SH 34 Feasibility Study

IH-30 to CR 2312, Hunt County, Texas

CSJ: 0173-06-042, 0173-07-054

July 2020

Executive Summary

Background

State Highway (SH) 34 from US Highway 82 in Honey Grove, TX, to Interstate Highway (IH) 35E in Italy, TX is typically a rural two-lane roadway that expands to add a center turning lane in populated areas along the alignment. It provides regional mobility–passing through four counties–and connects major roadways, including US 82, US 380, IH-30, IH-20, US 175, IH-45, US 287, US 77, and IH-35E, and serves motorists traveling between the cities of Honey Grove, Greenville, Quinlan, Terrell, and Ennis, and other local communities. It provides critical access to several rural communities along the periphery of the Dallas – Ft Worth metroplex. Certain portions of SH 34 experience high levels of congestion and delay during the morning and afternoon peak periods, and the daily traffic volumes have started to exceed the level at which the roadway provides safe and efficient operations.

Purpose of the Study

To address existing and increased future traffic congestion, the Texas Department of Transportation (TxDOT) initiated a feasibility study in Spring 2019 along a segment of SH 34 that is experiencing significant congestion. The purpose of the study was to analyze these transportation issues and develop short-, mid-, and long-term mobility and safety improvements.

Study Area

The study area for SH 34's feasibility analysis is 18.8 miles in length and extends from IH-30 in Greenville, TX, to CR 2312 at the border of Hunt and Kaufman counties. The study area crosses several municipal boundaries, including portions of Greenville, and Quinlan; and unincorporated communities such as Cash. The entire study area is within the Hunt County limits. SH 34 connects to several county roads leading to rural communities as well as providing access to the cities of Greenville, Quinlan, and the Majors Airfield in Greenville.

Public Involvement Plan

A public involvement plan was developed for the SH 34 Feasibility Study that describes TxDOT's approach for engaging stakeholders and members of the public and soliciting input on proposed improvements. Stakeholder groups included city representatives, county representatives, elected officials, school districts, and interested citizens. Public involvement for the project consisted of stakeholder committee meetings, two public meetings (held at two locations), an online survey, and a project newsletter.

An online survey developed to identify issues or concerns on existing roadways offered local residents and regular users of the roadway to share their mobility concerns. The online survey, MetroQuest, was conducted between August 21 and September 17, 2018. The online survey was available for the public to complete at the public meetings, and at the TxDOT/SH 34 Feasibility Study website. 273 responses were received from residents of the area. While the survey respondents indicated that they use SH 34 for shopping, school trips, recreation, among others, the majority travel the corridor to commute to/from work. Respondents indicated that their greatest concerns were – congestion, increasing growth, and safety.

Data Collection, Traffic Modeling, and Design Concepts

The SH 34 Feasibility Study was developed to address transportation issues and identify short-term, mid-term, and long-term mobility and safety improvements in the project corridor. In order to understand the existing and predict the future conditions along SH 34, a variety of data was collected and analyzed. To determine existing and increased future traffic congestion in the study area, existing AM, and PM peak hour traffic conditions (for Year 2018) along SH 34 were modeled using the traffic analysis software Synchro 10 (Trafficware LLC 2015). This analysis provided projections of short, mid, and long-term conditions.

Findings

In addition to analyzing existing traffic conditions and projected traffic volume increases, it was also necessary to investigate planned and proposed roadway improvements to accommodate existing congestion and expected growth. SH 34 is a critical link in the regional roadway network system, providing regional connectivity to a number of communities. Understanding the existing and future conditions, and the proposed roadway improvements served as the basis for developing a series of improvement options.

Short-Term Options

The proposed short-term, or current planned improvements would immediately improve traffic conditions in the study area. These short-term options mostly consist of intersection improvements at five locations. These improvements would have a positive impact on safety and traffic flow conditions at the intersections but would not address the capacity constraints along the corridor. As a result, some intersections would continue to operate at Level of Service (LOS) E/F. The improvements would consist of signalization adjustments and addition of turning lanes, which would channel the traffic and improve safety at these intersections. These intersection improvements are estimated to cost $2 million.

Mid-Term Options

Recommended mid-term improvements include the rehabilitation of six bridges along the alignment. Four of the bridges are located between FM 2101 and Quinlan, while the other two are located south of Quinlan. The total running length of all six bridges is 2625 feet. This mid-term option would result in decreased congestion in the study area. This method of improving traffic conditions is advantageous because it enhances travel times but does not involve the acquisition of any new right-of-way property. The total construction costs for improvements at bridges is approximately $54 million.

Long-Term Options

In the long term, since traffic is expected to increase to levels that can pose supply-side (capacity constraints) issues along the alignment, it is recommended that SH-34 be widened. This can be done by acquiring new right-of-way. As part of the analysis, three alternatives were considered to find the optimal location for acquiring new right-of-way. The results show that the best conditions are found by acquiring right-of-way along both sides of the existing road alignment, enough to make the road in the study area into a five- lane road (except for the southernmost 1.7 miles, which would be widened to a 4-lane road from the existing 2-lane).These improvements would add a total of 34.66 lane-miles of road which is a 75% increase with respect to the current lane—miles (45.92 lane-miles). The added capacity would

significantly reduce congestion and improve safety along the corridor. These improvements would cost an additional $76 million in construction.

