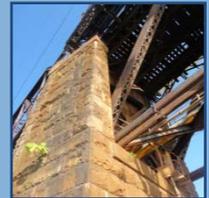


Susquehanna River Bridge Reconstruction and Expansion Project

Perryville and Havre de Grace, Maryland

Navigation Study

January 21, 2014



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1.0 Executive Summary

The existing Susquehanna River Bridge is located on Amtrak's Northeast Corridor (NEC) at Milepost (MP) 60.07 between Havre de Grace and Perryville, Maryland. The bridge carries two electrified tracks to support Amtrak operations as well as MARC commuter trains and Norfolk Southern freight trains.

The existing structure was built in 1906 and consists of 17 pin-connected deck truss spans and a movable swing span thru-truss over the navigation channel at River Mile 1.0. The existing bridge provides 52' vertical clearance above mean high water (MHW) in the closed position and 127' in the open position. The horizontal clearance in the navigation channel is 100' wide. Due to the Susquehanna River Bridge's vertical clearance over the waterway, occasional openings of the swing span are required to accommodate maritime traffic, which significantly impacts rail operations and requires considerable Amtrak resources and staff to properly open, close and maintain the movable swing span. The current bridge typically opens less than 10 times per year for mariners.

Amtrak has performed significant analysis and related repair work on the existing bridge to preserve its structural integrity and extend its service life. Future ridership projections indicate that public usage will continue to increase and additional rail capacity at this location is required to meet this need. This type of truss configuration precludes bridge widening to increase capacity. Therefore to meet the future ridership demand, Amtrak proposes to construct a new two-track fixed bridge adjacent to the current structure.



Photo 1: Amtrak Movable Bridge over Susquehanna River, Upstream (West) Fascia

HNTB Corporation was retained by Amtrak to perform a Navigation Study of the Susquehanna River in the vicinity of the existing Amtrak movable bridge. This study obtained and analyzed information related to present and future navigation uses and needs for the purposes of developing and evaluating alternatives for the new bridge. The data provided input into navigational considerations including vertical clearance over the water, horizontal clearance and bridge and channel alignment.

