
Proposed Extension of the Mark Clark Expressway

A Contingent
Valuation Survey

Greenfield Advisors, LLC

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CONTENTS

Survey Overview	3
1.1. Introduction and Demographics.....	3
1.2. Providing Respondents with Information.....	8
1.3. General Selling and Marketability Results	9
1.4. Value Impact Results	12
1.5. Conclusions	17

SURVEY OVERVIEW

1.1. Introduction and Demographics

Greenfield Advisors was asked to conduct a survey of Charleston-area and South Carolina residents to determine whether the proposed Mark Clark Expressway Extension would have any perceived effects on property marketability and property values. The research was conducted by Clifford A. Lipscomb, Ph.D., Director of Economic Research, with significant assistance from Abigail S. Mooney.

To carry out this assignment, we designed a contingent valuation (CV) survey where respondents were asked to state their willingness to buy in an area described in the survey, as well as their willingness-to-pay for a home near the proposed parkway route. At our request, the CV survey was administered by Wilkins Research Services, Inc. of Chattanooga, Tennessee via two modes: telephone and Internet (also referred to as the Web). In total, there were 50 respondents to the telephone survey and 435 respondents to the online Web-based survey for a grand total of 485 respondents. Given the most conservative assumptions, this sample size corresponds to a margin of error of 4.4%.

The survey included several demographic and screening questions that provided us with background information on the survey respondents. The survey was administered only to homeowners who were the primary decision-makers or shared the decision-making role to purchase their home. All survey respondents were over the age of 18. The majority of survey respondents were over 55 years of age. Figures 1 and 2 show the percentage of respondents in each age group for the telephone and Web-based surveys. One of the reasons we opted to use a telephone survey as the second survey mode was because a significant number of individuals in the area are older and have a lower level of income and therefore are less likely to have Internet access. For this reason, it is no surprise that the telephone survey group is relatively older than the Web-based survey group.

Figure 1. Respondent Age Groups – Telephone Survey

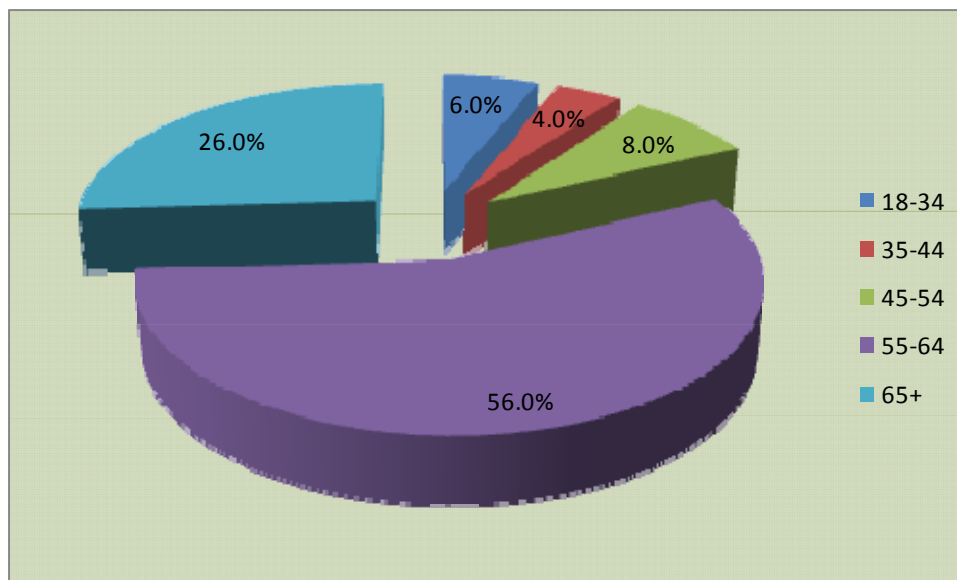
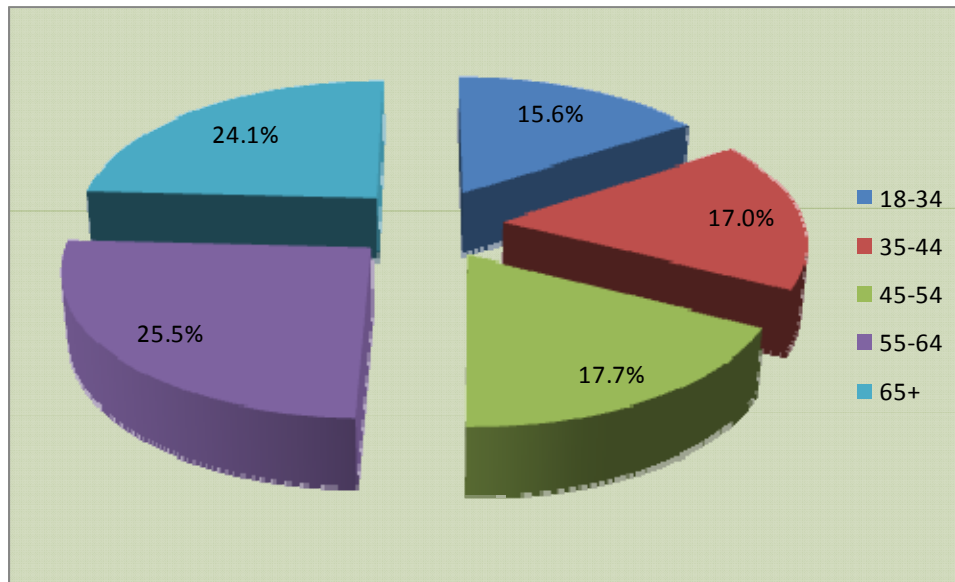


Figure 2. Respondent Age Groups – Web-based Survey



The age distribution of the survey sample is consistent with our expectations of respondents' answers to other questions; for example, most respondents indicated that they did not have any children or persons under the age of 18 living within their household. The average household size reported was approximately 2.5 persons per household, and those survey respondents who did have children had 2 children on average. Additionally, the survey respondents primarily live in entirely residential areas. The median annual household income of survey respondents was approximately \$90,000, most were either employed full-time or retired, and over half of the survey respondents held either college or post-graduate degrees. Finally, the sample was fairly evenly distributed across male and female (gender) categories. Table 1 outlines the characteristics of the survey respondents for both the Web-based and telephone surveys in detail.

Table 1. Survey Respondents' Demographic Characteristics (by Survey Mode)

