The Economic Impacts of Carolina Beach Inlet Navigability on Waterfront Property Values

Carolina Beach Inlet.

June 5, 2018

By:
Dr. Chris Dumas, Ph.D.
Professor of Economics
Department of Environmental Science
UNC-Wilmington
601 South College Road
Wilmington, NC 28401
910-962-4026
dumasc@uncw.edu

Mr. Brendan Manley, M.S.
Graduate Research Assistant
Department of Environmental Science
UNC-Wilmington
601 South College Road
Wilmington, NC 28401

UNCW®

For:
Carolina Beach Inlet Association
PO Box 1099
1500 Bridge Barrier Rd.
Carolina Beach, N.C. 28428

Acknowledgements

Contents

Executive Summary

- One amenity associated with coastal estuarine/waterway waterfront property is the ability to access the ocean by boat through inlets that connect inland waterways with the ocean. All else equal, one would expect faster ocean access to be associated with higher property values. If shoaling blocks an inlet, owners must travel farther to reach the next-nearest inlet, slowing access to the ocean, with possibly negative effects on waterfront property values.

- The purpose of this study is to assess the potential impact of the complete loss of Carolina Beach Inlet (CBI) navigability on estuarine/waterway waterfront (oceanfront properties excluded) residential property values in New Hanover County, North Carolina.

- For the set of properties for which CBI is the nearest inlet, the average distance to CBI is 2.15 miles, while the average distance to the next-nearest inlet is 9.24 miles. The difference in distance is twice as far as the difference in distance for the average estuarine/waterway waterfront parcel in New Hanover County.

- Multiple regression analysis is used to estimate the effect of inlet distance on estuarine/waterway waterfront parcel values while controlling for other factors that can affect parcel values, including parcel acreage, structure square footage, distance to the oceanfront, "neighborhood" effects, and annual effects.

- The analysis finds that inlet distance has a negative and highly statistically significant effect on single-family parcel values (see Figure 4). The result for single-family parcels is robust to several alternative model specifications. As expected, the effect is nonlinear, being stronger when a parcel is closer to an inlet and weaker when a parcel is farther from an inlet.

- Results are somewhat mixed for condominium/townhouse parcels, but on balance, inlet distance appears to have a negative effect on condominium/townhouse parcel values; however, the degree of statistical confidence in this result is lower, compared to results for single-family parcels.

- New Hanover County has 4,485 estuarine/waterway waterfront residential parcels with an assessed value of $3.34 billion (year 2016 dollars). CBI is the nearest inlet for 1,359 of these parcels with an assessed value of $561 million, and of these, 890 parcels with an assessed value of $278 million are located within the Town of Carolina Beach proper.

- If CBI were to become unnavigable and the next-nearest inlet (i.e., Masonboro Inlet) became the nearest inlet, the typical (median) parcel would lose an estimated $45,069 in value (16.6 percent), with an estimated aggregate loss of $84.7 million in assessed value for all parcels for which CBI is the nearest inlet. Of this, parcels located in the Town of Carolina Beach itself would lose an estimated $42.7 million in aggregate assessed value.

- The property tax rate for New Hanover County is 0.5700 per $100 of assessed value. For the parcels for which CBI is the nearest inlet, the $84.7 million in lost value equates to a reduction in county property tax revenues of $482,818 per year.

Introduction

Coastal estuarine/waterway waterfront property offers scenic views and water recreation amenities. One amenity associated with such property is the ability to access the ocean by boat through inlets that connect inland waterways with the ocean. A property located closer to an inlet provides faster access to the ocean. All else equal, one would expect faster ocean access to be associated with higher property values. In North Carolina, many coastal property owners rely on shallow water inlets to provide access to the ocean from their property and boat slips located along inland waterways. Typically, if these inlets are not maintained on a regular basis, they will shoal, reducing access to the ocean. The degree of shoaling varies from inlet to inlet and from year to year. In the worst cases, shoaling can prevent all but the smallest vessels (the smallest jon boats, kayaks, canoes) from using the inlet.

In recent years, the federal government portion of the traditional cost-share funding to support the dredging of shallow water inlets in North Carolina has become increasingly uncertain. If funding from all sources is not sufficient to maintain inlet navigability, shallow water inlets will shoal, reducing vessel access to the ocean. If shoaling completely blocks an inlet, then property owners must travel farther in their vessels to reach the next-nearest inlet, which is often miles away, slowing access to the ocean, which might reduce the value of coastal watefront property.

Dumas and Whitehead (2014) estimated the economic impacts of Carolina Beach Inlet (located in New Hanover County, North Carolina) shoaling on commercial fishing, for-hire fishing, and private boating activity; however, Dumas and Whitehead did not consider the impacts of inlet shoaling on waterfront property values. <u>The purpose of this study is to assess the potential impact of the complete loss of Carolina Beach Inlet navigability on estuarine/waterway ("sound-side") waterfront residential property values in New Hanover County, North Carolina.</u>

The properties included in the analysis are waterfront, estuarine/waterway residential parcels; no oceanfront parcels are included in the analysis. Parcels are located in the Town of Carolina Beach, the Town of Wrightsville Beach, other waterfront areas of New Hanover County (designated "Wilmington" for the purposes of this study) between Carolina Beach and Wrightsville Beach, and areas of New Hanover County between Wrightsville Beach, and waterfront areas of Pender County. Parcels located in all Pender County are grouped together as "Pender" parcels for the purposes of this study. No parcels from the Town of Kure Beach are included, because there are no estuarine/waterway waterfront residential parcels in Kure Beach. Parcels along the Snows Cut waterway (just north of Carolina Beach) are included, and parcels along the eastern edge of the Cape Fear River from Snows Cut to River Vista Drive are included.

Based on discussions between the Carolina Beach Inlet Association and University of North Carolina Wilmington (UNCW) professor Chris Dumas held on February 19, 2016, in Wilmington, NC, the UNCW Department of Environmental Sciences agreed to conduct a study of *The Economic Impacts of Carolina Beach Inlet Navigability on Waterfront Property Values* supported by funding from the UNCW Community Engagement Grant program.

Data

The study is based on two datasets: (1) county tax office property parcel data for years 2012 (most recent available for New Hanover County) and 2011 (most recent available for Pender County) and (2) Multiple Listing Service (MLS) real estate data for years 1999 to 2017 (inclusive) for New Hanover and Pender Counties, North Carolina. Although the study focuses on New Hanover County properties, parcel data from both New Hanover County and adjacent Pender County are used to develop the statistical relationship between inlet distance and property values.

The county tax office property parcel datasets for New Hanover and Pender Counties were obtained in April 2016 from the geographic information systems (GIS) data coordination site for North Carolina, "NC OneMap" (NC Geographic Information Coordination Council 2017). Each county in North Carolina uploads its tax office parcel data to the NC OneMap website. The tax office datasets provide parcel-level information on: the county in which the parcel is located, county parcel identification number, street address, property type (i.e., residential, commercial, government, etc.), lot acreage, assessed values as of 2011 (Pender County) or 2012 (New Hanover County), and, most importantly for this study, the geographic location (latitude and longitude) of each parcel. The New Hanover County tax office dataset contained information on 103,536 parcels. The Pender County tax office dataset contained information on 47,639 parcels.

For each parcel in the county tax office datasets, the straight-line ("as the crow flies") distance in miles was calculated between the centroid of the parcel and each coastal inlet in New Hanover, Pender and adjacent Onslow (to the north) and Brunswick (to the south) Counties. The inlets included in the study are presented in order from north to south in Table 1, and a map of these locations is presented in Figure 1. The latitude and longitude of each inlet were determined using ArcMap 10.3.1 GIS software (ESRI 2016) and geospatial data on the location of the North Carolina shoreline oceanfront obtained in August 2016 from the North Carolina Department of Environmental Quality (NCDEQ 2016). ArcMap was used to calculate the distance from each parcel to each inlet based on the latitude and longitude of each property parcel and the latitude and longitude of the center of each inlet. These distances were added to the county tax office parcel datasets.

The MLS data for New Hanover and Pender Counties, North Carolina, were obtained from the Wilmington Regional Association of Realtors (2017). The MLS data provide parcel-level information on: county name, county parcel identification number, street address, property type (i.e., residential, commercial, government, etc.), lot acreage, heated square feet of any structure present on the parcel, year built, number of bedrooms, number of full bathrooms, number of half bathrooms, number of garage spaces, whether the parcel was adjacent to a golf course, whether the parcel had a waterfront location, and, importantly for this study, the sales date and sales (market) price for each sale from 1999 through 2017. If a parcel sold more than once from 1999 through 2017, each sale is recorded separately in the dataset. Prices were adjusted for inflation to 2016-year equivalent dollars using the U.S. GDP Implicit Price Deflator (USBEA 2018). After dropping 226 observations with bad parcel identification numbers, the MLS dataset contained information on 27,014 real estate sales transactions in New Hanover County and 6,924 real estate sales transactions in Pender County. Note that the MLS dataset does not include

information on all parcels but rather only those parcels that were sold at some point from 1999 through 2017. The parcels in the MLS dataset are used to estimate the relationship between inlet distance and sales price, and this relationship is then applied to all parcels in the county tax office datasets.

The waterfront indicator variable in the MLS dataset does not distinguish ocean waterfront parcels from estuarine/waterway waterfront parcels. To identify estuarine/waterfront parcels, the county tax office parcel data were imported into ArcMap and combined with geospatial data on the location of the North Carolina estuarine/waterway shoreline in year 2012, the most recent shoreline data available when obtained in July 2016 from the North Carolina Department of Environmental Quality (NCDEQ 2016). ArcMap was used to identify all parcels within 300 feet of the estuarine/waterway shoreline using the "Select By Location" feature of ArcMap. The identified parcels were then checked individually in ArcMap to (1) delete any oceanfront parcels, (2) delete any non-waterfront parcels that were incorrectly included, and (3) add any estuarine/waterway waterfront parcels that were incorrectly excluded by the 300 foot buffer selection criterion. An indicator variable was added to the tax office parcel datasets to indicate which parcels are estuarine/waterway waterfront parcels.

The "Near" function in ArcMap was used to calculate the Euclidean (straight-line) distance between each parcel and the nearest ocean shoreline. This distance to the ocean shoreline for each parcel was added to the tax office parcel datasets.

The information in the county tax office parcel datasets was added to the MLS dataset for those parcels present in both datasets using the county parcel identification numbers. New Hanover and Pender counties have different parcel ID numbering systems, and this difference was accounted for when combining the datasets. If a given property sold more than once during the study time period, the tax office data for the property was matched with the MLS data for the property for each transaction in the MLS dataset.

Methods

Descriptive Statistics

To provide a general overview of the data, summary descriptive statistics were calculated for all estuarine/waterway waterfront residential parcels that were used to estimate the relationship between inlet distance and parcel value (those parcels in the MLS dataset). This information is presented for three geographic regions: (1) all parcels in New Hanover and Pender Counties, (2) all parcels for which the nearest inlet is Carolina Beach Inlet, and (3) all parcels in the Town of Carolina Beach. Where relevant, information is presented separately for two property type categories, single-family parcels and condominium/townhouse parcels.

Multiple Regression Analysis

Multiple regression analysis is used to determine the relationship between property value (market sales price) and distance to the nearest inlet for all estuarine/waterway waterfront residential

parcels located in New Hanover and Pender Counties. Using data from both counties to estimate the relationship improves the accuracy of the estimate. The analysis controls for other factors that may affect property values, as discussed in detail below. After estimating the relationship for the two-county region, the study uses the relationship to simulate the effect of losing navigability in Carolina Beach Inlet on estuarine/waterway waterfront residential parcel values in New Hanover County (Pender County parcels are excluded) for two geographic regions: (1) all parcels for which the nearest inlet is Carolina Beach Inlet and (2) all parcels in the Town of Carolina Beach.

