

**Bogue Inlet Channel Erosion Response Project
Draft Environmental Impact Statement**

5.0 ENVIRONMENTAL CONSEQUENCES

This section is the scientific and analytic basis for the comparisons of the alternatives. The following section includes the anticipated changes to the existing environment including direct, indirect, and cumulative effects. Tables 12 and 23 provide a summary of the impacts and changes expected to result from the implementation of each alternative. The acreages associated with each of the alternatives in Table 12 are based on a 10-year analysis.

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**Table 12
Physical Effects of Alternatives on Habitats (Net Change)**

Habitat Types	Total Approx. Acreage Project Area	Alternative A No Action	Alternative B Relocate Homes	Alternative C Sandbag Revetments	Alternative E Channel Relocation Without Beach Nourishment	Alternative F Channel Relocation With Beach Nourishment
Aerial Mapping (June 2003)						
Residential	227 acres	-22 acres	-22 acres	-22 acres	0 acres	0 acres
Back Dune	360 acres	-43 acres	-43 acres	-43 acres	0 acres	0 acres
Beach and Fore Dune	270 acres	-8 acres	-8 acres	-8 acres	0 acres	0 acres
Subtidal	552 acres	0 acres	0 acres	0 acres	-68 (channel/dike) + 128 (sand spit) acres	-68 -68 (channel/dike) + 128 (sand spit) acres
Intertidal	524 acres	0 acres	0 acres	-0.05 acres	-2 (dike) acres	-2 (dike) acres
On-Site Investigations and Mapping (September 2003)						
SAV	17 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Shellfish Strata W Habitat	3.5 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Shellfish Strata V Habitat	1607 acres	-50 acres	-50 acres	-50 acres	-50 acres	0 acres
Beach (unvegetated sand)	555 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Upland Scrub Shrub	200 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Wetland Scrub Shrub	13 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Low Salt Marsh	1607 acres	-50 acres	-50 acres	-50 acres	0 acres	0 acres

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**Table 12 (cont.)
Physical Effects of Alternatives on Habitats (Net Change)**

Habitat Types	Total Approx. Acreage	Alternative A - No Action	Alternative B - Relocate Homes	Alternative C - Sandbag Revetments	Alternative E - Channel Relocation Without Beach Nourishment	Alternative F - Channel Relocation With Beach Nourishment
High Salt Marsh	75 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Upland Hardwood Forest	70 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Wetland Hardwood Forest	11 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Upland Mixed Forest	233 acres	-.75 acres	-.75 acres	-.75 acres	0 acres	0 acres
Wetland Mixed Forest	27 acres	0 acres	0 acres	0 acres	0 acres	0 acres

(-) Erosive or negative effects
(+) Positive or accumulative effects

5.1 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Alternative D (suspension of USACE channel maintenance), Alternative G (hard structure), and Alternative H (inlet sand management) have been eliminated from further consideration and evaluation.

Alternative D has been eliminated from further consideration because it does not meet the project needs and is an action that is regulated and administered by the USACE beyond the scope of the Bogue Inlet Channel Erosion Response Project. Continued channel maintenance activities will continue as a Congressionally-mandated activity operating under separate and distinct regulatory authority (Section 933) of the USACE maintenance dredging program administered by the Wilmington District USACE – Navigation Branch. For these reasons, the cessation of maintenance dredging activity alternative is eliminated from further consideration.

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Alternative G, use of hard shoreline protection structures to stabilize the inlet shoreline and channel does not satisfy the project needs. Furthermore, the use of hard structures as a shoreline erosion response measure for ocean and inlet shorelines is prohibited by the State of North Carolina. Prior to 2003, the hard structure prohibition was controlled by regulations enacted by the N.C. Coastal Resources Commission in response to the Coastal Area Management Act (CAMA). In 2003, the N.C. State Legislature pass a law (Session Law 2003-427, § 113A-115.1) specifically prohibiting the construction of breakwaters, bulkhead, groins, jetties, revetments, seawalls, and similar structures in response to ocean and inlet shoreline erosion. Therefore, this alternative has been eliminated from further consideration.

The development and implementation of an Inlet Sand Management Program (Alternative H) is in compliance with several of the project needs, but is outside the scope of this project and does not address the issue of remedial actions required to immediately address channel migration and erosion along the Emerald Isle segment of the Bogue Inlet shoreline. Alternative H has been eliminated from further consideration in the following analysis of potential actions.

