DRAFT

FEASIBILITY STUDY

H183785 (FS-1703A)

Drawbridge No. 12 Replacement on US 74 (Wrightsville Avenue) / US 76 (Causeway Drive) between Wilmington and Wrightsville Beach

**Prepared for North Carolina Department of Transportation,
Feasibility Studies Unit**

Prepared by RS&H

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1. Introduction

1.1 General Description

This project explores the feasibility of replacing Drawbridge No.12, the C. Heide Trask Memorial Bridge, which connects the City of Wilmington and the Town of Wrightsville Beach via US 74 (Wrightsville Avenue) / US 76 (Causeway Drive). The project is included in the North Carolina Department of Transportation (NCDOT) 2018-2027 State Transportation Improvement Program (STIP) as project FS-1703A.

1.2 Background

Replacement of Drawbridge No. 12 is not specifically mentioned in current local plans and will need to be added. However, the following recommendations have been made regarding bicycle and pedestrian accommodations. Improvements to the current bridge structure are not possible given its load bearing ability is at full-capacity and cannot accommodate additional weight on the structure (i.e. steel plates over the grated bridge deck).

The Wilmington Urban Area Metropolitan Planning Organization (WMPO) *Cape Fear Transportation 2040 Metropolitan Transportation Plan* (MTP), adopted November 18, 2015, recommends bicycle and pedestrian accommodations on US 74 (Eastwood Road / Wrightsville Avenue) across Drawbridge No. 12 (BP-35, page vii). The *Cape Fear Moving Forward 2045 MTP* is in development and will replace the *Cape Fear Transportation 2040 MTP*, which will expire in November 2020.

The *Wilmington Comprehensive Transportation Plan (CTP)* was adopted by the WMPO in January 2016 and recommended by the NCDOT Transportation Planning Branch in February 2016. The CTP represents the region's consensus on the future transportation system needed to support anticipated growth over a 25-30 year timeframe. In the CTP, the project corridor is classified as an on-road pedestrian facility and on-road bike facility that needs improvement.

The *Wrightsville Beach Community Transportation Plan*, adopted in February 2013, notes that most vehicular crashes occur on or near Drawbridge No. 12 and around the intersection of US 74 (Salisbury Street) and US 76 (Causeway Drive). The plan recommends improvements to Drawbridge No. 12 and the US 74 (Salisbury Street) / US 76 (Causeway Drive) intersection.

The City of Wilmington's *River to the Sea Bikeway Master Plan* (2013) notes that the River to the Sea Bikeway (WMPO Bike Route 1) is an 11-mile on- and off-road bicycle route that follows the Historic Beach Car Line and connects downtown Wilmington and Wrightsville Beach across the Heide Trask Drawbridge.

2. Problem Statement

The purpose of this project is to provide a long-term, safe, and efficient multi-modal crossing of the Intracoastal Waterway between the City of Wilmington and the Town of Wrightsville Beach. There are several needs to be addressed along the project corridor:

- Aging structure (see subsequent paragraphs for more details)
- Crash rate on US 74 / US 76 higher than the state-wide average for similar routes (see Section 2.3)
- Provision of safe and efficient pedestrian and bicycle accommodations
- Multi-modal mobility for vehicles, pedestrians, and cyclists using the roadway or the bridge, and for marine traffic passing under the bridge through the Intracoastal Waterway
- Reduction of long-term maintenance costs
- Provision of a hurricane evacuation route

Drawbridge No. 12 carries US 74 / US 76 over the Intracoastal Waterway between Wilmington and Wrightsville Beach. Based on the 2015 and 2017 Bridge Inspection Reports respectively, Drawbridge No. 12 has a sufficiency rating of 39.92 and an estimated remaining life of 23 years; however, this is only after numerous major rehabilitation projects. The average annual maintenance costs over the last three years for Drawbridge No. 12 total $234,102.51. This does not include rehabilitation costs but does include the costs of operation and maintenance.

The most recent major rehabilitation project, in 2014, cost approximately $9 million and consisted of a metal grid deck replacement, latex modified concrete overlay on the approaching spans, replacement of the steel cross bracing, painting of the metal structure, substructure concrete repairs, a full remodel of the bridge tender house, and an update to the electrical systems that control the operation of the bascule spans. The Division estimates that major rehabilitation projects of this magnitude are required about every 10-15 years.

Currently, the bridge experiences problems with corrosion of the steel grid deck in both lanes leaving the island. This is primarily caused by saltwater pouring from boats and trailers as they leave the boat launch located just below the bridge. Because of this, the Division has seen the need to recoat this area of the deck every six months instead of as a normal yearly practice.

Additionally, in 2017, the installation of 30-foot bike plates on the outside lanes of the bridge was considered. At that time, the Division discovered that their solution could not be accomplished, as the counterweights for the existing bridge are at capacity, meaning that no additional weight can be added to the bridge without making significant changes to the structure. The use of lightweight concrete to fill the grates in the deck was also considered, but also could not be accomplished due to the additional weight it would add. Overall, any attempt to retrofit the existing bridge to the current needs risks negatively affecting the structure itself. The Division acknowledges that the long-term solution is replacing Drawbridge No. 12.

It should be noted that a Project Scoping Report is a preliminary document that is the initial step in the planning and design process for a candidate project and not the product of exhaustive environmental or design investigations. The purpose of this Project Scoping Report is to describe the proposed project, including cost, and identify potential issues/problems that may require consideration in the planning and design phases.

If a candidate project is identified for funding in the State Transportation Improvement Program (STIP), the Project Scoping Report is followed by a rigorous planning and design process that meets the appropriate requirements of the National Environmental Policy Act (NEPA) and/or State Environmental Policy Act (SEPA).

2.1 Previous Studies

The replacement of Drawbridge No. 12 is not included in any other known previous studies. Long-range studies, including the project corridor, are referenced in Section 1.2.

2.2 Adjacent Projects

Other proposed NCDOT Statewide Transportation Improvement Program (STIP) projects included in the 2018-2027 STIP adjacent to or within three miles of the project vicinity are included in Table 1.

Table 1. STIP Projects in the Vicinity

County	STIP No.	Description	Schedule
New Hanover	U-5710A	Construct a roadway on a new location from SR 1409 (Military Cutoff Road) at Drysdale Drive to US 74 (Eastwood Road)	ROW: FY 2019 Construction: FY 2020
New Hanover	U-5710	Convert the existing at-grade intersection of US 74 (Eastwood Road) and SR 1409 (Military Cutoff Road) to an interchange	ROW: FY 2019 Construction: FY 2022
New Hanover	U-5534B	Construct a public walkway underneath the C. Heide Trask Drawbridge to provide a safe crossing for cyclists and pedestrians across US 74 (Wrightsville Avenue).	Construction: FY 2018

2.3 Crash Analysis

Table 2 shows the crash rate per 100 million vehicle miles traveled (MVMT) on US 74 (Eastwood Road) / US 76 (Causeway Drive) from SR 1409 (Military Cutoff Road) to Keel Street. The total crash rate on US 74 / US 76 was 467.11 crashes per 100 MVMT in the five year period spanning May 1, 2012 to April 30, 2017. This rate is higher than the state-wide average of 305.77 crashes per 100 MVMT for similar US routes.

A total of 238 crashes were reported for US 74 (Eastwood Road) / US 76 (Causeway Drive) along the given segment. Table 3 lists crashes along the corridor by type of collision. Of these, one fatal collision was reported where a pedestrian was struck by an SUV traveling straight ahead at 40 miles per hour. Of the 238 collisions, 126 (approximately 53% of all collisions) were categorized as rear-end. Rear-end collisions are typically associated with stop-and-go conditions along congested corridors. Angle collisions were the next most common with 63 instances (26%) where sight distance and roadway geometrics often play a role. Crashes along US 74 / US 76 are primarily caused by stop and go traffic, which is a common condition of congested corridors containing signalized intersections.