Single-family residential properties are modeled separately from condominium/townhouse properties. The primary reason for the separate analyses is that lot acreage is not a relevant factor in condo/townhouse value, whereas it is for single-family properties. There are also other differences, including proximity to neighbors, parking and garage arrangements, HOA/COA amenities, insurance, shared utilities, etc.

Three versions of the multiple regression model are estimated for each type of property (three versions for single-family residences, and three versions for condominium/townhouses). The versions differ in the way that distance to the nearest inlet affects parcel price. In the first version (Model 1), inlet distance and parcel price have a linear relationship. In the second and third versions (Models 2 and 3), inlet distance and parcel price have a nonlinear/curved relationship. It is expected that a nonlinear relationship will best fit the data, as the effect of inlet distance likely diminishes as distance increases.

In each multiple regression model, the sales price of a parcel (SoldPrice in Model 1, or LN_SoldPrice in Models 2 and 3), depends on the heated square feet of the structure (SqFtHeated), the acreage of the parcel (Acres), the distance to the nearest inlet measured in miles (InletDistance, INVInletDistance or LN_InletDistance, depending on the model version), and the distance to the oceanfront shoreline measured in miles (OceanDistance, INVOceanDistance or LN_OceanDistance, depending on the model version).

The baseline multiple regression equation applies to parcels located in the town of Carolina Beach, but additional "neighborhood effects" variables (Dwilmington, Dwrightsvillebch, and Dpender) adjust the equation for parcels located in Wilmington, Wrightsville Beach, or Pender County. These neighborhood effects variables capture differences between towns in tax rates, distances to employment, distances to commercial/retail centers, etc.

The baseline regression equation applies to year 2016, but "annual effects" variables (D1999, D2000, D2001, D2002, D2003, D2004, D2005, D2006, D2007, D2008, D2009, D2010, D2011, D2012, D2013, D2014, D2015, and D2017) adjust the equation to account for factors that differ across years, such as interest rates, the unemployment rate, weather, etc.

Other variables were considered for inclusion in the regression model but were ultimately dropped from the analysis. The number of bedrooms, number of half-bathrooms, and number of full-bathrooms were so strongly correlated with heated square footage (and to each other) that they provided no additional explanatory power in the model, and so they were dropped from the analysis.

The number of garage spaces was dropped from the analysis because it, too, was strongly related to heated square feet, and, also, due to an unusual feature of coastal waterfront property--coastal building codes require some waterfront property to be constructed on pilings, and the space beneath the house is used for parking, often in lieu of a formal garage. However, the space beneath the house is often not enclosed, and so it is not technically considered a garage. Yet again, some homeowners partially enclose the space beneath a house on pilings and call it a garage. Because the structures on pilings are located on some of the most valuable parcels, while structures with formal garages are often located on less valuable parcels, a counter-intuitive relationship can arise in which the presence of a garage is associated with *lower* property values, contrary to the typical result in real estate valuation. In addition, confusion in the field about what constitutes a "garage" when properties are on pilings, and inconsistent reporting of garages for condos and townhouses, resulted in poor-quality garage data in the MLS dataset. For these several reasons, garages were dropped from the analysis.

Whether a parcel was located adjacent to a golf course was not statistically significant in determining the sales price of waterfront parcels, so the golf course variable was dropped from the analysis.

In real estate valuation, all else equal, older structures are typically worth less than newer structures, due to wear-and-tear, changing styles/fashion, and other types of depreciation. However, for coastal waterfront parcels this result does not hold consistently. Older parcels tend to have the best locations, because they "arrived first," and location is a prime determinant of value, even among waterfront parcels. In addition, many coastal waterfront structures have been renovated (some more than once), so the *effective* age is often much younger than the "year built" data in county records and MLS data. For these reasons, the age of the structure was dropped from the analysis.

Regarding boat slips, all else equal, one would expect a parcel with a boat slip to sell for more than a parcel without a boat slip. However, the available data on boat slips were incomplete and inconsistent. The MLS data contained information on boat slips for properties that were members of a homeowners' association (HOA) but did not contain information on boat slips for properties that were not members of HOAs. For properties that were HOA members, the MLS data recorded whether the boat slip was assigned to a particular HOA member or the boat slip was shared by several HOA members. It was unclear how to assign the value of shared boat slips to particular parcels. Furthermore, spot-checking of some parcels against current online real estate listings indicated that the boat slip information was often not accurate. For these reasons, boat slips were not included in the analysis.

Parcels that were common areas belonging to HOAs were dropped from the analysis. Ultimately, it was assumed that any changes in the value of common areas would be capitalized into the value of the associated residential units. Similarly, all parcels with an acreage of zero (and that were not condos/townhouses) were dropped from the analysis; these parcels were typically easements, etc.

All parcels built or sold after 2017 (i.e., in 2018) in the MLS dataset were dropped from the analysis, because the county parcels dataset did not include these parcels.

This study focuses on residential parcels; hence, all parcels categorized as "Land" (i.e., without a structure) in the MLS dataset or "No Structure" in the county tax office datasets were dropped from the analysis.

When estimating the inlet distance--sales price multiple regression relationships, extreme "outlier" parcels were excluded from the analysis. For single-family parcels, all parcels with heated square feet (SqFtHeated) less than 300 sq.ft. or greater than 8000 sq.ft., or with acreage (Acres) equal to zero acres or greater than 5 acres, or with a price per square foot (PricePerSqFt) greater than $652.57/ft. (which is the mean value plus two standard deviations), or with sales price (SoldPrice) less than $10,000 or more than $2,464,414 (the mean value plus two standard deviations) were dropped from the multiple regression analysis. However, importantly, all of these dropped parcels were included in the subsequent *application* of the multiple regression equations to estimate the effect of Carolina Beach Inlet navigability loss on total parcel value in the region. For condominiums/townhouses, there were no extreme/outlier parcels, so no parcels were dropped.

Policy Simulation--Loss of Carolina Beach Inlet

After the best-fitting relationships between inlet distance and parcel sales price were identified for single-family parcels and for condo/townhouse parcels using multiple regression analysis, the relationships were used to predict sales prices for all estuarine/waterway waterfront parcels for two groups of parcels: the parcels for which Carolina Beach inlet is the nearest inlet, and parcels in the Town of Carolina Beach. All parcels in both sets of parcels are located in New Hanover County, and the set of parcels for which Carolina Beach inlet is the nearest inlet includes all of the parcels in the Town of Carolina Beach.

To simulate the loss of navigability of Carolina Beach inlet, for each set of parcels, the distance to Carolina Beach inlet in the multiple regression equation is replaced with the distance to the second-nearest inlet, and the equation is used again to predict the value of each parcel. The value of each parcel with Carolina Beach inlet as the nearest inlet is subtracted from the value of each parcel with Carolina Beach inlet replaced by the second-nearest inlet to obtain the (negative) change in value for each parcel.

The change in value for each parcel is summed across all parcels for each group to estimate the *aggregate* change in parcel value for each group. The average change in value *per parcel* for each group is obtained by dividing the aggregate change for each group by the number of parcels in each group. The median change in value per parcel for each group is obtained by identifying the parcel in each group for which fifty percent of the parcels in the group had a smaller change in value. Results are presented for all parcels in each group and for the sub-groups of single-family parcels and condo/townhouse parcels.

Results

Descriptive Statistics

Figure 2 presents a simple plot of estuarine/waterway waterfront <u>single-family</u> residential parcel sales prices for all transactions (n = 2,108) from 1999 to 2017 in the MLS database (2016-year dollars) against distance to the nearest inlet (in miles). For single-family parcels, a pattern of declining sales prices with increasing inlet distance is apparent. A similar plot for <u>condominium/townhouse</u> parcels (n = 1,518) is presented in Figure 3. The pattern of declining sales prices with increasing inlet distance is less apparent for condominium/townhouse parcels.

The variable names and definitions used in the multiple regression analysis models are presented in Table 2. Descriptive statistics for variables used in the multiple regression models are presented in Table 3 for the single-family parcel models and Table 4 for the condo/townhouse parcel models. Note that these descriptive statistics describe estuarine/waterway waterfront residential parcels only. (The sample size in Table 3 is less than the sample size in Figure 2 because some extreme/outlier observations were dropped from the regression analysis dataset described in Table 3. The criteria used to identify outliers are described in the Methods section of this report.)

Table 3 presents descriptive statistics for those <u>single-family</u> estuarine/waterway waterfront parcel transactions in the MLS dataset that were used in the multiple regression analysis.[1] A total of 1,899 single-family parcel sales transactions with a value of $1,515,562,098 occurred in New Hanover and Pender Counties combined during the time period covered by the study (1999-2017). The minimum parcel sales price used in the regression analysis was $33,385, the maximum was $2,453,655 and the mean (average) was $798,084. The typical (median) sales price was $655,963. The minimum heated square footage was 458, the maximum was 7,416, the mean was 2,815, and the median was 2,680. The minimum acreage was 0.03, the maximum was 5.00 (the cutoff value used to exclude outliers), the mean was 0.592, and the median was 0.46. The minimum distance to the nearest inlet was 0.366 miles, the maximum was 9.488 miles, the mean was 2.738 miles, and the median was 2.321 miles. The minimum distance to the oceanfront was 0.01 miles, the maximum was 3.39 miles, the mean was 1.11 miles, and the median was 1.14 miles. In terms of location, 908 parcels sales occurred in Wilmington, 201 occurred in Wrightsville Beach, and 612 occurred in Pender County, with the remaining 178 occurring in Carolina Beach. Over time, more parcel sales occurred in the 2003-2005 and 2012-2017 economic boom periods, and fewer parcel sales occurred in the 2000-2001 and 2006-2011 economic downturns.

Table 4 presents descriptive statistics for those <u>condominium/townhouse</u> estuarine/waterway waterfront parcel transactions in the MLS dataset that were used in the multiple regression analysis.[1] A total of 1,518 condo/townhouse parcel sales transactions with a value of

---

[1] Note--Tables 3 and 4 present descriptive statistics for *only* those parcels in the MLS dataset used in the multiple regression analysis to estimate the relationship beween inlet distance and parcel sales price. Descriptive statistics for *all* estuarine/waterway waterfront residential parcels in the county tax office datasets (including those not used in the multiple regression analysis) are presented in Tables 10a-10c.

$538,336,012 occurred in New Hanover and Pender Counties combined during the time period covered by the study (1999-2017). The minimum parcel sales price was $58,190, the maximum was $1,939,993 and the mean (average) was $354,635. The typical (median) sales price was $293,864. The minimum heated square footage was 300, the maximum was 2,731, the mean was 1,264, and the median was 1,207. The minimum distance to the nearest inlet was 0.875 miles, the maximum was 5.403 miles, the mean was 2.206 miles, and the median was 2.200 miles. The minimum distance to the oceanfront was 0.04 miles, the maximum was 3.15 miles, the mean was 0.50 miles, and the median was 0.27 miles. In terms of location, 123 parcel sales occurred in Wilmington, 439 occurred in Wrightsville Beach, and 34 occurred in Pender County, with the remaining 922 occurring in Carolina Beach. Over time, more parcel sales occurred in the 2003-2005 and 2012-2017 economic boom periods, and fewer parcel sales occurred in the 2000-2001 and 2006-2011 economic downturns.

