Indian River Inlet
DelDOT BRIDGE

Section 3.0
Alternatives Considered

Final Environmental Assessment and Nationwide Section 4(f) Evaluation

III. ALTERNATIVES CONSIDERED

A range of alternatives were developed for the replacement of the bridge and park access requirements. This section will summarize the resource assessment and decision-making process, which resulted in the selection of DelDOT's selected alternative. More specific details of the alternatives analysis are provided in the *Alternatives Analysis Document* that was prepared by DelDOT and accepted by FHWA on November 24, 2003. This document was distributed to the Agencies representatives (same agencies that concurred to the Purpose and Need Statement) for final review and concurrence on November 25, 2003. DelDOT and FHWA received concurrence from these agencies in the winter of 2004 on the *Alternatives Analysis Document.*

The existing Indian River Inlet Bridge carries four lanes of traffic, two in each direction. The structure has a concrete deck, supported by steel girders. There are two concrete land piers and two concrete piers in the inlet. The existing structure is 879 feet in length with a main span of 250 feet providing a 100-foot wide by 35-foot high (above the mean high water) navigational clearance.

SR 1 serves as the only access to the Delaware Seashore State Park, so a key component of the replacement of the Indian River Inlet Bridge Project is maintaining the access to the park facilities directly north and south of the Inlet. Existing access to the parking and marina on the north side of the Inlet is accomplished through a single point at-grade access with right in/right out and left in/left out movements while access to and from northbound SR 1 is provided through a median break. Existing access south of the inlet is provided by an at-grade "U-road" or dual access on both sides of SR 1, providing right only turns in and out of the park and no median opening.

The existing bridge does not have shoulders, but does have five-foot sidewalks on the outsides of the bridge. Safety to cyclists, pedestrians and drivers could be improved by providing shoulders on the new bridge and a separated, wider bike/pedestrian path would provide a better connection between park facilities north and south of the inlet.

III.A. Bridge Elements Considered: The following sections detail the selection of the primary elements of the proposed bridge structure. These elements include navigational clearance, span length, bridge type and typical section.

III.A.1. Bridge Navigational Clearance Alternatives: The current vertical navigational clearance under the existing bridge is 35 feet above the mean high water for a width of 100 feet, which is adequate for the passage of one vessel characteristic of those utilizing the inlet. The Project recently concluded an evaluation of the navigational clearance of the existing bridge and the potential vertical alignments for the new bridge. This assessment, *Replacement of 3-156, SR-1 Over the Indian River Inlet, Vertical Clearance Study* dated July 15, 2003, by Figg Bridge Engineers, Inc. considered the expansion of the horizontal clearance and both a 35-foot or 45-foot vertical clearance while maintaining the existing 100-foot horizontal by 35-foot vertical clearance during construction.

a. Horizontal Navigational Clearance: The existing horizontal clearance of approximately 100 feet is adequate for the passage of one vessel. However, the turbulent nature of the inlet makes the 100 feet horizontal clearance challenging if not inadequate for the passage of two large vessels directly under the bridge. A new bridge without piers in the water would enable the horizontal navigational clearance to be wider. The recommended horizontal clearance for the new bridge is approximately 200 feet. This should provide ample room for two vessels of maximum height to pass while crossing under the bridge and should improve the navigational conditions under the bridge and through the inlet.

b. 35-Foot Navigational Clearance: The 35-foot bridge clearance was considered as an option since it maintains the existing navigational conditions under the bridge. The Vertical Clearance Study involved an assessment of the vessels typical to the inlet and concluded that the 35-foot vertical navigational clearance restricts sport-fishing boats with "tuna towers" and sailboats from using the inlet. The study also noted that if the 35-foot navigational clearance was maintained, the inlet would be closed or restricted at times during the construction of the new bridge by platforms and rigging suspended approximately 10 feet below the new deck.

c. 45-Foot Clearance: The 45-foot vertical clearance was considered primarily because it does not reduce the existing vertical clearance during construction and would accommodate taller vessels following completion of construction. Other advantages of the 45-foot vertical clearance profile include:

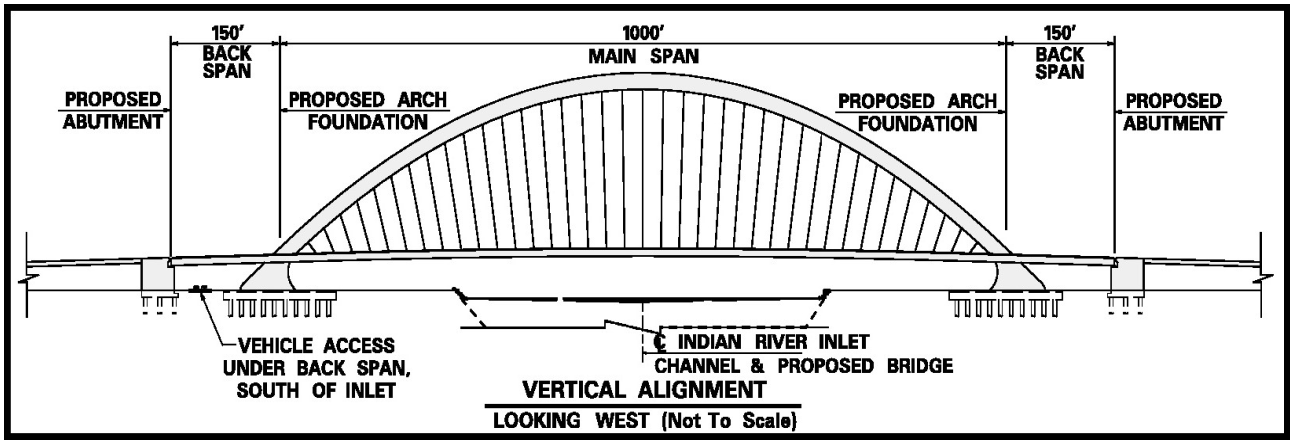
- Creates a larger more useable land area under the bridge,
- Affords greater protection against a potential terrorist or accidental blast event,
- Provides potential for an improved view shed between east and west sides of the Delaware Seashore State Park, and
- Allows for greater flexibility in the design for the park circulation options.

