



**NEW CASTLE INDUSTRIAL TRACK TRAIL
PHASE 3 FEASIBILITY STUDY**

NOVEMBER 2012

NEW CASTLE INDUSTRIAL TRACK TRAIL PHASE 3 FEASIBILITY STUDY

Prepared for the
Delaware Department of Transportation, Division of Planning

In association with
Delaware State Parks
and the Wilmington Area Planning Council

With the support of additional advisory committee organizations
Bike Delaware
City of Wilmington Department of Public Works
Delaware Bicycle Council
Delaware Economic Development Office
Delaware Greenways
Delaware Nature Society
Delaware Transit Corporation
East Coast Greenway Alliance
New Castle County Department of Special Services
Riverfront Development Corporation
Wilmington Bicycle Advisory Committee

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Wilmington, Delaware

November 2012

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by Julia Robertson
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INTRODUCTION

The New Castle Industrial Track was a rail line connecting the Wilmington Riverfront and the City of New Castle. The line, shown in Figure 1, was taken out of service in the 1970s and the right of way is now owned by the State of Delaware. Starting in the 1990s, the Delaware Department of Transportation (DelDOT), Delaware Department of Natural Resources and Environmental Control (DNREC), and New Castle County discussed the possibility of reusing the Industrial Track alignment for an active (bicycle and pedestrian) transportation connection between New Castle and Wilmington. This alignment is desirable not only because of its directness, but because the entire six-mile alignment has very few at-grade road crossings.

Previous plans have outlined the need for a trail in this location. Specifically, the Industrial Track was addressed by the East Coast Greenway Feasibility Study and is part of the New Castle County Greenway Plan. Extensive public outreach conducted during the development of those plans indicated support for an active transportation connection between Wilmington and New Castle. Furthermore, both the Wilmington Area Planning Council (WILMAPCO) 2040 Regional Transportation Plan and the 2007 New Castle County Comprehensive Plan include the trail. These last two plans specifically describe a connection crossing the Christina River at the location of the former Industrial Track bridge and continuing northeast to the Wilmington Riverwalk. This route is evaluated as the red alternative in this report.

Funding from the American Reinvestment and Recovery Act in 2010 allowed the Industrial Track Trail to start moving from an idea to reality. These funds were used by DelDOT and the County to complete construction of the first phase of the trail. Phase 1, from SR 273 in the City of New Castle to the Suburban Little League fields just north of Boulden Boulevard, is 1.8 miles in length and opened in summer 2010. A prior section of the Industrial Track Trail, currently named the Heritage Greenway Trail, was completed in 2005. This 0.25-mile segment was constructed from SR 273 to Young Street in the City of New Castle. Funding for this segment came from the Transportation Enhancements Program and a Delaware Land & Water Conservation Trust Fund Trail Grant (Division of Parks and Recreation, DNREC).

In early 2012 New Castle County started construction of Phase 2, a 1.3-mile segment from north of Interstate 295 to the south bank of the Christina River north of Interstate 495, primarily along the former rail alignment. Interstate 295 is owned by the Delaware River and Bay Authority (DRBA). Although discussions are ongoing among DelDOT, the County, and DRBA, it is anticipated that an agreement will be reached to connect Phases 1 and 2 across Interstate 295. This will likely occur in the 2015-2016 timeframe, coinciding with the completion of DRBA's reconstruction of the southbound lanes of I-295. Upon completion, this will result in a continuous trail from the City of New Castle to the Christina River. A later phase will connect the south end of the Heritage Greenway Trail to Battery Park in New Castle.

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Figure 1. New Castle Industrial Track context map.



Purpose of the study

The purpose of this study is to address feasibility of the third link in the New Castle Industrial Track Trail, between I-495 on the south and the Wilmington Riverwalk on the north. This link poses challenges not experienced by the first two phases, including a river crossing, tidal wetlands, industrial properties, and an existing in-service rail line.

The National Environmental Policy Act of 1969 (NEPA) requires that formal environmental documentation be prepared when federal funds are used for any undertaking that may affect the environment. This document is a precursor to the NEPA process and does not include necessary elements for environmental approval. The Recommended Alternative section provides an overview of next steps, including completion of environmental documentation, to proceed with the project.

INVENTORY OF EXISTING CONDITIONS

The DelDOT study team began the technical aspects of the project by gathering existing information. The limits of the study area are shown in Figure 3 on the following page.

Key features

The study area is bounded by significant physical features in the landscape. Immediately adjacent to the north end of Phase 2, the Christina River flows from west to east, then turns north toward downtown Wilmington. The river is tidal in this area and varies from about 300 to 600 feet in width. Because this portion of the Christina River is navigable, navigation is governed by the U.S. Coast Guard. The documented navigable waterway is 200 feet wide.

DelDOT is currently working on the Christina River Bridge Project, which is located just downstream from the Norfolk Southern (NS) Shellpot Secondary river crossing described below. DelDOT, in consultation with the Coast Guard, has established a navigable clearance of 14 feet above mean high water (MHW) and a horizontal clearance of 150 feet. The Federal Highway Administration has issued a Finding of No Significant Impact based on these dimensions.

Along the north edge of the study area is the NS Shellpot Secondary, shown in Figure 2. This single-track freight line is located on the north side of a 70-foot right of way that used to carry two tracks. It is only lightly used, carrying, on average, two slow-moving freight trains each day. The line crosses under I-95 at the west edge of the project area and under US 13 at the east edge. The Shellpot Secondary utilizes a low-clearance swing bridge to cross the Christina River. Although this bridge officially qualifies as movable to ensure navigation, it is no longer operable because the rail is continuously welded. In contrast to the navigation channel

requirements mentioned above, even when operable this bridge provided a clear channel width of less than 100 feet.

On February 7, 2012, the Coast Guard published a notice to allow the bridge shown in Figure 2 to remain in its closed-to-navigation position, about 6 feet above MHW. An upstream property owner has filed an objection, so navigation requirements have not been resolved as of the date of this report.

Figure 2. Norfolk Southern Shellpot Secondary.



The southern boundary of the project area is formed by I-495. The highway was built as close as possible to the river; at some locations the right of way is separated from the water by only about 30 feet of steep, wooded slope. Figure 4 illustrates this condition. Tidal marsh occupies those areas where there is greater separation between the road and the river.

To the west of the study area lies another interstate highway, I-95. I-95 was built primarily on fill through the tidal marshes along the Christina in the early 1960s. It crosses over the river and the Shellpot Secondary on bridges. The river bridge also does not comply with the Coast Guard navigation clearance requirements. Although its lowest span is more than 20 feet above MHW, each of the bridge's spans is 80 feet long as shown in Figure 5.

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Figure 3. Study area.



Figure 4. Slope along Interstate 495.



Figure 5. Interstate 95 bridge over the Christina River.
Source: New Castle County Department of Special Services.



