2.0   SUMMARY OF METHODOLOGIES

This section will summarize the methodologies utilized to complete the Alternatives Analysis for the RRE. Summaries of those methodologies which were previously submitted to the USACE for review will be updated to include any changes that were made to the methodology and why said changes were made. In addition, those methodologies which were newly developed and not previously submitted to the USACE for review will be described in some additional detail and the source of the methodologies provided. All methodologies will be included as attachments along with a report describing the results of the analyses.

2.1 Cost Estimates

The full methodology and the results of the Cost Estimates are provided in Attachment B. A methodology statement was submitted to the USACE on September 19, 2012 for review. A revised methodology statement was submitted to reflect USACE comments following a meeting on November 15, 2012. An estimate of total cost was developed for each of the 17 alternatives. There are three separate components of total cost—construction costs; right-of-way costs; and mitigation costs. Each is discussed separately below:

2.1.1 Construction Cost Estimates

Construction cost estimates were generated using costs developed by the FDOT planning office. For roadways, these construction costs are based on the typical design characteristics of common road types for a centerline mile of roadway and average price estimates for pay items. The basis of the estimates is the FDOT's Long Range Estimate (LRE) system. The LRE System is a parametric estimating tool used for planning estimates prior to the development of design quantities. For bridges, the construction costs are per square foot of deck area.

Since construction costs vary across the state, the latest available cost information specific to District 7, which includes Pasco County, will be utilized (June 2014) . The Tables of Roadway Per Mile Costs and Bridge Cost Per Square Foot are available on FDOT's website at: http://www.dot.state.fl.us/planning/policy/costs/costs-D7.pdf

For alternatives that are on the state highway system (e.g., SR 52 and SR 54), the construction cost estimating methodology was consistent with the FDOT methodology described above.

The roadway centerline mile costs include factors for MOT (Maintenance of Traffic) at 10%, Mobilization at 10%, Scope Contingency (project unknowns) at 25%, PE Design (Preliminary Engineering Design) at 15% and CEI (Construction Engineering and Inspection) at 15%. Pasco County's Traffic Impact Studies and Substandard Road Review Guidelines (TIS Guidelines), dated December 2007, specifies adjustments to be made to the standard FDOT costs. For alternatives that are part of the county roadway network, the adjustments listed on page 14 of the TIS Guidelines were applied to the FDOT costs. For alternatives on new alignments, there is no traffic to maintain during construction and the maintenance of traffic factor was not utilized.

Bridge costs do not include bridge approach (roadway) work or related improvements such as drainage facilities. The bridge per square foot of deck costs are construction costs only and do not include design or construction engineering costs. The same factors for design and CEI as used for the roadway costs were added to determine the total bridge cost estimates.

2.1.2 Right-of-Way Cost Estimates

The Pasco County TIS Guidelines specifies that right of way costs from a location specific study be used when available. The FDOT's Guidance Document 2, Right of Way Cost Estimates, dated January 7, 2011 provides guidance concerning items and practices to be considered in the preparation of cost estimates for right of way in accordance with their Right of Way Manual. Section III.D of the Guidance Document suggests that each District should develop a worksheet to use for summarizing the cost estimate. The FDOT developed Right of Way Cost Estimate spreadsheet will be used to prepare location specific cost estimates for each alternative. As indicated on the Application and System Information sheet included with the spreadsheet, "Anyone can use or give copies of this application software to anyone else."

Development of input for right of way cost estimates were developed from a "desk top" analysis of each alternative. Areas of acquisition were determined based on the location of existing right of way and property lines compared to proposed right of way lines associated with each alternative. Proposed right of way lines were established using the proposed typical sections for each alternative. Existing property lines were based on a GIS shape file obtained from the Pasco County GIS site. A 2011 aerial image was used to illustrate locations of the impacts (proposed right of way versus existing right of way).