Tables 5a and 5b provide descriptive statistics for the set of parcels in the MLS dataset whose closest inlet is Carolina Beach Inlet. Tables 6a and 6b provide descriptive statistics for the set of parcels in the MLS dataset located in the Town of Carolina Beach. Note that while Carolina Beach accounts for only 9.4 percent (178/1899) of single-family estuarine/waterway waterfront parcels sold and only 7.2 percent of single-family estuarine/waterway waterfront sales value in the New Hanover and Pender County region, Carolina Beach accounts for 60.7 percent of condo/townhouse parcels sold and 47.2 percent of condo/townhouse sales value.

Table 7 provides descriptive statistics for the *distances* to the nearest inlet and second-nearest inlet for estuarine/waterway waterfront parcels in the MLS dataset for three location categories (1) the New Hanover/Pender County region, (2) the set of parcels for which the closest inlet is Carolina Beach Inlet and (3) parcels in the Town of Carolina Beach. On average, single-family waterfront parcels in the New Hanover/Pender region are 2.74 miles (2.20 miles for condos) from the nearest inlet and 6.26 miles (7.58 miles for condos) from the second-nearest inlet. For parcels whose closest inlet is Carolina Beach Inlet, the average distance to the nearest inlet is 2.09 miles for single-family parcels (2.16 miles for condos), but the distance to the second-nearest inlet is 8.68 miles for single-family parcels (9.92 miles for condos). For parcels in the Town of Carolina Beach, the average distance to the nearest inlet is 2.08 miles for single-family parcels (2.07 miles for condos), but the distance to the second-nearest inlet is 10.15 miles single-family parcels (10.19 miles for condos).

Comparing the mean distances to the closest inlet, waterfront parcels located in the Town of Carolina Beach are, on average, 0.13 (for condos) to 0.66 (for single-family parcels) miles *closer* to an inlet than similar parcels in the New Hanover / Pender County region. However, the parcels in the Town of Carolina Beach are, on average, 2.61 (for condos) to 3.89 (for single-family parcels) miles *farther* from a second-nearest inlet, compared to similar parcels in the New Hanover / Pender County region. This implies that the loss of the nearest inlet might have a greater effect on waterfront parcels in the Town of Carolina Beach compared to an average waterfront parcel in the region, because the distance to the "backstop," second-nearest inlet is substantially farther away for parcels in the Town of Carolina Beach. Another way of viewing this difference is that the loss of the nearest inlet for a typical parcel in the New Hanover / Pender County region would result in an additional one-way trip distance of 3.5 to 5.4 miles (7 to 10.8 additional miles round-trip) to the second-nearest inlet, whereas the loss of the nearest inlet

for a typical parcel in the Town of Carolina Beach would result in an additional one-way trip distance of about 8 miles (16 miles round-trip).

<div align="center">Multiple Regression Analysis -- Single-Family Parcels</div>

Table 8 presents multiple regression analysis results for single-family estuarine/waterway waterfront parcels in New Hanover and Pender Counties, NC, for all sales transactions in the MLS database from 1999 to 2017. Results from three models are presented in order to assess whether model results are robust to variations in modeling assumptions. The three models differ in the following ways. In Models 1 and 2, parcel sales price ("SoldPrice") is the dependent ("Y") variable, while in Model 3 the logarithm of parcel sales price ("LN_SoldPrice") is the dependent variable; as a result, in Models 1 and 2 the independent variables have *additive* effects on SoldPrice, while in Model 3 the independent variables have *multiplicative* effects on sales price. In Model 1 the variable InletDistance allows inlet distance to have a *linear* effect on sales price, while in Models 2 and 3, the variables INVInletDistance (the reciprocal of InletDistance) and LN_InletDistance (the logarithm of InletDistance) allow inlet distance to have a *curved/nonlinear* effect on sales price.

For all three models, the sample size (n) is 1,899 sales transactions. The F-statistic values indicate that all three models are highly statistically significant (p-value < 0.01). Most importantly for the present study, in all three models inlet distance (InletDistance, INVInletDistance, or LN_InletDistance) has a negative and highly statistically significant (p < 0.01) effect on parcel sales price.

Model 1 results indicate that distance to the nearest inlet (InletDistance) has a negative and highly statistically significant (p < 0.01) effect on parcel sales price, with each additional mile of distance to the nearest inlet subtracting $21,231 (on average) from parcel sales price. However, this effect would likely diminish with greater distance to the inlet, and Model 1 does not allow this effect to diminish with distance. This can lead to unrealistic, negative parcel values for parcels that are far from an inlet.

Models 2 and 3 allow the negative effect of inlet distance to diminish with greater distance from the inlet, "correcting" the unrealistic, negative parcel value results that can occur with Model 1. Between Models 2 and 3, Model 3 appears to provide a slightly better fit to the data and is the preferred model for single-family parcels.

Focusing on the results for preferred Model 3, the Adjusted R-square value indicates that the independent variables in the model explain 68% of the variation in parcel sales prices. As expected, heated square feet (LN_SqFtHeated) has a positive and highly statistically significant (p < 0.01) effect on parcel sales price. Parcel acreage (LN_Acres) also has a positive and highly statistically significant (p < 0.01) effect on parcel sales price. As expected, increasing distance from the ocean (LN_OceanDistance) has a negative and highly statistically significant (p < 0.01) effect on sales price. Model 3 results for the "neighborhood" indicator variables for the Wilmington (Dwilmington), Wrightsville Beach (Dwrightsvillebch) and Pender County (Dpender) regions are all positive and highly statistically significant (p < 0.01), indicating that

(on average, and all else equal) a parcel in the Wilmington[2], Wrightsville Beach or Pender County regions sells for more than a similar parcel in Carolina Beach. Model 3 results for the "annual/year effect" indicator variables (D1999--D2017) indicate that inflation-adjusted parcel sales prices in "dot-com bust" recession year 2000 were less than parcel sales prices in baseline year 2016 (comparing a given parcel across years). Parcel sales prices in "boom" years 2004-2006 were significantly higher than year 2016, but the effect began to diminish in 2007 (though still positive) with the onset of the Great Recession, and prices fell thereafter, bottoming in 2011. Prices began slowly rising again in 2012, though in many years prices were not significantly different from prices in baseline year 2016.

Results for Model 2 closely resemble results for Model 3. Most importantly, greater inlet distance (INVInletDistance) has a negative[3] effect on parcel sales price, and this effect is highly statistically significant ($p < 0.01$). As expected, heated square footage and acreage both have positive effects on sales price, and ocean distance has a negative[3] effect on sales price. Parcels in the Wilmington and Wrightsville Beach regions have higher sales prices than similar parcels in Carolina Beach. Pender County parcels have somewhat lower sales prices compared to similar parcels in Carolina Beach, but the effect is weak and not statistically significant. The pattern of statistical significance in the "annual effect" indicator variables is generally similar to the patter in Model 3, with some minor variations.

Multiple Regression Analysis -- Condominium / Townhouse Parcels

Table 9 presents multiple regression analysis results for condominium / townhouse estuarine/waterway waterfront parcels in New Hanover and Pender Counties, NC, for all sales transactions in the MLS database from 1999 to 2017. As with single-family parcels, results for three models are presented for condominium/townhouse parcels in order to assess whether model results are robust to variations in modeling assumptions. The three models differ from one another in the following ways. In Models 1 and 2, parcel sales price ("SoldPrice") is the dependent ("Y") variable, while in Model 3 the logarithm of parcel sales price ("LN_SoldPrice") is the dependent variable; as a result, in Models 1 and 2 the independent variables have *additive* effects on sales price, while in Model 3 the independent variables have *multiplicative* effects on sales price. In Model 1 the variable InletDistance allows inlet distance to have a *linear* effect on sales price, while in Models 2 and 3, the variables INVInletDistance (the reciprocal of InletDistance) and LN_InletDistance (the logarithm of InletDistance) allow inlet distance to have *curved/nonlinear* effects on sales price.

---

[2] Recall that the "Wilmington region" is defined as all estuarine/waterway waterfront parcels between Carolina Beach and the south end of Wrightsville Beach, and between the north end of Wrightsville Beach and the Pender County line.

[3] Note that in Model 2, where the *reciprocal* of inlet distance (INVInletDistance) is the key distance variable in the model, a *positive* parameter estimate for INVInletDistance indicates that inlet distance has a *negative* effect on sales price. Hence, inlet distance has a negative effect on parcel sales price in all three models. The same is true for the ocean distance variable (INV_OceanDistance)

For each of the three condominium / townhouse models, the sample size (n) is 1,518 sales transactions. The F-values indicate that each of the three models is highly statistically significant (p-value < 0.01). In contrast to single-family parcels, for condominium/townhouse parcels the results are mixed concerning the effect of inlet distance on parcel sales price. In Models 1 and 2, inlet distance has a negative effect on parcel sales price, and the effects are highly (in Model 1, p < 0.01) and moderately (in Model 2, p < 0.10) statistically significant. In Model 3, however, inlet distance has a *positive* effect on parcel sales price, and the effect is highly statistically significant (p < 0.01). On balance, the evidence for condominium/townhouse parcels appears to indicate that inlet distance has a negative effect on sales prices, but the degree of statistical confidence in this result is lower than the degree of confidence for single-family parcels.

Model 1 results indicate that distance to the nearest inlet (InletDistance) has a negative and highly statistically significant (p < 0.01) effect on condominium/townhouse sales price, with each additional mile of distance to the nearest inlet subtracting \$18,873 (on average) from parcel sales price. However, this effect would likely diminish with greater distance to the inlet, and Model 1 does not allow the effect to diminish with distance. This can lead to unrealistic, negative parcel values for parcels that are far from an inlet.

Models 2 and 3 allow the negative effect of inlet distance to diminish with greater distance from the inlet, "correcting" the unrealistic, negative parcel value results that can occur with Model 1. Between Models 2 and 3, both models provide a good fit to the square footage, ocean distance, neighborhood indicator, and year indicator variables, but Model 2 is the preferred model, as the sign of the inlet distance effect is the same as that for Model 1. However, the degree of statistical confidence is lower for this result.

Focusing of the results for preferred Model 2, the Adjusted R-square value indicates that the independent variables in the model explain 72 percent of the variation in condominium / townhouse sales prices. As expected, heated square feet (SqFtHeated) has a positive and highly statistically significant (p < 0.01) effect on sales price, and ocean distance (INV_OceanDistance) has a negative[3] and highly statistically significant (p < 0.01) effect on sales price. Model 2 results for the neighborhood indicator variable for Wrightsville Beach (Dwrightsvillebch) are positive and highly statistically significant (p < 0.01), indicating that (on average, and all else equal) a condominium / townhouse parcel in the Wrightsville Beach area sells for more than a similar parcel in Carolina Beach. Results for the Wilmington (Dwilmington) region[4] are positive, and those for the Pender County region are negative, but neither of these results is statistically significant, indicating that condominium / townhouse sales prices in these regions are similar to those in Carolina Beach. Model 2 results for the "annual/year effect" indicator variables (D1999--D2017) for condominiums / townhouses are generally similar to the results described for single-family parcels.

---

[4] Recall that the "Wilmington region" is defined as all estuarine/waterway waterfront parcels between Carolina Beach and the south end of Wrightsville Beach, and between the north end of Wrightsville Beach and the Pender County line.