Finally, the eastern edge is formed by US 13, a four-lane arterial highway through the South Wilmington industrial area.

In the center of all of these features is the Russell W. Peterson Urban Wildlife Refuge, owned by the Riverfront Development Corporation (RDC). The Refuge consists primarily of tidal marsh interspersed with scattered upland forest land. At one time the home of significant industrial activity, much of the marsh has been restored by DNREC to a more natural state. The marsh is bisected by the Little Mill Creek, which runs north-to-south into the Christina River.

The northeast corner of the Refuge features the DuPont Environmental Education Center (DEEC), which provides nature education programs. This dramatic building, illustrated in Figure 6, is connected to the Wilmington Riverwalk by a bridge over the Shellpot Secondary. This bridge would be the northern terminus of the Industrial Track Trail Phase 3 project.

Participants in the Center's programs can access a loop boardwalk to the Refuge from the building itself. The western marshes in the Refuge cannot be accessed without using the Shellpot Secondary right of way, which keeps the public from enjoying that part of the Refuge.

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Figure 6. DuPont Environmental Education Center.



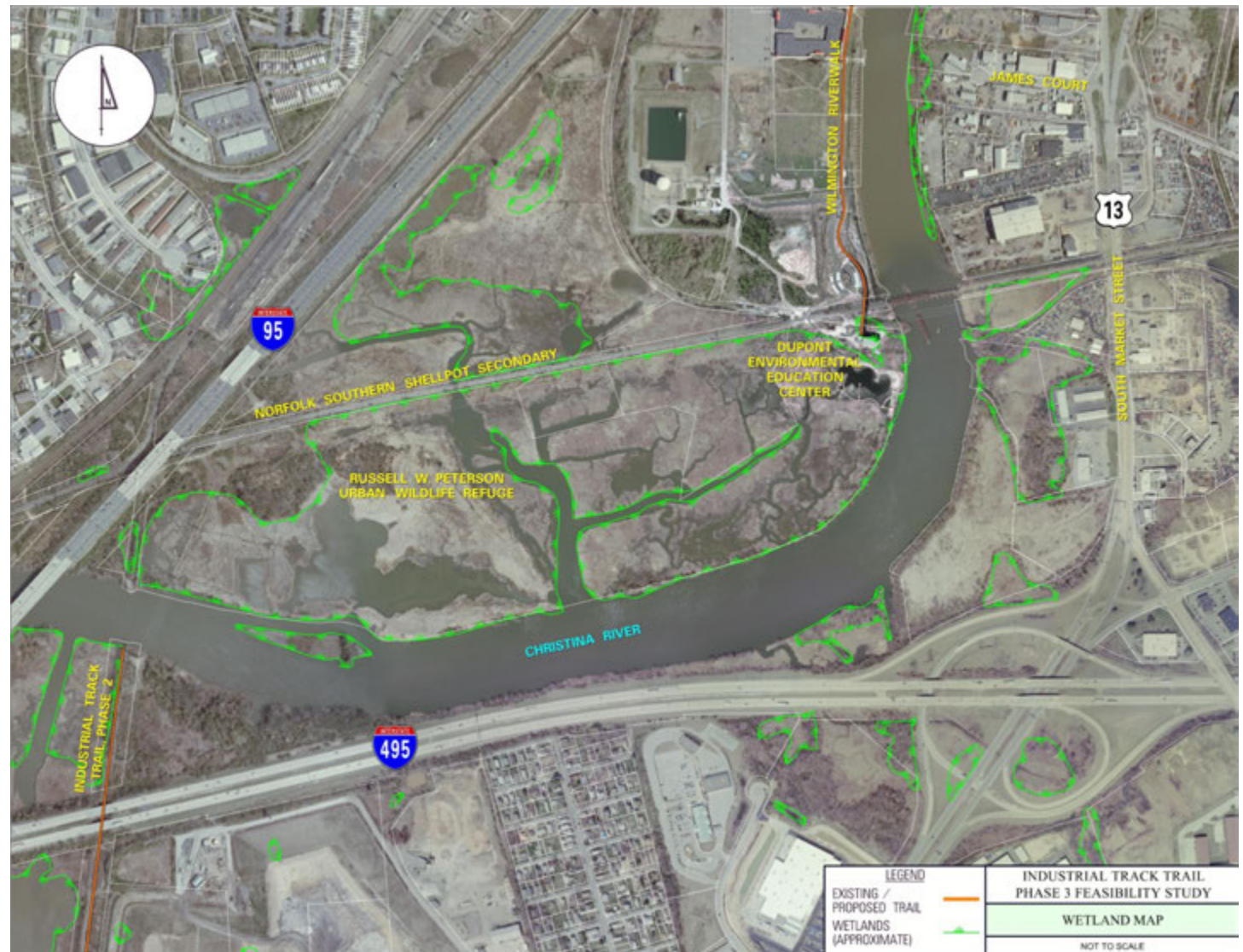
Wetlands

Given the topography of the study area, there are extensive tidal wetlands. DNREC provided delineated wetland boundaries for the Refuge, which were surveyed and recorded on the 2004 marsh restoration record plan prior to formation of the Refuge. The study team conducted field investigations to note any obvious changes in these boundaries and to develop approximate limits of tidal wetlands in other parts of the study area. These wetlands are shown in Figure 7 on the following page. Note that wetlands were evaluated in a cursory manner, appropriate to the early planning stage of this study. If construction of the trail takes place outside the previously-delineated area, formal wetland delineation will need to be performed prior to design.

In Delaware, tidal wetlands fall under the jurisdiction of DNREC. As described in the Public and Agency Process section below, DNREC's Wetlands Section participated in a meeting and field view to observe wetland conditions.

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Figure 7. Wetlands. Data source: State of Delaware.



