	%	25%	Assumed
Average distance travelled by Rail Car or Truck	miles		Figure13 & Figure9
Avg cargo weight per I/M 40 ft container - imports	MT/FEU	15	Based on Datamyne/ US Census information
Avg cargo weight per I/M 40 ft container - exports	MT/FEU	24	Industry Average
Of Truck Diverted - Percent of Trucks 60 Kip Loads	%	10%	Derived from 1997 Federal Highway Cost Allocation
Of Truck Diverted - Percent of Trucks 80 Kip Loads	%	90%	Derived from 1997 Federal Highway Cost Allocation
Of Truck Miles Diverted - Percent of miles Urban	%	35%	Derived from 1997 Federal Highway Cost Allocation
Of Truck Miles Diverted - Percent of miles Rural	%	65%	Derived from 1997 Federal Highway Cost Allocation
Pavement Maintenance Cost per truck mile	$/truck mile	0.275	FHWA 1997 Study - Table 13
Congestion Cost per truck mile	$/truck mile	0.110	FHWA 1997 Study - Table 13
Noise Cost per truck mile	$/truck mile	0.0150	FHWA 1997 Study - Table 13
Shipping Cost Rate - Truck Rate	$/ton-mile	0.0842	Estimated from carrier rate.
Shipping Cost Rate - Rail Rate	$/ton-mile	0.0340	Estimated from rail rate.
Accident Cost per Vehicle Mile Traveled	$/ton-mile	0.0048	National Highway Traffic Safety Administration
Accident Cost per Train Mile Traveled	$/ton-mile	0.0008	USDOT BCA Guidelines, Federal Railroad Administration
NOx Cost per ton	$/ton	$4,000	USDOT BCA Guidelines
CO2 Cost per ton – 2018	$/ton	$7	USDOT BCA Guidelines
PM Cost per ton - 2018	$/ton	$168,000	USDOT BCA Guidelines
VOC Cost per ton - 2018	$/ton	$1,700	USDOT BCA Guidelines

Appendix 2: Cost model supporting data

A2.1 Route costs for imports from Asia

SPB versus ASB

Mode	Import flows from ASIA via SPB w/o Project	Units			
	Loaded_ORIG			**Shanghai**	
Ocean	Ocean transport costs	$ / FEU		$740	
	Gateway costs	$ / FEU		$660	
	Ocean subtotal	$ / FEU		*$1,400*	
	DEST1 (ship-to-rail)			**SPB**	
	Gateway-to-inland I/M terminal dist.	mi		1,740	
	Rail loading cost	$ / FEU		(incl. in gateway)	
Rail	Gateway-to-inland I/M terminal cost	$ / FEU		$1,630	
	Rail discharging cost	$ / FEU		(incl. in linehaul rail)	
	Rail subtotal	$ / FEU		*$1,630*	
	DEST2 (rail-to-truck)			**Kansas City**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	122	51	144
Drayage	Trucking to BCO cost	$ / FEU	$350	$230	$110
	Final DEST (empty return point)			**Kansas City Rail or Depot**	
	Empty-to-I/M terminal trucking dist.	mi	122	51	144
	Empty-to-I/M terminal cost	$ / FEU	$350	$230	$110
	Drayage subtotal	$ / FEU	*$700*	*$460*	*$220*
	Total cost per 40 ft container		**$3,730**	**$3,490**	**$3,250**

Mode	Import flows from ASIA via ASB w Project	Units			
	Loaded_ORIG			**Shanghai**	
Ocean	Ocean transport costs	$ / FEU		$1,600	
	Gateway costs	$ / FEU		$400	
	Ocean subtotal	$ / FEU		*$2,000*	
	DEST1 (ship-to-barge)			**New Orleans / USGC**	
	Gateway-to-ASB dist.	mi		1,435	
	Barge loading cost	$ / FEU		$200	
Barge	Gateway-to-ASB transport cost	$ / FEU		$635	
	Barge discharging cost	$ / FEU		$125	
	Barge subtotal	$ / FEU		*$960*	
	DEST2 (barge-to-truck)			**ASB**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	57	69	96
Drayage	Trucking to BCO cost	$ / FEU	$170	$310	$70
	Final DEST (empty return point)			**ASB**	
	Empty-to-ASB terminal trucking dist.	mi	57	69	96
	Empty-to-ASB terminal cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$340*	*$620*	*$140*
	Total cost per 40 ft container		**$3,300**	**$3,580**	**$3,100**
	Potential benefits (disbenefits) from the project:		**$430**	**($90)**	**$150**

NWSA versus ASB

Mode	Import flows from ASIA via NWSA w/o Project	Units			
	Loaded_ORIG			**Shanghai**	
Ocean	Ocean transport costs	$ / FEU		$740	
	Gateway costs	$ / FEU		$600	
	Ocean subtotal	$ / FEU		*$1,340*	
	DEST1 (ship-to-rail)			**NWSA**	
	Gateway-to-inland I/M terminal dist.	mi		**2,062**	
	Rail loading cost	$ / FEU		(incl. in gateway)	
Rail	Gateway-to-inland I/M terminal cost	$ / FEU		$1,970	
	Rail discharging cost	$ / FEU		(incl. in linehaul rail)	
	Rail subtotal	$ / FEU		*$1,970*	
	DEST2 (rail-to-truck)			**Kansas City**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	**122**	**51**	**144**
Drayage	Trucking to BCO cost	$ / FEU	$350	$230	$110
	Final DEST (empty return point)			**Kansas City Rail or Depot**	
	Empty-to-I/M terminal trucking dist.	mi	**122**	**51**	**144**
	Empty-to-I/M terminal cost	$ / FEU	$350	$230	$110
	Drayage subtotal	$ / FEU	*$700*	*$460*	*$220*
	Total cost per 40 ft container		**$4,010**	**$3,770**	**$3,530**

Mode	Import flows from ASIA via ASB w Project	Units			
	Loaded_ORIG			**Shanghai**	
Ocean	Ocean transport costs	$ / FEU		$1,600	
	Gateway costs	$ / FEU		$400	
	Ocean subtotal	$ / FEU		*$2,000*	
	DEST1 (ship-to-barge)			**New Orleans / USGC**	
	Gateway-to-ASB dist.	mi		**1,435**	
	Barge loading cost	$ / FEU		$200	
Barge	Gateway-to-ASB transport cost	$ / FEU		$635	
	Barge discharging cost	$ / FEU		$125	
	Barge subtotal	$ / FEU		*$960*	
	DEST2 (barge-to-truck)			**ASB**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	**57**	**69**	**96**
Drayage	Trucking to BCO cost	$ / FEU	$170	$310	$70
	Final DEST (empty return point)			**ASB**	
	Empty-to-ASB terminal trucking dist.	mi	**57**	**69**	**96**
	Empty-to-ASB terminal cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$340*	*$620*	*$140*
	Total cost per 40 ft container		**$3,300**	**$3,580**	**$3,100**
	Potential benefits (disbenefits) from the project:		**$710**	**$190**	**$430**

A2.2 Route costs for imports from Europe

NYNJ versus ASB

Mode	Import flows from EUROPE via NYNJ w/o Project	Units			
	Loaded_ORIG			**N. Europe**	
Ocean	Ocean transport costs	$ / FEU		$430	
	Gateway costs	$ / FEU		$520	
	Ocean subtotal	$ / FEU		*$950*	
	DEST1 (ship-to-rail)			**NYNJ**	
	Gateway-to-inland I/M terminal dist.	mi		**1,310**	
	Rail loading cost	$ / FEU		(incl. in gateway)	
Rail	Gateway-to-inland I/M terminal cost	$ / FEU		$860	
	Rail discharging cost	$ / FEU		(incl. in linehaul rail)	
	Rail subtotal	$ / FEU		*$860*	
	DEST2 (rail-to-truck)			**Kansas City**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	**122**	**51**	**144**
Drayage	Trucking to BCO cost	$ / FEU	$350	$230	$110
	Final DEST (empty return point)			**Kansas City Rail or Depot**	
	Empty-to-I/M terminal trucking dist.	mi	**122**	**51**	**144**
	Empty-to-I/M terminal cost	$ / FEU	$350	$230	$110
	Drayage subtotal	$ / FEU	*$700*	*$460*	*$220*
	Total cost per 40 ft container		**$2,510**	**$2,270**	**$2,030**

Mode	Import flows from EUROPE via ASB w Project	Units			
	Loaded_ORIG			**N. Europe**	
Ocean	Ocean transport costs	$ / FEU		$640	
	Gateway costs	$ / FEU		$400	
	Ocean subtotal	$ / FEU		*$1,040*	
	DEST1 (ship-to-barge)			**New Orleans / USGC**	
	Gateway-to-ASB dist.	mi		**1,435**	
	Barge loading cost	$ / FEU		$200	
Barge	Gateway-to-ASB transport cost	$ / FEU		$635	
	Barge discharging cost	$ / FEU		$125	
	Barge subtotal	$ / FEU		*$960*	
	DEST2 (barge-to-truck)			**ASB**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	**57**	**69**	**96**
Drayage	Trucking to BCO cost	$ / FEU	$170	$310	$70
	Final DEST (empty return point)			**ASB**	
	Empty-to-ASB terminal trucking dist.	mi	**57**	**69**	**96**
	Empty-to-ASB terminal cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$340*	*$620*	*$140*
	Total cost per 40 ft container		**$2,340**	**$2,620**	**$2,140**
	Potential benefits (disbenefits) from the project:		**$170**	**($350)**	**($110)**

Baltimore versus ASB

Mode	Import flows from EUROPE via BAL w/o Project	Units			
	Loaded_ORIG			**N. Europe**	
Ocean	Ocean transport costs	$ / FEU		$430	
	Gateway costs	$ / FEU		$520	
	Ocean subtotal	$ / FEU		*$950*	
	DEST1 (ship-to-rail)			**Baltimore**	
	Gateway-to-inland I/M terminal dist.	mi		**1,114**	
	Rail loading cost	$ / FEU		(incl. in gateway)	
Rail	Gateway-to-inland I/M terminal cost	$ / FEU		$820	
	Rail discharging cost	$ / FEU		(incl. in linehaul rail)	
	Rail subtotal	$ / FEU		*$820*	
	DEST2 (rail-to-truck)			**Kansas City**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	**122**	**51**	**144**
Drayage	Trucking to BCO cost	$ / FEU	$350	$230	$110
	Final DEST (empty return point)			**Kansas City Rail or Depot**	
	Empty-to-I/M terminal trucking dist.	mi	**122**	**51**	**144**
	Empty-to-I/M terminal cost	$ / FEU	$350	$230	$110
	Drayage subtotal	$ / FEU	*$700*	*$460*	*$220*
	Total cost per 40 ft container		**$2,470**	**$2,230**	**$1,990**

Mode	Import flows from EUROPE via ASB w Project	Units			
	Loaded_ORIG			**N. Europe**	
Ocean	Ocean transport costs	$ / FEU		$640	
	Gateway costs	$ / FEU		$400	
	Ocean subtotal	$ / FEU		*$1,040*	
	DEST1 (ship-to-barge)			**New Orleans / USGC**	
	Gateway-to-ASB dist.	mi		**1,435**	
	Barge loading cost	$ / FEU		$200	
Barge	Gateway-to-ASB transport cost	$ / FEU		$635	
	Barge discharging cost	$ / FEU		$125	
	Barge subtotal	$ / FEU		*$960*	
	DEST2 (barge-to-truck)			**ASB**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	**57**	**69**	**96**
Drayage	Trucking to BCO cost	$ / FEU	$170	$310	$70
	Final DEST (empty return point)			**ASB**	
	Empty-to-ASB terminal trucking dist.	mi	**57**	**69**	**96**
	Empty-to-ASB terminal cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$340*	*$620*	*$140*
	Total cost per 40 ft container		**$2,340**	**$2,620**	**$2,140**
	Potential benefits (disbenefits) from the project:		**$130**	**($390)**	**($150)**

Norfolk versus ASB

Mode	Import flows from EUROPE via NRF w/o Project	Units			
	Loaded_ORIG			**N. Europe**	
Ocean	Ocean transport costs	$ / FEU		$430	
	Gateway costs	$ / FEU		$520	
	Ocean subtotal	$ / FEU		*$950*	
	DEST1 (ship-to-rail)			**Norfolk**	
	Gateway-to-inland I/M terminal dist.	mi		**1,237**	
	Rail loading cost	$ / FEU		(incl. in gateway)	
Rail	Gateway-to-inland I/M terminal cost	$ / FEU		$810	
	Rail discharging cost	$ / FEU		(incl. in linehaul rail)	
	Rail subtotal	$ / FEU		*$810*	
	DEST2 (rail-to-truck)			**Kansas City**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	**122**	**51**	**144**
Drayage	Trucking to BCO cost	$ / FEU	$350	$230	$110
	Final DEST (empty return point)			**Kansas City Rail or Depot**	
	Empty-to-I/M terminal trucking dist.	mi	**122**	**51**	**144**
	Empty-to-I/M terminal cost	$ / FEU	$350	$230	$110
	Drayage subtotal	$ / FEU	*$700*	*$460*	*$220*
	Total cost per 40 ft container		**$2,460**	**$2,220**	**$1,980**

Mode	Import flows from EUROPE via ASB w Project	Units			
	Loaded_ORIG			**N. Europe**	
Ocean	Ocean transport costs	$ / FEU		$640	
	Gateway costs	$ / FEU		$400	
	Ocean subtotal	$ / FEU		*$1,040*	
	DEST1 (ship-to-barge)			**New Orleans / USGC**	
	Gateway-to-ASB dist.	mi		**1,435**	
	Barge loading cost	$ / FEU		$200	
Barge	Gateway-to-ASB transport cost	$ / FEU		$635	
	Barge discharging cost	$ / FEU		$125	
	Barge subtotal	$ / FEU		*$960*	
	DEST2 (barge-to-truck)			**ASB**	
	DEST3 (truck-to-BCO)		**PA1**	**PA1.5**	**PA2**
	Trucking to BCO distance	mi	**57**	**69**	**96**
Drayage	Trucking to BCO cost	$ / FEU	$170	$310	$70
	Final DEST (empty return point)			**ASB**	
	Empty-to-ASB terminal trucking dist.	mi	**57**	**69**	**96**
	Empty-to-ASB terminal cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$340*	*$620*	*$140*
	Total cost per 40 ft container		**$2,340**	**$2,620**	**$2,140**
	Potential benefits (disbenefits) from the project:		**$120**	**($400)**	**($160)**