5.2 GENERAL ENVIRONMENTAL CONSEQUENCES

All of the alternative actions carried forth and considered for implementation, have environmental consequences associated with them and are discussed in greater detail in the following sections. Although the scope of the habitat and resource mapping currently being conducted by the Town of Emerald Isle encompass a much larger survey area (Appendix C) only those resources within the USACE defined Permit Area (Appendix C) have been discussed and evaluated. The Permit Area for the project has been defined as that segment of the Bogue Inlet complex that will receive direct and immediate indirect impacts from project construction and equilibration based on geotechnical evaluation and engineering models of the proposed alternatives.

Table 23 provides a summary of the alternatives and the associated physical effects expected to result from their implementation. The summary information in Table 12 provides an acreage estimate of effect expected to result from the implementation of each alternative on the specific marine, estuarine, and upland habitat within the permit area. This general overview of effects based on habitats is provided to allow the reviewer the opportunity to evaluate the specific alternatives and their effect on the biological communities within the permit area. Further evaluation of the direct, indirect, and cumulative effects of each alternative on specific environmental resources is presented in recognition that many of the resources are found within, or utilize numerous habitats through their life cycle. Table 8 provides a summary of the direct and indirect impacts to specific resources anticipated to result from the implementation of each alternative.

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5.3 VEGETATION

A variety of vegetative resources exist within and adjacent to the Bogue Inlet complex as described in Section 4 of the DEIS. The following section provides an impact assessment resulting from implementation of the various alternatives on the vegetative resources in the permit area.

5.3.1 Maritime Hammock

Alternatives A, B, and C

Alternatives A, B, and C would all have the following impacts on maritime hammocks.

Direct and Indirect Impacts. In the event that the inlet channel naturally migrates toward Bear Island and results in erosion of the shoreline to a point where maritime hammock resources are threatened, the Alternatives A, B, and C may have a direct impact on these resources. Likewise, natural changes in the channel location may increase the erosion currently occurring on the southern shore of Dudley Island, and may result in the loss or degradation of the resource to a point where maritime hammock resources are threatened. The recent history of the inlet does not indicate that channel migration is likely and therefore, no direct or indirect impacts to maritime hammock are expected to result.

Cumulative Effects. The eastern migration of the Bogue Inlet channel is not expected to impact the maritime hammocks located on Bear Island and Dudley Island, in the near future. Future actions within the inlet complex, with the exception of development on Bear or Dudley Islands, or natural events that alter or destroy the resource beyond the point of sustainability are not anticipated. No adverse cumulative impacts should result from Alternatives A, B, and C.

Compatibility with Project Objectives. The maritime hammocks on Bear Island and Dudley Island are not directly associated with the stated project needs and objectives.

Alternatives E and F

The impacts of Alternatives E and F on maritime hammocks would be essentially the same.

Direct and Indirect Impacts. Construction activities will be centrally located in the Bogue Inlet complex and should not affect the maritime hammocks present on Dudley Island and Bear Island. Erosion along southern Dudley Island should be

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temporally reduced but should resume once the Emerald Isle sand spit reforms and merges with the sand dike. This should not influence the maritime hammock on Dudley Island as the hammock community is situated well north of the eroding south shoreline of Dudley Island. No direct or indirect impacts to maritime hammock resources is expected.

Cumulative Effects. Alternatives E and F are expected to cause accretion along Bear Island. Maritime hammocks are found upland from the beach environment and additional beach habitat may lead to increased land for maritime hammock growth. Therefore, cumulative impacts to maritime hammock may be positive.

Compatibility with Project Objectives. The maritime hammocks on Bear Island and Dudley Island are not directly associated with the stated project needs and objectives.

5.3.2 Beach and Dune Communities

Alternatives A and B

The impacts of Alternatives A and B on beach and dune communities would be the same as described below.

