Appendix A: Summary of Project Ranking Method

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Rural Highway Project Ranking

1.0 Project List

1.1. How the Project List was Developed

The list of projects that were considered for ranking as a part of the TRTP were those capacity-added highway projects that were not included in the current UTP. These projects were derived from:

- TxDOT's Design-Construction Information System (DCIS)
- Unfunded Project Lists
- TxDOT's Super 2 Report
- List of Proposition 12 Projects (2012)
- District Input
- Stakeholder and Public Input

1.2. DCIS Data Compilation

To identify candidate rural projects for consideration in the TRTP 2035, the TPP provided an initial DCIS data set for projects outside of MPO boundaries with the parameters set as "not in UTP." This data set yielded over 7,000 projects. Many of these projects were maintenance and rehabilitation projects, and other project which were not long term capacity additions. To identify the rural added-capacity projects, the following sequential steps were undertaken to filter these projects:

Step 1: Added-capacity projects were selected from the original DCIS list based on multiple criteria:

- Included projects programmed to add lanes on either main lanes or frontage roads;
- Included projects programmed to construct additional mileage of existing facilities;
- Records were further checked individually to include projects that were classified in DCIS as "CNF" (convert non-freeway to freeway), "WF" (widen freeway), "WNF" (widen non-freeway), "NLF" (new location freeway), "NNF" (new location non-freeway), "INC" (interchange), "UPG" (upgrade to standards freeway) or "UGN" (upgrade to standards non-freeway). Projects indicated as having additional capacity based on their layman descriptions were retained.

Rehabilitation projects with "Super 2" or "Add Passing Lanes" in the layman description were also retained.

Step 2: County codes and district codes were converted to county and district names to assist with the identification of projects located within an MPO to confirm proper coding of the MPO field in DCIS.

Step 3: Any project in a county that was located entirely within an MPO (based on the latest MPO boundary maps) was identified and excluded.

Step 4: Any project in a county that was located partially within an MPO was evaluated on a case-by-case basis to determine if the project limits were within the MPO boundaries. If the limits were entirely within an MPO boundary, then the project was excluded. Projects that went across an MPO boundary were retained. Projects were split at a logical break point, such as an intersection, as close to the MPO boundary as possible in most cases.

Step 5: Projects with short lengths (adding two-way left-turn lanes <1 mile) and projects that did not qualify as rural added-capacity projects were identified and excluded. A complete list of rural (non-MPO) added-capacity projects were identified after this step.

Step 6: Projects in the list that represented a Super 2, rehabilitation that included adding two-way left-turn lanes > 1 mile, interchanges, or needed further confirmation with TxDOT were identified as "capacity enhancements" and compiled into a separate list.

Step 7: Projects in the list that are on the 2012 UTP but not indicated as being so in DCIS were excluded.

After review of the project lists by TxDOT TPP, the DCIS information was distributed to each TxDOT District for review. A webinar to address questions from the District staff was held September 27, 2011. The following list provides the information reviewed and checked by the Districts:

1. *Confirmed the data sort* –
    a. Were there any rehabilitation projects that are planned to add Super 2 passing lanes that are not identified as such in the project description?
    b. Were there any other projects outside of the UTP timeframe that were sorted improperly?
2. *Supplied missing data* – some projects were missing data, such as the number of existing/future lanes or project length.
3. *Provided location information* – several projects, such as new location routes and extensions, lacked adequate location information for GIS mapping and analysis purposes.

4. *Validated need for overlapping projects* – there were some projects in DCIS that have both a two- to four-lane expansion and a Super 2 project set up for approximately the same limits.

5. *Confirmed construction costs* – specific costs were reviewed and some were updated.

    a. The average costs developed for the SLTRP Needs Evaluation were used when project specific information was not supplied by District staff.

    b. Super 2 projects used average unit cost from the task force report.

    c. District staff were asked to pay close attention to cost data for interchange only projects, in addition to other projects, since these projects can be very high cost.

    d. Conversion of two-way frontage roads to one-way operation will use the unit cost for arterial unless directed otherwise by district staff.