A2.3 Route costs for exports to Asia

SPB versus ASB

Mode	Export flows to ASIA via SPB w/o Project	Units	If laden backhaul		
	Empty_ORIG			**Kansas City**	
	Empty-to-Load point trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Empty-to-Load point trucking dist.	**mi**	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
	Drayage subtotal	$ / FEU	*$700*	*$460*	*$220*
	DEST2 (truck-to-rail)			**Kansas City**	
	Rail-to-Gateway rail distance	mi		1,740	
	Rail loading cost			(incl. in linehaul rail)	
Rail	Rail-to-Gateway rail cost	$ / FEU		$750	
	Rail discharging cost			(incl. in gateway port)	
	Rail subtotal	$ / FEU		*$750*	
	DEST3 (rail-to-ship)			**San Pedro Bay**	
	US gateway costs	$ / FEU		$570	
Ocean	Ocean transport costs	$ / FEU		$0	
	Foreign gateway costs	$ / FEU		$220	
	Unloading time perdiem	$ / FEU		$100	
	Final_DEST			**Shanghai**	
	Ocean subtotal	$ / FEU		*$890*	
	Total cost per 40 ft container		**######**	**######**	**######**

Mode	Export flows to ASIA via ASB with Project	Units	Laden barge		
	Empty_ORIG			**Kansas City**	
	Empty-to-Load pt trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Load point-to-ASB trucking dist.	**mi**	57	69	96
	Load point-to-ASB trucking cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$520*	*$540*	*$180*
	DEST2 (truck-to-barge)			**ASB**	
	ASB-to-Gateway distance	river mi		1,435	
	Barge loading cost	$ / FEU		$125	
Barge	Barge-to-Gateway transport cost	$ / FEU		$635	
	Barge discharging cost	$ / FEU		$200	
	Barge subtotal	$ / FEU		*$960*	
	DEST3 (barge-to-ship)			**New Orleans / USGC**	
	US gateway costs	$ / FEU		$310	
Ocean	Ocean transport costs	$ / FEU		$0	
	Foreign gateway costs	$ / FEU		$220	
	Unloading time perdiem	$ / FEU		$100	
	Final_DEST			**Shanghai**	
	Ocean subtotal	$ / FEU		*$630*	
	Total cost per 40 ft container		**$2,110**	**$2,130**	**$1,770**

Potential benefits (disbenefits) from the project:				
Empty backhauls	**$ / FEU**	**($760)**	**($780)**	**($420)**
Laden backhauls	**$ / FEU**	**$230**	**($30)**	**$90**

NWSA versus ASB

Mode	Export flows to ASIA via NWSA w/o Project	Units	If laden backhaul		
	Empty_ORIG		**Kansas City**		
	Empty-to-Load point trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Empty-to-Load point trucking dist.	**mi**	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
	Drayage subtotal	$ / FEU	*$700*	*$460*	*$220*
	DEST2 (truck-to-rail)		**Kansas City**		
	Rail-to-Gateway rail distance	mi	2,062		
	Rail loading cost		(incl. in linehaul rail)		
Rail	Rail-to-Gateway rail cost	$ / FEU	$800		
	Rail discharging cost		(incl. in gateway port)		
	Rail subtotal	$ / FEU	*$800*		
	DEST3 (rail-to-ship)		**NWSA**		
	US gateway costs	$ / FEU	$510		
Ocean	Ocean transport costs	$ / FEU	$0		
	Foreign gateway costs	$ / FEU	$220		
	Unloading time perdiem	$ / FEU	$100		
	Final_DEST		**Shanghai**		
	Ocean subtotal	$ / FEU	*$830*		
	Total cost per 40 ft container		**######**	**######**	**######**

Mode	Export flows to ASIA via ASB with Project	Units	Laden barge		
	Empty_ORIG		**Kansas City**		
	Empty-to-Load pt trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Load point-to-ASB trucking dist.	**mi**	57	69	96
	Load point-to-ASB trucking cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$520*	*$540*	*$180*
	DEST2 (truck-to-barge)		**ASB**		
	ASB-to-Gateway distance	river mi	1,435		
	Barge loading cost	$ / FEU	$125		
Barge	Barge-to-Gateway transport cost	$ / FEU	$635		
	Barge discharging cost	$ / FEU	$200		
	Barge subtotal	$ / FEU	*$960*		
	DEST3 (barge-to-ship)		**New Orleans / USGC**		
	US gateway costs	$ / FEU	$310		
Ocean	Ocean transport costs	$ / FEU	$0		
	Foreign gateway costs	$ / FEU	$220		
	Unloading time perdiem	$ / FEU	$100		
	Final_DEST		**Shanghai**		
	Ocean subtotal	$ / FEU	*$630*		
	Total cost per 40 ft container		**$2,110**	**$2,130**	**$1,770**

Potential benefits (disbenefits) from the project:				
Empty backhauls	**$ / FEU**	**($780)**	**($800)**	**($440)**
Laden backhauls	**$ / FEU**	**$220**	**($40)**	**$80**

A2.4 Route costs for exports to Europe

NYNJ versus ASB

Mode	Export flows to EUROPE via NYNJ w/o Project	Units	If laden backhaul		
	Empty_ORIG			**Kansas City**	
	Empty-to-Load point trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Empty-to-Load point trucking dist.	**mi**	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
	Drayage subtotal	$ / FEU	*$700*	*$460*	*$220*
	DEST2 (truck-to-rail)			**Kansas City**	
	Rail-to-Gateway rail distance	mi		1,310	
	Rail loading cost			(incl. in linehaul rail)	
Rail	Rail-to-Gateway rail cost	$ / FEU		$600	
	Rail discharging cost			(incl. in gateway port)	
	Rail subtotal	$ / FEU		*$600*	
	DEST3 (rail-to-ship)			**NYNJ**	
	US gateway costs	$ / FEU		$430	
Ocean	Ocean transport costs	$ / FEU		$290	
	Foreign gateway costs	$ / FEU		$250	
	Unloading time perdiem	$ / FEU		$100	
	Final_DEST			**N. Europe**	
	Ocean subtotal	$ / FEU		*#####*	
	Total cost per 40 ft container		**######**	**######**	**######**

Mode	Export flows to EUROPE via ASB with Project	Units	Laden barge		
	Empty_ORIG			**Kansas City**	
	Empty-to-Load point trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Load point-to-ASB trucking dist.	**mi**	57	69	96
	Load point-to-ASB trucking cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$520*	*$540*	*$180*
	DEST2 (truck-to-barge)			**ASB**	
	ASB-to-Gateway distance	river mi		1,435	
	Barge loading cost	$ / FEU		$125	
Barge	Barge-to-Gateway transport cost	$ / FEU		$635	
	Barge discharging cost	$ / FEU		$200	
	Barge subtotal	$ / FEU		*$960*	
	DEST3 (barge-to-ship)			**New Orleans / USGC**	
	US gateway costs	$ / FEU		$310	
Ocean	Ocean transport costs	$ / FEU		$430	
	Foreign gateway costs	$ / FEU		$250	
	Unloading time perdiem	$ / FEU		$100	
	Final_DEST			**N. Europe**	
	Ocean subtotal	$ / FEU		*$1,090*	
	Total cost per 40 ft container		**$2,570**	**$2,590**	**$2,230**

Potential benefits (disbenefits) from the project:				
Empty backhauls	**$ / FEU**	**($1,440)**	**($1,460)**	**($1,100)**
Laden backhauls	**$ / FEU**	**($200)**	**($460)**	**($340)**

Baltimore versus ASB

Mode	Export flows to EUROPE via BAL w/o Project	Units	If laden backhaul		
	Empty_ORIG		**Kansas City**		
	Empty-to-Load point trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Empty-to-Load point trucking dist.	**mi**	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
	Drayage subtotal	$ / FEU	*$700*	*$460*	*$220*
	DEST2 (truck-to-rail)		**Kansas City**		
	Rail-to-Gateway rail distance	mi	1,114		
	Rail loading cost		(incl. in linehaul rail)		
Rail	Rail-to-Gateway rail cost	$ / FEU	$600		
	Rail discharging cost		(incl. in gateway port)		
	Rail subtotal	$ / FEU	*$600*		
	DEST3 (rail-to-ship)		**Baltimore**		
	US gateway costs	$ / FEU	$430		
Ocean	Ocean transport costs	$ / FEU	$290		
	Foreign gateway costs	$ / FEU	$250		
	Unloading time perdiem	$ / FEU	$100		
	Final_DEST		**N. Europe**		
	Ocean subtotal	$ / FEU	*#####*		
	Total cost per 40 ft container		**######**	**######**	**######**

Mode	Export flows to EUROPE via ASB with Project	Units	Laden barge		
	Empty_ORIG		**Kansas City**		
	Empty-to-Load point trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Load point-to-ASB trucking dist.	**mi**	57	69	96
	Load point-to-ASB trucking cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$520*	*$540*	*$180*
	DEST2 (truck-to-barge)		**ASB**		
	ASB-to-Gateway distance	river mi	1,435		
	Barge loading cost	$ / FEU	$125		
Barge	Barge-to-Gateway transport cost	$ / FEU	$635		
	Barge discharging cost	$ / FEU	$200		
	Barge subtotal	$ / FEU	*$960*		
	DEST3 (barge-to-ship)		**New Orleans / USGC**		
	US gateway costs	$ / FEU	$310		
Ocean	Ocean transport costs	$ / FEU	$430		
	Foreign gateway costs	$ / FEU	$250		
	Unloading time perdiem	$ / FEU	$100		
	Final_DEST		**N. Europe**		
	Ocean subtotal	$ / FEU	*$1,090*		
	Total cost per 40 ft container		**$2,570**	**$2,590**	**$2,230**

Potential benefits (disbenefits) from the project:				
Empty backhauls	**$ / FEU**	**($1,440)**	**($1,460)**	**($1,100)**
Laden backhauls	**$ / FEU**	**($200)**	**($460)**	**($340)**

Norfolk versus ASB

Mode	Export flows to EUROPE via NRF w/o Project	Units	If empty backhaul			If laden backhaul		
	Empty_ORIG			**Kansas City**			**Kansas City**	
	Empty-to-Load point trucking dist.	mi	0	0	0	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$0	$0	$0	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**	**PA1**	**PA1.5**	**PA2**
	Empty-to-Load point trucking dist.	**mi**	0	0	0	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$0	$0	$0	$350	$230	$110
	Drayage subtotal	$ / FEU	*$0*	*$0*	*$0*	*$700*	*$460*	*$220*
	DEST2 (truck-to-rail)			**Kansas City**			**Kansas City**	
	Rail-to-Gateway rail distance	mi		1,740			1,237	
	Rail loading cost			(incl. in linehaul rail)			(incl. in linehaul rail)	
Rail	Rail-to-Gateway rail cost	$ / FEU		$450			$600	
	Rail discharging cost			(incl. in gateway port)			(incl. in gateway port)	
	Rail subtotal	$ / FEU		*$450*			*$600*	
	DEST3 (rail-to-ship)			**Norfolk**			**Norfolk**	
	US gateway costs	$ / FEU		$430			$430	
Ocean	Ocean transport costs	$ / FEU		$0			$290	
	Foreign gateway costs	$ / FEU		$250			$250	
	Unloading time perdiem	$ / FEU		$0			$100	
	Final_DEST			**N. Europe**			**N. Europe**	
	Ocean subtotal	$ / FEU		*$680*			*$1,070*	
	Total cost per 40 ft container		**$1,130**	**$1,130**	**$1,130**	**$2,370**	**$2,130**	**$1,890**

Mode	Export flows to EUROPE via ASB with Project	Units	Laden barge		
	Empty_ORIG			**Kansas City**	
	Empty-to-Load point trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Load point-to-ASB trucking dist.	**mi**	57	69	96
	Load point-to-ASB trucking cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$520*	*$540*	*$180*
	DEST2 (truck-to-barge)			**ASB**	
	ASB-to-Gateway distance	river mi		1,435	
	Barge loading cost	$ / FEU		$125	
Barge	Barge-to-Gateway transport cost	$ / FEU		$635	
	Barge discharging cost	$ / FEU		$200	
	Barge subtotal	$ / FEU		*$960*	
	DEST3 (barge-to-ship)			**New Orleans / USGC**	
	US gateway costs	$ / FEU		$310	
Ocean	Ocean transport costs	$ / FEU		$430	
	Foreign gateway costs	$ / FEU		$250	
	Unloading time perdiem	$ / FEU		$100	
	Final_DEST			**N. Europe**	
	Ocean subtotal	$ / FEU		*$1,090*	
	Total cost per 40 ft container		**$2,570**	**$2,590**	**$2,230**

Potential benefits (disbenefits) from the project:				
Empty backhauls	**$ / FEU**	**($1,440)**	**($1,460)**	**($1,100)**
Laden backhauls	**$ / FEU**	**($200)**	**($460)**	**($340)**