Impacts to buildings or other site improvements that are discernible on aerial maps were included as applicable. Land and structure values were based on data available on the Pasco County Property Appraiser website. Default factors included in the spreadsheet for estimating professional and support costs were used without modification. These include estimated costs such as appraisal and review fees, CPA fees, court reporter and witness fees, outside counsel fees, title search fees and in-house direct costs. Some features of the spreadsheet are not applicable, such as the Phase Contrast form and the Inflate table, and were not implemented for any alternatives.

2.1.3 Mitigation Cost Estimates

Compensatory mitigation costs were estimated assuming that each acre of direct wetland impact would cost $150,000 to mitigate. The asking price for mitigation credits varies by type of wetland and by individual mitigation bank. Asking prices for credits in six mitigation banks within Pasco, Hillsborough and Polk Counties can range from $120,000 to $180,000, but final costs are negotiated and usually lower than the upper range. The $150,000 figure is simply an estimate to use for comparison purposes.

2.2 Traffic Analysis Procedure

The Tampa Bay Regional (Transportation) Planning Model (TBRPM) was developed and is maintained by the FDOT and used by the Metropolitan Planning Organizations (MPOs) of Pasco, Pinellas, Hillsborough, and Hernando counties. It is the MPO-sanctioned technical support tool for undertaking the local, Federally-mandated "3-C" transportation planning process ("MPO Planning Process"), current at the time this analysis was undertaken. It is the most appropriate technical analysis tool to use to assess the effects of the proposed Alternatives on daily traffic circulation.

Prior to undertaking this analysis, a methodology statement proposing analysis assumptions and procedures was prepared and reviewed by the USACE. A revised methodology statement was prepared to reflect discussions at a November 15, 2012 meeting with USACE staff.

The procedures summarized in the original methodology statement guided this assessment, with the exceptions summarized below resulting from the November 15 discussions and subsequent direction given by the USACE:

- The analysis is based on a shorter-term (five-year) planning horizon and recognizes only "existing roads plus USACE-permitted roadway improvements" in the roadway network. These roads for which performance is reported are referred to as the "Study Network" and includes SR 52 from Moon Lake Road to US 41, SR 54 from Starkey Blvd. to US 41, US 41 from SR 54 to SR 52, and the Suncoast Parkway from SR 54 to SR 52. Information reported subsequently in this report addresses these roads and includes the proposed Ridge Road Extension and Tower Road (as applicable to the specific alternatives that include one or both of these roadways).
- The analysis documented herein addresses seventeen alternative network scenarios including the "no-build" alternative.

Measures to be reported indicating the quality of transportation service provided by the alternative transportation networks include:

- Network weighted average volume to capacity ratio (v:c)
- Vehicle-hours of travel
- Average travel speed
- Crash rates
- Vehicle-miles of travel

All other model inputs were held constant for these applications so that the effects of the proposed Alternatives on daily traffic circulation could be estimated and compared.

Adjustments to "Out-of-the-Box" Model

"Out-of-the-Box" model refers to the version of the TBRPM made available from the model's host website at http://www.tbrta.com. The 2014 existing plus committed ("E+C") model road and transit networks were used as the basis for the analysis, and adjusted to reflect the existing roads plus permitted improvements, as requested by the USACE and as noted above.

In addition, the 2014 E+C model network for Pasco County, north Hillsborough County and south Hernando County were reviewed to identify if the network changes that were expected when the 2014 E+C network was created (in 2009) had indeed been implemented, and to reflect the roads considered "permitted" by the USACE. The changes made include the following:

- reflecting the six-laning of SR 54 from the Suncoast Parkway to US 41, and
- widening the existing four-lane I-75 from State Road 54, north through Hernando County to six lanes.

The above adjustments to the 2014 E+C model were applied to create the "No-Build" model scenario. Then the remaining alternatives were created from the No Build network by adding the proposed Ridge Road Extension from Moon Lake Road to US 41, by adding Tower Road, or by adjusting the number of lanes, as applicable to the alternative.