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Flood areas

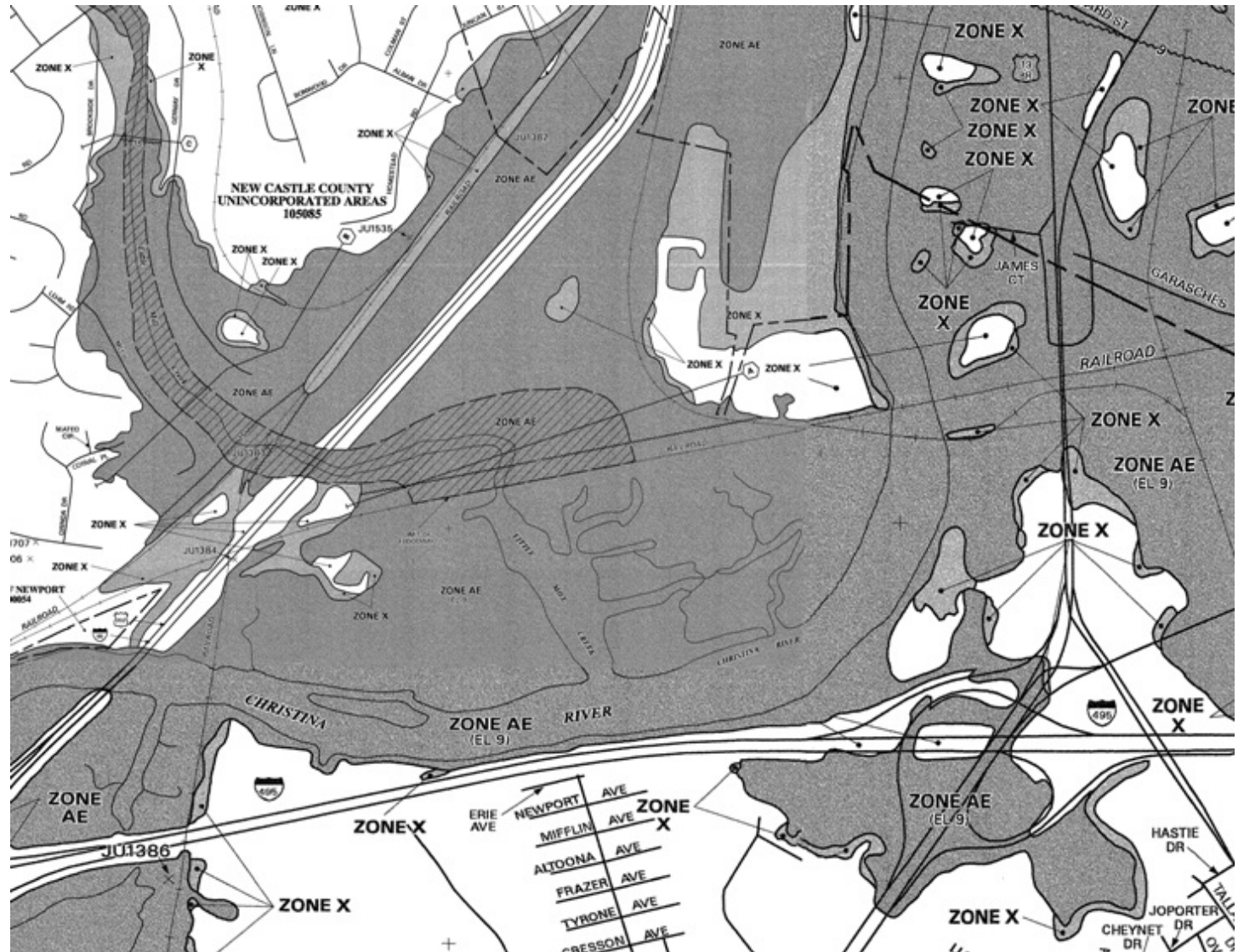
According to Flood Insurance Rate Maps published by the Federal Emergency Management Agency, nearly the entire study area falls within a Special Flood Hazard Area. Special Flood Hazard Areas are “subject to inundation by the 1% annual chance flood event. The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year.” Along this portion of the Christina River, FEMA defines the surface of the base flood at an elevation of nine feet above sea level.

Figure 8 on the following page illustrates Flood Insurance Rate Maps for the Phase 3 area.

Land use

Land use in the study area is dominated by the Refuge at its core and the previously described roads and railroads. Developed land exists only along the east side of the project area and consists entirely of industrial land along US 13.

Figure 8. Flood Insurance Rate Map.
Source: Federal Emergency Management Agency.



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Utilities

Given the area's industrial heritage, it is not surprising that portions are crisscrossed by utility lines. The lines within the limits of the Refuge are shown in Figure 9 on the following page.

Delmarva Power (DP&L) owns and maintains aerial transmission lines within the project boundaries. From the southern limits at I-495, the aerial lines cross the Christina River and roughly parallel I-95 along the western boundary, then turn east just south of the Shellpot Secondary. The aerial lines then parallel the rail line through the eastern extents of the project area. North of the Christina River, the transmission lines are located entirely within the Russell W. Peterson Urban Wildlife Refuge inside an existing utility easement. There are no anticipated impacts to the transmission lines as part of this project.

DP&L also owns and maintains underground gas facilities within the Refuge beginning at I-95 and running east and west. The facilities meander south of the Shellpot Secondary within an existing utility easement until approximately 900 feet west of the DEEC, where they turn north and cross the railroad.

New Castle County owns and maintains a large 78-inch underground sanitary sewer force main within the Refuge. This line runs west-to-east through the Refuge, paralleling the Shellpot Secondary beginning at I-95 and continuing to just west of the DEEC. Near the DEEC, the line turns to the southeast and continues across the Christina River. The force main is located within an existing utility easement. The size and importance of this line indicate that it should be avoided during trail construction. The bridge connecting the DEEC and the existing boardwalk to the south was built to span this line.

United Water owns and maintains underground water facilities in the vicinity of the DEEC. The facilities service the DEEC, with access provided via a 10 foot utility easement from the Wilmington Riverfront.

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Figure 9. Utilities.



ALTERNATIVES CONSIDERED

General design considerations

Alternatives considered for Phase 3 of the New Castle Industrial Track Trail are illustrated in Figure 10 on the following page. Each alternative was assumed to consist of a 10-foot-wide paved trail for consistency with previously constructed phases of the trail. Design would comply with the *AASHTO Guide for the Development of Bicycle Facilities*, Fourth Edition (2012). On bridges, the surface would widen to 14 feet between railings to account for a two-foot lateral clearance between the trail edge and any obstructions. These bridges would be designed to accommodate a pickup truck for maintenance purposes.

Profile grades are generally governed by the requirements of the Americans with Disabilities Act (ADA). In urban and suburban contexts the most commonly referenced application of ADA is the Americans with Disabilities Act Accessibility Guidelines, or ADAAG, published by the U.S. Access Board. However, there is disagreement among professionals on which guidelines constitute compliance with the ADA with respect to trails. Some guidance, such as the Accessibility Guidelines for Outdoor Developed Areas (also developed by the Access Board), allows for steeper accessible routes than ADAAG over short distances. For this feasibility study, the most restrictive scenario is assumed: a maximum profile grade of five percent. This grade does not require landing areas and is generally preferred by Delaware's Architectural Accessibility Board. In final design, consideration should be given to the pros and cons of providing steeper grades as needed.