6. *Compared DCIS projects to Super 2 Task Force Report* – determined if any additional Super 2 projects should be included in the TRTP analysis and provided the necessary information, including limits, length, Super 2 location on a map (if new location), existing lanes, proposed lanes, construction cost estimate.

7. *Compared DCIS projects to Unfunded Priorities List* – the Unfunded Priorities List was compiled from the brochures developed for each district in January 2011. In many cases, the project description is not adequate for this TRTP effort. Those projects which are Super 2 or added-capacity projects, including limits, length, location on a map (if new location), existing lanes, proposed lanes, construction cost estimates were identified.

8. *Compared DCIS projects to Corridor Recommendations List* – identified those Super 2 and added-capacity projects in the various corridor studies to be included in the TRTP analysis, including limits, length, location on a map (if new location), existing lanes, proposed lanes, construction estimate.

9. *Identified Prop 12 projects* – identified any projects that will be moved into the UTP by virtue of being selected for Prop 12 funding.

10. *Identified Other Projects* – are there other identified roadway projects that are not yet in DCIS that should be included in the TRTP analysis?

The current statewide list of rural, added-capacity projects includes almost 600 projects and is included at the end of this Appendix.

1.3. Proposition 12 Projects

The proposed list of projects for Proposition 12 funding was approved by the TxDOT Commission at the September 2012 meeting. The TRTP project lists were compared to

the Proposition 12 projects to remove any projects moved into the UTP by this Commission action from further analysis in the TRTP prioritization process.

1.4. District Input and Other Projects

All projects currently listed in the DCIS by District staff were included. The I-69 and My35 segment committees have not recommended specific projects; however, several projects along US 59 and I-35 are included as they were listed in the DCIS.

Super 2 projects from the Super 2 Task Force and other locations were also included as added by District staff.

Projects not currently in DCIS were submitted by a few districts, including 8 locations in Hudspeth County to replace at-grade intersections on IH 10 with interchanges.

1.5. Stakeholder and Public Input

Through the stakeholder and public outreach efforts, several projects and project modifications were identified. A review of these projects revealed that some were already included on the list; some were not appropriate for this particular analysis as they were not capacity-added highways. A complete list of these projects is provided at the end of this Appendix. The team coordinated with the districts on disposition/response to the suggested projects.

1.6. GIS Mapping

All projects that were identified as rural added-capacity projects and capacity enhancements have been mapped in GIS based on either the limits provided as longitude/latitude in DCIS, the limits description in DCIS or as provided by the Districts for new location projects. All mapping was done using TxDOT's RHiNO database as a basis. Due to the use of RHiNO some projects may go slightly beyond or fall short of the limits described in DCIS. Projects on new location were mapped in the Statewide Analysis Model (SAM) as well as in RHiNO.

1.7. SLTRTP Unit Cost Assumptions for Added Capacity Projects

The following table is copied from Chapter 3 of the SLTRTP. The cost estimates do not include right-of-way, utility adjustments, preliminary engineering, environmental, design engineering, or construction engineering/inspection.

Roadway Unit Cost Data from SLRTP

Area Type	Arterial (2008)	Freeway (2008)	Arterial (2010)	Freeway (2010)

Highway Construction Cost Index	191.60	191.60	165.11	165.11
	$ Million per Lane-Mile (2010 dollars)			
Rural	1.0	1.6	0.86	1.39

Source: 2030 Committee Texas Transportation Needs Report, 2009; URS

Project-specific costs were derived from the DCIS and reviewed by District staff. If project-specific costs are missing, then these Unit Costs are used.