Direct and Indirect Impacts. Beach and Dune communities are typically composed of beach grasses and woody shrubs. These species can be found across the primary and secondary dune features. The eastern migration of the inlet channel and shoreline is likely to continue under Alternatives A and B for a period of at least four years and perhaps as long as 10 years. This will result in the loss of beach and dune communities along the inlet shoreline and the ocean shoreline for a distance ranging from 240 feet to 600 feet east of the existing inlet. Continued erosion of the inlet shoreline could also result in a breach of the sand spit in an area just north of the existing sand bag revetments. Such a breach would connect the old Coast Guard Channel with Bogue Inlet resulting in a completely new circulation pattern in Bogue Inlet. The new circulation pattern would isolate the north end of the existing Bogue Banks sand spit which could result in this feature becoming an over-wash terrace rather than a dry beach area.

Erosion of the ocean shoreline along the eastern 7,500 feet of Bear Island is likely to continue as long as the inlet channel maintains a position adjacent to the west end of Emerald Isle. Erosion of the east end of Bear Island will result in the loss of beach and dune habitat.

The Town of Emerald Isle would use offshore borrow areas to obtain material to nourish the 23,831 feet of beach included in Phase 3 of its beach nourishment project. The offshore borrow material used to nourish other sections of Bogue

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Banks under the county-wide beach nourishment project have contained high concentrations of shell and shell hash, however the high shell content does not appear to have an impact on the recovery of the flora and fauna within the nourishment area.

Cumulative Effects. The erosion of Emerald Isle inlet shoreline is expected to continue and thus, loss of beach and dune plants and their habitat may result. Erosion on the east end of Bear Island is also likely to continue. The loss of beach and dune plants and their habitat on the west end of Emerald Isle and the east end of Bear Island could lead to negative cumulative impacts.

Compatibility with Project Objectives. Alternatives A and B would not restore the 700 feet of inlet shoreline presently protected by the sandbag revetment. Erosion of the Emerald Isle sand spit north of the existing sandbag revetment will likely continue and could result in a breach of the sand spit connecting Bogue Inlet with the old Coast Guard Channel.

Alternative C – Without Project - Sand Bag Revetments

Direct and Indirect Impacts. Under this alternative, a series of sand bags would be placed to protect threatened houses for two years. While the sand bag revetments would slow the rate of inlet shoreline erosion over a 10-year period, a breach could still occur in the sand spit north of the existing sand bags. If a breach occurs, the isolated portion of the sand spit would slowly evolve into an over-wash terrace with resulting replacement of the beach and dune resource with another habitat either intertidal. Erosion of the ocean shoreline on the east end of Bear Island will also likely continue with the same impacts as Alternatives A and B.

Cumulative Effects. After two years, sand bags would be required to be removed and thus, erosion of western Emerald Isle would continue. A new row of sand bag revetments would be constructed to protect newly threatened homes and roadways. Negative cumulative impacts would result due to the loss of habitat for beach and dune plant communities from continued shoreline erosion and the construction of the sand bag revetments. Since the sand bag revetments can only be constructed to protect homes and infrastructure, erosion of the sand spit north of the existing sand bags would continue and could result in a breach between the inlet and the old Coast Guard Channel and the resulting loss of beach and dune resources in the area. Erosion of the east end of Bear Island would likely continue resulting in the loss of additional beach and dune habitat.

Compatibility with Project Objectives. The series of sand bag revetments would not restore the inlet beach and dune habitats, rather, the sand bags and inlet shoreline erosion would contribute to the continued deterioration of the natural

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beach and dune communities along the sections of the inlet shoreline protected by the sandbags. If a breach occurs between the inlet and the old Coast Guard Channel, the dry sand beach and dunes located on the existing sand spit would evolve into an over-wash terrace.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. The channel will be located to a central location with approximately 200,000 cubic yards used to construct a sand dike across the existing channel and the majority of the material (809,500 cubic yards) stockpiled for eventual transfer to the existing channel. Stockpiling the dredged material on the Emerald Isle sand spit would negatively impact beach and dune communities on the sand spit. Once the stockpiled material is removed from the sand spit, recovery of the beach and dune system could take 1 to 2 years. Since the material removed to construct the new channel would not be used to nourish the portion of the Emerald Isle shoreline included in Phase 3 of the Town's beach nourishment project, offshore borrow material would be used to nourish the 23,831 feet of beach included in Phase 3. Due to the limited fiscal capability of the Town, nourishment of Phase 3 would probably be delayed several years until the Town of Emerald Isle is fiscally capable to undertake the nourishment project. This waiting period for construction of Phase 3 could result in the loss of additional dune and beach habitat along the ocean shoreline of Emerald Isle. Once accomplished, construction of Phase 3 will result in the direct burial of all flora and fauna along this 23,831-foot section of shoreline.