Savanna versus ASB

Mode	Export flows to EUROPE via SAV w/o Project	Units	If empty backhaul			If laden backhaul		
	Empty_ORIG			**Kansas City**			**Kansas City**	
	Empty-to-Load point trucking dist.	mi	0	0	0	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$0	$0	$0	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**	**PA1**	**PA1.5**	**PA2**
	Empty-to-Load point trucking dist.	**mi**	0	0	0	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$0	$0	$0	$350	$230	$110
	Drayage subtotal	$ / FEU	*$0*	*$0*	*$0*	*$700*	*$460*	*$220*
	DEST2 (truck-to-rail)			**Kansas City**			**Kansas City**	
	Rail-to-Gateway rail distance	mi		1,100			1,100	
	Rail loading cost			(incl. in linehaul rail)			(incl. in linehaul rail)	
Rail	Rail-to-Gateway rail cost	$ / FEU		$450			$600	0
	Rail discharging cost			(incl. in gateway port)			(incl. in gateway port)	
	Rail subtotal	$ / FEU		*$450*			*$600*	
	DEST3 (rail-to-ship)			**Savanna / Charleston**			**Savanna / Charleston**	
	US gateway costs	$ / FEU		$360			$360	
Ocean	Ocean transport costs	$ / FEU		$290			$290	
	Foreign gateway costs	$ / FEU		$250			$250	
	Unloading time perdiem	$ / FEU		$0			$100	
	Final_DEST			**N. Europe**			**N. Europe**	
	Ocean subtotal	$ / FEU		*$900*			*$1,000*	
	Total cost per 40 ft container		**$1,350**	**$1,350**	**$1,350**	**$2,300**	**$2,060**	**$1,820**

Mode	Export flows to EUROPE via ASB with Project	Units	Laden barge		
	Empty_ORIG			**Kansas City**	
	Empty-to-Load point trucking dist.	mi	122	51	144
	Empty-to-Load point trucking cost	$ / FEU	$350	$230	$110
Drayage	**DEST1 (container loading point)**		**PA1**	**PA1.5**	**PA2**
	Load point-to-ASB trucking dist.	**mi**	57	69	96
	Load point-to-ASB trucking cost	$ / FEU	$170	$310	$70
	Drayage subtotal	$ / FEU	*$520*	*$540*	*$180*
	DEST2 (truck-to-barge)			**ASB**	
	ASB-to-Gateway distance	river mi		1,435	
	Barge loading cost	$ / FEU		$125	
Barge	Barge-to-Gateway transport cost	$ / FEU		$635	
	Barge discharging cost	$ / FEU		$200	
	Barge subtotal	$ / FEU		*$960*	
	DEST3 (barge-to-ship)			**New Orleans / USGC**	
	US gateway costs	$ / FEU		$310	
Ocean	Ocean transport costs	$ / FEU		$430	
	Foreign gateway costs	$ / FEU		$250	
	Unloading time perdiem	$ / FEU		$100	
	Final_DEST			**N. Europe**	
	Ocean subtotal	$ / FEU		*$1,090*	
	Total cost per 40 ft container		**$2,570**	**$2,590**	**$2,230**

Potential benefits (disbenefits) from the project:				
Empty backhauls	**$ / FEU**	**($1,220)**	**($1,240)**	**($880)**
Laden backhauls	**$ / FEU**	**($270)**	**($530)**	**($410)**

A2.5 Transit time build-up by mode

Imports

Transit time without project (Days) Origin	Gateway	Destination	Ocean & Gateway	Rail	Drayage	Total w/o project
		PA1			0.18	**21**
Asia	**SPB**	PA1.5	14	7	0.08	**21**
		PA2			0.22	**21**
		PA1			0.18	**24**
Asia	**NWSA**	PA1.5	17	7	0.08	**24**
		PA2			0.22	**24**
		PA1			0.18	**18**
N. Europe	**NYNJ**	PA1.5	13	5	0.08	**18**
		PA2			0.22	**18**

Transit time with project (Days) Origin	Gateway	Destination	Ocean & Gateway	Barge	Drayage	Total with project
		PA1			0.08	**40**
Asia	**ASB**	PA1.5	32	8	0.10	**40**
		PA2			0.14	**40**
		PA1			0.08	**31**
N. Europe	**ASB**	PA1.5	23	8	0.10	**31**
		PA2			0.14	**31**

Potential benefits (disbenefits) from the project:			Without minus With project: Ocean diff.	Barge diff.	Drayage diff.	TOTAL (w/o - with)
		PA1			0.10	**(19)**
Asia	**ASB v. SPB**	PA1.5	(18)	(1)	(0.02)	**(19)**
		PA2			0.08	**(19)**
		PA1			0.10	**(16)**
Asia	**ASB v. NWSA**	PA1.5	(15)	(1)	(0.02)	**(16)**
		PA2			0.08	**(16)**
		PA1			0.10	**(13)**
N. Europe	**ASB v. NYNJ**	PA1.5	(10)	(3)	(0.02)	**(13)**
		PA2			0.08	**(13)**

Exports

Transit time without project (Days) Origin	Gateway	Destination	Ocean & Gateway	Rail	Drayage	Total w/o project
PA1					0.18	**31**
PA1.5	**SPB**	**Asia**	24	7	0.08	**31**
PA2					0.22	**31**
PA1					0.18	**26**
PA1.5	**NWSA**	**Asia**	18	8	0.08	**26**
PA2					0.22	**26**
PA1					0.18	**16**
PA1.5	**NYNJ**	**N. Europe**	10	6	0.08	**16**
PA2					0.22	**16**

Transit time with project (Days) Origin	Gateway	Destination	Ocean & Gateway	Barge	Drayage	Total with project
PA1					0.13	**38**
PA1.5	**ASB**	**Asia**	32	6	0.09	**38**
PA2					0.18	**38**
PA1					0.13	**24**
PA1.5	**ASB**	**N. Europe**	18	6	0.09	**24**
PA2					0.18	**24**

Potential benefits (disbenefits) from the project:			Without minus With project: Ocean diff.	Barge diff.	Drayage diff.	TOTAL (w/o - with)
PA1					0.05	**(7)**
PA1.5	**ASB v. SPB**	**Asia**	(8)	1	(0.01)	**(7)**
PA2					0.04	**(7)**
PA1					0.05	**(12)**
PA1.5	**ASB v. NWSA**	**Asia**	(14)	2	(0.01)	**(12)**
PA2					0.04	**(12)**
PA1					0.05	**(8)**
PA1.5	**ASB v. NYNJ**	**N. Europe**	(8)	0	(0.01)	**(8)**
PA2					0.04	**(8)**

Appendix 3: Financial plan

A3.1 Project financial plan

This section presents the results of the financial analysis of the ASB COB project. The objective of this analysis is to assess the viability of this project as a commercial enterprise. In this section we describe the methodology applied, our financial model, and its underlying assumptions. This section presents the Base Case analysis, including the projected demand to be handled by the ASB Project, the necessary capital investments (capex), fixed and variable operating expenditures (opex), as well as the handling rates and their associated revenues. Results indicate that the project as conceived barely meets financial feasibility criteria from a private investor perspective. Nonetheless, the project is expected to generate public benefits to the region that cannot be recouped by a private investor as demonstrated by our BCA.

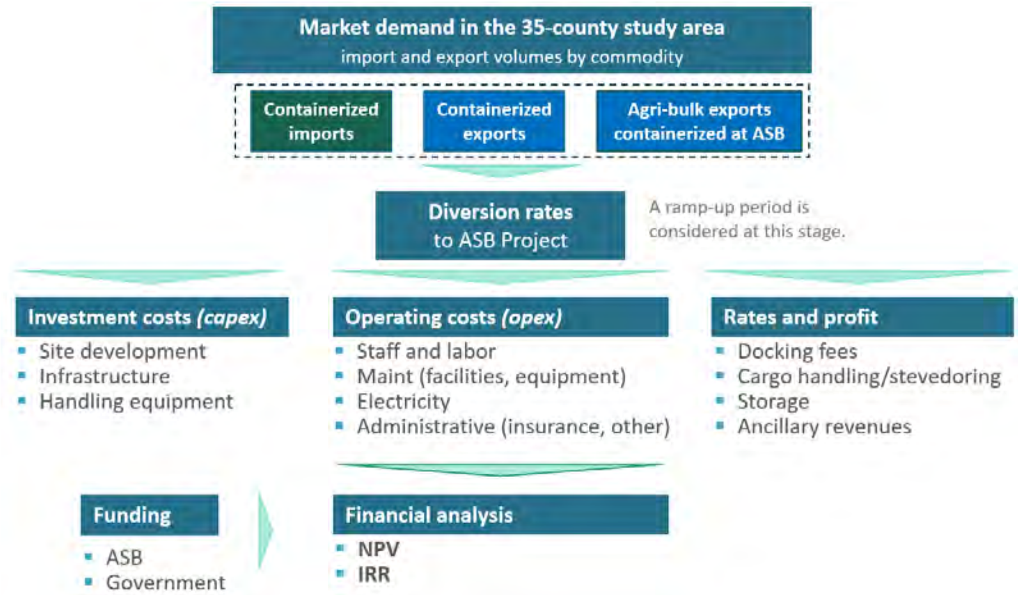
A3.2 Description of the financial model

Mercator constructed a discounted cash flow model integrating the projected demand to be handled by the COB terminal with the assumptions for capex and opex. In the project financial model, the value to the private entity (i.e. ASB) investing in the development of the project is entirely driven by its future cash flows. Throughput volumes are based on the market demand projections and the route cost analyses presented in *Section 5.7*. The volume projections assume that only a growing fraction of the overall market will be captured in the early years of the project (i.e. a ramp-up period).[43] Revenues are based on the expected volume demand and handling rates for each of the container flows for import and export and the transloading operation. Variable capex and opex are also modeled as a function of the volume forecast.

Capital costs were generated from indicative quotes and estimates based on independent research from online sources and third-party vendors and service providers. Benchmarks from other ports and interviews with barge operators in the Mississippi were used to estimate handling rates. The financial model also considers additional revenue from storage and ancillary services as a percentage from the overall revenue from the COB operation. The model also allows the ability to develop scenarios where the share of capital investments can be split between ASB and Government funding. The overall structure of the financial model for the ASB Project is illustrated in Figure 56.

[43] The ramp-up refers to the amount of time it takes a new facility to become fully productive from when first opens operations. For this case, the Base Year (Yr 0): 2020, Construction Period (Yr 1): 2021, Opening to the public (Yr 2): 2022 with a ramp-up of only 50% of the target volume, (Yr 3): 2023 with 75%, and (Yr4-30): 2024-2050 with 100%.

Figure 56. ASB Project financial modeling framework overview



The indicators used in the model to analyze the degree of financial feasibility are the Net Present Value (NPV) and the Internal Rate of Return (IRR). The financial model considers all cash flows at the end of each year over a 30-year analysis period. The capital structure is assumed to be 50% equity and 50% debt throughout the 30 years of analysis. The cost of equity is considered at 13%, based on rates a private investor would achieve as a strategic player. The cost of debt is assumed at 6% based on recent trends for comparable business and industry loans.[44] This results in a weighted avg. cost of capital (WACC) of 9.5%, which is used as the hurdle rate.

A3.3 Indicative capex:

Mercator developed scenario-based capex calculations utilizing the capital costs estimated by Manley Brothers. Given the size of the investment, it is reasonable to assume that the project will be constructed in less than one year; hence, initial capex costs will occur all in Year 1. Capex related to *handling equipment* consider only the minimum necessary to handle the expected container volumes. Capex related to *construction and civil works* consider only the minimum necessary for the business to operate. Capex are organized in the following six categories:

1. **Floating crane on barge - Option 1**—Budgets $1.06 million related to the infrastructure necessary to construct the dock barge that will support the crane. This assumes a 54' by 297' by 12' deep retired tank with reinforcement, along with the mooring piles. This concept also includes the crew access gangway and hoisting system as well as a break room for the crew.
2. **Marine construction (barge handling)—**accounts for $228 thousand related to marine construction, including barge haul positioning winches as well as barge breasting system & slide line.

   2e. Barge handling tug—budgets $500 thousand for a used inland push tugboat based on online prices (models between 1960-1980, and 800hp).

[44] USDA Business & Industry, traditional, or construction loans, December 2020: https://www.business.org/finance/loans/commercial-loan-rates/

3. **Container handling equipment—**budgets $1.81 million which consider a refurbished crane (incl. delivery), a container spreader bar for the crane, two container handling forklifts, and three bombcarts each with its respective tractors.
4. **Miscellaneous equipment**—budgets $40,000 for electrical winches, miscellaneous equipment for the crew break room, safety, and other equipment.

   4c. Site work—budgets $281,000 for 10,000 SF of roads and 74,000 SF of area dedicated to the container yard, both paved with compact limestone.
5. **Engineering & surveying—**budgets $105,000 to account for marine and electrical engineering, as well as site surveying.
6. **Contingency**—assumes 30% of the budget.

A summary for the startup capex modeled is shown in Table 47.