Alignment Alternatives

Three alternative alignments were developed and marked for ten aspects cutting across safety, access, environment, and community benefits. The alignments varied by the side of Right-of-Way expansion side – Eastern side, Western side, and Both sides (called the 'Center side'). The alignment was further refined by checking for improvements at the site of Boles Children's Home. Two alternatives were checked against the base condition on six aspects.

Conclusion

Proposed short-term, mid-term and long-term improvements all have substantial benefits in improving the LOS of service along the corridor compared to the no-build options. The short-term improvements, which are low-cost and easily implementable, improve safety and better manage traffic flow but do not address current capacity constraints. Since traffic volumes are anticipated to substantially increase between 2018 and 2048, peak period traffic congestion is also anticipated to worsen substantially.

Given the existing traffic conditions, the short-term improvements would improve the LOS for almost all the intersections. However, for the future (2038, and 2048) conditions, additional improvements would be needed to address the capacity constraint issue. Rehabilitating the bridges by reconstructing them into five-lanes would eliminate choke points and improve the flow of traffic. The expansion could then be replicated into the rest of the alignment through the year 2048 so that finally almost the entire stretch of road would be five-lanes wide.

Positive economic impact of these improvements would be significant for the region. Beginning with the implementation of the short-term improvements, new and sustained economic activity would directly and indirectly have a positive impact. This economic benefit does not factor in costs due to crashes. This is another corridor problem that the proposed signalizations, bridge widenings and additional capacity would effectively address. Acquiring right-of-way from both sides (center alignment) was found to be the better alternative. Below is a summary of the costs involved in implementing these changes:

- Short-term Projects: $2 million
- Mid-term Projects: $54 million, without the ROW and utilities' cost
- Long-term Projects: $76 million, without the ROW and utilities' cost
- TOTAL: $132 million, in construction
  $17 million, in ROW and utilities.

In addition, near Boles Home, at FM 2101 in Quinlan, alternative analysis was conducted to flatten the curve. Alternative 1 is recommended because it was found to reduce disruption to the property, and improve traffic safety as compared to the current/long-term alternative.

Next Steps

TxDOT is committed to improving rural road connectivity and SH 34 is an integral part of this plan. As an example, one of the proposed short-term improvements–the reconfiguring and signal improvements at the intersection of SH 34 and FM 2101–has already been implemented. Subject to the availability of funds, TxDOT will implement mid-term improvements at the four other intersections and reconstruct the six bridges. As for the long-term improvements, right-of-way acquisition will occur as and when funding becomes available.

Table of Contents

Chapter 1: Introduction 1
Purpose of Study 2
Study Area 6
Chapter 2: Public Involvement 8
Public and Agency Involvement 9
The Need for Public Involvement 9
Audience 10
Public Involvement Activities 11
Public Meetings 12
Project Website 15
Conclusion 19
Chapter 3: Existing Conditions 20
Regional Connectivity 21
Land Use/Environmental Constraints 23
Roadway Characteristics 23
Railroads 24
Intersections 24
Traffic Data 25
Crashes 32
Access Management Practices 35
Alternative Transportation Options 35
Pedestrian and Bicycle Facilities 35
Signage 36
Utilities 36
Chapter 4: Future Conditions 39
Methodology 40
No-Build Scenario – Existing Conditions 40
No-Build Scenario – Level of Service 41
Short-Term Conditions – Build 43
Mid-Term Conditions - Build 48

Long-Term Conditions - Build 50
Alternative Evaluation and Scoring 54
Chapter 5: Recommended Improvements 64
Recommendations 65
References 66

List of Appendices

Appendix A — Public Involvement Plan
Appendix B — Traffic Analysis Report
Appendix C — Drainage Analysis Report
Appendix D — Environmental Report
Appendix E — Cost Estimate
Appendix F — Boles Homes Alternative Analysis (Supplemental Analysis)

Supporting Exhibits

DSR Form
Property Base Map
Utility Base Map
Preliminary Alternatives
Environmental Constraints
Alternative Evaluation Scoring
Conceptual Roll Plot
Conceptual Profile Rolls
Comments and Responses Matrix

List of Tables

Table 1 - Synchro Analysis Matrix 5
Table 2 - Project Advisory Committee Members 12
Table 3 - Priorities Ranked 19
Table 4 - List of Signalized Intersections 25
Table 5 - Average Daily Traffic, and Percentage of Trucks 26
Table 6 - Level of Service Definitions – Signalized Intersection 27
Table 7 - Level of Service Definitions - Unsignalized Intersections 27
Table 8 - LOS, and Delay under Existing Conditions 28
Table 9 - Level of Service and Delays - No Build Scenarios 42
Table 10 - Level of Service and Delays - Short Term Improvements 44
Table 11 - Preliminary Environmental Constraints for Mid-Term Improvements 49
Table 12 - Level of Service and Delays - Long-Term Improvements 51
Table 13 - Alternatives Evaluation 55
Table 14 - Summary of Scoring Results 55
Table 15 - Preliminary Environmental Constraints for Long-Term Improvements 60
Table 16: Criteria, Description, and Assessment of Boles Home Alternatives 63

