

APPENDIX A
NAVIGATION ON THE CHRISTINA RIVER
TECHNICAL MEMORANDUM

Date: February 2, 2012
To: US Coast Guard and US Army Corps of Engineers
From: Terry Fulmer, DelDOT
Reference: Christina River Bridge Project
Wilmington, Delaware
Subject: Navigation on the Christina River, Technical Memorandum

1. Executive Summary

The Delaware Department of Transportation (DelDOT) and Riverfront Development Corporation (RDC), in cooperation with the Federal Highway Administration (FHWA) are evaluating a potential new bridge across the Christina River connecting the communities and developments of South Wilmington.

In 2008, the US Coast Guard and US Army Corps of Engineers requested information on navigation on the Christina River and how it would be affected by the construction of a new bridge. The purpose of this technical memorandum is to document the current users of the Christina River between the confluence with Brandywine Creek and Newport, to assess the potential for additional boat traffic along the Christina River, and to evaluate the effect of the proposed bridge on existing and future boat traffic.

The primary use of the Christina River is currently recreational, with most boat traffic consisting of privately operated recreational boats less than 23 feet long and 6 feet tall. The bolted-shut swing rail bridge upstream of the proposed bridge limits river traffic from upstream to vessels less than six feet above the waterline at high tide. A river taxi, a tour boat and a restored tall-ship are the largest vessels in service in the Wilmington area, however none of these vessels require access upstream of the proposed bridge. Emergency responders also use the river, and the Wilmington Fire Department's fire boat is the largest vessel that could access upstream of the proposed bridge location. Commercial or industrial navigation along the river is currently not common and unlikely to increase in the future.

The proposed bridge has a vertical clearance of 14 feet and a horizontal clearance between piers of 150 feet. This clearance will accommodate the current commercial, recreational and emergency access needs and should not preclude any reasonable future use of the river. This clearance will limit the Wilmington Fire Department's fire boat, but the department has indicated that the parcels upstream of the bridge are easily reached by land and the installation of a standpipe system at the bridge with connections to both sides of the river and a safe mooring facility at the bridge will allow the boat to augment the city water supply in the event of fire upstream of the proposed bridge location. The area upstream of this crossing is located in New Castle County and the Wilmington Fire Department would be a second responder after the County.

2. Background

DelDOT and the RDC, in cooperation with the FHWA, are proposing a new bridge crossing over the Christina River in south Wilmington, Delaware. Alternative crossing locations and their associated clearances are currently being evaluated as part of the NEPA process. The US Coast Guard (USCG) and the US Army Corps of Engineers (USACE) have asked DelDOT to gather information on boat traffic along the Christina River. This technical memorandum compiles the existing data on river traffic, vertical and horizontal clearance, and existing and proposed land uses to assess the effect of a new bridge on boat traffic and navigation on the river.

The study area considered in this memo is shown on **Figure 1**. The study area reach is the 5.8 miles of the Christina River between the James Street Bridge in Newport and the confluence with Brandywine Creek.

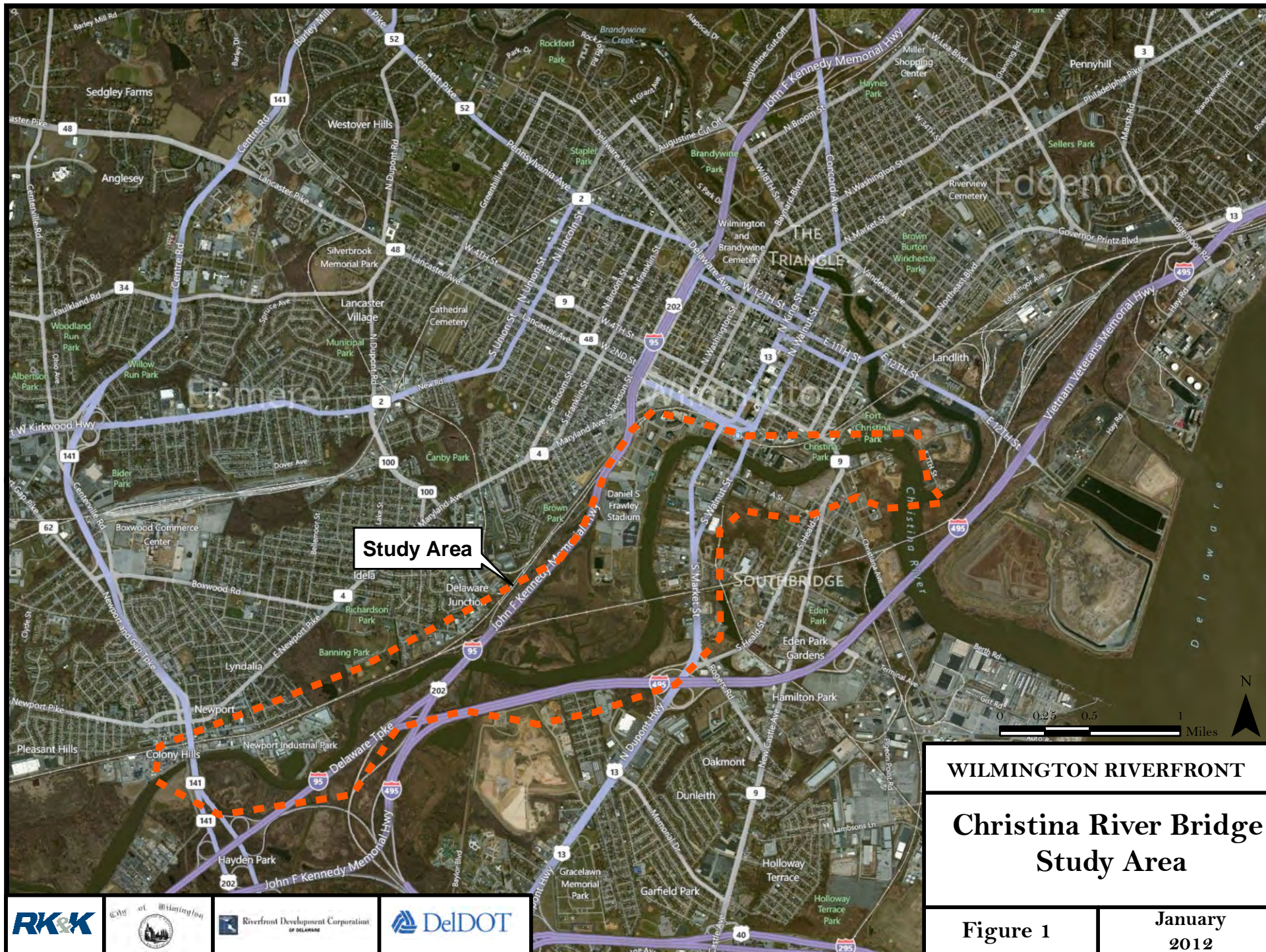
3. River History

Historically, the Christina River served as a navigation and industrial route for local inhabitants. The wide, meandering channel, slow current, and access to the Delaware River provided an ideal route for transportation between coastal and interior points. Native Americans used the river as a roadway for trade between settlements in the Piedmont region of southeastern Pennsylvania and coastal inhabitants, as well as a seasonal migration route. Fort Christina was established at a strategic trade position near the Delaware and Christina Rivers in 1638, near the foot of present day Seventh Street in the City of Wilmington. Production and export of flour, gunpowder, and cloth developed along the banks of the Christina River and Brandywine Creek in the eighteenth and nineteenth centuries. As it developed, Wilmington became a significant port for the import of overseas goods in demand by the local populace. The local shipbuilding industry took advantage of the wide channel, deep riverside port, and available stands of forest to build numerous vessels for coastal and overseas trade. The Christina River was in heavy industrial and port use through the first half of the twentieth century, but these uses have since declined. Remnants of these industries are still present along the banks of the river.