Illustration of the Estimated Effect of Inlet Distance on Parcel Value

Based on the results of the preferred multiple regression analysis models for single-family parcels and condominium/townhouse parcels, it is possible to simulate the effects of greater distance to the nearest inlet on parcel values. Figure 4 illustrates the effect of nearest inlet distance (in miles) on typical (median) parcel values for single-family parcels and condominium/townhouse parcels. The two relationships in Figure 4 are based on all estuarine/waterway waterfront (oceanfront parcels excluded) residential parcels in New Hanover and Pender Counties, NC, in the MLS database for years 1999 to 2017. The parcel value for single-family parcels begins at the median value[5] of $485,730 and decreases as the distance to the nearest inlet increase. The parcel value for condominium/townhouse parcels begins at the median value of $164,731 and decreases as inlet distance increases. To reflect the range of typical inlet distances[6] for these parcels, the graphs begin at a nearest inlet distance of 2 miles and extend to 10 miles.

Policy Simulation--Loss of Carolina Beach Inlet

Results from the multiple regression analysis models are used to simulate the impact of Carolina Beach Inlet shoaling (i.e., complete loss of navigability to all but the smallest jon boat / kayak / canoe vessels) on the value of estuarine/waterway waterfront residential parcels for two groups of parcels, those parcels for which Carolina Beach Inlet is the nearest inlet, and those parcels located in the Town of Carolina Beach. All parcels in both groups are located in New Hanover County, and the parcels in the Town of Carolina Beach are a subset of the parcels for which Carolina Beach Inlet is the nearest inlet. For each group of parcels, results are presented for all parcels in the group (Tables 10a and 11a), and for the subcategoris of single-family (Tables 10b and 11b) and condominium/townhouse parcels (Tables 10c and 11c).

For context, the tax office parcels dataset for New Hanover County contains information on 103,536 property parcels with an assessed value of $31.5 billion (year-2016 dollars). Of these, 5,643 were estuarine/waterway waterfront parcels with an assessed value of $3.8 billion. Of the 5,643 estuarine/waterway waterfront parcels, 924 were "land only" with no building/structure present. Of the 4,719 parcels with a building/structure, 4,485 were residential. The 4,485 estuarine/waterway waterfront residential parcels had an assessed value of $3.3 billion.

---

[5] The parcel values illustrated in Figure 4 are median values for the set of parcels for which Carolina Beach Inlet is the nearest inlet (see Tables 10b and 10c).

[6] For those parcels whose nearest inlet is Carolina Beach inlet, the median distance to the nearest inlet (Carolina Beach Inlet) was 2.11 miles for single-family parcels and 2.13 miles for condominium/townhouse parcels (Tables 10b and 10c). The median distance to the next-nearest inlet for these parcels was 9.87 miles for single-family parcels and 10.01 miles for condo/townhouse parcels.

Tables 10a-10c present policy simulation results for the 1,359 estuarine/waterway waterfront residential parcels in New Hanover County for which Carolina Beach Inlet is the nearest inlet.[7] Of these parcels, 890 are located in the Town of Carolina Beach, and 469 are located in New Hanover County between the Town of Carolina Beach and the Town of Wrightsville Beach (named "Wilmington" parcels). Eight hundred and five parcels are single-family, and 554 are condominium/townhouse. The parcels occupy 1,356 acres and have an aggregate assessed value of $561 million (about 16.8 percent of the assessed value of all estuarine/waterway waterfront residential parcels in New Hanover County). Single-family parcels account for $444 million of this aggregate assessed value, and condominium/townhouse parcels account for $117 million. The average (mean) parcel has an assessed value of $412,702, with a minimum parcel value of $44,754 and a maximum parcel value of $4,181,871. The typical (median) single-family parcel has an assessed value of $485,730, and the typical (median) condominium/townhouse parcel has an assessed value of $164,731. The average (mean) distance to the nearest inlet (i.e., Carolina Beach Inlet) for these parcels is 2.15 miles, with a minimum distance of 0.37 miles and a maximum distance of 4.23 miles. The average (mean) distance to the next-nearest inlet is 9.24 miles, with a minimum distance of 3.66 miles and a maximum distance of 11.18 miles. <u>If Carolina Beach Inlet were to become unnavigable and the next-nearest inlet (i.e., Masonboro Inlet) became the nearest inlet, the typical (median) parcel would lose an estimated $45,069 in value</u> (the mean loss in value is somewhat higher, at $62,329, due to several, highly-valued parcels pulling up the average), with a minimum loss in value of $559 and a maximum loss in value of $1,216,023. The typical (median) parcel would experience a 16.6 percent decrease in value. In total, with the loss of Carolina Beach Inlet, the parcels in this group would lose an estimated $84.7 million in assessed value. Tables 10b and 10c present detailed results for the subcategories of single-family parcels and condominium/townhouse parcels. With the loss of Carolina Beach Inlet, the median single-family parcel loses $76,485 in value (about 17.5 percent), and the median condominium/townhouse loses $16,472 in value (about 8.2 percent).

Tables 11a-11c present policy simulation results for the 890 estuarine/waterway waterfront residential parcels located in the Town of Carolina Beach itself.[7] Three hundred and ninety-three parcels are single-family, and 497 are condominium/townhouse parcels. The parcels occupy 830 acres and have an aggregate assessed value of $278 million (about 8.3 percent of the assessed value of all estuarine/waterway waterfront residential parcels in New Hanover County). Single-family parcels account for $184 million of this aggregate assessed value, and condominium/townhouse parcels account for $95 million. The average (mean) parcel has an assessed value of $312,742, with a minimum parcel value of $44,754 and a maximum parcel value of $1,511,995. The distance to the nearest inlet (i.e., Carolina Beach Inlet) for these parcels is 2.08 miles, on average, with a minimum distance of 1.32 miles and a maximum distance of 3.07 miles. The distance to the next-nearest inlet is 10.19 miles on average, with a minimum distance of 6.66 miles and a maximum distance of 11.18 miles. If Carolina Beach

---

[7] The numbers of parcels in Tables 10a-c and Tables 11a-c can differ from the numbers of parcels in Tables 5a-b and Tables 6a-b because Tables 5a-b and Tables 6a-b include only those parcels in the MLS database, whereas Tables 10a-c and Tables 11a-c include the MLS database parcels plus the other estuarine/waterway waterfront residential parcels that are not in the MLS database. Some parcels are not in the MLS database because they were not bought/sold during the 1999-2017 MLS database coverage period. On the other hand, some parcels appear multiple times in the MLS database because they sold more than once during the 1999-2017 period.

Inlet were to become unnavigable and the next-nearest inlet (i.e., Masonboro Inlet) became the nearest inlet, the typical (median) parcel would lose an estimated $25,233 in value (the mean loss in value is somewhat higher, at $47,977, due to several highly-valued parcels pulling up the average), with a minimum loss in value of $10,131 and a maximum loss in value of $313,055. The typical (median) parcel would experience a 17.3 percent decrease in value. In total, with the loss of Carolina Beach Inlet, the parcels in this group would lose an estimated $42.7 million in assessed value. Tables 11b and 11c present detailed results for the subcategories of single-family parcels and condominium/townhouse parcels. With the loss of Carolina Beach inlet, the median single-family parcel loses $74,129 in value (about 18.4 percent), and the median condominium/townhouse loses $17,755 in value (about 9.0 percent).

The property tax rate for New Hanover County is 0.5700 per $100 of assessed (appraised) value (NCDOR 2018). For the group of parcels for which Carolina Beach Inlet is the nearest inlet, the $84.7 million in lost value equates to a reduction in county property tax revenues of $482,818 per year. For the subset of parcels located in the Town of Carolina Beach, the $42.7 million in lost value equates to a reduction in county property tax revenues of $243,388 per year. [8]

---

[8] The reductions in tax revenues for the Town of Carolina Beach are part of, not in addition to, the reductions for the larger group of parcels.

Conclusions

Coastal estuarine/waterway waterfront property offers scenic views and water recreation amenities. One amenity associated with such property is the ability to access the ocean by boat through inlets that connect inland waterways with the ocean. A property located closer to an inlet provides faster access to the ocean. All else equal, one would expect faster ocean access to be associated with higher property values. If shoaling completely blocks an inlet, then property owners must travel farther in their vessels to reach the next-nearest inlet, which is often miles away from the nearest inlet. This slows access to the ocean, which might affect the value of estuarine/waterway waterfront property.

The purpose of this study is to assess the potential impact of the complete loss of Carolina Beach Inlet (CBI) navigability (due to shoaling) on estuarine/waterway waterfront (oceanfront properties excluded) property values in New Hanover County, North Carolina. The study is based on county tax office property parcel data for years 2011-2012 (the most recent available) and Multiple Listing Service (MLS) real estate data for years 1999 to 2017 (inclusive) for New Hanover County and adjacent Pender County, North Carolina.

For the properties for which CBI is the closest inlet, the average distance to CBI is 2.15 miles, while the average distance to the next-nearest inlet is 9.24 miles. For the parcels located in the Town of Carolina Beach, the average distance to CBI is 2.08 miles, while the average distance to the next-nearest inlet is 10.19 miles. In contrast, for all estuarine/waterway waterfront residential parcels in New Hanover County, the average distance to the nearest inlet is a similar 2.17 miles, but the average distance to the next-nearest inlet is only 5.73 miles. Hence, the distance to the next-nearest inlet for parcels in the Town of Carolina Beach is more than twice as far as the distance to the next-nearest inlet for the average estuarine/waterway waterfront parcel in New Hanover County.

Multiple regression analysis is used to estimate the effect of inlet distance on estuarine/waterway waterfront parcel values while controlling for other factors that can affect parcel value, including distance to the oceanfront and "neighborhood" effects. The analysis finds that inlet distance has a negative and highly statistically significant effect on single-family parcel values (see Figure 4). The result for single-family parcels is robust to several alternative model specifications. However, results are somewhat mixed for condominium/townhouse parcels, but on balance, inlet distance appears to have a negative effect on condominium/townhouse parcels, as well, but with a lower degree of statistical confidence.

Results from the multiple regression analysis are used to conduct a policy simulation of the loss of CBI navigability (due to shoaling) on estuarine/waterway waterfront property values for which CBI is the nearest inlet, and for the subset of properties in the Town of Carolina Beach proper. The impact on parcel value is estimated by replacing the distance to the nearest inlet with the distance to the next-nearest inlet in the multiple regression models and calculating the change in parcel value.

For context, New Hanover County has 4,485 estuarine/waterway waterfront residential parcels with an assessed value of $3.34 billion (year 2016 dollars). CBI is the nearest inlet for 1,359 of

these parcels with an assessed value of $561 million, and of these, 890 parcels with an assessed value of $278 million are located in the Town of Carolina Beach proper. If CBI were to become unnavigable and the next-nearest inlet (i.e., Masonboro Inlet) became the nearest inlet, the typical (median) parcel would lose an estimated $45,069 in value (16.6 percent), with an estimated aggregate loss of $84.7 million in assessed value for all parcels for which CBI is the nearest inlet. Of this, parcels located in the Town of Carolina Beach itself would lose an estimated $42.7 million in aggregate assessed value. The property tax rate for New Hanover County is 0.5700 per $100 of assessed (appraised) value (NCDOR 2018). For the group of parcels for which CBI is the nearest inlet, the $84.7 million in lost value equates to a reduction in county property tax revenues of $482,818 per year. For the subset of parcels located in the Town of Carolina Beach, the $42.7 million in lost value equates to a reduction in county property tax revenues of $243,388 per year.

This study does not consider "land only" parcels (i.e., parcels without structures), commercial parcels, government or non-profit-owned parcels, conservation areas, or parcels owned in common by homeowners' associations or condominium owners' associations. Any effects of inlet distance on the value of these parcel types are not included in the impact estimates presented in this study.

The potential effects of CBI navigability loss are not limited to impacts on property values. Other potential effects include impacts on commercial fishing, for-hire (charter and headboat) fishing, and private recreational boating (Dumas and Whitehead 2014), all of which use CBI to access the ocean. These potential effects are not included in the impact estimates presented in this study.