d. Selected Bridge Clearance Alternative: Based upon the above considerations, the final (post construction) navigation clearance has been selected as approximately 200 feet horizontal by approximately 45 feet vertical, and will maintain the existing 100 feet by 35 feet navigational clearance conditions throughout the construction period. In September 2003, Agency representatives concurred with the 45-foot clearance because it maintains the existing navigational clearance during construction and will accommodate larger vessels. Additionally, this alternative resulted in no significant additional parkland or natural resource impacts than the 35-foot clearance alternative. US Coast Guard direction on vertical clearance will occur during their Section 9 permit process. However, the Coast Guard has indicated, in informal discussions to date, no objection to the selected 45-foot navigational clearance for the new bridge.

III.A.2. Bridge Span Alternatives: The width of the current inlet is approximately 500 feet. As per the Purpose and Need Statement, the new bridge is proposed to span the entire inlet, which would result in an 800-foot bridge span. The 800-foot span was considered the minimum length required to span the existing inlet that would eliminate piers within the inlet. Because of functional and cost considerations, DelDOT initially selected the 800-foot bridge span. However, to accommodate potential future inlet expansion and considering the 100-year design life of the new structure DelDOT continued to assess the bridge span options with the FHWA and ACOE. Although the ACOE indicated that they have, "*no plans to widen the inlet now or in the foreseeable future*," future expansion of the inlet beyond the foreseeable future would affect the 800-foot bridge span. Because of this possibility, DelDOT and FHWA believe that, in the best interest of the public, the selected bridge length for the project is the proposed the 1,000-foot main span.

III.A.3. Bridge Type Alternatives: The decision to utilize cable-stayed/cable-supported bridge technology was made early in the design process because the configuration offers an opportunity to design and construct a cost effective long-span bridge with a broad array of aesthetic options. Several configurations of the cable-stayed/cable-supported bridge were developed and presented during the public involvement bridge design charette process (Section V.A.2). Public selection of the bridge type was made at Design Charette 2 from two selections for the Cable Supported Single Arch and three selections for the Vertical Pylon configurations. Charette participants voted on the five bridge type options and overwhelmingly selected the single arch span with radial cable supports as shown in **FIGURE 4** as the selected bridge type. The cable-stay bridge type was also selected as DelDOT's selected bridge type based on the public support at the workshops in May 2003, and an engineering analysis and benefit assessment. The specific aesthetic selection of the bridge had no bearing on the amount and degree of environmental impacts associated with the project, since each bridge option generally had the same affect on the natural and cultural environment.

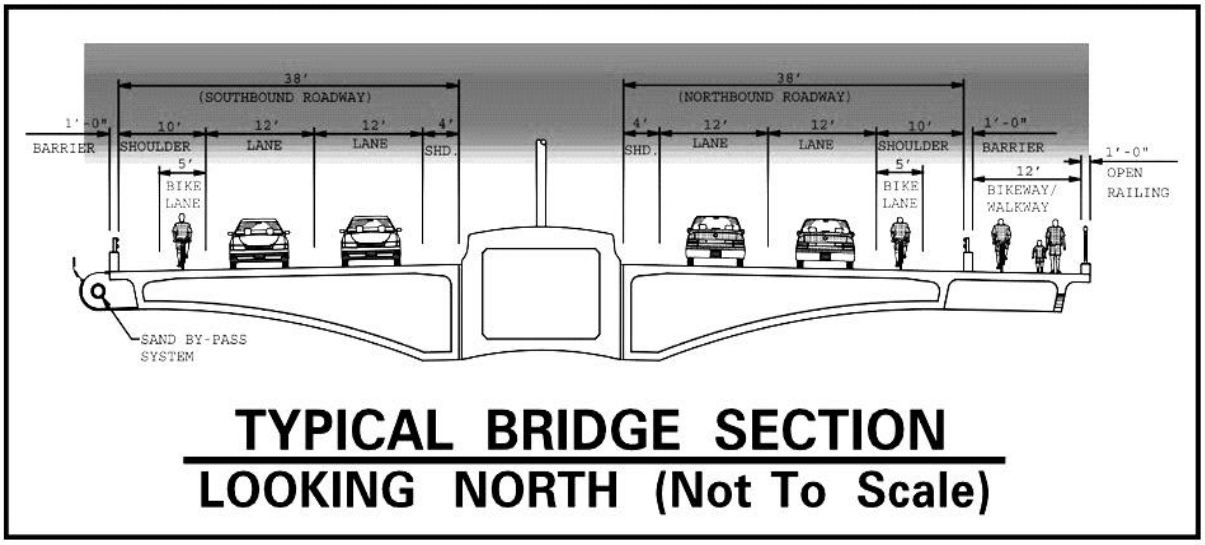
Figure 4: Selected Bridge Type



III.A.4. Bridge Typical Section: In order to maintain a suitable level of vehicular service similar to the existing bridge, the proposed bridge will provide two twelve-foot lanes in the northbound and southbound directions. The shoulders for each two-lane section are designed to meet the American Association of State Highway Officials (AASHTO) criteria for a four-lane, divided, rural arterial highway with a 60 mile per hour design speed. As per AASHTO, the outside shoulders provide eight feet of useable width and inside shoulders, four feet of useable space, both adjacent to a rigid barrier. As the outside shoulder also accommodates a five-foot bike lane for through traffic, the useable width has been extended an additional two feet to provide a shy line buffer adjacent to the rigid barrier to provide safe use for through bicycles and recreation users adjacent to vehicles. The total outside shoulder width is approximately ten feet to the face of the rigid barrier.