Table 2. Crash Statistics

Roadway Segment	Total Crashes	Crash Rate*		Crash Severity**					
		Total	Non-Fatal Injury	Fatal	Type A Injury	Type B Injury	Type C Injury	PDO	EPDO Severity Index***
US 74 (Eastwood Road) / US 76 (Causeway Drive) from SR 1409 (Military Cutoff Road) to Keel Street	238	467.11	127.27	1	2	11	52	172	3.91

**Rate = Crashes per 100 Million Vehicle Miles Traveled (MVMT); 2012-2017 (5 years)*

***Crash severity is rated Fatal, Class A to C (highest to lowest), or PDO (property damage only)*

****EPDO severity index greater than 8.4 is the threshold for locations that have more serious crashes (Chapter 14 of NCDOT TEAAS Training Material)*

Table 3. Crash Type Summary

Roadway Segment	Type of Crash								
	Rear End	Sideswipe	Angle	Ran Off Road	Left Turn	Right Turn	Head-On	Other*	Total
US 74 (Eastwood Road) / US 76 (Causeway Drive) from SR 1409 (Military Cutoff Road) to Keel Street	126	13	63	5	17	5	1	8	238

**Other types of crashes include collisions with fixed objects, other collisions with vehicles, other non-collisions, collisions with cyclists, and collisions with pedestrians.*

3. Express Design Evaluation

3.1 Design Options

Concept designs are included in the Appendix and are available on the NCDOT Connect project site[1].

Concept 1 includes replacing the existing drawbridge with a new drawbridge to be located north of the existing structure, with a three-legged roundabout replacing the current US 74 (Salisbury Street) / US 76 (Causeway Drive) intersection

[1] If you are unable to access the files on the NCDOT Connect project site, please contact the NCDOT Feasibility Studies Unit at 919-707-4663

configuration east of the bridge. The intersection at Airlie Road would become a right-in-right-out (RIRO) only movement. The bridge typical section features a bike lane on each side and a multi-use path on one side (north) to connect the Cross-City Trail in Wilmington to the existing multi-use path network on Wrightsville Beach.

Concept 2 includes replacing the existing drawbridge with a new drawbridge to be located south of the existing structure, with a three-legged roundabout replacing the current US 74 (Salisbury Street) / US 76 (Causeway Drive) intersection configuration east of the bridge. The intersection at Airlie Road would become a RIRO only movement. The southern drawbridge features a larger bridge typical section than the northern drawbridge, providing a bike lane on each side and a multi-use path on each side. The multi-use path on the north side serves to connect the Cross-City Trail to the multi-use path network on Wrightsville Beach, and the multi-use path on the south side replaces the existing (to be removed) sidewalk on Causeway Drive, tying to existing sidewalk across the waterway.

Concept 3 includes replacing the existing drawbridge with a high-rise bridge to be located north of the existing structure, with a four-legged roundabout replacing the current US 74 (Salisbury Street) / US 76 (Causeway Drive) intersection configuration east of the bridge. Residents along Summer Rest Road and businesses along Airlie Road would lose direct access to US 74 (Wrightsville Avenue). The bridge typical section features a bike lane on each side and a multi-use path on one side (north) to connect the Cross-City Trail in Wilmington to the existing multi-use path network on Wrightsville Beach.

Concept 4 includes replacing the existing drawbridge with a high-rise bridge to be located south of the existing structure, with a four-legged roundabout replacing the current US 74 (Salisbury Street) / US 76 (Causeway Drive) intersection configuration east of the bridge. Residents along Summer Rest Road and businesses along Airlie Road would lose direct access to US 74 (Wrightsville Avenue). The southern drawbridge features a larger bridge typical section than the northern drawbridge, providing a bike lane on each side and a multi-use path on each side. The multi-use path on the north side serves to connect the Cross-City Trail to the multi-use path network on Wrightsville Beach, and the multi-use path on the south side replaces the existing (to be removed) sidewalk on Causeway Drive, tying to existing sidewalk across the waterway.

Concept 5 includes replacing the existing drawbridge with a new drawbridge to be located north of the existing structure, with the current US 74 (Salisbury Street) / US 76 (Causeway Drive) intersection configuration being maintained east of the bridge. The intersection at Airlie Road would become a RIRO only movement. The bridge typical section features a bike lane on each side and a multi-use path on one side (north) to connect the Cross-City Trail in Wilmington to the existing multi-use path network on Wrightsville Beach.

Concepts including a high-rise (Concepts 3 and 4) propose a 7% grade, which is compliant with the Americans with Disabilities Act (ADA) according to the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Planning, Design, and Operations of Pedestrian Facilities.* A 7% grade allows the high-rise bridge to reach a vertical clearance of 65 feet above mean high water (MHW), which is the guide clearance set by the US Coast Guard for fixed bridges crossing the Intracoastal Waterway from Virginia to Florida. If the grade were reduced, the bridge would extend past the current project limits, negatively impacting the existing Salisbury Street / Causeway Drive intersection, the access for several residential and commercial properties, and potentially numerous Section 4(f) properties (see Section 5.3.1).

3.2 Other Options Considered

The option to grade-separate US 74 (Salisbury Street) and US 76 (Causeway Drive) was considered. After further analysis, the option was deemed unfeasible due to the restriction of access it would cause to nearby properties and anticipated high construction costs.

Several options on new location were also considered, but were deemed unreasonable due to their high level of impacts. A map of the new location options, along with a matrix of their estimated impacts, are included on the NCDOT Connect site[2].

Additionally, a No Build alternative is unfeasible and unreasonable due to the fact that Drawbridge No. 12 serves as the only access to the island and cannot be maintained long-term. It is anticipated that the No Build alternative would

[2] If you are unable to access the files on the NCDOT Connect project site, please contact the NCDOT Feasibility Studies Unit at 919-707-4663

result in increased maintenance costs until eventual bridge closure, which would result in a complete loss of vehicular access to Wrightsville Beach.

3.3 Traffic Analysis

A traffic forecast for the study area was completed in 2017. The Current Year (2017) No Build Conditions average annual daily traffic (AADT) crossing Drawbridge No. 12 is 28,000 vehicles per day (vpd). The Future Year (2040) Build Conditions AADT crossing Drawbridge No. 12 is 33,500 vpd.

Six levels of service (LOS), from A to F, are related to vehicle delay. LOS A represents no congestion, LOS E represents long delays, and LOS F represents excessive delays. Table 4 summarizes the LOS criteria used in two-way stop-controlled intersection capacity analysis while Table 5 summarizes the LOS criteria used in the signalized intersection capacity analysis.

Table 4. Level of Service Definitions for Two-Way Stop-Controlled Intersections

Level of Service	Average Delay per Vehicle (seconds) Without Signal	Description
A	< 10	Little or no delay
B	10 to 15	Short traffic delays
C	15 to 25	Average traffic delays
D	25 to 35	Longer but acceptable delays
E	35 to 50	Very long traffic delays
F	> 50	Unacceptably long traffic delays

Source: Highway Capacity Manual (6th Edition) Chapter 20 Exhibit 20-2.

Table 5. Level of Service Definitions for Signalized Intersections

Level of Service	Average Delay per Vehicle (seconds) Without Signal	Description
A	< 10	Little or no delay
B	10 to 20	Short traffic delays
C	20 to 35	Average traffic delays
D	35 to 55	Longer but acceptable delays
E	55 to 80	Very long traffic delays
F	> 80	Unacceptably long traffic delays

Source: Highway Capacity Manual (6th Edition) Chapter 19 Exhibit 19-8.

At intersections without signals, the LOS is evaluated for left-turning traffic from the main road and for all traffic on the minor street. The LOS reported for unsignalized intersections in the capacity analysis tables is the worst case LOS among left-turning traffic from the main road and all turning movements on the cross-street. It should be noted that the unsignalized intersection capacity analysis is extremely conservative. That is, if traffic on an approach is predicted to flow at LOS F (over capacity), then the intersection should be monitored to determine if a traffic signal or other intersection improvements are warranted. In some cases, gaps in the traffic stream created by upstream and downstream signals would enable traffic at nearby unsignalized intersections to flow with little or no delay. This condition may not be reflected in the technical analysis.