The results from this study should be useful to coastal managers and policymakers who seek to balance the various benefits and costs to public and private stakeholders of coastal waterway and inlet management. Future work could apply the methods used in this study to other locations in coastal North Carolina as well as to areas in other states where inlets provide ocean access to estuary/waterway-side communities.

References

Dumas, Chris, and John Whitehead. 2014. *The Economic Impacts of Carolina Beach Inlet Navigability*. UNC-Wilmington, Swain Center. 36pp.

ESRI. 2016. ArcMap 10.3.1 software. ESRI, Inc. Redlands, CA.
http://desktop.arcgis.com/en/arcmap/

NCDEQ. 2016. Oceanfront spatial data (downloads). North Carolina Department of Environmental Quality. Raleigh, NC.
https://deq.nc.gov/about/divisions/coastal-management/coastal-management-data/spatial-data-maps

NCDOR. 2018. Property Tax Rates and Revaluation Schedules for North Carolina Counties, 2017-2018. North Carolina Department of Revenue. Raleigh, NC.
https://www.ncdor.gov/reports-statistics-property-tax-rates

North Carolina Geographic Information Coordination Council. 2017. NC OneMap geospatial data portal. http://www.nconemap.com/

USBEA. 2018. Gross Domestic Product: Implicit Price Deflator [GDPDEF dataset].
U.S. Bureau of Economic Analysis, Federal Reserve Bank of St. Louis, St. Louis, MO.
https://fred.stlouisfed.org/series/GDPDEF

White, H. 1980. A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrics*. 48: 817–838.

Wilmington Regional Association of Realtors. 2017. Wilmington, NC. http://wrar.com

Tables

Table 1. Inlets Considered in This Study

County	Inlet Name
Onslow	New River Inlet
Pender	Topsail Inlet
Pender/New Hanover (boundary)	Rich Inlet
New Hanover	Mason Inlet
New Hanover	Masonboro Inlet
New Hanover	Carolina Beach Inlet (focus of this study)
New Hanover	Cape Fear Inlet
Brunswick	Lockwood Folly Inlet

Table 2. Names and Definitions of Variables Used in Multiple Regression Analysis Models

Variable Name	Definition
SoldPrice	MLS market sales price in inflation-adjusted year 2016 dollars.
LN_SoldPrice	The natural logarithm of SoldPrice.
SqFtHeated	Parcel structure size in heated square feet.
LN_SqFtHeated	The natural logarithm of SqFtHeated.
Acres	Parcel lot size in acres.
LN_Acres	The natural logarithm of Acres.
InletDistance	Distance (straight-line) in miles from parcel to the nearest inlet.
LN_InletDistance	The natural logarithm of InletDistance.
INVInletDistance	The inverse or reciprocal of Inlet Distance (1 / InletDistance)
OceanDistance	Distance (straight-line) in miles from parcel to the nearest ocean shoreline.
LN_OceanDistance	The natural logarithm of OceanDistance.
INVOceanDistance	The inverse or reciprocal of Ocean Distance (1 / InletDistance)
Dwilmington	An indicator variable equal to 1 if the parcel is in Wilmington or unincorporated portions of New Hanover County and equal to 0 otherwise.
Dwrightsvillebch	An indicator variable equal to 1 if the parcel is in the Town of Wrightsville Beach and equal to 0 otherwise.
Dpender	An indicator variable equal to 1 if the parcel is located in Pender County and equal to 0 otherwise.
Dcarolinabch	An indicator variable equal to 1 if the parcel is located in the Town of Carolina Beach and equal to 0 otherwise.
D1999 D2000 D2001 D2002 D2003 D2004 D2005 D2006 D2007 D2008 D2009 D2010 D2011 D2012 D2013 D2014 D2015 D2016 D2017	Indicator variables equal to 1 if the MLS transaction for the parcel occurred in that year and equal to 0 otherwise.

Notes: The indicator variable for the Carolina Beach location (Dcarolinabch) is not used in the regression analysis because the baseline regression equation predicts for Carolina Beach. The indicator variables for other locations are included in the regression analysis to adjust the regression equation for other locations. Indicator variables were created for the Kure Beach and Castle Hayne locations, but these variables were not used in the regression analysis, because Kure Beach and Castle Hayne had no estuarine/waterway waterfront residential parcels.

The indicator variable for year 2016 (D2016) is not used in the regression analysis because the baseline regression equation predicts for year 2016. The indicator variables for other years are included in the regression analysis to adjust the regression equation for other years.

Table 3. Descriptive Statistics for Estuarine/Waterway Waterfront <u>Single-Family</u> Property Parcels in MLS Database in <u>New Hanover and Pender Counties</u>, NC, Used in Multiple Regression Analysis. (n = 1,899)

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
SoldPrice	$798,084	$493,809	$33,385	$655,963	$2,453,655	$1,515,562,098
SqFtHeated	2,815	1,091	458	2,680	7,416	5,345,439
Acres	0.59	0.58	0.03	0.46	5.00	1,123.51
InletDistance	2.74	1.72	0.37	2.32	9.49	-
nextInletDistance	6.26	2.86	2.39	5.39	13.49	-
OceanDistance	1.11	0.79	0.01	1.14	3.39	-
Dwilmington	0.48	0.50	0	0	1	908
Dwrightsvillebch	0.11	0.31	0	0	1	201
Dpender	0.32	0.47	0	0	1	612
Dcarolinabch	0.09	0.29	0	0	1	178
D1999	0.04	0.19	0	0	1	74
D2000	0.04	0.20	0	0	1	83
D2001	0.05	0.21	0	0	1	86
D2002	0.06	0.23	0	0	1	110
D2003	0.07	0.25	0	0	1	126
D2004	0.09	0.28	0	0	1	165
D2005	0.06	0.24	0	0	1	113
D2006	0.03	0.17	0	0	1	54
D2007	0.02	0.14	0	0	1	39
D2008	0.02	0.14	0	0	1	38
D2009	0.02	0.16	0	0	1	47
D2010	0.04	0.19	0	0	1	72
D2011	0.05	0.21	0	0	1	86
D2012	0.07	0.25	0	0	1	130
D2013	0.07	0.26	0	0	1	138
D2014	0.06	0.24	0	0	1	120
D2015	0.07	0.26	0	0	1	136
D2016	0.08	0.27	0	0	1	149
D2017	0.07	0.26	0	0	1	133

Prices are in 2016-year dollars.

Table 4. Descriptive Statistics for Estuarine/Waterway Waterfront <u>Condominium / Townhouse</u> Property Parcels in MLS Database in <u>New Hanover and Pender Counties</u>, NC, Used in Multiple Regression Analysis. (n = 1,518)

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
SoldPrice	$354,635	$237,826	$58,190	$293,864	$1,939,993	$538,336,012
SqFtHeated	1,264	520	300	1,207	2,731	1,919,441
Acres	-	-	-	-	-	-
InletDistance	2.21	0.60	0.88	2.20	5.40	-
nextInletDistance	7.58	3.38	2.47	9.65	11.14	-
OceanDistance	0.50	0.53	0.04	0.27	3.15	-
Dwilmington	0.08	0.27	-	-	1.00	123
Dwrightsvillebch	0.29	0.45	-	-	1.00	439
Dpender	0.02	0.15	-	-	1.00	34
Dcarolinabch	0.61	0.49	-	1.00	1.00	922
D1999	0.04	0.20	0	0	1	64
D2000	0.04	0.19	0	0	1	60
D2001	0.04	0.21	0	0	1	67
D2002	0.07	0.25	0	0	1	105
D2003	0.10	0.30	0	0	1	147
D2004	0.08	0.27	0	0	1	123
D2005	0.09	0.28	0	0	1	130
D2006	0.04	0.19	0	0	1	55
D2007	0.03	0.18	0	0	1	52
D2008	0.03	0.16	0	0	1	42
D2009	0.03	0.17	0	0	1	44
D2010	0.03	0.17	0	0	1	43
D2011	0.04	0.19	0	0	1	57
D2012	0.05	0.22	0	0	1	75
D2013	0.05	0.22	0	0	1	75
D2014	0.06	0.24	0	0	1	93
D2015	0.05	0.22	0	0	1	80
D2016	0.06	0.24	0	0	1	91
D2017	0.08	0.26	0	0	1	115

Prices are in 2016-year dollars. The variable Acres is not used in the condominium/townhouse regressions.

Table 5a. Descriptive Statistics for Estuarine/Waterway Waterfront <u>Single-Family</u> Property Parcels in MLS Database <u>for which the Nearest Inlet is Carolina Beach Inlet</u>. (n = 427)

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
SoldPrice	$660,492	$346,916	$91,374	$603,506	$2,357,065	$282,030,052
SqFtHeated	2,693	1,019	500	2,534	6,000	1,150,073
Acres	0.48	0.55	0.06	0.33	5.00	203.52
InletDistance	2.09	0.94	0.37	2.09	4.13	-
nextInletDistance	8.68	2.02	4.35	9.49	11.07	-
OceanDistance	0.77	0.60	0.06	0.64	3.39	-
Dwilmington	0.58	0.49	0	1	1	249
Dwrightsvillebch	0.00	0.00	0	0	0	0
Dpender	0.00	0.00	0	0	0	0
Dcarolinabch	0.42	0.49	0	0	1	178
D1999	0.03	0.17	0	0	1	13
D2000	0.04	0.20	0	0	1	18
D2001	0.07	0.25	0	0	1	28
D2002	0.04	0.21	0	0	1	19
D2003	0.09	0.28	0	0	1	37
D2004	0.09	0.28	0	0	1	37
D2005	0.06	0.24	0	0	1	27
D2006	0.02	0.14	0	0	1	8
D2007	0.02	0.15	0	0	1	10
D2008	0.03	0.17	0	0	1	13
D2009	0.02	0.15	0	0	1	10
D2010	0.04	0.21	0	0	1	19
D2011	0.06	0.24	0	0	1	27
D2012	0.05	0.22	0	0	1	21
D2013	0.05	0.22	0	0	1	21
D2014	0.05	0.22	0	0	1	21
D2015	0.07	0.26	0	0	1	32
D2016	0.08	0.28	0	0	1	36
D2017	0.07	0.26	0	0	1	30

Prices are in 2016-year dollars.

Table 5b. Descriptive Statistics for Estuarine/Waterway Waterfront <u>Condominium / Townhouse</u> Property Parcels in MLS Database <u>for which the Nearest Inlet is Carolina Beach Inlet</u>. (n = 971)

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
SoldPrice	$286,506	$163,698	$61,814	$242,413	$1,001,471	$278,197,472
SqFtHeated	1,252	546	350	1,150	2,600	1,215,400
Acres	-	-	-	-	-	-
InletDistance	2.16	0.61	1.42	1.94	4.32	-
nextInletDistance	9.92	1.30	4.64	9.99	11.14	-
OceanDistance	0.30	0.26	0.04	0.23	1.17	-
Dwilmington	0.05	0.22	-	-	1.00	49
Dwrightsvillebch	-	-	-	-	-	-
Dpender	-	-	-	-	-	-
Dcarolinabch	0.95	0.22	-	1.00	1.00	922
D1999	0.05	0.21	0	0	1	45
D2000	0.04	0.19	0	0	1	38
D2001	0.04	0.20	0	0	1	41
D2002	0.06	0.24	0	0	1	61
D2003	0.08	0.28	0	0	1	81
D2004	0.09	0.29	0	0	1	88
D2005	0.10	0.30	0	0	1	95
D2006	0.04	0.20	0	0	1	39
D2007	0.03	0.16	0	0	1	26
D2008	0.03	0.17	0	0	1	30
D2009	0.03	0.18	0	0	1	31
D2010	0.04	0.19	0	0	1	35
D2011	0.04	0.18	0	0	1	34
D2012	0.04	0.21	0	0	1	43
D2013	0.05	0.23	0	0	1	52
D2014	0.05	0.21	0	0	1	47
D2015	0.05	0.23	0	0	1	52
D2016	0.06	0.24	0	0	1	57
D2017	0.08	0.27	0	0	1	76

Prices are in 2016-year dollars. The variable Acres is not used in the condominium/townhouse regressions.