The construction of the sand dike followed by the filling of the existing channel with the stockpiled material is expected to hasten the recovery of the inlet shoreline. A new sand spit is expected to rapidly develop off the west end of Emerald Isle due to a combination of onshore migration of abandoned ebb tide delta material and the longshore movement of material off the western 7,500 feet of ocean shoreline fronting Emerald Isle. This rapid recovery should lead to the development of new sand dunes along the existing eroded inlet shoreline and a rather wide beach fronting the new sand dunes. The recovery of the inlet shoreline and dune system should occur within a 2 year period (see Appendix B). The relocation of the channel is also expected to result in the erosion of the western 7,500 feet of Emerald Isle with shoreline recessions ranging from 400 feet near the inlet to around 10 feet at a point 7,500 feet from the inlet over a 10-year adjustment period (see Appendix B). The erosion will remove a portion of the natural dune field that has developed along this section of the shoreline over the last 15 years. Phase 3 of the permitted Emerald Isle beach nourishment project would probably be constructed in 2007 – 2008 using offshore borrow material that has proved to have a higher than desirable shell content. While the flora and fauna along the nourished beaches of Bogue Banks appear to be recovering, the time period for recovery could be longer than that associated with more compatible

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material.

Some of the predicted erosion on the west end of Emerald Isle would be mitigated by the construction of Phase 3 of the permitted Emerald Isle beach nourishment project. Phase 3 will include placement of some material along the eastern 3,000 feet of the affected shoreline on the west end of Emerald Isle either as part of the main fill or the western taper section. Another mitigating element is the disposal of channel maintenance material on the west end of Emerald Isle by the Corps of Engineers. Since 1984, the Corps has placed a total of 325,000 cubic yards of channel maintenance material on the western 1,500 feet of Emerald Isle, or an average of 20,300 cubic yards/year. The disposal operations, which have occurred at one to three year intervals with amounts ranging from 15,000 cubic yards to 56,000 cubic yards, are expected to continue.

The beach and dune system on the east end of Bear Island (Hammocks Beach State Park) are expected to be positively impacted by the relocation of the channel with shoreline accretion ranging from over 500 feet near the inlet to around 100 feet at a point 7,500 feet west of the inlet (see Appendix B). The accretion of the Bear Island shoreline, which could also take 10 years, should result in the development of a much wider dune field along this section of the Bear Island shoreline.

Cumulative Effects. A large portion of Bogue Banks, including the western 23,831 feet of Emerald Isle included in Phase 3, could become part of a 50-year nourishment program sponsored by the Federal Government to reduce storm damages along the island. A draft Environmental Impact Statement for the Federal Bogue Banks storm damage reduction project is scheduled to be released in 2004. Given the time frame normally associated with the implementation of these types of projects, the first beach nourishment under the Federal program may occur as early as 2008 or 2009. Accordingly, there may be some lingering effects of the Phase 3 beach nourishment project on beach and dune communities at the time the Federal project is constructed.

Compatibility with Project Objectives. The dune and beach habitat would be restored along the 700 feet of inlet shoreline presently protected by the sandbag revetment, however, the beach and dune system located along the western 7,500 feet of Emerald Isle could be negatively impacted as the shoreline adjusts to the new channel position. Phase 3 of the permitted Emerald Isle beach nourishment project will place some material along the eastern 3,000 feet of the shoreline impact area which should mitigate for some of the predicted erosive impacts. The use of offshore borrow material to construct Phase 3 of the permitted Emerald Isle beach nourishment project could result in a higher shell content compared to what naturally exists. Construction of Phase 3 of the permitted Emerald Isle beach nourishment project could be delayed for at least 2 years while the Town of