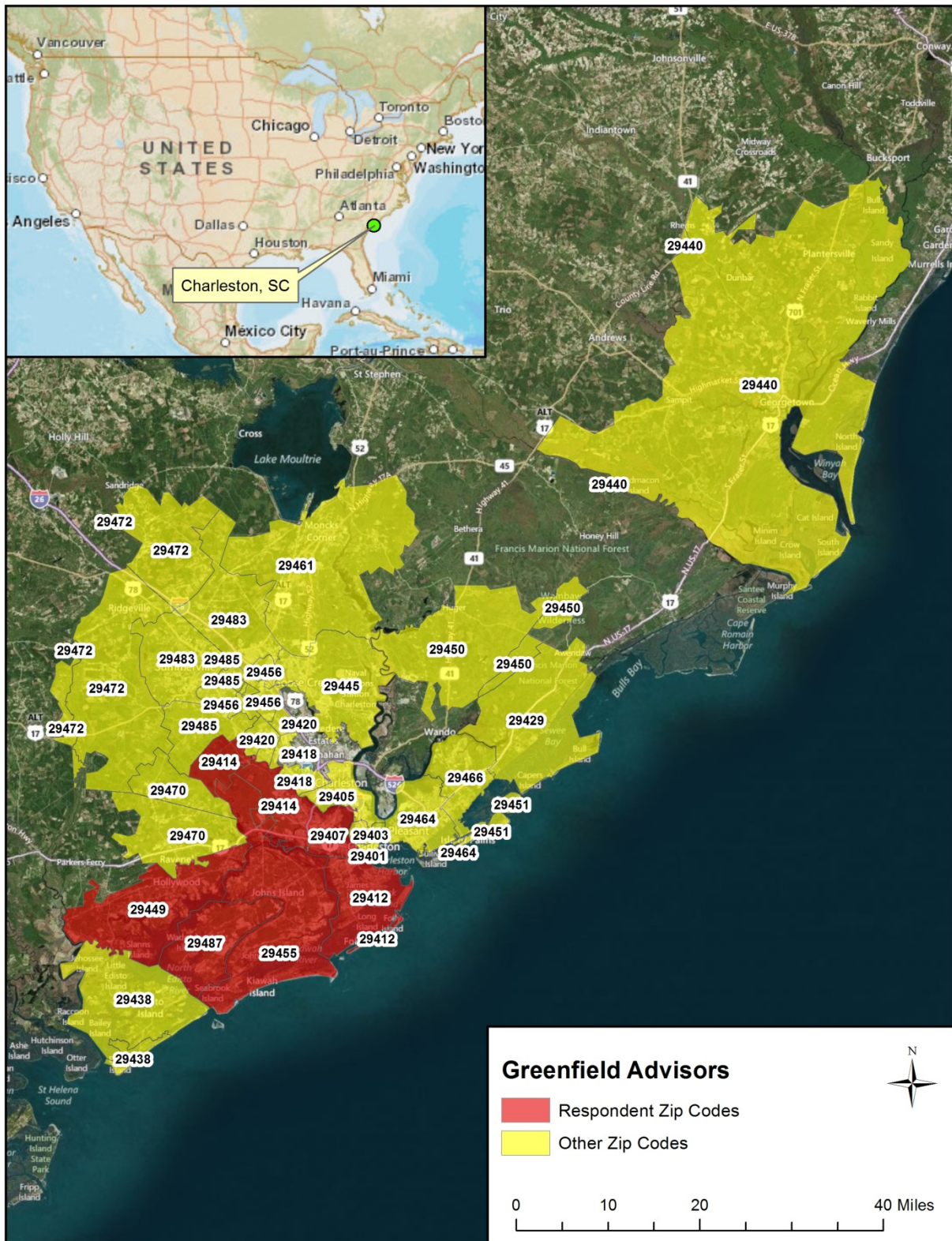
	Phone	Web
Gender		
Male	50.0%	47.6%
Female	50.0%	52.4%
Household Characteristics		
Average Household Size	2.3	2.5
Average Number of Children Per Household	2.0	1.8
Percent of Homeowners with Children	16.0%	28.5%
Neighborhood		
Entirely residential	74.0%	77.5%
Primarily residential with a little commercial or industrial	24.0%	13.3%
A mixture of residential and commercial or industrial	0.0%	3.0%
Rural or other	2.0%	6.2%
Education		
Less than or some high school	2.0%	0.0%
High school graduate	10.0%	5.5%
Some college or technical school	18.0%	22.8%
College graduate	44.0%	38.9%
Post graduate	26.0%	32.9%
Employment Status and Income		
Employed Full Time	42.0%	56.6%
Employed Part Time	6.0%	8.0%
Unemployed / Looking for work	4.0%	1.4%
Student	0.0%	0.9%
Homemaker	4.0%	2.8%
Retired	44.0%	30.3%
Median Annual Household Income	\$77,500	\$90,000

Our goal was primarily to target individuals living within the Zoning Improvement Plan (ZIP) codes that would be directly affected by the construction of the proposed parkway: 29407, 29412, 29414, 29449, 29455, and 29487. Due to sampling restrictions, approximately 30% of the survey respondents came from the directly affected ZIP codes and nearly 70% came from other ZIP codes surrounding the Charleston area. Table 2 provides the percentage of individuals coming from each of the directly affected ZIP codes and the other ZIP code category as a whole. Map 1 shows an aerial view of the ZIP code polygons with the ZIP codes of the survey respondents who would potentially be directly affected by the Mark Clark Expressway construction highlighted in red and the other surveyed ZIP codes outlined in yellow.

Table 2. Respondent ZIP Codes

Zip Code	Phone	Web
29407	12.0%	7.8%
29412	10.0%	6.2%
29414	0.0%	9.2%
29449	0.0%	1.1%
29455	6.0%	7.6%
29487	0.0%	0.2%
Other	72.0%	67.8%

Map1. Surveyed Zip Codes



To determine if the proposed Mark Clark Expressway extension would affect residential property values in surrounding communities, we first had to get survey respondents thinking about the property values where they live. Table 3 summarizes the respondents' opinions on the average home prices in their current neighborhood. In addition to asking about the average price of homes in the respondents' general neighborhoods, in an open-ended question we also asked respondents to opine on the value of their current home. The median home value reported by respondents taking the telephone survey was \$222,500, and the median home value reported by respondents taking the Web-based survey was \$230,000.

Table 3. Average Neighborhood Price

Price Range	Phone	Web
\$100,000 to \$200,000	46.0%	38.2%
\$201,000 to \$300,000	18.0%	28.3%
\$301,000 to \$400,000	8.0%	14.0%
\$401,000 to \$500,000	10.0%	6.7%
\$501,000 to \$600,000	8.0%	4.4%
\$601,000 to \$750,000	4.0%	3.0%
\$751,000 or higher	6.0%	5.5%

1.2. Providing Respondents with Information

For the respondents to have enough information to make a decision about how property values may or may not be affected by the construction of the Mark Clark Expressway Extension, we developed a fact card that describes the location, proposed route, and speed limit of the extension. The fact card also included information about predicted improvements to commute time should the parkway be completed, the proximity of the parkway to existing homes, and predicted noise impacts for homes along the parkway's proposed route. Further, predicted land impacts to wetlands, floodplains, and upland area within the proposed route were also mentioned. All information within the fact card related to the plans and impacts of the proposed parkway extension were obtained from the South Carolina Department of Transportation (SCDOT)'s Draft Environmental Impact Statement¹ and plans and studies associated with the SCDOT Draft Environmental Impact Statement.

Additionally, in the Web-based survey, four different sets of before-and-after pictures along the proposed parkway route were shown to subsets of the respondents. These renderings and figures were also taken from the SCDOT's Draft Environmental Impact Statement and associated plans and studies. For the before-and-after renderings in the fact card photo scenarios, each respondent saw only one set of before-and-after pictures, so 25% of the Web-based survey population viewed Fact Card 1, which depicted the Northwest portion of the parkway extension; 25% viewed Fact Card 2, which depicted the Western portion of the parkway extension; 25% viewed Fact Card 3, which depicted the Central portion of the parkway extension; and 25% viewed Fact Card 4, which depicted the Southeastern portion of the parkway extension. The before-and-after photo sets and the full survey instrument are attached as Appendix A.

¹ South Carolina Department of Transportation. "Mark Clark Expressway – Draft Environmental Impact Statement." *Federal Highway Administration*.

1.3. General Selling and Marketability Results

After they viewed the fact card information, survey respondents were asked specific questions about the expressway extension. Respondents were asked to indicate on a scale of 1 to 10 how likely they would be to purchase any home in the area near the proposed parkway route - approximately 67% of Web-based respondents indicated that they would not buy a home in the area, while approximately 78% of telephone respondents stated that they likely would not purchase a home in the area. In an open-ended question that followed, the respondents were asked to explain why they would or would not want to purchase a home in the area. The quotations below represent direct statements from survey respondents regarding their views in favor of or opposing the purchase of a home adjacent to the parkway extension.