Super 2 Projects

The unit cost used for estimating a two-lane highway to a Super 2 design upgrade was $600,000 per mile. This unit cost is the value used in the cost estimates developed by the Super 2 Task Force and reported in the Super 2 Task Force Final Report dated July 27, 2011.

1.8. Data input for the Project List

After all information was reviewed by TxDOT District staff the list of projects was compiled into a final master project list that was used for the ranking process. This list is provided at the end of this Appendix.

Each project was coded with the following data which was used to calculate scores using weighted criteria.

1. District
2. County
3. Hwy_No
4. Limit From
5. Limit To
6. Cost Estimates (Criteria H)
7. Length of Project
8. SAM2 TAZ (Based on Project Center Point)
9. Project County Truck Tons
10. Project County Truck Dollars
11. "Trunk Flag (P1=Phase 1 Trunk, OT=Other Trunk, NT=Not Trunk) (Criteria A)"
12. System Gap (F=Full, P=Partial, N=No) (Criteria B)
13. Gap Distance (Criteria B)
14. Travel Time to Population Index (60 Minute Travel Time Boundary) (Criteria E)
15. Hurricane Route (Y=Yes, C=Connection, N=No) (Criteria F)
16. County Proximity to Coast Hurricane Factor (Criteria F)
17. 2010 Census Block Population Buffer (5 Miles) (Criteria G)
18. 2009 ADT (Criteria O)
19. 2035 ADT (Criteria P)
20. 2009 Trucks (Criteria M)
21. 2035 Trucks (Criteria N)
22. 2009 Truck % (Criteria L)
23. 2035 Truck %
24. 2009 VMT

25. 2035 VMT

26. Current Lanes

27. FY Lanes

28. 2009 Volume PCE for Existing Capacity

29. 2035 Volume PCE per 2 Lanes for Existing Capacity

30. 2035 Volume PCE per 2 Lanes for Future Capacity

31. 2009 ADT on Current Design LOS (Criteria I)

32. 2035 ADT on Current Design LOS (Criteria J/K)

33. 2035 ADT on FY Design LOS (Criteria J/ K)

34. Super2 or not (Criteria Q)

35. Median Type (Is Current Med Type for Non-New Location, Is Proxy Current Med Type for New Location) (Criteria Q)

36. Hwy_Des1 (Is Current Des1 for Non-New Location, Is Proxy Current Des1 Type for New Location) (Criteria Q)

37. Terrain (Criteria Q)

2.0 Development of Evaluation Criteria

The six TxDOT Strategic Plan goals were utilized to establish a framework for criteria measures to evaluate and rank the capacity-added highway projects. The six goals are:

1. Develop an organizational structure and strategies designed to address the future multimodal transportation needs of all Texans;
2. Enhance safety for all Texas transportation system users;
3. Maintain the existing Texas transportation system;
4. Promote congestion relief strategies;
5. Enhance system connectivity; and
6. Facilitate the development and exchange of comprehensive multimodal transportation funding strategies with transportation program and project partners.

In reviewing these six goals and taking into consideration that the ranking was to include only added capacity projects and the need to have measureable criteria with which to evaluate specific projects, it was determined that the following two strategic plan goals would apply for project specific evaluation within the TRTP. These goals establish broad areas from which to develop quantifiable measures. The goals proposed for developing criteria measures include:

Promote **congestion relief** strategies; and

Enhance system **connectivity**.

These two goals were simplified into two general areas: **Mobility** (congestion relief) and **Connectivity**. From these general areas, criteria measures were developed and are discussed below.

The values for each criteria measure were reviewed by the participants of the initial stakeholder meetings in coordination with TxDOT district and division staff members. The criteria measures for mobility and connectivity were evaluated as part of one scoring matrix.

Projects that were evaluated were long range and in various stages of development and therefore not likely to have category-specific funding identified. Although maintenance and safety are a large part of the rural transportation budgets, those projects are programmed separately and tend to be funded as the need arises and within a shorter timeframe than the projects being analyzed in this process. The TRTP focus is on capacity/mobility projects and as such, maintenance and safety will not be included in the evaluation process.

