

ATTACHMENT D

Ridge Road: Moon Lake Road/Starkey Road to US 41 Extension Alternatives Evacuation Assessment

Prepared for:

Pasco County, Florida

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**Ridge Road: Moon Lake Road/Starkey Road to US 41 Extension
Alternatives Evacuation Assessment**

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Part 1: Methodology

Ridge Road: Moon Lake Road/Starkey Road to US 41 Extension Alternatives Evacuation Assessment

1.0 Introduction

Pasco County proposes to extend Ridge Road from Moon Lake Road to US 41 in central Pasco County. Figure D-1 illustrates the extension concept. As a part of the assessment of impacts and benefits of this extension, the US Army Corps of Engineers (USACE), who has regulatory authority over filled wetlands in the road corridor, has requested consideration of the effects of the proposed extension and its alternatives on emergency (e.g. hurricane) evacuation times relative to the project's stated overall project purpose, to wit:

To improve east-west roadway capacity and enhance overall mobility within the area bounded by SR-52 to the north, SR-54 to the south, US-41 to the east, and Moon Lake Road/DeCubellis Road/Starkey Boulevard to the west in accordance with the County's current Comprehensive Plan and the Metropolitan Planning Organization's Long Range Transportation Plan. The project will also provide additional roadway capacity and improved routing away from coastal hazard areas and improve hurricane evacuation clearance times in the event of a hurricane or other major weather-related occurrence in accordance with State of Florida requirements and the County's current Comprehensive Plan.

This assessment was undertaken to address the “provide additional roadway capacity and improved routing away from coastal hazard areas and improve hurricane evacuation clearance times” element of the overall project purpose.

As a part of preparing this analysis, the USACE requested the County evaluate the proposed project, the no action alternative, and 15 other alternatives for a total of 17 evacuation alternatives. These alternatives are described in Attachment A of this submittal, and are referred to herein by the alternative number provided there.

2.0 Methodology Details

This assessment was undertaken using a computer model that simulates evacuation for major events, the Transportation Interface for Modeling Evacuations (TIME). The model provides a framework for evaluating the time over which evacuation to in-county and/or out-of-county destinations can be facilitated on existing and future roadway networks. TIME 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 this purpose. TIME is documented in a series of technical documents available from the Tampa Bay Regional Planning Council (TBRPC).



- Legend**
- TIME Model Roadway Network
 - Ridge Rd Extension
 - Pasco County Streets



Figure D-1
Ridge Road Extension Analysis
Ridge Road Extension Location

2.1 Methodology Agreements

Prior to undertaking this analysis, a methodology statement proposing analysis assumptions and procedures was prepared and was submitted to the ACOE 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 USACE in November of 2012. The statement, prepared to support a meeting on November 15, 2012, to discuss the methodology, is provided in Appendix D-1.

2.1 Adjustments to “Out-of-the-Box” Model

As we applied the “out-of-the-box” TIME model, several corrections and adjustments were noted to be appropriate, as follows:

Several facilities which were two-lane roadways in the model’s “base” (e.g. 2010) condition either have been, or are recognized in future years as being, widened to four- or six-lane divided roadways. However, when the number of lanes in the model was changed to four or six, the facility type designation was left unchanged. When improved to divided roadways, however, facility type codes (in the 30s for *undivided* roadways), should be changed to facility type codes in the 20s, denoting *divided* roadways. Such corrections were made for several facilities in the vicinity of the study area, including portions of SR 54, US 41, CR 1 (Little Road), Moon Lake Road, and SR 52, as well as other facilities further away. Locations where facility types were changed to reflect the widening are indicated in Appendix D-2.

In the out-of-box model, the number of lanes for the 2015 network was based on the capital programs current at the time the TIME model was developed. In fact, some of the scheduled improvements were not implemented, or changes were made to the design/improvement concept. The model network in Pasco, south Hernando, and north Hillsborough counties was reviewed for consistency with existing roads and current capital programs. Locations where the number of lanes was changed from the “out-of-the-box” model either due to incorrect coding or because permits for the improvements have been issued by the USACE, are illustrated on a map in Appendix D-2.