Respondents Who Would Move to a Home Adjacent to the Proposed Parkway:

"Because I like to be close to the Interstate. My current home is that close to the interstate. Homes now are pretty much sound resistant."

"If I love the home, I'd buy there."

"The convenience with the new extension would make travel time much quicker to everything. The area is still good and will only increase in value once completed."

"I wouldn't buy until the road was complete and if the noise and traffic weren't too bad, I have no reason to reject property so close to a major road."

"Due to the economy, I would consider buying the property because of the price. However, it would have to be a good area where crime was minimal, and the upkeep of the neighborhood was enforced."

"The price is good and I think the 526 expansion is a needed project."

Respondents Who Would Not Move to a Home Adjacent to the Proposed Parkway:

"Would not want to be in close proximity to the major road. Also, do not think it would be a good investment as it is likely that not very many people would want to live in that area once 526 runs through and destroys all of the wetlands."

"Potential for future property value loss due to roadway."

"The area's wildlife and natural resources that would have otherwise attracted me to the area will no longer be an attraction after the blight of urban sprawl damages them. I would not even consider purchasing a house that close to the noise, air and other pollutants that will result from this proposed expansion."

"I would not want to be so close to the parkway. I do not want to deal with the traffic or the air & noise pollution."

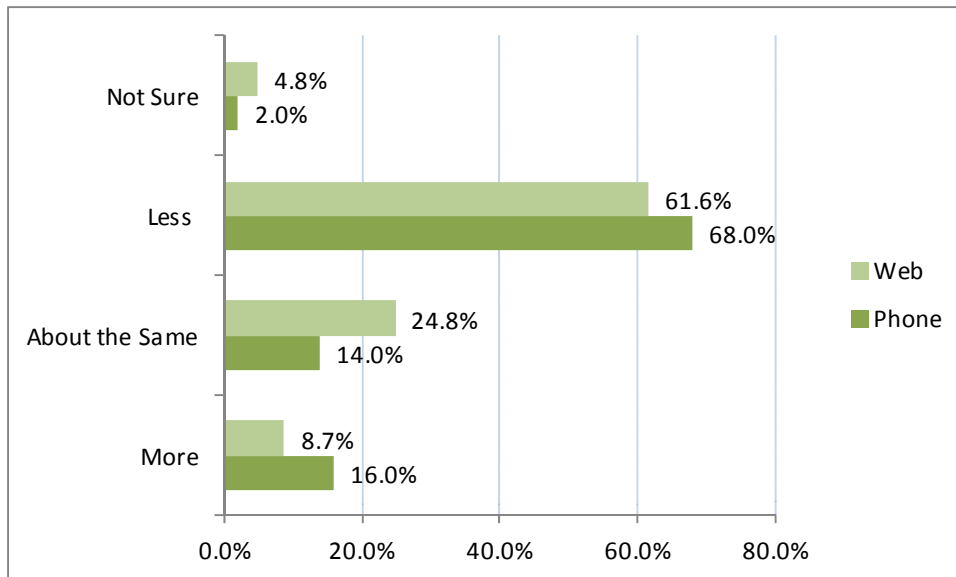
"Living in a coastal area/flood plain is already a bad idea. Add in a major highway, there are no benefits to living in that area."

“Noise and traffic factor outweigh the convenience of living that close. I currently live close enough to enjoy the convenience and far enough away to not experience the noise.”

“Wetlands damage and high volume of traffic. Poor air quality, noise pollution and general disruption of daily activities as consideration must be given to traffic.”

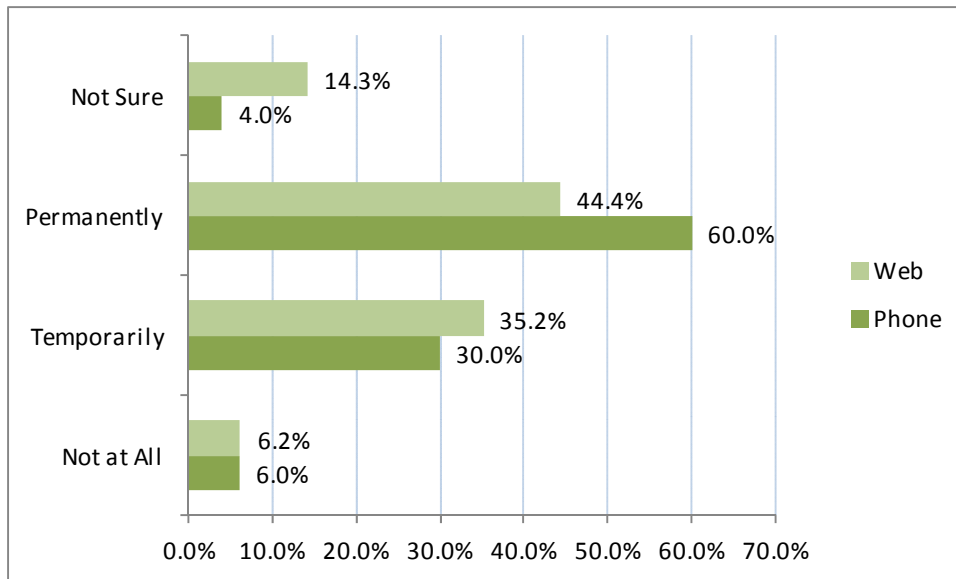
Respondents were also asked if they would expect to pay more, about the same, or less for a home that was adjacent to the proposed parkway. Approximately 68% of telephone respondents and approximately 62% of Web-based respondents stated that they expected to pay less for a home adjacent to the proposed parkway. When those respondents who expected to pay less were asked how far away from the parkway they would need to be for no price discount to be expected for the home, the average response was nearly 3.5 miles. Figure 3 summarizes the value expectations based on telephone and Web-based responses.

Figure 3. Value Expectations



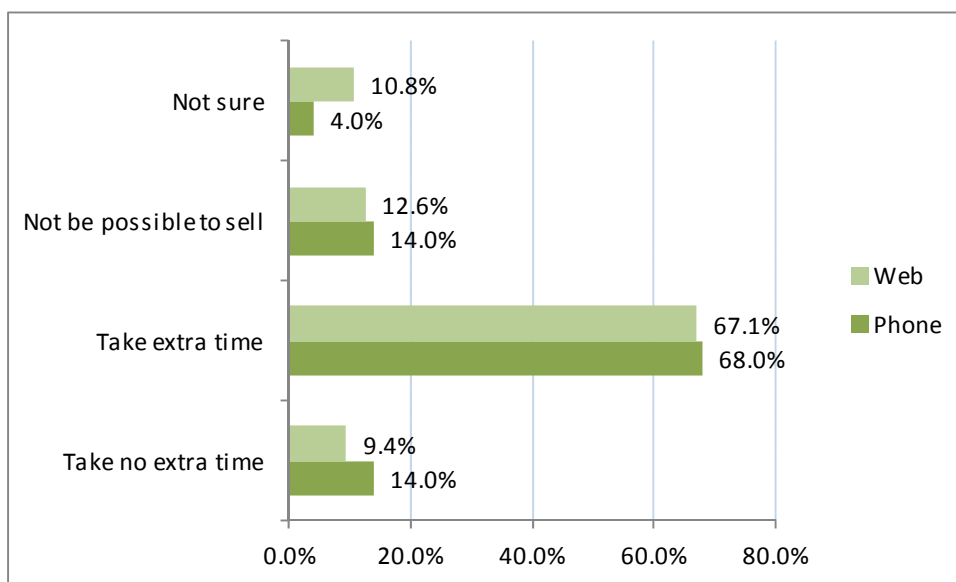
Respondents were also asked how long they thought property values of homes in adjacent neighborhoods would be affected once construction on the Mark Clark Expressway Extension began. Their answers indicated that most respondents thought the parkway would either temporarily or permanently affect property values in surrounding neighborhoods. The respondents who indicated that they felt property values would be temporarily affected were then asked to indicate, in number of years, how long they thought values would be temporarily affected. The overall average answer for the surveys was just over 3.5 years. Complete results for the telephone and Web-based surveys for these two questions are summarized in Figure 4.