List of Figures

Figure 1 - Project Location and Limits 3
Figure 2 - 2017 Population (Hunt County, and Cities Within) 4
Figure 3 - Route Alignment, and other Important Roads 6
Figure 4 - Location of Signalized Intersection 7
Figure 5 - Online Engagement Welcome Page 15
Figure 6 - Online Engagement Screen 2 17
Figure 7 - Response Ranking 18
Figure 8 - Surrounding Roads, Project Alignment, and Phasing 22
Figure 9 - Project Lane Use Map, Existing 23
Figure 10 - Typical Roadway Section 24
Figure 11 - Crashes (2013 - 2017) on SH 34 34
Figure 12 - Proposed Right-of-Way Section 1 52
Figure 13 - Proposed Right-of-Way Section 2 52
Figure 14 - Location of Sections 1 and 2 Along Alignment 53

Chapter 1: Introduction

Purpose of Study
Study Area

Purpose of Study

The Texas Department of Transportation, in conjunction with Hunt County, conducted the State Highway (SH) 34 Feasibility Study to examine the economic feasibility of improving the roadway to meet the demand for improved mobility and enhanced connectivity in this growing community in northeast Texas. In particular, the study addresses the approximately 18-mile segment of SH 34 in Hunt County, TX, extending from IH-30 to CR 2312. The northern limit of the project connects with IH-30 in the City of Greenville and the southern limit is at the Hunt/Kaufman County Line, south of the City of Quinlan. The project limits are stated in Figure 1; the project in the context of cities in Hunt county is shown in Figure 2. The SH 34 project is divided into two segments: from IH 30 to FM 2101 and from FM 2101 to CR 2312. This is shown

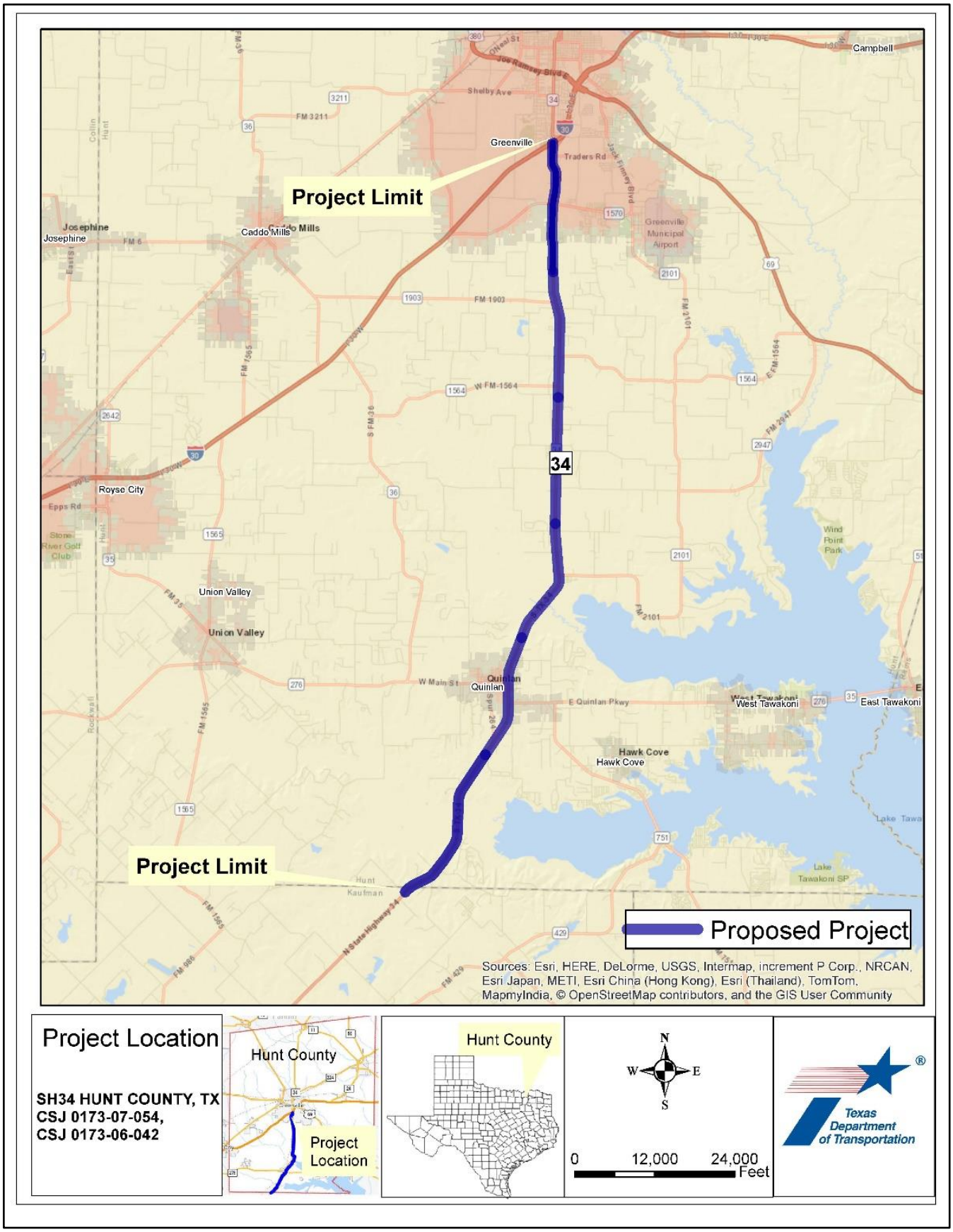


Figure 1 - Project Location and Limits

Greenville is about 50 miles northeast of Dallas and is located on the eastern edge of the Dallas-Fort Worth metropolitan area. Greenville is the county seat of Hunt County and has a population of approximately 27,000. Originally, settled in 1846, Greenville was a major international cotton producer, but today is home to several high-tech and manufacturing companies.