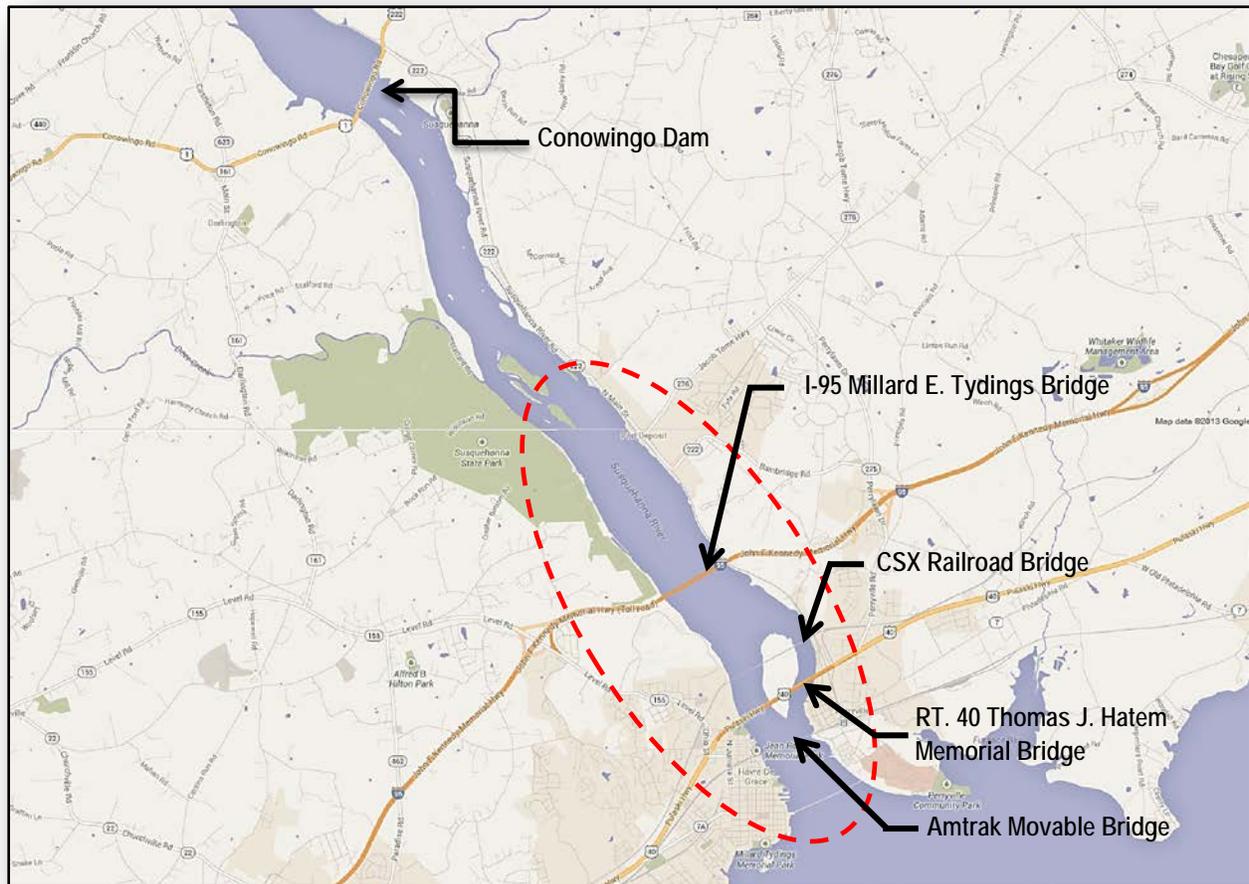


Figure 1: Navigation Study Area for the Amtrak Movable Bridge and Upstream Structures over the Susquehanna River

Data was collected from multiple sources including numerous marinas, commercial users, contractors, federal agencies and local municipal employees. Amtrak also furnished plans and information including data from local bridge operations personnel.

General findings of the study include:

- Most of the bridge openings requested of the Amtrak movable bridge are related to transporting barge cranes for rehabilitation of the existing upstream structures; a minority of the openings is for pleasure craft.

- Most tall vessels in the study area are docked at downstream (east) marinas of the existing Amtrak structure during the boating season.
- Several mariners requested the new bridge increase the horizontal clearance within the navigational channel compared to the existing bridge's clearance. An increase to a minimum of 120' has been specifically requested by a frequent commercial user to reduce vessel congestion in the channel and aide tug boat and barge navigation during periods of turbulent river flow.
- A vertical clearance of 60' above the MHW elevation for any new fixed bridge would reasonably accommodate mariners' current and future needs at this project location. Only one known vessel in the vicinity of the bridge, the skipjack Martha Lewis, would be unable to sail upstream beneath a new bridge providing 60' vertical clearance. This skipjack is currently not in operation but undergoing restoration and will have a 65' height. It is presently docked downstream of the proposed bridge site. While some very large barge cranes may require disassembly, sixty feet of vertical clearance would accommodate barge crane delivery for future rehabilitation work on upstream bridges. Based on current conceptual track design, a further increase above 60' vertical clearance would adversely affect the track profile for freight operations and significantly increase property impacts in the community.