Figure 4. Effects on Property Values



As a test for marketability impacts on the area, respondents were asked the following question: “If all potential buyers knew the proposed parkway would be constructed within 1,000 feet of the home, do you think it would take no extra time, take extra time, or not be possible to sell the home?” Answers indicated that more than half of the respondents felt that it would take extra time to sell the home, and many even responded that it would not be possible to sell the home. Then, those who felt it would take extra time to sell the home were asked to state, in number of months, how much longer they thought it would take to sell a home within 1,000 feet of the proposed parkway compared to the same home, still having good access to the parkway, but not within 1,000 feet of the parkway. On average, the respondents thought it would take approximately 10 months longer to sell the home. The results regarding marketability of the properties along the proposed parkway are shown in Figure 5.

Figure 5. Property Marketability



1.4. Value Impact Results

One of the main goals of the survey was to determine if property values will likely be affected upon construction of the proposed Mark Clark Expressway Extension. To address this, we developed a dichotomous-choice (DC) contingent valuation (CV) question where respondents were required to answer yes or no to purchasing a home at a randomly generated price. The randomly generated price represented either 5%, 15%, 30%, 45%, 60%, 75%, 90%, 105%, 120%, or 135% of the homeowner's current home value reported earlier in the survey. In other words, the value presented to the respondents represented a percentage of their current home's value. For example, if a respondent says the current value of her current home is \$200,000, and if the respondent receives a randomly generated percentage of 90%, then the value presented to the respondent for answering the DC question is \$180,000 (computed as $\$200,000 \times 0.9$). What the survey respondents viewed or heard was this percentage expressed *in dollars*, as in the example above, so they did not have to perform those percentages-to-dollars computations mentally before answering the question. Roughly an equal number of respondents were presented with each bid percentage; thus each respondent was randomly assigned a bid percentage.

General Results

Respondents' answers indicate that a majority of respondents would not purchase the home for the amount presented to them. As expected, more individuals were likely to say "Yes" to the question when the randomly generated price represented a lower percentage of their home value; and as the randomly generated price represented larger percentages of home value, fewer respondents said "Yes" to the question about purchasing the home. Interestingly, in the phone survey, all of the respondents who were presented with a price representing 5% of their home value said "No" to the proposed bid. This result is likely capturing those individuals who protest living in the area – these are known as "protest zeros" in the economics literature. Recall from Section 1.3 that approximately 67% of Web respondents and approximately 78% of telephone respondents stated that they would likely not purchase a home in the area at all. Table 4 summarizes the respondents' answers organized by bid percentage.

When we analyzed the data according to which set of fact card photos respondents viewed (on the Web-based survey), the remarkably similar results indicated that more than half of the respondents would not purchase their same home at the randomly generated price if it were adjacent to the parkway. The similar results across the various fact cards indicate that any one set of before-and-after photos did not influence the answers more than the other sets of before-and-after photos. Table 5 summarizes the results across fact card scenarios for the Web-based survey.

In sum, a majority of respondents would not purchase a home in the area near the proposed parkway extension, even at a significant discount. When we look at the "Yes" and "No" responses generally across the survey modes, 68% of phone respondents and approximately 55% of Web respondents said "No" to purchasing a home within 1,000 feet of the proposed parkway extension at the percentage of their current home's value. Cumulatively, this indicates that around 56%² of all survey respondents would not be willing-to-pay the offered percentage of their current home's value to live near the parkway extension. In other words, when discounting purchase prices for homes in the area, around 56% of the survey population would still not be willing to purchase a property, even at a discounted price.

² Based on a weighted average of phone and web "Yes" and "No" responses.

Table 4. Results by Bid Percentage

Percentage of Current Home's Value	Respondent Answer	Phone Survey	Web Survey	Total Weighted Responses
5%	Yes	0.0%	40.0%	36.0%
	No	100.0%	31.1%	38.0%
	Not Sure	0.0%	28.9%	26.0%
15%	Yes	42.9%	30.4%	32.1%
	No	57.1%	56.5%	56.6%
	Not Sure	0.0%	13.0%	11.3%
30%	Yes	20.0%	46.5%	43.8%
	No	80.0%	37.2%	41.7%
	Not Sure	0.0%	16.3%	14.6%
45%	Yes	40.0%	23.3%	25.0%
	No	60.0%	46.5%	47.9%
	Not Sure	0.0%	30.2%	27.1%
60%	Yes	20.0%	19.5%	19.6%
	No	80.0%	56.1%	58.7%
	Not Sure	0.0%	24.4%	21.7%
75%	Yes	60.0%	44.4%	46.0%
	No	40.0%	35.6%	36.0%
	Not Sure	0.0%	20.0%	18.0%
90%	Yes	25.0%	33.3%	32.6%
	No	75.0%	54.8%	56.5%
	Not Sure	0.0%	11.9%	10.9%
105%	Yes	40.0%	9.5%	12.8%
	No	60.0%	71.4%	70.2%
	Not Sure	0.0%	19.0%	17.0%
120%	Yes	0.0%	2.2%	2.0%
	No	75.0%	75.6%	75.5%
	Not Sure	25.0%	22.2%	22.4%
135%	Yes	40.0%	4.7%	8.3%
	No	60.0%	81.4%	79.2%
	Not Sure	0.0%	14.0%	12.5%

Table 5. Results by Fact Card for Web-Based Survey

	Answer	Percent
Fact Card 1	Yes	21.1%
	No	51.4%
	Not Sure	27.5%
Fact Card 2	Yes	28.7%
	No	53.7%
	Not Sure	17.6%
Fact Card 3	Yes	23.9%
	No	59.6%
	Not Sure	16.5%
Fact Card 4	Yes	28.4%
	No	53.2%
	Not Sure	18.3%

As another measure of property value impact, all respondents were asked to state the highest dollar amount they would pay for a property within 1,000 feet of the parkway. Telephone respondents who said “Yes” to the randomly generated dollar amount would, on average, be willing-to-pay up to \$198,333, and Web-based respondents would, on average, be willing-to-pay up to \$203,825 for a home within 1,000 feet of the parkway. When the same question was asked of survey respondents who said “No” to the randomly generated dollar amount, slightly lower prices were provided. This is expected, as the “No” votes also capture those individuals who would not choose to live in the area at all. The average willingness-to-pay for telephone respondents who said “No” to the original bid was \$49,706, and the average willingness to pay for Web-based respondents was \$119,046. There were also several respondents who reported that they would pay \$0.00 for a property within 1,000 feet of the parkway; so many, in fact, that the median willingness-to-pay of the phone respondents was \$0.00. In other words, over half of the phone sample said they would pay \$0.00 for a home within 1,000 feet of the parkway. Without further analysis of these respondents’ answers, we cannot determine whether these are true “zeros” or if there is some kind of strategic bias in these respondents’ answers. But, there are relatively few “zeros” in the survey data overall.

