North East Texas Regional Mobility Authority

Toll 49 Segment 6 Feasibility Study

From State Highway (SH) 110 to United States Highway (US) 271 in Smith County

November 2019

Executive Summary

The North East Texas Regional Mobility Authority (NET RMA) launched the Toll 49 Segment 6 Feasibility Study in September 2018 to evaluate the feasibility of extending Toll 49 north from the Toll 49 Segment 5 eastern terminus at State Highway (SH) 110 to United States (US) 271 in Smith County, Texas. At the first public workshop, held December 2018, the public provided more than 50 route suggestions. Using these routes, the comprehensive evaluation criteria, and input from the stakeholder working group, the team identified six proposed route options to study further. At the second public workshop in June 2019, the team presented the six proposed route options, which are identified from west to east as Purple, Yellow, Teal, Pink, Blue, and Orange.

A total of 893 members of the public completed a public survey, which elicited feedback on route preferences and was used as a tool for objectively evaluating public input. Additional written comments and several routes, or suggestions to routes, were also provided by the public at the June workshop or within the workshop's comment period that ended on June 19, 2019. The study team evaluated these suggested route options and developed adjusted and new combination route options as a result. A total of 13 proposed (the original 6 and 7 adjusted/new/combination) route options were evaluated proportionally using the original 22 evaluation criteria, a public preference score, construction costs, and average annual daily traffic. It was determined that five of the proposed route options (Yellow, Teal, Pink, Blue and Orange) had disqualifying considerations such as lack of independent utility, impacts to cellular towers, cemeteries, parkland, and proximity to school facilities. These route options were therefore dismissed from further study, leaving eight proposed route options.

As a result of this data-driven evaluation process, the following three routes were identified for further study: Purple, Yellow Adjusted, and Teal Adjusted. These three routes had the three highest scores in the evaluation compared to all other routes evaluated. These routes also support NET RMA's intent to develop a regional transportation facility. The data in this report is current as of Fall 2019. The NET RMA will be moving into a federally required Environmental Impact Statement (EIS), in which the three routes identified through this study and a no build alternative will be reviewed and thoroughly evaluated. Opportunities for public involvement will be ongoing throughout this process, and the study team will continue to gather and analyze data.

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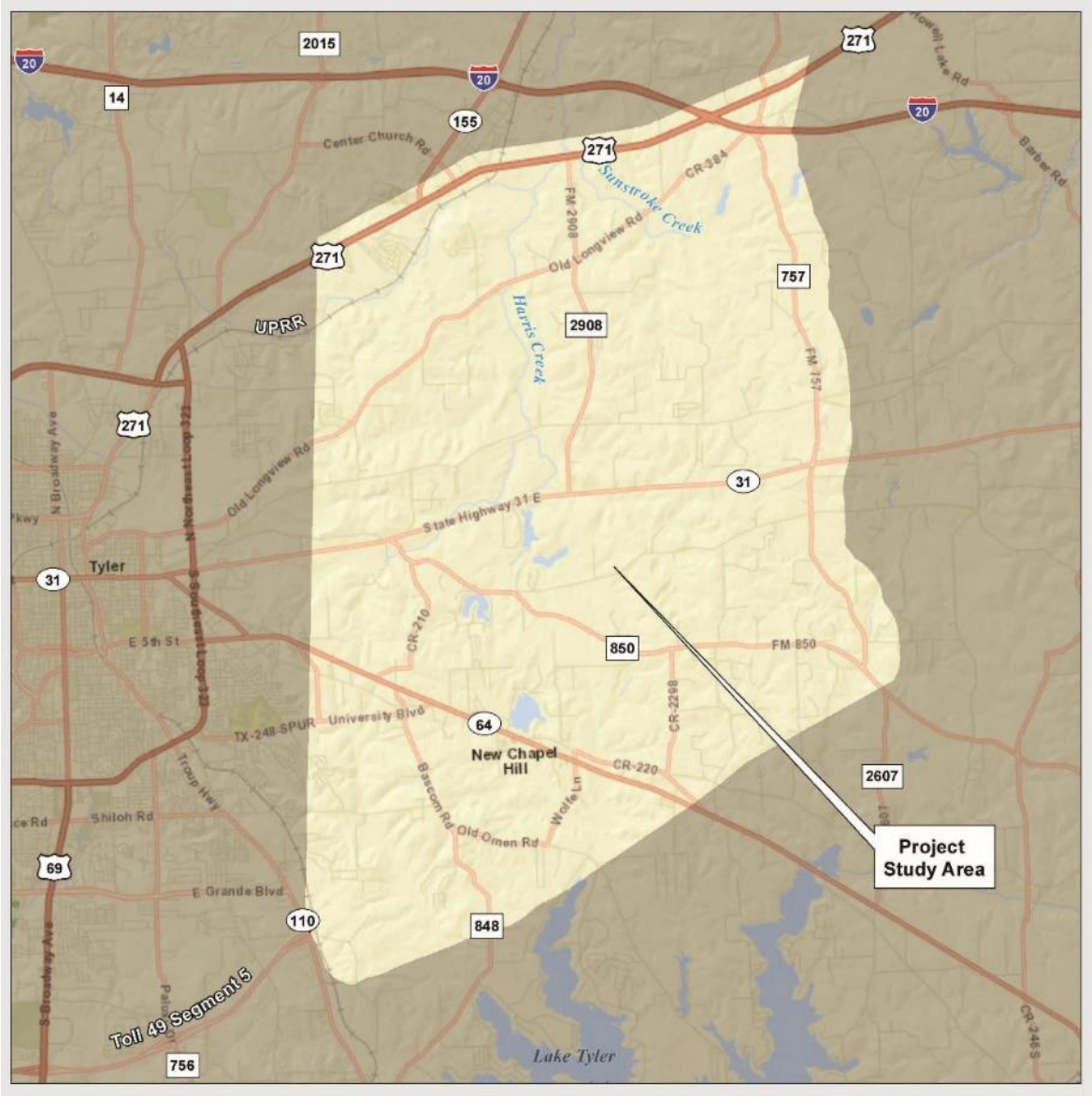
1.0 Introduction

The North East Texas Regional Mobility Authority (NET RMA) launched the Toll 49 Segment 6 Feasibility Study in September 2018 to evaluate the feasibility of extending Toll 49 north from the Toll 49 Segment 5 eastern terminus at SH 110 to US 271 in Smith County, Texas. **Figure 1** shows the Toll 49 Segment 6 study area, in relation to Smith County and the cities of Tyler and New Chapel Hill. This report serves to document the purpose, process, findings, and recommendations of the Toll 49 Segment 6 Feasibility Study.

Figure 1 ● Study Area Map



2.0 Purpose

The purpose of the Feasibility Study is to identify locally preferred route options that are deemed reasonable to potentially build. A comprehensive evaluation process and public involvement effort was utilized to identify recommended route options. The recommended route options will serve as the starting point for the future phases of project development, including the EIS.

3.0 Proposed Facility Design and Assumptions

Toll 49 Segment 6 would extend the facility from the existing Segment 5 eastern terminus at SH 110 eastward and northward to US 271 at a point still to be determined. The purpose of this Feasibility Study was to evaluate the route options and develop three proposed alignments for Segment 6, which would be carried forward into a federally required EIS. The Feasibility Study also identified potential configurations for the conceptual cross section for Segment 6. Two key factors in establishing the preferred cross section for Segment 6 are right-of-way (ROW) width and the ultimate lane configuration.

The existing Toll 49 facility consists of an interim two-lane controlled access highway from United States (US) 69 northwest of Tyler to SH 110 southeast of Tyler. The existing ROW allows for expansion of the facility to a four-lane divided highway with frontage roads where necessary. The ROW for the existing facility has a typical width of 450 feet although it varies at many locations along the corridor from as narrow as 350 feet to as wide as 650 feet at interchanges. Access to the facility is provided by slip ramps to and from major intersecting highways. The configuration of much of the existing facility generally follows the proposed Configuration No. 1 Interim Section shown in **Figure 2**, but without the 4-foot buffer option for most of its length. The segments north of SH 64 and Segment 4 north of Interstate Highway 20 (I-20) appear to generally follow the proposed Configuration No. 2 Interim Section shown in **Figure 3**. Super 2 sections (i.e. intermittent passing lanes) have also been implemented on some of the existing segments.

Preliminary design criteria have been established for Toll 49 Segment 6 main lanes, ramps and frontage roads, and include the following assumptions:

- Main lanes - desirable criteria uses a 70-mph design speed; an alternate 60 mph design speed is included for use if needed in constrained areas.
- Frontage roads – 50 mph criteria if rural frontage roads are required; 45 mph low-speed urban frontage road criteria included for use if needed. It is unlikely that frontage roads would be required on the facility. The need for frontage roads will be evaluated as part of the EIS.
- Ramps - 50 mph design speed criteria are included for use as the desirable condition; 45 mph design speed criteria are included for use in constrained areas.

Two interim sections would be feasible through the length of this corridor. Each of the two sections also includes an option to implement a Super 2 configuration. Under a Super 2 configuration, a single passing lane that alternates directions along the length of the corridor is added periodically to allow passing of slower vehicles. Depending upon site conditions, various combinations of these configurations were assumed along each of the route options. Two potential configurations are proposed for the ultimate section, which consists of a four-lane divided highway. These configurations are shown in **Figures 2** and **3**, below.

For Configuration No. 1, a 450-foot ROW width is assumed and would allow the construction of frontage roads or access roads (if necessary) to maintain access to existing properties or minor roadways. The barrier-separated section proposed under Configuration No. 2 would have a reduced ROW requirement (380 feet). Although it is unlikely that frontage roads will be required, this ROW width would allow for the construction of frontage roads (if required) to maintain access to the existing properties or minor roadways. At the interchanges, ROW would typically widen to 650 feet and 580 feet respectively for Configurations Nos. 1 and 2. Where terrain is more severe, the ROW may need to be wider for grading purposes.