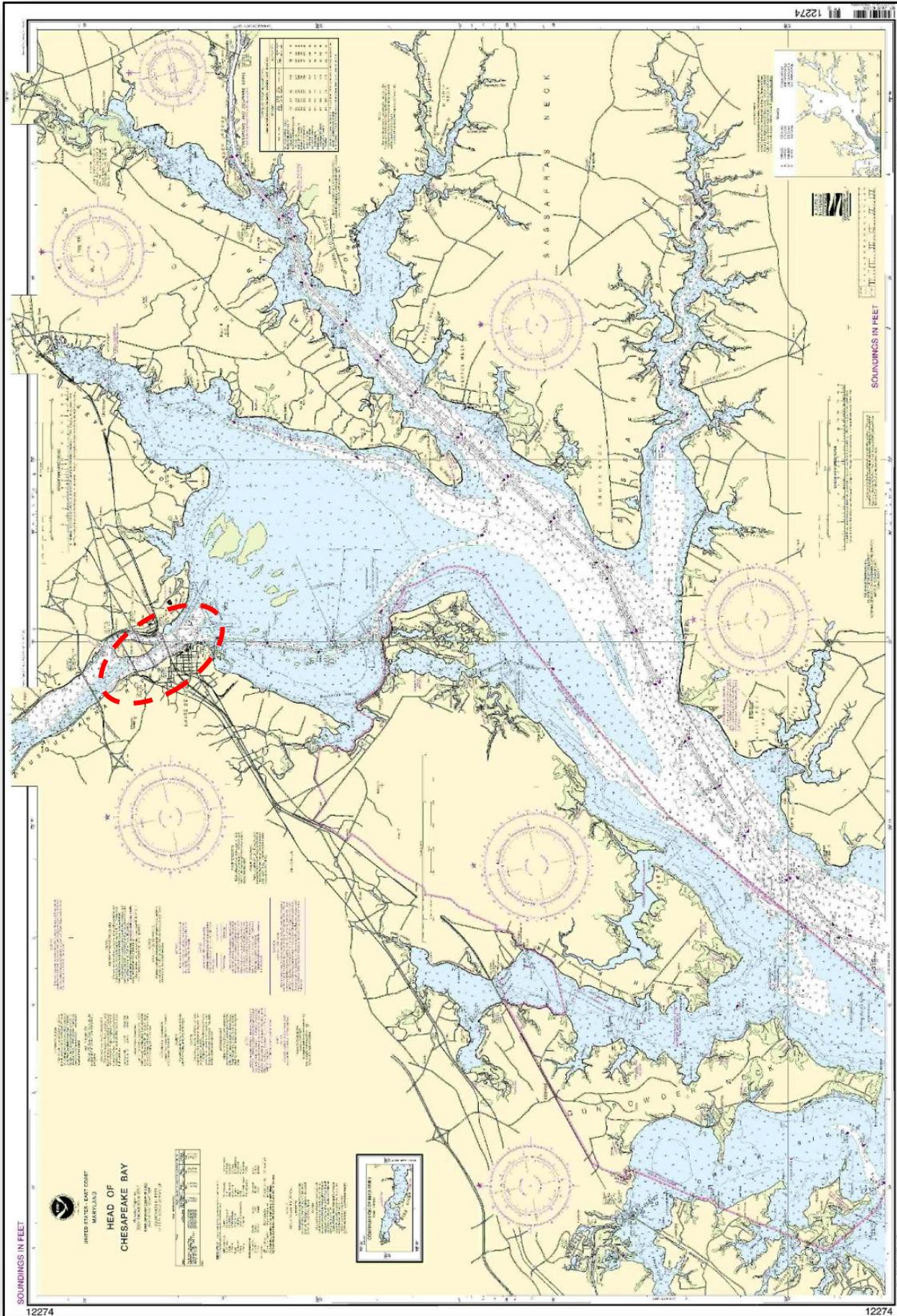


Figure 2: National Oceanic and Atmospheric Administration Navigational Chart, 12274 Head of Chesapeake Bay.

2.0 Introduction

2.01 Background

The National Railroad Passenger Corporation (Amtrak) owns and operates on the existing Susquehanna River Bridge, which is located on Amtrak's Northeast Corridor (NEC) at Milepost (MP) 60.07 in eastern Maryland. This structure spans the Susquehanna River at River Mile 1.0 between the municipalities of Havre de Grace and Perryville. The bridge carries two electrified tracks and is essential to Amtrak's operations. It also supports MARC commuter trains and Norfolk Southern freight trains.

Built in 1906, the Susquehanna River Bridge is comprised of 17 pin-connected deck truss spans and a movable swing span thru-truss over the navigation channel. This type of truss construction precludes widening of the bridge to increase track capacity and the structure presently serves as a choke point for the corridor. Travel forecasts predict that ridership and train traffic along the NEC will continue to increase. In partnership with the Maryland Department of Transportation (MDOT) and the Federal Rail Administration, Amtrak is investigating reconstructing the existing bridge and constructing a new adjacent structure to provide increased operational capacity and meet the growing demand for additional rail service.