4. Existing River Conditions

4a. Navigation Channel

The USACE has recorded a navigation channel along the Christina River from the mouth of the river to just upstream of the proposed bridge location. The navigation channel is 200 feet wide on average, with some bridges limiting the horizontal clearance to 62 feet, however the channel is not maintained in the vicinity of the proposed bridge.



4b. Water Depths

The latest NOAA navigation chart indicates that the navigation channel depths from Brandywine Creek upstream through the project area are as follows:

- Brandywine Creek to Market Street Bridge – 5.5 feet below MLLW (USACE surveyed January 2007)
- Market Street Bridge to 39° 43' 38"N, 75° 33' 40"W (includes proposed bridge location) – 2.8 feet below MLLW (USACE surveyed January 2007)
- 39° 43' 38"N, 75° 33' 40"W to the upstream end of the channel – 11.7 feet below MLLW (USACE surveyed January 2007)

Upstream of the navigation channel to the DNREC Newport boat ramp, which uses Harvey Drive for access, the NOAA chart shows spot water depths that range from 6 to 12 feet below MLLW. A portion of the NOAA navigation chart and the USACE Channel Depth Survey table from the NOAA navigation chart are appended to this memo.

River cross sections have been developed based on detailed bathymetry in the immediate vicinity of the proposed bridge. Representative river cross sections downstream of the proposed bridge location, at the proposed bridge location and upstream near the Upper Shellpot Branch Rail Bridge are appended to this memo.

4c. Bridges

There are ten bridges over the Christina River between Newport and its confluence with the Delaware River. The bridges are listed from upstream to downstream with their type, vertical, and horizontal clearances in **Table 1**. The locations of the bridges and the docks along the river are shown in **Figure 2**.

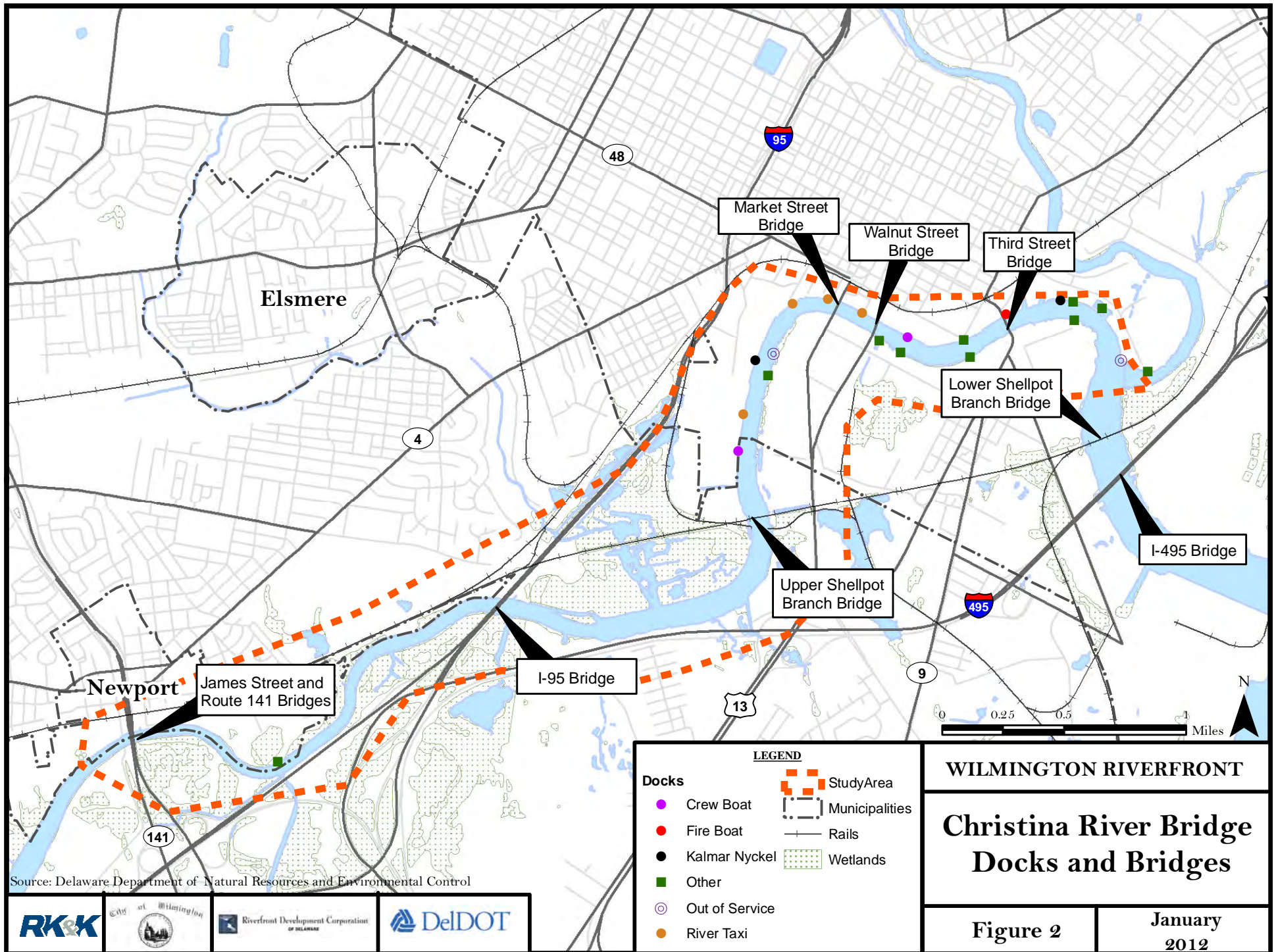
Table 1: Bridges over the Christina River

		Clearance in Feet		Channel
Name	Type	Vertical	Horizontal	Depth in Feet
Upstream of Proposed Bridge				
James Street	Bascule	4*	49	5.5
SR 141	Fixed	22	100	5.5
I-95	Fixed	22	80	5.5
Defunct Railroad	Swing	n/a ¹	60	5.5
Upper Shellpot Branch Rail	Swing	6 ²	62	5.5
Downstream of Proposed Bridge				
Market Street	Bascule	8*	175	11
Walnut Street	Bascule	13*	175	11
Third Street Bridge	Bascule	20*	175	11
Lower Shellpot Branch Rail (CR-1888)	Swing	8*	80	11
I-495	Fixed	60	200	11

* Swing and Bascule Bridges have infinite vertical clearance when open.

1: This Bridge has been unusable and open for over 20 years, with no approach spans remaining.

2: This Bridge is bolted in the closed position. The bridge can be opened to river traffic with the aid of a tugboat and coordination with Norfolk Southern Railroad.



The Upper Shellpot Branch Rail bridge is located just upstream of the proposed bridge location, along Norfolk Southern Railroad's Shellpot Branch. Norfolk Southern operates freight service along the Shellpot Branch to the Edgemoor rail yards east of Wilmington, facilitating rail traffic along the Northeast Corridor. The Upper Shellpot Branch Rail Bridge has a vertical clearance of six feet and is bolted shut. It can only be opened for river traffic via tugboat and any opening would require coordination with Norfolk Southern due to the time required to open and close the bridge. There have been no recorded requests for vessel openings of the Upper Shellpot Branch Rail Bridge



Figure 3. Typical Bolt Plate on Upper Shellpot Branch Rail Bridge

in over 20 years and there are no plans to upgrade it to a self-opening bridge. The U.S. Coast Guard has proposed changing the current regulations by allowing the Upper Shellpot Branch Rail bridge to be maintained in the closed position to navigation, per the USCG December 27, 2011 Local Notice to Mariners. The USCG has also proposed allowing the defunct railroad bridge upstream of the Upper Shellpot Branch Rail Bridge to be left in the open-to-navigation position.