2.1. Connectivity

In general, these criteria served as a measure of a project's ability to connect rural Texas to markets and population centers, increase the accessibility of the rural population, and connect population and employment centers. Also included in this goal area is removal of capacity gaps in the system to provide for a more contiguous rural roadway network. All added capacity projects, including Trunk System and Super 2 projects, were evaluated.

The criteria measures for connectivity include the following.

2.1.1. Trunk System (A)

The Texas Trunk System established "a network of four-lane divided rural highways to improve rural mobility, connect major activity centers, and provide access to ports of entry into Texas" (SLRTP-2035). As such, projects on the Trunk System significantly help address the issues of connectivity (as well as mobility). The TRTP did not evaluate changes to the Texas Trunk System.

Scoring for this criterion varied depending on whether the project is Phase 1 Trunk, Other Trunk, or not on the Trunk System.

2.1.2. System Gap (B)

Alleviating gaps (deficiencies in capacity) on the existing system will enhance connectivity, relieve congestion, and optimize prior investments. If a potential project falls (geographically) between two segments of roadway with higher capacity it will be categorized as a "System Gap" project.

Projects are given the highest points if the gap is completely filled. Otherwise, a partial completion of a gap is given a proportional score.

2.1.3. Commodity by Truck Freight Movement (C and D)

Commodity by truck freight movement is a measure of economic activity near a project that is specific to truck travel demand. Two measures are used

- ★ One based on the aggregate dollar value of annual truck freight flows in/out of the county where a project is geographically located (C);
- ★ One based on the annual tonnage of truck freight flows (D).

All commodities will be included in this measurement. Data for this measure is derived from the SAM model by county. Each county is ranked based on its level of freight tonnage or dollars shipped and received. Projects are then given a score based on a percentile ranking of the counties,

2.1.4. Accessibility to Population Centers (E)

Accessibility to population centers is a good measure for determining the need for, and geographic location of a new project or improvement to the existing system. This criterion will be a measure of the composite travel time to key population centers weighted by the population at key centers for each project.

The SAM model zones (over 4,000 of them) were used for this measure. A 2010 estimate of population in the SAM model was used. Traffic analysis zones in the SAM model were ranked according to their level of accessibility to population within 60 minutes of each zone. The SAM zones were then ranked, and each project was given a score based on the percentile of the zone in which it was located (measured by the center point of the project); e.g., the top 10 percent of zones ranked by composite accessibility is given the highest points, etc.

Accessibility from Zone "i" to Zone "j" is calculated as:

> Composite Accessibility$_i$ = $\sum$ (Population in Zone$_j$) * (1 / Travel Time from Zone$_i$ to Zone$_j$) for all zones within 60 minutes of Zone "i".

2.1.5. Hurricane Evacuation Route (F)

Hurricane evacuation is a critical issue during times of major storms requiring significant planning at the state and local level. Sufficient system connectivity is also a major consideration.

A "tiered" score was developed based on proximity of each project to the Gulf coast, and whether the project was on a designated hurricane evacuation route or connected to a hurricane evacuation route.

2.2. Mobility

Generally, these criteria measured existing and forecast levels of mobility performance of the rural roadway system. All added capacity projects, including Trunk System and Super 2 projects, were evaluated. This mobility performance can be measured in Level-of-Service (LOS) as indicated by the volume/capacity ratio (V/C), average annual daily traffic (AADT), and truck average daily traffic (ADT) and also the amount of population served by the rural roadways. Additionally, a cost effectiveness ratio which divides project cost by the vehicle miles of travel (VMT) within the project limits is included to identify projects that give the best value for dollars spent.

The criteria measures for mobility included the following.