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Emerald Isle develops the financial capability to complete the beach nourishment project. Erosion of the 23,831 feet of ocean shoreline included in Phase 3 would continue during this interim period.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Construction activities associated with the sand dike could have a temporary negative impact on the beach and dune system on the Emerald Isle sand spit. The sand dike will hasten the development of a new sand spit off the west end of Emerald Isle, however, the time of recovery for the inlet beach and dune system will be somewhat longer compared to Alternative E. Material transported onshore from the abandoned portion of the ebb tide delta should migrate onshore over a 2-year period, filling the seaward portions of the existing channel and welding onto the existing beach on the west end of Emerald Isle. This would be followed by the growth of a sand spit off the west end of Emerald Isle. The sand spit, which would develop from a combination of the abandoned ebb tide delta material and material eroded off the west end of Emerald Isle, should merge with the sand dike in approximately 4 to 6 years following the relocation of the channel (see Appendix B). The newly formed sand spit will provide a wide beach area fronting the existing inlet shoreline which could lead to the development of natural dunes. Shoreline adjustments along the west end of Emerald Isle would be the same as with Alternative E, i.e., the loss of beach and dune fields, and should occur over a 10-year time period.

Most of the material removed to construct the new channel (809,500 cubic yards) would be used to nourish the 23,831 feet of shoreline included in Phase 3 of the permitted Emerald Isle beach nourishment project. The material from the inlet is slightly coarser than but otherwise completely compatible with the native beach material. In this regard, the inlet material contains less than 5% shell and only 1.25% fines. Construction of Phase 3 with the inlet material will result in the immediate burial of the existing flora and fauna, however, given its high degree of compatibility of the inlet material with the native material, the recover time for the flora and fauna should be less than 12 months.

The beach and dune system on the east end of Bear Island (Hammocks Beach State Park) are expected to be positively impacted by the relocation of the channel with shoreline accretion ranging from over 500 feet near the inlet to around 100 feet at a point 7,500 feet west of the inlet (see Appendix B). The accretion of the Bear Island shoreline, which could also take 10 years, should result in the development of a much wider dune field along this section of the Bear Island shoreline.

Cumulative Effects. The beach and dune system along the inlet shoreline will continue to develop over a period of at least 15 years or as long as the new

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channel remains in a position well west of its present location. Shoreline adjustments on the west end of Emerald Isle and the east end of Bear Island will continue over a 6 to 10-year period (see Appendix B). As with Alternative E, the 23,831 feet of beach included in Phase 3 of the permitted Emerald Isle beach nourishment project may eventually be included in a 50-year Federal storm damage reduction project; however, the direct and indirect impacts of the Phase 3 nourishment project should be minor or nonexistent by the time the Federal project is implemented. Also, construction of Phase 3 will mitigate some of the predicted erosion along the eastern 3,000 feet of the shoreline predicted to be negatively impacted by the relocation of the channel.

Compatibility with Project Objectives. Alternative F would eventually result in the complete restoration of the 700 feet of inlet shoreline presently protected by the sandbag revetment and dune habitat and would provide highly compatible beach nourishment material for Phase 3 of the permitted Emerald Isle beach nourishment project. Alternative F fully supports the Town of Emerald Isle's objectives for the project.

5.3.3 Salt Marsh Communities

5.3.3.1 High Salt Marsh

Alternatives A, B, and C would have the same impacts on high salt marsh as described below.

Direct and Indirect Impacts. The south shoreline of Dudley Island and a portion of the Dudley Island shoreline located adjacent to Eastern Channel will continue to erode in response to the growth of the Bogue Banks sand spit. Also, the narrow sand area located just north of the existing sand bag revetments which separates old Coast Guard Channel from Bogue Inlet could be breached resulting in the loss of some high marsh lining the old Coast Guard Channel. The new flow and circulation pattern associated with such a breach could result in long-term erosion or transition of some high marsh resources that have developed along this channel well north of the potential breach. Should a breach occur in the Bogue Banks sand spit, the character of the sand spit would eventually evolve to an over-wash terrace which would not only remove the beach and dune system but would destroy the substantial high marsh community that has developed on the sound side of the sand spit. Some of the high marsh could be replaced by low marsh particularly on the back side of the over-washed sand spit.

Cumulative Effects. If erosion continues along the eastern shoulder of Bogue Inlet there may be a loss of high salt marsh habitat. High salt marsh occurs along the east end of the sand spit and along the northern estuarine shoreline of Emerald Isle. If the channel continues to migrate east and erode the shoreline, inlet hydraulics

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may change and high salt marsh may become inundated or transition to a low salt marsh resource.