Red alternative

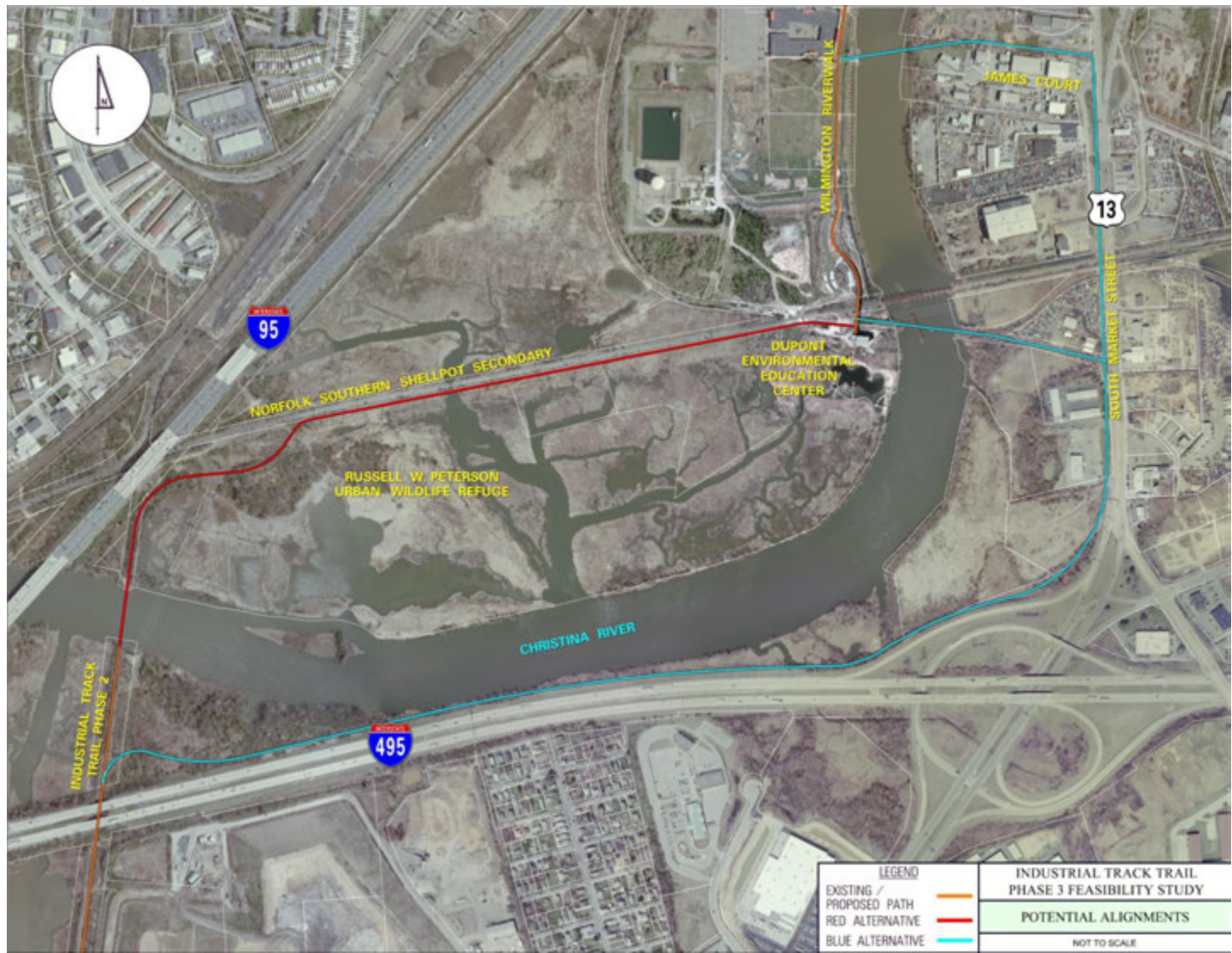
The red alternative would follow the alignment of the former Industrial Track railroad across the Christina River. The railroad bridge was removed many years ago, and aerial photographs show no evidence that any traces of the bridge piers remain intact. The remaining bridge abutments are 330 feet apart. Given this length, it is likely that intermediate piers would be needed in the river to accommodate a crossing at this location.

The Industrial Track alignment is clearly visible as a dirt road from the north bank of the Christina to the vicinity of the I-95 bridge over the Shellpot Secondary. At this point the red alternative turns east and follows the south side of the Shellpot Secondary toward the DEEC. For about 1,200 feet from I-95, the trail can be built on uplands adjacent to the NS right of way.

The final 3,100 feet between that point and the DEEC could be traversed by two different options. The first option would be use of unused railroad right of way adjacent to the Shellpot Secondary track. As mentioned previously, at one time the Secondary had a second track south of the existing track; this railbed remains intact and could be used for a trail alignment while maintaining adequate clearance from the operating track. This would be the most logical option for trail construction along the red alternative because it would not impact any Refuge or wetland resources and can be built at a lower cost than a parallel trail bridge. However, NS currently maintains a position against all rails-with-trails system-wide, citing safety concerns. Discussions should be held with the railroad to determine whether there is flexibility in that position.

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Figure 10. Alternatives considered.



Avoidance of the NS right of way would require a second option: building an extended bridge across tidal wetlands adjacent to the railroad. Keeping the bridge immediately next to the railroad right of way would ensure that the bulk of the wetland resources would remain undisturbed. This bridge would utilize standard Delaware State Parks best practices, including helical anchors to minimize physical disturbance to the wetland and permeable decking (ThruFlow™ or similar) to maintain hydrology and minimize shading. The height of the bridge should be sufficient to further reduce shading and provide appropriate opportunities for wildlife passage. Because this bridge would be built from above, working from the completed section of the bridge out across the marsh, physical impacts to the wetland would be limited.

Both options would ramp up on a bridge approaching the DEEC, tying into the west side of the existing pedestrian bridge over the Shellpot Secondary and providing access to the Wilmington Riverwalk.

Yellow alternative

The yellow alternative would be very similar to the red alternative in most respects. It was envisioned as an opportunity to avoid constructing a new bridge over the Christina River by instead widening the existing I-95 bridge. Early investigations by the study team's structural engineers indicated that the I-95 bridge has a design that cannot be readily widened. Therefore this option was not considered further, and this alternative is not evaluated in subsequent sections of this report.

Blue alternatives

The family of blue alternatives would follow the south bank of the Christina River rather than crossing at the site of the former Industrial Track bridge. Beginning north of I-495 and

connecting to the County's Phase 2 segment, the blue alternative would immediately turn east and parallel I-495 within the constrained area immediately adjacent to the Christina River.

The alignment would be located outside of the clear zone and along the fill slopes bordering the highway shoulder. Members of the advisory committee and resource agency representatives visited this segment of the blue alternative during a field view meeting on September 28, 2011 in order to gauge the general experience a trail user would encounter. Given the high vehicular speeds and volumes and associated noise, several participants noted a strong feeling of discomfort. Although this discomfort is difficult to quantify, the consensus was that high speeds, noise, and lack of aesthetic appeal would make this alignment undesirable for potential trail users.