2.2.1. Population near a Project (G)

The population that a project can serve is an important measure since it impacts the volume of traffic that may ultimately utilize the facility. This criterion is used to score

projects according to the population served within a 5-mile buffer distance of the roadway project. This will measure the local need for the project, tabulating the traffic that uses the project within the 5-mile buffer. For this analysis, 2010 population from the Census by Census block was used.

Projects are scored according to their statewide percentile-ranking of total population within the 5-mile buffer.

2.2.2. Cost Effectiveness (H)

Considering the limited funds to construct added capacity projects, it will be important to score projects higher that provide greater mobility per dollar spent. This criterion rates projects based on the project cost compared to the forecasted traffic as measured by VMT. If a project has a lower ratio of cost to VMT, then it receives a higher score for this measure.

Projects are scored in this category according to their percentile rank.

2.2.3. Volume to Capacity Ratio (I, J, and K)

The LOS of a project can be calculated using the existing or forecasted traffic volumes (in vehicles per day) and the existing or forecasted capacity, as measured in number of lanes (by facility type). For this analysis the 2010 Highway Capacity Manual (HCM) was referenced. Three measures of LOS were used to evaluate existing and future need and future project performance (how well the project meets the need):

- ★ Current Volume/Capacity (I): The existing LOS for the project segment was calculated using 2009 counted traffic on the existing cross-section capacity. This indicated an existing LOS for the project. This measure equates to existing volume on existing capacity.
- ★ Forecast Volume/Existing Capacity (J): The forecasted, unimproved LOS was calculated and scored for the project segment using forecasted traffic on the existing cross-section capacity, showing a possible projected future LOS if the project is not built. This measure equates to forecasted volume on existing capacity and helps define future problems/needs.
- ★ Forecast Volume/Forecast Capacity (K): The forecasted, improved V/C ratio was calculated using the forecasted 2035 traffic on the proposed project cross-section capacity. This indicates a future LOS if the project is built. This was then compared to Forecast Volume/Existing Capacity to develop a measure of whether the project, if constructed, would improve the facility's operational performance and address the future needs. If the project improved the future LOS, as measured by V/C ratio, it received points. If the project improved the LOS significantly it received the highest point (changed from LOS A to LOS F when the project is built receives 10 points). The score declined as the LOS change declined.

Existing LOS tests how congested an existing roadway is currently. The second criterion measures the future congestion anticipated if the project is not built. The third criterion measures future LOS with the improvements made and will measure how well the project meets the future demand.

All measures of LOS used the estimated percentage of trucks to ensure an accurate representation of capacity.

2.2.4. Truck Traffic and Percentage (L, M, and N)

In addition to freight flows, truck volume (2009 existing and 2035 forecasted) on the project provides an indication of the demand for improved facilities. Three measures were used to assess the impact of trucks on rural roadways:

- ★ Truck route usage using 2009 truck percent of total traffic count (L)
- ★ Existing truck traffic measured in 2009 trucks per day (M)
- ★ Forecast truck traffic measured in 2035 forecasted trucks per day (N)

When 2 or more truck counts were found along a project, the project count was calculated as the segment-weighted average of the counts.

Truck VMT as a measure would be biased in favor of a longer project. If two projects, one spanning 8 miles and the other 2 miles, had the exact same volume of 2,000 trucks per day, the longer project would calculate to 16,000 VMT, and the shorter project would calculate to 4,000 VMT. This measurement would just inflate trucks on a longer roadway, and would bias results as opposed to just the single measure of trucks per day.

Truck percentage in isolation will also potentially bias measurements in favor of low total volume roadways. Truck percentage combined with total truck count is a better indication of truck utilization.

Projects are scored in this category according to their percentile rank.

2.2.5. Annual Average Daily Traffic (O and P)

Annual average daily traffic volumes indicate the level of usage on a facility (i.e., demand). Two measures were used to score project segments in terms relative to demand:

- ★ Existing 2009 average daily traffic (O)
- ★ Forecasted 2035 average daily traffic (P)

When 2 or more truck counts were found along a project, the project count was calculated as the segment-weighted average of the counts.