Table 6 summarizes the operational effects (in terms of level of service and delay times) to intersections along US 74 / US 76 in the study area for No Build Conditions in the Current Year (2017) and Future Year (2040) scenarios.

Table 6. Current Year (2017) and Future Year (2040) No Build Conditions Intersection Capacity Analysis

Intersection	Level of Service (Seconds of Delay)			
	Current Conditions (2017)		Future Conditions (2040)	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
US 74 / US 76 (Eastwood Road) at Lions Gate Drive / Pembroke Jones Drive	B (18.6)	B (18.2)	B (19.4)	B (20.0)
US 74 / US 76 (Eastwood Road) at SR 2782 (Wrightsville Avenue)	B (13.8)	B (13.7)	C (21.6)	C (20.8)
US 74 / US 76 (Wrightsville Avenue) at Summer Rest Road*	C (17.3)	C (15.6)	C (20.7)	C (18.3)
US 74 / US 76 (Wrightsville Avenue) at Airlie Road*	D (28.5)	D (34.6)	E (48.1)	F (59.6)
US 74 / US 76 (Wrightsville Avenue) at US 74 (W Salisbury Street) / US 76 (Causeway Drive)*	F (70.1)	F (61.9)	F (220.9)	F (191.7)
US 76 (Causeway Drive) at Island Drive*	C (17.3)	C (17.4)	C (20.9)	C (23.0)
US 74 (W Salisbury Street) at Lookout Harbor*	B (12.4)	B (12.7)	B (13.8)	B (14.1)

**Unsignalized intersection; worst stop-controlled or yield-controlled movement LOS and delay reported*

Table 7 summarizes the operational effects (in terms of level of service and delay times) to intersections along US 74 / US 76 in the study area for Build Conditions in the Future Year (2040).

Table 7. Future Year (2040) Build Conditions Intersection Capacity Analysis Alternative Scenarios

Intersection	Alternative	Intersection Type	Approach Leg	Level of Service (Seconds of Delay)	
				Future Conditions (2040)	
				AM Peak Hour	PM Peak Hour
US 74 / US 76 (Wrightsville Avenue) at US 74 (W Salisbury Street) / US 76 (Causeway Drive)	1	Roundabout	West (EB)	A (9.4)	B (12.3)
			East (WB)	C (15.2)	B (13.9)
			North (SB)	A (21.4)	B (13.5)
	2	Signalized	Total	B (15.2)	B (11.9)
	3	Signalized	Total	B (18.1)	B (17.2)

Based on the analysis, there are two unsignalized intersections of concern in the 2040 Design Year: US 74 / US 76 (Wrightsville Avenue) at Airlie Road and US 74 / US 76 (Wrightsville Avenue) at US 74 (W Salisbury Street) / US 76 (Causeway Drive).

Shown in Table 6, the delay at the intersection of US 74 / US 76 (Wrightsville Avenue) at Airlie Road is expected to increase by approximately 20 seconds and 25 seconds, reaching 48.1 seconds and 59.6 seconds in the AM and PM peak hours respectively. One option to decrease delay at this intersection is signalization. A second option to decrease delay at this location is to restrict the intersection to right-in-right-out only movements, with left-turning traffic utilizing the US 74 / US 76 (Eastwood Road) at Wrightsville Avenue intersection, then turning left onto Stokley Drive to travel to locations along Airlie Road. The delay at the intersection of US 74 (Salisbury Street) / US 76 (Causeway Drive) is expected to increase by approximately 150 seconds and 130 seconds, reaching 220.9 seconds and 191.7 seconds in the AM and PM peak hours respectively. Based on additional analysis completed to improve this intersection, shown in Table 7, the desired level of service with acceptable delay would be achieved by reconfiguring the intersection to a roundabout or signalized intersection.

The remaining intersections, listed in Table 6, would function at a good rate of flow (level of service C or better) during both peak hours of the day under Design Year Conditions. Therefore, no changes to any other intersection geometrics

are recommended at this time. However, it should be noted that the intersection of US 74 / US 76 (Wrightsville Avenue) at Summer Rest Road may be within the bridge limits depending on the selected bridge design with no alternative way to access the area based on the review of aerial photography. This access should be considered when making a decision about the bridge design.

A capacity analysis of the operations of the replacement of the existing drawbridge with another drawbridge was also performed. The purpose of this analysis was to determine expected westbound queue lengths within the project area during the time that the drawbridge is raised. The drawbridge analysis included the intersection of US 74 / US 76 (Eastwood Road) and US 74 (Salisbury Street) / US 76 (Causeway Drive) under the existing interchange configuration (Concept 1) and as a roundabout (Concept 5).

The results of the traffic operations analysis conclude that westbound queuing would be similar between Concept 1 and Concept 5. Table 8 shows a comparison of the queuing results for each location under 2040 Design-Year Build Conditions. Queue lengths were determined from the 95th percentile queue on the Synchro report and the maximum observed queue from the SimTraffic simulation. The larger of the two results is typically used to determine the recommended storage lane length and is a reflection of the queue expected under drawbridge conditions.

Based on the simulation, the two alternatives for this intersection are expected to experience similar queuing in the westbound direction when the drawbridge is raised during the AM and Pm peak hours. In the eastbound direction, however, it appears that the roundabout queue would be shorter, indicating that if the eastbound direction is blocked by vehicles waiting for the drawbridge to lower, the roundabout would return to normal operations quicker than the existing interchange configurations.

Table 8. Drawbridge Conditions Queue Summary for 2040 Design-Year Build Conditions

Location	Scenario	Queue Length (ft)			
		AM Peak Hour		PM Peak Hour	
		Synchro	SimTraffic	Synchro	SimTraffic
US 74 / US 76 from Drawbridge No. 12 to US 74 (Salisbury Street) / US 76 (Causeway Drive)	Existing Conditions Salisbury Street (westbound)	2,425	1,301	1,807	991
	Existing Conditions Causeway Drive (northbound)	2,425	1,227	1,807	1,102
	Existing Conditions Eastwood Road (eastbound)	---	1,035	---	911
	Roundabout Salisbury Street (westbound)	2,425	1,218	1,807	1,071
	Roundabout Causeway Drive (northbound)	2,425	1,113	1,807	1,060
	Roundabout Eastwood Road (eastbound)	---	523	---	451

--- No queue reported for this movement

Note: Queue measurements begin at drawbridge

Additionally, a roundabout operations analysis was performed. Based on the analysis, a multi-lane roundabout is expected to operate at an acceptable level of service until 2052, based on a 1% annual growth rate. A summary of the roundabout level of service and delay is provided in Table 9.

Table 9. Roundabout Level of Service (LOS) and Delay Summary for 2040 Design-Year Build Conditions

Location	Approach Leg	AM Peak Hour		PM Peak Hour		Longest Queue (ft)
		Delay (s)	LOS	Delay (s)	LOS	
US 74 / US 76 (Eastwood Road) at US 74 (Salisbury Street) / US 76 (Causeway Drive) and Old Causeway Drive	West (eastbound)	10.6	B	17.4	C	187.8
	East (westbound)	19.1	C	18.9	C	141.9
	North (southbound)	28.9	D	19.5	C	83.3
	South (northbound)	9.0	A	12.5	B	12.1
	Overall	**17.0**	**C**	**18.0**	**C**	**187.8**

Based on the roundabout analyses, if a drawbridge is selected as the final build alternative, the intersection of US 74 / US 76 (Eastwood Road) and US 74 (Salisbury Street) / US 76 (Causeway Drive) is expected to experience queue lengths of approximately the same distance under peak hour volumes under both the existing intersection configuration and roundabout configuration. It is important to note that the westbound queue from the drawbridge is expected to extend into the roundabout and would impact circulation until the westbound vehicles are moving again. In the eastbound direction, queuing at the roundabout is expected to be approximately half of the queueing expected with the existing intersection configuration.