Based upon the "Harmony with Nature" theme coordinated during Design Charette 1, the bridge superstructure will have a unique curvilinear cross section that contains a soffit that is symbolic of the long arching wingspan of an aquatic bird in flight, as shown in **FIGURE 5**.

Figure 5: Typical Bridge Cross Section



III.B. SR 1 Mainline Horizontal Alignment Alternatives

The alternatives considered for the SR 1 mainline include a No Build Alternative and four build alternatives. The Build Alternatives include a new bridge on existing alignment, an alignment east of the existing bridge and two alignments west of the existing bridge, a 30-foot and 50-foot offset from the existing bridge, each skewed or parallel to the existing bridge. The east-west location of the new bridge is based on constructability and natural resource avoidance issues. A conceptual level analysis of potential environmental impacts, particularly

the wetland, upland and parkland impacts, were considered in the evaluation of these alternatives. **FIGURE 6** depicts the SR 1 Mainline Horizontal Alignment Alternatives considered for this project while descriptions of each are provided below.

III.B.1. Alternative 1 - No Build: The No-Build Alternative consists of maintaining the current transportation system for SR 1 and the park access roads. This alternative will include the monitoring and maintenance of the existing bridge piers within the inlet. However, maintenance and monitoring of the bridge piers are temporary and potentially ineffective measures that are not a solution to the serious scour problem. Therefore, the No-Build Alternative was not retained for detailed study, as it does not meet the Project Purpose and Need.

III.B.2. Alternative 1A - New Bridge on Existing Alignment Alternative: The new bridge on existing alignment alternative consists of reconstructing a new bridge within the existing DelDOT right-or-way and reconnecting/improving the Delaware Seashore State Park access roads. For this alternative, DelDOT has assumed a bridge type similar to that envisioned by the selected alternative. For this option to be feasible, the existing bridge would have to be closed, demolished, and a new bridge reconstructed. These activities could result in closure of SR 1 over the Indian River Inlet for a period of over three years, thus affecting the emergency evacuation route, levels of emergency services, viability of the park to generate revenue, and reconnection of the park access road as proposed for the selected alternative. Although this alternative meets the strict interpretation of the projects purpose and need it was not retained for detailed study since it is not reasonable or practical to close SR 1 for a period of over three years.

III.B.3. Alternative 2 - Eastern Alternative: An alignment constructing the bridge and mainline east of the existing structure was initially considered as a matter of protocol. The beach north of the inlet is currently susceptible to heavy erosion with the sand accumulating on the beach south of the inlet. A sand bypass system was installed in 1990 and continues to operate to ensure the beach north of the inlet does not erode away. Based on the current beach erosion problems and the other destructive environmental forces described earlier, if the new bridge was relocated closer to the ocean, the protective dune system would be impacted, and the susceptibility of the bridge and roadway to storm damage would be increased. Also, the land east of the existing roadway is important upland habitat that would be impacted by an alternative east of the bridge. For these reasons Alternative 2 was not further considered.

III.B.4. Alternative 3 - 50 Feet West of Existing Bridge: An alternative 50 feet west of the existing bridge was considered with alignments parallel (Alternative 3A) or skewed (Alternative 3B) to the existing bridge. While this alternative would provide additional distance for construction of the proposed structure and for demolition of the existing bridge, it would impact significant amounts of wetlands, upland and parkland outside of DelDOT's right-of-way. For these reasons, the 50-foot west alternative (parallel or skewed) was not retained for detailed study.

III.B.5. Alternative 4 - 30 Feet West of Existing Bridge: An alternative 30 feet west of the existing bridge was considered with alignments parallel (Alternative 4A) or skewed (Alternative 4B) to the existing bridge. The 30 feet provides the minimum distance required for construction of the proposed structure and demolition of the old bridge. The 30-foot offset utilizes DelDOT's existing right-of-way as much as possible, limiting the impacts to the surrounding wetlands, uplands and parkland beyond DelDOT's right-of-way. For these reasons, the 30-foot west alternative (parallel and or skewed) was retained for detailed study.

a. Alternative 4A - Parallel 30-Foot Offset Alignment West of Existing Bridge: This alignment would construct the proposed bridge approximately 30 feet west of, and parallel to, the existing bridge. The 30-foot offset is the absolute minimum distance required for construction and demolition activities. However, Alternative 4A does not minimize impacts to wetlands and uplands when compared to the skewed alignment (Alternative 4B). For this reason, the parallel 30-foot offset alignment was not retained for detailed study.