The land use and growth forecasts ("socio-economic data") of the standard model horizon years of 2007 and 2035 were interpolated to create a set of year 2019 growth estimates. The 2019 socio-economic data was held constant across all scenario tests so that the effects of the road network changes could be isolated.

Peak season daily traffic volumes were analyzed because that is currently the standard approach in Florida.

A detailed methodology and results of the analysis are provided in Attachment C.

2.3 Hurricane Evacuation Analysis

This assessment was undertaken using a model that simulates evacuation for major events, the Transportation Interface for Modeling Evacuations (TIME) model. The model was developed as a part of the Statewide Regional Evacuation Study Program (SRESP), circa 2010. This model was used because it is the only model available for estimating evacuation times. The full methodology and findings of the assessment are provided in Attachment D.

The TIME model is documented in a series of technical documents available from the Tampa Bay Regional Planning Council (TBRPC). The model provides a framework for evaluating the time over which evacuation to in-county and/or out-of-county destinations can be facilitated by the existing and future roadway networks. This model was applied to assess the effects on evacuation times of adding the proposed Ridge Road Extension (RRE) and the other evaluated alternatives to the RRE.

Prior to undertaking this analysis, a methodology statement proposing analysis assumptions and procedures was prepared and was submitted to the USACE on September 19, 2012 for review. Based on input from the North East Regional Planning Council, the agency charged with oversight of the use of the TIME model in Florida, a revised methodology was prepared and submitted to the Corps in November of 2012.

The TIME model provides for various combinations of planning parameters to be tested. For this comparative analysis, a particular combination of planning parameters called the "Base" scenario, a "worst-case" set of assumptions, was judged to be appropriate for this comparative analysis based on input from the North East Florida Regional Planning Council. These parameters are as follows:

- Demographic Data   Year 2015 horizon
- Highway Network   Appropriate to scenario
- One-Way/Reversible Lane Operations   None
- University Population   Fall/Spring (100% in residence)
- Tourist Rate   Included
- Shelters Open   All open
- Response Curve   12-hour response
- Evacuation Phasing   None
- Behavioral Response   100% evacuation
- Evacuation Zones   A-E
- Counties Evacuating   Six (Sarasota, Manatee, Pinellas, Hillsborough, Pasco, and Hernando)

During review of the TIME model, several corrections and adjustments were needed. For example, the network used for the 2015 scenario of the TIME model assumed certain road improvements would be completed by 2015. Some of these improvements have not occurred; therefore, the model network in Pasco, south Hernando, and north Hillsborough counties were reviewed to eliminate such assumed improvements. These and other corrections and adjustments are described in detail in the full methodology provided in Attachment C.

The TIME model produces Standard Reports that provide In-County, Out-of-County, To Shelter, and Regional Evacuation Times. Standard Reports for the No Action and 16 alternatives are provided as an Appendix to Attachment C.

The standard reports do not specifically measure the time required for evacuation traffic to clear the evacuation zone, which is part of the stated Project Purpose. Aspects of the Project Purpose statement that relate to evacuation time refer to evacuation of the "coastal hazard areas". Thus, it is appropriate to extract from the TIME model information related to evacuation capability for the coastal Pasco County area. The TIME model is able to provide evacuation traffic volumes served on each road segment in the model in 30-minute time increments, and "in-county" evacuation traffic volumes separately from "out-of-county" evacuation volumes. These volumes were extracted for the roads crossing a cordon that we defined around the coastal west Pasco County area (see Figure D-2, Attachment D). The cordon was defined to isolate traffic entering and exiting the coastal evacuation zones.

The primary measure reported to address the Project Purpose is the elapsed time from the time the evacuation order is issued until 99 percent of the traffic leaving Pasco County's coastal evacuation zone are able to clear out of that zone.