3.4 Maintenance of Traffic

3.4.1 Bridge Construction (Concepts 1-5)

Access to business and residences should be maintained at all points during construction. Any construction restrictions including requests for night time work, off-season work, and noise or environmental considerations, will have a direct impact on the schedule and duration of the project. Since Drawbridge No. 12 serves as the only access to the island, a detour that provides access to Wrightsville Beach is not possible. The new bridge should be phase constructed as follows:

Phase I:

With traffic maintained on the existing bridge and roadway, construct the new bridge in a separate location (either north or south of the existing bridge). Since the new bridge is built away from the existing bridge and traffic, the design of the bridge itself will not impact traffic control; however, all alternatives should have the proposed roadway tie-ins designed over the existing roadway as to be built using lane closures and wedging.

Phase II:

Shift traffic onto the new bridge and roadway and deconstruct the existing bridge.

3.4.2 US 74 / US 76 Roundabout Construction (Concepts 1-4)

Phase I:

With traffic in the existing pattern at US 74 (Salisbury Street) / 76 (Causeway Drive), use lane closures and wedging to construct the roadway widening and tie-ins and to begin construction of the roundabout.

Phase II:

Shift traffic onto the proposed roadway and use lane closures to perform pavement removal of the existing roadway and complete construction of the roundabout.

3.4.3 US 74 / US 76 Intersection Construction (Concept 5)

Phase I:

With traffic in the existing pattern at US 74 (Salisbury Street) / US 76 (Causeway Drive), use lane closures and wedging to construct the proposed roadway.

4. Design Option Impacts and Costs

4.1 Impacts

Because this Project Scoping Report is not the product of an exhaustive environmental or design effort, but rather an initial step to this process, the environmental impacts, shown in Table 10, are estimated based on a screening of readily available GIS data and measured with a 25 foot buffer on each side from the conceptual slope stakes. It is assumed that a more detailed impacts analysis would be performed during the NEPA/SEPA phase.

Table 10. Project Concept Impact Matrix

Impact	Concept 1	Concept 2	Concept 3	Concept 4	Concept 5
Wetland Impacts (acres)	0.7	0.1	0.5	0.1	0.7
Stream Impacts+ (linear feet)	140	70	140	70	140
Total Relocations (# of parcels)	0	49	118	54	12
Residential	0	45	117	45	12
Business	0	2	1	7	0
Non-Profit	0	0	0	0	0
Section 4(f) Impact*	Yes	No	Yes	No	Yes
Utility Crossing(s)	Yes	Yes	Yes	Yes	Yes
Overhead Power Lines	No	Yes	No	Yes	No
Underground Water Lines	No	Yes	No	Yes	No
Existing Force Main	Yes	No	Yes	No	Yes
Underground Telephone Cable	Yes	No	Yes	No	Yes
Abandoned Power Cable	Yes	No	Yes	No	Yes
Proposed Redundant Sewer Line	Yes	No	Yes	No	Yes

+Includes undeveloped Intracoastal Waterway banks

**Impact could be mitigated with use of retaining wall*

4.2 Costs

Cost estimates have been developed for the proposed project design options based upon the conceptual designs. Table 11 shows cost estimates for the build alternatives for construction, utility relocations, and right of way.

Proceed to next page for Table 11

Table 11. Cost Estimates (Rounded)

Design Option	Construction Costs	Utility Relocation Costs	Right-of-Way Costs	Total Costs
Concept 1	$66,500,000	$1,500,000	$1,600,000	$69,600,000
Concept 2	$71,700,000	$2,900,000	$31,400,000	$106,000,000
Concept 3	$67,100,000	$2,000,000	$43,000,000	$112,100,000
Concept 4	$76,600,000	$3,200,000	$42,700,000	$122,500,000
Concept 5	$65,700,000	$1,400,000	$22,000,000	$89,200,000

5. Existing Conditions

5.1 Land Use

Within the project area, US 74 / US 76 is a four-lane roadway with sidewalks traversing developed land, which provides access to residences, businesses, and parks. The corridor is also a part of the River to the Sea Bikeway. Shown in Table 12, US 74 / US 76 has two signalized intersections along the study corridor out of seven total study intersections. US 74/76 has a functional classification of a principal arterial on the mainland and minor arterial on the island. The speed limit on US 74/ US 76 is 35 mph throughout the project area.

Table 12. Project Study Intersections

Intersection	Control Type
US 74 / US 76 (Eastwood Road) at Pembroke Jones Drive / Lions Gate Drive	Signal
US 74/ US 76 (Eastwood Road) at Canal Street / SR 2782 (Wrightsville Avenue)	Signal
US 74/ US 76 (Wrightsville Avenue) at Summer Rest Road	Stop Sign
US 74 / US 76 (Wrightsville Avenue) at Airlie Road	Stop Sign
US 74/76 (Wrightsville Avenue) / US 76 (Causeway Drive) at US 74 (W Salisbury Street)	Stop Sign
US 76 (Causeway Drive) at Island Drive	Stop Sign
US 74 (W Salisbury Street) at Lookout Harbor	Stop Sign

5.2 Utilities

There are numerous utility owners surrounding Drawbridge No. 12 on both sides. To the south, there are overhead power lines and underground water lines. To the north, there is an existing sanitary sewer force main, an underground telephone cable, and an abandoned power cable (Duke Energy). There is also a proposed redundant sanitary sewer force main, which is currently planned to be located to the north of the bridge, and is not included as a part of H183785 (FS-1703A). The plans for the additional sewer line originate from a September 21, 2017 memorandum prepared by Highfill Infrastructure Engineering, P.C. If this additional line is to be constructed under the H183785 (FS-1703A) project, it will be considered a betterment and will require a municipal agreement and permanent utility easement for the existing boat ramp property, along with coordination with appropriate state and federal agencies.

5.3 Community Resources

The land surrounding the bridge is highly developed, with multiple marinas as well as waterfront shopping and restaurants and residential areas. On the north side of the bridge, there is a large boat ramp and areas for kayaks/paddle boards to be put into the water. There are several residences near the bridge, including some with private docks. There is also a hotel (Waterway Lodge) and a new multi-use development (Grand View Luxury

Apartments) located near the west end of the bridge. The bridge itself serves as part of Wilmington's River to Sea Bikeway, which travels from downtown Wilmington to Wrightsville Beach. Notable community resources in the vicinity (1,000 feet) of the project include:

- North Carolina Wildlife Resources Commission Boat Ramp
- Marinas (Wrightsville Beach Marina, Bridge Tender Marina)
- River to the Sea Bikeway
- Waterfront shopping and restaurants
- Lodging and private residences
- Wrightsville Beach Arboretum
- Wrightsville Beach Town Hall
- Wrightsville Beach Town Park

A detailed community resource study was not conducted for this Project Scoping Report. GIS-level research and a preliminary site review were completed. The Environmental Features Map shows the location of documented community resources within and near the project study area.

5.3.1 Section 4(f) Resources

Section 4(f) of the US Department of Transportation Act of 1966 (49 USC § 303), as amended, regulates the use and taking of Section 4(f) resources for federally-funded transportation projects. Section 4(f) resources include publicly-owned parks, recreation areas, and wildlife and waterfowl refuges as well as significant historic sites under public or private ownership.

The boat ramp located on the northeast side of Drawbridge No. 12, the Wrightsville Arboretum, and the Wrightsville Beach Town Park are publicly owned recreation areas and are protected under Section 4(f).

The bridge itself has been determined eligible for listing on the National Register of Historic Places (see Section 5.4.1) and therefore is protected under Section 4(f) as well as Section 106 of the National Historic Preservation Act. Coordination with the North Carolina State Historic Preservation Office (NC SHPO), the City of Wilmington, and the Town of Wrightsville Beach will be needed during the planning process to discuss the future of the existing structure.

Projects that receive only state funding are not typically subject to compliance with Section 4(f). However, the replacement of this drawbridge also involves coordination with the US Coast Guard, giving it a federal nexus.

5.3.2 Section 6(f) Resources

The Land and Water Conservation Fund (LWCF) Act of 1965 established funding to provide matching cooperative agreement assistance to states and local governments for the planning, acquisition, and development of outdoor public recreation sites and facilities. Section 6(f) of the Act prohibits the conversion of property acquired or developed with these cooperative agreements to a non-recreational purpose without the approval of the National Park Service. Section 6(f) requires that any applicable land converted to non-recreational uses be replaced with land of equal or greater value, location, and usefulness.