2.02 Navigation Study Purpose

Amtrak has authorized HNTB Corporation to proceed with the Conceptual Design Phase of the Susquehanna River Bridge Reconstruction and Expansion Project. The Navigation Study is an important task of this project phase to identify the needs of mariners that utilize the Susquehanna River near the project location.

The purpose of this navigation study is to gather and review available information regarding marine use and future needs. The collected data will be considered in developing and comparing technical alternatives. The information will provide insight regarding proposed vertical and horizontal bridge clearances and the alignment of the new bridge with the navigation channel.

2.03 Study Method

Data and information was collected through the following means:

- Discussions with local marinas
- Contacting commercial users that frequently utilize the Susquehanna River
- Coordination with agencies including the US Coast Guard and US Army Corps of Engineers
- Interviews with local municipal employees
- Review of available existing plans and drawings
- Review of current bridge operating practices including coordination with Amtrak staff regarding recent openings

- Site visit observations

Since the existing Amtrak movable bridge provides 52' vertical clearance above mean high water, the study focused primarily on vessels in excess of 50' in height above the water.

3.0 Study Findings



Figure 3: Navigation Study location map for obtained and analyzed information related to present and future navigation uses and needs.

3.01 Local Marinas and Boat Launches

Havre de Grace City Yacht Basin

Havre de Grace City Yacht Basin is located in Havre de Grace downstream (east) of the Amtrak Movable Bridge. They have 240 boat slips on site and are currently at full capacity. They accommodate vessels that are up to 25 feet high and 52 feet long. There are no plans in the near future to expand their marina. Therefore they are not impacted by the clearances of the existing bridge.

The Marinas at Havre de Grace Marine Center

The Marinas at Havre de Grace Marine Center is comprised of two separate marinas located in Havre de Grace. The Havre de Grace Marina is located upstream (west) of the Amtrak Bridge. It has 45 floating docks and 30 moorings to accommodate up to 35 foot yachts in length. Currently it is at full capacity and in the winter they store approximately 150 vessels, several of which require over 50 feet of vertical clearance. These vessel collectively request one opening at the start of the season and approximately 12 to 25 boats sail out east of the bridge. Similarly the vessels require an opening to return for winter storage. However, this season, they have needed two (2) additional openings. Due to the vertical clearance limitations of the bridge, once the larger vessels traverse downstream at the start of season, they dock downstream at the Log Pond Marina or another facility until they return for winter storage. The tallest boat docked at the Havre de Grace Marina in the 2013 boating season is 56' high. For winter storage, the marina has received requests for vessels up to 63' high. At this time there are no plans for expansion, but if the vertical clearance were to increase, the owner would consider expansion to accommodate larger vessels. Boat repairs are performed at this facility and the majority of this work includes restoration and installation of sailboat canvas. The boating season typically runs from May thru October; and the winter "on-land" season is from November thru April.

The Log Pond Marina is located downstream (east) of the Amtrak Bridge and therefore is not affected by the vertical clearance of the Amtrak Bridge. This marina has floating docks and offers 68 slips for larger boats. Transient slips are available for a day, a week, or a month and can accommodate transients in excess of 100 feet on the main floating dock. The sailing season at the Log Pond runs from April thru November with on-land storage available at the Havre de Grace Marina thru the winter.

Penn's Beach Marina at Heron

The Penn's Beach Marina at Heron is located in Havre de Grace, MD which is downstream (east) of the Amtrak Movable Bridge. Due to their location the vertical clearance of the bridge does not have an effect on their business. This marina has 119 slips and currently accommodates approximately 60-65 boats. The facility can store vessels up to 60 feet wide and 200 feet long, and has boats with mast heights that exceed 50 feet.

Tidewater Marina

The Tidewater Marina is located in Havre de Grace downstream (east) of the Amtrak Bridge. The vertical clearance of the bridge does not have an effect on their business. This marina has 158 slips, 121 hi and dry storage slips, 12 moorings, 27 hoist, and 15 trailers. Currently they have 332 boats at their facility but in the winter this number increases to between 450 to 500 boats. About half the vessels require more than 50 feet of vertical clearance; and most of those are sail boats. This facility has a fueling station on site and also provides boat repair services. In discussions with the owner, while most of their clients do

not travel upstream, they requested that clearances of any new bridge not be less than the existing movable bridge.