Some roads were added to the model road network for this analysis. The TIME model roadway network originated from an early version of the Tampa Bay Regional Planning Model (TBRPM -- the official Metropolitan Planning Organization planning model) but, since the TIME model covers a much more substantial geographic area (entire state of Florida, plus other southeastern states), the TBRPM road network was “pruned” by the model developer to remove many roads that are of lesser evacuation and regional significance, and the land areas of the original model (traffic analysis zones, or TAZs), of the original TBRPM were combined into larger “traffic evacuation zones” (TEZs). However, these lesser roads exist and provide connections to the major evacuation routes. In the immediate area of the Ridge Road extension, we added a key existing road corridor, the Starkey Road/DeCubellis Road corridor,

providing access from the south to Ridge Road. This road connects SR 54 to Ridge Road. This road is illustrated in the maps in Appendix D-2.

Another adjustment to the out-of-box model was the correction of the geographic coding of a road in Sumter County that had been incorrectly coded as located in Pasco County. This segment was re-coded to indicate its correct location in Sumter County.

In 2010, Evacuation Zones in coastal Pasco County were expanded by the Director of the Pasco County Office of Emergency Management based on new data provided by the Florida Division of Emergency Management's Coastal LIDAR (Light Detection and Ranging) project conducted between 2006 and 2009. Five of Pasco County's designated shelter locations would not be useable for a storm event such as the event being modeled in this analysis because they are located in the current evacuation zones. These five shelters provided a total of 5,692 shelter spaces. These shelter locations were deleted from the model.

To compensate for the loss of shelter space, Pasco County's Office of Emergency Management identified the following facilities along the US 41 corridor between Land O Lakes and SR 52 as shelter or shelter of last resort destinations.

- First Baptist Church, 5105 School Rd, Land O Lakes, 106 shelter spaces
- Land O Lakes High School, 20325 Gator Lane, Land O Lakes, 2,000 shelter spaces
- The Groves Clubhouse, 7924 Melogold Circle, Land O Lakes 597 shelter spaces
- Lakeshore Ranch CDD Clubhouse, 19730 Sundance Lake Blvd., Land O Lakes 603 shelter spaces
- Caliente Clubhouse, 21443 Gran Via Blvd., Land O Lakes 152 shelter spaces
- Countryside Montessori Academy, 5852 Ehren Cutoff Rd, Land O Lakes 357 shelter spaces
- First United Methodist Church, 6209 Land O Lakes Blvd., 333 shelter spaces
- Pasco County Facilities Management Bldg., 6801 Wisteria Loop, Land O Lakes 270 shelter spaces
- Preserve at Wilderness Lake CDD, 21326 Wilderness Lake Blvd., Land O Lakes 227 shelter spaces
- Connerton Community Council, 21100 Fountain Garden Way, Land O Lakes 512 shelter spaces
- Fraternal Order of Police, 21735 YMCA Camp Rd, Land O Lakes 237 shelter spaces

These locations provide 5,394 shelter spaces, and were added to the inventory of available shelter spaces for this analysis.

2.2 Model Application Parameters

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" alternative, a "worst-case" set of assumptions, were established by staff of the Statewide

Regional Evacuation Study Program team that directed the TIME model development to be appropriate for this comparative analysis. These parameters are as follows:

- Demographic Data Year 2015 horizon
- Highway Network Appropriate to alternative
- 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 Four primary (Manatee, Hillsborough, Pasco, and Pinellas) plus two “shadow” (Sarasota and Hernando).

These parameters were held constant in all alternatives evaluated.

Part 2: Findings and Conclusions

3.0 Findings

This section discusses the findings of the applications of the TIME model. Tables and graphs provided in Appendix D-3 summarize the standard reporting results of the TIME model for the tested alternatives. We have added to the standard report for each alternative a map illustrating the location of the last road segment(s) to clear that is associated with the reported regional evacuation time.

The standard model reports provide measures of the time required to evacuate each county, measured in three ways – the “In-County” evacuation time, the “Out-of-County” evacuation time, and the “To Shelter” evacuation time. An important aspect of the TIME model standard reports is that they summarize information at the County-wide and at the region-wide levels, but do not provide much detail as to what is occurring within each County. By looking at the added map of the last road segment to clear, it becomes evident that it is conditions away from the coastal evacuation zone that govern the information provided in the standard reports.