Table 47. Startup capex (Yr 1) (million, $)

		Unit	Yr 0	1
1. Floating crane on barge - Option 1		$		**$1,060,000**
2. Marine construction (barge handling)		$		**$228,300**
2e. Barge handling tug		$		**$500,000**
3. Container handling equipment				
Crane - Refurbished (incl. delivery)		$		$750,000
Container Handling Forklift		$		$700,000
Container Spreader Bar for Crane		$		$40,000
Bombcarts		$		$45,000
Tractors		$		$195,000
Container tilter machine		$		$80,000
Subtotal CHE		**$**		**$1,810,000**
4. Miscellaneous equipment		$		$40,000
4c. Site work		$		$281,000
5. Engineering & surveying		$		$105,000
Total (before contingency)		**$**		**$4,024,300**
6. Contingency	**30%**			$1,207,290
Grand total				**$5,240,000**

Table 48. NPV of capex: inputs for the benefit-cost analysis

Inputs for BCA Model	NPV ($)
NPV of opex (in 2020$)	5,240,000
Discounted at:	5,090,000
Discounted at:	4,900,000

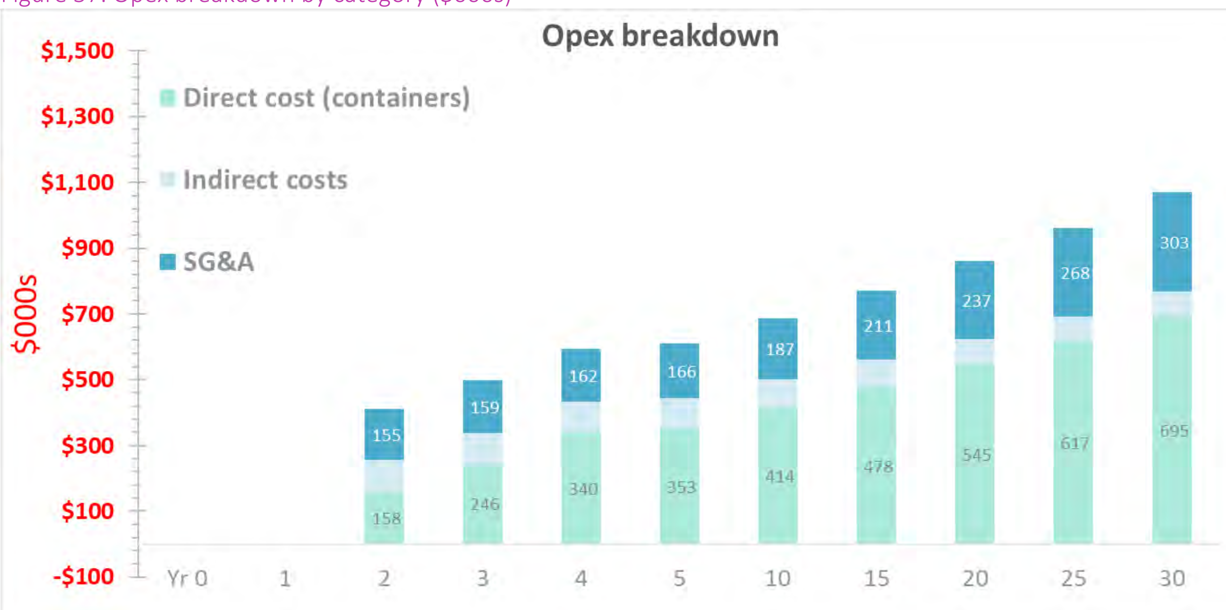
A3.4 Indicative opex

Mercator assumed the minimum operating expenses necessary for the operation and the facility. Opex costs are modelled to begin in Year 2 which is when construction has completed, the facility opens to the public, and traffic volumes begin. Opex are grouped in three main categories according to their operational characteristics:

(iv) Direct costs for containers
(v) Indirect costs
(vi) Selling, General and Administrative (SG&A)

Variable expenses are calculated as a function of the expected volume for the container flows and transloading: (i)direct costs for containers. Fixed expenses include (ii) indirect/overhead and (iii) SG&A and are only adjusted for inflationary changes. A summary of the opex breakdown by category is provided in Figure 57, and each category detailed in the following sections.

Figure 57. Opex breakdown by category ($000s)



Direct costs

Variable cost stevedoring gangs are considered for the container operations. Gangs are assumed to work based on the volume of cargo received for each flow of cargo. In addition to the variable costs for gang labor, 2 permanent positions are budgeted for receiving and delivering on the landside: 1 is a driver for the toploader and the other is a clerk. The transload operation also requires 2 personnel to operate the toploader and load the containers. Table 49 shows the composition of the gangs, container receiving, and transloading. The model utilizes a cost per unit (container) calculation as it is assumed that the labor for container receiving and delivering can also be utilized for transloading services as the volumes for the container on barge operation would not necessitate a full-time employee for either operation.

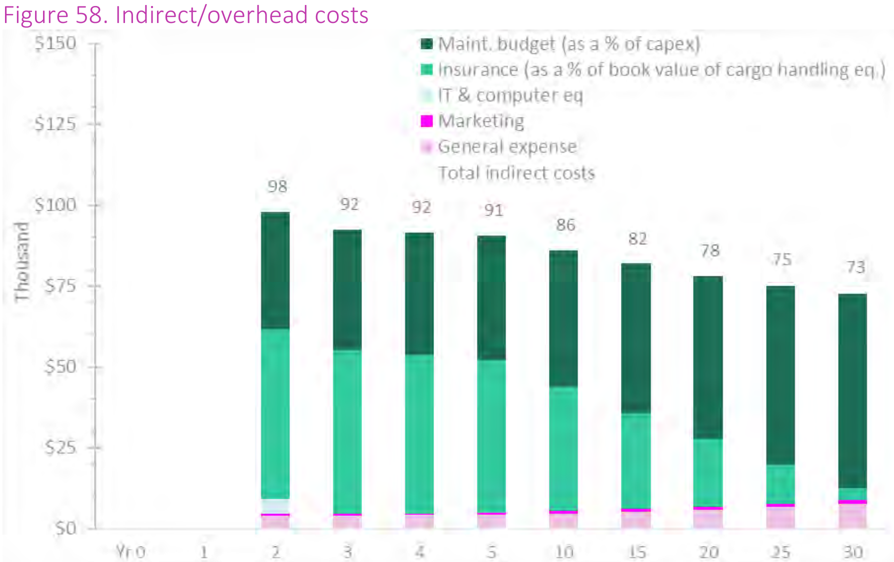
Table 49. Composition of specialized labor assumed for container and transload operations (variable cost)

Activity table:	Vol driver	Rate/hr	Person Req.	Lab Hr / unit	$ / LabHr	Cost $ / Unit
Barge loading / discharging						
Crane operator / checker	Cont Volume	10	2	0.2	$55	$11
Lasher / barge men / dock man	Cont Volume	10	2	0.2	$36	$7
Top-loader operator	Cont Volume	10	1	0.1	$55	$6
Drivers for ship loading	Cont Volume	10	2	0.2	$36	$7
Total stevedoring gang						**$31**
Container receive/deliver						
Toploader driver	Cont Volume	10	1	0.1	$55	$6
Clerk	Cont Volume	10	1	0.1	$55	$6
Total receive/deliver						**$11**
Container stuffing						
Toploader driver	Cont Volume	2	1	0.5	$55	$28
Utility	Cont Volume	2	1	0.5	$36	$18
Total transloading						**$46**

Indirect/overhead and SG&A costs

- Indirect/overhead. Indirect and overhead expenses are assumed to be driven by staffing levels and costs. Once estimated for the operation, these costs are only expected to grow at the rate of inflation. Further explanation of the main indirect and overhead cost components is provided in the following bullets:
  - *Infrastructure maintenance*—considered as a 1% of the initial capex beginning in year 2.
  - *Insurance*—considered as a 10% of the book value of the cargo handling equipment.
  - *IT & computer equipment*—included minimal costs per employee for hardware and software.
  - *Marketing* – There is a small budget for additional marketing for this new COB operation.
  - *Other expenses*—assumed to be driven as a function of the number of professional staff, which remain fixed, and are composed of *General Business Expenses* (supplies, postage, communications, etc) and *Miscellaneous Overhead (*safety equip., tools, etc).

Figure 58. Indirect/overhead costs



- **Selling, General Management, and Admin salaries (SG&A).** Salaries and overhead expenses are assumed to be driven by staffing levels and costs. In the early stage of the project, management and administrative staff is assumed to consist of:
  - 1 General manager with an annual loaded salary $ 85,000
  - 1 Maintenance staff member with annual loaded salary $ 65,000

Figure 59. Selling, general management, and admin salaries (SG&A)

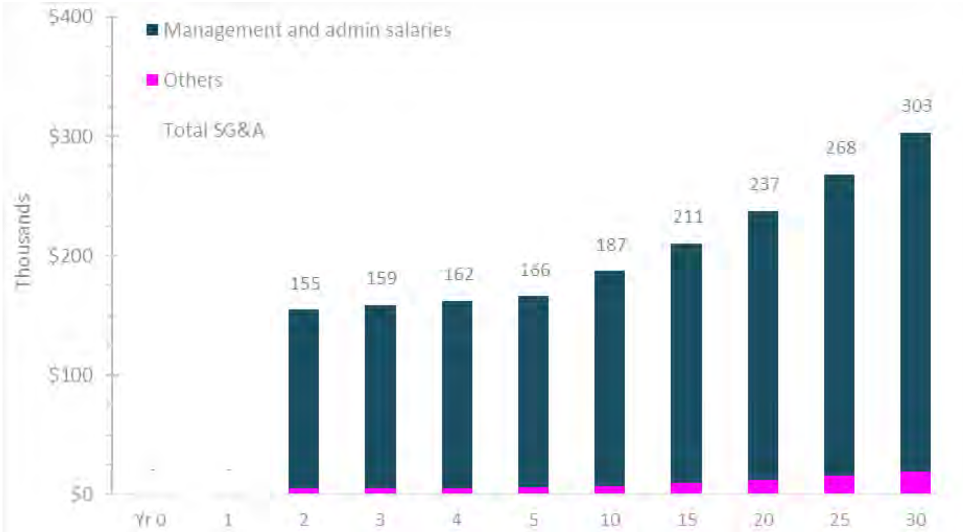


Table 50. NPV of opex: inputs for the benefit-cost analysis

Inputs for BCA Model	Disc. Rate	NPV ($)
NPV of opex (in 2020$)	0%	22,919,000
Discounted at:	3%	13,570,000
Discounted at:	7%	7,531,000

A3.5 Handling rates

The assumptions for cargo handling rates that can be expected for ASB for import and export container on barge loading and transloading export cargo into containers is listed below. Revenues begin in year 2 as volumes begin in that year. There is revenue stream for storage and ancillary service in the model. The rates assumed in the financial model are included in Table 51.

Table 51. Handling rates used in the financial model

Cargo handling rates charged by port	Input	Units
Containerized		
Container lift rate	$125	US$/Box
Container stuffing rate (export)	$140	US$/Box
Storage + ancilliary revenue	5%	% of Tot Rev

A3.6 Financial analysis

The financial modeling based on the revenue generated from imports, exports, and export transloading operations with the cost structures and capital expenditures outlined above. The project produces significant positive earnings by year 3 (EBITDA of $196,000) and a positive net income, after considering interest, taxes, depreciation, and amortization over the life of the project by year 4 (of $38,000). The internal rate of return is 10.8% which is just above the 9.5% WACC used as the discount rate, which would be the minimum return needed to invest in the project. A visual summary of the key outputs from the financial model is shown in Figure 60.

Figure 60. Summary outputs from the financial model ($ in Thousands)

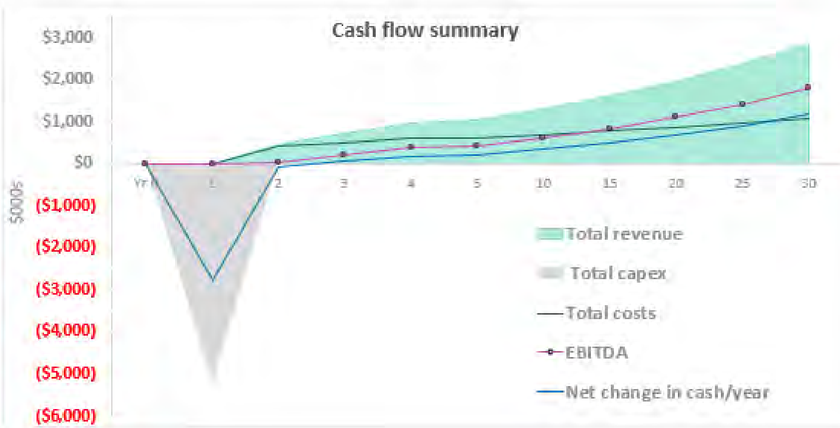
Summary of outputs $000	Discount rate	EBITDA NPV	Cash Flow NPV
Discounted at WACC	9.5%	$5,006	$497
		IRR	10.8%

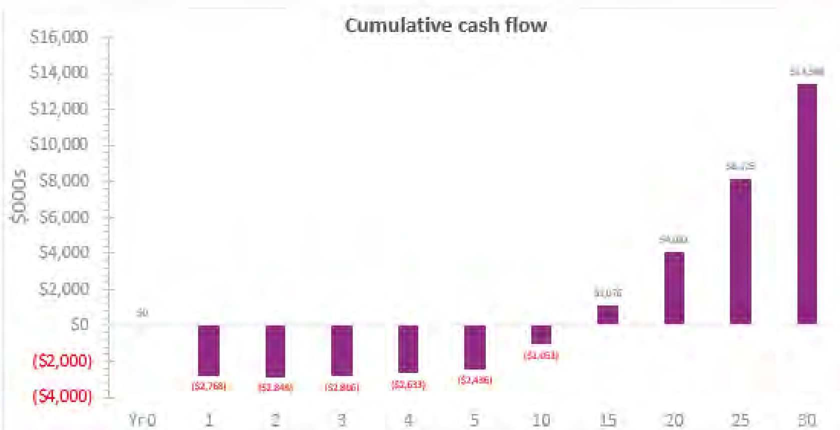
Total startup capex	($5,240)
Return on total assets	96%
No of yrs w positive cash flow	28
Years to payback	13

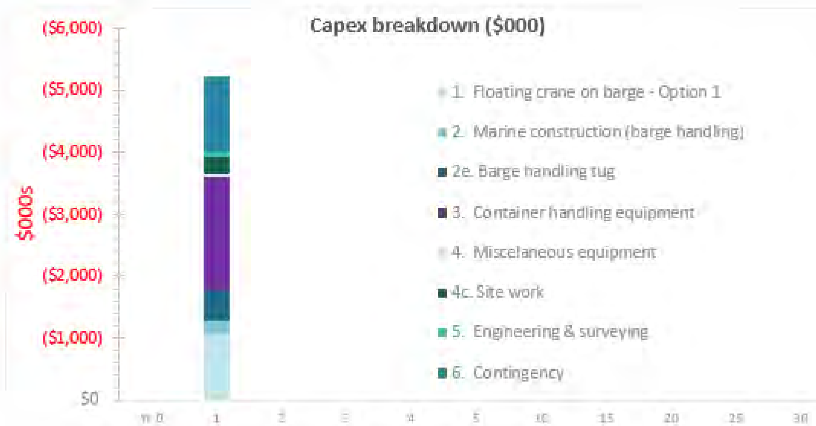
thousand US$

Summary of outputs	Yr 1 2021	Yr 2 2022	Yr 3 2023	Yr 4 2024	Yr 5 2025	Yr 10 2030	Yr 20 2040	Yr 30 2050
Volume (TEUs)	-	3,651	5,665	7,804	8,054	9,309	11,888	14,691
Gross revenue ($000s)	-	439	693	972	1,022	1,290	1,956	2,862
Total costs ($000s)	-	(411)	(497)	(594)	(609)	(687)	(861)	(1071)
EBITDA ($000s)	-	28	196	378	412	603	1,096	1,790
Net Income ($000s)	(114)	(220)	(96)	38	65	214	605	1,168

thousand US$







Appendix 4: Letters of support

MoDOT

Missouri Department of Transportation
Patrick K. McKenna, Director

105 West Capitol Avenue
P.O. Box 270
Jefferson City, Missouri 65102

1.888.ASK MODOT (275.6636)

February 26, 2020

Ms. Jill S. Wood, Executive Director
Missouri Agriculture and Small Business Development Authority
P.O. Box 6301
Jefferson City, MO 65102

RE: AGRIServices of Brunswick, LLC MASBDA Application

Dear Ms. Wood,

The Missouri Department of Transportation has been working with ports along the inland waterway system to develop a container on barge service to the Gulf of Mexico. This COB service will open the Missouri and Mississippi Rivers to additional commodities and allow economical movement of smaller quantities of specialized agricultural products along the waterway system.