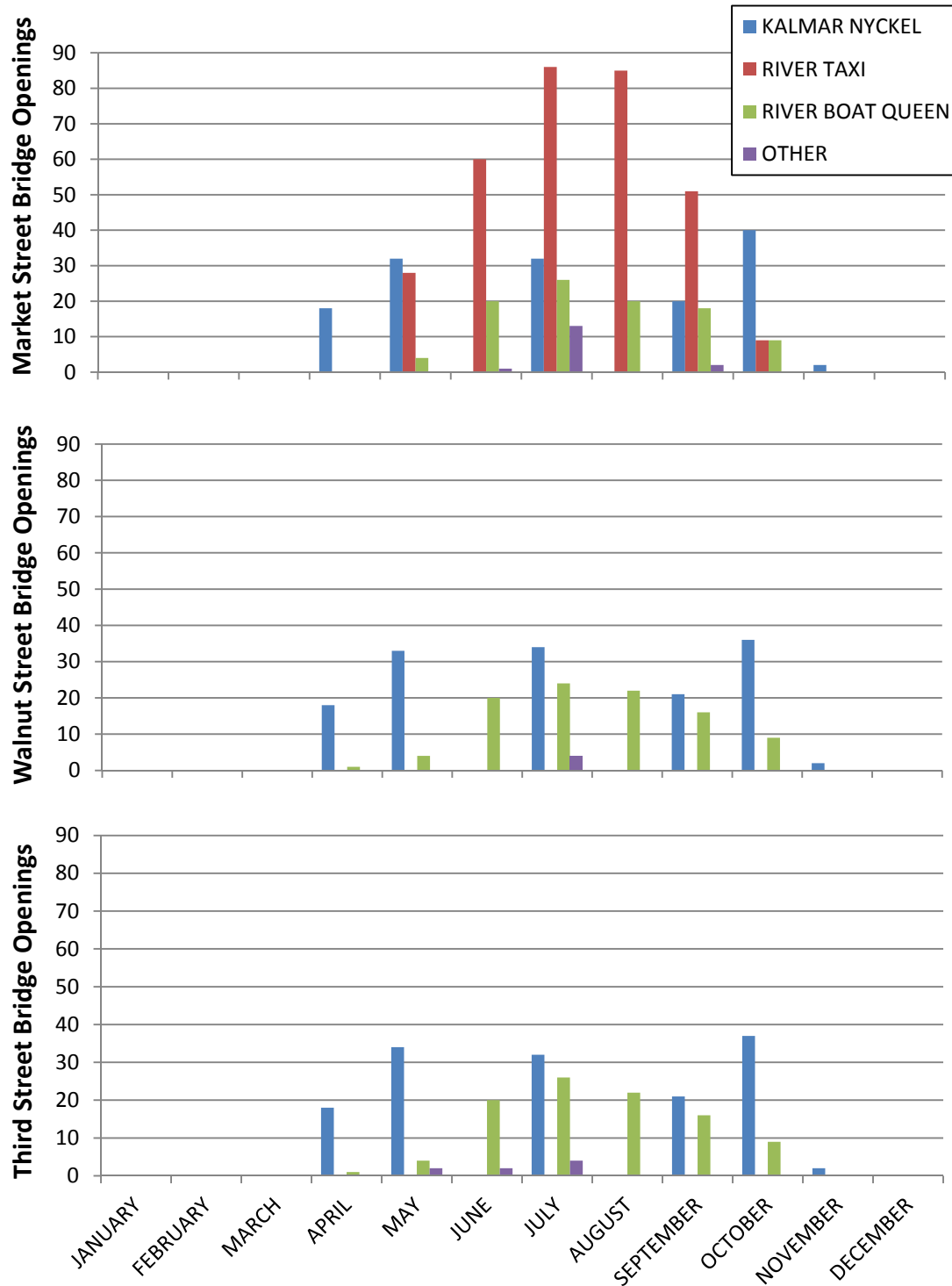
The Walnut Street, Market Street, and Third Street bascule bridges are all downstream from the proposed crossing of the new bridge. These three bridges are all bascule bridges that open for unrestricted vertical clearance. Information on how frequently these bridges were opened for boat traffic in 2011 is summarized in **Figure 4**. The graph shows that the river taxi required the Market Street Bridge to open the greatest number of times. The Kalmar Nyckel tall-ship required the all of the bridges to open most frequently, but the openings were limited to their operating season of April to October and the months that they are docked in Wilmington. Figure 4 shows that the Kalmar Nyckel was not operating in Wilmington during June or August 2011, but during the other months required the bridges to open about 20 times on average (10 round trips). The River Boat Queen required the bridges to open an average of 14 times per month. The river taxi can pass under the Third Street and Walnut Street Bridges, but requires the Market Street Bridge to open during high tide. The “other” boats shown on Figure 4 include primarily private motor boats. Most of these other boats were able to pass under the Third Street and Walnut Street bridges, but required the Market Street bridge to open. These boats did not travel upstream of the Upper Shellpot Branch Rail Bridge and it is likely that their destination was the Wilmington Riverfront. One sailboat required the Third Street Bridge to open in June 2011, but did not travel upstream past the Walnut Street Bridge and quickly turned around, requiring another opening of the Third Street Bridge.

The lower Shellpot Branch Bridge (CR-1888) was first constructed as a double track swing bridge in 1888, and shut down in 1995 after structural failure. It was reconstructed and reopened in 2003 as a single track swing bridge. This bridge opens regularly to allow tall ships to pass.

5. Current Users

As the industrial uses of the Christina River have declined the boat traffic on the river has shifted from commercial shipping vessels to recreational boats. Current river users can be grouped in to three categories: recreational, commercial and emergency responders.

Figure 4. Number of Bridge Openings in 2011 by Vessel*



* The Kalmar Nyckel was not operating in Wilmington during June and August 2011.

5a. Recreational Boating

i. Docks and Access

There is one recreational floating dock, three recreational boat ramps and two crew boat docks along the Christina River. The recreational floating dock is located near Beech Street and can accommodate 10 to 12 small recreational boats.

The Newport Boat Ramp was constructed in 2003 and includes a two-lane concrete boat ramp with barrier-free access boarding piers and a canoe-kayak platform. This boat ramp serves traffic from both human-powered and motorized boaters. The operator of the boat ramp, DNREC Division of Fish and Wildlife, indicated that the Upper Shellpot railroad bridge downstream from the boat ramp restricts the boat traffic to human-powered and motorized boats less than 23 feet long and six feet tall. (Personal communication with Mr. Lacy Nichols, February 2008).



Figure 5. Newport Boat Ramp

The 7th Street Park boat ramp on the Christina River is closed indefinitely for repairs according to the DNREC website. A working boat ramp in the same park is located on Brandywine Creek immediately upstream of its confluence with the Christina River.

The Churchman's Road boat ramp is approximately six miles upstream of the proposed bridge location. This boat ramp is only used for recreational boats.