Compatibility with Project Objectives. Alternatives A, B, and C would not satisfy the project objective to restore the inlet habitat along the 700 feet of inlet shoreline presently protected by the sandbag revetment and erosion of Dudley Island would contribute to the continued degradation of inlet resources and habitats. A breach of the existing Bogue Banks sand spit would completely alter the character of the sand spit changing it from a dry beach/dune system backed by salt marsh to an over-wash terrace. Some of the high marsh could be replaced by low marsh particularly on the back side of the sand spit.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. Erosion of the Dudley Island shoreline and the associated loss of high salt marsh should be diminished for a period of time until the new sand spit develops off the west end of Emerald Isle and merges with the sand dike across the existing channel. Once the spit connects with the sand dike, the northward growth of the sand spit should resume resulting in a resumption of erosion of the south shoreline of Dudley Island. The time period for the spit to merge with the sand dike is approximately two years (see Appendix B). Alternative E would restore the 700 feet of inlet shoreline presently protected by the sandbag revetment and prevent the possible breach of the existing sand spit. This would preserve the character of the sand spit and prevent the possible loss of high salt marsh located on the sound side of the sand spit.

The well-sorted sands, with a low percentage of fines, to be removed from the proposed channel relocation site and deposited in the existing channel to construct the sand dike or stored on the Emerald Isle sand spit and transferred to fill the existing channel are not expected to be transported to areas of the inlet with high salt marsh resources (see Appendix B). High salt marsh communities are located on Dudley Island approximately 1,500 feet from the landward end of the proposed channel and about 3,500 feet east of the proposed channel behind the Emerald Isle sand spit. The short suspension time of these materials combined with the typical elevation of high salt marsh resources (high salt marsh generally above MHW), which is above the zone of bed load transport, will minimize the potential for direct or indirect impacts on high salt marsh resources.

Cumulative Effects. Cumulative effects to high salt marsh communities are not likely to occur if the channel relocation without beach nourishment alternative is selected. Stockpiling 809,500 cubic yards of channel material on the Emerald Isle sand spit can be done in a manner to prevent the uncontrolled release of this material into the water column until such time that it is mechanically transferred to the existing channel.

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Compatibility with Project Objectives. The existing high salt marsh habitat within the inlet complex would be preserved and possibly enhanced. Therefore, the Town's project objective of inlet resource restoration is supported by this alternative.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Erosion of the Dudley Island shoreline and the associated loss of high salt marsh should be diminished for a period of time until the new sand spit develops off the west end of Emerald Isle and merges with the sand dike across the existing channel. Once the spit connects with the sand dike, the northward growth of the sand spit should resume, resulting in a resumption of erosion of the south shoreline of Dudley Island. The time period for the spit to merge with the sand dike under Alternative F would be approximately four to six years after project completion (see Appendix B). High salt marsh communities are located on Dudley Island approximately 1,500 feet from the landward end of the proposed channel and about 3,500 feet east of the proposed channel behind the Emerald Isle sand spit. Alternative F would restore the 700 feet of inlet shoreline presently protected by the sandbag revetment and prevent the possible breach of the existing sand spit. This would preserve the character of the sand spit and prevent the possible loss of the high salt marsh located on the sound side of the sand spit.

Cumulative Effects. The high salt marsh located behind the Bogue Banks sand spit would be protected and allowed to continue to function as in the past.

Compatibility with Project Objectives. The existing high salt marsh habitat within the inlet complex would be preserved and possibly enhanced. Therefore, the Town's project objective of inlet resource restoration is supported by this alternative.

5.3.3.2 Low Salt Marsh

Alternatives A, B, and C would have the same impacts on low salt marsh as described below.

Direct and Indirect Impacts. The south shoreline of Dudley Island and a portion of the Dudley Island shoreline located adjacent to Eastern Channel will continue to erode in response to the growth of the Bogue Banks sand spit. Also, the narrow sand area located just north of the existing sand bag revetments which separates old Coast Guard Channel from Bogue Inlet could be breached resulting in the loss of some low marsh lining the old Coast Guard Channel. The new flow and circulation pattern associated with such a breach could result in long-term erosion

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or transition of some low marsh resources that have developed along this channel well north of the potential breach. Should a breach occur in the Bogue Banks sand spit, the character of the sand spit would eventually evolve to an over-wash terrace which would not only remove the beach and dune system but would destroy some of the low marsh community that has developed along the sides of the old Coast Guard Channel. Some areas of high salt marsh located on the backside of the sand spit could evolve into low marsh habitat thus replacing some of the low marsh habitat that could be lost if the sand spit is breached at the old Coast Guard Channel.