The boat ramp property located on the northeast side of Drawbridge No. 12 was sold in a deed of gift on October 13, 1977 by the Town of Wrightsville Beach to the State of North Carolina. No LWCF were used in this transaction, exempting it from Section 6(f) protection. No Section 6(f) properties were identified near the project area.

5.4 Cultural Resources

5.4.1 Historic Resources

Records and maps of the North Carolina State Historic Preservation Office (NC SHPO) were reviewed using the NC SHPO GIS database for historic architectural resources that had been identified in previous survey or that were listed in or had been determined eligible for listing in the National Register of Historic Places. Table 13 provides a list of previously identified historic resources found within the 1,000 feet of the project area. More detailed evaluations of these properties and the potential effects of the project on these resources would be conducted during the project development phase of the project.

Table 13. Historic Resources

Name	ID	Status	Location
C. Heide Trask Memorial Bridge	NH3471	Determined as eligible for listing on the National Register of Historic Places (NRHP)	US 74/76 over the Intracoastal waterway in Wrightsville Beach

5.4.2 Archaeological Resources

Because this Project Scoping Report is not the product of an exhaustive environmental or design effort, but rather an initial step to this process, the environmental impacts are based on a screening of readily available GIS data. At this time, there are no known cemeteries or other archaeological resources in the project area. It is assumed that a more detailed impacts analysis would be performed during the NEPA/SEPA phase.

5.5 Natural Environment

A detailed environmental study was not conducted for this Project Scoping Report. GIS-level research and a preliminary site review were completed. The Environmental Features Map shows the preliminary conceptual design and location of environmental features within the project.

5.5.1 Water Quality Resources

Drawbridge No. 12 crosses the Intracoastal Waterway, which runs from the western mouth of Howe Creek to the southwest mouth of Shinn Creek as a part of the White Oak River Basin. According to the North Carolina Department of Environmental Quality (NCDEQ), the Intracoastal Waterway is classified as Class SA with a supplemental classification as a High Quality Water (HQW), as listed in Table 14. Class SA waters includes tidal salt waters that are used for commercial shellfishing or marketing purposes, and are also protected for all Class SC and Class SB uses. Class SC uses include secondary recreation actives, such as fishing and boating. Class SB uses include primary recreation actives, such as swimming and water skiing. All Class SA waters are also HQW by supplemental classification. The HQW classification is intended to protect waters which are rated excellent based on biological and physical/chemical characterises through Division monitoring or special studies, primary nursery area designated by the Marine Fisheries Commission, and other functional nursery areas designated by the Marine Fisheries Commission.

Table 14. Surface Water Classifications

Surface Water Name	Classification(s)
Intercostal Waterway	*SA* *HQW*

5.5.2 Jurisdictional Features

Jurisdictional “Waters of the United States,” including wetlands, are protected under Section 404 of the Clean Water Act (CWA). Any action that proposes impacts to waters of the United States falls under the jurisdiction of the US Army Corps of Engineers (USACE) through Section 404 of the Clean Water Act (33 U.S.C. 1344) and under the jurisdiction of the NC Department of Environmental Quality (NCDEQ) through the Section 401 Water Quality Certification Process (NC General Statutes Chapter 143 Article 21, Part 1). Encroachments into areas determined as subject under CWA must be reviewed and approved by the USACE through the Section 404 program.

The project development team should coordinate with the USACE to determine whether a Section 408 (33 US Code § 408) permit is applicable.

A Natural Resource Technical Report will be prepared during project development to fully identify and evaluate impacts to these resources. For the purposes of this report, the US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) data for wetlands and NCDEQ’s online mapping for streams or other water bodies that may be present within 1,000 feet of the project were reviewed. Based on a preliminary review of NWI mapping, NCDEQ’s online mapping for streams, and conceptual ROW limits conducted on August 20, 2018, wetland and stream impacts for each concept were calculated and are shown in Table 10 found in Section 4.1 of this report.

5.5.3 Protected Species

Species with the federal status of endangered or threatened are protected under provisions of the Endangered Species Act (ESA) of 1973 as amended (16 USC § 1531 et. seq.). Any action likely to adversely affect a species classified as federally protected will be subject to review by the United States Fish and Wildlife Service (USFWS) and possibly the National Marine Fisheries Service (NMFS). As of June 27, 2018 (accessed February 15, 2019), the USFWS lists 15 federally protected species for New Hanover County (Table 15).

Table 15. Federally Protected Species listed for New Hanover County

Common Name	Scientific Name	Federal Status
American alligator	*Alligator mississippiensis*	T (S/A)
Green sea turtle	*Chelonia mydas*	T
Hawksbill sea turtle	*Eretmochelys imbricata*	E (H)
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Loggerhead sea turtle	*Caretta caretta*	T
Northern long-eared bat	*Myotis septentrionalis*	T
Piping plover	*Charadrius melodus*	T
Red-cockaded woodpecker	*Picoides borealis*	E
Red knot	*Calidris canutus rufa*	T
West Indian manatee	*Trichechus manatus*	E
Cooley's meadowrue	*Thalictrum cooleyi*	E
Golden sedge	*Carex lutea*	E
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E
Seabeach amaranth	*Amaranthus pumilus*	T

Source: Endangered and Threatened Species and Species of Concern by County for North Carolina (USFWS 2017)

E=endangered; T=threatened; (S/A)=threatened or endangered due to similarity of appearance
(H)=historic record status; FSC=federal species of concern; BGPA=Bald and Golden Eagle Protection Act

5.5.4 Existing NCDOT Mitigation Sites

There are no known NCDOT mitigation sites in or within 1,000 feet of the project area.

5.5.5 Federal Emergency Management Agency (FEMA) Resources

Protection of floodways and floodplains is required under 23 CFR 650A; Executive Order 11988, Floodplain Management; and US Department of Transportation (USDOT) Order 550.2, Floodplain Management and Protection. The intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains or regulatory floodway, where practicable, and to avoid supporting land use development that is incompatible with floodplain values.

Based on a preliminary review of data available on the North Carolina Flood Risk Information System, the project is located in three flood zones. Most of the project area is located in flood zones VE and AE, which includes coastal high hazard areas where wave action and/or high velocity water can cause structural damage during the base flood and the 100-year floodplain. Additionally, sections of the project area are located in the 500-year floodplain.

In addition, there are no FEMA Hazard Mitigation Grant Program buyout properties within the vicinity of the project area.

5.6 Additional Permitting Considerations

As a condition of the US Coast Guard's Bridge Permit Application, a Navigational Impact Report (NIR), and vessel survey data, will be required. As part of the NIR, interviews with local marinas, owners of locally registered vessels, and other major stakeholders will be conducted. Additional documentation or coordination during the permitting phase for safety measures during construction over the Intracoastal Waterway may be required.

6. Stakeholder Coordination and Public Involvement

Outreach efforts for this project will be critical once planning and design are funded / underway. Coordination with stakeholders could involve the following groups:

- City of Wilmington
- Town of Wrightsville Beach
- Wilmington Urban Area MPO
- Local marinas
- Locally-registered boast owners
- Local cycling groups (i.e., Cape Fear Cyclists)
- North Carolina Wildlife Resources Commission (boat ramp operations / maintenance)
- Local businesses (charters, jet ski / kayak rentals, etc.)

Pubic involvement can be tailored for individual projects and could include the following methods for this project:

- Every-Door Direct Mailers and postcards to non-resident owners
- Social media outreach
    - Facebook ads using geo-fencing
    - NCDOT / City / Town Facebook and Twitter posts, coordinated
- Visualization of potential alternatives
- Open-house public workshops during tourist season
- Local official's meetings / small group meetings with focused audiences
- Newsletter updates
- Project website
- Publicinput.com page

7. Construction Considerations

Certain items should be taken into consideration along with proper coordination with applicable agencies when the project is being constructed including, but not limited to:

- Investigation of the existence of lead-based paint should be performed and should be considered during the demolition of the existing bridge in order to protect surrounding human and natural environments.
- Exploration of the possibility of restoring the existing bridge for a secondary (pedestrian only) use with maintenance and operation performed by others (may require a municipal agreement).
- Consulting with emergency responders to see if any special considerations are needed in the event of hurricane evacuation situations.
- Taking care installing the new substructure / structure in order to ensure that vibrations do not impact the current bridge while open to traffic, nearby structures, or disturb the surrounding natural environment.