Table 6a. Descriptive Statistics for Estuarine/Waterway Waterfront <u>Single-Family</u> Property Parcels in MLS Database, <u>Carolina Beach only</u>. (n = 178)

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
SoldPrice	$613,632	$322,352	$96,304	$550,277	$2,031,556	$109,226,537
SqFtHeated	2,471	963	555	2,401	5,137	439,837
Acres	0.24	0.16	0.06	0.19	1.46	42.46
InletDistance	2.08	0.46	1.33	2.00	2.98	-
nextInletDistance	10.15	0.57	7.16	10.16	11.07	-
OceanDistance	0.31	0.21	0.06	0.26	0.96	-
Dwilmington	0.00	0.00	0	0	0	0
Dwrightsvillebch	0.00	0.00	0	0	0	0
Dpender	0.00	0.00	0	0	0	0
Dcarolinabch	1.00	0.00	1	1	1	178
D1999	0.04	0.19	0	0	1	7
D2000	0.03	0.18	0	0	1	6
D2001	0.08	0.27	0	0	1	14
D2002	0.04	0.19	0	0	1	7
D2003	0.09	0.29	0	0	1	16
D2004	0.10	0.29	0	0	1	17
D2005	0.07	0.26	0	0	1	13
D2006	0.01	0.07	0	0	1	1
D2007	0.02	0.15	0	0	1	4
D2008	0.04	0.19	0	0	1	7
D2009	0.02	0.13	0	0	1	3
D2010	0.06	0.24	0	0	1	11
D2011	0.07	0.25	0	0	1	12
D2012	0.06	0.24	0	0	1	11
D2013	0.03	0.18	0	0	1	6
D2014	0.05	0.22	0	0	1	9
D2015	0.03	0.18	0	0	1	6
D2016	0.08	0.28	0	0	1	15
D2017	0.07	0.26	0	0	1	13

Prices are in 2016-year dollars.

Table 6b. Descriptive Statistics for Estuarine/Waterway Waterfront <u>Condominium / Townhouse</u> Property Parcels in MLS Database, <u>Carolina Beach only</u>. (n = 922)

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
SoldPrice	$275,912	$158,181	$61,814	$234,263	$1,001,471	$254,390,575
SqFtHeated	1,212	531	350	1,120	2,600	1,117,439
Acres	-	-	-	-	-	-
InletDistance	2.07	0.49	1.42	1.87	4.32	-
nextInletDistance	10.19	0.49	9.52	10.02	11.14	-
OceanDistance	0.25	0.17	0.04	0.23	0.81	-
Dwilmington	-	-	-	-	-	-
Dwrightsvillebch	-	-	-	-	-	-
Dpender	-	-	-	-	-	-
Dcarolinabch	1.00	-	1.00	1.00	1.00	922
D1999	0.05	0.22	0	0	1	45
D2000	0.04	0.19	0	0	1	35
D2001	0.04	0.19	0	0	1	34
D2002	0.06	0.24	0	0	1	59
D2003	0.08	0.28	0	0	1	77
D2004	0.09	0.29	0	0	1	86
D2005	0.10	0.30	0	0	1	90
D2006	0.04	0.19	0	0	1	36
D2007	0.03	0.16	0	0	1	24
D2008	0.03	0.17	0	0	1	29
D2009	0.03	0.17	0	0	1	27
D2010	0.03	0.18	0	0	1	32
D2011	0.04	0.19	0	0	1	34
D2012	0.05	0.21	0	0	1	42
D2013	0.05	0.23	0	0	1	50
D2014	0.05	0.22	0	0	1	45
D2015	0.05	0.23	0	0	1	50
D2016	0.06	0.24	0	0	1	55
D2017	0.08	0.27	0	0	1	72

Prices are in 2016-year dollars. The variable Acres is not used in the condominium/townhouse regressions.

Table 7. One-Way Distances of Estuarine/Waterway Waterfront Property Parcels to Nearest Inlet and Second-Nearest Inlet, for Parcels in the MLS Database, for Three Locations, by Parcel Type (Single-Family vs. Condo/Townhouse). (distances in miles)

Location	Parcel Type	Variable	N	Mean	Std Dev	Minimum	Median	Maximum
New Hanover/ Pender County Region	Single-Family	Nearest Inlet Distance	1899	2.74	1.72	0.37	2.32	9.49
		Second-Nearest Inlet Distance	1899	6.26	2.86	2.39	5.39	13.49
	Condos/Townhouses	Nearest Inlet Distance	1518	2.20	0.59	0.87	2.20	5.40
		Second-Nearest Inlet Distance	1518	7.58	3.38	2.47	9.65	11.14
Parcels for which Nearest Inlet is Carolina Beach Inlet	Single-Family	Nearest Inlet Distance	427	2.09	0.94	0.37	2.09	4.13
		Second-Nearest Inlet Distance	427	8.68	2.02	4.35	9.49	11.07
	Condos/Townhouses	Nearest Inlet Distance	971	2.16	0.61	1.42	1.94	4.32
		Second-Nearest Inlet Distance	971	9.92	1.3	4.64	9.99	11.14
Town of Carolina Beach	Single-Family	Nearest Inlet Distance	178	2.08	0.46	1.33	2.00	2.98
		Second-Nearest Inlet Distance	178	10.15	0.57	7.16	10.16	11.07
	Condos/Townhouses	Nearest Inlet Distance	922	2.07	0.49	1.42	1.87	4.32
		Second-Nearest Inlet Distance	922	10.19	0.49	9.52	10.02	11.14

Table 8. Multiple Regression Analysis Results for <u>Single-Family</u> Estuarine/Waterway Waterfront Properties in MLS Database, New Hanover and Pender Counties, NC, 1999-2017.

	Model 1		Model 2		Model 3 (Preferred Model)	
Dependent Variable	**SoldPrice**		**SoldPrice**		**LN_SoldPrice**	
Independent Variables	**Coefficients**	**p-Values**	**Coefficients**	**p-Values**	**Coefficients**	**p-Values**
Intercept	1994.18	0.9521	-260381	0.0001 ***	5.80174	0.0001 ***
SqFtHeated	264.982	0.0001 ***	260.15	0.0001 ***		
LN_SqFtHeated					0.94026	0.0001 ***
Acres	54370	0.0001 ***	43606	0.0014 ***		
LN_Acres					0.07747	0.0001 ***
InletDistance	-21231	0.0001 ***				
LN_InletDistance					-0.12513	0.0001 ***
INVInletDistance			101509	0.0005 ***		
OceanDistance	-231157	0.0001 ***				
LN_OceanDistance					-0.19622	0.0001 ***
INV_OceanDistance			24470	0.0001 ***		
Dwilmington	330355	0.0001 ***	159217	0.0001 ***	0.31129	0.0001 ***
Dwrightsvillebch	611903	0.0001 ***	601116	0.0001 ***	0.6989	0.0001 ***
Dpender	172160	0.0001 ***	-14797	0.4848	0.10868	0.0006 ***
D1999	27831	0.4658	38408	0.3626	-0.00878	0.8657
D2000	-64326	0.105	-70934	0.0723 *	-0.10238	0.0474 **
D2001	12609	0.7421	5988.33	0.8833	-0.0435	0.3473
D2002	23961	0.562	14088	0.736	-0.04692	0.3143
D2003	73466	0.0412 **	52437	0.1652	0.04093	0.3495
D2004	130631	0.0001 ***	120960	0.001 ***	0.17801	0.0001 ***
D2005	296248	0.0001 ***	256367	0.0001 ***	0.37301	0.0001 ***
D2006	365682	0.0001 ***	347476	0.0001 ***	0.44106	0.0001 ***
D2007	257380	0.0001 ***	234078	0.0001 ***	0.35588	0.0001 ***
D2008	287203	0.0001 ***	275812	0.0001 ***	0.35801	0.0001 ***
D2009	12429	0.8099	21631	0.6933	0.04308	0.4482
D2010	64459	0.1047	66917	0.1209	0.08018	0.0988 *
D2011	-42159	0.2983	-58823	0.152 **	-0.06596	0.172
D2012	-23899	0.4447	-23852	0.4632	-0.02634	0.4824
D2013	-19137	0.5642	-26389	0.4569	-0.04768	0.2273
D2014	-41029	0.2388	-38057	0.3113	-0.01879	0.6368
D2015	20470	0.5608	15185	0.6914	0.0233	0.5511
D2017	32350	0.3371	30961	0.3904	0.07003	0.0824 *
	n = 1899 R^2Adj = 0.65		n = 1899 R^2Adj = 0.59		n = 1899 R^2Adj = 0.68	
	F = 139.18 (p<0.0001)		F = 110.49 (p<0.0001)		F = 158.76 (p<0.0001)	

*, **, *** indicate statistical significance at p<0.10, p<0.05 and p<0.01 (***, p<0.01, indicates highest statistical significance). All p-values calculated using White's (1980) heteroscedasticity-consistent standard errors. Carolina Beach is the omitted indicator variable ("D" variable) for geographic location/neighborhood, and 2016 is the omitted indicator variable for year. Hence, the baseline regression equation for all three models predicts for Carolina Beach for year 2016. The included indicator variables adjust the regression equation results for other locations and other years. "-----" indicates a variable intentionally omitted from a model.

Table 9. Multiple Regression Analysis Results for <u>Condominium/Townhouse</u> Estuarine/Waterway Waterfront Properties in MLS Database, New Hanover and Pender Counties, NC, 1999-2017.