One of the avenues to fund a pilot project or acquire equipment for the ports and navigators is through the US Department of Transportation Maritime Administration (MARAD) marine highways grant program. Eligibility for that program requires a feasibility analysis depicting a likelihood of success for the COB service plus a public entity project sponsor. My office has been working with AGRIServices, Port KC and America's Central Port to submit an application for the COB service with MoDOT as the sponsor. I have spoken with multiple staff at MARAD and they are very excited about the potential of COB service on this section of river and supportive of MoDOT's potential application.

I support AGRIServices MASBDA application to provide the critical feasibility analysis needed for my office to submit the marine highway application to bring COB service between Missouri and the Gulf of Mexico.

If I can provide any additional information, please contact me at Cheryl.Ball@modot.mo.gov or 573.526.5578.

Sincerely,

Cheryl R. Ball, IMPM
Administrator of Waterways and Freight

MoDOT

Our mission is to provide a world-class transportation system that is safe, innovative, reliable and dedicated to a prosperous Missouri.

www.modot.org

Appendix 5: Environmental Regulatory Requirements

This section presents a preliminary identification of the environmental regulatory requirements that would need to be satisfied in order for the project to move forward. The objective of this section is to provide a roadmap for the different types of factors that would need to be considered in an Environmental Impact Review process typical for a project of this magnitude. Such roadmap considers the expected roles of and rules in relationship to the ASB COB Port Project of the following environmental agencies and regulations. Summaries for the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ), and U.S. Army Corps of Engineers (USACE) are presented in this section. Summaries for the tribal land/consultation, United States Fish and Wildlife Services (USFWS) Endangered Species Act, field office of MO Conservation department in Jefferson City, Missouri, and the Missouri Department of Natural Resources (DNR), each is presented in more detail in the following sections.

A5.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) is the nation's basic environmental law that applies to all actions taken or approved by federal agencies. A Declaration of National Environmental Policy requires the federal government to use all practical means to create and maintain conditions under which man and nature can exist in productive harmony. The key goals of NEPA are to assist Federal agency officials with making well-informed decisions and to ensure both public and other agency's involvement in decision-making. NEPA requires that before federal agencies take a major action, they must evaluate environmental impacts prior to decision making on any major Federal action, such as the review of a permit application.

Major Federal actions involved in marine river terminals, such as the ASB COB Port Project, typically involve the USACE Section 10/404/408. The NEPA process consists of an evaluation of the environmental effects of a federal undertaking including its alternatives. There are three levels of analysis depending on whether or not an undertaking could significantly affect the environment:

- Categorical exclusion determination
- Preparation of an environmental assessment/finding of no significant impact (EA/FONSI), and
- Preparation of an environmental impact statement (EIS).

Categorical exclusion is used if the proposed action does not "individually or cumulatively have a significant effect on the human environment" (40CRF 1508.4). If an Environmental Assessment is needed, the two outcomes are either a finding of no significant impact, which will allow the project to continue, or an Environmental Impact Statement (EIS) will be required.

An EIS is the mechanism used to comply with the NEPA in the construction of marine river terminals like the ASB COB Port Project. An EIS must be prepared pursuant to the NEPA of 1969 (42 U.S.C. 4321 et seq.) and the Council on Environmental Quality (CEQ) NEPA Regulations (40 CFR Parts 1500-1508). The typical requirements of an EIS are described next.

A5.1.1 EIS overview

An EIS is a detailed study of the potential impacts, both beneficial and adverse, of a proposed project on the environment and local community. It also evaluates reasonable alternatives based off the identified project purpose and need. NEPA requires a federal agency to prepare an EIS for any major Federal action with the potential to significantly affect the quality of the human environment.

For marine river terminals of the scale of the ASB COB Port Project, the USACE typically bears the responsibility as the “Lead Federal Agency” responsible for both managing and overseeing the entire EIS process and identifying Cooperating Agencies to ensure compliance with other applicable laws and regulations. The USACE will use the EIS to inform its permit decisions and permissions. The EIS will conclude with a Record of Decision (ROD) for the 10/404 permit decision and the 408-permission decision. The ROD is the document in which USACE will announce and explain our permit and permission decisions regarding CPRA’s proposed project.

Following the publication of the Notice of Intent, the NEPA process involves the ASB COB Port Authority and the USACE holding scoping meetings, preparing and distributing the draft EISs for public review, holding public hearings to solicit public comment on the draft EISs, and publishing final EISs. Not less than 30 days after the publication of the U.S. Environmental Protection Agency's Notice of Availability of the final EISs, the USAC may issue a ROD documenting its decision concerning the proposed action for the project. The EIS process is illustrated in Figure 61.

Figure 61. EIS process

Source: NSDOT.

A5.1.2 Typical requirements for each stage of the EIS process

NEPA recommends that EIS must be analytic rather than encyclopedic. They must contain discussions of impacts in proportion to their significance. Insignificant impacts eliminated during the process under § 775.11(a) to determine the scope of issues must be discussed only to the extent necessary to state why they will not be significant. The focus of the EIS document must be to comply with NEPA and to assess the environmental impact of proposed actions, rather than to justify decisions already made. If a cost-benefit analysis relevant to the choice among environmentally different alternatives was prepared for the proposed action, it must be incorporated by reference or appended to the statement to aid in evaluating the environmental consequences. Table 52 provides information on each stage of the EIS process.

Table 52. EIS Process

Notice	The public is notified that the agency is preparing an EIS. The agency provides the public with information regarding how they can become involved in the process. The agency announces its project proposal with notices in the Federal Register, local media, and letters to citizens and groups that it knows are likely to be interested. Citizens and groups are welcome to send in comments helping the agency identify the issues it must address in the EIS (or EA).
Scoping, purpose, and need	The public scoping process is an early and open phase in the EIS process intended to provide interested or affected parties an opportunity to express concerns, ideas, and comments, which will inform/identify the issues and alternatives analyzed in the EIS document. The first meetings are held to discuss existing laws, the available information, and the research needed. The tasks are divided up and a lead group is selected. Decision makers and all those involved with the project should attend the meetings. At this stage the following questions must be answered: ▪ What is the purpose of this project? ▪ What is the goal trying to be achieved? ▪ Why is this project needed? ▪ What are the critical issues, resources, and impacts to be considered?
Project Alternatives	This stage must be informed by the information collected during the scoping process of the EIS. At this stage the following questions must be answered: ▪ What alternatives will be looked at in the EIS? ▪ No action alternative ▪ Proposed action, and ▪ A reasonable range of alternatives.
Affected Environment	This stage must aim to identify the potential environment to be affected by each of the alternatives. At this stage, the agency must conduct reasonable efforts to define the baseline conditions of the human environment that could potentially be affected and the anticipated environmental consequences. That is, defining how will building, operating, and maintaining this project could potentially affect those baseline conditions of the human environment.
Draft EIS (DEIS)	Based on both agency expertise and issues raised by the public, the agency prepares a Draft EIS with a full description of the affected environment, a reasonable range of alternatives, and an analysis of the impacts of each alternative.
Comment	Affected individuals then have the opportunity to provide feedback through written and public hearing statements. Formal comments for the EIS can be recorded multiple ways: ▪ Submit comment cards and letters during scoping meetings and by mail to the USACE ▪ Direct comments during public hearings (which must be recorded by the lead agency or the project sponsor) ▪ Construct and circulate a project website explaining the project, the EIS process, and soliciting public feedback.
Final EIS (FEIS) and Proposed Action	Based on the comments on the *Draft EIS*, the agency writes a *Final EIS*, and announces its Proposed Action. The public is not invited to comment on this, but if they are still unhappy, or feel that the agency has missed a major issue, they may protest the EIS to the Director of the agency. The Director may either ask the agency to revise the EIS.
Record of Decision (ROD)	Once all the protests are resolved the agency issues a Record of Decision which is its final action prior to implementation. If members of the public are still dissatisfied with the outcome, they may sue the agency in Federal court.
Supplemental EIS (SEIS)	Typically prepared after either a *Final EIS* or *Record of Decision* has been issued and new environmental impacts that were not considered in the original EIS are discovered, requiring the lead agency to re-evaluate its initial decision and consider new alternatives to avoid or mitigate the new impacts. Supplemental EISs are also prepared when the size and scope of a federal action changes, or when all of the proposed alternatives in an EIS are deemed to have unacceptable environmental impacts and new alternatives are proposed.

Items such as permits, licenses and authorizations relating to the proposal must be listed in the draft environmental impact statement. An EIS must also include discussion of any deviation from the proposal actions and any state or local law, or ordinances. Included in this discussion is an explanation on how the actions will be reconciled to the law, or ordinance. An outline for the standard format for an EIS is provided as reference in Appendix E.[45]

A5.2 The Council on Environmental Quality (CEQ)

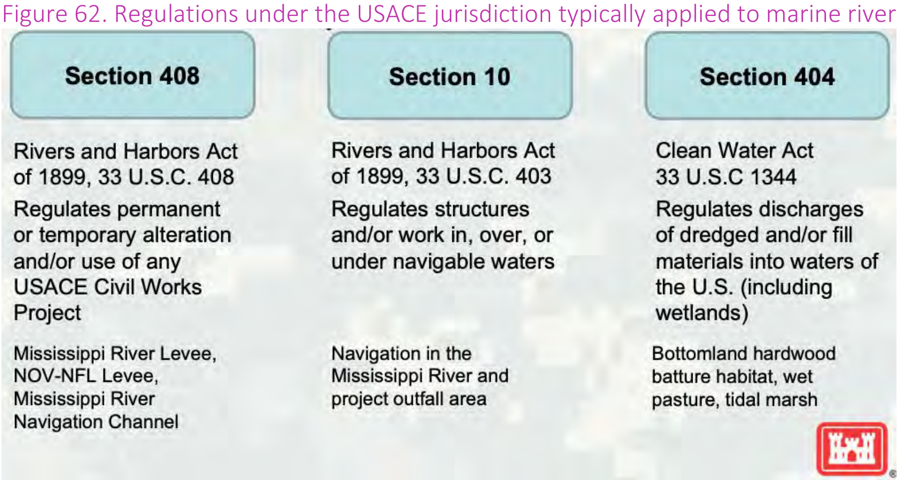
The Council on Environmental Quality (CEQ) oversees Federal agency NEPA implementation and develops and recommends national policies that promote the improvement of environmental quality. The CEQ proposed an update on regulations for implementing the procedural provisions of the NEPA. The proposed update is to reduce unnecessary paperwork and delays, and to promote better decision-making consistent with NEPA's statutory requirement. CEQ announced the proposed update on January 10, 2020 and is currently in the commenting period phase.

A5.3 Clean Water Act of 1972 (CWA)

A5.3.1 The U.S. Army Corps of Engineers (USACE)

USACE reviews an applicant's request for permits and permissions to make decisions based on the best available science, engineering standards, and professional judgment, that considers impacts to USACE projects, waters of the U.S., and jurisdictional wetlands. For marine river terminal projects, the USACE typically considers regulations contained in the River and Harbors Act (Sections 408 and 403) and in the Clean Water Act (Section 404). These requirements, as applied by the USACE, are illustrated in Figure 62.

Figure 62. Regulations under the USACE jurisdiction typically applied to marine river terminals



Source: USACE.

- **Section 408—**A Section 408 permit is required for alterations that builds upon, alters, improves, moves, occupies, or otherwise affects the usefulness, or structural or ecological integrity of USACE projects. A decision on the Section 408 must come before a Section 10/404 is issued. In addition, other environmental compliances must be issued prior to the approval of a Section 408. Documentation that is needed includes: technical analysis, hydrologic system performance,

[45] 39 CFR § 775.11—Environmental impact statements. Legal Information Institute, Cornell University, https://www.law.cornell.edu/cfr/text/39/775.11

geotechnical, NEPA Compliance, real estate requirements, and the requester's review plan. NEPA compliance, ESA compliance, and the NHPA compliance should all be provided to the USACE.