LEGEND

- Alternative 1: No Build Alternative
- Alternative 2: Eastern Alternative
- Alternative 3: 50 Feet West of Existing Bridge
  - Alternative 3A: Parallel Alignment
  - Alternative 3B: Skewed Alignment
- Alternative 4: 30 Feet West of Existing Bridge
  - Alternative 4A: Parallel Alignment
  - Alternative 4B: Skewed Alignment

NOTE: Mainline Alternative Alignments Included Within Corridors

Indian River Inlet
DelDOT

SR 1 Mainline Horizontal Alignment Alternatives

Final Environmental Assessment and Nationwide Section 4(f) Evaluation

Scale:	Date:	Figure:
1"=200'	May 2004	6

U.S. COAST GUARD STATION

Indian River Inlet

(Road 50A)

NEW PLAY GROUND

OVERHEAD UTILITY TOWER

℄ INDIAN RIVER INLET

ALTERNATIVE 3A & 3B 50–FOOT

ALTERNATIVE 4A & 4B 30–FOOT

RV CAMPGROUND

OVERHEAD UTILITY TOWER

PARK OFFICE

RECYCLE BINS

CONTACT STATION

OVERHEAD UTILITY TOWER

LIFT STATION /RESTROOMS

DAY AREA PARKING

DAY AREA PARKING

DAY AREA PARKING

EASTERN ALTERNATIVE

NO BUILD ALTERNATIVE

BATH HOUSE

SAND BY–PASS

Atlantic Ocean

b. Alternative 4B - Skewed 30-Foot Offset Alignment West of Existing Bridge: Horizontal Alignment Alternative 4B provides a skewed alignment (approximately six degrees west of parallel) west of, and 30 feet offset from, the existing bridge. The offset and skew are designed to provide 30 feet between the existing and the proposed southern abutment, which is the minimum distance required for bridge construction and demolition activities. This alternative with a skewed alignment minimizes wetland and upland impacts, while retaining the SR 1 mainline within existing DelDOT right-of-way. The geometrics of the skewed alignment also affords for tie-in to the existing roadway within existing DelDOT's right-of-way. As it minimizes impacts, while meeting the Project Purpose and Need and remaining within DelDOT's existing right-of-way, Alternative 4B was retained for further consideration.

III.B.6. Selected SR 1 Mainline Horizontal Alignment Alternative: Horizontal Alignment Alternative 4B, the 30-foot offset, skewed alignment was chosen as the selected SR 1 mainline alternative because it minimizes potential resource impacts and best utilizes the existing DelDOT right-of-way. Alternative 4B forms the foundation for analyzing the park access road alternatives for the Delaware Seashore State Park, as detailed in Section III.C of this document.

III.C. Park Access Road Alternatives

A key component of the replacement of the Indian River Inlet Bridge Project is the maintenance of vehicular access to and from the park facilities directly north and south of the inlet. Existing park access configurations consist of an at-grade single point intersection with SR 1 north of the inlet and an at-grade U-Road configuration with SR 1 south of the inlet. Specifically, north of the inlet park access to and from southbound SR 1 is through right in/right out movements while left in/left out movements provide access to and from northbound SR 1 via a median break. South of the inlet park access is provided by an at-grade "U-Road" or dual access from northbound and southbound SR 1 without median breaks. Internal park access roadways under the southern most bridge span connect the park access roads to SR 1. Currently, SR 1 includes acceleration and deceleration lanes to allow for the safe movement of vehicles to and from the existing park access roads. To ensure the proposed facility continues to provide safe movements to and from the park, park access speed change lanes (acceleration/deceleration lanes) were studied as part of the alternatives development and are described below.

III.C.1. Park Access Road Speed Change Lanes (acceleration/deceleration lanes): Park access roads speed change lanes (acceleration/deceleration lanes) were designed based on AASHTO criteria and interpretation of site-specific conditions. The application of these criteria result in a recommendation not to place deceleration lanes on the bridge structure and only on mainline roadways with slopes less than 2%. This recommendation provides the design vehicle (recreational vehicle with trailer) with safe and adequate stopping and queuing distance as it enters the park. Additionally, the separation provides additional distance for drivers that may become distracted by the scenic view sheds from the bridge to refocus attention to slowing traffic intending to enter the park. Analysis of the selected bridge profile indicates slopes of 2% and less begin approximately 1,100 feet from the bridge abutments. As per the criteria discussed above and as recommended by DelDOT and accepted by FHWA, deceleration lanes begin approximately 1,100 feet south of the bridge abutment (southwest quadrant) and will extend the appropriate distance recommended by the AASHTO criteria or determined by site-specific criteria.

The design criteria recommended by DelDOT and accepted by FHWA for acceleration lanes varied slightly from the AASHTO recommendations because of site-specific conditions present north and south of the inlet, specifically wetlands and uplands. Although desired for safety consideration, acceleration lanes were not subject to the 1,100-foot offset recommended by DelDOT for deceleration lanes in order to reduce and/or avoid environmental impacts. Acceleration lanes were permitted to extend to the bridge structure, but not onto the main bridge spans. Although not specifically precluded by AASHTO criteria, park access intersection configurations solely located on the length of acceleration lanes would result in differential displacement of additional lanes on the decking. Differing lengths of the acceleration lanes would change the typical bridge cross-section and result in unbalanced deck loads that would pose significant design constraints and cost considerations. Accordingly, DelDOT applied the criterion for acceleration and deceleration lanes to all park

access road configurations studied.

