

Figure E.5 Emerald Isle Inlet Shoreline Change Rates

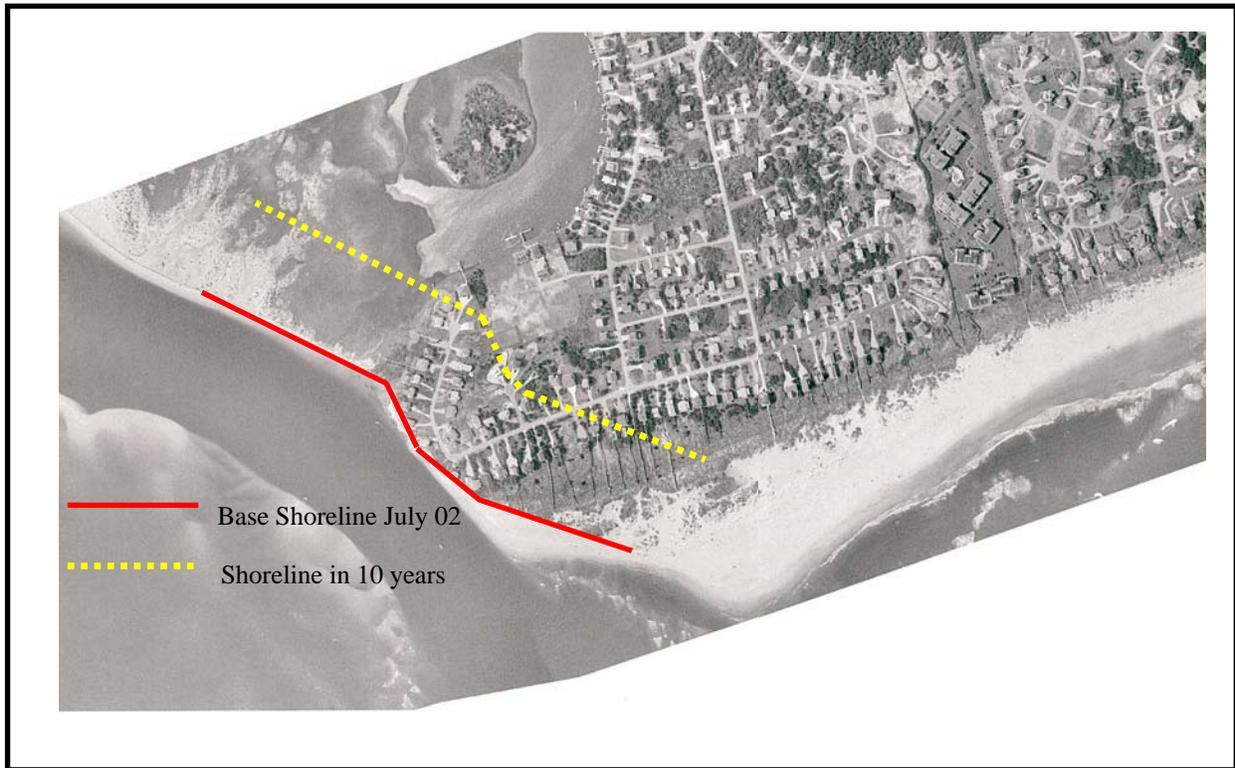
in an inlet shoreline erosion rate of 87.5 feet/year with the September 1996 shoreline position included (Figure E.5) versus 91.3 feet/year with the September 1996 position excluded (Figure E.5). Even though the inlet shoreline has experienced a range of shoreline changes from around 60 feet/year to 90 feet/year since the mid 1980's, the evaluation of the without project impacts on the economy of Emerald Isle and Carteret County was based on the continuation of an erosion rate of 60 feet/year for at least the next 10 years.