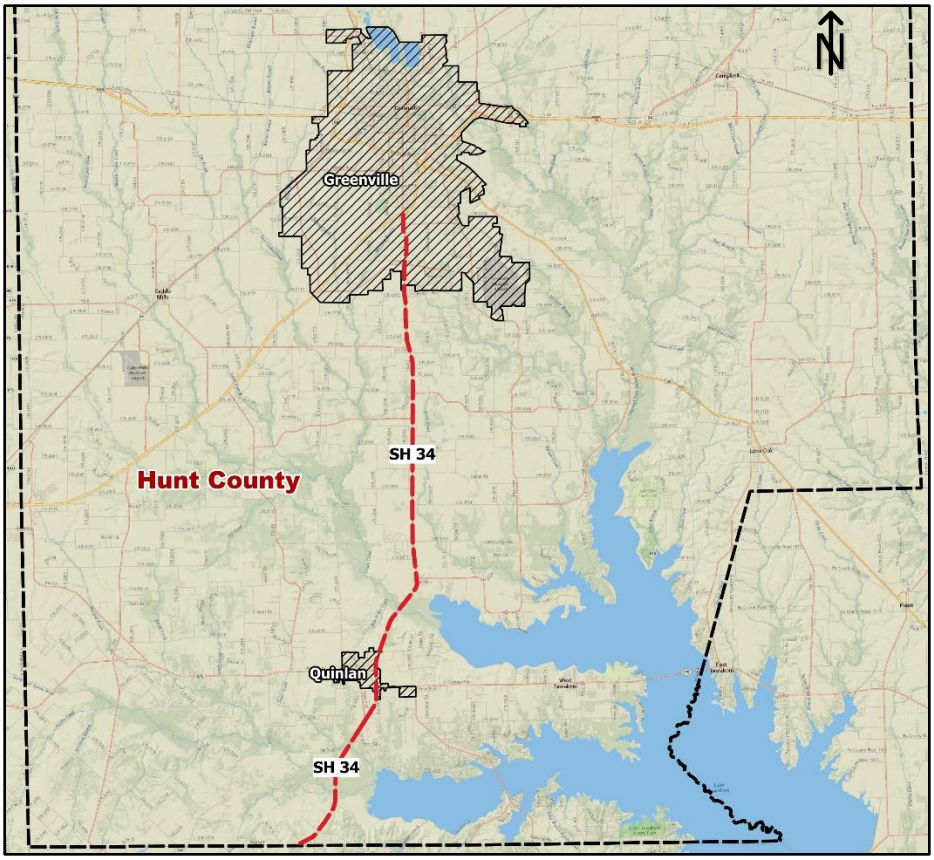


Figure 2 - 2017 Population (Hunt County, and Cities Within Project Limits)

Hunt County Population	90,322
City of Greenville	27,443
City of Quinlan	1,483
Community of Cash	1,296

Quinlan is in the southern part of Hunt County and is also within the Dallas-Fort Worth Metropolitan Statistical area. Quinlan is a smaller, rural community with a population of roughly 1,500 people. Established in 1892 as a depot stop, Quinlan is a very developed community for its small size, with a big national box store and a few chain stores located in the town. Hunt County is in the North Central Texas Council of Governments (NCTCOG) and a participant in the region's Metropolitan Planning Organization.

Quinlan, Greenville, and the surrounding communities are experiencing significant growth in both residential and commercial development. This increased development can be attributed to the expansion of commerce in the region and the suburban growth stretching east from the Dallas area. With continued development, demand on the roadway has increased, warranting an examination of opportunities to expand and improve the roadway, and enhance the regional movement of both people and goods.

SH 34 is currently experiencing traffic congestion, and with the anticipated growth, this congestion is projected to have a serious impact on travel times and safety in the future. Limited route alternatives, constrained right-of-way in some locations, and environmental impacts pose a challenge in addressing the increased congestion. To gain a better understanding of the issues that impact mobility, a detailed analysis of the demands and opportunities along the SH 34 corridor was warranted in order to develop a workable solution to improve mobility and travel reliability. In 2016, the residents of Hunt County approved a bond election to make transportation improvements along area roadways. At the time, sections of SH 34 were identified for improvement in the Bond package. TxDOT is now analyzing SH 34 operations and travel demand and reviewing improvement options along SH 34 between Greenville and Quinlan.

SH 34 is traveled by a variety of users, including area residents, commuters, commercial drivers, pedestrians, and bicyclists. As a result, a substantial portion of the area roadway network, especially in the vicinity of Greenville, experiences high levels of congestion and delay during the morning and afternoon peak periods. Due to this mix of users, the Feasibility Study involved stakeholders and community leaders throughout the corridor to identify needs and gather feedback and ideas on proposed short-, mid- and long-term mobility and safety improvements. TxDOT retained a project engineering team, referred in this report as the Engineer, to conduct the feasibility study and data analysis to develop solutions for improving mobility, relieving congestion, and enhancing safety along the corridor.