Cumulative Effects. If erosion continues along the eastern shoulder of Bogue Inlet there may be a loss of low salt marsh habitat. Low salt marsh occurs along the east end of the sand spit and along the northern estuarine shoreline of Emerald Isle. If the channel continues to migrate east and erode the shoreline, inlet hydraulics may change and some of the high salt marsh could become inundated and transition to low salt marsh.

Compatibility with Project Objectives. Alternatives A, B, and C would not satisfy the project objective to restore the inlet habitat along the 700 feet of inlet shoreline presently protected by the sandbag revetment and erosion of Dudley Island would contribute to the continued degradation of inlet resources and habitats. A breach of the existing Bogue Banks sand spit would completely alter the character of the sand spit changing it from a dry beach/dune system backed by salt marsh to an over-wash terrace. Some of the high marsh could be replaced by low marsh particularly on the back side of the sand spit.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. Erosion of the Dudley Island shoreline and the associated loss of low salt marsh should be diminished for a period of time until the new sand spit develops off the west end of Emerald Isle and merges with the sand dike across the existing channel. Once the spit connects with the sand dike, the northward growth of the sand spit should resume resulting in a resumption of erosion of the south shoreline of Dudley Island. The time period for the spit to merge with the sand dike is approximately two years (see Appendix B). Alternative E would restore the 700 feet of inlet shoreline presently protected by the sandbag revetment and prevent the possible breach of the existing sand spit. This would preserve the character of the sand spit and prevent the possible loss of low salt marsh located on the sound side of the sand spit.

The well-sorted sands, with a low percentage of fines, to be removed from the proposed channel relocation site and deposited in the existing channel to construct the sand dike or stored on the Emerald Isle sand spit and transferred to fill the existing channel are not expected to be transported to areas of the inlet with low

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salt marsh resources (see Appendix B). Low salt marsh communities are located on Dudley Island approximately 500 feet from the landward end of the proposed channel and about 3,500 feet east of the proposed channel behind the Emerald Isle sand spit.

Cumulative Effects. Cumulative effects to low salt marsh communities are not likely to occur if the channel relocation without beach nourishment alternative is selected. Stockpiling 809,500 cubic yards of channel material on the Emerald Isle sand spit can be done in a manner to prevent the uncontrolled release of this material into the water column until such time that it is mechanically transferred to the existing channel.

Compatibility with Project Objectives. The existing low salt marsh habitat within the inlet complex would be preserved and possibly enhanced. Therefore, the Town's project objective of inlet resource restoration is supported by this alternative.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Erosion of the Dudley Island shoreline and the associated loss of low salt marsh should be diminished for a period of time until the new sand spit develops off the west end of Emerald Isle and merges with the sand dike across the existing channel. Once the spit connects with the sand dike, the northward growth of the sand spit should resume, resulting in a resumption of erosion of the south shoreline of Dudley Island. The time period for the spit to merge with the sand dike under Alternative F would be approximately four to six years after project completion (see Appendix B). Low salt marsh communities are located on Dudley Island approximately 500 feet from the landward end of the proposed channel and about 3,500 feet east of the proposed channel behind the Emerald Isle sand spit. Alternative F would restore the 700 feet of inlet shoreline presently protected by the existing sandbag revetment and prevent the possible breach of the existing sand spit. This would preserve the character of the sand spit and prevent the possible loss of the low salt marsh located on the sound side of the sand spit.

Cumulative Effects. The low salt marsh located behind the Bogue Banks sand spit would be protected and allowed to continue to function as in the past.

Compatibility with Project Objectives. The existing low salt marsh habitat within the inlet complex would be preserved and possibly enhanced. Therefore, the Town's project objective of inlet resource restoration is supported by this alternative.

5.3.4 Submerged Aquatic Vegetation (SAV) Communities

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Alternatives A, B, and C would have the same impacts on SAV as described below.