Figure 2 • Conceptual Cross Section Configuration No. 1, Depressed Median

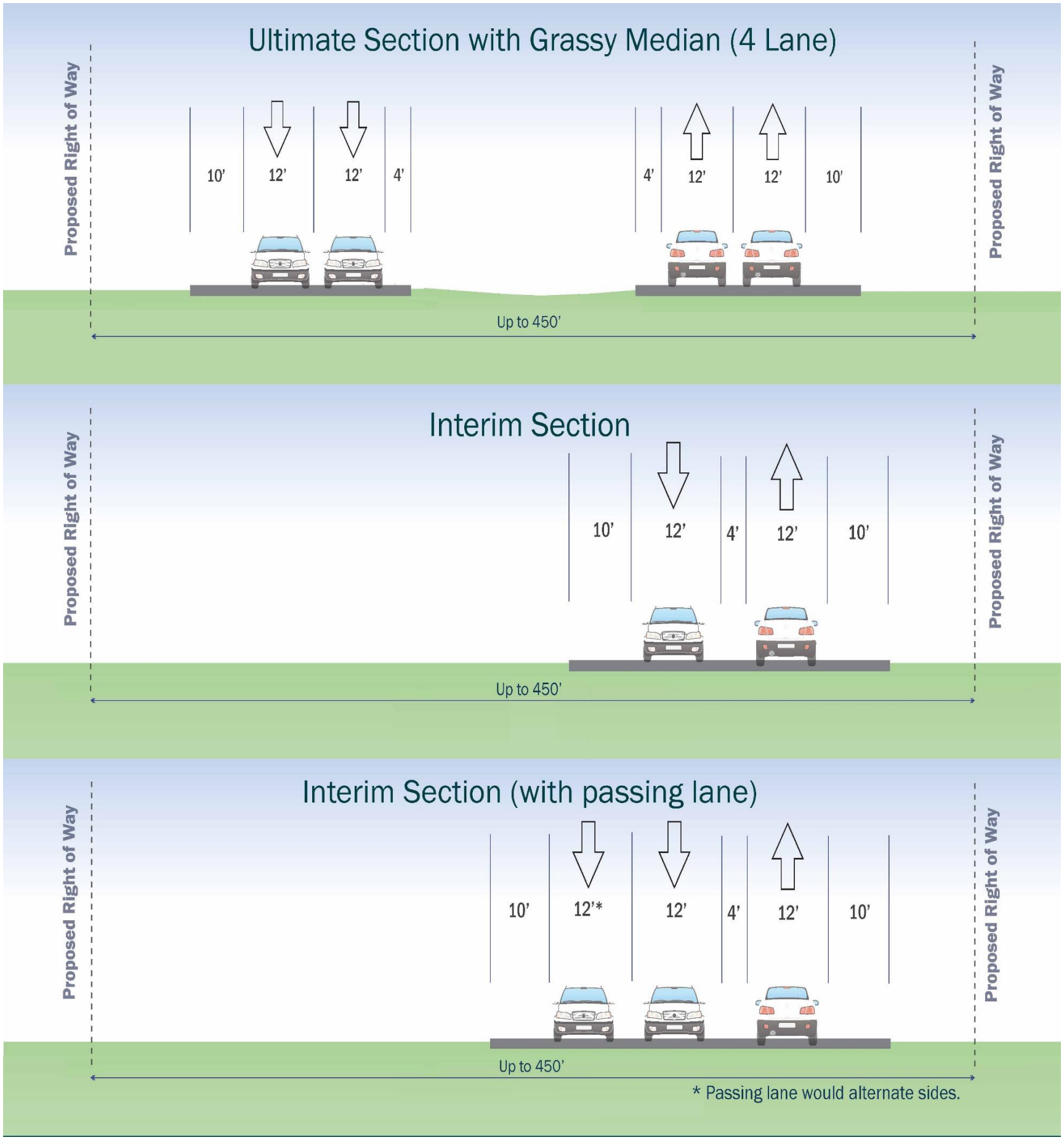
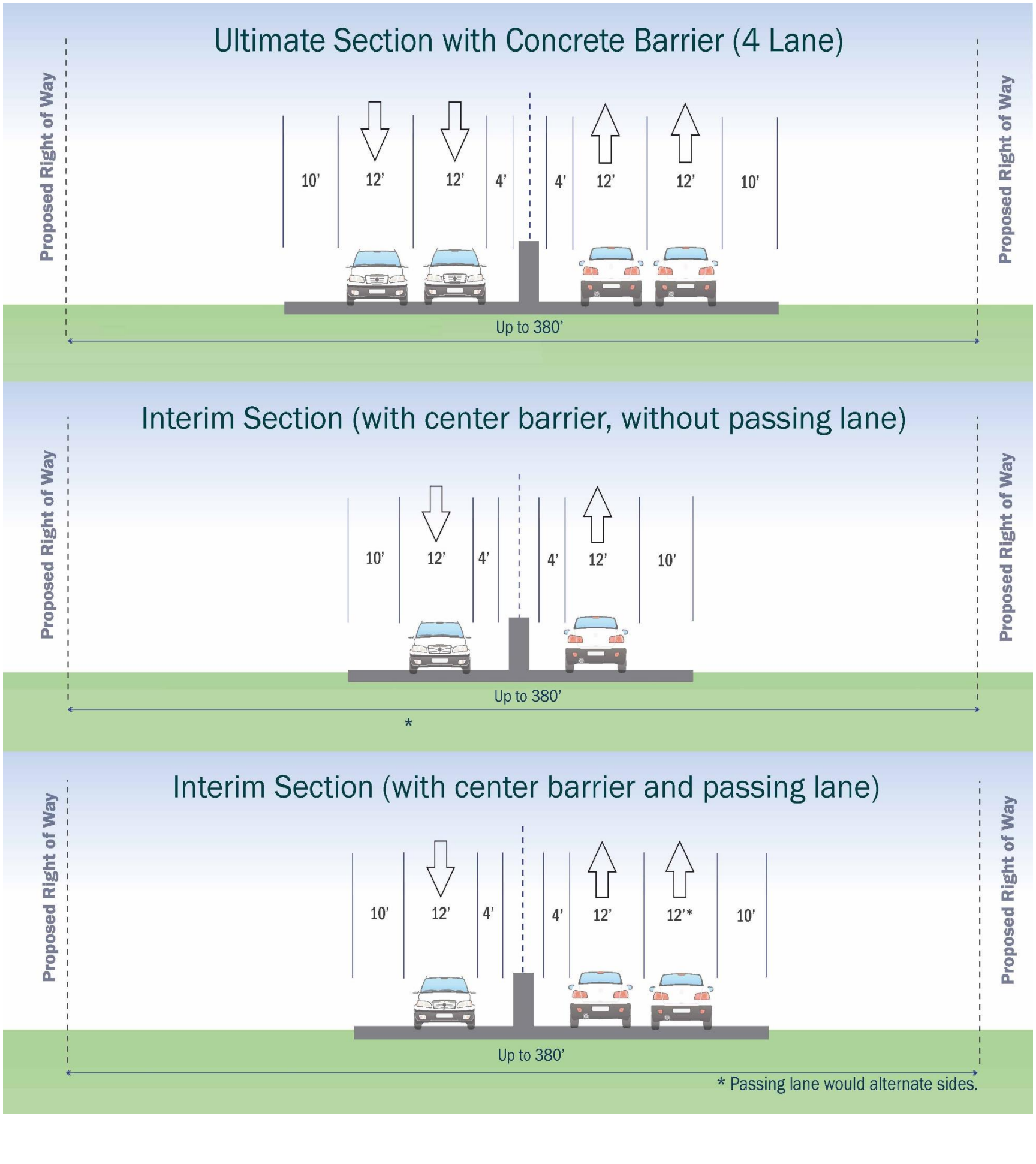


Figure 3 • Conceptual Cross Section Configuration No. 2, Barrier Median



4.0 Process Overview

An iterative and interactive process was used throughout the Feasibility Study to identify, evaluate, and vet route options. To facilitate community and stakeholder involvement and validate study findings, a stakeholder working group was formed, project goals and objectives were established, and public workshops were held.

4.1 Toll 49 Segment 6 Stakeholder Working Group

The overarching goal of the Toll 49 Segment 6 Feasibility Study was to be community driven. To that end, NET RMA established a stakeholder working group to guide the study and provide locally focused input. Stakeholder working group members include elected officials, City and County representatives and representatives from other stakeholder groups. The goals and objectives, study area, evaluation criteria, and final route options were developed with input from and the concurrence of the stakeholder working group.

The stakeholder working group met four times throughout the course of the study:

- November 13, 2018 - Identified goals and objectives; identified constraints, and provided input on study area;
- February 28, 2019 - Finalized goals and objectives; discussed preliminary evaluation criteria; commented on preliminary route options;
- May 3, 2019 - Finalized evaluation criteria; discussed preliminary route option evaluation findings; recommended proposed route options; and,
- September 26, 2019 - Reviewed input from the second public workshop; discussed proposed route options evaluation findings and route option adjustments; discussed the group's concurrence regarding the three routes recommended to be carried forward to the EIS.

A complete list of the Toll 49 Segment 6 stakeholder working group members and summaries of each stakeholder working group meeting are available upon request.

4.2 Goals and Objectives

The study goals and objectives, as identified by the stakeholder working group and public input are shown in **Table 1**.

The stakeholder working group met twice during the development of the preliminary route options. At the first meeting (Nov. 13, 2018) the stakeholder working group identified goals and objectives for the Feasibility Study and participated in a facilitated group exercise to identify constraints and make suggestions regarding the study area map.

In addition to the stakeholder working group, NET RMA furthered its commitment to the community by holding public workshops for all members of the public to provide input. To date, two public workshops have been held. Public workshop summaries are available on the project website (https://www.netrma.org/projects/segment-6/).

At the first public workshop (Dec. 11, 2018), participants had the opportunity to learn about the project, take a survey regarding project goals and objectives, and draw route suggestions on provided study area maps. The goals and objectives in **Table 1** below were presented at the first public workshop, and the public was given the opportunity to provide input on the goals and objectives via the provided survey. Participants were able to rate the importance of the goals and objectives relative to the project development process. The second public workshop is discussed in detail in Section 7.0.

At the second meeting (Feb. 28, 2019) the stakeholder working group finalized goals and objectives, discussed preliminary evaluation criteria, and commented on preliminary route options. The goals and objectives below served as the basis for development of the evaluation criteria used to screen the range of preliminary options. For each goal, the project team identified evaluation criteria that could be measured, or otherwise gauged and subsequently used to identify and refine the proposed route options and recommended route options to carry forward to the EIS. The evaluation criteria as developed by the team, in conjunction with the stakeholder working group and public input, are presented later in this report.

Table 1 ● Goals & Objectives

Enhance Accessibility and Mobility
▪ Develop the most direct route with the shortest travel time ▪ Provide access to local communities ▪ Provide access at existing federal and state highways ▪ Improve access for first responders
Minimize Impacts to the Community and Natural Environment
▪ Minimize impacts to private property ▪ Protect water quality ▪ Minimize impacts to parks, schools and other community resources
Support Economic Development
▪ Protect existing businesses/sources of income ▪ Enhance access for commerce and business development