- A temporary work platform and / or barges may be needed to construct the new bridge, which is not included in this Project Scoping Report's impact estimate.
- Consulting with environmental agencies to determine the applicability (if any) of a construction moratorium on in-water work.
- It should be noted that access to Summer Rest Road from US 74 / US 76 (Wrightsville Avenue) may be affected depending on the selected bridge design with no alternative way to access the area. If applicable, a replacement route will need to be provided.
- The corridor currently has no control of access, but will have partial control of access with the high-rise options. Additionally, access to various side-streets may be impacted depending on the chosen concept:

	Airlie Road accesses US 74/76 with a right-in-right-out movement	Airlie Road and Summer Rest Road lose direct access to US 74/76	Keel Street is rerouted under the bridge for boat ramp access	Causeway Drive loses direct access to Old Causeway Drive
Concept 1: Northern Drawbridge with Roundabout	YES	NO	NO	YES
Concept 2: Southern Drawbridge with Roundabout	YES	NO	NO	YES
Concept 3: Northern High-rise with Roundabout	NO	YES	YES	NO
Concept 4: Southern High-rise with Roundabout	NO	YES	YES	YES
Concept 5: Northern Drawbridge with Current Intersection	YES	NO	NO	NO

8. Recommendations

It is assumed that an alternative will be chosen during the project development NEPA/SEPA phase. Impacts associated with each concept are shown in Table 10 located in Section 4.1 of this report. Additionally, cost information associated with each concept is shown in Table 11 Section 4.2 of this report. It is anticipated that a State Environmental Assessment / Finding of No Significant Impact (EA/FONSI) or Federal Categorical Exclusion (CE) will be prepared as part of the project development process depending on the funding of the project.

9. References

NCDOT Current STIP	August 2018	https://connect.ncdot.gov/projects/planning/STIPDocuments1/NCDOT%20Current%20STIP.pdf
2018-2027 STIP (Divisions 1-7)	August 2017	https://connect.ncdot.gov/projects/planning/STIPDocuments1/2018-2027%20STIP%20-%20Divisions%201-7.pdf
2018-2027 STIP Map	August 2017	http://ncdot.maps.arcgis.com/home/webmap/viewer.html?webmap=cb02f4f828974670ad01bb83be91b18c
Cape Fear Moving Forward 2040 Metropolitan Transportation Plan (MTP)	November 2015	http://www.transportation2040.org/PDFs/CFT2040_adoptiondate_111815.pdf
Cape Fear Commutes 2035 Transportation Plan	December 2010	http://www.focussenc.org/wp-content/uploads/2014/02/2010-12-Cape-Fear-Communtes-2035-Transportation-Plan.pdf
Wilmington Metropolitan Planning Organization (MPO) Comprehensive Transportation Plan (CTP)	January 27, 2016	http://wdc.wmpo.s3.amazonaws.com/wp-content/uploads/2016/12/2016-01-13_CTP_FinalDraftDocsCombined_small.pdf
Wrightsville Beach Community Transportation Plan	February 2013	https://www.townofwrightsvillebeach.com/DocumentCenter/View/116/Community-Transportation-Plan-Final-Web-2013-PDF?bidId=
NCDOT Bridge Inspection Report	April 2015	See Connect
NCDOT Bridge Inspection Report	April 2017	See Connect
Crash Analysis Memo prepared by RS&H	June 13, 2017	See Connect
Concept Maps created by RS&H	July 2018	See Report Appendix See Connect
Offline Concept Maps created by RS&H	April 2018	See Connect
Traffic Forecast Cover Letter prepared by Patriot Transportation Engineering, PLLC	July 12, 2017	See Connect
Traffic Forecast Diagrams prepared by Patriot Transportation Engineering, PLLC	July 12, 2017	See Connect

Traffic Operations Memorandum prepared by RS&H	March 2, 2018	See Connect
Traffic Operations Memorandum prepared by RS&H	September 19, 2018	See Connect
Northeast Interceptor (NEI) Segment 1 Intracoastal Waterway Crossing (ICW) Preliminary Assessment Technical Memorandum prepared by Highfill Infrastructure Engineering, PC	September 21, 2017	See Connect
River to the Sea Bikeway Map	June 27, 2011	http://www.rivertoseabikeway.com/PDFs/2011-06-27_RiverToSeaPocketBikeMap.pdf
NCDOT Functional Class GIS Map	August 2018	http://ncdot.maps.arcgis.com/home/webmap/viewer.html?layers=029a9a9fe26e43d687d30cd3c08b1792
Boat Ramp Deed of Gift by the Town of Wrightsville Beach to the State of North Carolina	October 13, 1977	See Connect
North Carolina State Historic Preservation Office (NCSHPO) GIS Map	August 2018	http://gis.ncdcr.gov/hpoweb/
North Carolina Department of Environmental Quality (NCDEQ) Division of Water Resources (DWR) Surface Water Classifications GIS Map	August 2018	https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=6e125ad7628f494694e259c80dd64265
United States Fish and Wildlife Service (USFWS) Endangered and Threatened Species of New Hanover, NC	Accessed August 2018	https://www.fws.gov/raleigh/species/cntylist/new_hanover.html
NCDOT Mitigation Site GIS Map	Accessed August 2018	http://ncdot.maps.arcgis.com/home/webmap/viewer.html?webmap=d560dfeb1ea443b299ca7fc68b2506b4
National Marine Fisheries Service, Atlantic Sturgeon Information Page	Accessed November 2018	https://www.fisheries.noaa.gov/species/atlantic-sturgeon
American Association of State Highway and Transportation Officials (AASHTO) Guide for the Planning, Design, and Operation of Pedestrian Facilities	July 2004	See Connect

Appendix

H183785 (FS-1703A)
Environmental Features Map

New Hanover County

Wrightsville Beach Bridge Replacement
Drawbridge No. 12 carrying US 74/76 over the Intracoastal Waterway

Division 3

February 2019

0 300 600 Feet

N

Eastwood Rd
76
Wrightsville Ave
Wrightsville Ave
Drawbridge No. 12
Waterway Lodge
Intracoastal Waterway
The Bridge Tender
NCWRC Boat Ramp
Lees Cut
Fish House Grill
Airlie Rd
Sea Gate Boating
Bluewater Grill
Wrightsville Beach Marina
W Salisbury St
74
Wrightsville Beach Arboretum
Wrightsville Beach Town Hall
Wrightsville Beach Park
76
Causeway Dr
Motts Channel

Legend

- River to Sea Bikeway
- Other Bike Routes
- Underground Storage Tank
- Fire Station
- Police Station
- NWI Wetlands
- Conservation Tax Credit Property
- Park
- State Owned Land
- Parcels
- Determined Eligible for National Register
- Determined Eligible Boundary