Havre de Grace Boat and Kayak Launch

The City of Havre de Grace owns and manages the community boat launch on Water Street which is located upstream (west) of the bridge. Roadway access to this community facility restricts large vessels greater than 50 feet vertical clearance to launch from this location. Therefore this facility is not affected by the vertical clearance of the existing Amtrak movable bridge.

Susquehanna State Park – Lapidum Boat Launch

The Maryland Department of Natural Resources – Park service is responsible for the boat ramp located in Havre de Grace, MD upstream (west) of the Amtrak Bridge. This launch can accommodate two boats at a time, but vessels in excess of 50' high cannot access the launch area due to vertical height constraints on the roadway system to the park. Therefore, the current Amtrak bridge does not impact this public launch.

Owens Marina

Owens Marina is located in Perryville which is upstream (west) of the existing Amtrak bridge. This marina has 188 slips; currently 122 boats are stored at the facility. None of the vessels at the facility are higher than 50' vertically. Owens Marina provides boat repair services on site. The business is in the process of procuring a permit to allow expansion of the marina. If approved, the number of slips would increase to 220 slips. However, even with this expansion, marina personnel do not foresee larger vessels being stored at this facility due to the vertical clearance of the existing bridge.

Perryville Yacht Club at Riverwalk Marina

Perryville Yacht Club at Riverwalk Marina is located in Perryville, MD and is upstream (west) of the Amtrak Movable Bridge. The marina has 76 slips; but that number is increasing as repairs are made to the marina due to Hurricane Sandy. The marina is not currently at full capacity. Although repairs are being made to the current marina, expansion is not planned. Based on a conversation with the marina owner, the facility currently has two (2) boats with vertical heights exceeding 50 feet. These vessels are 53' and 56' high. These taller vessels sail frequently, several times each week, and schedule their travel beneath the Amtrak movable bridge during low tide. The marina performs boat repairs which are made to vessels greater than 50 feet high. Requests for boat openings for vessels associated with this facility are typically 2 or 3 per year. The boating season ends mid-November and the summer season begins in early April. With the number of vessels traveling from the quarry, the owner requested that a new bridge increase the horizontal clearance in the navigation channel to improve navigability and increase the vertical clearance to potentially attract more large vessels to use this facility.

Town of Perryville Transient Dock and Boat Launches

The Town of Perryville owns and manages several facilities including the kayak launch in Perryville Community Park which is located downstream (east) of the Amtrak Bridge, the transient dock and pier at Rodgers Tavern and the community boat launch on Frenchtown Road which are both located upstream (west) of the bridge. Each of these community facilities can only support smaller vessels less than 50 feet

in height. In addition, roadway access to these facilities limits large vessels from launching at these sites. Therefore the Perryville owned facilities are not affected by the vertical clearance of the existing bridge.

The transient dock and pier are located just west of the Amtrak Bridge. It has 14 slips and can accommodate up to 16 boats. This facility has a 24-hour docking limit. This facility is relatively new addition to the town, only be completed less than two years ago. Town personnel plan to have commercial river taxi service between Perryville and Havre de Grace in the future since the local bridge crossings do not accommodate pedestrians and bicyclists. The existing vertical clearance of the Amtrak bridge would not affect any potential river taxi service.

The community boat launch consists of two floating docks. These docks are removed every November before the winter. When the dock is removed, residents do continue to use the facility year around for very small craft. The busiest time of the year is from April to November.

The police and fire department in Perryville do not have rescue boats, and the Mayor does not foresee the need to be acquiring vessels in the future.

Sam's Marina

Sam's Marina is located in Perryville and is upstream (west) of the Amtrak Bridge. Specific data is limited on this establishment because contact was not made with the owner despite several attempts by phone and in person. During a site visit, it was observed that the vessels stored at the facility were limited to small craft and well less than 50 feet in height.