5.0 Identification of Route Options

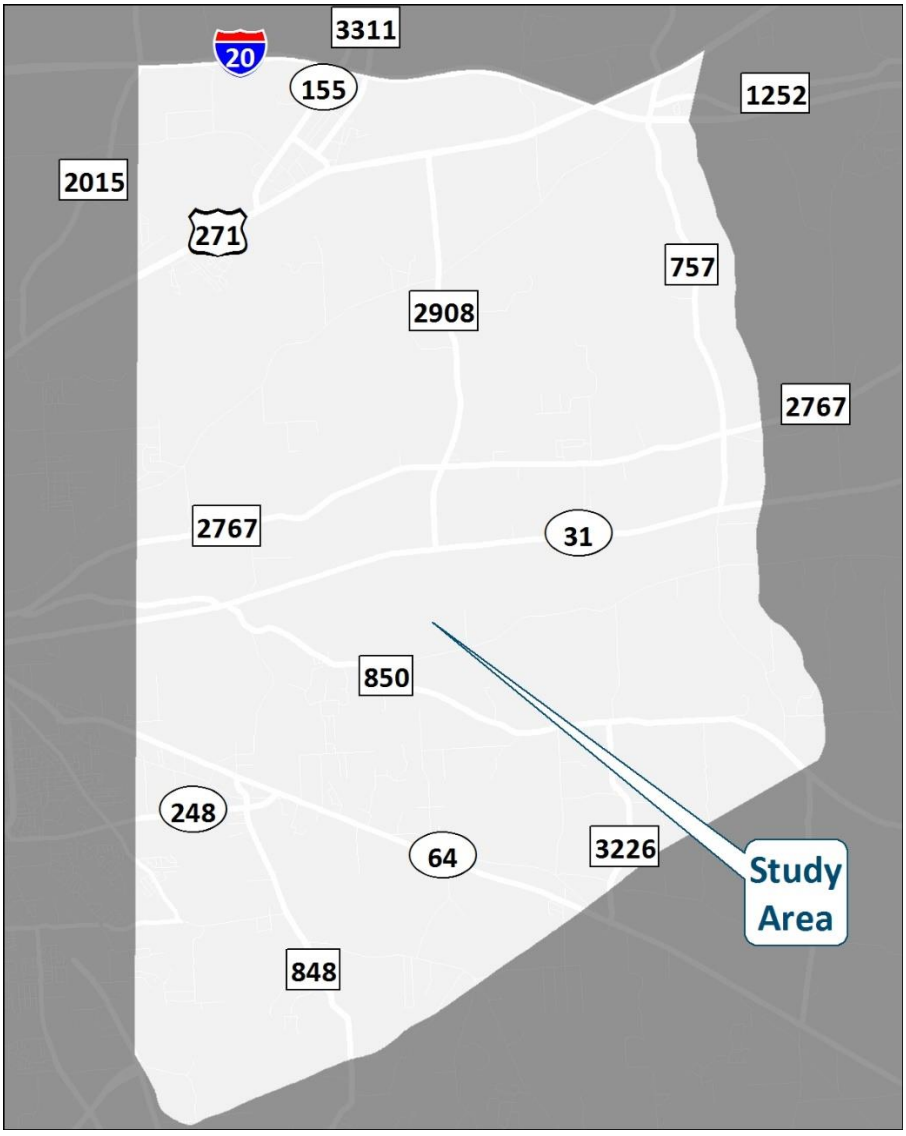
A multi-stepped process was utilized to identify, refine, and evaluate Toll 49 route options. The process began with identification of constraints and recommended edits to the project study area, followed by identification of conceptual route options. The full set of conceptual route options was then evaluated to identify preliminary route options and, subsequently, proposed route options, refined proposed route options, and recommended route options. Each step in the process is described below.

Step 1 (Approve Study Area)

The first step was conducted during a facilitated group exercise at the Nov. 13, 2018, meeting of the Toll 49 Stakeholder working group. At that meeting, stakeholder working group members were presented with a draft of the project study area and asked to identify and designate areas that may be barriers to the construction of a potential new route.

Participants were encouraged to mark on the maps to indicate areas of concern, and to recommend edits to the boundaries of the study area. No edits to the study area were recommended by the stakeholder working group. The Preliminary Study Area was moved forward to be presented to the public. **Figure 4** shows a black and white version of the Toll 49 Preliminary Study Area. A color aerial image was presented to the stakeholder working group and the public; however, due to size limitations and clarity for this report, a simpler figure was selected to depict the limits of the study area.

Figure 4 • Preliminary Study Area

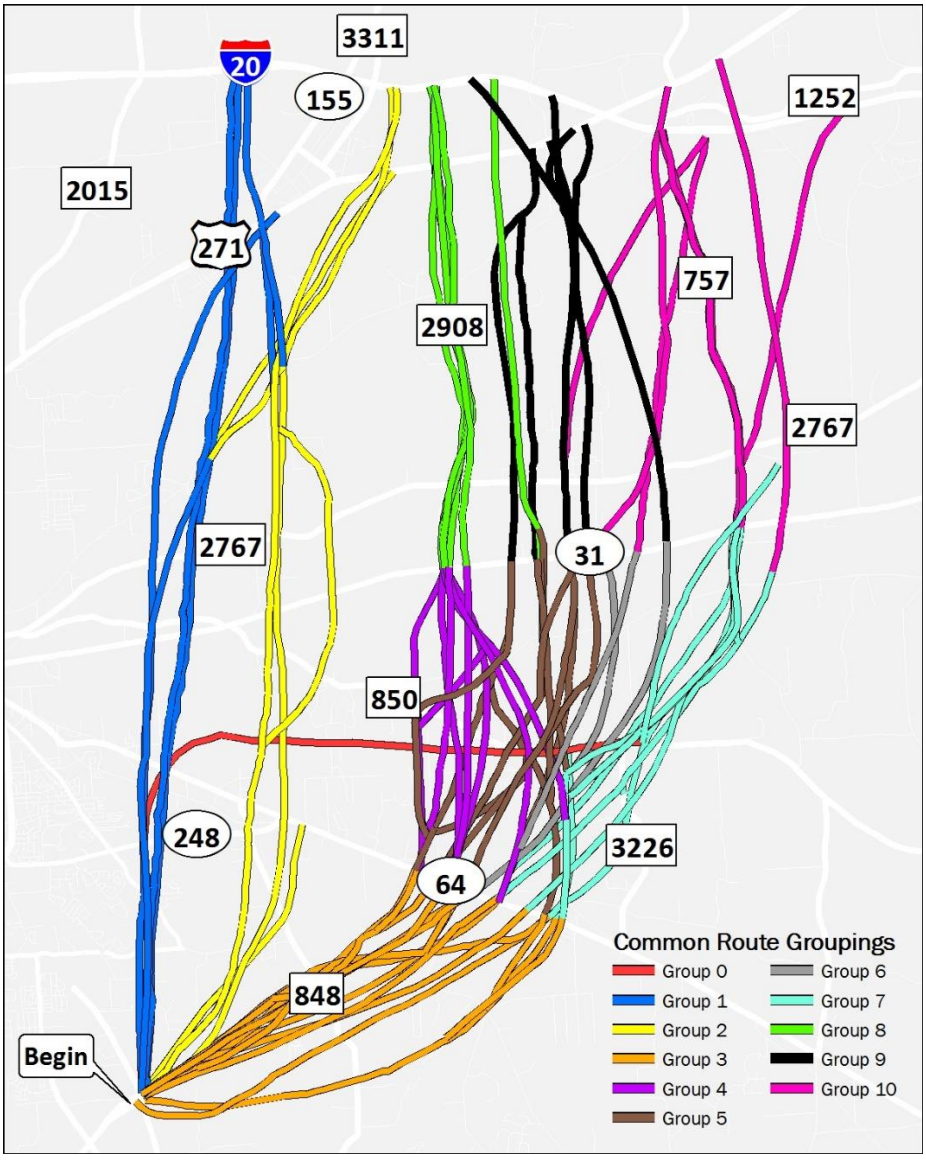


Step 2 (Identify Options)

The next step in the process was to present the preliminary study area to the public and ask for route suggestions at the Dec. 11, 2018, public workshop. At the workshop, four study area plots were spread throughout the meeting space for participants to view and discuss. Additionally, participants were provided with markers and invited to draw possible routes for Toll 49 Segment 6.

Although a defined study area was provided, participants were given the latitude to draw routes extending outside the study area. **Figure 5** shows a compilation of all routes (50+) suggested by the public, grouped by common themes, represented by routes of the same color on the map.

Figure 5 • Routes Drawn by Public



Step 3 (Update Study Area)
Following the first public workshop, the project team met to evaluate the routes and study area. It was determined that US 271 is the logical northern terminus of the study area. **Figure 1** shows the map that reflects the change. It should be noted that setting US 271 as the northern terminus does not mean that a connection between US 271 and I-20 is precluded from being developed in the future if there is a need and funding is available.

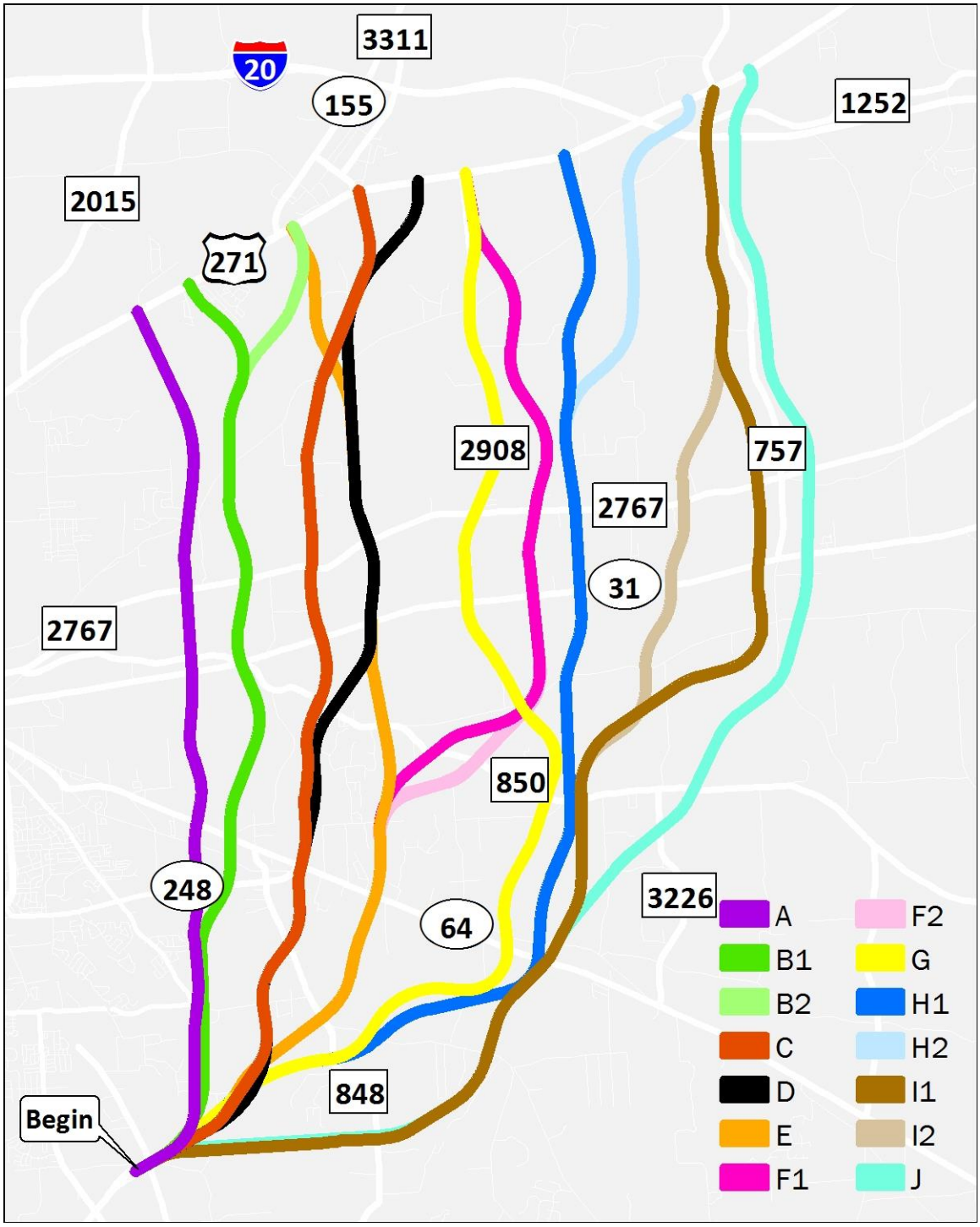
Step 4 (Refine Routes Drawn By Public and Identify Preliminary Route Options)
Following the first public workshop and the initial grouping of the routes drawn by the public, the project team developed 14 initial preliminary route options. Similar route suggestions were combined to minimize redundancy, with all concepts identified by the pubic captured on the map.