2.4 Logistics

The Guidelines cite *logistics* as one of the considerations in the determination of practicability and whether or not an alternative is "available and capable of being done". There is no definition of *logistics* in the Clean Water Act, nor have USACE or EPA issued guidance defining this term. For the purpose of this alternatives analysis, *logistics is* defined in the commonly understood way as "the things that must be done to plan and implement a complicated activity". Based on this, two areas of logistical concern will be assessed: administrative obstacles to construction and impacts to residences and businesses. A detailed methodology and findings of the Logistics assessment are provided in Attachment E.

2.4.1 Obstacles to Construction

Logistical obstacles to construction will be considered as those things that must be done during the planning and design phase of the project to allow for the implementation of an alternative. To evaluate if there are logistical obstacles to construction for an alternative, two elements necessary for the implementation of an alternative will be evaluated: 1) consistency with the recommendations of the adopted Pasco County Long Range Transportation Plan (LRTP), a document prepared in compliance with the Federally required transportation planning process; and 2) the ability to obtain permits/approval from the Florida Department of Transportation, the owning/maintaining agency for state highways, for alternatives involving modification to state highways.

Logistical obstacles to construction will be determined as a yes or no condition for each alternative based on the two criteria described above.   An alternative that is consistent with the LRTP will receive a "yes" rating. Likewise, an alternative that is unlikely to obtain permits from or the approval of the FDOT to allow for its construction as a state facility due to not meeting FDOT policy or having safety, planning consistency or other concerns will receive a "no" rating. A "yes" rating will be shown in the Summary Data (Table 1-1) for the Alternatives Analysis if an alternative receives a yes based on either of the two determining criteria for logistical obstacles to construction.

2.4.2 Impacts to Neighborhoods, Residences and Businesses

Impacts that are adverse to neighborhoods, individual residences, and businesses are obstacles to construction of roadways. Impacts were determined in the following manner:

Proposed right of way lines were established using the proposed typical sections for each alternative. Existing property lines were based on a GIS shape file obtained from Pasco County's GIS site. A 2011 aerial image was used to illustrate locations of the impacts (proposed right of way versus existing right of way).

Determination of residential versus commercial use was made using the Pasco County Property Appraiser website. The website was also used to locate any structures that are newer than 2011 on parcels that appear undeveloped on the aerial.

An impact was considered to result in relocation if the proposed right of way infringed on an existing property and was less than 20' from an existing structure. If the proposed right of way infringed on a property but was more than 20' from the structure, it was considered as a partial acquisition. Impacts to community cohesion were also considered in the analysis of alternatives. A more detailed methodology and sample aerials are provided in Attachment E.

2.5 Wetland Impacts-- Qualitative Assessment of Aquatic Function

The qualitative scoring described in the Florida Uniform Mitigation Assessment Method (UMAM) has been used as a basis for determining the aquatic functions and a "quality score" will be identified for each wetland area. The wetlands, including the wetlands that include streams, were mapped using the Florida Land Use, Cover, and Forms (FDOT 1999) [FLUCFCS] system. A quality control review was applied at a high level, and in the few cases where corrections were needed in order to produce a valid comparison of the alternatives, the changes were documented and a map and associated explanation of each change has been provided as in Attachment F to this report.

The full UMAM procedure is a multi-step procedure that begins with a standardized process for assessing ecological functions provided by wetlands and surface waters. Only the first steps, which evaluate wetland functions through consideration of an ecological community's current condition using the UMAM location and landscape, water environment, and community scores, were used for this alternatives analysis.

The assessment provided is intended for use at the scale and detail of an Alternatives Analysis. The functional scores were assigned based on interpretation of aerial photography informed by Cardno-ENTRIX's knowledge of the sites in general. Area specific site visits and assessments were not conducted for this general assessment. The end product of this functional assessment was a "quality score" of High, Medium or Low for each wetland along an alignment and as a summary quality descriptor for the overall alignment. This assessment is not intended to be applied as a full UMAM for impact calculation or mitigation calculation purposes for any alignment. The scores and overall UMAM assessment values are provided as maps and summary tables attached to this report in Attachment F.