Tome's Landing Marina

Tome's Landing Marina is located in Port Deposit, Maryland several miles upstream (west) of the Amtrak Bridge. The marina has 200 hi and dry slips and is currently at full capacity. In the winter, typically an additional 50 to 75 boats are housed. None of the existing craft at this facility exceed 50 feet in height. Additional services at this site include a fueling station and boat repair services. At this time, there are no plans for expansion. However, the marina personnel indicated that if the vertical clearance were to increase, then expansion may be considered.

Port Deposit Boat Launch

The Town of Port Deposit oversees the community boat launch on Route 222 which is located upstream (west) of the bridge. This community facility does not allow vessels greater than 50 feet vertical clearance to launch and therefore this facility is not impact by the current clearances of the existing bridge.

3.02 Perryville – River Road Private Docks

There are four local residences along River Road in Perryville that own and maintain private docking facilities upstream (west) of the Amtrak movable bridge and have multiple slips. The addresses of these residences are 41, 47, 49 and 55 River Road. Based on a site visit on August 22, 2013, these four locations accommodate only small craft. In addition, certified letters were sent to all four property owners to request information regarding these small waterway facilities. Only one resident responded as listed below:

41 River Road Perryville, MD

This residence is located in Perryville and is upstream (west) of the Amtrak Movable Bridge. The dock has 25 slips, of which 16 are currently in use. The vessels stored at the facility are less than the 50 feet in height. Therefore, the vertical clearance from the Amtrak Bridge has no impact on their navigation upstream.

3.03 Commercial Users

Vulcan Materials Company

The Arundel Quarry is owned by Vulcan Materials Company. The facility is located upstream (west) of the Amtrak Movable Bridge between I-95 and CSX Bridges. Seventy five percent (75%) of their materials are transported by water. Water transportation is typically four (4) days per week. The transportation fleet consists of nine (9) tug boats and several barges with varying sizes. All of their vessels are less than 50 feet high and do not require openings of the existing Amtrak Movable Bridge. On average, each barge makes 3 to 4 roundtrips per day. At this time, there are no plans for future expansion or acquisition of larger vessels unless any new bridge configuration provides an increased horizontal clearance for the navigation channel. Their largest barge is 60 feet wide, and their personnel requested any new structure provide 120 feet of horizontal clearance to ease navigation during rough currents. In some instances of more turbulent flow, two tugs must navigate one barge (with one pushing and the other acting as a braking system) to prevent the barge from hitting the fender system of the movable bridge. In the event that the horizontal clearance was to increase, larger tug boats could be considered which would have taller associated heights.

The Lantern Queen Riverboat

The Lantern Queen Riverboat is owned by the River City Trading, LLC. It is the largest passenger vessel in the Upper Chesapeake Region and is used for public and private charter cruisers. The Lantern Queen sails out of Frank Hutchins Park which is located downstream (east) of the Amtrak Bridge. The tall faux stack of the vessel does not retract, but does clear the swing span of the existing Amtrak bridge. Lantern Queen staff estimate the vessel makes about 150 trips per year from Hutchins Park to the Havre de Grace light house and upstream to Port Deposit. At this time, there are no plans to expand their business with larger vessels. However, if the state approves casino boats there would be a consideration for expansion.

Chesapeake Heritage Conservancy

The skipjack Martha Lewis is owned by the Chesapeake Heritage Conservancy, Inc. This vessel is currently under a year-long restoration at the Frank J. Hutchins Park and docked downstream (east) of the Amtrak bridge. The anticipated year-long restoration process will consist of replacing the tall mast, various parts on both the forward and aft cabins as well as some rigging. The total height of the vessel after restoration will be 65' based on discussion with the conservancy. This vessel is used for charters, small events and children's field trips. On special occasions, this vessel sails to neighboring towns for historic presentations. In past years, it has traveled upstream to Port Deposit which required a bridge opening. This vessel sails between May and October.

HP Marine

HP Marine is located at Tidewater Marina which is downstream (east) of the Amtrak Movable Bridge. They specialize in powerboat repairs, with about only 10% of their work being sail boats. They deal specifically with sales and services and do not store vessels on the site. The existing bridge and its clearances do not have their business and customers.