In developing the preliminary route options, several factors were considered in addition to using the route lines drawn by the public. These considerations included:

1. The alignment of each route was designed to meet TxDOT design criteria for 70 mph freeways.
2. Several critical features were identified that all the alignments were developed to avoid, including cemeteries, schools, parks, emergency service stations, and lakes. Some specific features that were avoided entirely included Lake Tyler, Pleasant Acres Lake, Greenwood Farms Landfill, Texas Parks & Wildlife Department office and Nature Center, and the Chapel Hill ISD schools.
3. Alignments were developed to minimize impacts to a number of other existing features, including residences, businesses, oil wells, communication towers, utility lines, floodplains, and potential wetlands.
4. Alignments were designed to optimize the geometry at intersections with existing state highway facilities, and other roadways to the extent feasible.
5. Each alternative was developed to minimize the use of existing roadway corridors in order to reduce the need for frontage roads and to maintain existing mobility.

Desirable criteria for the alignment curves were used wherever possible. However, several of the routes included one or two curves that did not meet desirable criteria but still met minimum criteria. Minimum radius curves were used at these locations as a last resort to avoid impacting critical existing features while still maintaining the general route of that particular option. **Figure 6** shows the 14 initial preliminary route options as identified by the project team.

Figure 6 • Initial Preliminary Route Options Identified by Project Team

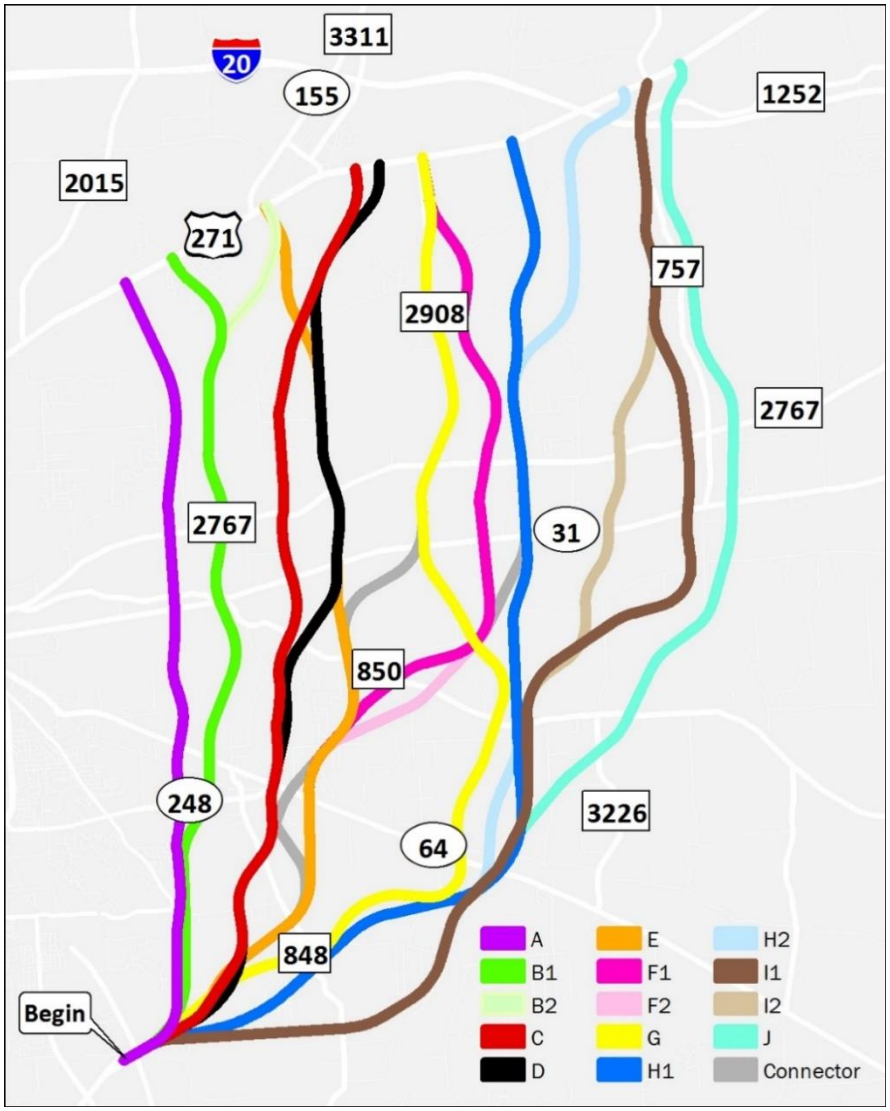


Step 5 (Refine Preliminary Route Options)

At the February 28, 2019 stakeholder working group meeting, members of the stakeholder working group were presented with the preliminary route options and invited to consider if they agree with the suggestions and would feel comfortable presenting them to the public at the second public workshop. Working group members provided suggestions for changes to be made to the routes prior to the second public workshop. Suggestions were considered and changes were made accordingly to shift specific alignments from noted features and add connections between others.

These modifications resulted in an additional seven preliminary combination route options for consideration, bringing the total number of preliminary route options to 21. **Figure 7** shows the refined preliminary route options that were finalized to be evaluated further. There are 14 unique routes (A, B1, B2, C, D, E, F1, F2, G, H1, H2, I1, I2 and J), and seven additional combination routes (DE, ED, CDEF2, EG, FH1, FH2 and JH1). Only the connections from one route to the next are depicted and called out as "Connectors" because it would be impossible to clearly show all routes as a separate color.

Figure 7 • Refined Preliminary Route Options



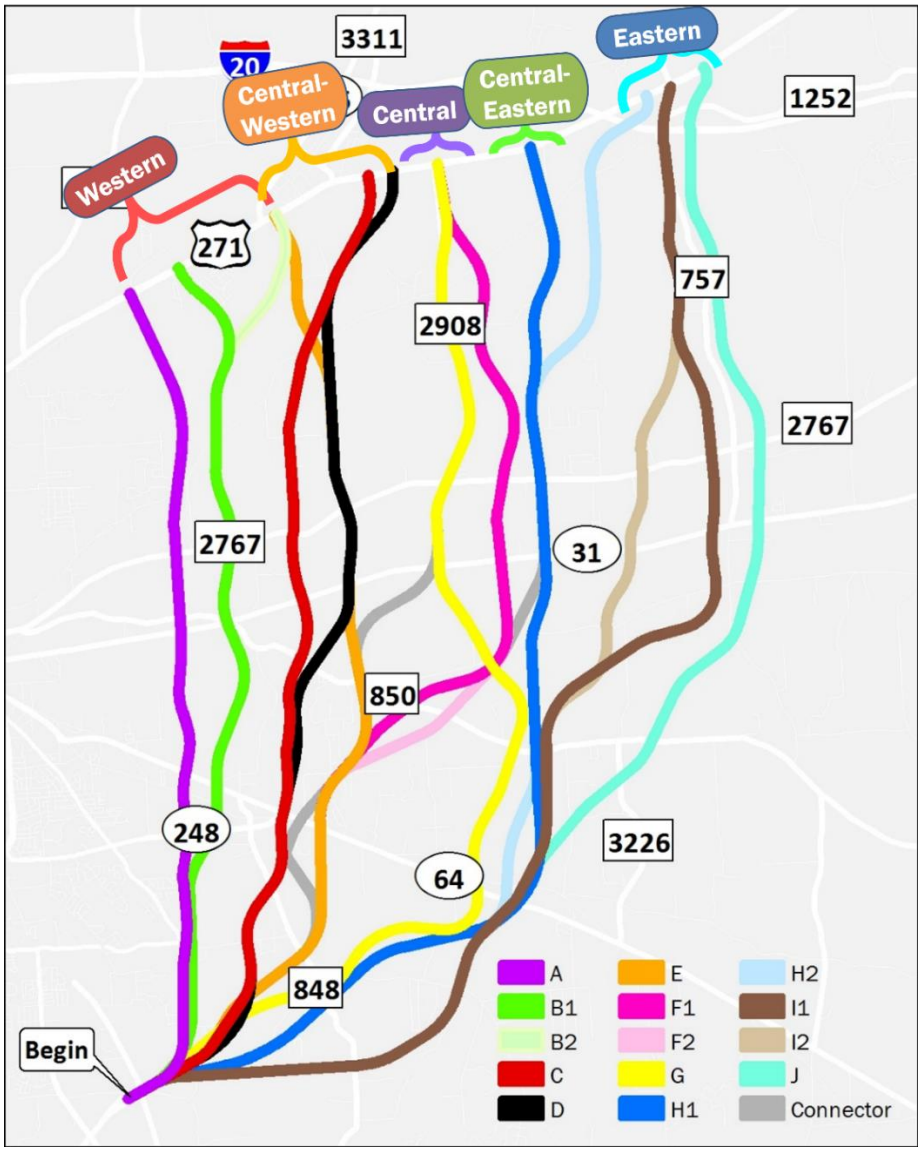
Step 6 (Identification of Proposed Route Options)

Between stakeholder working group meetings 2 and 3, the project team screened the 21 preliminary route options using the evaluation criteria reviewed and agreed to by the stakeholder working group. The project team grouped the preliminary route options into five distinct geographic areas for evaluation purposes, as shown in **Figure 8**.

This was done for the following reasons:

1. To ensure that the proposed route options reflected the geographic diversity of the routes drawn by the public during the first public workshop; and,
2. By providing this geographic diversity, the proposed route options would enable the project team to identify routes that provided the best regional mobility. A traffic study of the six proposed route options was also conducted to assess the traffic generated by each of the six routes.

Figure 8 ● Map of Preliminary Route Options Grouped by Geographic Area



Through the route evaluation process the project team determined that certain factors should be disqualifying considerations for some routes. These disqualifying considerations included the following:

1. Routes crossing the Greenwood Farms Landfill due to cost and engineering considerations;
2. Routes with less than desirable curve radii (turns that are too sharp for 70 mph speeds) due to safety considerations;
3. Routes that follow existing roadways because they would require frontage roads and would reduce the mobility benefits of Toll 49 Segment 6; and,
4. Routes that are too close to the existing US 271/I-20 interchange because they would require reconstruction/relocation of interchanges, which would be costly and have negative effects on existing travel patterns.

The geographic grouping of preliminary route options during the evaluation, the inclusion of disqualifying considerations, input from the stakeholder working group, and the use of the evaluation matrix shown in **Table 2** led to the identification of six proposed route options, which included at least one route option from each geographic area identified for evaluation. To eliminate confusion when presenting to the public, the routes were renamed using colors. The six proposed route options are designated by color (Purple (A), Yellow (B1), Teal (C), Pink (F2), Blue (JH1) and Orange (I2)) and are shown in **Figure 9**. A summary of the findings of the evaluation of routes by geographic area follows in **Table 2**. The data in this **Table 2** matrix for the preliminary route options differs slightly from the data presented later, in the proposed route option matrix, due to the ongoing evaluation and subsequent analyses that occurred between the preliminary route options evaluation, and the development of the initial proposed, and refined/adjusted proposed route options.