Projects are scored in this category according to their percentile rank.

2.2.6. Safe Passing Needs (Q)

Safe passing conditions affect mobility particularly on two-lane roadways with sight distance constraints. Project scoring was done using the facility type (multi-lane, Super 2, 2-lane, divided/undivided) and the type of terrain (flat, rolling, mountainous). In this category, a project was scored higher if there was a greater “typical” need for a safe passing opportunity. This need was greater for two-lane facilities and undivided facilities. The need was also deemed greater if the terrain was rolling or mountainous as compared to flat.

The methodology used to score each project is shown in the following table.

Criteria Measures Scoring

CRITERIA CATEGORY	CRITERIA ID	CRITERIA	DATA SOURCE	PARAMETERS									
CONNECTIVITY	A	Trunk System	SLRTP	Not on Trunk System	Other Trunk System	Phase 1 Trunk System							
				0	5	10							
	B	System Gap	SLRTP, 2009 RHiNO	Project Does Not Address a Gap	Project Partially Completes of a Gap	Project Entirely Completes the Gap							
				0	10 * Length of Project / Total Gap Length	10							
	C	Commodity Flow by Truck To/From County (Annual Dollar)	Transearch/SAM	Bottom 10% of Rural Counties	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Rural Counties
				1	2	3	4	5	6	7	8	9	10
	D	Commodity Flow by Truck To/From County (Annual Tonnage)	Transearch/SAM	Bottom 10% of Rural Counties	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Rural Counties
				1	2	3	4	5	6	7	8	9	10
	E	Composite Travel Time to Population/Employment Centers	SAM	Bottom 10% of Projects	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Projects
				1	2	3	4	5	6	7	8	9	10
	F	Hurricane Evacuation Route (HER)	TxDOT/TPP	Not on Hurricane Evacuation Route	Connection to HER Other Counties	Connection to HER 3 Counties Inland	Connection to HER 2 Counties Inland	Connection to HER Coastal Counties	HER Other Counties	HER 3 Counties Inland	HER 2 Counties Inland	HER Coastal Counties	
				0	1.25	2.5	3.75	5	2.5	5	7.5	10	
MOBILITY	G	Population within a 5-Mile Buffer Along Project	Census 2010 and Texas State Data Center	Bottom 10% of Projects	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Projects
				1	2	3	4	5	6	7	8	9	10
	H	Cost per Future VMT	DCIS/RHiNO/SAM	Bottom 10% of Projects	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Projects
				1	2	3	4	5	6	7	8	9	10
	I	Current Volume/Capacity	RHiNO and SLRTP Analysis	LOS A	LOS B	LOS C	LOS D	LOS E	LOS F to LOS A				
				0	2	4	6	8	10				
	J	Forecast Volume/Existing	RHiNO and SLRTP Analysis	LOS A	LOS B	LOS C	LOS D	LOS E	LOS F to LOS A				
				0	2	4	6	8	10				
	K	Forecast LOS Change with Project	RHiNO and SLRTP Analysis	No LOS Change	LOS 1-Step (e.g C to B)	LOS 2-Step (e.g. C to A)	LOS 3-Step (e.g. D to A)	LOS 4-Step (e.g. F to B)	LOS F to LOS A				
				0	1	2	6	8	10				
	L	Truck Percentage	RHiNO	Bottom 10% of Projects	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Projects
				1	2	3	4	5	6	7	8	9	10
	M	Existing Truck Traffic	DCIS/RHiNO/SAM	Bottom 10% of Projects	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Projects
				1	2	3	4	5	6	7	8	9	10
	N	Projected Truck Traffic	DCIS/RHiNO/SAM	Bottom 10% of Projects	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Projects
				1	2	3	4	5	6	7	8	9	10
	O	Existing ADT	DCIS/RHiNO/SAM	Bottom 10% of Projects	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Projects
				1	2	3	4	5	6	7	8	9	10
	P	Forecast ADT	DCIS/RHiNO/SAM	Bottom 10% of Projects	Tiered Between 20%	Tiered Between 30%	Tiered Between 40%	Tiered Between 50%	Tiered Between 60%	Tiered Between 70%	Tiered Between 80%	Tiered Between 90%	Top 10% of Projects
				1	2	3	4	5	6	7	8	9	10
	Q	Safe Passing Needs	Disctrict Input	Multilane COA Facility	Multilane Facility Divided	Multilane Facility Undivided	Super 2 with Flat Terrain	Super 2 with Rolling Terrain	Super 2 with Mountain Terrain	2-Lane with Flat Terrain	2-Lane with Rolling Terrain	2-Lane with Mountain Terrain	
				0	2	4	5	6	7	8	9	10	