Caribbean Refinishing North, Inc.

Caribbean Refinishing North, Inc. is located at Tidewater Marina which is downstream (east) of the Amtrak Movable Bridge. Data about this establishment is limited because the owner declined to disclose any information. Based on a site visit to this facility, it appears that facility restores smaller craft and the vertical clearance of the bridge does not have an effect on the business.

Havre de Grace Seaplane Base

Havre de Grace Seaplane Base is located downstream (east) of the Amtrak Movable Bridge. Most of these planes are privately owned and the biggest commercial aircraft that uses the facility is a 10 passenger plane. Most planes will take off traveling to the east (into the wind and away from the bridge). There are three (3) different landing strips paths in the water, which are east of the Amtrak bridge and depending on the weather conditions the landing path will be chosen. The strips are shown on the NOAA navigation chart 12274. The base is experiencing declining usage and is functioning under a grant from the Maryland Aviation Administration. The terms are such that the base must be maintained and operated through 2014. Based on information from the base manager, the existing bridge and any proposed adjacent structure will not impact the current or future operations of the seaplane base.

3.04 Agency Contacts

United States Coast Guard

The United States Coast Guard (USCG) 5th District has jurisdiction regarding navigational matters within the study limits. The USCG Sector Baltimore – Waterways Management Division was contacted to solicit input regarding the project and the site. USCG personnel advised that they patrol the Susquehanna River at this location. The vessels utilized to conduct these patrols are less than 50' in height and do not require openings of the Amtrak movable bridge. The USCG further advised that any new fixed bridge must address the "reasonable needs" of the mariners.

United States Army Corp of Engineers

The United States Army Corps of Engineers (USACOE) was contacted regarding the project as this area of the Susquehanna River and the Chesapeake Bay resides within the USACOE jurisdiction. The USACOE is responsible for operating locks and dams, flood control and dredging for waterway navigation in the area among other tasks. The Chesapeake Bay which is located downstream (east) of the Amtrak bridge was dredged in May 2013 to build up the offshore refuge, known locally as Battery Island. There are no plans in the near future to dredge that area around the Amtrak Bridge. Vessels used for local dredging to clear the existing bridge both horizontally and vertically and do not require an opening. The USACOE noted that in the last 40 years of working in that area, they have never required a bridge opening to dredge the river.

Local Emergency Services

The Susquehanna Hose Company

The Susquehanna Hose Company is responsible for the fire protection services in the City of Havre de Grace. They consist of five (5) firehouses that operate with a variety of land equipment including one boat. The boat consists of a 1995 Boston Whaler which is 21' in length and 8'-6" high. It is docked at the Havre de Grace City Yacht Basin Marina located downstream (east) of the Amtrak bridge. The clearances of the existing bridge do not impact the Havre de Grace fire response and emergency services.

The Community Fire Company of Perryville

The Community Fire Company of Perryville is responsible for providing fire, rescue and emergency medical services to the Town of Perryville and surrounding communities. They are comprised of two stations, having both volunteer and career firefighters. The town does not have emergency rescue boats and the mayor does not foresee the town acquiring such a vessel in the future.

3.05 Existing Upstream Structures

Conowingo Dam (U.S. Route 1)

The Conowingo Hydroelectric Station is located at River Mile 9.9. This dam supports U.S. Route 1 and prevents mariners from traveling upstream and downstream on the Susquehanna River at this point. Between the proposed location for the new Amtrak bridge and the Conowingo Hydroelectric Station, there are four existing upstream bridge crossings.

Amtrak Movable Bridge

At River Mile 1.0, this movable bridge supports Amtrak passenger trains, MARC commuter trains and Norfolk Southern freight trains. Built in 1906, significant resources and time are required to open the aged bridge to accommodate vessel traffic. Approximately 40 railroad personnel from various crafts are needed to swing the bridge to the open position. In addition, the time required to open and close the bridge delays trains on the heavily traveled NEC.

The bridge has a vertical clearance of 52' above mean high water. This is the governing vertical clearance of the four bridges when the swing bridge is in the closed position. The vertical clearance increases to 127' when the bridge is in the open position. The number of openings per year is listed in the table below.