For example, the standard model report for Alternative 1, the “No-Action” alternative, indicates that the regional evacuation time is 63.5 hours. This is the number of hours after the evacuation order is given that the last evacuating vehicle, from any evacuating county, clears off of the road system in one of the four primary evacuating counties. Figure 1 in Appendix D-3 illustrates the location of the last road segment to clear, which occurs on a road in the northeastern area of Pasco County, away from the coastal evacuation zone.

The standard reports from the model applications provided in Appendix D-3 document some of the settings for the model applications. Results from the standard report tables are summarized in Table D-1, below. While there are differences between the alternatives, note that the “In-County” and “To Shelter” clearance times are the same within each alternative, and that the “Out-of-County” and “Regional” clearance times are the same within each alternative. The “In-County” and “To Shelter” measures being the same within each alternative indicates that the evacuation zone clears of all traffic (in-county evacuating traffic and out-of-county traffic passing through the evacuation zone) before all in-county evacuees reach their destinations. That the regional clearance time is the same as the out-of-county clearance time in each alternative and, in all alternatives but one, is greater than the in-county clearance time is likely the result of a combination of Pasco County being the most geographically “remote” county in the region, the volume of traffic seeking to evacuate northward, and constraints in the transportation network delaying traffic exiting the region through Pasco County.

Table D-1: Summary of Standard TIME Reports

Alternative No:	1	2-7	8	9	10	11	12	13	14	15	16	17
Description:	"No Action"	RRE-4	SR 52-4	SR 54-4	Tower-4	SR 54-4E	Tower-2/ SR 54-2	SR 54-2/ SR 52-2	Tower-2/ SR 52-2	RRE-2/ Tower-2	RRE-2/ SR 52-2	RRE-2/ SR 54-2
In County:	58.0	54.5	72.5	52.5	62.5	63.5	55.5	62.5	51.0	70.5	69.5	64.0
Out of County:	63.5	73.0	73.5	52.5	65.5	64.0	64.5	68.5	54.0	81.5	83.5	73.0
To Shelter:	58.0	54.5	72.5	52.5	62.5	63.5	55.5	62.5	51.0	70.5	69.5	64.0
Regional Clearance Time:	63.5	73.0	73.5	52.5	65.5	64.0	64.5	68.5	54.0	81.5	83.5	73.0

As indicated above, the standard reports do not specifically address clearance of the coastal hazard areas, and the regional clearance time results seem inconsistent and contrary to expectations. For example, it is not logical to assume that the construction of new roads would increase regional clearance times, as is indicated in several of the alternatives.

- Examples of apparent inconsistencies involve Alternatives 2-7, 8, and 16, where building Ridge Road as a four-lane facility, or adding four lanes to SR 52, produce regional clearance times of 73 and 73.5 hours, respectively. Alternative 16, where Ridge Road is built as a two-lane road, and two lanes are added to SR 52, produces a regional evacuation time of 83.5 hours, ten hours longer. Another example involves Alternatives 8, 10, and 14 -- adding four lanes each to SR 52 and Tower Road result in regional clearance times of 73.5 and 65.5 hours, respectively, while adding two lanes to each of them results in a regional evacuation time of 54 hours.
- No general trend of results seems evident, as alternatives providing the shortest regional clearance times (in the low-to-mid 50-hour range -- Alternatives 9 and 14) involve improvements to SR 52, Tower Rd, and SR 54. The next group of alternatives, providing regional clearance times in the mid-60 hour range is led by Alternative 1, the “No-Action” alternative. Other alternatives, resulting in the longest regional clearance times (ranging from 73 to 83 hours), include Ridge Road improvements.
- On the other hand, the three shortest “in-county” and “to-shelter” evacuation times within Pasco County are provided by alternatives that involve improvements in each of the three general “corridors” – SR 52, SR 54/Tower Rd, and the Ridge Road Extension corridor (Alternatives 14, 9, and 2-7).

As indicated above, the standard report measures do not specifically measure the ability 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 provides evacuation traffic volumes served on each road segment in the model in 30-minute time increments, and provides “in-county” evacuation traffic volumes separately from “out-of-county” evacuation traffic volumes. These volumes were extracted from the model output files for the roads crossing a cordon that we defined around the coastal west Pasco County area (see Figure D-2). The cordon was defined to isolate traffic entering and exiting the coastal evacuation zones, and it crosses the major roads and a few TEZ connectors where traffic volumes can be cleanly identified.