Criteria Weighting and Scoring

2.2.7. Criteria Weighting Scenarios

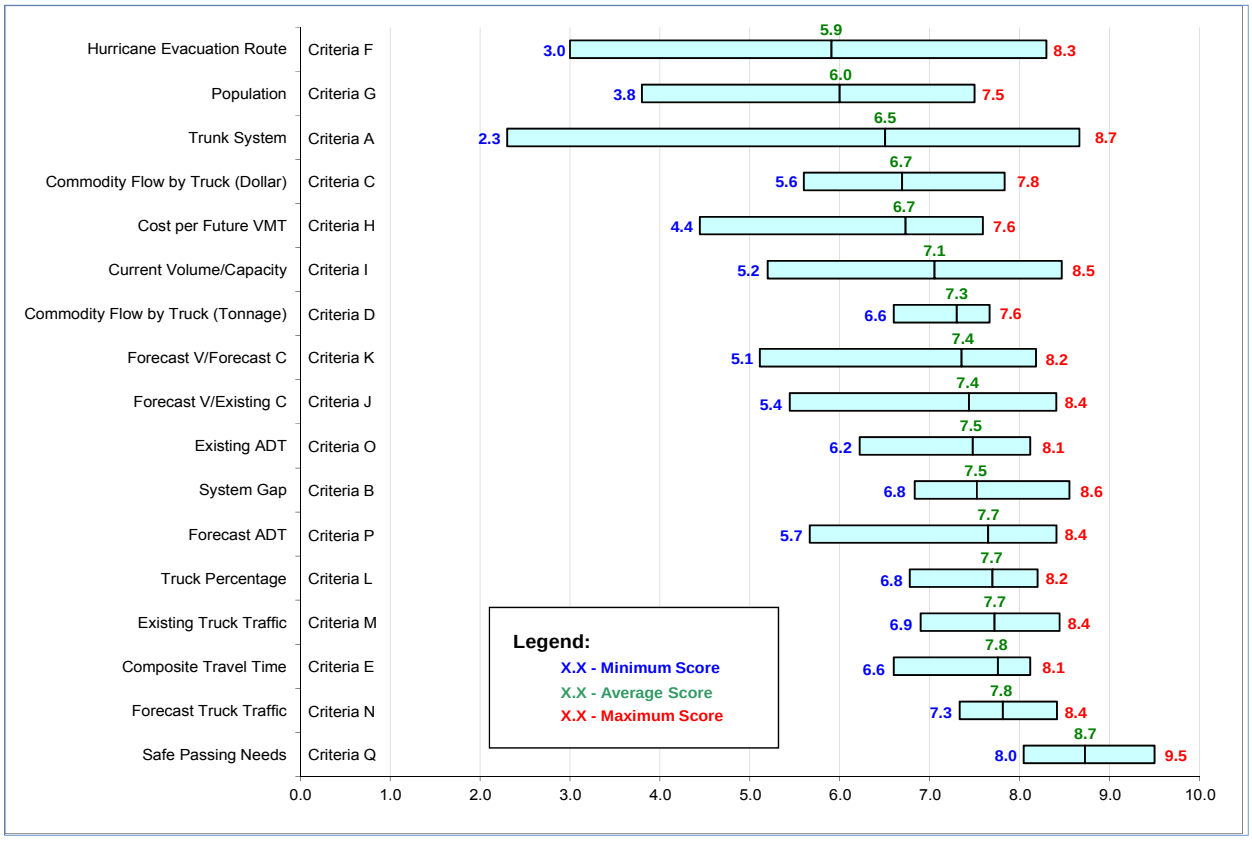
The criteria measures were then weighted. Several “weighting scenarios” were developed. As a baseline, an equal weighting was used for all criteria measures. This scenario was called “Equal All” (EA).