From a safety perspective, the clear zone along I-495 is a minimum of 30 feet from the edge of the southbound travel lane, but also varies up to 46 feet dependent upon the fill slopes at any given section per AASHTO guidelines. In addition, the presence of fill slopes steeper than 4:1 substantially decreases the potential for an errant high-speed vehicle to recover within this area. For this reason, the alignment would be shifted as far from the roadway as possible and into the wooded slopes near the river bank. To mitigate safety concerns, especially in areas with fill slopes steeper than 4:1, a barrier is recommended to protect trail users from errant vehicles which fail to recover. A noise abatement system could also be considered. This barrier would screen the trail user's view of the roadway, but would also limit visibility of the trail to passing motorists.

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Once reaching the southbound US 13 ramp to I-495 southbound, the blue alternative would be aligned adjacent to the ramp and could be continued via three different options. All three options would impact wetlands, which would likely require environmentally sensitive construction methods described under the red alternative in order to minimize impacts. Given the industrial heritage of the US 13 corridor south of Wilmington, it is expected that all three options could also require environmental remediation.

From the ramp, the first blue option would continue north along the west side of US 13 to the South Market Street bridge over the Shellpot Secondary. This existing vehicular bridge over the railroad is historic in nature and early investigations by the study team's structural engineers indicated that the bridge cannot be widened; a separate structure paralleling this bridge would be necessary. There are also frequent driveway crossings at the industrial parcels along US 13, which would create conflicts for trail users. This option would ultimately tie into the planned vehicular crossing of the Christina River connecting US 13 and the Wilmington Riverfront. This crossing is planned to include a ten-foot shared-use path, which would allow access between the east and west banks of the river independent of which Industrial Track Trail alternative is selected.

The second blue option would involve continuing north on US 13 for about 700 feet and turning west just prior to the NS railroad and utilizing a strip of existing right of way between US 13 and the Christina River. Statewide wetland mapping indicates the presence of wetlands within the strip. At the Christina River, the trail would cross the river at the location

of the existing abandoned Deepwater Bridge. An opportunity may exist to examine the utilization of this structure, which is located immediately south of the active NS Shellpot Secondary bridge, to accommodate the trail. Utilization of this former railroad bridge has been suggested as desirable by some stakeholders. If this reuse is deemed structurally infeasible, elements of the steel truss could potentially be incorporated into a new bridge. Either through the reuse of the Deepwater Bridge or construction of a new structure, the design would ramp up to the DEEC bridge as a means to eliminate the need for a separate structure crossing over the active railroad.

The third blue option would consist of aligning the trail northbound adjacent to the bank of the Christina River. The trail would then turn west at the location of the Deepwater Bridge as discussed above and would utilize the same series of options when crossing the Christina River. This option would involve aligning the trail through two privately owned parcels, both of which were likely industrial in the past. Wetland mapping also indicates the presence of a large wetland encompassing one of the commercial parcels. Among all the blue alternative options, this option would present the most pleasing viewshed, with scenic views of the Christina River and DEEC as opposed to the US 13 corridor. There would also be no driveway crossings conflicting with trail users along this option. However, due to the combination of extensive right of way impacts, wetland impacts, and potential environmental mitigation, this option would pose some significant challenges.

PUBLIC AND AGENCY PROCESS

To guide the course of the study, DelDOT assembled an advisory committee composed of the following organizations:

- Bike Delaware
- City of Wilmington Department of Public Works
- Delaware Bicycle Council
- Delaware Nature Society
- Delaware State Parks
- Delaware Transit Corporation (DTC)
- East Coast Greenway Alliance
- Delaware Economic Development Office (DEDO)
- Delaware Greenways
- New Castle County Department of Special Services
- Riverfront Development Corporation (RDC)
- Wilmington Area Planning Council (WILMAPCO)
- Wilmington Bicycle Advisory Committee

Kickoff meeting

The advisory committee met twice during the course of the study. The first meeting was held on December 16, 2010 at the Delaware Economic Development Office in Dover. This kickoff meeting was held to provide an overview of the project's goals and to discuss initial findings. The attendees indicated their agencies' reasons why this project should move forward. In general, it was agreed that the Industrial Track Trail will not only provide an important transportation and recreational route between Wilmington and New Castle, it will serve a significant economic development purpose as well.

Preliminary discussions with the RDC prior to this meeting indicated their willingness to use the existing pedestrian bridge over the Shellpot Secondary as a means to connect the trail to the Wilmington Riverwalk. It was noted that the existing DEEC boardwalk is primarily used for educational purposes and would not be suitable for a trail as it is currently built, nor is it proposed to become part of the Industrial Track Trail. It is relatively narrow, lacks handrails, and is only open from dawn until dusk. RDC may extend the boardwalk south and west in the future. This extension could be designed differently than the current boardwalk, allowing for bicycle and pedestrian use and providing an alternative alignment for around-the-clock transportation purposes. Use of the Riverwalk bridge over the railroad would eliminate concerns of crossing the Shellpot Secondary at grade.

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Stakeholder meeting

The second advisory committee meeting was held on March 3, 2011 at the DEEC. This meeting served to introduce the project to a larger base of stakeholders. As shown in Figure 11, the study team presented preliminary findings along with photos of each alternative.

Of primary concern was the potential to use NS right of way for a rail-with-trail. NS is one of eight Class I railroads which operate in the United States, with its classification relating to its annual carrier operating revenues compared to all other railroads in the country. The project team contacted the Rails-to-Trails Conservancy (RTC) as a means to identify other successful examples of rail-with-trail conditions within Class 1 railroad rights-of-way. While the Conservancy noted many examples among locally classified railroads, no Class 1 railroad to their knowledge has entered into such an agreement. It was noted that NS's executive policy also prohibits purchase of right of way with the intention of creating a rail-with-trail.

Discussions also focused on the feasibility of a new structure over the Christina River and how the U.S. Coast Guard's decision on navigational clearance of the new river bridge downstream will likely dictate configuration of a new trail bridge.

Potential wetland impacts of the red alternative were discussed. The project team's cursory investigations indicated a mixture of uplands and wetlands within the Refuge. The group agreed to engage DNREC's Wetlands and Subaqueous Lands Section to determine the best path forward if the red alternative were selected. Delaware State Parks also noted their successful experiences with trail construction best practices in environmentally sensitive areas.

The group highlighted that the red alternative involves coordination with RDC, NS, DNREC, and the Coast Guard, but with no private landowners like the blue alternative. The importance of public outreach in the design process and the economic and tourism benefits of the trail were also stressed.

Figure 11. Stakeholder meeting.



Agency field view

Because the project was identified as having the potential to impact natural and cultural resources, DelDOT also led an on-site meeting and field view on September 28, 2011. The following agencies were represented at the meeting:

- Delaware Department of Transportation
- Delaware Nature Society (DNS)
- DNREC, Division of Fish and Wildlife (Refuge staff and Natural Heritage Program)
- DNREC, Delaware State Parks
- DNREC, Site Investigation and Restoration Branch
- DNREC, Wetlands and Subaqueous Lands Section
- Federal Highway Administration
- U.S. Army Corps of Engineers

In addition, the project team invited the following resource agencies who were unable to attend. Meeting minutes were forwarded to representatives of those agencies.