An understanding of in-county and out-of-county traffic is important to the discussion that follows.

- In-county evacuation traffic is traffic that leaves the evacuation trip origin within Pasco County and travels to a place of refuge that is also within Pasco County, but is outside of the evacuation zones. As a result, this traffic is largely accommodated on roads within Pasco County.

- Out-of-county evacuation traffic is evacuating traffic with destinations in any county other than the county where the origin is. For roads within Pasco County, “Out-of-County” evacuating traffic includes traffic originating in Pasco County that is destined to a place of refuge outside of Pasco County, or evacuating traffic that originates in any county other than Pasco that either passes through Pasco County or is destined to a place of refuge in Pasco County.
- The TIME model does not provide the ability to track out-of-county evacuation travel that is generated specifically in Pasco County, so we cannot report on the performance of Pasco County out-of-county evacuation travel at the cordon. But Pasco County out-of-county travel is generated alongside the in-county evacuation travel and mostly shares the same road system that Pasco County’s in-county traffic uses – particularly at the cordon. Thus the performance of Pasco County-generated out-of-county evacuation travel will align with the in-county evacuation travel, at least in the close-to-home coastal areas. This is important in considering the results of the network tests, because the information presented shows some out-of-county evacuation travel occurring at times later than the Pasco County in-county evacuation travel. The later-occurring out-of-county travel appears to be generated in other counties and arrives and passes through Pasco County after Pasco County’s In-County evacuation travel has completed its clearance. Thus, the key measure of the ability to clear Pasco County’s coastal high hazard area is Pasco County’s In-County travel.