The Wilmington Rowing Center docks are located on the west bank of the river at the south end of the Wilmington redevelopment area, near the Shipyard Shops and Frawley Stadium. The Wilmington Youth Rowing Association crew boat docks are located just downstream of the South Walnut Street Bridge on the north bank of the river.

ii. Recreational Boats

A variety of recreational boats are used on the Christina River in the study area, including both human-powered and motorized crafts. The Wilmington Rowing Club uses the Christina River for training and race events. Two crew boats side-by-side require 65 feet horizontal clearance for safety and oar length.

Since there are no marinas on the river, the majority of the recreational boats access the river by being loaded onto a trailer and towed to the previously identified boat ramps. Since the boats must be transported on state and local roads, there is limit on how tall boats transported by a trailer can be. According to Delaware state code (§ 4502(b)), no vehicle, including any load, shall exceed a height of 13 feet, 6 inches. Assuming an average trailer height of 1 foot and a

minimum draft of 1.5 feet, the tallest “trailerable” boat would have a height of 11 feet above the surface of the water. The minimum clearances of typical boat types and lengths is listed in **Table 2**, (Source = Oregon State Marine Board 2002). As shown in **Table 2**, typical recreational boats (excluding sailboats) up 27’ in length are “trailerable” and are less than 8 feet high. Due to the relatively narrow and sinuous nature of the Christina River, sailing the river is not practical and sailboat use is not anticipated.

Table 2. Typical Recreational Boat Types and Lengths

		Height	Draft	Trailerable?
1.	Boats up to 16’ in length			
	Propeller Boats	4’	1.5’	Yes
	Jet Boats	6’	1.5’	Yes
	Rafts and Drift Boats	4’	1.0’	Yes
	Canoes and Kayaks	4’	0.5’	Yes
	Sailboats	20’	3.0’ - 4.5’	No
2.	Boats 16’ up to 21’ in length			
	Propeller Boats	6’	2.0’	Yes
	Jet Boats	6’	1.5’	Yes
	Sailboats	25’	4.0-6.0’	No
3.	Boats 21’ up to 27’ in length			
	Propeller Boats	8’	2.5’	Yes
	Jet Boats	6’	2.0’	Yes
	Sailboats	35’	5.5-6.5’	No
4.	Boats 27’ up to 32’ in length			
	Propeller Boats	10’	3.5’	No
	Sailboats	50’	6.5’ - 7.5’	Yes
5.	Boats 32’ up to 40’ in length			
	Propeller Boats	14’	4.5’	No
	Sailboats	65’	6.5’ - 7.5’	No

5b. Commercial Navigation

i. Tug Boat

Wilmington Tug operates a tug boat fleet between Wilmington and Philadelphia along the Delaware River. Hickman Rowland, owner of Wilmington Tug, reports that he rarely barges anything up the Christina River. Wilmington Tug has only been contacted once in the past 10 years to provide a price estimate to move a barge down the Christina River to Newport, but the work never took place. Mr. Rowland recalled that it has been over 10 years since his company has been asked to assist in opening the Upper Shellpot Branch Railroad Bridge.

ii. River Taxi

The Wilmington River Taxi is a 36-passenger boat operated by the Riverfront Development Corporation of Delaware. The River Taxi makes stops at six locations along a 1.6 mile route on the northwest bank of the Christina River, between Dravo Plaza near the Frawley Stadium and

the Kalmar Nyckel Shipyard, all located downstream of the proposed crossing. There are five River Taxi boat docks along the northwest banks of the Christina River. Four of these docks are distinguished by their long platforms for safe mooring and boarding along the length of the River Taxi.

The vertical clearance requirement of the River Taxi is eight feet. This is low enough that the Walnut Street and Third Street Bridges do not ordinarily need to open for the River Taxi. As shown in Figure 4, the Market Street Bridge opens for the River Taxi during high tides.



Figure 6. Wilmington River Taxi

iii. Kalmar Nyckel

The historic replica tall-ship Kalmar Nyckel is the tallest ship on the Christina River upstream of the I-495 Bridge. The dock for the Kalmar Nyckel is approximately 200 feet long, and provides mooring for the Kalmar Nyckel Foundation and the City of Wilmington to access and maintain the Kalmar Nyckel. The Kalmar Nyckel travels on the Christina River between the mouth of the Delaware River to the dock at the Shipyard Shops where the ship turns around. The ship berths at the Kalmar Nyckel Dock downstream of the Third Street Bridge. The main operating season for the Kalmar Nyckel is between mid-April and October, part of which the Kalmar is not docked in Wilmington. In the month of July 2011 each bridge was opened for the Kalmar Nyckel 32 times (or 16-round trips) and in September each bridge was opened 20 times (or 10- round trips). The dimensions of the Kalmar Nyckel ship are: 85-foot horizontal clearance and a 105-foot vertical clearance. However, the rigging can be lowered resulting in a 60-foot vertical clearance. The Kalmar Nyckel currently has to lower the rigging to travel under the I-495 Bridge, which has a 60-foot vertical clearance at high tide.



Figure 7. Kalmar Nyckel (left) and Riverboat Queen (right)

iv. Riverboat Queen

The Riverboat Queen is a two-story tall paddle wheeled passenger boat, operating since the summer of 2008. It departs from a dock next to the Iron Hill Brewery near the Frawley Stadium and follows a route to the port of Wilmington and back. The Riverboat Queen serves the tourist trade, and currently operates only on Sundays during the summer. The vertical clearance for the Riverboat Queen is between 16 and 22 feet, requiring that three bascule-bridges and one swing-bridge be opened for it to travel downstream then upstream during its tour of the Christina River.

5c. Emergency Response

The emergency responders that currently use the river include the Wilmington Fire Department, Wilmington Marine Police, Newport Fire & Rescue, and DNREC Marine Patrol. A fireboat dock downstream of the 4th Street Bridge allows fireboat access to Wilmington and the Port of Wilmington with the opening of bascule and swing bridges in each direction. The Fire Department's current fire boat will be replaced in the spring of 2012 with a new boat that has a height of 25 feet and a length of 70 feet. The new boat will have a mast that can be lowered to reduce the height to 18 feet, 2 inches. The Fire Department's emergency rescue boat requires a vertical clearance of only 8 feet and during low tides is able to pass under the Upper Shellpot Railroad Bridge. The other emergency responders that use the river have boats that can pass under bridges with 12 foot clearance.