**E.4. Without Project Alternatives.** The economic impacts of three without project alternatives were evaluated in detail to determine their economic impact on the economy of Emerald Isle and Carteret County. The first alternative (Without Project – No Action) assumed that the inlet shoreline would continue to migrate to the east unimpeded over a period of 10 years. Under this alternative, a structure would be lost to erosion once the inlet shoreline reaches its foundation. When this occurs, the structure would be abandoned and demolished by its owner. The second alternative (Without Project – Structure Relocation) assumes that once a structure becomes threatened, the property owner would elect to relocate the building to some other location within the town limits of Emerald Isle. The inlet shoreline erosion rate used to evaluate this alternative was the same as the No Action Alternative. The third alternative (Without Project – Interim Sandbags) assumes that sandbag revetments would be constructed to protect buildings and roads once they become threatened. In this regard, the State of North Carolina considers a structure to be threatened once the erosion encroaches within 20 feet of its

foundation. In the case of a road, the threatened status begins when erosion reaches the road right-of-way. State rules allow temporary sandbags protecting buildings to remain in place for a period of 2 years after which they must be removed. Sandbag structures constructed to protect roads are allowed to remain in place for 5 years after which they too must be removed. In practice, the State has granted some extensions of the 2-year and 5-year rules, particularly if a long-term protection plan is being formulated. However, for the without project analysis, the assumption was made that no long-term plans are being considered and that the sandbags must be removed at the end of their permit period.

E.5. In addition to the three without project alternatives evaluated in detail for their economic impacts, four other alternatives to the applicant's preferred alternative for responding to the erosion being caused by the eastward migration of the Bogue Inlet channel were evaluated. The additional alternatives considered were; hard structures, suspension of the Corps of Engineers maintenance dredging in Bogue Inlet, channel relocation without beach nourishment, and inlet sand management. An evaluation of the ability of the seven alternatives to applicant's preferred alternative to satisfy the project goals and objectives is provided at the end of this Appendix.

**E.6. Without Project – No Action.** The projected 10-year shoreline position for the 60-foot/year erosion rate is shown on Figure E.6. The base shoreline used for these projections is shown in red on each of these figures and generally follows the July 2002 vegetation line.



**Figure E.6**  
**Without Project Shoreline Projection Based on Erosion Rate of 60 feet/year**

**E.7. Erosion Damage to Real Property and Infrastructure - No Action Alternative.**

The future shoreline position based on the 60-foot/year erosion rate was plotted in 2-year increments and the properties that would be impacted by the new shorelines identified. The future shoreline positions are based on the assumption that the existing 700 feet of sandbags protecting the Pointe would be removed in year 0 of the analysis. The one-time correction in the shoreline position expected to occur following the removal of the sandbag revetment was assumed to be included in the 2-year shoreline position. The projected erosion during the first 2 years would remove the western end of Inlet Drive and a portion of Bogue Court. As a result of the loss of a portion of Bogue Court, a temporary road would have to be constructed to provide access to Bogue Court. The likely route for the road would be off Channel Drive and would run behind the Coast Guard property to connect with the west end of Bogue Court. The total length of this temporary access road would be approximately 900 feet. As the erosion continues, the intersection of Inlet Court and Inlet Drive would also be lost by year 6 requiring another 100-foot long access road to connect with the west end of Inlet Court. This 100-foot access road would be constructed off of the temporary access road to Bogue Court.

E.8. The 2002 tax value associated with each impacted building or parcel was obtained from the Carteret County Tax Office with the value of the properties increased by 4.8 percent per year over the 10-year analysis period to account for inflation. Buildings were assumed to be lost to erosion when the future shoreline position reached or moved past its foundation. Once a building is lost to erosion, the owner would be responsible for removing the debris including abandoned septic tanks. The cost associated with this cleanup was assumed to be 10 percent of the property value. Cleanup costs were not included for vacant lots. In most instances, the loss of the structures would be slow enough to allow the owners to remove all furnishings and other personal articles from the structures, therefore, damage to contents are not included in the analysis. The length of roads that would be lost during each 2-year increment was also measured along with the length of service utilities that are located within the road right-of-way such as waterlines, storm sewers, electrical, and telephone lines. The values of the roads and utilities were based on 2002 construction costs and inflated at a rate of 3 percent per year as determined from historic changes in the Engineering News Record Construction Cost Index for the period from 1992 to 2002. The cumulative economic value of the properties and infrastructure lost during each 2-year increment over the 10-year analysis period is given in Table E.1. In order to put all of the future damages on an equitable basis for comparison with the cost of the channel relocation project, all values in Table E.1 are given in terms of their present worth based on an interest rate of 6 percent.