- Delaware State Historic Preservation Office
- National Oceanic and Atmospheric Administration
- U.S. Coast Guard
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

A focal point of the meeting was to discuss, review, and evaluate potential wetland impacts along the red and the blue alternatives. DNREC Wetlands Section staff reviewed State wetland regulations and the permitting process as it relates to transportation projects. Wetlands staff noted a preference for constructing the trail within upland areas

where possible. It was noted that although challenges will exist with the permitting process, the agency is willing to work with the advisory committee to find equitable solutions.

At the field view following the meeting, participants had the opportunity to observe existing conditions at key points along all alternatives. DNREC expressed concern about two issues: impacts to wetlands along the red alternative and discomfort regarding I-495 traffic and noise along the blue alternative (see Figure 12).

Figure 12. Agency representatives along Interstate 495.



The group highlighted that the new vehicular bridge downstream connecting US 13 to the Wilmington Riverfront is going through the NEPA process. If the northernmost blue alternative option would be selected, the trail would be incorporated into this structure.

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EVALUATION CRITERIA

Route directness

One of the primary criteria travelers use in choosing a route is anticipated travel time, which is directly related to the directness of the route. The viability of the New Castle Industrial Track Trail, then, depends on how direct it is compared to other alternatives. Although research has not been done to determine exactly how far pedestrians and bicyclists are willing to go “out of the way” to reach their destination before choosing another route, it is clear that the most direct connection is preferable to one that is perceived by users as circuitous. This is particularly important when the destination is in sight, as is the case in the Phase 3 area.

The following list compares the red and blue alternatives from end to end, connecting Phase 2 at the north side of I-495 with the Wilmington Riverwalk where it meets the Shipyard Shops.

- Straight line distance: 1.25 miles
- Red alternative: 1.57 miles
- Blue alternatives: 1.85 to 2.09 miles

Although the red alternative is about 26% longer than the straight line route, it represents the most direct feasible route to avoid the river and most of the marsh. The blue alternatives vary in length, but the shortest of them is 18% longer than the red alternative, and the longest is 33% longer than red. At a speed of 12 miles per hour (not unusual for a commuting bicyclist), the red alternative would take 7.9 minutes and the blue alternatives would take between 9.3 and 10.5 minutes.

For sake of comparison, the total length from New Castle (SR 273 at the trail crossing) to the intersection of Martin Luther King, Jr. Boulevard and Market Street in downtown Wilmington was also considered. Trail alternatives and existing road routes are included as shown in Figure 13; lengths and travel times are approximate.

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Figure 13. Trail alternatives and road routes.



Route	Length	Approximate estimated travel times		
		Bicyclist at 12 mph	Bicyclist at 18 mph	Motorist
ITT red	6.4 miles	32 minutes	21 minutes	N/A
ITT blue (shortest)	6.6 miles	33 minutes	22 minutes	N/A
ITT blue (longest)	6.9 miles	35 minutes	23 minutes	N/A
SR 141 and US 13	6.2 miles	31 minutes*	21 minutes*	14 minutes**
SR 9/A St	6.2 miles	31 minutes*	21 minutes*	18 minutes**
I-95 via SR 141	7.7 miles	N/A	N/A	11 minutes**

* Does not include delay at traffic signals.

** As estimated by Google Maps.
May be longer during peak hours.

These distance and travel time comparisons illustrate the viability of commuting by bicycle along the trail as opposed to driving. A pace of 12 mph is typical for a commuter; experienced, fit cyclists can maintain 18 mph for six to seven miles. At that speed, cycling is a viable travel time alternative to driving. Considering potential motorist delays due to traffic signals, congestion, and time to park, as well as car parking costs in downtown Wilmington, even more casual cyclists are likely to find commuting by bicycle along the Industrial Track Trail an attractive option.

User comfort

The red alternative would be fully separated from motor vehicle traffic for its entire length. As the trail passes along and through the Refuge, it would provide panoramic views of both the marsh and the downtown Wilmington skyline. Users on the portion of the route that parallels the Shellpot Secondary would travel alongside slow-moving freight trains (limited to 10 mph crossing the Christina River bridge) about twice a day on average. Adequate fencing and lateral separation can be provided to enhance bicyclist and pedestrian safety.

The blue alternative would travel immediately adjacent to I-495 (within the right of way) for almost a mile. The trail would be wedged on a steep slope between the highway and the river for much of that length. I-495 currently carries 28,000 vehicles per day with a speed limit of 65 mph. Anticipated user comfort in this area is best illustrated by some participants' reactions during the September 28, 2011 field view mentioned above. Some attendees were not comfortable exiting the tour van well off the side of the road despite the use of a flashing beacon and safety vests. Traffic noise from the concrete road surface would also detract from the user experience. Due to the proximity of the trail to the road and the slope, a traffic barrier and fence would need to be built between the road and the trail.

The western blue options from I-495 north would be constructed along the bank of the river, providing similar panoramic river and skyline views to the red alternative. North of the Shellpot Secondary, the western blue options would go through existing industrial land, detracting from the user experience. The eastern options would go directly along US 13, which has similar traffic volumes to I-495, albeit at somewhat lower speeds. These options traverse a landscape of strip clubs and heavy industrial facilities.

Visibility/connections

The entire length of the red alternative would be visible from I-95, traveled by over 76,000 people daily. The most prominent element of the trail to motorists would be the bridge crossing the Christina River. Glimpses of this bridge might also be seen from I-495, particularly in the winter. Because of this visibility, the potential exists to create a "signature" bridge at this location, raising awareness and generating interest in the trail among the traveling public. This bridge would be in a unique location, clearly visible from both downtown and the Riverfront. It would also enhance the cityscape for travelers looking north toward downtown.

Moreover, the red alternative would pass close to the location where I-95 crosses over the Shellpot Secondary. This bridge is one of the few locations where potential future connections could be made to the west toward Newark and to the northwest toward Pike Creek.

The portion of the blue alternative along I-495 would be clearly visible to motorists on that highway, though it would be separated by a traffic barrier and fence. During times when I-495 is congested, the bicycle traffic flowing freely on this portion of the trail might build awareness of commuting by bike rather than by car. This is also true of the eastern blue options along US 13. None of the blue options provides the same opportunity for a signature element as the red alternative, and none allow for additional regional trail connections.

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Property impacts

The red alternative uses publicly-owned land along its entire route, including the State-owned former Industrial Track alignment and the northern edge of the RDC's Russell W. Peterson Urban Wildlife Refuge. The areas where the alternative would go through Refuge land coincide with existing utility easements, so no new right of way or easements would be required. Should future negotiations determine that the trail can be shifted to NS right of way, use of utility easements on Refuge property would be significantly reduced.