To address existing and projected increased traffic congestion, existing AM, and PM peak-hour traffic conditions (year 2018) along SH 34 were modeled using the macroscopic traffic analysis software Synchro 10 to establish base conditions. Using the existing conditions base models and proposed improvements, the following scenarios were modeled in Synchro 10:

Table 1 - Synchro Analysis Matrix

	YEAR	NO-BUILD	BUILD (IMPROVEMENTS)
SHORT TERM	2018	YES	YES
MID TERM	2038	YES	YES
LONG TERM	2048	YES	YES

The results of the analysis were used by TxDOT to engage and inform stakeholders (e.g., area residents, road users, and business owners) as part of the public involvement process of the Feasibility Study. These and provided the public to review and comment on the existing conditions findings and improvement scenarios.

Study Area

The SH 34 feasibility study area is 18.8 miles in length and extends from IH-30 to CR 2312 in Hunt County. The SH 34 Study area is divided into two sections from the northern limit at IH 30 to FM 2101 and from FM 2101 to CR 2312 near the Hunt/Kaufman County line. The two principal municipalities included in the study area are Greenville at the northern project limit and Quinlan located in the southern section of the corridor. Along the corridor, there are a number of intersections where safety and congestion are major concerns. Opportunities exist to address and recommend short-term intersection improvements that will enhance area mobility. Long term, there are also opportunities to increase capacity and proactively plan for the increased travel demand along the corridor.

The SH 34 corridor was divided into two sections for engagement and project coordination purposes (as shown in Figure 8). The overall project alignment is shown in Figure 3.

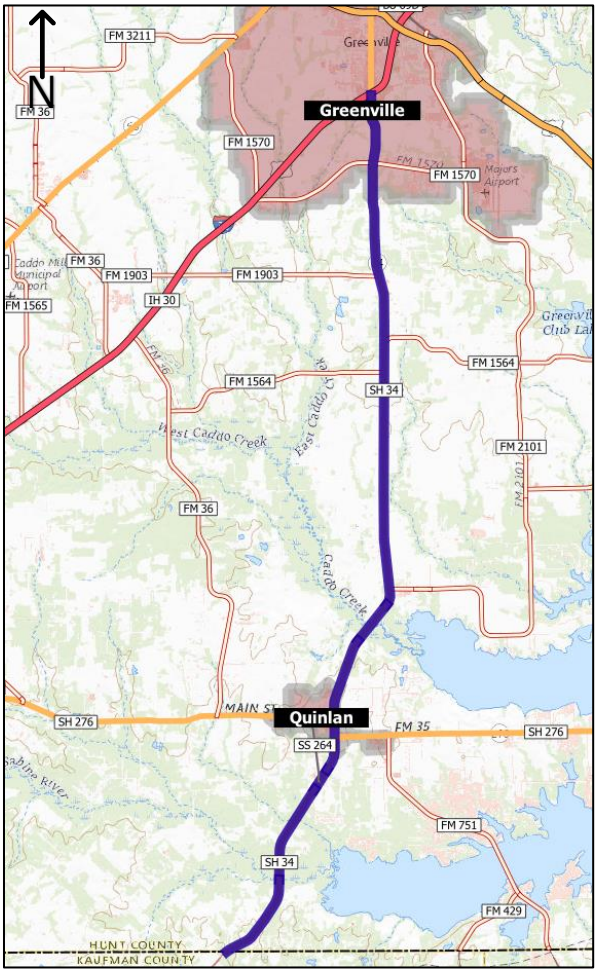


Figure 3 - Route Alignment, and other Important Roads

Below is a map of all the signalized intersections in the study area:

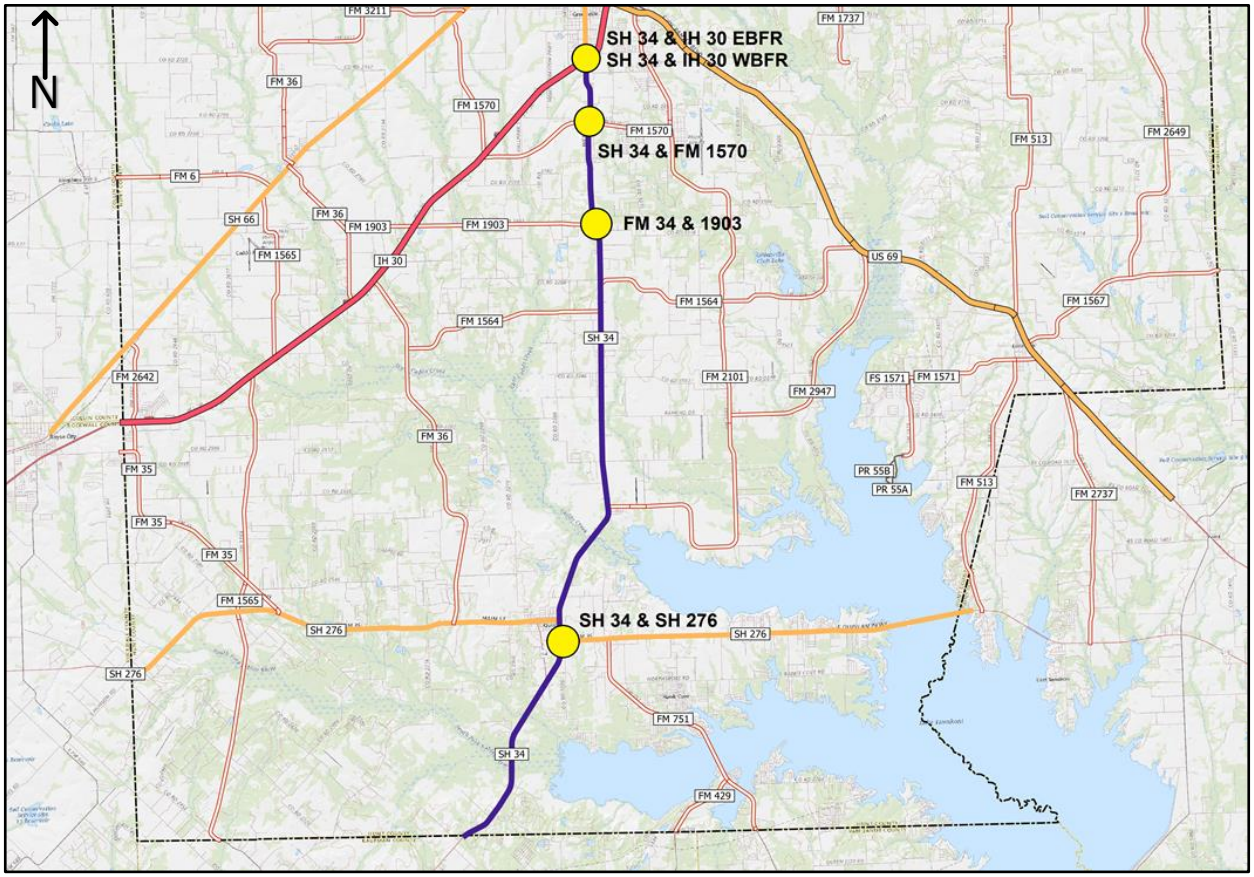


Figure 4 - Location of Signalized Intersection

Chapter 2: Public Involvement

Public and Agency Involvement

The Need for Public Involvement

Audience

Public Involvement Activities

Public Meetings

Project Website

Conclusion

Public and Agency Involvement

Public and agency participation are critical elements of the Project. One of the first tasks undertaken by TxDOT was the creation and implementation of a Public Involvement Plan (PIP). This PIP outlines the techniques, timing, and content of the informational distributions and participatory events necessary to complete the Feasibility Study and associated route and design improvements.

This PIP for the Project describes the proactive public and stakeholder outreach activities that provided the State with meaningful input from study area stakeholders throughout the duration of the study. The input obtained assisted TxDOT in developing the SH 34 Feasibility Study purpose and need and recommendations for reconstructing a key section of SH 34 from IH 30 to CR 2312 in Hunt County, Texas.

Public Involvement Objectives and Goals

The project involves, and is responsive to, local (Project Area) communities in an established manner that complies with the requirements of federal, state, and local agencies including the U.S. Department of Transportation (USDOT) guidelines for public involvement and TxDOT's Environmental Handbook for public involvement. This guidance reflects the Project Team's desire and overriding goal of involving the public and affected agencies in the decision-making process.

This PIP was designed to be proactive and provide opportunities for timely and productive public review and comment. Public meetings and activities were scheduled to coincide with the Project's various milestones. Public involvement opportunities were made available through a range of techniques including scheduled public meetings at traditional, accessible community meeting places.

Within the context of the public involvement process, the following goals were developed to guide the Project's public and agency involvement:

1. Inform, educate, and actively involve the public throughout the Project.
2. Create opportunities for early and continuous community and agency participation.
3. Maintain the accountability, credibility, and responsibility of the State/Engineer Team.
4. Assure inclusion of any traditionally underserved or under-represented groups; and
5. Strive for consensus among potential competing interests.

The Need for Public Involvement

Effective public involvement provides an open exchange of information and ideas between the public, stakeholders, and transportation decision-makers. The overall objective of TxDOT's public involvement process is to be proactive and provide complete and accurate information, timely public notice, public access to key decisions, and opportunities for early and continuous involvement.

Not only does the public involvement process provide a mechanism for TxDOT to solicit ideas

and public comments, it also builds support and a degree of ownership among members of the public who are stakeholders in the proposed transportation investments that affect their communities.

Key elements for effective public involvement include:

1. A clearly defined purpose and need with associated objectives that initiate a public dialogue on a transportation "project" or mobility "study(-ies)" that entails gathering data, soliciting input, evaluating, and recommending solutions and upgrades.
2. Identification of specifically who the affected public and stakeholder groups are with respect to the project.
3. Identification of suitable outreach techniques to thoroughly engage all segments of the public.
4. Notification procedures that effectively identify and focus on affected public groups.
5. Education and assistance techniques that result in an accurate and full public understanding of the transportation problem, potential solution(s), and obstacles and opportunities within the various solutions to the defined problem.
6. Any necessary follow-through by public agencies demonstrating that the transportation decision-makers openly, diligently, and all-inclusively pursued and considered public input.
7. Provide reasonable public access to project information to enhance the public's knowledge and ability to participate in the development of the project; and
8. Ensure that public participation opportunities are held at convenient and accessible locations and times (in compliance with the Americans with Disabilities Act of 1990).

Audience

To meet the public involvement objectives and goals of this project, TxDOT's Paris District reached out to a diverse audience that represented both local and regional interests in the project area including the following:

- Local community members who reside in or near the project area
- Local school districts
- Local business owners whose businesses are within or adjacent to the project area
- Local and regional agencies/elected officials
- Individuals who regularly travel through the project area for work (e.g., freight) or pleasure

Interested parties were given ample opportunity to voice their opinions, even if adversarial, and have their viewpoints recorded with regard to project development and prioritization.