The results from the stated willingness-to-pay questions were then compared to the median price of respondent homes reported earlier in the survey. This provides an initial estimate of the discount for homes within 1,000 feet of the proposed parkway extension based on the open-ended survey questions. Table 6 summarizes the average discount required for each group.

Table 6. Overall Discount Statistic

	Phone	Web	Total Weighted Responses
Discount for "Yes" Votes	21.3%	34.8%	34.8%
Discount for "No" Votes	77.7%	56.5%	67.4%

Econometric Results

Next, we estimated the property value discount required by respondents based on the DC question. This estimation procedure is more theoretically sound and allows the researcher to explore possible data anomalies that may occur. For example, the economics literature shows how more precise WTP estimates can be obtained by accounting for possible “strategic bias”, “anchoring”, information learned throughout the survey, and respondent certainty. To address these issues, we conducted several sensitivity tests, the results of which are reported below.

In preliminary runs of the WTP econometric model, we tested whether the different sets of fact cards, the use of telephone and Web-based survey modes, and the respondents located in the ZIP codes located closest to the proposed Mark Clark Expressway extension had an impact on the results. None of these variables were significant predictors of the dependent variable (the “Yes/No” DC question) in our most restrictive logistic regression model. In other words, the results were not significantly different based on which fact card was presented to respondents, which survey mode (web or telephone) was presented, or in which group of ZIP codes respondents resided. As a result, we were able to specify a more parsimonious logistic regression model to use in the calculation of mean WTP to live within 1,000 feet of the proposed expressway extension.

Although there were no differences in responses between fact cards, survey modes, or ZIP codes, the preliminary runs of the WTP model indicated that there were significant differences in

respondent answers according to whether the respondents were male or female. Generally, females are more likely to reject living within 1,000 feet of the proposed parkway extension than male respondents. The breakdown of male and female acceptance rates of the bid presented to them in the survey, regardless of survey model, is shown in Table 7. To control for male and female response differences in the econometric model, we included an indicator variable (male) that identified the respondent's gender.

Table 7. Female and Male Acceptance Rates, by Bid

	Female	Male
5%	25.0%	46.2%
15%	22.6%	45.5%
30%	32.1%	60.0%
45%	13.0%	36.0%
60%	19.2%	20.0%
75%	28.6%	58.6%
90%	20.0%	42.3%
105%	13.8%	11.1%
120%	3.6%	0.0%
135%	13.0%	4.0%

Source: Greenfield Advisors

To estimate WTP, we used a logistic regression model. A logistic regression model is a nonlinear regression model that uses data collected from the survey to estimate the mean WTP for a particular group of respondents. This model includes a dependent variable (the variable to explain) and a series of independent variables used to explain variation in the dependent variable. To define the dependent variable, we used the responses from Question 5 and re-categorize them. We defined the dependent variable ACCEPT to be equal to 0 if the respondent said “No” or “Don’t Know” to the dichotomous choice question and equal to 1 if the respondent said “Yes” to the dichotomous choice question. “Don’t Know” responses were offered to respondents in accordance with the National Oceanic and Atmospheric Administration (NOAA) Blue Ribbon Panel on Contingent Valuation report recommendation (Arrow et al., 1993)³. The conservative approach in situations like this is to treat “Don’t Know” responses as a “No” response, which will tend to underestimate WTP (Carson et al., 1998)⁴.

Next, we defined the following independent (or explanatory) variables: BID, MALE, INCOME, CHILDREN, and CERTAINTY. BID is the random house percentage value presented to each respondent (5%, 15%, 30%, 45%, 60%, 75%, 90%, 105%, 120%, and 135%); different bid values were presented to different respondents randomly so that the value of the status-quo house could be estimated. MALE indicates whether the respondent is male (MALE = 1) or female (MALE = 0). INCOME is a variable derived from the open-ended Question, DEMO6 where respondents entered their income in \$10,000 increments. CHILDREN measures whether (CHILDREN = 1) or not (CHILDREN = 0) a respondent has children under the age of 18 living at the home. Finally, we

³ Arrow, K., Solow, R., Portney, P.R., Leamer, E.E., Radner, R., and Schuman, H. (1993), “Report of the NOAA panel on contingent valuation”, *Federal Register*, 58, pp. 4601–4614.

⁴ Carson, R.T., Hanemann, W.M., Kopp, R.J., Krosnick, J.A., Mitchell, R.C., Presser, S., Ruud, P.A., and Smith, V.K. (1998), “Referendum design and contingent valuation: the NOAA panel’s no-vote recommendation”, *Review of Economics and Statistics*, 80, pp. 484–487.

constructed CERTAINTY directly from Questions Q6A2 and Q6B2 in the survey, which provides a measure of how certain respondents are that they would pay the house price percentage randomly presented to them. CERTAINTY takes on values 0 to 10, with 10 indicating that the respondent is most certain of her answer.

From the logistic regression analysis, several parameters are estimated. The general form of the logistic regression equation is $ACCEPT = f(BID, AGE, MALE)$. The estimated parameters for the independent variables tell us the marginal influences of each independent variable on the dependent variable ACCEPT. Following the studies of Hanemann (1989)⁵ and more recently Johansson (1995, p. 113)⁶, mean WTP for a status-quo house is estimated using this equation:

$$-\frac{1}{\beta} [\ln(1 + e^a)]. \quad (1)$$

In this calculation, which we call the Hanemann estimator, β is the estimated parameter for the variable BID from the logistic regression equation, $\ln$ refers to the natural logarithmic function, e is the exponential function, and a is the constant from the logistic regression equation added to the effects of all other independent variables. This formula restricts willingness to pay to be nonnegative, which is appropriate for a private good such as the house described in the survey (Blumenschein *et al.*, 2008)⁷. Also, as a validation tool, we also estimate mean WTP using the so-called Turnbull estimator, which provides a lower bound estimate of WTP (and therefore an upper bound on the discount required to live proximate to the proposed expressway extension). According to Haab and McConnell (1997)⁸, the lower-bound Turnbull estimator is not as sensitive to assumed distributions as other WTP estimators.

The results of the logistic regression models are presented in Table 8. Recall that in preliminary runs of this model several independent variables (discrete variables indicating which fact card was presented to Web respondents, a discrete variable indicating those respondents surveyed via telephone, and a discrete variable indicating whether the respondent lived in one of the Charleston area ZIP codes of interest) did not significantly predict the dependent variable. The results presented in Table 8 reflect a parsimonious model. Also, the results in Table 8 summarize the results of testing different subsets of the survey data. These sensitivity analyses not only are good econometric practice, but they also show how a wide range of results can be used to draw an overall conclusion about the impact of the proposed expressway extension on nearby property values.

Table 8 shows the results of a sensitivity analysis for property value discounts due to proximity to the proposed expressway extension. Property value discounts in this table are computed as 100% minus the mean WTP. For all 485 observations, the Hanemann formula indicates a discount of 25% on property values whereas the Turnbull formula indicates a discount range of 45% to 77%. For the next four rows, the analysis was limited to those respondents who said in a “debriefing” question that they would have answered the DC question the same even after having additional time

⁵ Hanemann, W.M. (1989), “Welfare Evaluations in Contingent Valuation Experiments with Discrete Response Data: Reply”, *American Journal of Agricultural Economics*, 71, pp. 1057-1061.

⁶ Johansson, P.-O. (1995), *Evaluating Health Risks: An Economic Approach*, Cambridge University Press, Cambridge, 190.

⁷ Blumenschein, K., Blomquist, G.C., Johannesson, M., Horn, N., and Freeman, P.R. (2008), “Eliciting Willingness to Pay without Bias: Evidence from a Field Experiment”, *The Economic Journal*, 118, pp. 114-137.