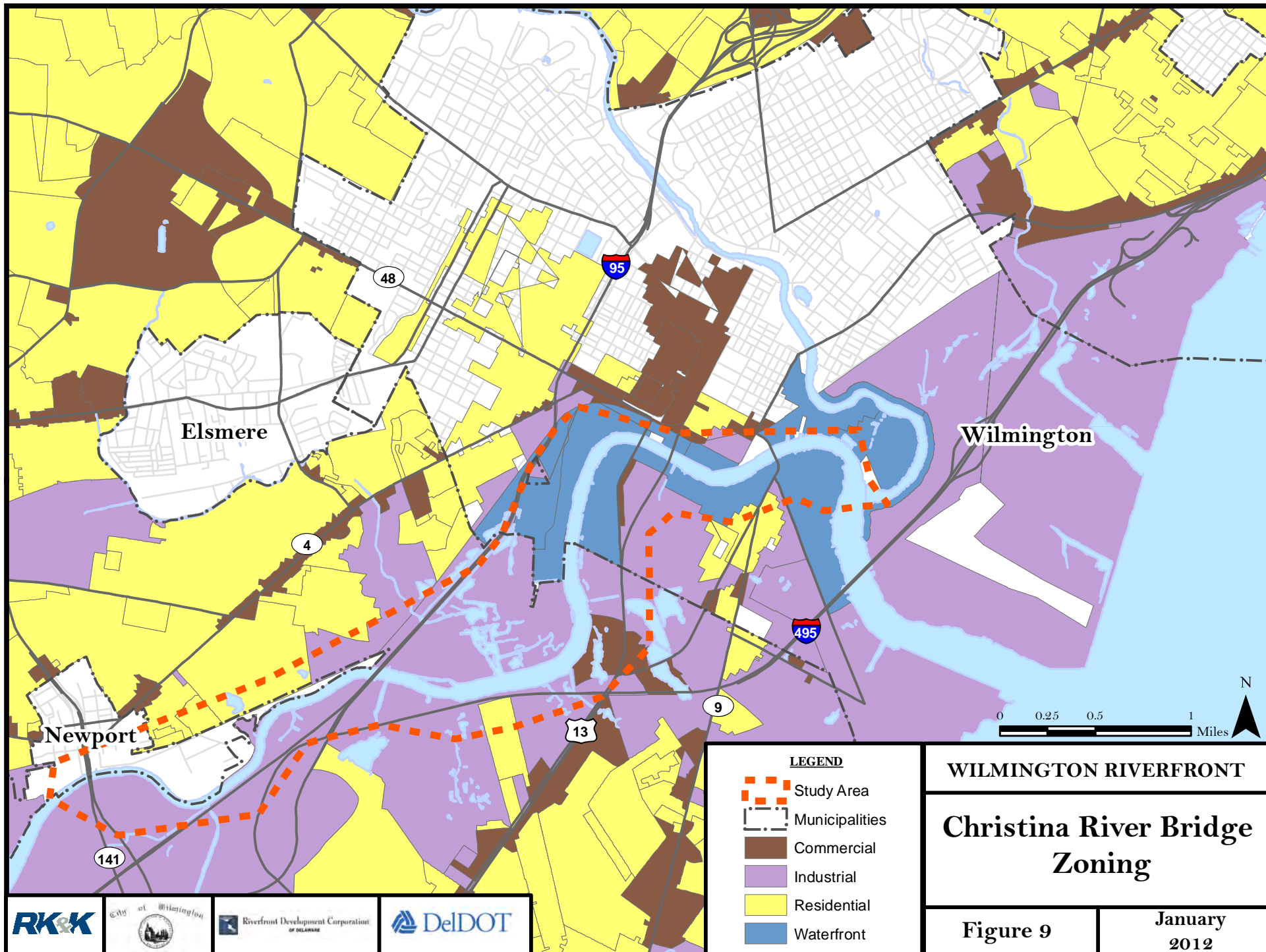


Figure 8. Current Wilmington Fire Marine Unit

6. Existing Land Use and Development

6a. Zoning

The study area includes three political jurisdictions: New Castle County, the town of Newport and the City of Wilmington (**Figure 9**). The shores of the Christina River are zoned mostly industrial or heavy industrial in Newport and New Castle County. In Wilmington, the shores of the Christina River and surrounding parcels are zoned W1 through W4. These "Waterfront" zoning classes prohibit industrial uses, including junkyards, docks for barge traffic, and hazardous waste operations. Several parcels within these zones are non-compliant, but they are prohibited from expanding their operations, including the addition of any docks for barge operations.



6b. Land Uses

i. Wetlands

The Christina River is buffered by wetlands along both banks of the river between Wilmington and Newport, limiting the development potential of these areas (**Figure 10**).

ii. Undeveloped Lands

There are undeveloped lands along the Christina River within the study area and upstream that could potentially be developed with dock access. However, the likelihood of development is low, as much of the undeveloped land is within DelDOT or railroad right of way or is dominated by wetlands. For development to occur, the undeveloped lands would need to be properly zoned, not within a wetland, and linked with the wider transportation network.

iii. Industrial Lands

Industrial land use (**Figure 10**) is common along the Christina River in the Wilmington portion of the study area and on the north bank in the Newport portion of the study areas. However, along the west bank of the Christina River in the Wilmington portion of the study area, industry has been replaced by commercial and residential mixed-use developments as part of the redevelopment of the waterfront. The east bank of the Christina River in Wilmington remains industrial. Two of these parcels, used in petrochemical processing, have docks designed for the transloading of fluids from boats, but the condition of these docks is not known and the docks are not currently utilized for commercial purposes. The north bank of the Christina River in Newport remains mostly industrial; however Newport industry is not supported by river traffic.

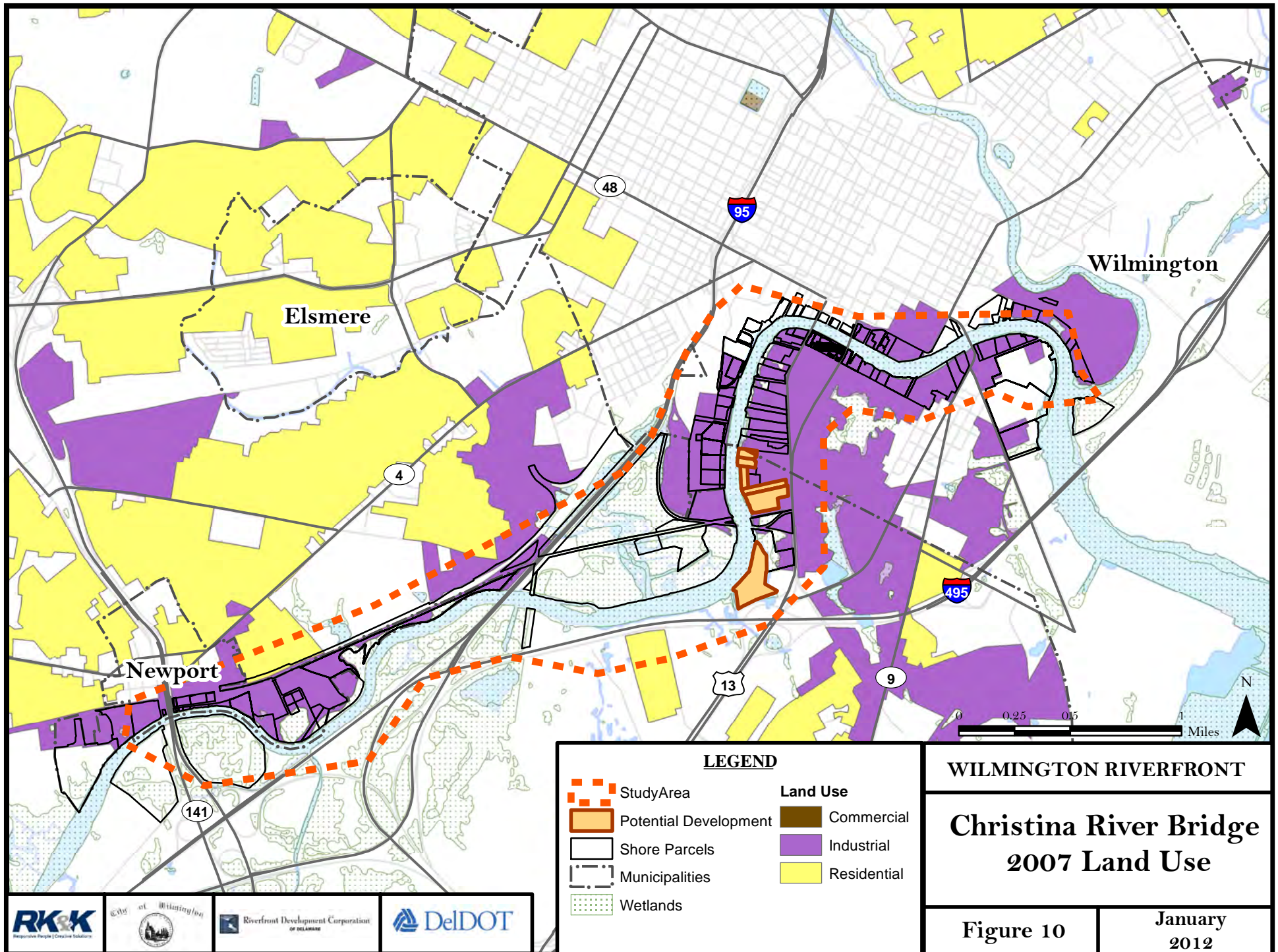
6c. Development

i. Developable Parcels

Most of the parcels along the study area are not available for redevelopment for industrial or marina uses that may add additional traffic to the Christina River. The only exceptions are the six parcels shown on **Figure 10** between Market Street and the Christina River south of Wilmington. These parcels are currently being used for automotive processing, and are zoned “Heavy Industrial” by New Castle County. These parcels are allowed by zoning to accept industries that may require barge operations on the Christina River. See **Table 3** for a description of the current land use and zoning of these six parcels.