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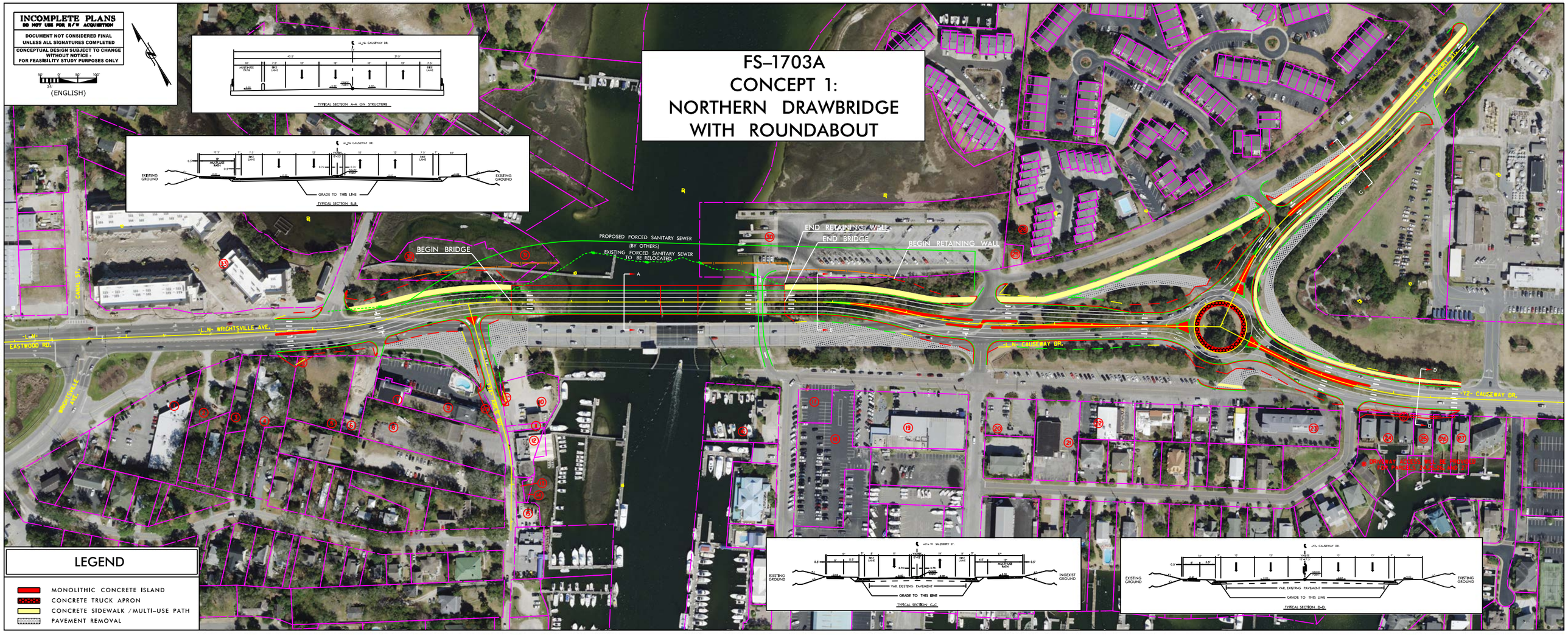
50' 0' 50' 100'
25'
(ENGLISH)

FS–1703A
CONCEPT 1:
NORTHERN DRAWBRIDGE WITH ROUNDABOUT

TYPICAL SECTION A–A ON STRUCTURE

TYPICAL SECTION B–B

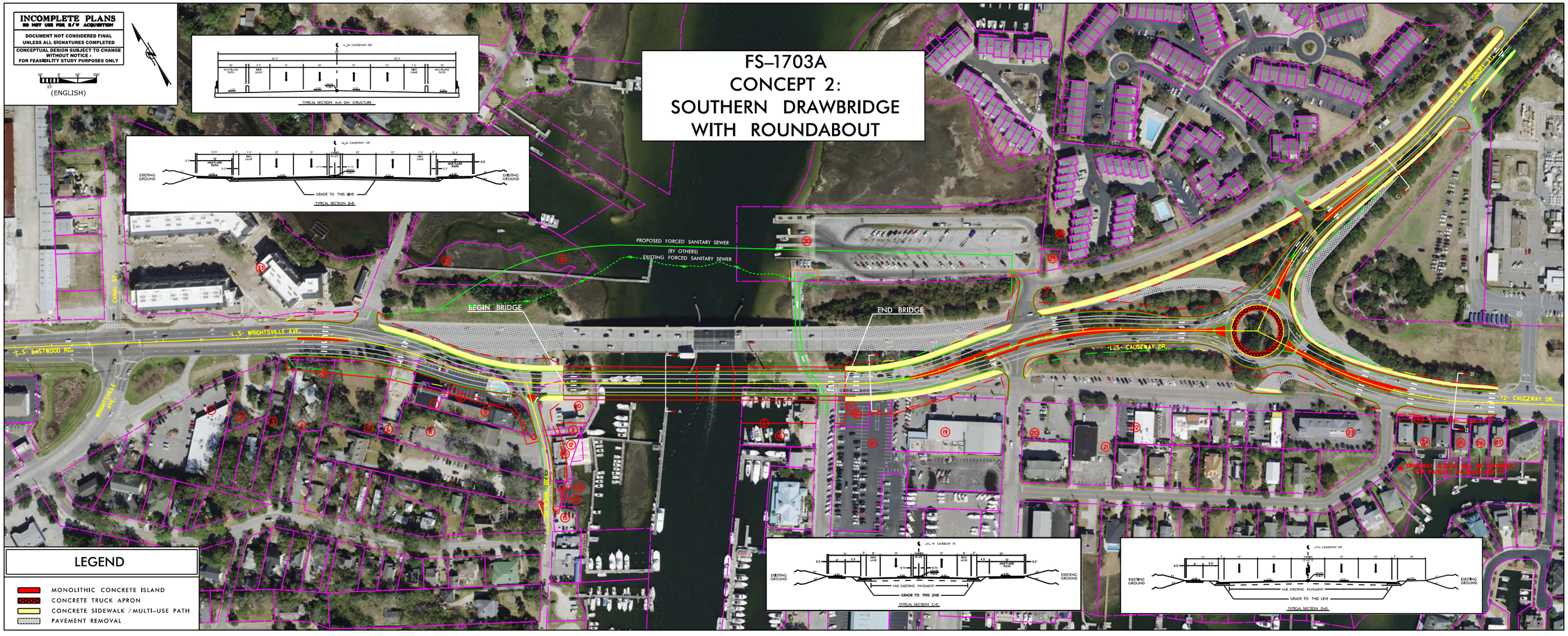


LEGEND

- MONOLITHIC CONCRETE ISLAND
- CONCRETE TRUCK APRON
- CONCRETE SIDEWALK /MULTI–USE PATH
- PAVEMENT REMOVAL

TYPICAL SECTION C–C

TYPICAL SECTION D–D



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CONCEPT 2:
SOUTHERN DRAWBRIDGE
WITH ROUNDABOUT
TYPICAL SECTION A-A ON STRUCTURE
TYPICAL SECTION B-B
PROPOSED FORCED SANITARY SEWER
(BY OTHERS)
EXISTING FORCED SANITARY SEWER
BEGIN BRIDGE
END BRIDGE
-L.S- WRIGHTSVILLE AVE.
-L.S- EASTWOOD RD.
-L.S- CAUSEWAY DR.
-Y2- CAUSEWAY DR.
CANAL ST.
WRIGHTSVILLE AVE.
TYPICAL SECTION C-C
TYPICAL SECTION D-D
LEGEND
MONOLITHIC CONCRETE ISLAND
CONCRETE TRUCK APRON
CONCRETE SIDEWALK /MULTI-USE PATH
PAVEMENT REMOVAL

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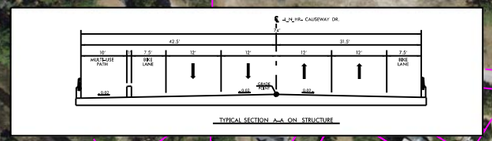
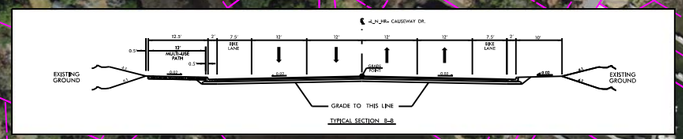
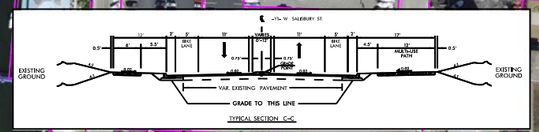
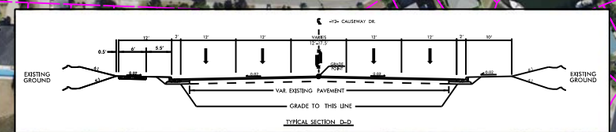
CONCEPT 3:
NORTHERN HIGH–RISE BRIDGE WITH ROUNDABOUT





BEGIN RETAINING WALL 1
END RETAINING WALL 1
BEGIN BRIDGE
PROPOSED FORCED SANITARY SEWER (BY OTHERS)
EXISTING FORCED SANITARY SEWER TO BE RELOCATED
BEGIN RETAINING WALL 3
END RETAINING WALL 3
END RETAINING WALL 2
BEGIN RETAINING WALL 2
END BRIDGE
BEGIN RETAINING WALL 4
END RETAINING WALL 4
DRIVEWAY ENTRY MAY BE REMOVED FOR SAFETY PURPOSES
U.S. HWY. 17 (MARKET ST.)
U.S. HWY. 17 BUS. (CAUSEWAY DR.)
N.C. HWY. 133 (MIDDLETOWN RD.)
S.R. 1148 (EASTWOOD RD.)
BRUNSWICK AVE.
PARK ST.