Figure 9 • Proposed Route Options

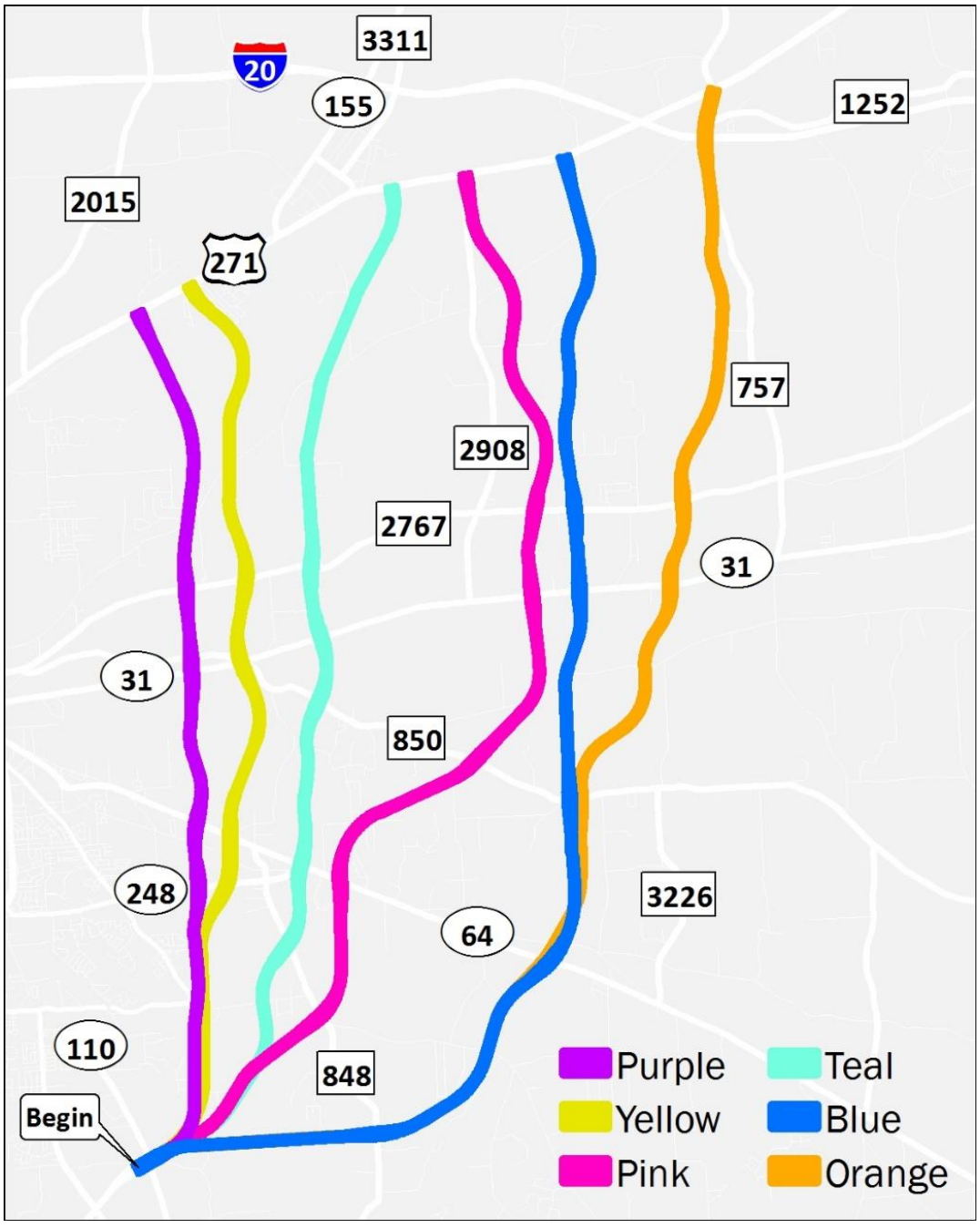


Table 2 ● Preliminary Route Options - Evaluation Matrix*

	EVALUATION CRITERIA	WESTERN			CENTRAL-WESTERN					CENTRAL					CENTRAL-EASTERN			EASTERN				
		A	B1	B2	C	D	E	DE	ED	F1	F2	G	EG	CDEF2	H1	FH1	JH1	H2	FH2	I1	I2	J
Enhance Accessibility and Mobility	Length of alternative (in miles)	10.5	11.2	11.8	12.7	12.9	12.4	12.4	13.5	14.2	14.2	15.0	13.5	14.0	15.1	14.3	15.3	16.2	15.5	17.4	16.6	17.4
	Existing roadway utilized (in miles)	0	0	0	0	0	0	0	0	0	0	3.6	3.6	0	0	0	0	0	0	0	0	0
	Percentage of facility on new location roadway	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	76%	73%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Number of intersections at federal and state highways	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4
	Improve access for first responders (# of first responders and hospitals within 5 miles of each alt.)	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	2
Minimize Impacts to Private Property	Number of parcels crossed by ROW	123	118	126	115	117	154	166	111	188	191	228	224	206	170	212	149	156	213	189	168	213
	Number of divided (bisected) parcels	29	27	34	28	43	45	46	40	34	30	32	22	23	38	26	22	45	37	32	25	44
	Potential residential displacements (residences with ROW)	30	32	33	11	11	33	38	8	44	42	44	57	47	15	38	11	13	39	15	18	26
	Potential for indirect effects (visual and noise) to residences, schools, parks and cemeteries within 500 ft of the ROW	149	169	105	52	58	146	152	51	172	177	166	222	185	60	183	71	48	171	69	89	104
	Population density along the route	0.6	0.4	0.5	0.1	0.1	0.4	0.2	0.1	0.4	0.4	0.2	0.3	0.4	0.1	0.3	0.1	0.1	0.4	0.1	0.1	0.2
	Number of environmental justice communities crossed	1	1	1	1	2	2	3	2	3	3	8	8	3	4	4	4	4	4	4	4	7
	Number of creek crossings	13	14	13	27	26	19	23	22	19	17	21	17	22	23	19	26	24	20	28	26	26
	Floodplain acreage within ROW	50.8	23.1	38.2	51.0	47.3	48.3	46.9	68.7	27.4	27.9	31.1	49.3	26.4	61.2	49.3	58.3	63.7	51.8	27.4	30.7	29.8
	Acreage of NWI polygons within ROW	12.0	17.0	16.5	20.7	23.9	21.3	24.6	21.0	16.5	15.3	17.3	29.2	17.4	20.5	20.0	24.4	14.9	14.5	18.1	19.1	19.3
	Number of water wells within ROW	0	1	1	0	1	2	1	2	1	1	1	2	0	2	2	2	2	2	1	1	2
	Number of parks, schools, cemeteries and other community resources within the ROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2 ● Preliminary Route Options - Evaluation Matrix (cont.)

	EVALUATION CRITERIA	WESTERN			CENTRAL-WESTERN					CENTRAL					CENTRAL-EASTERN			EASTERN				
		A	B1	B2	C	D	E	DE	ED	F1	F2	G	EG	CDEF2	H1	FH1	JH1	H2	FH2	I1	I2	J
Support Economic Development	Number of schools within 1 mile of each route	2	2	2	2	2	3	2	3	3	3	2	3	3	2	4	1	2	4	0	1	0
	Number of businesses displaced within the ROW	5	0	0	3	2	3	3	2	3	3	0	2	3	0	2	1	0	2	1	1	1
	Number of O/G wells displaced within the ROW	4	3	4	2	12	12	11	13	5	4	3	13	3	7	4	6	6	3	11	7	21
	Number of cell towers and electric substations within the ROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Number of employment centers within 1 mile of each route	2	4	5	5	5	5	5	5	5	5	4	4	5	2	4	1	2	4	1	1	1

*Subsequent analyses were performed following identification of the preliminary route options. Detailed analyses included consideration of additional evaluation criteria and refinement based on stakeholder working group and public input, which resulted in changes to the matrix criteria and values presented in the Proposed Route Options Evaluation Matrix (Table 4) compared to this table.

Additional information about the process that led to identification of the route options can be found in the Preliminary Route Options Technical Memorandum and the Proposed Route Options Technical Memorandum which are available upon request.

6.0 Proposed Route Options Evaluation

The six proposed route options were presented for public review and comment at the second public workshop, which was held in an open house format on June 4, 2019. The public was given the opportunity to provide route modifications and suggestions for improved routes as described in more detail in Section 7.1. Subsequent to the open house, a total of 13 routes were evaluated using the original 22 evaluation criteria. In addition, three new criteria were presented at the second public workshop, including cost estimates, public preference rankings, and traffic data. Each of these four criteria (1. original evaluation, 2. cost estimates, 3. public preference and 4. average annual daily traffic) accounted for 25 percent of the evaluation score. While the evaluation criteria used during this second screening were more refined and incorporated public input, construction costs and preliminary traffic data, the criteria remained true to the goals and objectives as established by the stakeholder working group.

The input received from the public at the second publish workshop and the online survey, adjusted route options, and findings from the ongoing evaluation are summarized below.

6.1 Public Input

A second public workshop was held from 5:30 to 7:30 p.m. on Tuesday, June 4, 2019. The workshop was held in the Chapel High School Gymnasium, 13172 SH 63 East, Tyler, TX 75707. The purpose of the second public workshop was to provide attendees with an opportunity to review and provide input on the six proposed route options. From west to east the proposed options were identified as Purple, Yellow, Teal, Pink, Blue and Orange. A total of 159 people registered their attendance at the workshop by signing in. In conjunction with the workshop and paper survey, an online survey was available as an additional means of providing public input. The complete summary for the second public workshop is included on the project website.

In total, 893 survey responses and 172 submitted written comments were received either at the public workshop or NET RMA website by the June 19, 2019, deadline for submission of comments. Overall, the Teal Route received the most support from the public. The Blue Route was the most opposed.

To objectively evaluate the level of public support/opposition, the team reviewed each submitted survey and determined whether it expressed support, opposition or was neutral with regards to a specific route option.

A public survey identified each proposed route and asked that feedback be provided on a scale of 1 (strongly dislike) to 5 (strongly like) to obtain a rating for each. The last question asked for a ranking of the routes in order of preference, with 1 being the route "you like the most," and 6 being the route "you like least."

The next step was to tally and obtain an average for the two ratings by route option to obtain an overall ranking of public support for each proposed route option. **Table 3** depicts the combined average value that reflects the ranking and ratings for each of the six proposed route options.

Table 3 ● Public Preference Rankings

Ranking	Route Option	Average Value
1	Teal	2.95
2	Purple	3.10
3	Yellow	3.19
4	Pink	3.54
5	Orange	3.84
6	Blue	3.96

*The public preference ranking was based on a scale of 1 to 5, where 1 is most favorable and 5 is least favorable.