This public involvement for this study was an ongoing process from the initial stage of data collection through individual project design and will continue as the design and project implementation proceeds. All public involvement was iterative as data was accumulated and evaluated and input received in regard to ways to address substantial issues such as crashes, capacity, congestion, fatalities, level of service and maintenance.

Public Involvement Activities

The public involvement activities for this study were designed to encourage participation by the public and stakeholders as partners in the Project and to provide an understandable and convenient means for the public to comment and ask questions. This PIP presented various planned outreach opportunities to encourage Project input, involvement, and feedback from interested citizens and stakeholders.

Mailing List

A comprehensive mailing list was developed and maintained for the SH 34 Feasibility Study. It consisted of adjacent property owners, resource agencies, elected officials, local governments, key SH 34 and IH- 30 travelers (including trucking/freight interests), and those who have previously indicated an interest in the project, such as individuals who have communicated with the State about the project.

A digital database (MS Excel document) of the property owners along the project limits was developed and maintained and included the parcel number (corresponding to a conglomeration of Appraisal District maps), owners name, address, and recording information including Volume/Page to owners' deeds. Database names were collated as needed, such as 1) general public; 2) adjacent property owners; 3) local government officials and staff; 4) State and Federal government officials and staff; 5) special interest associations/organizations; and 6) news media. The project mailing list is included in the public meeting documentation found in Appendix A.

Mailing addresses of adjacent property owners were obtained using a Geographic Information System (GIS) Shape file for parcels in Hunt County using ArcMap 10 and the local Central Appraisal District (CAD) website. These mailing addresses provided a dependable mailing list database of existing, adjacent property owners.

Project Working Group

TxDOT established a Project Working Group (based on the Hunt County Steering Committee) to enable community, business, and agency stakeholders to provide feedback throughout the Feasibility Study. This committee met periodically to provide input on the project and to serve as a conduit to the local community and stakeholders. A list of any additional committee members (other than those currently serving on the Hunt County Steering Committee) was identified and an effort was made to reach out to those individuals who were interested in participating in the study process. At each meeting, TxDOT and its consultant made a presentation that provided project information and asked for input from Working Group members. The meetings took place at locations that were agreed upon by the Paris District and the locations were easily accessible to the work group. Meeting details are as follows:

1. Advisory Meeting #1 on 05/09/2018 at the TxDOT Greenville Area Office
2. Hunt County Steering Committee Meeting on 07/25/2018 at the TxDOT Hunt County Office
3. Advisory Meeting #2 on 02/05/2019 at the office of Dee Hilton at 2716 Lee St, Greenville, TX

Project update information and facts shared at these meetings were relayed by each agency attendee to his/her respective agency leaders, or elected officials and their constituencies.

Table 2 - Project Advisory Committee Members

Chair, Hunt County Steering Committee	W.D. Hilton
Quinlan ISD Superintendent	Debra Crosby
Quinlan ISD Assistant Superintendent	Jeff Irvin
Exec. Dir., Quinlan ISD Facilities & Maintenance Dept.	Tommy Underwood
Greenville ISD Superintendent	Demetrus Liggins
Hunt County Alliance for Economic Development	Sarah Latham
City of Quinlan - Mayor	Jacky Goleman
City of Quinlan - City Administrator	John Adel
City of Quinlan - Director of Public Works	Bobby Clay
City of Greenville - Mayor	David Dreiling
City of Greenville - Chamber of Commerce, Chairman of the Board	Karen Clayton
City of Greenville - Public Works Director	John Wright
City of Greenville - City Manager	Summer Spurlock
Greenville Economic Development President/CEO	Greg Sims
Greenville Economic Development Chairman of the Board	Randy Tarpley
MPO (NCTCOG) Deputy Executive Director	Monte Mercer

Public Meetings

Two rounds of public meetings (open house format without formal presentation), one in 2018 and one in 2019, were held first to provide an introduction to the project and then to provide an update on the findings of the Feasibility Study. In addition, the Public Meetings were an opportunity to receive input and feedback from the public and local stakeholders on the project in general and in regard to specific concerns. The public meetings were held during a two-hour block of time in the early evening hours with TxDOT Paris District and consultant project team members on hand to explain project information, answer questions and collect input.

The public meetings were held at venues within the project area, as summarized below.

Meeting Location	Date	Time	Attendance
Butler Intermediate School, 410 Clardy Dr., Quinlan, TX 75474	8/21/2018	5:30 – 7:30 pm; presentation at 6:15 pm	63
Fletcher Warren Civic Center, 5501 Business Highway 69 S, Greenville, Tx 75402	8/30/2018	5:30 – 7:30 pm; presentation at 6:15 pm	52
Butler Intermediate School, 410 Clardy Dr., Quinlan, TX 75474	6/18/2019	5:30 – 7:30 pm; presentation at 6:15 pm	70
Fletcher Warren Civic Center, 5501 Business Highway 69 S, Greenville, Tx 75402	6/20/2019	5:30 – 7:30 pm; presentation at 6:15 pm	38

The first round of public meetings was held in August 2018, with one meeting conducted in Quinlan and the second meeting conducted in Greenville. These meetings were attended by area residents and the open house format provided the attendees an opportunity to view all the information and ask questions at their leisure. In addition, meeting participants also had an opportunity at the meeting to take the online survey for the project.