- **Section 10—**A Section 10 of the Rivers and Harbors Act of 1899 is required for the construction of any structure in or over any navigable water of the United States. This includes dredging or disposal of dredged materials, excavation, filling, or channelization of the water, and any construction in the water, such as docks, piers, pilings, etc. In addition, compliance with other federal regulations will also need to be completed in order for the issuance of the Section 10 approval.

  Section 10 Navigable Waters of the United States within the Kansas City District, Corps of Engineers Regulatory Boundary. USACE Kansas City District identified the following nine navigable waters:

  - *Blue River* – From river mile 0.0 (mouth at Missouri River) upstream to mile 4.38 (within the city limits of Kansas City, Missouri);
  - *Gasconade River* – From river mile 0.0 to mile 107.0 (confluence with the Missouri River upstream to the vicinity of Arlington, in Phelps County, Missouri);
  - *Grand River* – From river mile 0.0 to mile 3.0 (confluence with the Missouri River upstream to the vicinity of Brunswick, in Chariton County, Missouri);
  - *Kansas River* – From river mile 0.0 to mile 170.4 (confluence with the Missouri River upstream to its confluence with the Republican and Smoky Hill Rivers in the vicinity of Junction City, in Geary County, Kansas);
  - *Lamine River* – From river mile 0.0 to mile 14.0 (confluence with the Missouri River upstream to the vicinity of Roberts Bluff Bridge in Cooper County, Missouri);
  - *Missouri River* – From river mile 49.8 to mile 552.7 (St. Charles County upstream to the Missouri/Iowa state line in Atchison County, Missouri);
  - *Osage River* – From river mile 0.0 to mile 81.7 (confluence with the Missouri River upstream to Bagnell Dam in Miller County, Missouri); and
  - *Lake of the Ozarks* – From lake mile 0.0 to mile 89.3 (Bagnell Dam to the vicinity of Warsaw, in Benton County, Missouri).

- **Section 404—**A Section 404 permit is from the Clean Water Act to regulate the discharge of dredged or fill materials into any waters of the United States (including wetlands). No discharge of dredged or fill material may be permitted if either a practical alternative exists, or the water would be significantly degraded. For the permit application, it should be shown how impacts are being minimized, and if needed, it is possible to provide compensation if there are unavoidable impacts.

- **Section 401—**If the project may involve placing materials in a lake, river, stream, dry streambed or wetland, and is within jurisdictional waters, it will be considered a regulated activity and may require a Section 401 Water Quality Permit.

Best Management Practices should be established to reduce stormwater pollution. Prior to construction activities, the contractor would be required to obtain an NDPDES permit and develop a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP would outline phasing for erosion and sediment controls, stabilization measures, pollution-prevention measures, and prohibited discharges. The SWPPP would also include BMPs to minimize erosion, sedimentation, and stormwater runoff (e.g. fiber rolls, straw waddles, erosion mats, silt fencing, turbidity barriers, mulching, filter fabric fencing, sediment traps and ponds, surface water interceptor swales, ditches). In addition, waste material would be disposed of in accordance with state and federal laws. The SWPPP should include dust control measures during construction.

The responsible party or the operator is required to submit a Notice of Intent (NOI) to the Environmental Protection Agency (EPA) before start of construction project and submit the Notice of Termination (NOT) to EPA when construction project is complete.

A jurisdictional determination is a decision by the USACE Kansas City Division as to whether areas on property are regulated under federal statutes. A federally-regulated wetland, lake, pond or stream is called a "waters of the U.S. USACE performs wetland delineations for potential applicants for permits under Section 404 of the CWA; however, this can take months and it is highly recommended that the potential applicant uses qualified consultants to conduct wetland delineations, especially for project of this magnitude.

However, the EPA released a final rule recently to replace the 2015 Waters of the United States (WOTUS) regulation, which provided additional federal pollution protections to large and small bodies of water in accordance with the Clean Water Act (CWA). The rule is the second piece in a two-step process to repeal and replace WOTUS, pursuant to Executive Order 13778 issued in 2017. The revised definition includes four categories: territorial seas and traditional navigable waters (TNWs); tributaries; lakes, ponds, and impoundments of jurisdictional waters; and adjacent wetlands. It also outlines which waters are not subject to federal control, such as bodies that contain water from rainfall, groundwater, many ditches, prior converted cropland, farm and stock watering ponds; and water treatment systems. The rule will take approximately 60 days following publication in the Federal Register.

A5.3.2 Federal Safe Drinking Water Act, Missouri Safe Drinking Water Act

A permit is required if the proposed action plans to dispense water to the public, including submission of predesign studies and plans and specifications, system operation and reliability of the system. Missouri's Safe Drinking Water Commission 60 regulates such permit.

A5.4 Clean Air Act of 1963

Under the Missouri Air Conservation Law and in accordance with the Clean Air Act (CAA), Missouri establishes the criteria pollutants have human health-based or welfare-based standards that set the maximum concentrations that are allowed in the ambient air (i.e. the air that the general public is exposed to). The federal standards for the criteria pollutants are known as the National Ambient Air Quality Standards (NAAQS). These criteria pollutants include particulate matter less than 10 microns in diameter (PM10), particulate matter less than 2.5 microns in diameter (PM2.5), sulfur dioxide (SO2), carbon monoxide (CO), ozone, nitrogen dioxide (NOx) and lead. Missouri has two additional pollutants which have ambient air quality standards in addition to the NAAQS. These include hydrogen sulfide and sulfuric acid.

- A list of all Ambient Air Quality Standards can be found at 10 CSR 10-6.010. List of regulated air pollutants, please refer to the Code of State Regulations, specifically 10 CSR 10-6.020(3) at the following website:
    - http://www.sos.mo.gov/adrules/csr/current/10csr/10csr.asp.
- EPA approves States Implementation Plan. The link provides the current status of Missouri Designated Areas:

    - https://www3.epa.gov/airquality/urbanair/sipstatus/reports/mo_areabypoll.html
- Air Quality Standards, Definitions, Sampling and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri can be found here:
    - https://www.sos.mo.gov/cmsimages/adrules/csr/current/10csr/10c10-6a.pdf

A5.4.1 Air construction permits / new source review permits

Department of Natural Resources Air Pollution Control Program issues air construction permits. Construction permits are required for new air pollution source. Certain activities have been determined by the state to be a source of insignificant emissions and are exempt from permitting requirements per 10 CSR 10-6.061. Construction permits allow an installation to construct and operate an air emission source. There are various types of Air Permits: Air Pollution Control Program issues several types of construction permits: Major, Minor and De Minimis permits, portable relocation permits, temporary permits, and permits-by-rule. The Department of Natural Resources provides guidance on Air Quality:

- https://dnr.mo.gov/env/apcp/permits/constpmtguide.htm

A5.5 Section 106 Tribal Land and Consultation

Agencies are required to consult on a "government-to-government" basis with federally-recognized Indian tribes and nations on projects receiving federal funds or requiring federal permits.

The lead agency or the project sponsor must consult with federally-recognized Indian tribes with ancestral, historic, and ceded land connections to Missouri. Consultation with tribes is intended to facilitate avoiding or minimizing project impacts to cultural resources that a tribe considers of historical or religious significance. A tribe must determine if the proposed project is located at or near known culturally significant sites or localities. Placing this step early in the planning process allows the greatest opportunity to work to avoid or minimize adverse effects to these culturally sensitive/significant areas.

A5.5.1 The Archeological Historic Preservation Act of 1970

The American Indian Religious Freedom Act of 1978 requires consultation with Native American groups concerning proposed actions on sacred sites on federal land or affecting access to sacred sites. It establishes federal policy to protect and preserve for American Indians, Eskimos, Aleuts, and Native Hawaiians the right to free exercise of their religion in the form of site access, use and possession of sacred objects, as well as the freedom to worship through ceremonial and traditional rites.

The Act requires federal agencies to consider the impacts of their actions on religious sites and objects important to American Indians, regardless of eligibility for listing on the NRHP.

The Native American Graves Protection and Repatriation Act of 1990 is triggered by the possession of human remains or cultural items by a federally-funded repository or by the discovery of human remains or cultural items on federal or Tribal lands and provides for the inventory, protection, and return of cultural items to affiliated Native American groups. Permits are required for intentional excavation and removal of Native American cultural items from federal or Tribal lands.

A5.5.2 National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act (16 U.S.C. § 470), as amended, requires that federally-funded projects be evaluated for the effects on historic and cultural properties included in, or eligible for listing on, the NRHP.

The MoDOT has communicated with a large number of Indian tribes and nations with ties to Missouri to identify areas of tribal interest and concern. To date, 26 federally-recognized Tribes have requested consultation about transportation projects in some portion of Missouri. MoDOT keeps confidential information regarding archaeological sites, traditional cultural properties, and sacred sites. MoDOT's Tribal Consultation Map indicates the following 10 federally-recognized Tribes in Cole County:

- Iowa Tribe of Kansas and Nebraska
- Iowa Tribe of Oklahoma
- Kaw Indian Nation of Oklahoma
- Miami Tribe of Oklahoma
- Osage Nation
- Ponca Tribe of Nebraska
- Ponca Tribe of Oklahoma
- Sac and Fox Tribe of the Missouri in Kansas and Nebraska
- Sac and Fox Tribe of the Mississippi in Iowa
- Sac and Fox Nation of Oklahoma

For the ASB COB Port Project, the consultation process must seek, discuss, and consider the views of other participants, and, where feasible, seek agreement with them on matters arising in the Section 106 process. Typical Consulting Parties include:

- Federal Agency (USACE, FHWA, Forest Service, National Park Service, etc.)
- State Historic Preservation Office (SHPO)
- Tribes—see tribal consultation page
- Local governments with jurisdiction over historic properties
- Project applicants (MoDOT and local governments)
- Missouri Department of Natural Resources (MoDNR)
- Those with a demonstrated interest in the undertaking—legal or economic interest in the project or those with an interest in project effects on historic properties.

The Lead Agency and the project sponsor will need to work in close coordination with the MoDOT Historic Preservation Section to get the process started.[46] MoDOT will work with the State Historic Preservation Officer (SHPO) to identify consulting parties and invite them to participate in consultation. Participants must be conferred an official *"consulting party"* status. Consulting parties help the USACE and MoDOT make decisions. Because they often live in the community, consulting parties can help identify properties that are eligible for listing on the National Register of Historic Places. Consulting parties also help identify project effects on historic properties. An adverse effect occurs when a project alters the characteristics of a property that make it eligible for inclusion in the National Register in such a way that it diminishes the integrity of the historic property. If a project will have an adverse effect, consulting parties help to identify ways to minimize or mitigate the effect. A Section 106 Project Form must be completed in order to initiate the process. SHPO Section 106 Survey Memo Form, MO 780-1718 must be completed by a professional archaeologists or architectural historians reporting survey results. According to 36 CFR Part 800, Federal agencies are responsible for initiating Section 106 review. The Missouri State Historic Preservation Officer

[46] To get the process started the HPA must contact MoDOT Historic Preservation Manager. For contact information and a more comprehensive overview of the entire process please see https://www.modot.org/consultation-under-section-106.

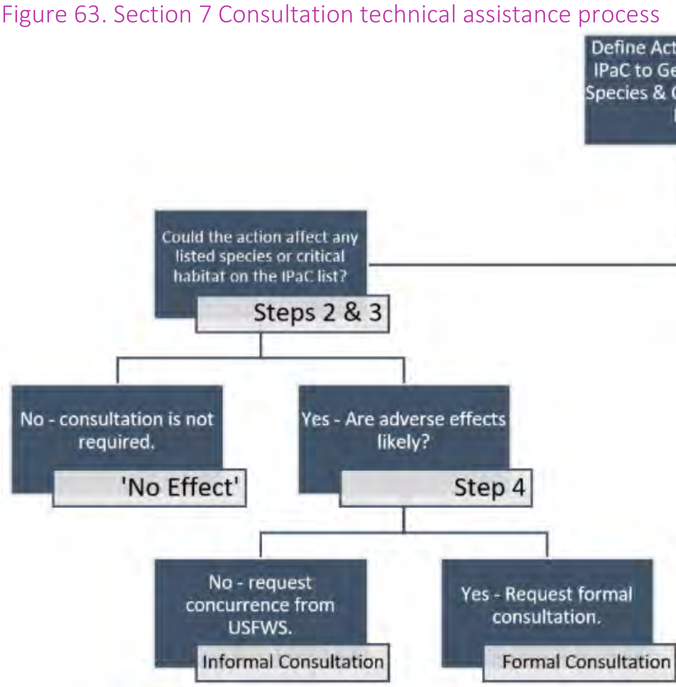
(SHPO) within the Department of Natural Resources, coordinates the state's historic preservation program and consults with agencies during Section 106 review. The process will include a cultural resource survey/inventory, consultation with SHPO and Tribes.

A5.6 Section 7 Fish and Wildlife Service Endangered Species Act

Section 7 of the Endangered Species Act of 1973 (ESA) requires all Federal agencies to use their authorities to conserve endangered and threatened species in consultation with U.S. Fish and Wildlife Service (USFWS). This 'proactive conservation mandate' for Federal agencies is articulated in section 7(a)(1) of the law. Section 7(a)(2) contains a complementary consultation mandate for Federal agencies, which we discuss below. Under the Section 7 implementing regulations (50 CFR Part 402), Federal agencies must review their actions to determine whether they may affect endangered or threatened species or critical habitat. To accomplish this, Federal agencies must determine whether any listed species may be present in the action area and whether that area overlaps with critical habitat. If one or more listed species may be present in the action area – or if critical habitat overlaps with the action area – agencies must evaluate the potential effects of their action.