The UMAM process as applied here consists of the following:

1. Assessment Area. The Assessment Area for an alternative consisted of the direct impact area, which is within the right of way, plus the area within 300 feet on each side of the alternative's direct impact area. For each alignment, wetlands in the alignment (direct impacts) and wetlands within 300 ft. on each side of the alignment (indirect impacts) were identified and mapped. Areas under bridges were assumed to be indirect impacts.

2. An "optimal" or "ideal" condition wetland description was assigned to each mapped wetland area. The assigned ideal condition was based on the types of wetlands found in the region and generally recognized by resource managers and with descriptions published in the current ecological literature. The assigned ideal was used as a comparative basis for scoring the quality or function of each mapped wetland area in the Assessment Area. The

"ideal" area would receive a perfect "10" score on each of the UMAM criteria (resulting in a computed UMAM score of 1.0). By contrast, a parking lot or other upland would receive a 0 on each criterion. A map of the assigned ideal wetland types has been provided.

3. Criteria Scoring. Scoring of each wetland on each of the UMAM criteria, with the assignment of the criteria scores being based on the published UMAM methodology scored against the optimal condition for each wetland type. The UMAM scoring criteria were used to assign a number from 0 to 10 was assigned, by mapped wetland area, for each of the UMAM criteria:

- Location and landscape support,
- Water environment, and
- Community structure.

Maps of the criteria scores are provided as an appendix to Attachment F.

4. Quality Score. A single quality score was determined by summing the three criteria scores and dividing that value by 30 to yield a number between 0 and 1. These were interpreted as "high", "medium", "low" quality descriptors based on the weighted average quality score of 0.7 to 1.0 (High), 0.4 to 0.69 (Medium) and 0 to 0.39 (Low) as specific numeric values could lead to the assumption of a higher degree of precision and accuracy than is appropriate based on the underlying data used in the analysis. The high, medium or low descriptor is identified for each assessed wetland area on maps with the alternative(s) overlaid.

Following computation of the UMAM quality score for each mapped wetland area, a summary quality descriptor was developed for each alternative. An area weighted average of the numeric quality scores was used for the wetlands within the alignment. These were then translated into "high", "medium", "low" quality descriptors based on the weighted average quality score of 0.7 to 1.0 (High), 0.4 to 0.69 (Medium) and 0 to 0.39 (Low). The same procedure was used for direct and indirect impact areas.

A detailed map has been prepared for each alternative that shows the assigned quality descriptor (High, Medium, Low) for each wetland along the alternative. Each map includes coverage of the direct impact area plus a 300 foot indirect impact area around the direct impact area. These maps provide a visual presentation of the alignment, and quality scores for each alignment.

A summary table has been provided presenting the total acreage along each alignment, by FLUCFCS code and quality score are reported. The summary "High, Medium, Low" score is based on an area weighted average of scores within the alignment.

2.6 Other Environmental Impacts

2.6.1 Streams

Four streams are impacted by one or more of the 17 alternatives: the Pithlachascotee River; Five Mile Creek; the South Branch of the Anclote River; and the Sandy Branch of the Anclote River. The impacts were calculated by measuring linear feet of stream channel (or ditch), by stream, within the footprint of the crossings for each of the alternatives. Using this approach, there is less impact for crossings where the roadway is perpendicular to the stream than for crossings where the roadway is oblique to the stream.   Stream impacts are detailed in Attachment G.

2.6.2 Habitat

Potential habitat impacts were compared using several recent wildlife habitat studies plus regional information developed from studies conducted in 1998, 2005, and 2013 within the overall analysis area. Previous studies within the analysis area provided information on habitat suitability for listed species likely to be present.

Wildlife Habitat Value:

The primary tool used to determine habitat impacts was acreage of direct impact to natural habitats along the alternative. The area of direct impact to natural habitats is reported for each alternative.