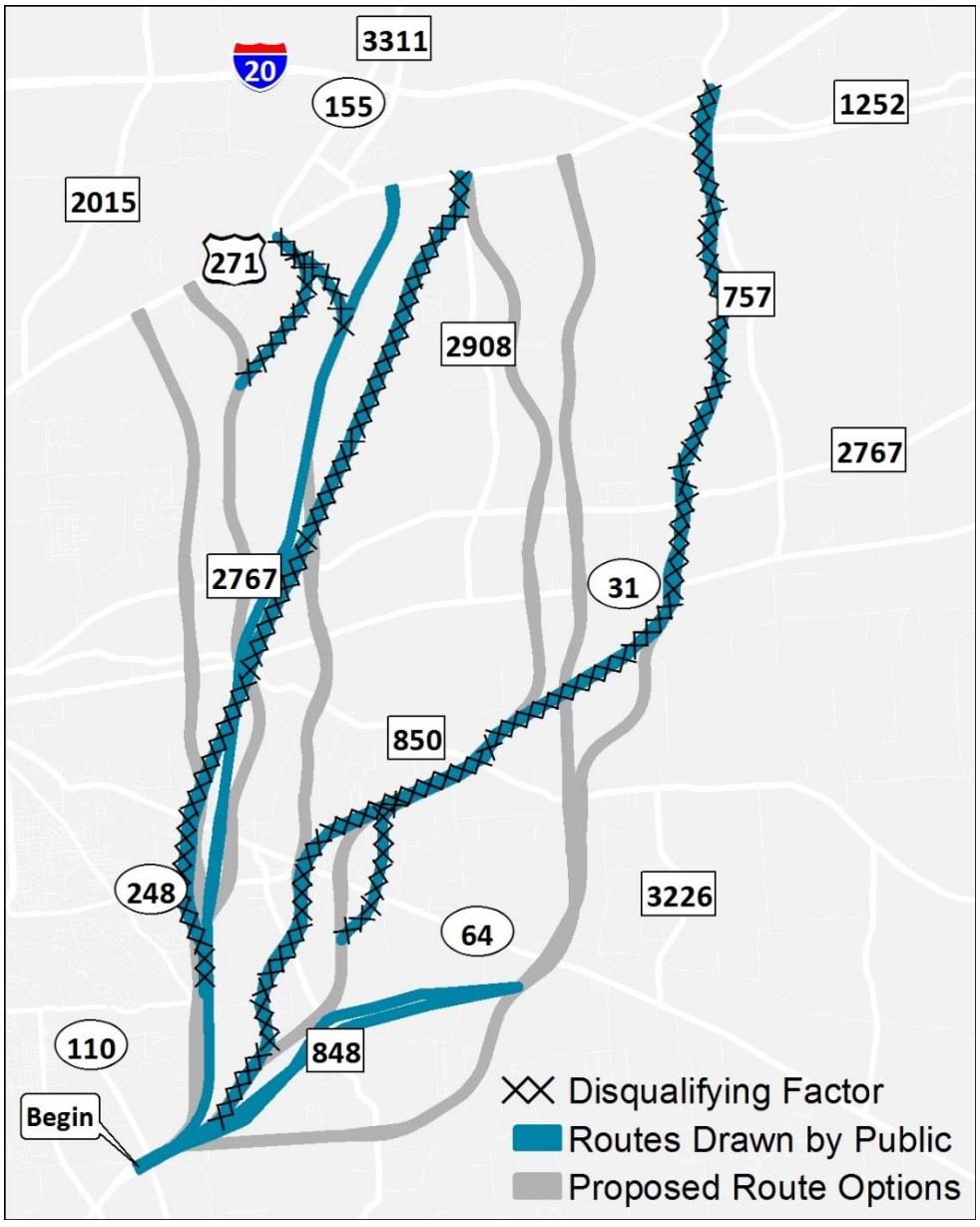
Using this ranking/evaluation methodology, those options with a combination of the most support/least opposition received the lowest (best) value and corresponding score. These values and scores were incorporated into the evaluation matrix and considered by the stakeholder working group and study team when determining which options to recommend for further development.

This methodology was effective for purposes of quantitatively ranking the route options. Although the total number of people that ranked the Orange route as their preferred route ranked close to the Purple and Teal routes, the number of people that ranked the Orange Route as the least liked option (rank 6), was significantly greater than any other route option. In general, the Teal, Purple and Yellow route options were preferred; considerably less support was received for the Pink, Blue, and Orange Routes, with the Blue and Orange routes clearly receiving the most opposition. Since the combination routes were developed following the public preference survey, route rankings, as included in **Table 4**, were generated based on an average of the original routes that comprise the combined alignments. For example, the public preference score for the Maroon route, which is comprised of segments from both the Yellow and Teal routes is the average of the public preference score for the Yellow and Teal routes. The public preference score for the adjusted routes was assumed to be the same as its corresponding original proposed route. Overall, the methodology identifies the Teal Route as being the most supported/least opposed and the Blue Route as being the least supported/most opposed.

Public Route Suggestions

The public was given the opportunity to provide route modifications and suggestions for improved routes at the second public workshop. The route suggestions are depicted on **Figure 10**. The public route suggestions were screened using the original evaluation criteria; the route suggestions with X's were removed from further consideration due to disqualifying factors. The other route suggestions were moved forward for further consideration, and subject to evaluation using the original 22 criteria and the three additional criteria as described below.

Figure 10 ● Proposed Public Routes



6.2 Goals and Objectives Screening/Evaluation Matrix

The initial goals and objectives screening conducted for the preliminary options provided the foundation for the evaluation of the proposed options. In addition to the original six proposed route options presented at the second public workshop, seven additional route options were evaluated after the workshop. The adjusted route options (Yellow Adjusted, Teal Adjusted, Pink Adjusted and Blue Adjusted) reflect shifted alignments to avoid existing features (including disqualifying considerations) and new combination routes (Gray (Y-P-Y-T) and Maroon (Y-T)) to reflect public input. An additional route option, identified as the Public route and commonly called the "green" route, also resulted from the ongoing public involvement activities. The study team evaluated all of these route options.

The 13 routes were evaluated based on the original evaluation criteria, as depicted on **Table 4** below, to obtain a value for each criterion on all routes. Each criterion was then assigned a "score" from 0 to 100 (with 100 being the best) based on the value. The score was calculated based on the value's proportional comparison for each criterion to the full range of values for that criterion for all routes. The most desirable value would receive a score of 100, the least desirable value, a score of 0 with all others following proportionally between those scores. A total average score for all 22 evaluation criteria was then calculated to obtain a route score for each of the 13 route options.

Public preference, average annual daily traffic and construction costs were also evaluated proportionally to obtain a value and corresponding route score for each factor. The three additional criteria and the original evaluation scores were then averaged to obtain an overall score and corresponding rank for each of the 13 route options. This methodology allowed for a quantitative ranking and visualization of similarities and significant deviations for each criterion. The route with the highest score was ranked as 1, and the route with the lowest score ranked 13. The following matrix shows the raw date (i.e. value) next to the corresponding score for each of the evaluation criteria. The corresponding values for each criterion were obtained through use of federal, state, and local resources, including review of aerial photography, agency databases and maps, and preliminary field reconnaissance.

Table 4 • Proposed Route Options - Detailed Evaluation Matrix*

EVALUATION CRITERIA	Range	Least Desirable	Most Desirable	PURPLE		YELLOW ADJUSTED		YELLOW		GRAY (Y-P-Y-T)		MAROON (Y-T)		TEAL		TEAL ADJUSTED		PINK		PINK ADJUSTED		BLUE		BLUE ADJUSTED		ORANGE		PUBLIC	
				Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Length of alternative (in miles)	6.12	16.49	10.37	10.37	100.00	11.34	84.15	11.05	88.89	12.62	63.24	12.52	64.87	12.50	65.20	12.75	61.11	14.04	40.03	14.05	39.87	15.31	19.28	15.13	22.22	16.49	0.00	11.85	75.82
Percentage of facility on new location roadway	-1.00	0.00	1.00	100%	100.00	100%	100.00	100%	100.00	100%	100.00	100%	100.00	100%	100.00	100%	100.00	100%	100.00	100%	100.00	100%	100.00	100%	100.00	92%	91.75	100%	100.00
Number of intersections at federal and state highways	-4.00	0.00	4.00	3	75.00	3	75.00	3	75.00	3	75.00	3	75.00	3	75.00	3	75.00	3	75.00	3	75.00	3	75.00	3	75.00	4	100.00	3	75.00
Improve access for first responders (# of first responders and hospitals within five miles of each alternative)	-4.00	0.00	4.00	3	75.00	4	100.00	4	100.00	4	100.00	4	100.00	4	100.00	4	100.00	4	100.00	4	100.00	4	100.00	4	100.00	3	75.00	4	100.00
Number of curve radii below desired radius	0.00	0.00	0.00	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00
Number of parcels crossed by ROW	87.00	208.00	121.00	130	89.66	142	75.86	131	88.51	147	70.11	140	78.16	121	100.00	132	87.36	208	0.00	201	8.05	161	54.02	179	33.33	188	22.99	133	86.21
Number of divided (bisected) parcels	16.00	36.00	20.00	30	37.50	34	12.50	21	93.75	25	68.75	20	100.00	31	31.25	34	12.50	33	18.75	36	0.00	33	18.75	32	25.00	28	50.00	30	37.50
Potential residential displacements (residences within ROW)	43.00	59.00	16.00	36	53.49	42	39.53	40	44.19	44	34.88	45	32.56	18	95.35	16	100.00	51	18.60	51	18.60	18	95.35	20	90.70	25	79.07	59	0.00
Potential for indirect effects (visual and noise) to residences, schools, parks and cemeteries within 500 ft of the ROW	146.00	204.00	58.00	171	22.60	204	0.00	189	10.27	133	48.63	123	55.48	58	100.00	85	81.51	185	13.01	182	15.07	83	82.88	71	91.10	103	69.18	150	36.99

Table 4 • Proposed Route Options - Detailed Evaluation Matrix (continued)