Table E.1  
No Action Alternative  
Present Worth of Cumulative Damages to Real Property and Infrastructure  
Inlet Shoreline Erosion Rate = 60 feet/year

Year	Sum of Parcels	Sum of Vacant Lots	Damage to Real Property ( <sup>1</sup> )	Cleanup Cost ( <sup>2</sup> )	Damage to Infrastructure ( <sup>3</sup> )	Total Damage
2	7	0	\$1,211,900	\$121,200	\$267,300	\$1,600,400
4	15	0	\$3,871,800	\$387,200	\$358,700	\$4,617,700
6	24	1	\$5,641,200	\$553,700	\$475,500	\$6,670,400
8	33	4	\$7,529,300	\$699,900	\$575,300	\$8,804,500
10	41	5	\$9,898,700	\$926,900	\$667,200	\$11,492,800

<sup>(1)</sup> Future values based on an inflation rate of 4.8% per year.

<sup>(2)</sup> Cleanup cost = 10% of structure damage (does not include vacant lots)

<sup>(3)</sup> Includes new access roads, damage to existing roads, waterlines, electric service, and telephone service.

E.9. As the inlet shoreline migrates to the east, the strip of land separating the old Coast Guard Channel and Bogue Inlet would become much narrower with a breach likely occurring around year 6. The reconnection of the Coast Guard Channel to the inlet would result in the eventual disintegration of the existing Emerald Isle sand spit as the movement of littoral sediment down the spit would be prevented. With the sand source to the spit eliminated, it would evolve into a low relief over wash terrace.

E.10. **Loss of Tax Revenue – No Action Alternative.** While the one-time loss of real property associated with the erosion of the inlet shoreline is substantial, the property

losses would have a reoccurring and long-term impact on the economy of the Town and Carteret County as a result of loss tax revenues. The current tax rate for the Town of Emerald Isle is \$0.175 per \$100 valuation and \$0.465 per \$100 valuation for Carteret County. These tax rates were assumed to remain constant during the analysis period. Once the properties are removed from the Town and County tax base, their removal would continue to impact both the Town and the County for years to come. However, estimates of future losses in tax revenues were limited to the 10-year analysis period. Cumulative losses in tax revenues for Emerald Isle, Carteret County and the total for the town and county are given in Table E.2. Again the future values of tax revenues lost are given in terms of their present worth based on an interest rate of 6%.

Table E.2  
Present Worth of Tax Revenue Losses  
Without Project Condition – No Action Alternative

Year	Cumulative Present Worth Lost Property	Emerald Isle Present Worth Cumulative Tax Losses	Carteret County Present Worth Cumulative Tax Losses	Town & County Present Worth Cumulative Tax Losses
0	\$923,900	\$1,600	\$4,300	\$5,900
1	\$1,067,900	\$3,500	\$9,300	\$12,800
2	\$1,211,900	\$5,600	\$14,900	\$20,500
3	\$2,541,900	\$10,100	\$26,700	\$36,800
4	\$3,871,800	\$16,800	\$44,700	\$61,500
5	\$4,756,500	\$25,200	\$66,800	\$92,000
6	\$5,641,200	\$35,000	\$93,100	\$128,100
7	\$6,585,300	\$46,600	\$123,700	\$170,300
8	\$7,529,300	\$59,700	\$158,700	\$218,400
9	\$8,714,000	\$75,000	\$199,200	\$274,200
10	\$9,898,700	\$92,300	\$245,300	\$337,600