In addition, a summary statistic, based on a study done by Endries et al. (2008) was used to provide a summary measure of the overall importance of the habitat to Florida wildlife. Known as the "Integrated Wildlife Habitat Ranking System" (IWHRS) and provided as a raster GIS dataset by the FWC, the summary statistic integrates spatial heterogeneity, acreage of road less habitat, number of listed species potentially supported, known occurrence of listed species, wildlife species richness, Florida Natural Areas Inventory Habitat Conservation Priorities status, distance to an area managed for conservation, landscape connectivity, and public land ownership into a single value known as an IWHRS score. A summary IWHRS value was developed for each alternative based on an area weighted average of the IWHRS values within 300 feet on each side of the alternative. See Attachment H for a more detailed methodology and results of the analysis.

2.6.3 Analyses of Individual Wildlife Species

Available information on individual species was used to assess the likely impact of each alternative on federally protected species including listed and candidate species. Available information ranges from site-specific (surveys conducted for Ridge Road (EMS 1998; PHA and BRA 2001; BRA 2005; Cardno ENTRIX 2013; Serenova Development of Regional Impact (DRI) 1993; the River Ridge DRI, the Bexley DRI, DeCubellis Avenue Route Study, Final Environmental Impact Statement for the North Suncoast Corridor, and the Corridor Analysis Report for the Bi-County Expressway PD&E Study) to very general (data on home range size, dispersal distances, etc.), or opportunistic (FNAI database) which provides locations of species

as submitted to them by individual researchers. In addition, the most current USFWS and FWC databases were reviewed for wood stork and wading bird colonies and Florida scrub-jays.

Information on individual species known to occur or to potentially occur that could be impacted by the alternatives is provided in Attachment I. Following the species discussion, a table is provided that summarizes the species specific data for each alternative. Each species has been assessed qualitatively based on what is known from past and current studies, the Consultant's knowledge of its habitat requirements, occurrence and quantity of appropriate habitats, and condition of those habitats. Some of the analyses are necessarily qualitative in nature as we are aware of no way to quantitatively tally important habitat characteristics such as connectivity. Where there are known quantitative features, such as acreage of wetlands or specific habitat types that correspond closely with likelihood of occupancy or population density, these have been used in developing the species scores and are documented for the relevant species. To keep the analyses comparable, each alternative was assigned a qualitative score for each species as follows:

Very High Impact (VH): Species is known to occur in the footprint of the alternative or adjacent habitats and substantial impact to the species and/or its habitat is anticipated at a level that could substantially affect long-term survival of the species in Florida or globally.

High Impact (H): Species is known to occur in the footprint of the alternative or adjacent habitats and moderate impact to the species and/or its habitat is anticipated at a level that could substantially affect long-term survival of local or regional populations.

Moderate Impact (M): Species is known to occur in the footprint of the alternative or adjacent habitats and moderate impact to the species and/or its habitat is anticipated. Impacts are not likely to substantially impact long-term survival of local or regional populations but are likely to affect abundance.

Low Impact (L): Substantial impact to the species is not anticipated, but some impact may occur if the species occurs in the alternative or adjacent habitats. The anticipated impact is likely to be minor and have little effect on local or regional abundance.

Very Low Impact (VL). Substantial impact to the species is not anticipated, but impact to individuals may occur if the species occurs in the alternative or adjacent habitats. This score was also assigned when a species is known to occur sporadically in the area.

No impact (N): Species almost certainly not present and/or little no habitat present. This impact level was assigned if the species occurs only as a rare dispersing juvenile with little or no potential to take up residence and find a mate (bear, panther), where the species is believed to have been extirpated from the region, or where the behavior of the species is such that it is highly unlikely to be affected by the roadway.

2.7 Archaeological and Historical Resource Impacts

Direct Archaeological/Historical impacts were measured by estimating the number of acres of archaeological and/or historical sites as identified in the Florida Master Site File within the Right-of-Way for each alternative.

Indirect impacts were measured by estimating the number of acres of archaeological and/or historic sites as identified in the Florida Master Site File within 300 feet of either side of the Right-of-Way for each alternative. The methodology and findings are reported for each alternative within Attachment J.