Table 3 : Developable Parcels along Christina River

Parcel ID	Street Address	Current Land Use	Zoning
1000100062	1 James Ct.	Tire Sales	Heavy Industrial
1000100061	4 James Ct,	Tire Sales	Heavy Industrial
1000100002	735-B South Market St.	Steel Assembly	Heavy Industrial
1000100009	741 South Market St.	Warehousing	Heavy Industrial
1000100056	811 South Market St.	Steel Assembly	Heavy Industrial
1000100013	1041 South Market St.	Vacant	Commercial



1. Industrial Parcels

Five of the six parcels shown in **Table 3** are stable industrial uses. The northern three properties are all surrounded by other industrial uses, primarily automotive repair and scrapping. The two parcels north of the rail line are being used for steel fabrication. One of these parcels has been in the same use for at least 60 years, and all have been under the same use for the last ten years. All five of these parcels use South Market Street for all of their supply and delivery needs, and are unlikely to build new docks on Christina River's right bank for these purposes. At the upstream end of the study area in Newport, Ciba Specialty Chemicals is located on the river, but does not use the river for shipping.

2. Potential Marina

The southernmost of the properties shown on **Table 3**, Parcel ID 1000100013, provides the most potential for new river traffic development, described below. The owner also owns adjacent parcel 1000100014, with frontage on South Market Street for street access to a potential marina.

This property was formerly the Booker Landfill and the Rogers Corner Dump between 1978 and 1988 for demolition debris, tree stumps, metals, tires, electrical equipment, asbestos shingles, railroad ties, and dredge spoils. It was a Delaware Superfund Site but it is currently closed by DNREC and not actively monitored. Due to the history of use of this land, any type of redevelopment would require managing/disposing of the landfill materials at a significant cost to the owner/developer, as well as operations and maintenance, reporting, and five-year reviews of the property. Operating and maintenance of this site could include groundwater sampling, water level monitoring, cover inspections, mowing, reseeding, repairs to the cap; an estimate for operating and maintenance of this site could cost approximately between \$20,000 and \$100,000 per year. There are no current permits or submitted or approved plans for any development to occur on this site.

The Upper Shellpot Branch Rail Bridge crosses the Christina River between the potential parcel and the proposed bridge locations. This bridge has a vertical clearance of six feet, and can only be opened to river traffic by a tugboat and with the coordination and consent of Norfolk Southern. The USCG recently proposed that the Upper Shellpot Branch Rail Bridge remain in the closed position. Therefore, boats from the potential marina are likely to be less than six feet tall in the area of the proposed bridge.

i. Comprehensive Plans

The comprehensive plans for Wilmington and Newport both emphasize redevelopment of the Christina River as a scenic and recreational river, not as an industrial or shipping channel. The comprehensive plan for New Castle County recognizes that much of the land along the study reach cannot be developed due to wetlands or poor transportation links, but does indicate some parcels south of the Wilmington border as potential development sites.

1. Wilmington

The 1979 Pilot Plan for Wilmington's In-Town Riverfront emphasized mixed use redevelopment under the supervision of a design review panel, replacing the industries that had lined Market Street and the Christina River for much of the 20th Century. A City-wide Plan of Land Use, a Component of the Comprehensive Development Plan for Wilmington, Delaware, July 2003, states the "most significant of all planning initiatives are waterfront redevelopment efforts which to date have involved the investment of over \$90 million for advancements along the Christina River, including the construction of the transportation network and infrastructure improvements, which directly support these redevelopment efforts." There is no mention in the Wilmington Citywide (2003) or Neighborhood Plans (2008) of intentions to expand industrial uses or shipping along the Christina River.

2. Newport

The 2003 Comprehensive Plan for the Town of Newport mentions the importance of the DNREC built and town operated Newport Boat Ramp. The boat ramp is located to the southeast of the town center and is accessed via Harvey Drive, at the end of Thom's Drive within an industrial park. Despite the proximity to industrial operations, the boat ramp is designed to accommodate recreational boaters, not industrial shipping. The industrial center for Newport is downstream of downtown Newport and does not contain any industries that are dependent on river traffic.

3. New Castle County

The Comprehensive Plan for New Castle County indicates that the banks of the Christina River are undeveloped, and does not identify the study reach banks as targets for redevelopment. The county comprehensive plan acknowledges that the banks of the Christina River are dominated by wetlands with poor transportation links (Delaware Department of Natural Resources and Environmental Control (DNREC)).