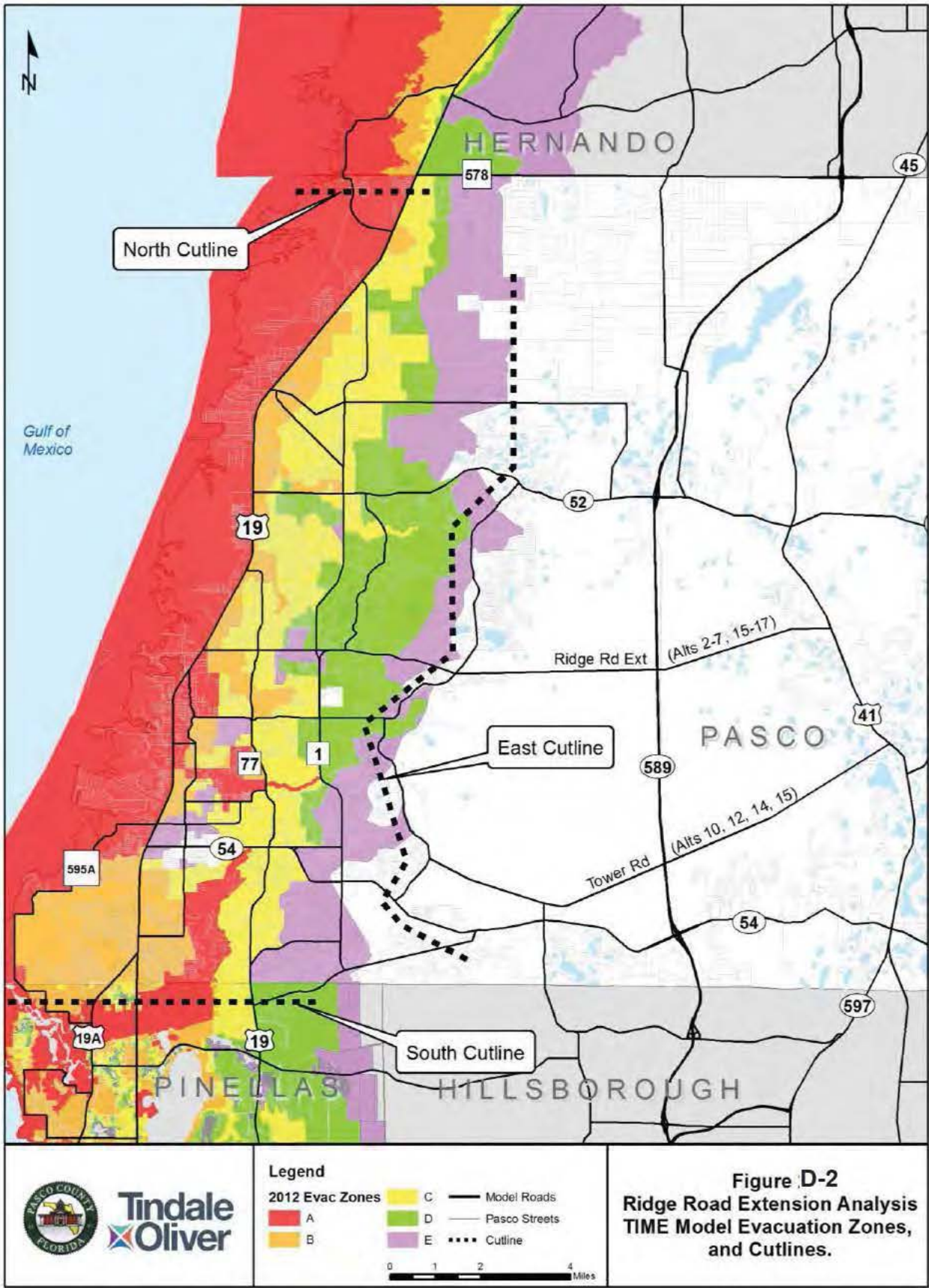


Figure D-2
Ridge Road Extension Analysis
TIME Model Evacuation Zones,
and Cutlines.

It is important to reiterate here that this information is generated by the TIME model in its routine, normal function and is saved in an output data file by the TIME model. The standard reports created by the TIME model access this data file to produce its “standard” tables and graphs provided in the appendices of this report. The data regarding the cutline above was extracted from that same data file to address the project purpose more specifically.

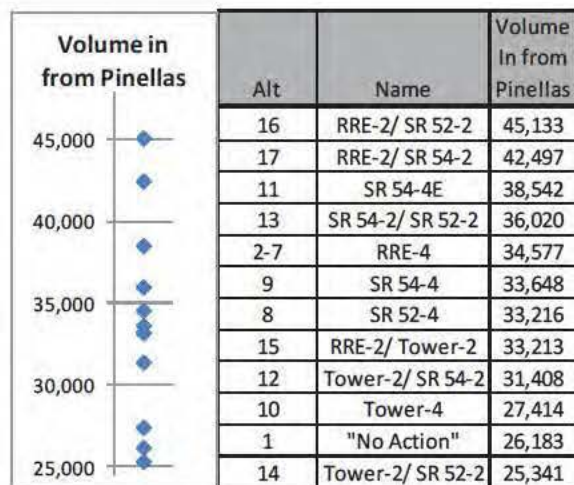
The evacuation capability of the road system under the various alternatives is summarized in two ways. Three “cut-lines” crossing key roadway corridors in Pasco County were created, as illustrated in Figure D-2. The three cut-lines also create a cordon of the coastal evacuation zones. Total (in-county plus out-of-county) evacuation traffic volumes crossing the cut-lines, by direction (in-bound vs. out-bound) are provided in Appendix D-4. Table D-2 summarizes several measures of interest, including evacuation traffic volumes entering Pasco County from Pinellas County, the total evacuation traffic exiting Pasco County’s evacuation zone, and the elapsed time until 99 percent of the Pasco County-generated evacuation traffic exits the evacuation zone. The Appendix D-4 worksheets provide more extensive data indicating in-county and out-of-county evacuation traffic volumes by road segment and graphs illustrating clearance times for both in-county and out-of-county evacuation trips.