EVALUATION CRITERIA	*Range*	*Least Desirable*	*Most Desirable*	PURPLE		YELLOW ADJUSTED		YELLOW		GRAY (Y-P-Y-T)		MAROON (Y-T)		TEAL		TEAL ADJUSTED		PINK		PINK ADJUSTED		BLUE		BLUE ADJUSTED		ORANGE		PUBLIC	
				Value	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*	*Value*	*Score*
Population density along the route	*0.49*	*0.61*	*0.12*	0.61	*0.00*	0.50	*22.45*	0.48	*26.53*	0.53	*16.33*	0.51	*20.41*	0.15	*93.88*	0.13	*97.96*	0.41	*40.82*	0.39	*44.90*	0.14	*95.92*	0.14	*95.92*	0.12	*100.00*	0.39	*44.90*
Number of environmental justice communities crossed	*4.00*	*4.00*	*0.00*	2	*50.00*	1	*75.00*	1	*75.00*	0	*100.00*	1	*75.00*	1	*75.00*	1	*75.00*	3	*25.00*	3	*25.00*	4	*0.00*	4	*0.00*	4	*0.00*	1	*75.00*
Number of creek crossings	*13.00*	*27.00*	*14.00*	14	*100.00*	16	*84.62*	14	*100.00*	18	*69.23*	19	*61.54*	27	*0.00*	24	*23.08*	17	*76.92*	17	*76.92*	26	*7.69*	25	*15.38*	25	*15.38*	19	*61.54*
Floodplain acreage within ROW	*60.82*	*89.69*	*28.87*	70.18	*32.08*	50.06	*65.16*	40.67	*80.60*	65.25	*40.18*	58.00	*52.10*	52.84	*60.59*	57.25	*53.34*	31.01	*96.48*	28.87	*100.00*	59.72	*49.28*	60.13	*48.60*	31.42	*95.81*	89.69	*0.00*
Acreage of NWI polygons within ROW	*23.82*	*41.30*	*17.48*	19.12	*93.12*	19.28	*92.44*	17.72	*98.99*	25.85	*64.86*	29.02	*51.55*	25.86	*64.82*	23.74	*73.72*	18.25	*96.77*	17.48	*100.00*	25.39	*66.79*	20.95	*85.43*	20.47	*87.45*	41.30	*0.00*
Number of water wells within ROW	*2.00*	*2.00*	*0.00*	0	*100.00*	0	*100.00*	1	*50.00*	1	*50.00*	1	*50.00*	1	*50.00*	1	*50.00*	2	*0.00*	1	*50.00*	2	*0.00*	2	*0.00*	1	*50.00*	2	*0.00*
Number of parks, schools, cemeteries and other community resources within the ROW	*3.00*	*3.00*	*0.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	1	*66.67*	0	*100.00*	1	*66.67*	3	*0.00*
Number of schools within 1 mile of each route	*3.00*	*3.00*	*0.00*	2	*33.33*	2	*33.33*	2	*33.33*	2	*33.33*	2	*33.33*	2	*33.33*	3	*0.00*	3	*0.00*	3	*0.00*	1	*66.67*	2	*33.33*	1	*66.67*	2	*33.33*
Number of businesses displaced within the ROW	*8.00*	*8.00*	*0.00*	8	*0.00*	3	*62.50*	1	*87.50*	3	*62.50*	1	*87.50*	2	*75.00*	2	*75.00*	3	*62.50*	3	*62.50*	1	*87.50*	0	*100.00*	1	*87.50*	3	*62.50*
Number of ACTIVE O/G wells displaced within the ROW	*3.00*	*3.00*	*0.00*	1	*66.67*	1	*66.67*	1	*66.67*	1	*66.67*	2	*33.33*	2	*33.33*	2	*33.33*	2	*33.33*	2	*33.33*	0	*100.00*	0	*100.00*	1	*66.67*	3	*0.00*
Number of INACTIVE O/G wells displaced within the ROW	*8.00*	*8.00*	*0.00*	4	*50.00*	6	*25.00*	2	*75.00*	8	*0.00*	4	*50.00*	2	*75.00*	6	*25.00*	4	*50.00*	4	*50.00*	6	*25.00*	7	*12.50*	6	*25.00*	2	*75.00*
Number of cell towers and electric substations within the ROW	*1.00*	*1.00*	*0.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	0	*100.00*	1	*0.00*	0	*100.00*	1	*0.00*	1	*0.00*

Table 4 • Proposed Route Options - Detailed Evaluation Matrix (continued)

EVALUATION CRITERIA	Range	Least Desirable	Most Desirable	PURPLE		YELLOW ADJUSTED		YELLOW		GRAY (Y-P-Y-T)		MAROON (Y-T)		TEAL		TEAL ADJUSTED		PINK		PINK ADJUSTED		BLUE		BLUE ADJUSTED		ORANGE		PUBLIC	
				Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Number of employment centers within 1 mile of each route	-5.00	0.00	5.00	2	40.00	4	80.00	4	80.00	5	100.00	5	100.00	5	100.00	5	100.00	5	100.00	5	100.00	1	20.00	2	40.00	1	20.00	5	100.00
AVERAGE SCORE FROM ORIGINAL CRITERIA				**64.5**		**67.9**		**76.1**		**66.5**		**69.1**		**74.0**		**69.3**		**56.7**		**59.1**		**55.9**		**62.2**		**57.7**		**48.4**	
Public Preference	1.01	3.96	2.95	3.1	85.1	3.14	81.2	3.19	76.2	3.08	87.1	3.07	88.1	2.95	100.0	2.95	100.0	3.54	41.6	3.54	41.6	3.96	0.0	3.96	0.0	3.84	11.9	3.07	88.1
Overall Cost (ROW, Const, O/G) in Millions	$ 124.70	$407.0	$282.3	$288.0	95.4	$297.2	88.1	$282.3	100.0	$332.7	59.6	$352.3	43.9	$352.6	43.6	$345.4	49.4	$362.8	35.4	$364.8	33.8	$382.3	19.8	$375.3	25.4	$407.0	0.0	$368.7	30.7
Average Annual Daily Traffic	-3,200	11,500	14,700	14,700	100.0	13,900	75.0	13,600	65.6	13,500	62.5	13,300	56.3	13,500	62.5	13,500	62.5	11,900	12.5	11,900	12.5	11,700	6.3	11,700	6.3	11,500	0.0	13,500	62.5
FINAL AVERAGE SCORE & RANK				**86.3**		**78.0**		**79.5**		**68.9**		**64.3**		**70.0**		**70.3**		**36.6**		**36.7**		**20.5**		**23.5**		**17.4**		**57.4**	
				1		***3***		***2***		***6***		***7***		***5***		***4***		***10***		***9***		***12***		***11***		***13***		***8***	
HAS DISQUALIFYING FACTOR?				***N***		***N***		***Y***		***N***		***N***		***Y***		***N***		***Y***		***N***		***Y***		***N***		***Y***		***N***	
FINAL RANK				***1***		***2***		***X***		***4***		***5***		***X***		***3***		***X***		***7***		***X***		***8***		***X***		***6***	

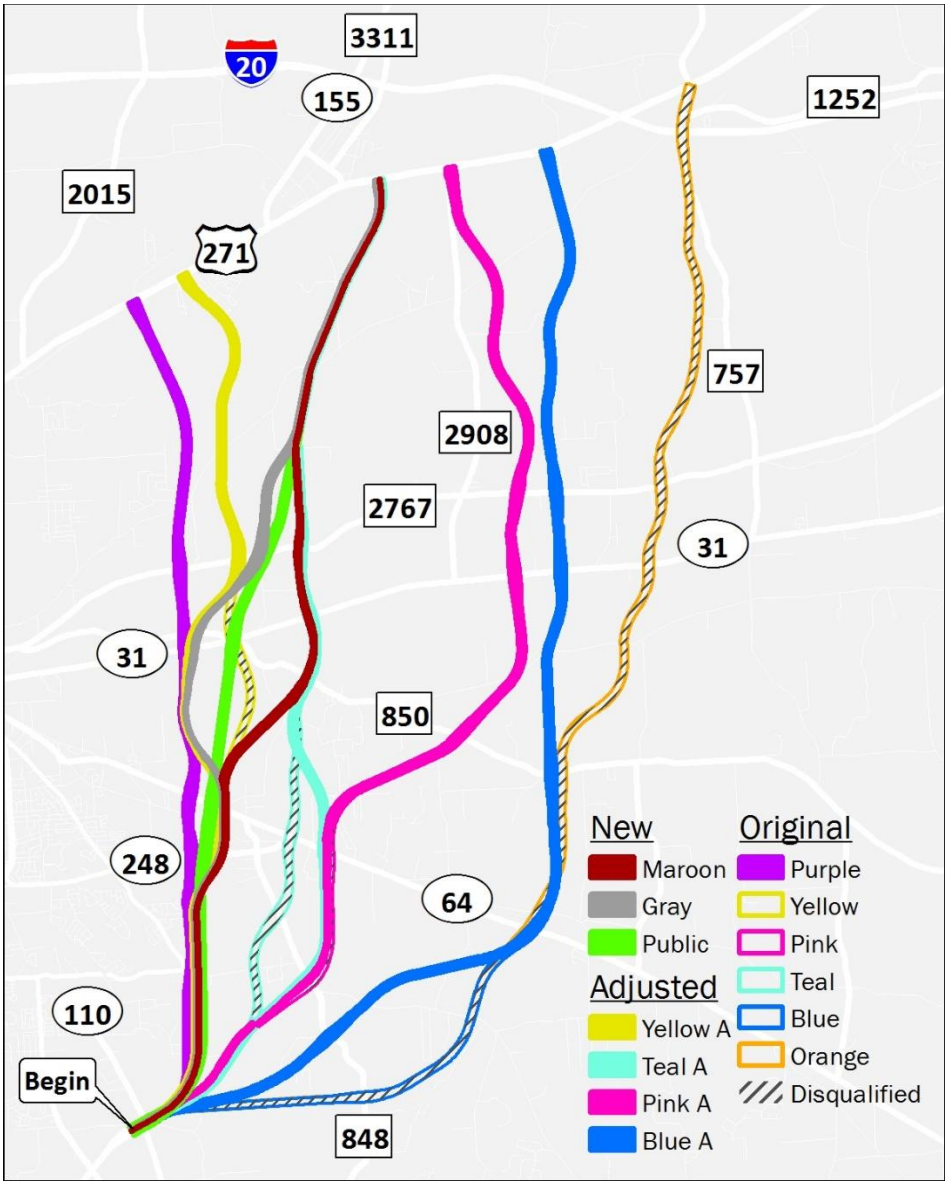
* The data in this matrix is current as of Fall 2019. The study team will continue to gather and analyze data during the Environmental Impact Statement process.

The matrix in **Table 4** highlights the differences between each of the route options and the overall corresponding score and rank. Purple, Yellow and Yellow Adjusted ranked as the top three route options; however, five of the route options as shown on **Figure 11** were removed from further consideration due to the disqualifying factors presented below: Yellow, Teal, Pink, Blue and Orange.

The disqualifying considerations and reasoning behind proposed adjustments included the following:

1. Original Yellow route - adjusted due to dependence on work from others at the FM 850 intersection
2. Original Teal route - adjusted due to dependence on work by others at the Spur 248 and/or CR 19 intersections
3. Original Pink route - adjusted to extend the route's distance from Kissam Elementary
4. Original Blue route - adjusted to avoid Dickson Cemetery and radio towers
5. Orange - removed to avoid Dickson Cemetery and radio towers

Figure 11 ● Proposed Adjusted Routes & Combination Routes



Since Yellow was among the route options with disqualifying factors, the route options next in sequence without disqualifying factors moved up in ranking. Beginning with the best ranked and ending with the last ranked option, the evaluation, as detailed in **Table 4**, yielded the following results: Purple, Yellow Adjusted, Teal Adjusted, Gray (Y-P-Y-T), Maroon (Y-T), Public, Pink Adjusted, and Blue Adjusted. These eight route options were moved forward for consideration.

6.3 Additional Considerations

As indicated above, additional criteria were used to evaluate the proposed route options after the second public workshop. The public preference criterion is described in detail in Section 7.1 above; construction and traffic considerations are presented in more detail below.

6.3.1 Cost Estimates

The three main elements contributing to the overall total cost estimate for each of the proposed route options is ROW, construction and oil/gas relocation. Estimated costs of the 13 proposed route options are summarized in **Table 5** below. The total estimated cost of the proposed route options varies from a low of approximately $282.3 Million (Yellow) to a high of $407.0 Million (Orange).

Table 5 ● Estimated Cost of Route Options

ROUTE	CONSTRUCTION COST	ROW ACQUISITION COST	OIL/GAS RELOCATION COST	TOTAL COST
Purple	$257,900,000	$18,100,000	$12,000,000	**$288,000,000**
Yellow	$254,300,000	$17,000,000	$11,000,000	**$282,300,000**
Yellow Adjusted	$264,200,000	$20,000,000	$13,000,000	**$297,200,000**
Gray (Y-P-Y-T)	$295,200,000	$23,600,000	$14,000,000	**$332,800,000**
Maroon (Y-T)	$307,300,000	$23,100,000	$22,000,000	**$352,400,000**
Teal	$318,300,000	$13,300,000	$21,000,000	**$352,600,000**
Teal Adjusted	$309,000,000	$13,400,000	$23,000,000	**$345,400,000**
Pink	$307,300,000	$33,600,000	$22,000,000	**$362,900,000**
Pink Adjusted	$307,300,000	$35,5000,000	$22,000,000	**$364,800,000**
Blue	$357,500,000	$21,800,000	$3,000,000	**$382,300,000**
Blue Adjusted	$349,200,000	$22,600,000	$3,500,000	**$375,300,000**
Orange	$372,400,000	$21,600,000	$13,000,000	**$407,000,000**
Public	$320,200,000	$17,500,000	$31,000,000	**$368,700,000**

The Yellow, Purple, and Yellow Adjusted routes are the least expensive routes overall; they are the three shortest routes and have the least number of streams, rail, and road crossings resulting in lower bridge costs. The Orange route is the longest and most expensive route to construct. The Orange Route also has significant structural costs due to the total number and length of stream, rail, and bridge crossings that would be required.