The blue alternatives use some public rights of way and have direct and indirect impacts to private property as well. All blue alternatives traverse the north side of the I-495 right of way from the Industrial Track Phase 2 to the US 13 interchange. The eastern options follow the west side of US 13, remaining primarily in public right of way. Businesses in this area will be indirectly impacted by the trail crossing their driveways. The trail connection from US 13 back west to a new river crossing may have some minor direct impacts to private property. The western blue options along the bank of the Christina River will have direct impacts to private property, requiring acquisition of right of way or easements.

Resource impacts

A bridge over the Christina River would be required for two of the alternatives and a bridge over the Shellpot Secondary would be needed for the longer blue alternative. Given a total length of over 300 feet between the river banks at all locations in the study area, it is likely that intermediate piers would be needed in the river. These piers would require approval by DNREC and the U.S. Coast Guard. There is a

possibility that some of the blue options could reuse an abandoned rail bridge adjacent to the DEEC or a proposed roadway bridge further downstream that is going through NEPA review under a separate effort.

The western portion of the red alternative would primarily follow an existing dirt road through uplands, impacting no resources. The eastern part of this alternative, if it cannot be built on the unused portion of the existing rail right of way, would require a 3,100-foot-long bridge over a low-quality wetland immediately adjacent to the Shellpot Secondary, including a span over Little Mill Creek. As noted previously, it is anticipated that the bridge would be built using best practices to minimize wetland impact and shading, including permeable decking and top-down construction. Further discussions with NS should be undertaken with the goal of moving the trail onto the edge of the NS property to avoid or minimize wetland impacts. This area also features an existing osprey nest that may require relocation.

The blue alternatives would require similar bridging of smaller tidal wetland areas along the south and east bank of the Christina River. Although these areas are individually smaller than the marsh in the Refuge, the cumulative length of bridges needed to span them would be significant, estimated to range from 1,200 to 1,800 feet. Similar best practices in bridge construction would be used to minimize impacts to wetlands. As noted in previous sections of this report, wetland areas outside the Refuge have not been delineated, but are instead based on available GIS mapping and preliminary field review. As such, estimated bridge lengths for the blue alternatives are approximate.

Potential cost range

Potential costs were developed at an early planning level based on available information. One element of the concept design process (discussed in the Recommended Alternative section below) is to refine the cost estimate for programming purposes.

Red alternative

- Bridge over the Christina River
- At-grade paved trail from the north bank of the Christina River to just west of Little Mill Creek
- Bridge over Little Mill Creek
- Bridge with open decking over wetlands between Little Mill Creek and DEEC
- Bridge/ramp from wetland bridge up to the existing Wilmington Riverwalk bridge over the Shellpot Secondary
- Non-construction costs (including professional services, administration, construction services, and contingencies)

Approximate cost range for the red alternative:

\$13 to 14 million

For comparison purposes, a scenario using the NS Shellpot Secondary railroad right of way in lieu of a long wetland bridge was also evaluated.

Red alternative using railroad right of way

- Bridge over the Christina River
- At-grade paved trail from the north bank of the Christina River to just west of Little Mill Creek
- Bridge over Little Mill Creek
- At-grade paved trail along the south side of the NS Shellpot Secondary right of way between Little Mill Creek and DEEC
- Bridge/ramp from railroad right of way up to the existing Wilmington Riverwalk bridge over the Shellpot Secondary
- Non-construction costs (including professional services, administration, construction services, and contingencies)

Approximate cost range for the red alternative using the railroad right of way:

\$5 to 6 million

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Blue alternative crossing at DEEC

- At-grade paved trail adjacent to I-495
- Bridge over wetlands in the I-495/US 13 interchange area
- Trail from US 13 to the Christina River, portions paved and portions on bridge over wetlands
- Bridge over the Christina River, including connection to the existing Wilmington Riverwalk bridge over the Shellpot Secondary
- Non-construction costs (including professional services, administration, construction services, and contingencies)

Approximate cost range for the blue alternative with a new bridge at the DEEC:

\$9.5 to 10.5 million

Blue alternative crossing at Shipyard Shops

- At-grade paved trail adjacent to I-495
- Bridge over wetlands in the I-495/US 13 interchange area
- Bridge over NS Shellpot Secondary parallel to US 13
- At-grade paved trail to Christina River bridge proposed by others
- [The trail would cross the Christina River on a new bridge proposed by DelDOT under a separate contract; no river bridge costs are provided here]
- Non-construction costs (including professional services, administration, construction services, and contingencies)

Approximate cost range for the blue alternative using a Christina River bridge proposed by others:

\$6.5 to 7.5 million

EVALUATION SUMMARY

The following table provides a summary of the evaluation criteria described above.

Criterion	Red alternative	Blue alternatives
Length	1.57 miles	1.85 to 2.09 miles
Travel time (at 12 mph)	7.9 minutes	9.3 to 10.5 minutes
User comfort	Good	Extremely poor
Visibility	Good, with opportunity for signature element	Good
Opportunities for regional connections	West to Newark; northwest to Pike Creek	None
Private property impacts	None	Direct for some options; indirect for all options
Resource impacts	Bridge over the Christina River (with navigational clearance) 3,100' bridge over wetlands	Bridge over the Christina River (with navigational clearance) 1,200' to 1,800' total in bridges over wetlands Potential environmental remediation on industrial properties
Potential cost	\$13 to 14 million (reduced to between \$5 and 6 million if the Norfolk Southern right of way can be used)	\$6.5 to 10.5 million

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RECOMMENDED ALTERNATIVE

Based on multiple factors described above, the recommended alternative is the **red alternative**. Most significantly, the red alternative is expected to provide an enhanced user experience by providing an increased feeling of safety, less noise, and more pleasing aesthetic surroundings. In contrast, the portions of the blue alternatives along I-495 and US 13 would, based on direct experience in the field, be very uncomfortable for trail users. The noise and perceived lack of safety would likely adversely impact the number of local residents who would use the trail and would certainly minimize the potential for tourist use. Moreover, some of the blue alternatives would require industrial driveway crossings along US 13, creating conflicts between trucks and trail users.

Among the other benefits of the red alternative, it would provide opportunities to link to an expanded trail network, including northwest into the Red Clay Creek Valley and west to Newark. The bridge over the Christina River would have outstanding visibility from I-95, which would improve trail awareness and could provide excellent tourism and economic development potential. Furthermore, the red alternative is slightly more direct and would avoid all potential conflicts between motor vehicles and trail users.

Although both alternatives would require bridging tidal wetlands using best practices to minimize impacts, the length of that bridge would be far longer for the red alternative if the rail right of way cannot be used.

The following issues should be considered if the red alternative is implemented.