Agencies must confer with the USFWS per Section 7(a)(4) of the ESA if any action is likely to jeopardize a species proposed for listing or to destroy or adversely modify proposed critical habitat. To determine whether either of these are likely, agencies may follow the same approach that we recommend for listed species and designated critical habitat – that is, evaluate the likely effects of their actions on any proposed species that may be present in the action area and on any proposed critical habitat that overlaps with the action area. Step-by-step instructions for Section 7 Consultation technical assistance are provided in Figure 63.

Figure 63. Section 7 Consultation technical assistance process



Source: U.S. Fish and Wildlife Service.

Mercator utilized the tools provided online by the U.S. Fish and Wildlife Service under the Section 7 Consultation to determine whether a listed or proposed species or designated or proposed critical habitat may be present within the action area.[47] The area definition of the ASB COB Project used for this purpose in the IPaC system is illustrated in Figure 64.

Figure 64. Area definition of the ASB COB Port Project used for this purpose in the IPaC system

Source: Developed by Mercator using the U.S. Fish and Wildlife Service IPaC System.

A5.6.1 Endangered Species Act of 1973

Formal Consultation with the United States Fish and Wildlife Midwest Region is required if an action is likely to "adversely affect" listed species and designated critical habitat. For proposed species, further consultation is required only if the action is likely to "jeopardize the continued existence" of the species or result in "destruction or adverse modification" of critical habitat. Federal agencies are required to determine whether their actions may affect listed or proposed species and designated and proposed critical habitat. In order to successfully execute a proposed Action. Biological Assessments (BA) are only required for "major construction activities," which are Federal actions that may significantly affect the quality of the human environment. The purpose of a biological assessment is to evaluate the potential effects of the action on listed and proposed species and designated and proposed critical habitat and determine whether any such species or habitat are likely to be adversely affected by the action. Section 7 Endangered Species Act Consultation, it is recommended that the proponent conduct a Biological Assessment to support conclusions regarding the effects of their proposed actions on protected resources.

Listed species and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries). Based on the analysis conducted using the IPaC System, Mercator identified the following as listed, proposed, or candidate endangered species in the ASB COB Port Project area, shown in Figure 65.

[47] US Fish and Wildlife Service, Information for Planning and Consultation (IPaC), project planning tool, https://ecos.fws.gov/ipac/

Figure 65. Presence of listed, proposed, or candidate endangered species at ASB

Endangered species

Listed species 1 and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries 2).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

Additional information on endangered species data is provided below.

The following species are potentially affected by activities in this location:

THUMBNAILS LIST

Mammals

NAME	STATUS
Gray Bat Myotis grisescens	Endangered
Indiana Bat CH Myotis sodalis	Endangered
Northern Long-eared Bat Myotis septentrionalis	Threatened

Fishes

NAME	STATUS
Pallid Sturgeon Scaphirhynchus albus	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

A5.6.2 Migratory Bird Treaty Act (MBTA)

Protection for migratory birds is provided under the Migratory Bird Treaty Act (MBTA) (916 U.S.C. § 703–711). The MBTA regulates impacts on migratory birds, such as taking, direct mortality, habitat degradation, and displacement of individual birds. The MBTA defines 'taking' to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof, except when specifically permitted by regulations. The MBTA regulates impacts on migratory birds, such as taking, direct mortality, habitat degradation, and displacement of individual birds. The MBTA defines 'taking' to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof, except when specifically permitted by regulations.

Certain birds are protected under the MBTA and the Bald and Golden Eagle Protection Act. The birds listed in Figure 66 are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in the area of the ASB COB Port Project. Based on the analysis conducted using the IPaC System, Mercator identified the following species as listed, proposed, or candidate migratory birds in the ASB COB Port Project area.

Figure 66. Presence of listed, proposed, or candidate migratory birds in the ASB COB Port Project Area

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act 6 and the Bald and Golden Eagle Protection Act 7.

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

RELATED LINKS

Birds of Conservation Concern

Measures for avoiding and minimizing impacts to birds

Nationwide conservation measures for birds

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

THUMBNAILS LIST PROBABILITY OF PRESENCE SUMMARY

NAME / LEVEL OF CONCERN	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus Non-BCC Vulnerable	Breeds Oct 15 to Aug 31
Red-headed Woodpecker Melanerpes erythrocephalus BCC Rangewide (CON)	Breeds May 10 to Sep 10

The Nationwide Standard Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year-round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure.

General Measures as defined by the Nationwide Standard Conservation Measures include:

- Educate all employees, contractors, and/or site visitors of relevant rules and regulations that protect wildlife. See the Service webpage on Regulations and Policies for more information on regulations that protect migratory birds.
- Prior to removal of an inactive nest, ensure that the nest is not protected under the Endangered Species Act (ESA) or the Bald and Golden Eagle Protection Act (BGEPA). Nests protected under ESA or BGEPA cannot be removed without a valid permit. See the Service Nest Destruction Policy.
- Do not collect birds (live or dead) or their parts (e.g., feathers) or nests without a valid permit. Please visit the Service permits page for more information on permits and permit applications.

Provide enclosed solid waste receptacles at all project areas. Non-hazardous solid waste (trash) would be collected and deposited in the on-site receptacles. Solid waste would be collected and disposed of by a local waste disposal contractor. For more information about solid waste and how to properly dispose of it, see the EPA Non-Hazardous Waste website.

- Report any incidental take of a migratory bird, to the local Service Office of Law Enforcement.
- Consult and follow applicable Service industry guidance.
- Habitat Measures as defined by the Nationwide Standard Conservation Measures include:
- Minimize project creep by clearly delineating and maintaining project boundaries (including staging areas).
- Consult all local, State, and Federal regulations for the development of an appropriate buffer distance between development site and any wetland or waterway.
- Maximize use of disturbed land for all project activities (i.e., siting, lay-down areas, and construction).
- Implement standard soil erosion and dust control measures. For example: (i) Establish vegetation cover to stabilize soil, (ii) Use erosion blankets to prevent soil loss, and (iii) Water bare soil to prevent wind erosion and dust issues.

Additional measures and/or permits may be advisable depending on the type of activity and the type of infrastructure or bird species present on the project site. A complete list of the Nationwide Conservation Measures can be found here.[48]

A5.6.3 Fish and Wildlife Coordination Act

Fish and Wildlife Coordination Act gives the National Oceanic and Atmospheric Administration (NOAA) an important advisory role to review and comment on proposed federally permitted activities that could affect living marine resources. As amended in 1964, the act requires that all federal agencies consult with NOAA Fisheries, U.S. Fish and Wildlife Service, and state wildlife agencies when proposed actions might result in modification of a natural stream or body of water. Federal agencies must consider how these projects would affect fish and wildlife and provide for improvement of these resources. Essential Fish Habitat mapper can be found here: https://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper

The act allows NOAA Fisheries to provide comments to the U.S. Army Corps of Engineers during review of projects under section 404 of the Clean Water Act (concerning the discharge of dredged materials into navigable waters) and section 10 of the Rivers and Harbors Act of 1899 (obstructions in navigable waterways). NOAA Fisheries comments provided under the Fish and Wildlife Coordination Act are intended to reduce environmental impacts to migratory, estuarine, and marine fisheries and their habitats.

A5.7 Wetlands

Lastly, in order to meet USACE's Dredge and Fill Wetlands Permit Requirements, a wetland delineation is recommended. USACE Wetlands Delineations Manual contains information to identify wetlands. All delineations must be conducted in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual, or appropriate Regional Supplement, and submitted to the District for review and verification.

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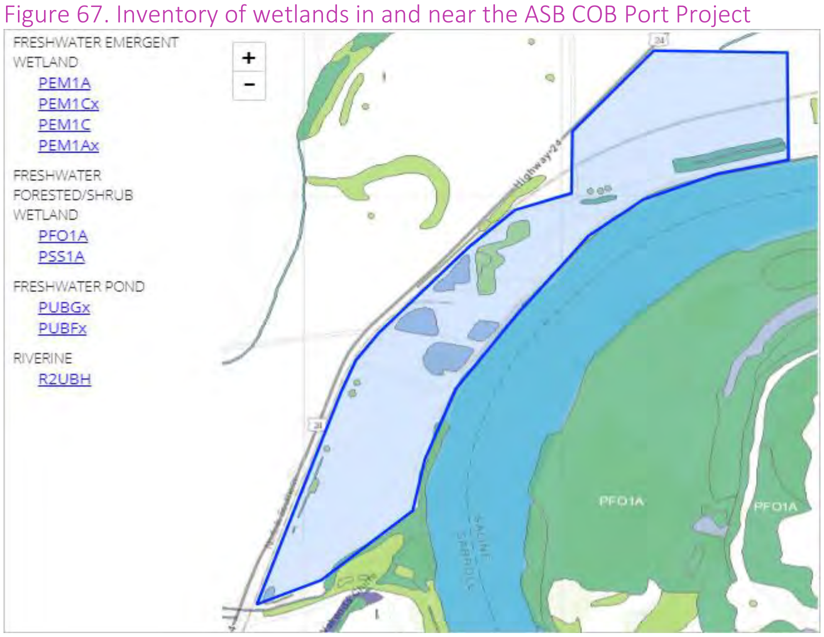
[48] US Fish and Wildlife Service, Nationwide Standard Conservation Measures, https://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Based on the outcomes from the IPaC System, Mercator utilized the U.S. Fish and Wildlife Service's Wetlands Mapper tool to generate current information on the status, extent, characteristics and functions of wetlands, riparian, and deepwater habitats. This information is intended to promote the understanding and conservation of wetland resources and to aid in resource management, research and decision making. The Wetlands Mapper shows wetland type and extent using a biological definition of wetlands. There is no attempt to define the limits of proprietary jurisdiction of any Federal, State, or local government, or to establish the geographical scope of the regulatory programs of government agencies.[49] Based on this analysis, Mercator identified the following wetlands, riparian, and deepwater habitats in or near the ASB COB Port Project according to their respective classification codes and definitions, as per the U.S. Fish and Wildlife Service, which are illustrated in Figure 67.

Figure 67. Inventory of wetlands in and near the ASB COB Port Project



Source: Developed by Mercator using the U.S. Fish and Wildlife Service's Wetlands Mapper tool.

A5.7.1 Floodplain management

Executive Order 11988 adopts a higher flood standard for future federal investments in and affecting floodplains. This includes projects where federal funds are used to build new structures and facilities or to rebuild those that have been damaged. The guidelines address an eight-step process that agencies should carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. There are eight steps in the decision-making process required in Section 2(a) of the Order.

A5.8 Missouri Department of Natural Resources (DNR)

The Missouri Department of Natural Resources helps to develop mineral, oil and gas resources in an environmentally safe manner, while promoting the environmentally sound operations of businesses, communities, agriculture, and industries in the state. The department and its Water Resources Center has statutory authority for water quantity issues such as statewide water use and availability, water resources monitoring and planning, drought assessment, flood and hydrology studies and wetland studies. The Surface Water Section provides technical support by performing water supply analyses, in-stream flow assessments and floodplain studies. The surface water section also administers the collection and analysis

[49] US Fish and Wildlife Service, Wetlands Mapper tool, https://www.fws.gov/wetlands/data/Mapper.html

of statewide water use data in accordance with the Major Water User Law. Depending on the final configuration of the ASB COB Port Project, compliance with additional regulations established by the DNR might be required. A complete list is included here.[50]

The Missouri DNR issues permits for wetland or dredge and fill, and land disturbance activities. These permits are required for any construction, placement, disposal or fill material, or earth movement within a wetland or body of water. Any land disturbance activities of greater than an acre will require a permit. Within the permit it is also required to have a stormwater pollution prevention plan implemented to reduce pollution to the waters. Additionally, the DNR also issues 401 permits. The Clean Water Act section 401 certification can be needed in tandem with a section 404, at the USACE discretion. The Missouri DNR has authority to issue 401 certification, and would evaluate the application, if needed.

A5.8.1 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

Hazardous substance, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. § 9601(14)), is defined as: "(A) any substance designated pursuant to section 1321(b)(2)(A) of Title 33; (B) any element, compound, mixture, solution, or substance designated pursuant to section 9602 of this title; (C) any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Resource Conservation and Recovery Act (RCRA) of 1976, as amended, (42 U.S.C. § 6921); (D) any toxic pollutant listed under section 1317(a) of Title 33; (E) any hazardous air pollutant listed under Section 112 of the CAA (42 U.S.C. § 7412); and (F) any imminently hazardous chemical substance or mixture with respect to which the Administrator of the USEPA has taken action pursuant to section 2606 of Title 15. The term does not include petroleum, including crude oil or any fraction thereof, which is not otherwise specifically listed or designated as a hazardous substance, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas)."

A5.8.2 Resource Conservation and Recovery Act (RCRA)

Resource Conservation and Recovery Act (RCRA) defines a hazardous waste in 42 U.S.C. § 6903, as "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may: (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."

A5.8.3 Missouri Hazardous Waste Management Law

Facilities and properties that (1) have documented releases of hazardous substances or wastes to the environment or (2) manage hazardous substances or wastes in substantial quantities and have the potential to release hazardous substances or wastes to the environment are required to report these activities to federal and state regulatory agencies. The Missouri Department of Natural Resources Hazardous Waste and Enforcement Unit and USEPA maintain databases to track and monitor these facilities and properties. The Hazardous Waste and Enforcement Unit handles hazardous waste permits and ensures compliance with hazardous waste laws and regulations: Revised Statutes of Missouri (Chapter 260.350-260.575), Code of Federal Regulations (40 CFR 260 – 279) and Code of State Regulations (10 CSR 25).

[50] Missouri Department of Natural Resources (DNR), Forms, Applications, Permits, Manuals and Other Documents https://dnr.mo.gov/forms/

A5.8.4 Toxic Substance and Control Act (TSCA)

The law requires all commercial Polychlorinated Biphenyl (PCB) facilities in Missouri obtain a hazardous waste permit from the Missouri Department of Natural Resources. The department's Hazardous Waste Program inspects these facilities to make sure they are following TSCA requirements. The department must also keep an updated list of all commercial PCB facilities in the state.