⁸ Haab, T. and K. McConnell (1997), “Referendum Models and Negative Willingness to Pay: Alternative Solutions.” *Journal of Environmental Economics and Management* 32(2), 251-270.

to think about the issues. For those respondents who responded with a CERTAINTY level greater than or equal to 9, the two WTP formulas indicate property value discounts of 10% (Hanemann) and 61% to 83% (Turnbull).⁹ As we examine subsequent rows, we see that the more confident respondents are with their answers to the DC question, the more convergence we get between the Hanemann and Turnbull formulas. In the end, the more certain survey respondents have lower mean WTP (and thus higher property value discounts).

Table 8. Mean WTP Results

		Discount Estimates		
		<i>No. of Observations</i>	<i>Hanemann</i>	<i>Turnbull</i>
All Observations		485	25%	45% to 77%
Debrief = Yes	Certainty ≥ 9	270	10%	61% to 83%
	Certainty ≥ 9 & Bid ≥ 15	245	21%	55% to 84%
	Certainty ≥ 10	232	32%	65% to 85%
	Certainty ≥ 10 & Bid ≥ 15	208	38%	58% to 85%

Source: Greenfield Advisors

1.5. Conclusions

The results of the CV survey indicate mixed views among the survey respondents – some view the extension of the Mark Clark Expressway as an overall beneficial infrastructure development whereas the majority of respondents view the extension as having more negative impacts overall. This is reflected in the perceived increase in the time it takes to sell a property and the perceived discount required for someone to purchase a property within 1,000 feet of the Expressway extension. A synthesis of the results shows that survey respondents, on average, expect between a 25% - 40% property value discount on properties within 1,000 feet of the proposed Mark Clark Expressway extension.

⁹ Using answers where CERTAINTY is greater than or equal to 9 is one level higher than the level recommended by Blomquist et al. (2009) that they deem equivalent to a “definitely sure” and “real” acceptance. Please see Blomquist, G.C., Blumenschein, K., and Johannesson, M. (2009), “Eliciting Willingness to Pay without Bias using Follow-up Certainty Statements: Comparisons between Probably/Definitely and a 10-point Certainty Scale”, *Environmental and Resource Economics*, 43, pp. 473-502.

APPENDIX A – SURVEY INSTRUMENT

Web-based/Telephone Survey for South Carolina Homeowners

INTRODUCTION AND SCREENERS

Hello, my name is _____ and I work for _____, an independent marketing research firm. We are talking to a cross section of people in your area regarding their views about property values and proximity to major roadways and highways. Your answers are completely confidential, and this will take less than 15 minutes of your time.

SCR1 To start, which category best describes your age?

1. Under 18 THANK AND TERMINATE
2. 18 – 34
3. 35 – 44
4. 45 – 54
5. 55 – 64
6. 65+
9. DK/Refused [DO NOT READ] THANK AND TERMINATE

SCR2 Do you own the residence you are living in or do you rent it?

1. Own
2. Rent..... THANK AND TERMINATE- OBTAIN RENTER'S NAME AND PHONE
3. DK/ Refused [DO NOT READ] THANK AND TERMINATE

SCR3 How long ago did you purchase your residence? Was it...?

1. Less than 2 years ago
2. 2 – 4 years
3. 5 – 10 years
4. 11 – 20 years
5. More than 20 years ago
9. DK/Refused [DO NOT READ] THANK AND TERMINATE

SCR4 Which of these categories best describes your role in the decision to purchase this property?

1. I was the primary decision maker
2. I shared in this decision with someone else
3. I did not participate in the decision**THANK AND TERMINATE**
9. DK / Refused **[DO NOT READ]**.....**THANK AND TERMINATE**

SCR5 Now, have you or anyone in your immediate family, worked...

[TERMINATE any 'YES' or 'DK' ANSWERS IF RESPONDENT WORKS IN MARKET RESEARCH and TERMINATE ONLY 'DK' ANSWERS IF RESPONDENT WORKS FOR THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION]

	Yes	No	Don't Know / No Answer
In Market Research	1	0	9
For the South Carolina Department of Transportation	1	0	9

SCR8 What is your Zip Code? _____

SCR9 What is your gender?

1. Male
2. Female

GENERAL ISSUES

Q1 Let's start by talking about some issues in South Carolina. Some may not be important to you while others might be. To what degree is each issue below important to you personally?

[PLEASE PRESENT AS RADIO BUTTONS TO BE CLICKED; ALSO THE ORDERING OF ISSUES IN THE FIRST COLUMN SHOULD BE RANDOMIZED]

	Not Important At All	Not Too Important	Somewhat Important	Very Important	Extremely Important	Not Sure
Improving education in South Carolina public K-12	1	2	3	4	5	9

schools						
Reducing air pollution in South Carolina cities	1	2	3	4	5	9
Maintaining local library services	1	2	3	4	5	9
Reducing crime	1	2	3	4	5	9
Protecting coastal areas from development	1	2	3	4	5	9
Finding ways to reduce state spending	1	2	3	4	5	9

Q2 The State of South Carolina spends tax money on many programs. For the following programs, please indicate how important it is to you that the State continues to spend money on it. [PLEASE PRESENT AS RADIO BUTTONS TO BE CLICKED; ALSO THE ORDERING OF ISSUES IN THE FIRST COLUMN SHOULD BE RANDOMIZED]

	Not Important At All	Not Too Important	Somewhat Important	Very Important	Extremely Important	Not Sure
Providing shelters for the homeless	1	2	3	4	5	9
Protecting wildlife	1	2	3	4	5	9
Providing job-training for the unemployed	1	2	3	4	5	9
Improving our	1	2	3	4	5	9

existing roadways and bridges						
Extending and widening roads and highways	1	2	3	4	5	9
Improving public transportation	1	2	3	4	5	9

[Only record one price (in dollars) reported for Q3.]

Q3 Now, I want to ask you questions about the area where you live. What do you think is the average price for houses in your current neighborhood?

\$100,000 to \$200,000 (go to a)

a. Is it closer to \$100,000 or \$133,000 or \$166,000 or \$199,000?

\$201,000 to \$300,000 (go to b)

b. Is it closer to \$201,000 or \$233,000 or \$266,000 or \$299,000?

\$301,000 to \$400,000 (go to c)

c. Is it closer to \$301,000 or \$333,000 or \$366,000 or \$399,000?

\$401,000 to \$500,000 (go to d)

d. Is it closer to \$401,000 or \$433,000 or \$466,000 or \$499,000?

\$501,000 to \$600,000 (go to e)

e. Is it closer to \$501,000 or \$533,000 or \$566,000 or \$599,000?

\$601,000 to \$750,000 (go to f)

f. Is it closer to \$601,000 or \$650,000 or \$700,000 or \$750,000?

\$751,000 or higher (go to g)

g. Is it closer to \$766,000 or \$825,000 or \$900,000+?

Q4 What do you think is the current value of your house? \$_____

FACT CARD

On the next screen you will be provided a scenario to read. Please read the scenario carefully as the survey questions that follow the scenario require you to use and think about the information provided. Please spend as much time as you need to read the information.

An extension of Interstate 526, also known as the Mark Clark Expressway, is proposed by Charleston County and the South Carolina Department of Transportation (SCDOT). The existing Mark Clark Expressway will be extended approximately seven miles from the current endpoint of I-526 at U.S. 17 to the James Island Connector at Folly Road in Charleston County. The proposed

parkway will cross the Stono River twice. The new seven-mile extension will likely have a posted speed limit of 45 miles per hour and consist of four lanes (two lanes in each direction).