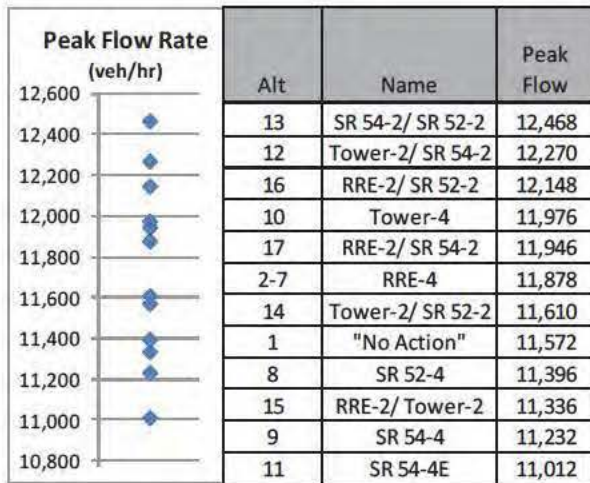
Table D-2: Summary of Pasco County Evacuation Zone Clearance

Alternative:	1	2-7	8	9	10	11	12	13	14	15	16	17
Description:	"No Action"	RRE-4	SR 52-4	SR 54-4	Tower-4	SR 54-4E	Tower-2/ SR 54-2	SR 54-2/ SR 52-2	Tower-2/ SR 52-2	RRE-2/ Tower-2	RRE-2/ SR 52-2	RRE-2/ SR 54-2
Volume in from Pinellas:	26,183	34,577	33,216	33,648	27,414	38,542	31,408	36,020	25,341	33,213	45,133	42,497
Total Volume Evacuating thru Pasco Evacuation Zone:	134,894	141,830	144,361	140,345	137,646	148,197	139,140	144,524	132,002	140,754	152,905	149,547
Peak Hourly Flow Rate:	11,572	11,878	11,396	11,232	11,976	11,012	12,270	12,468	11,610	11,336	12,148	11,946
99% Clearance Time for Pasco-Generated Trips (hrs):	23.4	16.8	19.5	17.1	21.8	25.8	26.0	20.4	22.7	19.3	26.0	15.8

To support the discussions below, the information in Table D-2 has been sorted and ranked, and the sorted tables are provided adjacent to each discussion, below. The evacuation volume cutline summary in Table D-2 provides the following insights:

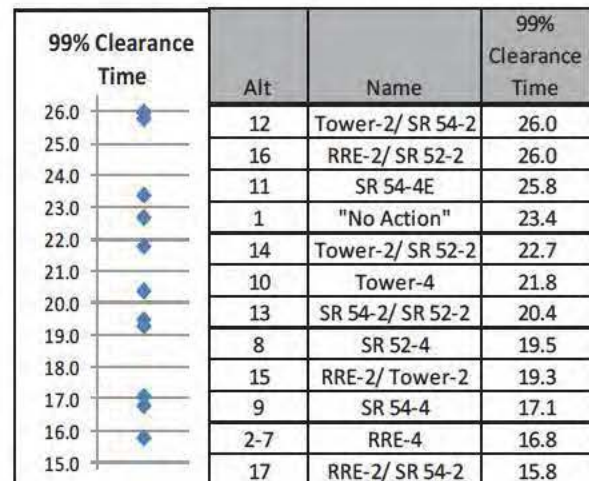
Volume in from Pinellas: All but one of the transportation system alternatives attracts more evacuating traffic from Pinellas County through Pasco County than the “No-Action” alternative. Traffic volumes attracted from Pinellas County ranges from 25,341 to 45,133, with Alternative 1, the “No-Action” alternative attracting 26,183. Improvements involving the proposed Ridge Road Extension project and it’s alternate configurations (Alternatives 2-7) and the two-lane Ridge Road (Alternatives 15-17) fall in the upper tier of “attractiveness”, accounting for nine of the top ten alternative analyses in this regard.





Peak Traffic Flow Rate: Peak evacuation traffic flow rates exiting the cordon range from 11,012 vehicles per hour to 12,468 vehicles per hour. Alternative 1, the “No-Action” alternative ranks at the top of the lower 1/3rd of results regarding the peak flow rate. No clear trend of alternative performance emerges from this measure, as the top three alternatives in this measure involve mixtures of improvements to SR 52, SR 54, Tower Rd, and the Ridge Road Extension.