III.C.2. Park Access Road Configurations Considered: The initial development of the park access alternatives involved the consideration of at-grade intersections, tunnels between the east and west sides of the park, the safety and security of vehicular traffic under the new bridge, and traffic signals controlling movement on the SR 1. An assessment of these park access road configurations are included below:

a. Park Access Road - At-Grade Intersection Option: The current configuration for park access north and south of the inlet includes at-grade intersections ("U-Road" and single point access roads). At-grade intersections are the most common type of intersection because of relatively low construction costs, and limited maintenance requirements. Therefore, at-grade intersections ("U-Road" and single point access roads) were carried forward for additional consideration.

b. Park Access Road – Tunnel Option: This element would incorporate a tunnel north and/or south of the inlet to accommodate U-Road type access to the park. The connected access between the west and east sides of the park via a tunnel under the roadway would expose SR1 to potential compromising events (i.e. terrorist or accidental blast). Additionally, this option presents specific challenges related to potential impact to surrounding habitats associated with deep excavations and maintenance from drifting and washed sand. For these reasons, the tunnel option was not retained for detailed study.

c. Park Access Road - Vehicular Traffic Under the Main Bridge Span Option: A Vulnerability Study (May 2003) of the proposed bridge was conducted to assess the susceptibility of the proposed bridge to a terrorist or accidental blast event. This study concluded that by locating the bridge adjacent to the park and permitting vehicular traffic under the bridge, the design would have increased vulnerability to a compromising incident. The results of the study support the prohibition of traffic and parking under the main span of the bridge. As a result of this study, DelDOT and FHWA agreed that access between the east and west sides of the park south of the inlet will be provided through the 150-foot back span (**FIGURE 4**). For this reason, this option was not retained for detailed study.

d. Park Access Road - Traffic Signal Option: There are currently no traffic signals at the north or south access points. The study of park access included analyzing the need for traffic signals based on current and future traffic counts. Analysis of the collected data strongly indicates that due to location, configuration and driver expectation, signalization would actually have the potential to increase the number of accidents. DelDOT experience has shown that, while reducing angle crashes, the installation of a traffic signal will typically increase the occurrence or frequency of rear-end collisions. Since the number of angle crashes has been extremely low at both the existing north and south park entrances, an increase in rear-end collisions would represent deterioration in overall safety. Despite these concerns DelDOT suggested that some configuration of traffic signals might provide a benefit; therefore, traffic signal options were carried forward for additional consideration.

e. Park Access Road - U-Turn and Jug-Handle Options: The U-Turn and Jug-Handle Alternatives were determined to have a high potential to decrease the safety within the study area and combined with park access road requirements would increase resource impacts. Concerns with these options include unconventional traffic movements, new traffic patterns and/or signals on SR 1, which could decrease the safety within the study area. Because of these factors, U-Turn and Jug-Handle Options were eliminated from further consideration.

III.C.3. Park Access Road Alternatives Considered: The following sections discuss the park access road alternatives considered for inclusion into the detailed study, specifically at-grade crossing options with and without signals. The alternatives include U-Roads, Single Point Access with and without full and partial signals and incorporate the selected design elements.

a. Alternative 4B-1 "U-Roads": U-Roads maximize safety by providing access points on each side of the SR 1 mainline, thereby eliminating conflicts caused by crossing traffic. The location of the U-Road

access points are primarily determined by the speed-change (acceleration and deceleration) lanes associated with each. U-Roads were considered both north and south of the inlet and are dependent on the feasibility of the access points in each quadrant.

***Northeast Quadrant*:** The location of the northeast U-Road access point is set by the northbound deceleration lane, applicable AASHTO design criteria, and site-specific conditions. The deceleration lane would begin at the 2% slope breakpoint, or approximately 1,100 feet from the northern bridge abutment. The deceleration lane would then continue the AASHTO recommended 530 feet for deceleration to the intersection. The intersection and corresponding access road would be located in area of sensitive upland habitat and would eliminate storm and scour protection afforded by ocean front dunes. When considering the balance of the safety provided by the U-Road with these impacts and the increased susceptibility of storm damage to the roadway and bridge structure, the U-Road north of the inlet was eliminated from further consideration.

***Northwest Quadrant*:** The southbound acceleration lane controls the location of the northwest access point to the park. The acceleration lane would start at the intersection and continue for a minimum of 1,500 feet, terminating at the bridge structure. As previously discussed, AASHTO criteria does not restrict placement of an acceleration lane on a structure, however the additional lane is prohibitive because of the differential loading on the bridge structure. Regardless of the feasibility of the access point in the northwest, the elimination of the access point in the northeast quadrant negates further consideration of the northern U-Road access.

Southeast Quadrant: The northbound acceleration controls the location of the southeast park access point. The acceleration lane extends 1,500 feet from the intersection to terminate at the bridge structure. The lane is prohibited from the bridge structure due to potential differential loading. The feasibility of a U-Road south of the inlet was primarily determined by the viability of the access point within the southwest quadrant. As the alternative was determined to be worthy of consideration for the southwest quadrant, it was correspondingly carried forward in the southeast.

Southwest Quadrant: This alternative is similar to the existing park access; however, as recommended by AASHTO, the deceleration lane initiates at the 1,100-foot slope breakpoint and extends approximately 530 feet to the access road intersection. The southwest quadrant is an area of extensive wetland habitat, however, consideration of the increased safety afforded by a U-Road compels additional analysis of the configuration.

b. Alternative 4B-2 Single Point Park Access with Protected Lefts to SR 1 – With or Without Partial Signal[1]:

Northwest Quadrant: This alternative is similar to the existing north park access; however, in this option left turns in and out of the park entrance would be protected by a proposed mountable concrete median between northbound SR 1 through lanes and a portion of the auxiliary lane to and from the park access. Unlike the U-Road Alternative, Alternative 4B-2 requires a northbound deceleration lane in the median. The deceleration lane would begin 1,100-feet offset from the bridge and would extend approximately 1,185 feet, with a 525-foot queue as determined by the traffic analysis and a 660-foot deceleration lane as recommended by AASHTO criteria, to the access road intersection. These criteria will locate the access road within the wetland and open water portions of Bottom Hills Drain. Therefore, the intersection and associated deceleration/acceleration lanes are located approximately 400 feet further north to avoid impact to these areas. A traffic light may also be installed in the future, as warranted for park traffic turning left onto northbound SR 1.