On Johns Island, two connector roads will connect the parkway extension to River Road. On James Island, the parkway will pass through the northern perimeter of the James Island County Park before tying into the existing James Island Connector/Folly Road interchange. The proposed route of the parkway will be within 1,000 feet of approximately 3,000 existing properties, including single-family homes, condominiums, apartments, vacant lots, and commercial buildings.

According to a noise analysis performed by SCDOT as part of the Environmental Impact Statement for this project, some properties near the project will experience noise levels ranging from about 40 (little to no noise) to 77 dBA (equivalent to a garbage disposal 3.3 feet from your ear or a lawnmower operating less than 100 feet away).

After the parkway is completed, SCDOT forecasts that the commute times for James Island and West Ashley commuters will be reduced by on average by 36 seconds. The one-way commute for John's Island travelers will be reduced by less than five minutes, on average.

Other studies that were performed by SCDOT as part of the Environmental Impact Statement noted that the proposed parkway extension will result in the filling of about 18 acres of wetlands, as well as direct impacts to 132 acres of floodplains and 168 acres of upland area.

[PROGRAMMER NOTE:

Please use the same text for all four fact cards, but alternate before and after picture sets so that 150 respondents see each before and after picture set. The only difference between the four fact cards should be the picture options outlined below.

PLEASE CREATE A VARIABLE CALLED "CONSIDER" WHERE:

CONSIDER = 0 IF RESPONDENT SEES BEFORE AND AFTER PICTURE OF THE NORTHWESTERN SECTION (Fact Card 1),

CONSIDER = 1 IF RESPONDENT SEES BEFORE AND AFTER PICTURE OF THE WESTERN SECTION (Fact Card 2),

CONSIDER = 2 IF RESPONDENT SEES BEFORE AND AFTER PICTURE OF CENTRAL SECTION (Fact Card 3), AND

CONSIDER = 3 IF RESPONDENT SEES BEFORE AND AFTER PICTURE OF SOUTHEAST SECTION (Fact Card 4)]

Fact Card 1: Before and After Northwest Section of Parkway

The following picture depicts the current state of the area where the Northwest Section of the Parkway will be constructed:



The following picture shows what that same area will look like after the parkway is constructed:



Fact Card 2: Before and After West Section of Parkway

The following picture depicts the current state of the area where the Western Section of the Parkway will be constructed:

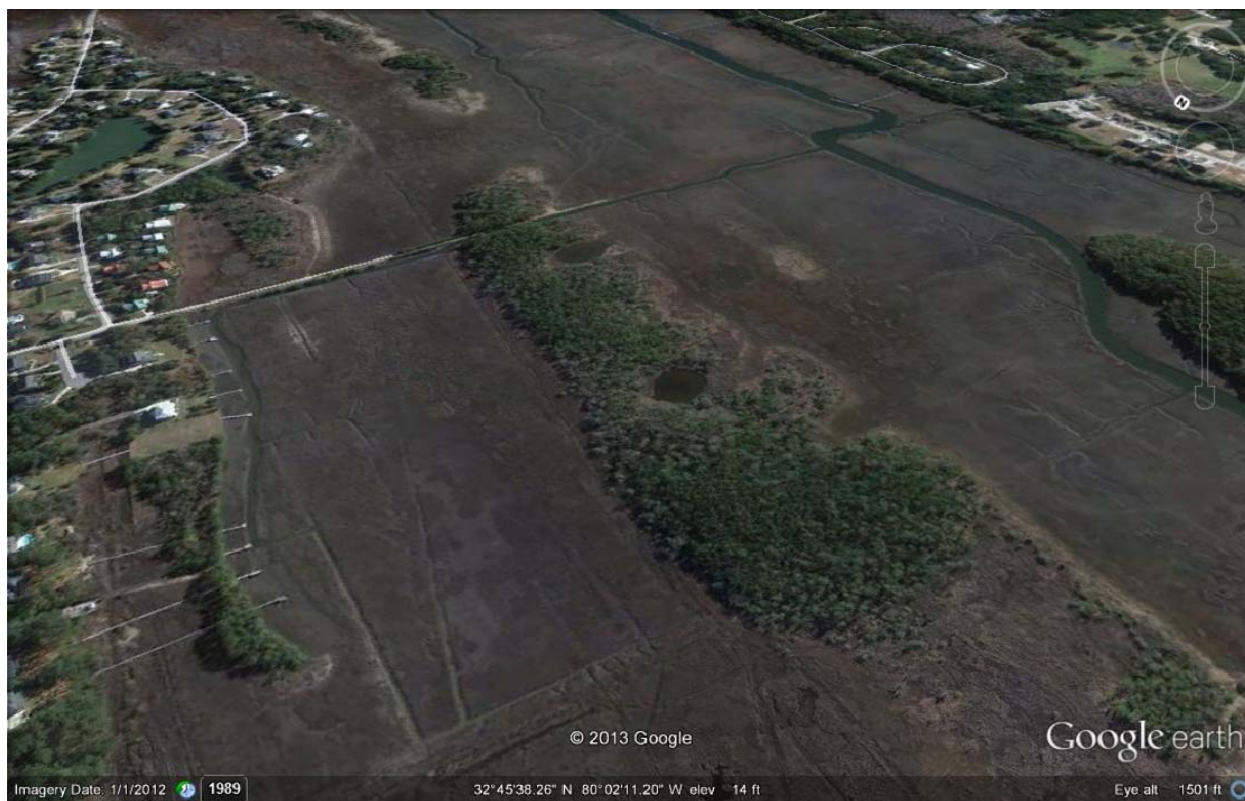


The following picture shows what that same area will look like after the parkway is constructed:



Fact Card 3: Before and After Central Section of Parkway

The following picture depicts the current state of the area where the Central Section of the Parkway will be constructed:



The following picture shows what that same area will look like after the parkway is constructed:



Fact Card 4: Before and After South East Section of Parkway

The following picture depicts the current state of the area where the South Eastern Section of the Parkway will be constructed:



The following picture shows what that same area will look like after the parkway is constructed:



CONTINGENT VALUATION

The next section asks you to consider the purchase of a house just like the one you currently own. As you answer the questions, please keep in mind your own household budget and the amount that you currently spend on things such as food, housing, and transportation. This is a hypothetical purchase question – not a real one. However, we would like you to respond to the question as if your response would involve a real cash payment. In other words, we would like to know the amount that you would actually pay for this home if this were a real purchase scenario. On average, more people say “yes” when the question refers to a hypothetical payment than to a real payment. With a real payment, when we are faced with the possibility of spending our own money, we think about all of our options for spending that money.

[PROGRAMMER NOTE: The value of \$X stated should be randomly distributed among respondents from the choices so we have about an equal number of each. Please be sure to include in the dataset which number for “\$X” each respondent saw – call this variable “bid” where \$X= 5%, 15%, 30%, 45%, 60%, 75%, 90%, 105%, 120%, or 135% of the respondent’s answer to Q4.]

Q5 Please imagine that you are looking for a home to purchase and you find one that you like that is similar to your current home and within 1,000 feet of the proposed Mark Clark Expressway extension. Considering both the advantages and disadvantages of living within 1,000 feet of a four-lane parkway, if everything else about your current home and the new home were exactly the same except for the location, would you buy this home in the neighborhood I’ve described for **[\$X]**?