Evacuation Zone Clearance Time for Pasco Residents: The time required for Pasco County-generated traffic to clear the evacuation zone ranged from 15.8 hours to 26.0 hours. This is the number of hours after the evacuation order is issued. One of the analysis methodology directives was to assume that evacuating traffic in the model would respond to the order and leave homes throughout the 12 hours following issuance of the evacuation order. Thus, a clearance time of less than 12 hours is not possible in this analysis, and the range of evacuation time after the 12-hour response period can be viewed as (15.8-12=) 3.8 to (26-12=) 14 hours. In rank order, the proposed Ridge Road Extension project and its alternate configurations (Alternatives 2-7) and two of the three two-lane Ridge Road alternatives (Alternatives 15 and 17) provide eight of the lowest evacuation zone clearance times for Pasco residents.



Three of the alternatives, 11, 12, and 16, result in 99th percentile evacuation zone times greater than the “No-Action” alternative. A feature of the hurricane evacuation model is that it decides on which routes to assign evacuating trips based only on what it “knows” through the first 12 hours of evacuation. These decisions are made and routes are assigned before the worst congestion develops. Once the routes are assigned, traffic will not deviate from those routes in following hours of the assignment.

Thus, these alternatives are likely to show good attractiveness early so that the model sends traffic to the improved routes, but then those routes become overloaded later at “bottlenecks” that cannot handle the attracted traffic after the initial 12 hours of network loading.

As applied to each of the three “longer” alternatives, consider the following:

In the case of Alternative 11, constructing a 4-lane expressway in the SR 54 corridor, this is easy to understand. The high capacity, high speed facility is attractive and attracts traffic in the early hours. But, later, the upstream and downstream facilities are not able to accommodate the attracted traffic flow, and congestion results.

In the case of alternative 12, adding two lanes each to Tower Rd and SR 54, a similar but not as “extreme” a situation occurs – two lanes of major collector road (Tower Rd) and two lanes of signalized arterial are added – not as attractive as the 4-lane freeway of Alternative 11 and less traffic is attracted from Pinellas County. Tower Rd’s western terminus is at Starkey Rd, a mile north of SR 54 and four miles south of Ridge Rd along two-lane roads, and is not as “accessible” as SR 54 or other alternatives. Thus, traffic attracted into this route must follow a more circuitous and lower-capacity route to evacuate.

In the case of alternative 16, a combination of two lanes for Ridge Rd and two lanes on SR 52, the most additional traffic is attracted from Pinellas County, and these two corridors are in the central and northern portions of the study network. Other alternatives involving the Ridge Rd corridor show good evacuation times, but alternatives involving SR 52 improvements tend to be less efficient than others. Thus, while the Ridge Rd element of the alternative may contribute to good evacuation zone clearance, the SR 52 corridor may show attractiveness early due to its northern location, and draw traffic further north on the basis of the initial 12-hour network loading period, but then exposes the later-arriving traffic to longer delays as congestion builds and later-arriving traffic contends with congestion as it passes through western Pasco County and on its two-lane approach to I-75.

The alternative testing done here is based on near-term future evacuation demand estimates (e.g. 2015). As the Tampa Bay area grows, the evacuation demands will also grow, and the conclusion reached from this assessment is that the coastal evacuation zone can be more quickly evacuated with Ridge Road in the network.

4.0 Conclusion

When looking specifically at the evacuation zone in Pasco County, using the cordon-extracted data, all of the tested alternatives add capacity for evacuation zone clearance. The proposed project, however, provides this capacity at an advantageous location and improved routing, resulting in quicker evacuation zone clearance times for Pasco County residents in all but one of the 17 tested alternatives.

The following statements attempt to summarize the findings of this analysis qualitatively:

Alternatives involving improvements in the SR 54 corridor are “attractive” in the initial hours of evacuation due to its proximity to existing population centers in Pasco and Pinellas, but surrounding roads aren’t able to feed/support its longer-term attractiveness.

Tower Rd is not as accessible, is not as well-developed a corridor, and will have a less efficient design/capacity, reducing its effectiveness for evacuation purposes.

The SR 52 corridor is further north and is more remote to evacuating traffic. Elements of that road are still only two lanes between US 41` and I-75, thus resulting in lesser effectiveness.

Ridge Rd is closer to the attractive SR 54 corridor and has reasonably well-developed accessibility on its west end, will have attractive speed and capacity characteristics, and provides access to shelters in the areas north of Land ‘o’ Lakes.

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