[1] A traffic light would be installed for added safety for park traffic turning onto SR 1. This traffic light would only be installed for either the north or southbound lanes, while in the opposing direction traffic would have continuous movement.

The concerns with this design include: the introduction of a new traffic signal, possible conflicts or confusion between lefts to and from SR 1 and the deceleration on a downgrade for northbound left turning movements. As discussed above, the U-Road Alternative north of the inlet appears infeasible due to impacts to the upland habitat and dune system in the northeast quadrant, the Single Point Alternative is carried forward for detailed analysis as a practical option for park access north of the inlet.

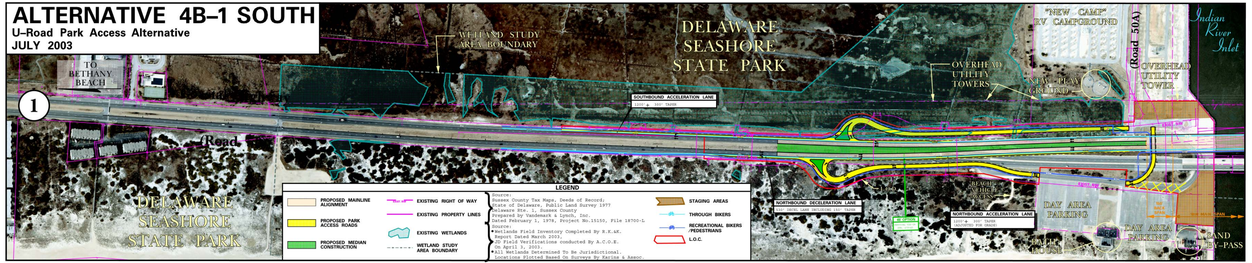
Southeast Quadrant: Although somewhat similar in nature to the southeast quadrant U-Road Alternative discussed in Section III.C.3.a, the Single Point Alternative also incorporates a southbound deceleration lane. Applying the 1,100-foot offset and 1,485-foot lane (825-foot queue as determined by the traffic analysis and a 660-foot deceleration as recommended by AASHTO), pushes the intersection approximately 2,600 feet from the southern bridge abutment. Including a mountable concrete median between the southbound SR 1 through lanes and the auxiliary lanes would protect left turns in and out of this park access point. A traffic light may also be installed in the future, as warranted, for park traffic turning left from or onto southbound SR 1 traffic. The concerns with this design include: introducing a new traffic signal, possible conflicts or confusion between lefts to and from SR 1, deceleration on a downgrade for left turning movements for northbound traffic. Although providing a lower level of safety than the U-Road Alternative, the Single Point Alternative does avoid permanent impacts to wetlands in the southwest quadrant. It was, therefore, carried forward for detailed study.

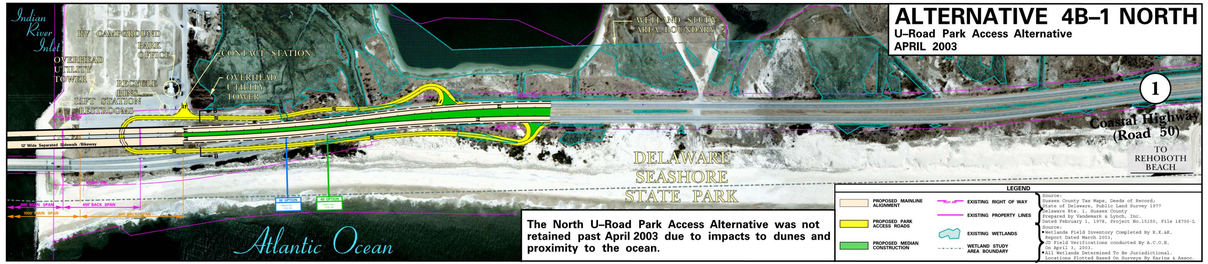
Southwest Quadrant: Although no permanent roadway would be necessary in the southwest quadrant for the single point access alternative, maintenance of traffic during construction would require construction of temporary access to State Road 50A, similar in configuration to the U-Road alternative. The temporary roadway would be required because traffic under the existing and proposed bridges will be prohibited during construction due to safety concerns.

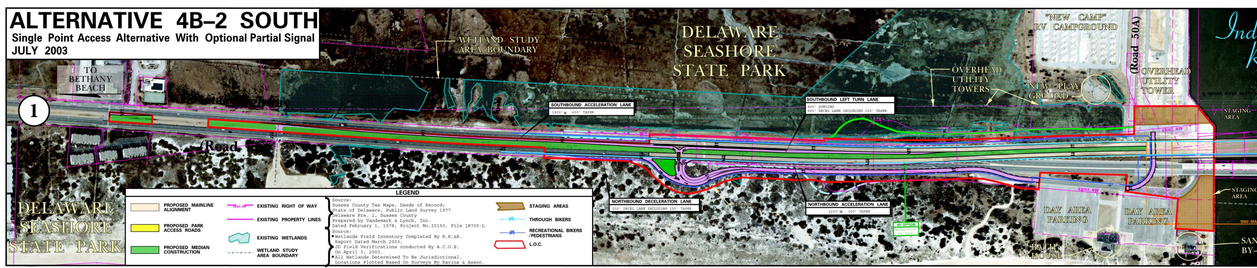
c. Alternative 4B-3 Single Point Park Access with Unprotected Lefts to SR 1 – With or Without Full Signal: This alternative is similar to Alternative 4B-2 described above. However, Alternative 4B-3 includes a full signal, which would stop both north and southbound traffic for traffic turning left in to or out of the park. The signals would not require an acceleration lane for traffic turning left from the park onto SR 1. A left turn lane would be provided for traffic turning left into the park; there would be no median between the left turn lane and through lanes. Concerns with this option include introduction of new traffic signals on SR 1 and the safety of stopping both lanes of traffic on the downgrades of the bridge. Based upon DelDOT experience, accident history, existing conditions and traffic studies conducted in July 2003, concerns have been raised regarding the benefit of signals controlling ingress and egress from the park onto the SR 1 mainline. However, because full signalization has the potential to improve safety under certain conditions, the alternative was retained for consideration in detailed studies.