1. Yes **CONTINUE TO Q6a1 – Q6a3**
2. No **SKIP TO Q6b1 – Q6b3**
9. No Answer/Not Sure **SKIP TO Q7**

Q6a1 How sure are you that you would pay **[\$X]** for a home that you were interested in which happened to be within 1,000 feet of the parkway? Would you say you are...? **[PLEASE ROTATE ANSWERS 1,2,3,4 WITH 4,3,2,1 PRESENTED FOR HALF]**

1. Definitely sure
2. Probably sure
3. Not very sure
4. Not at all sure

Q6a2 Again, on a scale from 0 to 10, how certain are you that you would pay **[\$X]** for the home? **[ROTATE: Zero (0) indicates you are very uncertain]; [10 indicates you are very certain of your answer].**

VERY UNCERTAIN
CERTAIN

VERY

0 1 2 3 4 5 6 7 8 9 10

Q6a3 Given that you would pay **[\$X]** for the house, what is the highest dollar amount that you would pay for this home within 1,000 feet of the parkway? \$_____

Q6b1 How sure are you that you would **not** pay **[\$X]** for a home that you were interested in which happened to be within 1,000 feet of the parkway? Would you say you are...? **[PLEASE ROTATE ANSWERS 1,2,3,4 WITH 4,3,2,1 PRESENTED FOR HALF]**

1. Definitely sure
2. Probably sure
3. Not very sure
4. Not at all sure

Q6b2 Again, on a scale from 1 to 10, how certain are you that you would **not** pay **[\$X]** for the home? **[ROTATE: Zero (0) indicates you are very uncertain]; [10 indicates you are very certain of your answer].**

VERY UNCERTAIN
CERTAIN

VERY

0 1 2 3 4 5 6 7 8 9 10

Q6b3 Given that you would **not** pay **[\$X]** for the home, what is the highest dollar amount that you would pay for this home within 1,000 feet of the parkway? \$_____

GENERAL AREA QUESTIONS

Q7 If you were in the market to buy a home today, how likely is it that you would make an offer on any home in the area we are discussing given the likely construction of the Mark Clark Expressway? Please use a scale of 1 to 10, where [ROTATE: Zero (0) represents that you likely would not make an offer] and [10 represents that you likely would make an offer].

Likely Would Not

Likely Would

0 1 2 3 4 5 6 7 8 9 10

[IF Q7 = 1-5, SKIP TO Q7a. IF Q7= 6-10, GO TO Q7b.]

Q7a Why would you not consider buying a residential property there? _____
[OPEN ENDED. Then, go to Q8.]

Q7b Why would you consider buying a residential property there? _____
[OPEN ENDED. Then, go to Q8.]

Q8 Imagine two similar homes, one that is in a neighborhood adjacent to the proposed Mark Clark Expressway and one in a neighborhood that is not adjacent to the proposed parkway. Would you expect to pay [FOR HALF SAY “more, about the same, or less” AND FOR THE OTHER HALF SAY “less, about the same, or more”] for a home in a neighborhood adjacent to the proposed parkway?

1. More.....SKIP TO Q9
2. About the same.....SKIP TO Q9
3. Less.....SKIP TO Q8a
9. Not sureSKIP TO Q9

Q8a How far away from the proposed Mark Clark Expressway would you need to be before no price discount would be expected for the home?

_____ Miles [IF ANSWER IS IN BLOCKS, PLEASE ASK TO REPHRASE AS MILES] [Please allow decimals, i.e. 0.5 miles]

9. Not sure

Q9 If construction on the proposed Mark Clark Expressway began tomorrow, how do you think property values of homes in adjacent neighborhoods would be affected? [PLEASE ROTATE ANSWERS 1,2,3 WITH 3,2,1 PRESENTED FOR HALF]

1. Not at allSKIP TO Q10
2. TemporarilySKIP TO Q9a
3. PermanentlySKIP TO Q10

9. Not sureSKIP TO Q10

Q9a How long do you think the residential property values of homes adjacent to the proposed Mark Clark Expressway would be temporarily affected?

_____ Years

Q10 Imagine you live in one of the neighborhoods adjacent to the proposed Mark Clark Expressway and you decide to sell your house. The list price does not give any discount for the proximity to the proposed Mark Clark Expressway. If all potential buyers knew the proposed parkway would be constructed within 1,000 feet of the home, do you think it would **[ROTATE: FOR HALF SAY: “Take no extra time, Take extra time, or Not be possible” to sell the home? AND FOR THE OTHER HALF SAY: “Not be possible, Take extra time, or Take no extra time”]** to sell the home?

1. Take no extra time.....SKIP TO Q11
2. Take extra timeSKIP TO Q10a
3. Not be possible to sell.....SKIP TO Q11
4. Not sureSKIP TO Q11

Q10a If you were selling your home and you held the list price steady, how much more time do you think it would take to sell a home within 1,000 feet of the proposed Mark Clark Expressway compared to the same home in a location that is not within 1,000 feet of the proposed Mark Clark Expressway but still has good access to the proposed parkway?

_____ Months

9. Not sure **[DO NOT READ]**

DEBRIEFING QUESTIONS

Q11 In a previous question, you answered **[PROGRAMMER, INSERT RESPONDENT ANSWER TO Q5]** when asked if you would be willing to pay **[\$X]** for a house within 1,000 feet of the proposed Mark Clark Expressway. How seriously did you consider the visual impacts of the parkway to the property in your answer?

1. I did not seriously consider the visual impact
2. I somewhat seriously considered the visual impact
3. I seriously considered the visual impact

Q12 In a previous question, you answered [PROGRAMMER, INSERT RESPONDENT ANSWER TO Q5] when asked if you would be willing to pay [\$X] for a house within 1,000 feet of the proposed Mark Clark Expressway. How seriously did you consider the noise impacts of the parkway to the property in your answer?

1. I did not seriously consider the noise impacts
2. I somewhat seriously considered the noise impacts
3. I seriously considered the noise impacts

Q13 Is your current house located within 1,000 feet of any parkway or interstate roadway?

1. Yes
2. No
9. Don't Know

Q14 Now that we are almost done with the survey, I'd like to give you a chance to review your answer to a question presented earlier in the survey. You were asked if you would be willing to pay [\$X] for a house within 1,000 feet of the proposed Mark Clark Expressway. You answered [PROGRAMMER, INSERT RESPONDENT ANSWER TO Q5]. Now that you have had more time to think about the issues presented here, would you still say [PROGRAMMER, INSERT RESPONDENT ANSWER TO Q5] to purchasing the home for [\$X]?

1. Yes
2. No
9. Don't Know

DEMOGRAPHICS

The last section has a few questions about your background. Your answers will be used for classification purposes only and will not be shared with anyone else.

DEMO1 Which of the following best describes your current neighborhood?

1. Entirely residential
2. Primarily residential with a little commercial or industrial
3. A mixture of residential and commercial or industrial
4. Rural or other

DEMO2 How many persons are permanently living in your household? _____

DEMO3 Do you have children or young people under the age of 18 living in your household?

1. Yes
2. No..... SKIP TO DEMO5

DEMO4 How many children are there in your household? _____

DEMO5 What is your highest level of education?

1. Less than or some high school
2. High school graduate
3. Some college or technical school
4. College graduate
5. Post graduate

DEMO6 In 2012, what was your annual household income? Add together all income for everyone in your household, which includes wages and salaries, social security or other retirement income, child support, public assistance, and business income. Please give your answers in \$10,000 increments. \$ _____

DEMO 7 What is your current employment status?

1. Employed Full Time
2. Employed Part-Time
3. Unemployed/Looking for work
4. Student
5. Homemaker
6. Retired

Thank you very much for your time. Your participation in this research is greatly appreciated. To ensure quality, someone may be contacting you just to verify that you participated in this survey. In order to contact you, what is your **first name only** please?

NAME _____

[ENTER NAME- IF REFUSED LEAVE BLANK]