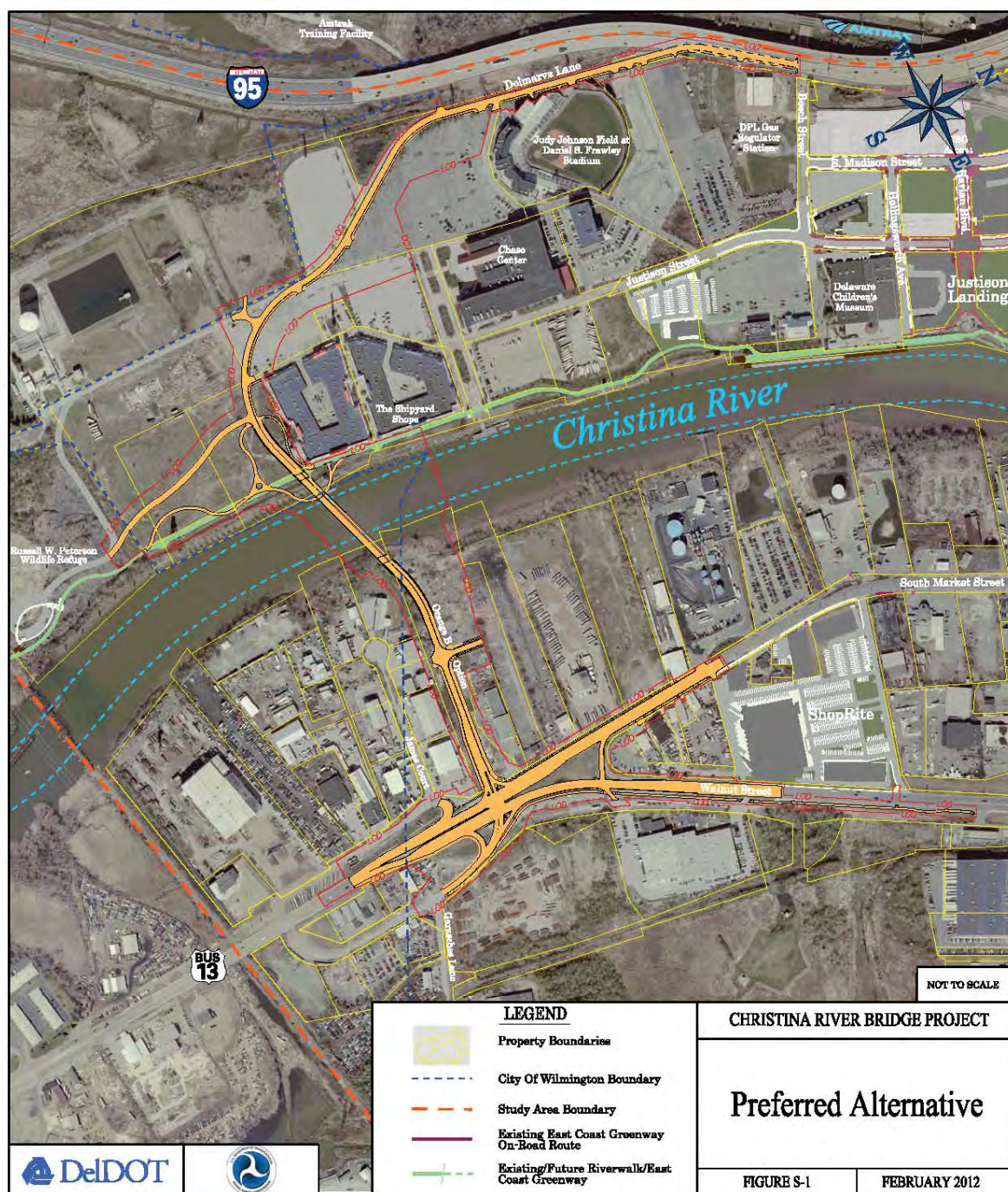
7. Potential Impacts to Navigation

7a. Proposed Alternative

i. Location

The proposed alternative is located between the existing Market Street Bridge and the existing Upper Shellpot Branch Railroad Bridge, providing a connection between I-95 and Business 13 (**Figure 11**). The preferred alternative is described in the EA as the Orange B Alternative alignment. The proposed bridge would cross the Christina River at an angle, with the west bank abutment located just upstream of the Shipyard Shops connecting to the east bank abutment on the state-owned parcel just downstream of the James Court businesses.

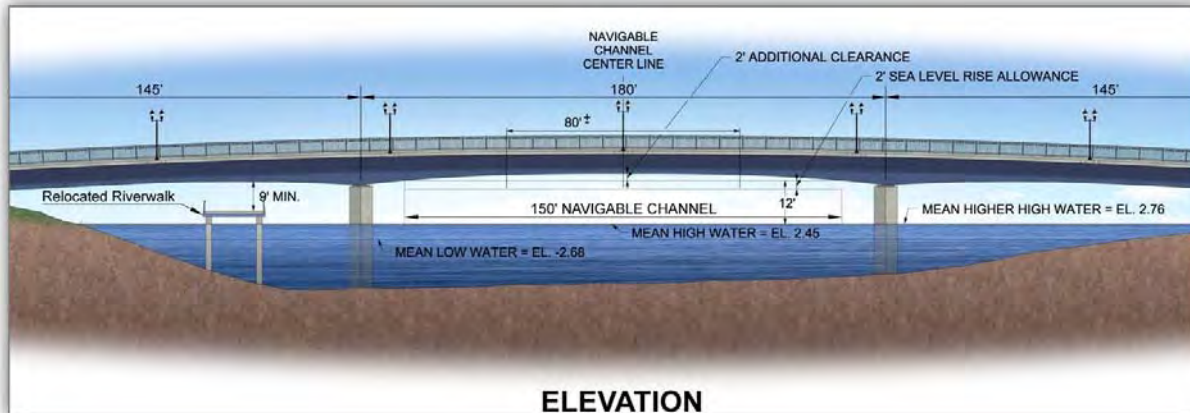
Figure 11. Proposed Bridge Alignment



ii. Clearance

The proposed alternative will provide a present day minimum vertical navigable clearance of 14 feet at mean high-high water and a horizontal clearance of 150 feet (**Figure 12**). There will be an additional 2 feet of clearance at the center of the bridge (approximately 80' wide) due to the shape of the steel girders for an effective clearance of 16 feet.

Figure 12. Proposed Bridge Design with Clearances



7b. User Coordination and Potential Effect

i. Recreational Boating

The proposed bridge will not have an impact on the majority of recreational boaters on the Christina River. The Wilmington Rowing Center requested that the bridge have a minimum 12 foot clearance and the proposed bridge design will fulfill that request. All trailerable boats, with the exception of sailboats will be able to freely pass under the bridge.

The exclusion of sailboats and large non-trailerable propeller boats is not likely to impact many boaters. Private boats traveling up the Christina River typically dock at the Wilmington Riverfront. The Christina River upstream of the proposed bridge is not an ideal river for sailing and the Upper Shellpot Railroad Bridge already restricts the boat traffic to boats less than 6' tall.

ii. Commercial Navigation

There are no businesses along the river that will be adversely affected by the proposed bridge. The Ciba Specialty Chemicals plant operations manager, Rudy Merstetter, was contacted on December 7, 2011. Mr. Merstetter reported that Ciba never uses the river for shipping, since all shipping is done via trucks. The Port of Wilmington Harbormaster, Robert Senseney, said that little to no marine traffic goes beyond the Rt. 495 bridge and the only Christina River traffic that he is aware of are emergency responders, including the Wilmington Fire Boat and Wilmington Marine Police.

The tourist boats operating on the river will also be unaffected by the proposed bridge. The river taxi will be able to pass under the bridge and neither the Kalmar Nyckel nor the River Boat Queen travel upstream of the proposed bridge location.

iii. Emergency Response

A meeting was held with the Wilmington City Fire and Police Departments on December 9, 2011. The Wilmington Police Department raised no objection to the bridge. While the proposed

bridge will limit the movement of the fire boat, the Wilmington Fire Department indicated that in the event of a fire upstream of the bridge, the few parcels blocked by the bridge are easily accessed from land. The primary need for the fire boat upstream of the bridge would be to augment the city water supply in the event of a fire on either side of the river upstream of the bridge. The Fire Department reported that the installation of a standpipe system on the downstream side of the bridge with connections at the east and west banks would fulfill this need. A fender and dolphin system would also need to be added to the bridge to ensure that the fire boat could safely dock while connecting to the standpipe. DelDOT agreed to the installation of a standpipe system and a fender and dolphin system at the bridge.

A meeting was held with the Holloway Terrace Fire Chief, Sage Logan, on December 10, 2011 to discuss the location, type and vertical clearance of the proposed bridge. Chief Logan responded that their emergency rescue boat requires 8' of clearance and their company would not be affected.

A meeting was held with Minquas Fire Chief, Joe Dierolf, on December 15, 2011 to discuss the location, type and vertical clearance of the proposed bridge. The Minquas Fire Department takes no exceptions to the bridge, as their emergency rescue boat only requires 8' of vertical clearance.

DNREC Fish and Wildlife Enforcement was contacted on November 10, 2011. David Blaasch reported that DNREC FWS uses boats that require clearance of 8 feet or less, thus DNREC FWS has no problem with the 12 foot clearance on the proposed bridge.

Newton Mayor Michael Spencer was contacted on November 30, 2011. Mayor Spencer was not interested in meeting to discuss the effect of the bridge and does not believe that the bridge will affect the town of Newport.