Design elements

Concept design process. The preliminary engineering (PE) phase of many DelDOT projects begins with development of a formal concept design report. The purpose of this report is to confirm design criteria, resolve major design issues, refine the design and costs, complete the environmental document (typically a categorical exclusion evaluation for these types of projects), document decisions made during the scoping process, and otherwise better define the scope so that funds can be obtained for construction. The development of a concept design report is recommended as the first PE step for the Industrial Track Trail Phase 3.

Railroad coordination. As noted above, the most logical location for a portion of the red alternative would be the Shellpot Secondary railroad right of way. DelDOT and other sponsoring agencies should work diligently to obtain relief from NS's policy against rails-with-trails. The Shellpot Secondary represents the ideal scenario for NS to consider a rail-with-trail. Because it is bounded by marsh on both sides, there is no reason for people to cross the railroad to or from the trail. There is sufficient room on the existing embankment to provide ample separation between the tracks and the trail with a safety fence. (Figure 14 shows a successful example that provides even less clearance, implemented at this location prior to the formation of NS.) Furthermore, freight trains on the Shellpot Secondary are infrequent and move very slowly. Specific lateral clearance and barrier requirements should be identified in concept design.

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Figure 14. Example of Norfolk Southern rail-with-trail in Muncie, Indiana.

Source: Rails to Trails Conservancy.



Signature bridge. One advantage of the red alternative is the opportunity to provide a highly-visible signature bridge over the Christina River on the former Industrial Track alignment adjacent to I-95. Figure 15 shows some examples of significant trail bridges. It may be desirable to scope the bridge separately from the remainder of Phase 3 because a number of questions remain to be answered, including confirmation of navigation clearances and the need for piers in the river.

Because careful stewardship of public funds is critical to the State of Delaware and to other agencies who may participate in funding this project, a practical design needs to be maintained so that funding limits for the project remain feasible. If more aesthetics are desired for the bridge, then a public/private partnership should be pursued to supplement public funding.

Figure 15. Examples of pedestrian and/or bicycle bridges.



Yankton Trail Bridge, Sioux Falls, South Dakota
Source: http://en.wikipedia.org/wiki/File:Yankton_Trail_Bridge_1.jpg



High Trestle Trail Bridge, Madrid, Iowa
Source: <http://iowagirlonthego.com/2011/09/04/high-trestle-trail/>



Court Street Bridge, Memphis, Tennessee
Source: <http://www.memphistanista.com/2010/08/i-can-tell-you-some-things-about-beale.html>



Tinker Creek Greenway, Roanoke, Virginia
Source: WR&A

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Lighting and security. The need for lighting and security elements such as cameras and call boxes would be dependent on the practices of the agency that operates and maintains this portion of the trail. New Castle County, who is responsible for Phase 1, limits trail use to daylight hours and does not provide lighting or other security features. Security is provided by random police patrols. Other design elements and practices may be appropriate for Phase 3 depending on the agency involved. In any case, the trail design should incorporate elements of Crime Prevention Through Environmental Design (CPTED), such as good sight lines, clear delineation of public and private areas, and ease of maintenance. Amount of use and visibility are both important factors. Lighting and security are especially important because access to and from Phase 3 of the trail is limited to either end, as described below.

Trailheads and other amenities. Public access to Phase 3 of the trail will be available at only two points: the south end of the Wilmington Riverwalk and the north end of Phase 2. The existing DEEC parking illustrated in Figure 16 provides a logical trailhead, and consideration should be given to trail user services such as bike racks, water, and seating at this location. Phase 3 could also provide public access to the water at Little Mill Creek and the Christina River, as well as overlooks at key points in the Refuge.

Figure 16. Potential DEEC trailhead location.



Trail ownership, operations, and maintenance

A number of public agencies have participated in previous planning and the development of this feasibility study. Each of these agencies (principally DelDOT, DNREC, New Castle County, and RDC) has extensive experience in owning, operating, and maintaining trails. This study recommends that the agencies develop a memorandum of agreement regarding ownership, operations, and maintenance as early as possible to ensure that its provisions will be in place prior to completion of the trail. As an example, prior phases of the trail are mostly along DelDOT-owned right of way, but through previous agreement are operated and maintained by New Castle County. The participating agencies will undoubtedly also look for partnership opportunities, such as a friends group and/or corporate sponsorship, to provide ongoing maintenance.

Construction funding

Since the Phase 3 feasibility study was initiated, the funding landscape for trails in Delaware has changed significantly. At Governor Markell's request, the General Assembly allocated \$7 million for trails in the FY 2012 Bond Bill. Building on this success, the Governor set in motion the First State Trails and Pathways Initiative, the goal of which is, in his words, "to establish a world class interconnected network of shared use pathways and trails that will support non-motorized travel and recreational trails opportunities within the State of Delaware." This goal is already underway on the Industrial Track Trail, as \$600,000 has been allocated in DelDOT's FY 2013 Capital Transportation Program for design of Phase 3.

Although the Bond Bill funding represents the most immediate and relevant opportunity to fund construction of Phase 3, it consists entirely of state funds. Consideration should be given to using those state funds as a local match to obtain federal construction funding. The Recreational Trails Program (managed by the Division of Parks and Recreation) and the Transportation Enhancements Program (managed by the Delaware Department of Transportation) could be options for federal funding, as could performance-based grant programs. Trail construction is an eligible activity under the Delaware Land & Water Conservation Trust Fund Grant Program, a recreational investment option managed by DNREC's Division of Parks and Recreation. Furthermore, state funds could be used to leverage private investment as well.

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Phasing

Fiscal realities often require significant public works projects to be phased. Due to the isolated nature of Phase 3 and the fact that it connects to the existing trail network only at its endpoints, construction of the project in phases would not provide benefits to the traveling public. Should funding constraints dictate, the project could be built in phases starting at the DEEC and working to the west and south. Although the trail would not provide a meaningful transportation function until it connected across the Christina River to Phase 2, it could provide recreational and educational benefits in the interim by connecting the DEEC with the western part of the Refuge. Completion of the entire trail from end to end will occur no earlier than 2015 or 2016 given DRBA's timeframe for reconstruction of southbound I-295 and DelDOT's reconstruction of adjacent bridges on US 13.

Permitting requirements

Implementation of the recommended alternative will require NEPA documentation and agency permits. The concept design process should include preparation of a categorical exclusion evaluation document for NEPA concurrence. Specific permit needs are typically identified during the concept design process rather than the feasibility stage. DNREC and the Coast Guard will require permits, and the U.S. Army Corps of Engineers may as well.

Conclusion

The study recommends that DelDOT, in conjunction with other agencies on the steering committee, move directly into concept and final design of the New Castle Industrial Track Trail Phase 3 along the red alternative. Upon completion of concept design, including a refined cost estimate, funds can be sought for construction.



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