A5.8.5 Missouri Soil Conservation Section 278

Refer to Soil and Water Districts Commission - Division 70

A5.8.6 Missouri Solid Waste Management Law

Section 260.200 through 260.345 only handled by Missouri Solid Waste Division 80.

A5.9 Missouri Conservation Department

The Missouri Department of Conservation can be a resource for new projects. The Missouri Conservation Department works with communities across the state to decrease the negative impacts of urbanization or construction projects on fish, forests, and wildlife or to benefit from the wiser use of natural resources. Communities turn to MDC every year for technical assistance. On their publication *Conservation Planning Tools for Missouri Communities—A Reference Manual*, the department outlines tools and strategies aimed to promote conservation practices that are applicable to the growth and management of all Missouri communities.[51]

This document recommends the development of a natural resource inventory (NRI). The NRI is a report that contains maps and descriptions of existing natural resources within the area of interest such as a the ASB COB Port Project area. Most, if not all, of the guidelines recommended by this document will be satisfied by the EIS. Nonetheless, equipped with the results of an NRI and an assessment of the physical condition of local natural resources, this document recommends that planners and community leaders can work with the public to craft a vision and set goals related to conservation.

Guiding principles that may be discussed during this process include:

- **Ecosystem management—**An approach to natural resource management that focuses on sustaining ecosystems to meet both ecological and human needs in the future. Ecosystem management is adaptive to changing needs and new information. It promotes a shared vision of a desired future by integrating social, environmental and economic perspectives to manage geographically defined natural ecological systems. An ecosystem is a dynamic complex of plant, animal and microorganism communities and their nonliving environment interacting as a functional unit.
- **Ecosystem, capital value—**The present value of the stream of ecosystem services that an ecosystem will generate under a particular management or institutional regime.
- **Ecosystem, direct use value—**The benefits derived from the services provided by an ecosystem that are used directly by an economic agent. These include consumptive uses (e.g. harvesting goods) and non-consumptive uses (e.g. enjoyment of scenic beauty). Agents are often physically present in an ecosystem to receive direct use value.

[51] Missouri Conservation Department, *Conservation Planning Tools for Missouri Communities—A Reference Manual, https://mdc.mo.gov/sites/default/files/downloads/Conservation%20Planning.pdf.*

- **Ecosystem, indirect use value—**The benefits derived from the goods and services provided by an ecosystem that are used indirectly by an ecosystem.

Lastly, the Missouri Department of Conservation provides grants and funding opportunities related to promotes sustainable development practices and the establishment of natural resource conservation practices in urban and developing areas. For some of these opportunities, eligible property includes lands in public ownership or open to the public. Private property is only eligible when another partner(s) is providing at least a 1:1 cash match or when the private property extends or connects projects on public land by providing stormwater conveyance, habitat connectivity, or other public benefits. This might be a resource for the ASB COB Port Project. A list of is provided here.[52]

A5.10 Noise impact

Federal Highway Administration (FHWA) has given MoDOT on flexibility of implementing Noise Standard at 23 CFR Part 772. MoDOT program to implement FHWA Noise Standard include traffic noise prediction requirements, noise analyses, noise abatement criteria and requirements for informing local officials. It would be beneficial to determine the need for a noise study early in project scoping.

A5.11 Environmental Justice in Minority and Low-Income Populations

In order to meet Executive Order 12898, the EIS must identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. The order also directs each agency to develop a strategy for implementing environmental justice. The order is also intended to promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income communities access to public information and public participation.

A5.12 Other laws and regulations

The initial boundaries of the ASB COB Port Authority include Counties of Callaway and Cole County, including Jefferson City. Further discussion required to ensure that project meets local laws and ordinances. All project activities must adhere to OSHA Regulations (Standard 1926, 29 CFR).

[52] Missouri Department of Conservation, Funding Opportunities, https://mdc.mo.gov/property/community-conservation/community-conservation-funding-opportunities

Appendix 6: Checklist – cross reference of topics by section

The following table lists the key considerations in the preparation of an AMH Project Designation application.

Item	Criteria	Description	Check	Section
(A)	**Minimum Eligibility requirements**			
1.1	**Documented Vessels**	Uses U.S. Documented Vessels - and mitigates landside congestion or promote short sea transportation See (2).	**Yes**	**3.2**
1.2	**Carries Cargo in Short Sea Shipping**	Self-explanatory	**Yes**	**3.3**
1.3	**Mitigates Landside Congestion**	Self-explanatory	**Yes**	**3.4**
2.1	**Short Sea Transportation**	Meets the definition of Short sea shipping. *Short sea transportation* means the carriage by a U.S. documented vessel of cargo (1) That is— (i) Contained in intermodal cargo containers and loaded by crane on the vessel; (ii) Loaded on the vessel by means of wheeled technology; (iii) Shipped in discrete units or packages that are handled individually, palletized, or unitized for purposes of transportation; or (iv) Freight vehicles carried aboard commuter ferry boats; and (2) That is— (i) Loaded at a port in the United States and unloaded either at another port in the United States or at a port in Canada located in the Great Lakes-Saint Lawrence Seaway System; or, (ii) Loaded at a port in Canada located in the Great Lakes-Saint Lawrence Seaway System and unloaded at a port in the United States [refer to 46 CFR sections 393.1(k)]	**Yes**	**3.5**
2.2	**New or expanded services**	Involves new or expand existing services for the carriage of cargo	**Yes**	**3.6**
2.3	**Designated Route**	Are on a designated Marine Highway Route	**Yes**	**3.7**
3.0	**Route Designation submission**	Project Designation applications can be submitted with Route Designations [refer to 46 CFR section 393.3(a)(3)]	**Yes**	**3.2**
4.0	**Direct Connection**	Successful Project Applicants must demonstrate a direct connection between a proposed Marine Highway Project and the carriage of cargo through ports on Designated Marine Highway Routes.	**Yes**	**3.2**
(B)	**The timing of Project Designation submissions**	Announcement of a Marine Highway Project Designation Open Season to allow Project Applicants opportunities to submit Marine Highway Project Designation applications will be made by notice in the **Federal Register** and on MARAD's AMHP Web site	**Yes**	**2.5**
(C)	**Project Application Contents**	What should Project Applicants include when preparing a Marine Highway Project designation application	**Yes**	**A6**
1.0	**Market and Customers**	The market or customer base to be served by the service and the service's value proposition to customers. This includes:	**Yes**	**4**
		(i) A description of how the market is currently served by transportation options;	**Yes**	**4.1**
		(ii) Identities of shippers that have indicated an interest in, and level of commitment to, the proposed service;	**Yes**	**4.1**
		(iii) Specific commodities, markets, and shippers the Project is expected to attract;	**Yes**	**4.1**
		(iv) The extent to which interested entities have been educated about the Project and expressed support, and	**Yes**	**A5**
		(v) A marketing strategy for the project if one exists.	**Yes**	
2.0	**Operational framework**	A description of the proposed operational framework of the project including:	**Yes**	**5 & 6**
		Origin & Destination Pairs	**Yes**	**5.1, 5.3**
		Transit times	**Yes**	**5.4**
		Vessel types	**Yes**	**6.1.3**
		Service Frequency	**Yes**	**6.1.4**

3.0	**Cost Model**	The cost model for the proposed service. The cost model should be broken down by container, trailer, or another freight unit, including loading and discharge costs, vessel operating costs, drayage costs, and other ancillary costs.	**Yes**	**5.3, A2**
3.1		Provide a comparison cost model outlining the current costs for transportation using landside mode (truck and rail) alternatives for the identified market that the proposed project will serve.	**Yes**	**5.3, A2**
3.2		Provide the project's financial plan and provide projected revenues and expenses. Include labor and operating costs, drayage, fixed and recurring infrastructure and maintenance costs, vessel or equipment acquisition or construction costs, etc.	**Yes**	**7.1, A2**
3.3		Include any anticipated changes in local or regional short sea transportation, policy or regulations, ports, industry, or other developments affecting the project.	**Yes**	**5.3, A2**
3.4		In the event that public sector financial support is being sought, describe the amount, form and duration of public investment required. Applicants may email *mh@dot.gov* to request a sample cost model.	**X**	X
4.0	**Overall Net Public Benefits**	An overall quantification of the net public benefits estimated to be gained through the successful initiation of the Marine Highway Project, including highway miles saved, road maintenance savings, air emissions savings, and safety and resiliency impacts. In other words, the collective savings from section 8.	**Yes**	**7**
5.0	**Marine Highway Route utilized**	Identify the designated Marine Highway Routes the Project will utilize.	**Yes**	**2.3. 3.7**
6.0	**Organizational Structure**	Provide the organizational structure of the proposed project, including an outline of the business affiliations, environmental, non-profit organizations and governmental or private sector stakeholders.	**Yes**	**2.1, 2.2**
7.0	**Partnerships**		**Yes**	**2.2, A.4**
7.1	**Private sector partners**	(i) Identify private sector partners and describe their levels of commitment to the proposed service. Private sector partners can include terminals, vessel operators, shipyards, shippers, trucking companies, railroads, third-party logistics providers, shipping lines, labor, workforce and other entities deemed appropriate by the Secretary.	**Yes**	**2.2, A.4**
7.2	**Public sector partners**	(ii) Identify State Departments of Transportation, metropolitan planning organizations, municipalities and other governmental entities, including tribal entities, that Project Applicants have engaged and the extent to which they support the service. Include any affiliations with environmental groups or civic associations.	**Yes**	**2.2, A.4**
7.3	**Documentation**	(iii) Provide documents affirming commitment or support from entities involved in the project.	**Yes**	**2.2, A.4**
8.0	**Public benefits**	These measures reflect current law and are consistent with USDOT's Strategic Goals. Project Applicants should organize external net cost savings and public benefits of the Project based on the following six categories:	**Yes**	**7**
8.1	**Emissions benefits**	(i). Address any net savings, in quantifiable terms, now and in the future, over current emissions practices, including greenhouse gas emissions, criteria air pollutants or other environmental benefits the project offers.	**Yes**	**7.2.2**
8.2	**Energy Savings**	(ii) Provide an analysis of potential net reductions in energy consumption, in quantifiable terms, now and in the future, over the current practice.	**Yes**	
8.3	**Landside transportation infrastructure maintenance savings**	(iii) To the extent, the data is available to indicate, in dollars per year, the projected net savings of public funds that would result in the road or railroad maintenance or repair, including pavement, bridges, tunnels or related transportation infrastructure from a proposed project.	**Yes**	**7.2.4**
8.3.1	**Landside transportation infrastructure maintenance savings**	Include the impacts of accelerated infrastructure deterioration caused by vehicles currently using the route, especially in cases of oversize or overweight vehicles. This information applies only to projects for a marine highway service where a landside alternative exists.	**Yes**	**7.2.4**
8.4	**Economic Competitiveness**	(iv) To the extent, the data is available, describe how the project will measurably result in transportation efficiency gains for the U.S. public. For purposes of aligning a project with this outcome, applicants should provide evidence of how improvements in transportation outcomes (such as time savings, operating cost savings, and increased utilization of assets) translate into long-term economic productivity benefits.	**Yes**	**7.2.1**
8.5	**Safety Improvements**	(v) Describe, in measurable terms, the projected safety improvements that would result from the proposed operation.	**Yes**	**7.2.3**

8.6	**System Resiliency and Redundancy**	(vi) To the extent data is available, describe, if applicable, how a proposed Marine Highway Project offers a resilient route or service that can benefit the public. Where land transportation routes serving a locale or region are limited, describe how a proposed project offers an alternative and the benefit this could offer when other routes are interrupted as a result of natural or man-made incidents.	**Yes**	**7.2.5**
9.0	**Proposed project timeline**	Include a proposed project timeline with estimated start dates and key milestones. If applicable, include the point in the timeline at which the enterprise is anticipated to attain self-sufficiency.	**Yes**	**7.1.2**
10.0	**Support and investment required**	Describe any known or anticipated obstacles to either implementation or long-term success of the project. Include any strategies, either in place or proposed, to mitigate impediments. Identify specific infrastructure gaps such as docks, cranes, ramps, etc. that will need to be addressed for the project to become economically viable. Include estimates for the required investments needed to address the infrastructure gaps.	**Yes**	**7.1.2**
11.0	**Environmental considerations**	Project Applicants must provide all information necessary to assist MARAD's environmental analysis of the proposed project, pursuant to the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 et seq.) and other environmental requirements.	**Yes**	**7.1.2**
12.0	**Other considerations**		**Yes**	**7.1.2**
12.1	**Confidentiality**	If your application, including attachments, includes information that you consider to be a trade secret or confidential commercial or financial information, or otherwise exempt from disclosure under the Freedom of Information Act (5 U.S.C. 552), as implemented by the Department at 49 CFR part 7, you may assert a claim of confidentiality.	**Yes**	**A3?**
12.2	**Application length**	The narrative portion of an application should not exceed 20 pages in length. Documentation supporting the assertions made in the narrative portion may also be provided in the form of appendices, but limited to relevant information. Applications may be submitted electronically via*regulations.gov* (*http://www.regulations.gov*). Applications submitted in writing must include the original and three copies and must be on 8.5" x 11" single-spaced paper, excluding maps, Geographic Information Systems (GIS) representations, *etc.*	**Yes**	
(D)		Conclusion	**Yes**	**7.1.2**
(E)		For Program Background, only	**Yes**	**7.1.2**
1.1		Freight Plans, Port Plans, State STIP/TIP or other approved planning documents	**Yes**	**5.2**
1.2		Identifying future planning studies that will be required before or part of any future Marine Highway Grant funding	**Yes**	
1.3		Whether the Project will proceed without Project Designation	**Yes**	**A3, 7.3**
1.4		Whether the Applicant only intends to seek Project Designation only (no intention to apply for future Marine Highway Grant funding opportunities)	**Yes**	**2.4**

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