Direct and Indirect Impacts. Submerged Aquatic Vegetation (SAV) is most often found in the sheltered environments of shallow estuarine waters. SAV resources in Bogue Inlet are located in areas behind Bear Island, around Dudley Island and throughout western Bogue Sound. Impacts of Alternatives A, B, and C are expected to be concentrated near the western end of Emerald Isle as the eastern migration of the channel continues.

The USACE Navigation Branch will continue to regularly maintain the navigation channel through Bogue Inlet using U.S. Government sidecast dredges capable of operating in shallow water. Sidecast dredges remove material from the navigation channel using dragarms similar to hopper dredges and discharge the material directly into the open waters of Bogue Inlet off the side of the vessel. Between 1984 and 1999, the average amount of material removed from the channel bottom and discharged into the open waters of Bogue Inlet averaged 151,500 cubic yards/year. Over the last three years (2000 to 2002) maintenance dredging has increased substantially, averaging 514,200 cubic yards/year. The discharge of the dredged material into the open waters of Bogue Inlet has apparently not had a negative impact on SAV farther back in the sound as SAV areas identified by a 1992 survey still exists in 2003. The lack of adverse impact on SAV resulting from maintenance dredging activities is probably due to the low silt content (approximately 1.25%) of the inlet material.

Cumulative Effects. The continuation of the erosion on the Emerald Isle inlet shoreline and the possible overwash and breaching of the Emerald Isle sand spit could create differences in water flux, salinity, and turbidity in areas that were once protected behind the Emerald Isle sand spit. If a breach in the sand spit does occur, the travel distance for suspended sediment from the inlet channel, where maintenance dredging takes place, and the SAV beds located in western Bogue Sound could be shortened substantially. If this changed circulation pattern results in changes in salinity and/or turbidity, cumulative effects on SAV could be negative.

Compatibility with Project Objectives. Alternatives A, B, and C would not restore the inlet habitat including the environment necessary to support SAV's and does not support the Town's objectives for the project.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. Dredging to relocate the channel to the middle of the inlet, construction of the sand dike across the existing channel, stockpiling material on the Emerald Isle sand spit, and the mechanical transfer of the stockpiled material

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to fill the existing channel is expected to temporarily increase the turbidity in the Inlet. However, turbidity should remain below the state standard outside the immediate area of dike construction because the sand in the Inlet is well-sorted and contains a low silt/clay percentage.

Cumulative Effects. Impacts from project construction that may affect SAV, such as increases in turbidity and sedimentation, are expected to be temporary during the construction phase and remain localized. No adverse cumulative impacts to SAV resources should result from the implementation of the channel relocation without beach nourishment alternative.

Compatibility with Project Objectives. SAV resources in the project area are not expected to be significantly impacted by Alternative E. Therefore, inlet habitats including SAV resources would be protected in support of the Town of Emerald Isle's project objectives.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Relocation of the channel and construction of the sand dike are predicted to cause a short term increase in turbidity and sedimentation levels. However, due to the low silt percentage and the well-sorted sands in the Inlet, the turbidity levels are expected to remain below the state standard outside the immediate area of dike construction. The relatively coarse grain size of the inlet material and its relatively low silt content (approximately 1.25%) will limit the movement of the sediment plume during construction to the confluence of the inlet channel with Eastern and Western Channels, that is, the plume is not expected to travel any appreciable distance into the sound (see Appendix B). In this regard, SAV resources are found in those areas away from the throat of Bogue Inlet in areas that are protected from sudden changes in water quality such as turbidity. SAV resources may also be impacted by changes in salinity; however, the dimensions of the new channel were selected to maintain the same tidal exchange (including salinity) through the inlet that presently exists (see Appendix B). Therefore, there should not be any impacts on SAV due to changes in water quality or sedimentation.

Cumulative Effects. Turbidity levels are predicted to remain localized and below the state standard. Salinity throughout the inlet complex will remain unchanged as Bogue Inlet, with the new channel, will have the same tidal prism or tidal flow as the existing inlet. Therefore, cumulative impacts to SAV under Alternative F are not expected.

Compatibility with Project Objectives. SAV resources in the project area are not expected to be significantly impacted by Alternative F. Therefore, inlet habitats including SAV resources would be protected and restored in support of the Town