A second weighting scenario was developed using the results of a questionnaire that was provided to all stakeholders to gauge the importance, in the eyes of the stakeholders, of each of the criteria measures.

First, the results of the questionnaire were evaluated and tabulated. As shown below, Hurricane Evacuation and Population received the lowest average score with Safe Passing Needs receiving the highest average score. The Trunk System received the lowest individual ranking and Safe Passing Needs received the highest individual ranking.

Using the average score from the questionnaire for each criteria measure, a weighting was developed that normalized the importance of each measure to the feedback we received from the stakeholders. This scenario was called “Normalized All” (NA).

Stakeholder Questionnaire Results



These two weighting methods were used to rank the projects. The normalized approach (NA) resulted in changes to the ranking compared to the equal all (EA) approach. Sensitivity Testing

Next the sensitivity of the criteria was tested. The following steps were used:

1. The projects were ranked with all the criteria;
2. Each of the criteria were removed one at a time;
3. The projects were re-ranked; then,
4. The number of projects that fell out of (dropped) from the top 100 were tabulated.

This resulted in 36 different scores and provided a measure of importance of each criteria measure. When analyzing changes in the top 100 projects, the table below shows the number of projects that fall out of the top 100 when that criterion is dropped. Commodity flow had no effect on ranking; however, each of the others affects the top 100 projects by as much as 20 percent when a criteria measure was dropped from the analysis.

Criteria Sensitivity Test by Scenario

(Number of Projects that Drop from Top 100 when Criteria is Removed)

Scenario	EA	NA
# In Baseline - All Criteria (A-Q)	100	100
Remove Criteria A: Trunk System	6	6
Remove Criteria B: System Gap	10	10
Remove Criteria C: Commodity Flow by Truck To/From County (Annual Dollar)	4	5
Remove Criteria D: Commodity Flow by Truck To/From County (Annual Tonnage)	2	5
Remove Criteria E: Composite Travel Time to Population/Employment Centers	3	7
Remove Criteria F: Hurricane Evacuation Route	4	2
Remove Criteria G: Population within a 5-Mile Buffer Along Project	8	9
Remove Criteria H: Cost per Future VMT	6	9
Remove Criteria I: Current Volume/Capacity	5	5
Remove Criteria J: Forecast Volume/Existing Capacity	7	7
Remove Criteria K: Forecast LOS Change with Project	10	10
Remove Criteria L: Truck Percentage	6	7
Remove Criteria M: Existing Truck Traffic	3	5
Remove Criteria N: Projected Truck Traffic	3	3
Remove Criteria O: Existing ADT	3	5
Remove Criteria P: Forecast ADT	2	5
Remove Criteria Q: Safe Passing Needs	10	11

Each scenario (EA and NA) resulted in very similar sensitivities. The “Normalized All” scenario was selected as the most representative of stakeholder responses and used in the final project rankings.

3.0 Ranking of Projects

An excel workbook was developed to assist in the analysis and ranking of projects. The workbook provides a tool to update in the future and revise various criteria and criteria weighting. Complete results are provided in Appendix E.