7c. Assessment of Impacts

i. Current Uses

The only current user of the river that will be affected by the proposed bridge is the Wilmington Fire Department, as their fire boat will not be able to travel under the bridge. Based on the inclusion of the standpipe system and fenders for mooring the fire boat at the bridge, the Wilmington Fire Department concurs with the current proposed bridge design with a vertical clearance of 12 feet and a horizontal clearance of 150 feet.

ii. Future Uses

In the future, the proposed bridge will limit the movement of vessels that need a clearance greater than 14 feet. There is not an apparent future need for movement of large vessels on the Christina River, given current and planned land uses.

8. Conclusion

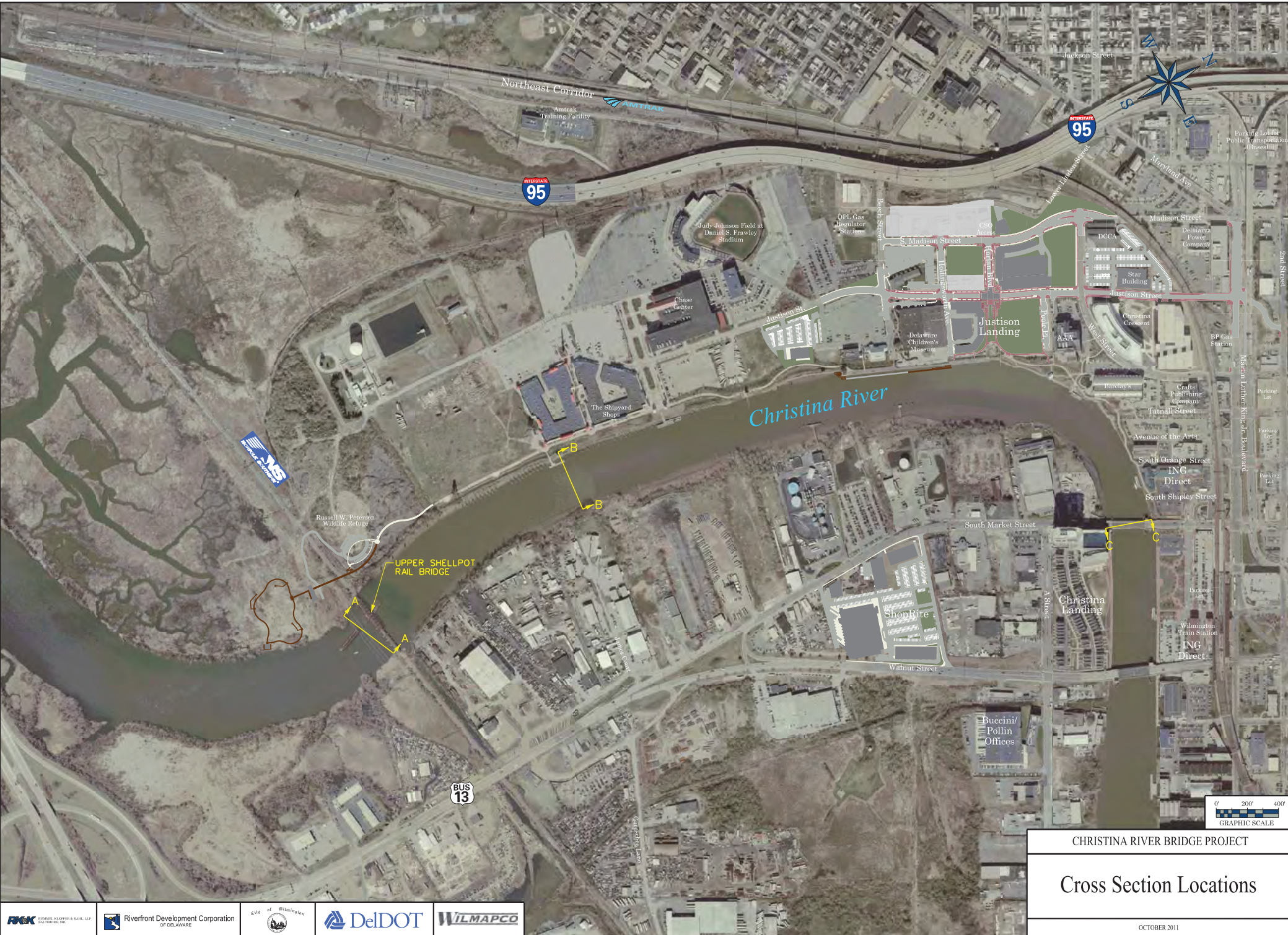
The proposed bridge over the Christina River is not likely to have an adverse impact on current or future navigation, since the primary use of the river is for recreational boating and the existing Upper Shellpot Branch bridge already limits boat traffic on the river to vessels that require less than 6 foot vertical clearance. This is also evidenced by the Upper Shellpot Branch bridge not being opened in over 2 decades, indicating that vessels requiring a higher clearance do not desire access upstream of this bridge. While the bridge would affect the movement of the Wilmington Fire Department's boat, the department has agreed to the proposed bridge design under the condition that a standpipe system and a mooring system be installed at the bridge.

SOUNDINGS IN FEET

45'

CHRISTINA RIVER CHANNEL DEPTHS							
TABULATED FROM SURVEYS BY THE CORPS OF ENGINEERS - SURVEYS TO APR 2011							
CONTROLLING DEPTHS FROM SEAWARD IN FEET AT MEAN LOWER LOW WATER (MLLW)					PROJECT DIMENSIONS		
NAME OF CHANNEL	LEFT OUTSIDE QUARTER	MIDDLE HALF OF CHANNEL	RIGHT OUTSIDE QUARTER	DATE OF SURVEY	WIDTH (FEET)	LENGTH (NAUT MILES)	DEPTH MLLW (FEET)
DELAWARE RIVER TO THE UPPER END OF THE TURNING BASIN	31.8	32.5	32.3	4-11	500-340	0.70	38
THENCE TO LOBDELL CANAL	31.2	29.4	27.9	4-11	400	0.33	35
TURNING BASIN		31.5		4-11	320	0.34	38
LOBDELL CANAL TO BRANDYWINE CR.		10.4		10-08	250	0.68	21
BRANDYWINE CR. TO MARKET ST.		5.5		1-07	200	1.24	21
MARKET ST. TO 39°43'38"N, 75°33'40"W		2.8		1-07	200	0.78	21
THENCE TO END OF CHANNEL		11.7		1-07	200	0.12	10
A. REPORTED DEPTH IS FOR FULL WIDTH OF BASIN.							
NOTE - CONSULT THE CORPS OF ENGINEERS FOR CHANGES SUBSEQUENT TO THE ABOVE INFORMATION							

Chart Name: DELAWARE RIVER SMYRNA RIVER TO WILMINGTON
 Chart ID: 12311_1
 Top Left: 39° 45' 28" N 75° 40' 18" W
 Bottom Right: 39° 43' 43" N 75° 36' 28" W



CHRISTINA RIVER BRIDGE PROJECT

Cross Section Locations

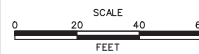
OCTOBER 2011

10/20/2011 9:19:06 AM
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DELAWARE
DEPARTMENT OF TRANSPORTATION

ADDENDUMS / REVISIONS



CHRISTINA RIVER BRIDGE

CONTRACT
T200512102
COUNTY
NEW CASTLE

BRIDGE NO.
DESIGNED BY:
CHECKED BY:

NOTE: ELEVATIONS ARE BASED
ON N.G.S. SURVEY DATUM
(NAVD 88).

CROSS SECTIONS

SHEET NO.
1
TOTAL SHTS.
1