	Model 1		Model 2 (Preferred Model)		Model 3	
Dependent Variable	**SoldPrice**		**SoldPrice**		**LN_SoldPrice**	
Independent Variables	**Coefficients**	**p-Values**	**Coefficients**	**p-Values**	**Coefficients**	**p-Values**
Intercept	-44084	0.0156 **	-181989	0.0001 ***	4.6963	0.0001 ***
SqFtHeated	290.511	0.0001 ***	306.306	0.0001 ***		
LN_SqFtHeated					1.067	0.0001 ***
Acres						
LN_Acres						
InletDistance	-18873	0.0032 ***				
LN_InletDistance					0.08442	0.0036 ***
INVInletDistance			44310	0.0679 *		
OceanDistance	-98977	0.0001 ***				
LN_OceanDistance					-0.0786	0.0001 ***
INV_OceanDistance			4363.72	0.0001 ***		
Dwilmington	153033	0.0001 ***	20377	0.194	0.0151	0.7196
Dwrightsvillebch	300678	0.0001 ***	273161	0.0001 ***	0.71677	0.0001 ***
Dpender	26373	0.1708	-5151.8	0.7281	0.02817	0.5022
D1999	-35533	0.015 **	-28140	0.0616 *	-0.1804	0.0001 ***
D2000	-55033	0.0007 ***	-47349	0.0042 ***	-0.2211	0.0001 ***
D2001	-53149	0.0003 ***	-37953	0.0084 ***	-0.1724	0.0001 ***
D2002	-32501	0.0119 **	-32140	0.0137 **	-0.2107	0.0001 ***
D2003	-30402	0.0188 **	-31525	0.0185 **	-0.1959	0.0001 ***
D2004	92186	0.0001 ***	92911	0.0001 ***	0.24198	0.0001 ***
D2005	202830	0.0001 ***	207178	0.0001 ***	0.50373	0.0001 ***
D2006	223725	0.0001 ***	227175	0.0001 ***	0.54832	0.0001 ***
D2007	302352	0.0001 ***	310572	0.0001 ***	0.55826	0.0001 ***
D2008	134392	0.0001 ***	141668	0.0001 ***	0.2924	0.0001 ***
D2009	90122	0.0108 **	101939	0.0042 ***	0.12986	0.002 ***
D2010	26957	0.1668	23518	0.2322 *	-0.0099	0.8228
D2011	-14757	0.4042	-18290	0.3053	-0.0975	0.0346 **
D2012	-48261	0.0019 ***	-48187	0.0023 ***	-0.2034	0.0001 ***
D2013	6139.65	0.7222	8451.99	0.6184	-0.0639	0.0679 *
D2014	3045.6	0.8553	1806.04	0.9178	-0.0573	0.169
D2015	-8181.2	0.5934	-6508.3	0.686	-0.0844	0.0222 **
D2017	8184.97	0.5313	9113	0.492	0.02716	0.3676
	n = 1518 R²Adj = 0.73 F = 151.5 (p<0.0001)		n = 1518 R²Adj = 0.72 F = 143.25 (p<0.0001)		n = 1518 R²Adj = 0.84 F = 291.08 (p<0.0001)	

*, **, *** indicate statistical significance at $p<0.10$, $p<0.05$ and $p<0.01$ (***, $p<0.01$, indicates highest statistical significance). All p-values calculated using White's (1980) heteroscedasticity-consistent standard errors. Carolina Beach is the omitted indicator variable ("D" variable) for geographic location/neighborhood, and 2016 is the omitted indicator variable for year. Hence, the baseline regression equation for all three models predicts for Carolina Beach for year 2016. The included indicator variables adjust the regression equation results for other locations and other years. Variables Acres and LN_Acres were omitted from all three condominium/townhouse regression models. "-----" indicates a variable intentionally omitted from a model.

Table 10a. Change in Parcel Value if Nearest Inlet Replaced with Next-Nearest Inlet, **All** Estuarine/Waterway Waterfront Residential Parcels **for which the Nearest Inlet is Carolina Beach Inlet.** (excludes oceanfront) n = 1,359.

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
Acres	1.00	1.61	0.01	0.40	19.20	1,356
Condominium/Townhouse Indicator Variable	0.41	-	-	-	-	554
Distance to Nearest Inlet (miles)	2.15	0.77	0.37	2.11	4.23	-
Distance to Next-Nearest Inlet (miles)	9.24	1.85	3.66	9.90	11.18	-
Distance to Carolina Beach Inlet (miles)	2.15	0.77	0.37	2.11	4.23	-
Wilmington Parcels	0.35	-	-	-	-	469
Town of Carolina Beach Parcels	0.65	-	-	-	-	890
Town of Wrightsville Beach Parcels	-	-	-	-	-	-
Parcel Value (2016-year $'s)	$412,702	$308,668	$44,754	$350,623	$4,181,871	$560,862,564
Change in Parcel Value if Nearest Inlet is Replaced with Next-Nearest Inlet	-$62,329	$70,184	-$559	-$45,069	-$1,216,023	-$84,704,949
Percentage Change in Parcel Value	-14.87	-	-	-16.60	-	-

Table 10b. Change in Parcel Value if Nearest Inlet Replaced with Next-Nearest Inlet, **Single-Family Only** Estuarine/Waterway Waterfront Residential Parcels **for which the Nearest Inlet is Carolina Beach Inlet.** (excludes oceanfront) n = 805

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
Distance to Nearest Inlet (miles)	2.06	0.78	0.37	2.11	4.23	-
Distance to Next-Nearest Inlet (miles)	8.94	1.86	3.66	9.87	11.18	-
Distance to Carolina Beach Inlet (miles)	2.06	0.78	0.37	2.11	4.23	-
Wilmington Parcels	0.51	-	-	-	-	412
Town of Carolina Beach Parcels	0.49	-	-	-	-	393
Town of Wrightsville Beach Parcels	-	-	-	-	-	-
Parcel Value (2016-year $'s)	$551,566	$323,448	$76,071	$485,730	$4,181,871	$444,010,347
Change in Parcel Value if Nearest Inlet is Replaced with Next-Nearest Inlet	-$93,832	$76,468	-$559	-$76,485	-$1,216,023	-$75,534,416
Percentage Change in Parcel Value	-17.26	-	-	-17.49	-	-

Table 10c. Change in Parcel Value if Nearest Inlet Replaced with Next-Nearest Inlet, **Condominium/Townhouse Only**, Estuarine / Waterway Waterfront Residential Parcels **for which the Nearest Inlet is Carolina Beach Inlet.** (excludes oceanfront) n = 554.

Variable	Mean	StdDev	Minimum	Median	Maximum	Sum
Distance to Nearest Inlet (miles)	2.28	0.72	1.42	2.13	3.84	-
Distance to Next-Nearest Inlet (miles)	9.67	1.73	4.64	10.01	11.07	-
Distance to Carolina Beach Inlet (miles)	2.28	0.72	1.42	2.13	3.84	-
Wilmington Parcels	0.10	-	-	-	-	57
Town of Carolina Beach Parcels	0.90	-	-	-	-	497
Town of Wrightsville Beach Parcels	-	-	-	-	-	-
Parcel Value (2016-year $'s)	$210,925	$114,052	$44,754	$164,731	$885,021	$116,852,217
Change in Parcel Value if Nearest Inlet is Replaced with Next-Nearest Inlet	-$16,553	$7,151	-$2,016	-$16,472	-$26,644	-$9,170,533
Percentage Change in Parcel Value	-11.39	-	-	-8.23	-	-

Table 11a. Change in Parcel Value if Nearest Inlet Replaced with Next-Nearest Inlet, <u>**All**</u> Estuarine/Waterway Waterfront Residential Parcels <u>**in the Town of Carolina Beach.**</u> (excludes oceanfront) n = 890.

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
Acres	0.93	1.29	0.01	0.36	4.73	830
Condominium/Townhouse Indicator Variable	0.56	-	-	-	-	497
Distance to Nearest Inlet (miles)	2.08	0.49	1.32	2.00	3.07	-
Distance to Next-Nearest Inlet (miles)	10.19	0.53	6.66	10.16	11.18	-
Distance to Carolina Beach Inlet (miles)	2.08	0.49	1.32	2.00	3.07	-
Wilmington Parcels	-	-	-	-	-	-
Town of Carolina Beach Parcels	1.00	-	-	-	-	890
Town of Wrightsville Beach Parcels	-	-	-	-	-	-
Parcel Value (2016-year $'s)	$312,742	$205,459	$44,754	$281,429	$1,511,995	$278,340,082
Change in Parcel Value if Nearest Inlet is Replaced with Next-Nearest Inlet	-$47,977	$43,000	-$10,131	-$25,233	-$313,055	-$42,699,634
Percentage Change in Parcel Value	-15.13	-	-	-17.25	-	-

Table 11b. Change in Parcel Value if Nearest Inlet Replaced with Next-Nearest Inlet, **Single-Family Only**, Estuarine/Waterway Waterfront Residential Parcels **in the Town of Carolina Beach.** (excludes oceanfront) n = 393.

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
Distance to Nearest Inlet (miles)	2.05	0.39	1.32	1.99	3.07	-
Distance to Next-Nearest Inlet (miles)	10.15	0.48	6.66	10.14	11.18	-
Distance to Carolina Beach Inlet (miles)	2.05	0.39	1.32	1.99	3.07	-
Wilmington Parcels	-	-	-	-	-	-
Town of Carolina Beach Parcels	1.00	-	-	-	-	393
Town of Wrightsville Beach Parcels	-	-	-	-	-	-
Parcel Value (2016-year $'s)	$467,462	$203,431	$92,258	$399,291	$1,511,995	$183,712,743
Change in Parcel Value if Nearest Inlet is Replaced with Next-Nearest Inlet	-$85,704	$39,965	-$18,006	-$74,129	-$313,055	-$33,681,853
Percentage Change in Parcel Value	-18.31	-	-	-18.39	-	-

Table 11c. Change in Parcel Value if Nearest Inlet Replaced with Next-Nearest Inlet, **Condominium/Townhouse Only**, Estuarine/Waterway Waterfront Residential Parcels **in the Town of Carolina Beach.** (excludes oceanfront) n = 497.

Variable	Mean	Std Dev	Minimum	Median	Maximum	Sum
Distance to Nearest Inlet (miles)	2.11	0.56	1.42	2.00	2.98	-
Distance to Next-Nearest Inlet (miles)	10.23	0.56	9.31	10.16	11.07	-
Distance to Carolina Beach Inlet (miles)	2.11	0.56	1.42	2.00	2.98	-
Wilmington Parcels	-	-	-	-	-	-
Town of Carolina Beach Parcels	1.00	-	-	-	-	497
Town of Wrightsville Beach Parcels	-	-	-	-	-	-
Parcel Value (2016-year $'s)	$190,397	$94,808	$44,754	$156,902	$711,403	$94,627,340
Change in Parcel Value if Nearest Inlet is Replaced with Next-Nearest Inlet	-$18,144	$5,669	-$10,131	-$17,755	-$26,644	-$9,017,781
Percentage Change in Parcel Value	-12.61	-	-	-9.01	-	-

Figures

Figure 1. Coastal Inlet Locations in New Hanover and Pender Counties, NC, and the Location of the Nearest Inlet in Each Adjacent County. (Green Triangles indicate inlet locations; Inlet names in white color.)