Right-of-way and the relocation of oil and gas wells also drive the total estimated construction costs. The overall least expensive route options do not necessarily have the lowest oil and gas relocation costs; however, the route options with the lower oil and gas relocation costs have significantly higher general construction costs. Estimated ROW acquisition costs deviate in excess of $22 million between Teal Adjusted, which has the lowest estimated ROW cost and Pink, which has the highest estimated ROW costs.

6.3.2 Projected Traffic

A Traffic Analysis was performed to develop traffic forecasts for the proposed Segment 6 route options. The models were developed using currently accepted professional practices and procedures, collected traffic data, the latest regional travel demand models obtained from the Tyler Area Metropolitan Planning Organization (MPO), which are based on the 2045 Metropolitan Transportation Plan, and assumptions regarding tolling and design.

A comprehensive traffic data collection program was conducted during October 2018 and supplemented in December 2018 to collect a series of traffic counts along the Toll 49 corridor and along several screenlines encompassing the study corridor. Annual straight-line growth rates were determined from the travel demand model runs. The travel demand model indicates that peak flow rate occurs during the PM peak period (3 to 6 p.m.); therefore, growth rates from this period of the model were used to compute the annual growth. Highway networks, socioeconomic information and trip tables for various years as obtained from the Tyler Area MPO were incorporated into the base year (2019) and future year (2045) models used for traffic forecasting.

As shown in **Table 6**, findings indicate that the Purple route would have the highest average weekday two-way traffic volume due to its proximity to the city of Tyler. The volume totals were developed using data for specific roadway segments comprising the routes. The Orange route would have the lowest volumes since the projected average daily traffic volumes decrease as the route options shift further east. Additional details regarding the data, model and results are included in the Traffic Analysis Memorandum which is available upon request.

Table 6 ● Average Daily Traffic Volume Summary

ROUTE	Approximate Distance (mi)	Average Weekday Traffic One-way*	Average Weekday Traffic Both Directions*
Purple	10.36	7,350	14,700
Yellow	11.05	6,800	13,600
Yellow Adjusted	11.26	6,950	13,900
Gray (Y-P-Y-T)	12.56	6,750	13,500
Maroon (Y-T)	12.47	6,650	13,300
Teal	12.51	6,750	13,500
Teal Adjusted	12.74	6,750	13,500
Pink	14.03	5,950	11,900
Pink Adjusted	13.96	5,950	11,900
Blue	15.36	5,850	11,700
Blue Adjusted	15.13	5,850	11,700
Orange	16.48	5,750	11,500
Public	11.80	6,750	13,500

*The traffic study provided average weekday traffic volumes by roadway segment for northbound and southbound travel. For purposes of this study, the average volumes were developed using the average of both directions to obtain volumes for one direction; this average was doubled to calculate the average daily traffic in both directions.

For purposes of the evaluation, a weighted average annual daily traffic (AADT) volume was developed for each proposed route based on the length of the segment and two-way travel volumes; a proportional AADT score was then calculated for each route based on the range of average traffic volumes across all route options, and included in the Detailed Evaluation Matrix, **Table 4**.

Supplemental traffic data for the adjusted routes, public route, and combination route options was developed using professional judgement to assign traffic roadway sections that did not correlate exactly with the segments evaluated for the original six proposed routes.

Travel time was initially estimated for each route option based on common points; however, it was determined that a faster route, such as the Orange route, functioned as more of a reliever route rather than a regional connection to destinations such as the University of Texas at Tyler or the University of Texas Health Science Center. For this reason, a shorter travel time was not necessarily indicative of a better route. Travel times were determined to be a poor indicator for equally evaluating and ranking the overall routes on this project, and therefore not incorporated into the evaluation metrics.

7.0 Study Findings

The Toll 49 Segment 6 Feasibility Study conducted between September 2018 and September 2019, led to the identification of several key findings. **Table 7** provides a summary of the findings following the evaluation.

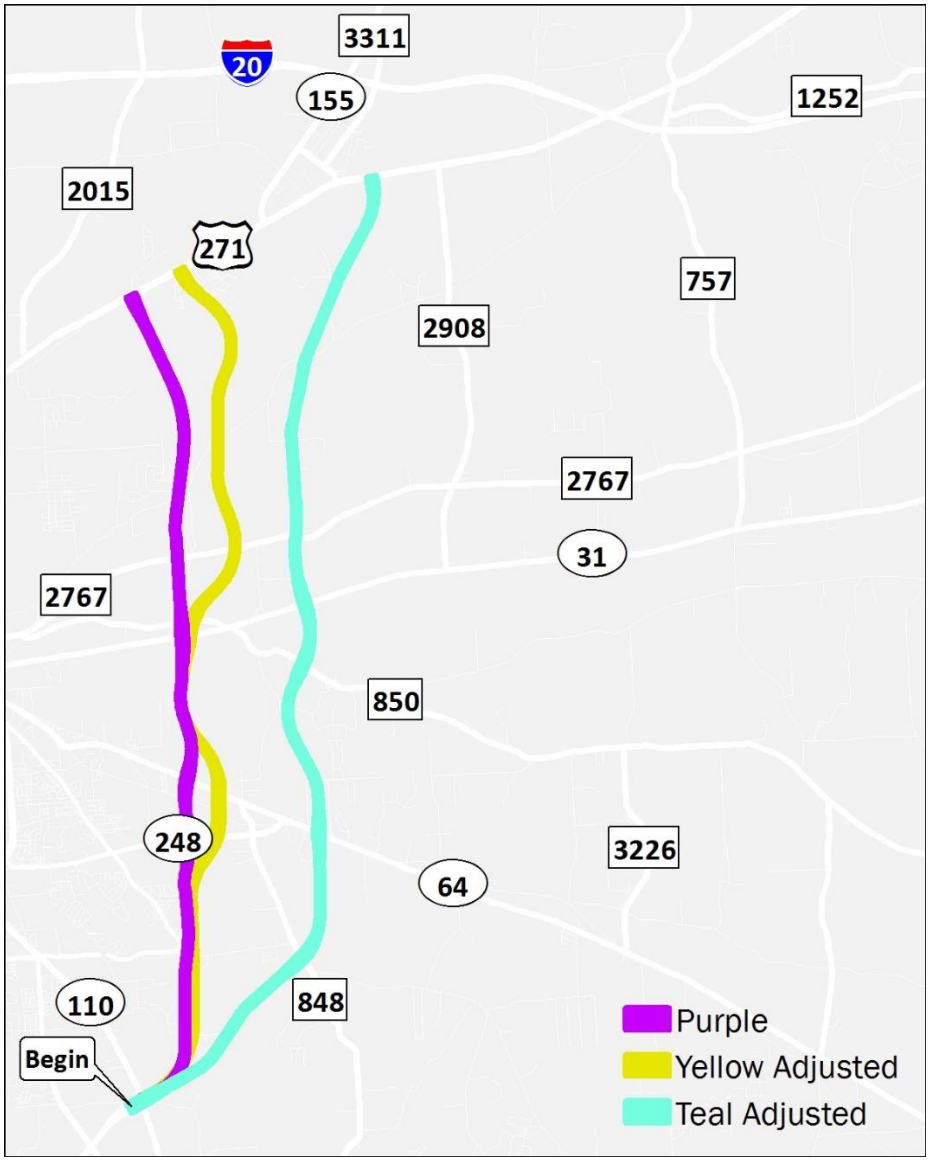
Table 7 ● Proposed Route Options Evaluation Summary

ROUTE EVALUATION RESULTS	*Mobility, Community & Natural Environment and Economic Development*	*Public Preference*	*Overall Construction Cost*	*Average Annual Daily Traffic*	COMBINED ROUTE SCORE & RANK		*Has Disqualifying Factor?*	FINAL RANK
Purple	*64.5*	*85.1*	*95.4*	*100.0*	***86.3***	**1**	**N**	*1*
Yellow	*76.1*	*76.2*	*100.0*	*65.6*	***79.5***	**2**	**Y**	X
Yellow Adjusted	*67.9*	*81.2*	*88.1*	*75.0*	***78***	**3**	**N**	*2*
Teal Adjusted	*69.3*	*100.0*	*49.4*	*62.5*	***70.3***	**4**	**N**	*3*
Teal	*74.0*	*100.0*	*43.6*	*62.5*	***70***	**5**	**Y**	X
Gray (Y-P-Y-T)	*66.5*	*87.1*	*59.6*	*62.5*	***68.9***	**6**	**N**	*4*
Maroon (Y-T)	*69.1*	*88.1*	*43.9*	*56.3*	***64.3***	**7**	**N**	*5*
Public	*48.4*	*88.1*	*30.7*	*62.5*	***57.4***	**8**	**N**	*6*
Pink Adjusted	*59.1*	*41.6*	*33.8*	*12.5*	***36.7***	**9**	**N**	*7*
Pink	*56.7*	*41.6*	*35.4*	*12.5*	***36.6***	**10**	**Y**	X
Blue Adjusted	*62.2*	*0.0*	*25.4*	*6.3*	***23.5***	**11**	**N**	*8*
Blue	*55.9*	*0.0*	*19.8*	*6.3*	***20.5***	**12**	**Y**	X
Orange	*57.7*	*11.9*	*0.0*	*0.0*	***17.4***	**13**	**Y**	X

This report serves to document the findings, listed below and provides detail regarding the evaluation of route options.

- Thirteen proposed routes were evaluated proportionally to obtain a route score for the original evaluation criteria, public preference, construction costs, and average annual daily traffic. The average of these four scores was used to obtain a combined route score, and ultimately a rank for each of the 13 route options.
- Five routes (Yellow, Teal, Pink, Orange and Blue) have disqualifying factors, excluding them from further consideration.
- The evaluation identified Purple, Yellow Adjusted, and Teal Adjusted as the top three ranked routes. These routes are shown on **Figure 12** and are the recommended route options moving forward to the EIS.
- The best ranked route options support the intent to develop a regional transportation facility.

Figure 12 ● Final Proposed Routes



8.0 Next Steps

The NET RMA is looking to improve long-term mobility and connectivity in northeast Texas. As a result of the data-driven evaluation process, the three recommended route options (Purple, Yellow Adjusted and Teal Adjusted) from this Feasibility Study and the No-Build option will be carried to a federally required EIS. The data in this report is current as of Fall 2019. The study team will continue to gather and analyze data during the Environmental Impact Statement process. The EIS will result in the identification of one preferred route. Additionally, further public involvement will occur throughout project development to ensure that the process for identifying a preferred route continues to be community driven.

Learn more about Toll 49 Segment 6 at www.netrma.org.