LEGEND

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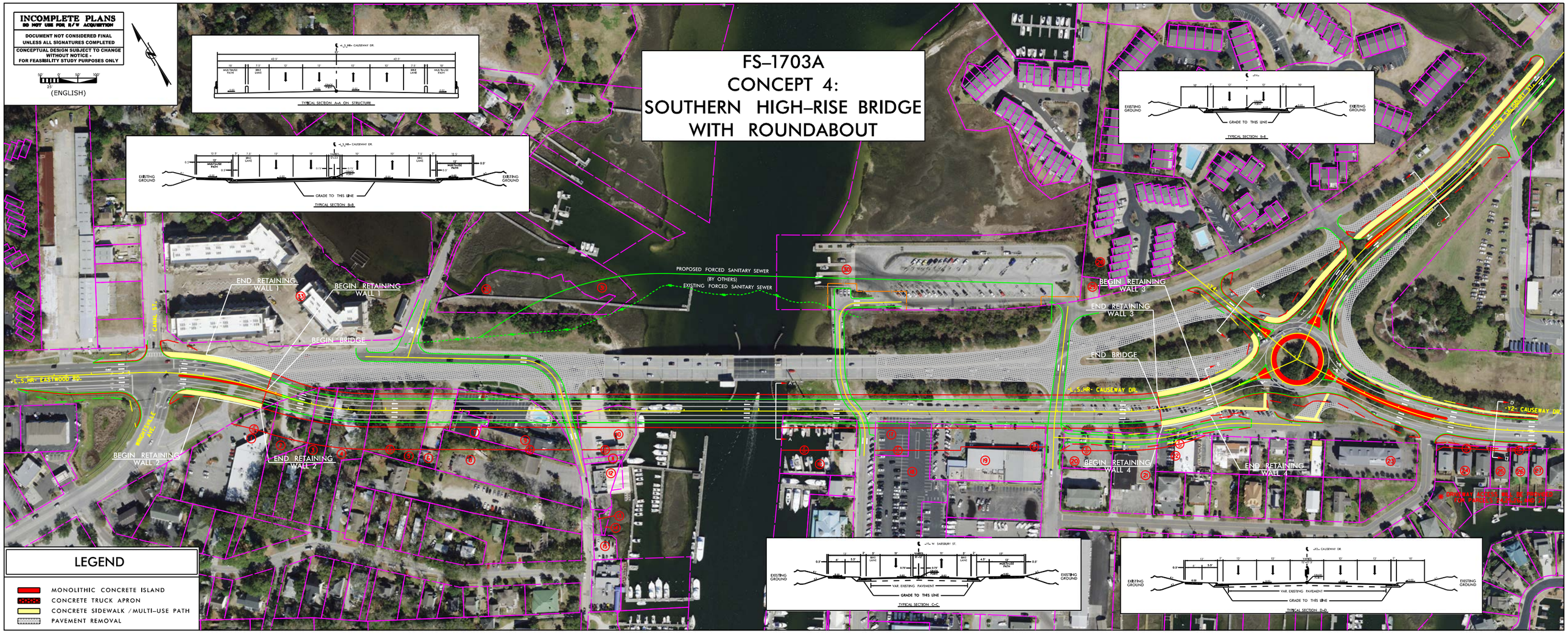
- CONCRETE TRUCK APRON
- CONCRETE SIDEWALK / MULTI–USE PATH
- PAVEMENT REMOVAL



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CONCEPT 4:
SOUTHERN HIGH–RISE BRIDGE
WITH ROUNDABOUT
TYPICAL SECTION A–A ON STRUCTURE
TYPICAL SECTION B–B
TYPICAL SECTION E–E
TYPICAL SECTION C–C
TYPICAL SECTION D–D
PROPOSED FORCED SANITARY SEWER
(BY OTHERS)
EXISTING FORCED SANITARY SEWER
END RETAINING WALL 1
BEGIN RETAINING WALL 1
BEGIN BRIDGE
BEGIN RETAINING WALL 2
END RETAINING WALL 2
BEGIN RETAINING WALL 3
END RETAINING WALL 3
END BRIDGE
BEGIN RETAINING WALL 4
END RETAINING WALL 4
L.S.HR- EASTWOOD RD.
L.S.HR- CAUSEWAY DR.
CANAL ST.
WRIGHTSVILLE AVE.
-Y2- CAUSEWAY DR.
LEGEND
MONOLITHIC CONCRETE ISLAND
CONCRETE TRUCK APRON
CONCRETE SIDEWALK / MULTI–USE PATH
PAVEMENT REMOVAL

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(ENGLISH)

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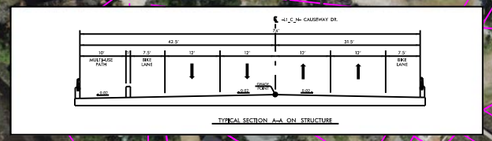
CONCEPT 5:
NORTHERN DRAWBRIDGE WITH UPGRADE OF CURRENT INTERSECTION CONFIGURATION



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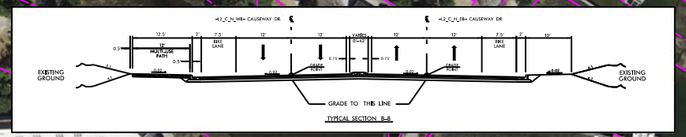

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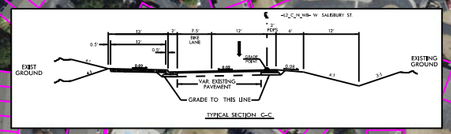
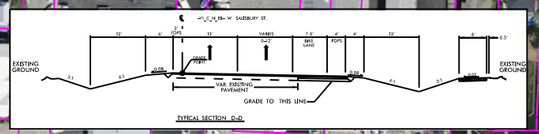
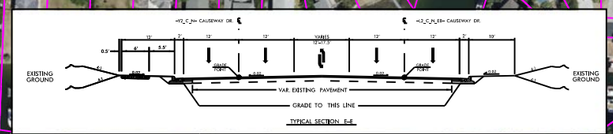


TYPICAL SECTION C-C



TYPICAL SECTION D-D



TYPICAL SECTION E-E

BEGIN BRIDGE
END BRIDGE
BEGIN RETAINING WALL
END RETAINING WALL
PROPOSED FORCED SANITARY SEWER (BY OTHERS)
EXISTING FORCED SANITARY SEWER TO BE RELOCATED
-L1_C_N- WRIGHTSVILLE AVE.
-L1_C_N- EASTWOOD RD.
CANAL ST.
WRIGHTSVILLE AVE.
-L2_C_N_WB- CAUSEWAY DR.
-L2_C_N- CAUSEWAY DR.
-L1_C_N_EB- W. SALISBURY ST.
-L2_C_N_EB- CAUSEWAY DR.
-L2_C_N- CAUSEWAY DR.
-L1_C_N- W. SALISBURY ST.
OPPORTUNITY TO CONSTRUCT A SHARED USE PATH ON PUBLIC PROPERTY

LEGEND

- MONOLITHIC CONCRETE ISLAND
- CONCRETE TRUCK APRON
- CONCRETE SIDEWALK / MULTI-USE PATH
- PAVEMENT REMOVAL