**E.11. Impact on Household Spending – No Action Alternative.** A total of 36 houses would be lost over the next 10 years if the inlet shoreline continues to erode at an average rate of 60 feet/year. Since all of the affected houses are not occupied year-round, an occupancy rate of 70 percent was assumed for this analysis. The loss of these households would have a direct impact on the local economy. According to a survey conducted by the American Express Company <sup>(1)</sup>, household spending for items such as utilities, groceries, gasoline, healthcare, fast food, education, home furnishings, and drug store items (health and beauty aids) totaled \$17,300 in 1999. These are items that would be purchased locally and have an impact on the local economy. The cost for these household expenses has historically increased by 5 percent per year so that the equivalent rate in 2003 would be approximately \$20,000/year per household. Like the loss of tax revenues, the impact of the reduction in household spending on the local economy would continue well beyond the 10-year analysis period, however, the estimate of the economic impact of reduced household spending on the local economy was limited to the 10-year analysis period. A summary of the yearly reduction in household spending resulting from the lost of these 36 homes over the 10-year analysis period is provided in Table E.3 along with the cumulative impacts throughout the analysis period. The reduction in household

spending would have a multiplying effect on the local economy and could result in the loss of some jobs and a reduction in local sales taxes. This multiplying effect was not included in the impact analysis.

<sup>(1)</sup> ([http://home3.americanexpress.com/corp/latestnews/everyday\\_spend.asp](http://home3.americanexpress.com/corp/latestnews/everyday_spend.asp))

Table E.3  
Reduction in Household Spending  
Without Project Condition – No Action Alternative

Year	Cumulative Households Impacted	Present Worth Reduced Household Spending	Cumulative Present Worth Reduced Household Spending
0	5	\$70,000	\$70,000
1	6	\$83,200	\$153,200
2	7	\$96,200	\$249,400
3	11	\$152,500	\$401,900
4	15	\$202,200	\$604,100
5	19	\$256,600	\$860,700
6	23	\$304,200	\$1,164,900
7	26	\$343,000	\$1,507,900
8	29	\$376,400	\$1,884,300
9	33	\$420,500	\$2,304,800
10	36	\$485,400	\$2,763,200

E-12. **Summary Economic Impact – No Action Alternative.** Table E.4 provides a summary of the damages to real property and infrastructure and the recurring losses to the local economy that would result from the continued unimpeded erosion of the inlet shoreline over the next 10 years (No Action Alternative). All values are given in present worth based on an interest rate of 6 percent computed over the 10-year analysis period.

Table E.4  
Summary of Damages and Impact on Local Economy  
(Without Project – No Action Alternative)  
Continued Inlet Shoreline Erosion Over the Next 10 Years

year	Cumulative Present Worth Damages <sup>(1)</sup>	Cumulative Present Worth Lost Taxes Town & County	Cumulative Present Worth Reduction in Household Spending	Total Present Worth Economic Impact
2	\$1,600,400	\$20,500	\$249,400	\$1,870,300
4	\$4,617,700	\$61,600	\$604,100	\$5,283,400
6	\$6,670,400	\$128,100	\$1,164,900	\$7,963,400
8	\$8,804,500	\$218,400	\$1,884,200	\$10,907,100
10	\$11,492,800	\$337,600	\$2,763,100	\$14,593,500

<sup>(1)</sup> Includes lost structures, damage to infrastructure, and temporary access roads.

E.13. **Beach Nourishment Costs.** Some of the material that would be removed from Bogue Inlet to reposition the channel midway between Bogue Banks and Hammocks Beach State Park (Bear Island) would be used to nourish the western 20,000 feet of

Emerald Isle (Phase 3 of the Bogue Banks beach nourishment project). Based on an in place fill rate of 40.5 cubic yards/lineal foot of beach, a total of 810,000 cubic yards of material would be needed to complete Phase 3 of the project. If the channel relocation project is not implemented, the Town of Emerald Isle would use the approved offshore borrow areas to complete the project and the costs for using the offshore borrow areas would be additional costs associated with the without project condition. Based on the contract costs for nourishing the east portion of Emerald Isle (Phase 2 of the Bogue Banks project), the costs for pumping 810,000 cubic yards of material to the beach from the offshore borrow areas would be approximately \$5.8 million.