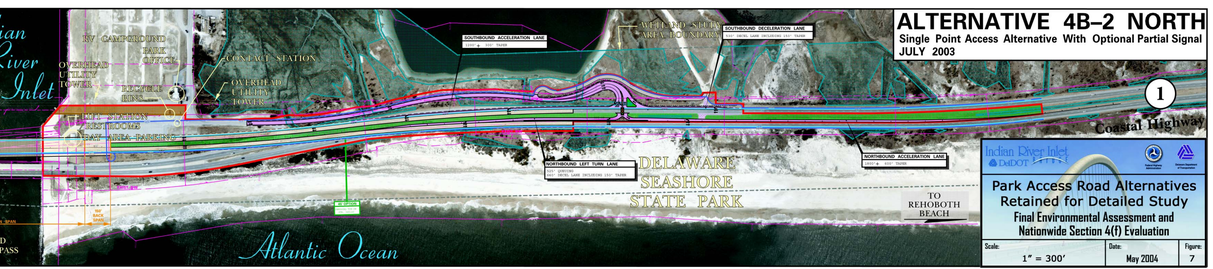
III.C.4. Analysis of Park Access Road Alternatives Retained for Detailed Study: Alternatives 4B-1 through 4B-3 were evaluated in detail with regards to safety, constructability, and impact to environmental resources. This evaluation included comment and feedback at the Agency Coordination Meetings on June 12, 2003 and July 21, 2003. See **FIGURE 7** for the alternatives retained for detailed study.

a. Alternative 4B-1: U-Roads Access: The U-Road Alternative was initially retained because it represented the safest option by providing access to all four quadrants of the Park without left turns, median openings or traffic signals. However, since the U-Road within the northwest quadrant would result in additional pavement east of the existing pavement limits north of the inlet thus requiring substantial potential impacts to sensitive dune, back dune, and upland habitat, Alternative 4B-1 was dropped from consideration for park access north of the inlet. This recommendation was based on consensus from the regulatory agency representatives and was based on an intuitive assessment of relative impacts to the resource without substantial limit of construction determinations. South of the inlet, the U-Road Alternative would still provide safe, viable park access with impacts equivalent, including temporary impacts, to the Single Point Alternative. **TABLE 2** provides an assessment of impacts for the Single Point Alternative and the U-Road Alternative for park access south of the inlet, with single point access north of the inlet.









b. Alternative 4B-2: Single Point Signalized Park Access with Protected Lefts to SR 1 – Partial or Unsignalized: This design alternative would provide park access only within the northwest and southeast and southwest quadrants in order to avoid/minimize permanent impacts to environmental resources in either or both the northeast and southwest. Park access north of the inlet for this alternative is similar to the existing configuration and avoids significant impact to existing sensitive upland habitat in the northeast quadrant.

The configuration of a single point access in the southeast quadrant was also discussed in detail in Section III.C.3.b. The intersection for the single point configuration is located approximately 2600 feet south of the southern bridge abutment. Because of access requirements to Road 50A, this alternative would also include a temporary access for maintenance of traffic in the southeast quadrant. The access would be required throughout construction, as traffic under the bridges will be prohibited during construction and demolition activities.

c. Alternative 4B-3: Single Point Park Access with Unprotected Lefts to SR 1 – Full Signal Alternative: Alternative 4B-3 with full-signalized intersections with unprotected left turn movements was retained for further study for the reasons similar to Alternative 4B-2. This design would provide direct access to northwest and southeast quadrants of the park and access to the southwest quadrant by an extension to Road 50A under the bridge. Since being retained for detailed study, full signalization has been analyzed against July 2003 traffic data and has been assessed by DelDOT on a quantitative and qualitative basis. Although several full signalization configurations have been evaluated, it remains that, due to location and driver expectation; signalization would actually have the potential to cause deterioration in overall safety. Therefore, Alternative 4B-3 was dropped from further consideration

III.C.5. Comparison of Impacts for Alternatives Retained for Detailed Study: TABLE 2 contains details of the assessed potential impacts associated with the alternatives retained for detailed study based on October 2003 preliminary design information and ACOE jurisdictional wetland limits which are more conservative than DNREC jurisdictional wetland limits. These two alternatives retained for detailed study are (1) Unsignalized Single Point access north of the inlet with Unsignalized Single Point access south of the inlet (Single Point North/Single Point South) and (2) Unsignalized Single Point Access north of the inlet with U-Road Access south of the inlet (Single Point North/U-Road South).