Table 1: Number of Bridge Openings by Year *

Year	Number of Openings
2007	6
2008	7
2009	3
2010	5
2011	11
2012	5
2013	9

Thomas J. Hatem Memorial Bridge (U.S. Route 40)

The Maryland Transportation Authority (MTA) owns the Thomas J. Hatem Memorial Bridge which was built in 1940; it carries Route 40 (Pulaski Highway) traffic. This 7,749' long structure is comprised of steel deck trusses and one through truss and is located between Havre de Grace and Perryville.

Currently the MTA has hired McLean Contracting to perform foundation and substructure repairs to the bridge. This construction started in April 2012 and will be completed in September 2014. To perform the repairs on the piers, McLean Contracting requested the swing span be opened to transport barge cranes to and from the site. The construction company anticipates requiring approximately 10 total openings of the Amtrak bridge over the life of this repair project. McLean Contracting owns and rents tug boats which are used to transport materials from a mooring downstream east of the Amtrak bridge to the Route 40 bridge by utilizing smaller tugs to avoid additional bridge openings.

CSX Bridge

CSX Transportation owns and maintains this existing 6,109' long structure which was built in 1939. The structure supports freight trains and provides approximately 85' vertical clearance over the river.

Millard E. Tydings Memorial Bridge (Interstate 95)

Opened in 1963 and located at River Mile 3.2, the MTA owns this structure which supports Interstate 95 (I-95) between Havre de Grace and Perryville, MD. The bridge is approximately 5,061' in length and has a steel deck truss superstructure. Similar to the Thomas J. Hatem Memorial Bridge, the MTA has a construction company under contract to repair the ten river piers and their foundations, which began in August 2011 and is estimated to be completed by late 2013.

Corman Construction has been contracted by the MTA to perform piers repairs on this bridge. Corman Construction has requested openings of the Amtrak swing span to facilitate delivery of the barge cranes to the project site. The company maintains tug boats, both owned and rented, and their entire fleet has heights less than 50'. The barges used to bring materials upstream to the I-95 bridge reside at a mooring in the Havre de Grace area downstream of the Amtrak bridge, which do not require openings for material transport.

4.0 Summary

4.01 Conclusions

The following conclusions were reached based on survey information from local mariners and study findings:

- Vessel traffic in the study area of the Susquehanna River consists of both commercial and private recreational usage.
- The existing Amtrak bridge typically opens less than ten (10) times per year. These openings are generally between the boating season of April and November.
- Bridge openings of the existing bridge are primarily to accommodate
 - ♦ Crane barges to access major river crossings upstream of the Amtrak bridge
 - ♦ Tall vessels stored or repaired at two marinas located upstream of the existing bridge
 - ♦ Infrequent upstream trips of the skipjack Martha Lewis for historic presentations
- The existing navigation channel, both the width and height, addresses the needs of most mariners and vessels.
- Some mariners requested the new Amtrak structure increase the horizontal channel clearance to alleviate vessel congestion, increase sight distance and aide navigation during times of turbulent river flow. A wider channel opening also reduces the risk of pier impact and thereby providing a safety improvement for Amtrak.

4.02 Recommendations

The following recommendations are made for further consideration in developing alternatives as part of Conceptual Design:

- Based on this study, a new fixed Amtrak bridge adjacent to the existing movable bridge should provide 60' vertical clearance above MHW to meet current and future demand of the navigation traffic. This height will accommodate the reasonable needs of the mariners within the study area. The skipjack Martha Lewis is the only known vessel in the area with a height (65') that exceeds this clearance. This skipjack is currently under restoration and docked downstream of the existing Amtrak bridge. While some very large barge cranes may require disassembly, sixty feet of vertical clearance would accommodate barge crane delivery for future rehabilitation work on upstream bridges. Based on current conceptual track design, a further increase above 60' vertical clearance would adversely affect the track profile for freight operations and significantly increase property impacts in the community.

- The new fixed Amtrak bridge should increase the horizontal clearance of the navigational channel to a minimum of 120.'