Figure 2. Plot of estuarine/waterway waterfront single-family parcel sales prices (SoldPrice) for all transactions 1999 to 2017 in the MLS database (2016-year dollars) in New Hanover and Pender Counties, NC, against distance to the nearest inlet (InletDistance) (in miles). (n = 2108)
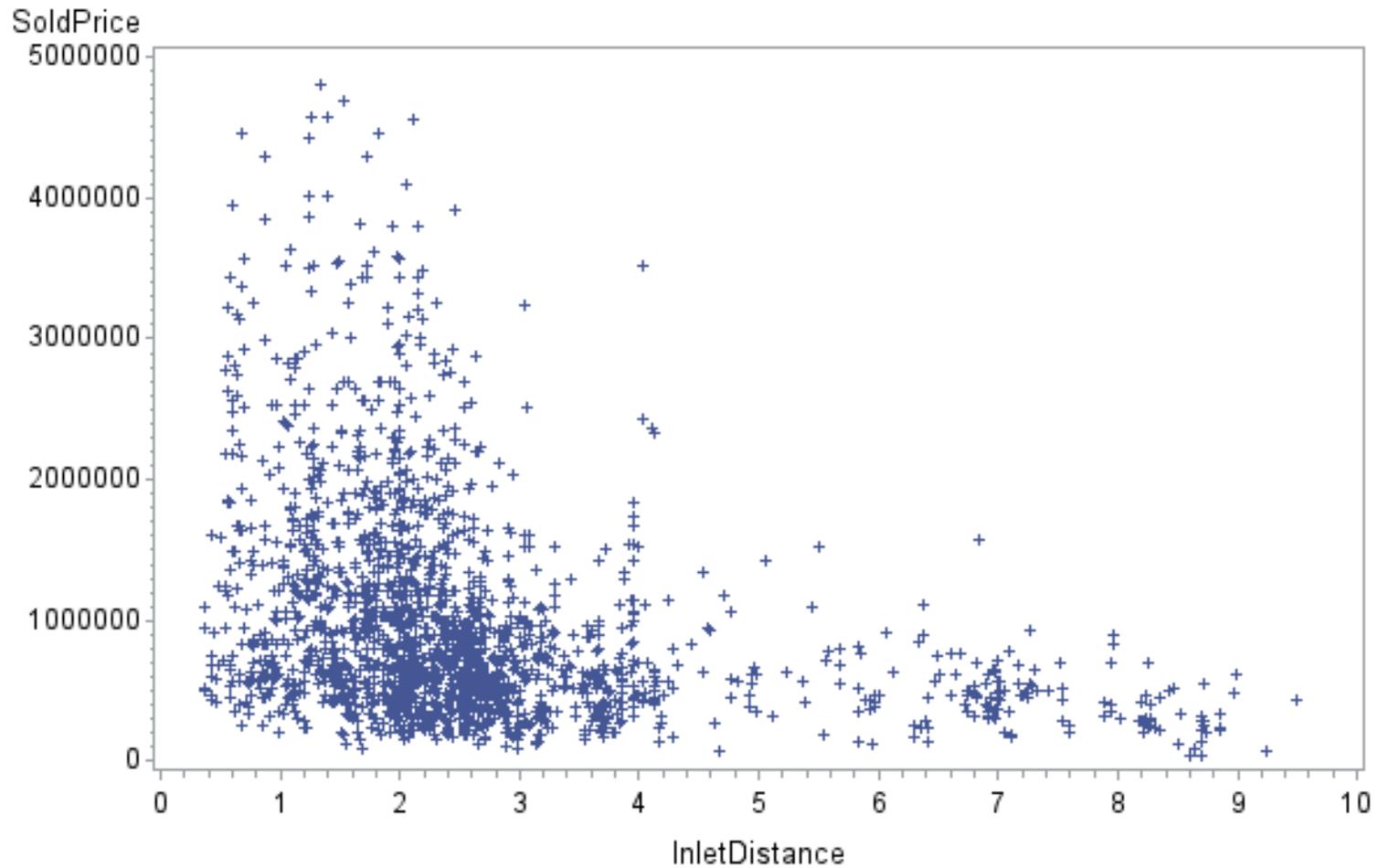

(Note: Figure does not show two parcels between 1 and 2 miles InletDistance with SoldPrice greater than $5 million)

Figure 3. Plot of estuarine/waterway waterfront condominium/townhouse parcel sales prices (SoldPrice) for all transactions 1999 to 2017 in the MLS database (2016-year dollars) in New Hanover and Pender Counties, NC, against distance to the nearest inlet (InletDistance) (in miles). (n = 1518)
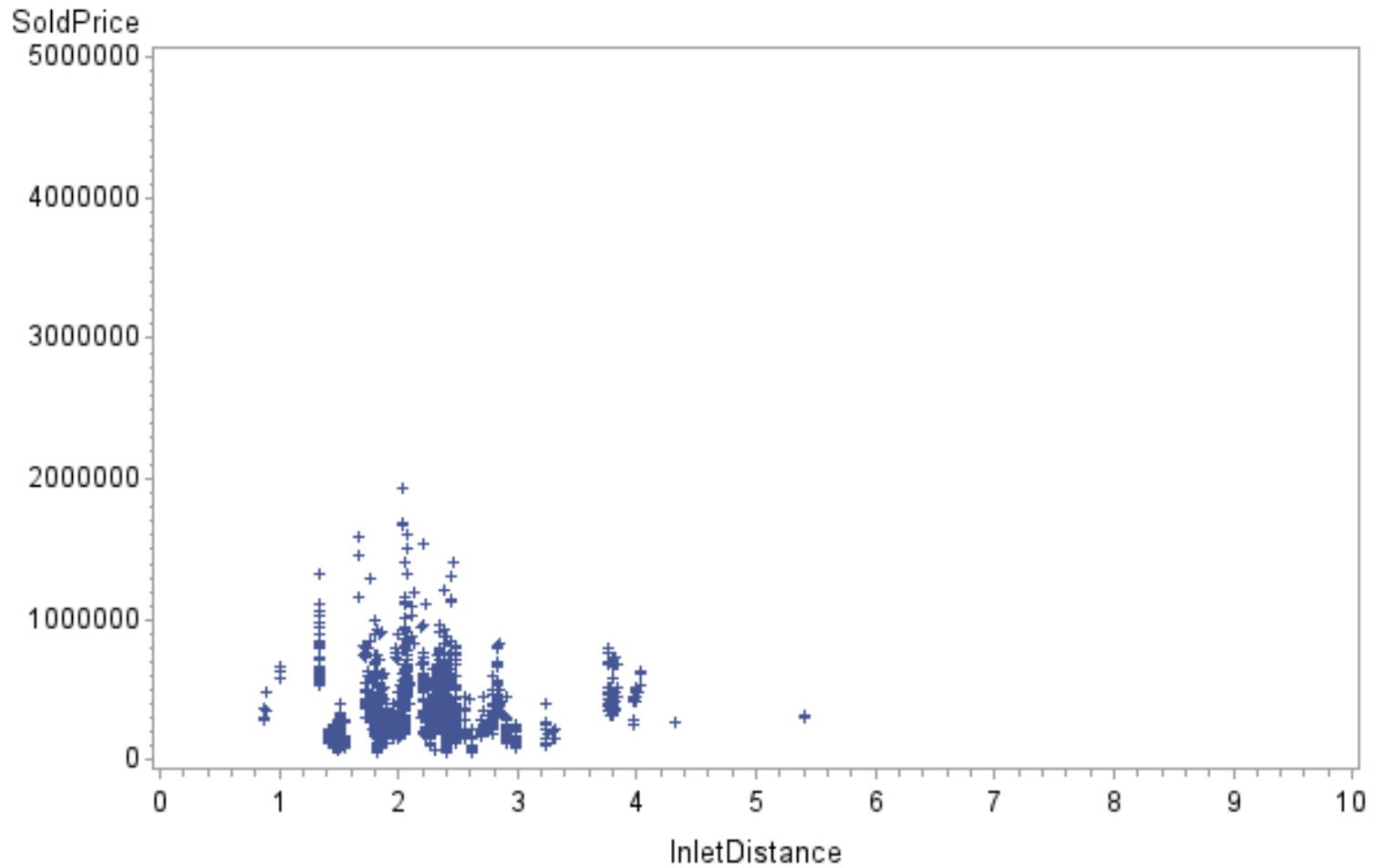
Figure 4. Estimated Effect of Nearest Inlet Distance on Median Parcel Value for Single-Family and Condominium/Townhouse Parcels, New Hanover and Pender Counties, North Carolina. (year 2016 dollars).
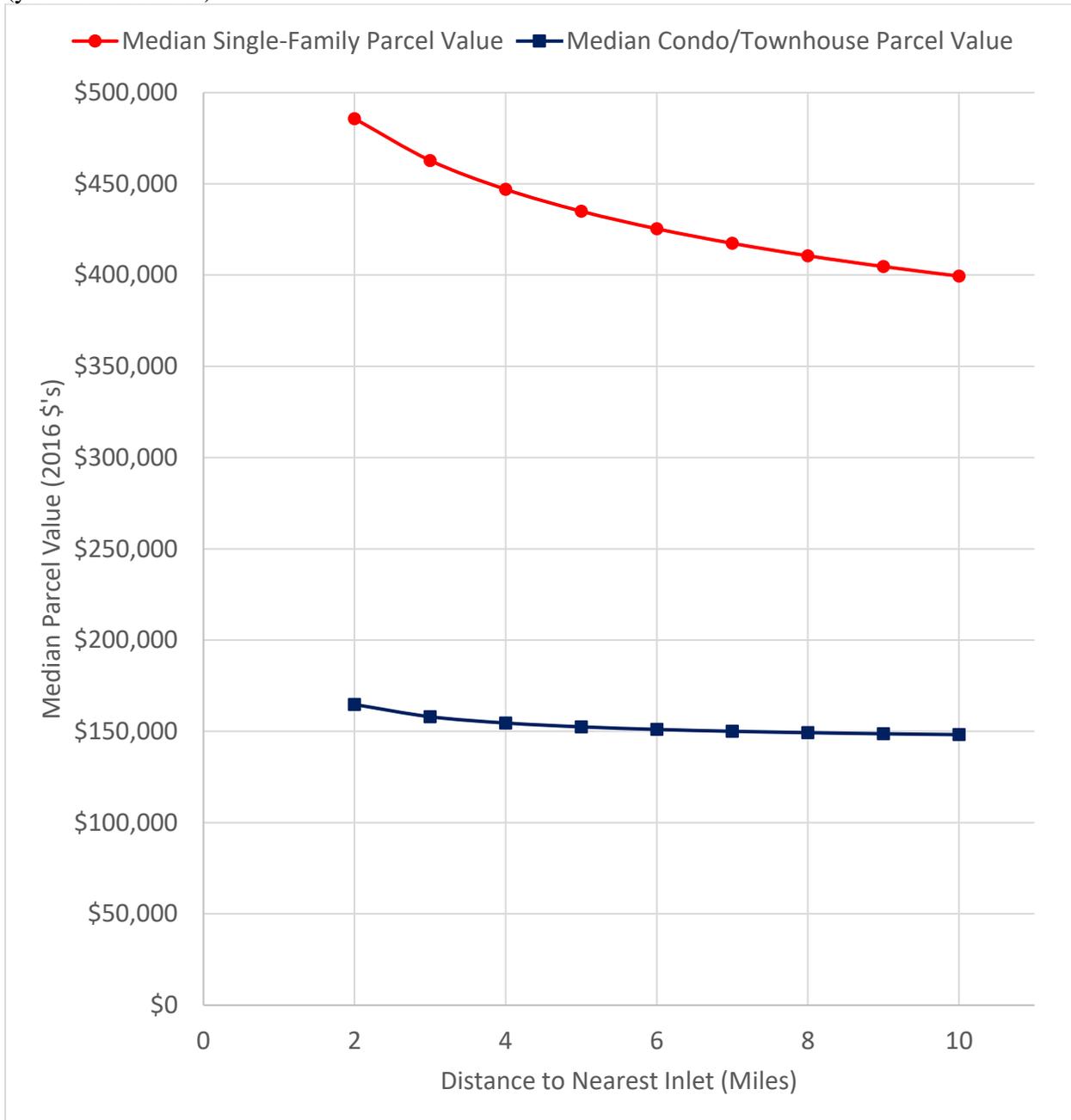
The estimated relationships in Figure 4 are based on all parcel sales transactions (excluding extreme outliers) from 1999 to 2017 for estuarine/waterway waterfront parcels (oceanfront parcels excluded) located in New Hanover and Pender Counties, NC. The starting (left-most) parcel values in Figure 4 are the median values for those parcels whose nearest inlet is Carolina Beach inlet, $485,730 for single-family parcels and $164,731 for condominium / townhouse parcels. For these parcels, the median distance to the *nearest* inlet (Carolina Beach Inlet) was 2.11 miles for single-family parcels and 2.13 miles for condominium/townhouse parcels. The median distance to the *next-nearest* inlet was 9.87 miles for single-family parcels and 10.01 miles for condo/townhouse parcels. To reflect this range of typical distances, the graph begins at a distance of 2 miles and extends to 10 miles. At 10 miles, the value of the median single-family parcel is $399,440 and the value of the median condo/townhouse parcel is $148,209.