Table 2: Comparison of Total Resource Impacts for the Park Access Alternatives

NORTHERN ALTERNATIVE	SINGLE POINT			SINGLE POINT		
SOUTHERN ALTERNATIVE	SINGLE POINT			U-ROAD		
RESOURCE	PERM (Acres)	TEMP ** (Acres)	TOTAL (Acres)	PERM (Acres)	TEMP (Acres)	TOTAL (Acres)
MAIN WETLANDS	1.2	1.1	2.3	2.2	0.0	2.2
ROADSIDE DITCH WETLANDS	1.2	0.0	1.2	1.2	0.0	1.2
OPEN WATER WETLANDS*	0.1	0.1	0.2	0.2	0.0	0.2
TOTAL WETLANDS	2.5	1.2	3.7	3.6	0.0	3.6
UPLAND HABITAT***	8.6	0.6	9.2	7.0	0.0	7.0

* Open Water Wetlands are those areas, which are within the jurisdictional boundaries of the ACOE and are therefore considered wetlands, but are permanently inundated. Open Water (Subaqueous Lands) are those areas out side of the jurisdictional wetland boundary, but channel ward of the High Tide Line. Impacts to non-wetland open waters were not assessed as part of the initial inventory level analysis.

** Temporary impacts are associated with the temporary access road in the southwest quadrant for maintenance of traffic. No impact for installation, maintenance and removal of erosion and sediment control is considered.

*** Upland habitat does not include impacts to previously disturbed areas as determined by the functional assessment. This habitat includes densely vegetated and sparsely vegetated uplands.

In comparing the alternative retained for detailed study, DelDOT balanced mainline safety, safety associated with maintaining the current park access road configuration while improving park access operations, function, queuing, and turning radii, AASHTO requirements of the acceleration/deceleration

lanes, and design criteria for transportation enhancements as well as natural resources impacts (permanent and temporary) to wetland and upland habitat. Further, a review of the natural resource impacts for these two alternatives reveals that each alternative generally has similar impacts (permanent and temporary) to wetlands; however, the south single point access option has over 1.5 acres of additional upland habitat impacts. Since these two options have a similar affect on the resources and because DelDOT's design criteria favors the U-Road option to the south, the alternative selected by DelDOT is the Single Point North/U-Road South Alternative. The composite natural resource impacts, as shown in **TABLE 2**, further supported DelDOT's selected alternative for the park access roads.

The preliminary impacts are based on the limits of construction (LOC) available as of October 2003 for each alternative, and were calculated only for wetlands and uplands. **TABLE 2** does not include an assessment of impact to open water because these areas are not delineated as wetlands and are located channelward of the high tide line. Upland area impacts included in **TABLE 2** represent sparsely and densely vegetated uplands. The impacts shown in **TABLE 2** were used to assess competing alternatives and resulted in DelDOT's selected alternative (Single Point North/ U-Road South).

Since October 2003, further design refinement on the selected alternative have resulted in refined impacts to natural resources as presented in Chapter 4 and TABLE 1 within Appendix B of this document, which are similar to the resource impacts included in the Federal and State wetland permit requests for this project. Specifically, further design efforts associated with utilities, grading, erosion and sediment control and other design related elements as well as the inclusion of Open Water (Subaqueous Lands) have resulted in larger impacts than those noted in **TABLE 2**. Although impacts associated with the selected alternative increased due to these design refinements (TABLE 1 within Appendix B), similar increases in impacts would result from the advancement of competing design options (Single Point North/Single Point South). Accordingly the selection of the selected alternative, based on DelDOT's safety criteria coupled with the impacts included in **TABLE 2**, is both justifiable and appropriate for the level of design completed at the time of selection and further design refinement would not alter that selection.

III.D. Selected Alternative

Based on the information and analyses contained herein and input from the general public and resource agencies, DelDOT has identified its selected bridge alternative as a single arch span with radial cable-supports. The proposed structure will be constructed at a minimum of approximately 30 feet west of the existing bridge and contain an approximate 1,000-foot main span and two 150 foot back spans. All bridge supports will be located beyond the limits of the existing inlet. The bridge will be designed with a post construction vertical clearance of 45 feet, a post construction horizontal navigation clearance width of 200 foot, and a minimum clearance envelope during construction of approximately 35 feet vertical and 100 feet horizontal during construction (matching the clearance envelope of the existing bridge).

Based on resource assessments, impact analyses, and input from the regulatory agencies, DelDOT has selected a single point park access road configuration north of the proposed bridge and a U-road park access configuration south of the proposed bridge. These park access road configurations are similar to those that exist today and represent the safest access configuration that minimizes overall impacts to the natural resources while balancing the needs of the traveling public, bike users/pedestrians and park users. The configuration and length of the access roadways have been located in concert with minimizing resource affects and speed-change lane (acceleration/deceleration lanes) criteria associated with SR 1. Reference **FIGURE 8** for the DelDOT Selected Alternative.

Indian River Inlet
U.S. COAST GUARD STATION
Bottom Hills Drains
BIG CEDAR ISLAND
DELAWARE SEASHORE STATE PARK
TO REHOBOTH BEACH
TO BETHANY BEACH
Coastal Highway
1
(Road 50)
DELAWARE SEASHORE STATE PARK
DELAWARE SEASHORE STATE PARK
Atlantic Ocean
LEGEND
PREFERRED ALTERNATIVE BASED ON 90% DESIGN
EXISTING ROADS TO BE REMOVED
EXISTING DELDOT RIGHT OF WAY
EXIST. R/W
APPROXIMATE PARK PROPERTY LINE
RETAINING WALLS
EXISTING WETLANDS
WETLAND STUDY AREA BOUNDARY
Indian River Inlet Bridge
DelDOT
Federal Highway Administration
Delaware Department of Transportation
Preferred Alternative
Bridge: Single Arch with radial cable stays / 1,000-foot span / No bridge piers in Inlet
Roadway: 30-Foot Offset / Single Point Access (NW Quad) /U-Roads (South Quads)
Final Environmental Assessment and Nationwide Section 4(f) Evaluation
Scale:
0
200
400
600
Date:
May 2004
Figure:
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