**E.14. Total Costs of Without Project – No Action Alternative.** The cost for nourishing the western 20,000 feet of Emerald Isle using material from the offshore borrow areas will be added to the total present worth of damages and economic losses given in Table E.4 in order to obtain the without project costs of the No Action Alternative for comparison with the cost of the channel relocation project. The resulting total cost for the Without Project Condition – No Action Alternative for the 2-year intervals used in the analysis are given in Table E.5.

Table E.5  
Total Costs for Without Project – No Action Alternative  
Including Offshore Nourishment Cost for Phase 3 of Emerald Isle

Year	Total PW Damages & Economic Impact Plus Offshore Dredging Costs
2	\$7,670,300
4	\$11,083,400
6	\$13,763,400
8	\$16,707,100
10	\$20,393,500

**E.15. Without Project – Structure Relocation.** Rather than allow the structures to fall victim to the continued eastward migration of the inlet shoreline, the Structure Relocation Alternative assumes that each home owner would elect to move the structure to another lot located somewhere within the town limits of Emerald Isle once they become threatened. In this regard, the time line in and the number of structures that would become threatened are the same as the No Action Alternative. The relocation alternative involves the following:

- a. Purchase of a new lot
- b. Site work at the new lot that would include the installation of new utilities and the driving of new pile foundations.
- c. Clean-up of the abandoned lot. This would include the removal of any concrete slabs and the removal of the old septic system and other utilities.
- d. Prepare and move the structure to the new lot.
- e. Connecting the structure to the utilities installed on the new lot.

E.16. Based on the price of lots listed by several real estate companies in Emerald Isle, available lots in range in price from \$50,000 to \$150,000 for typical interior, i.e., non-waterfront lots. For this analysis, the cost of the new lot was assumed to be \$80,000 in 2002 with the cost of the lot purchase inflated by 4.8 % per year over the 10-year analysis period. The costs for the site work at the existing and new lot and the cost of moving the structure were based on costs developed by Coastal Science and Engineering, PLLC (CSE) and Stroud Engineering, PA (Stroud) for the Bogue Banks beach nourishment project (1). The base unit cost for the site work reported by CSE-Stroud was \$32.59/square foot with the cost of the move equal to \$25/square foot of structure plus \$8,000 for secondary power during the move. These costs were also inflated 4.8 % per year over the analysis period. Once the structure is removed from its existing lot, the lot would be lost to erosion and would therefore be removed from the Emerald Isle and Carteret County tax bases. The value of the structure situated on its new lot was assumed to hold its original value; therefore there would be no net loss in tax base for the structure. Since the existing lot is already included in the existing tax base, placing the structure on the lot was assumed not to affect its current tax value.

E.17. The costs of the Structure Relocation Alternative were grouped into three categories: (a) cost to the property owner for purchase of a new lot and moving the structure to the new lot; (b) damage and cost to infrastructure at the Pointe; and (c) reduction in the Emerald Isle and Carteret County tax bases due to the loss of the abandoned lots. Damage and costs associated with the Pointe infrastructure would be the same as the No Action Alternative. As was the case for the No Action Alternative, the future tax rates for both the town and county were assumed to remain constant at their current values however, the future value of the abandoned lots were inflated by 4.8 % per year from their 2002 values to the year the lots would be removed by erosion. The Relocation Alternative would not involve any reduction in household spending since the assumption was made that all affected property owners would elect to keep there structures within the town limits of Emerald Isle.

E.18. A summary of the cost and damages for the Structure Relocation Alternative for each 2-year increment of the analysis is provided in Table E.6. As was the case with the No Action Alternative, the Structure Relocation Alternative would not provide any material for Phase 3 of the Emerald Isle beach nourishment project. Therefore, the town would have to complete Phase 3 using the approved offshore borrow areas at a cost of \$5.8 million. The cost for constructing Phase 3 of the Emerald Isle beach nourishment project using an offshore borrow area is included in the total cost column in Table E.6.