TxDOT and its consultant also delivered a presentation with information about the project, including the goals of the Feasibility Study and the study timeline. The focus of this first round of meetings was to inform stakeholders and the community about the SH 34 Feasibility Study and to solicit their input regarding concerns, major problem areas and safety issues. The information received through the stakeholder and public meetings were incorporated in the analysis of data and existing conditions and provided direction in refining the study purpose and need and developing the improvement scenarios.

The second round of public meetings was held in mid-June 2019. Again, one meeting was conducted in Quinlan and the second meeting was conducted in Greenville. These meetings were held at the same venues as those used in 2018 and again the meeting consisted of an open house followed by a presentation. The focus of the second round of meetings was to present the findings of the analysis that had been conducted for the Feasibility Study and to obtain input on the proposed modeled scenarios designed to provide a phased approach to improved mobility.

The public meetings were conducted in a manner so that attending community members could freely view exhibits and obtain project information from Project team members via topic-specific tables and easel exhibits. Environmental constraints maps and corridor schematics were available at the meetings for review and comment. The public meetings also provided opportunities to distribute information materials to the public, such as Project-related handouts, a newsletter, and comment forms.

Team members helped guide attendees through the public meeting process. Comment tables were available for attendees to submit questions, suggestions, and concerns via comment forms. Attendees also had the option to study the material and mail in a comment form at a later date using a return mailing address printed on the back of the form. Prepaid postage was not provided on any of the forms. Unless otherwise indicated, attendees who chose to mail back a comment form were asked to have the form postmarked within 15 days after the public meeting date for the comment(s) to be included and addressed in the Public Meeting Documentation Report found in Appendix A.

Public comments received during the public comment period for each public meeting were compiled and documented by the Engineer in Public Meeting Documentation Reports for both round of public meetings. These reports, found in Appendix A, contain a comment/response matrix; summary of online survey feedback (for the 2018 meetings only); copies of all meeting ads, notices, and social media postings; copies of all comments submitted and all sign-in sheets; and copies of all public meeting handouts, exhibits, and presentations, as well as photographs of each meeting..

Public Meeting Notice

TxDOT prepared and published public meeting notice ads that announced each of the public meetings in 2018 and 2019. The dates of publication and names of the newspapers are shown below:

Date Published	Publication
8/3/2018	Quinlan Tawakoni News
8/3/2018	Greenville Herald Banner
8/10/2018	Quinlan Tawakoni News
8/10/2018	Greenville Herald Banner
5/31/2019	Quinlan Tawakoni News
5/31/2019	Greenville Herald Banner

A copy of the of the public meeting ads may be found in the public meeting documentation included in Appendix A.

As a means of announcing each upcoming public meeting, meeting notices were sent to the adjacent property owners listed on the Project mailing list. These meeting notices were identical to the display ads sent to newspapers.

In addition, the same meeting notice letter was sent to public officials, elected officials, and stakeholders.

TxDOT posted the public meeting notices (in 2018 and 2019) on the project page on txdot.gov and posted notices on the TxDOT Facebook and Twitter accounts.

Summary of Public Meeting Input

In summary, both rounds of public meetings were well attended and the community expressed interest in improving mobility along the SH 34 corridor. In 2018, the two meetings drew 115 attendees and generated 10 comments (plus an additional 7 comments after the meeting) and other input. The attendees provided 35 additional comments directly on the roll plots that showed the SH 34 corridor study area. The most common comments provided at these meetings included concern about growing traffic congestion and increased traffic volumes and the need for improved roadway safety. The community generally was very supportive of the Feasibility Study and having the opportunity to learn about the project and provide input.

The second round of public meetings in 2019 drew 108 people. The purpose of the second round of meetings was to share the findings of the existing conditions and data analysis, and to present proposed short-term, mid-term and long-term improvements and the estimated costs associated with the recommended improvements. There was considerable interest in the SH 34 corridor improvements. Twenty-nine written comments were received from the meetings and the project website. Many of the comments were very supportive of the proposed improvements and phasing. Other comments received expressed concern with right-of-way acquisition associated with the project and questioned what the impact would be

to specific parcels along the corridor. Safety was also a major concern and residents shared information about the increased number, severity, and impact of crashes along the corridor. All comments received were recorded and responded to in a comment/response matrix that was part of the Public Meeting Documentation Report included in Appendix A.

Project Newsletter

The Engineer developed a project newsletter to keep stakeholders and the public up to date on the SH 34 Feasibility Study. The first newsletter (August 2018) was distributed at the two public meetings. This newsletter explained the SH 34 Feasibility Study and encouraged readers to take the online survey. A second newsletter was distributed via email and surface mail in November 2019. This newsletter provides an update on the Feasibility Study along with an explanation of the proposed short-, mid-, and long-term SH 34 improvement options. In addition, the newsletter was posted on the project website.

Project Website

The Engineer created and provided project information regarding the SH 34 Feasibility Study to the State for publication on the project web page at TxDOT.gov. After each public meeting, all meeting materials were uploaded to the project page. In addition, the online survey was accessible to the public on this web page from August – September 2018.

The online survey consisted of four screens: Welcome, Priorities, Corridor Map, and Thank You! The Welcome screen was used to provide project background information. The Priorities screen sought input on personal preferences regarding priorities for corridor improvements and the Corridor Map screen was used to collect comments about the project study area by

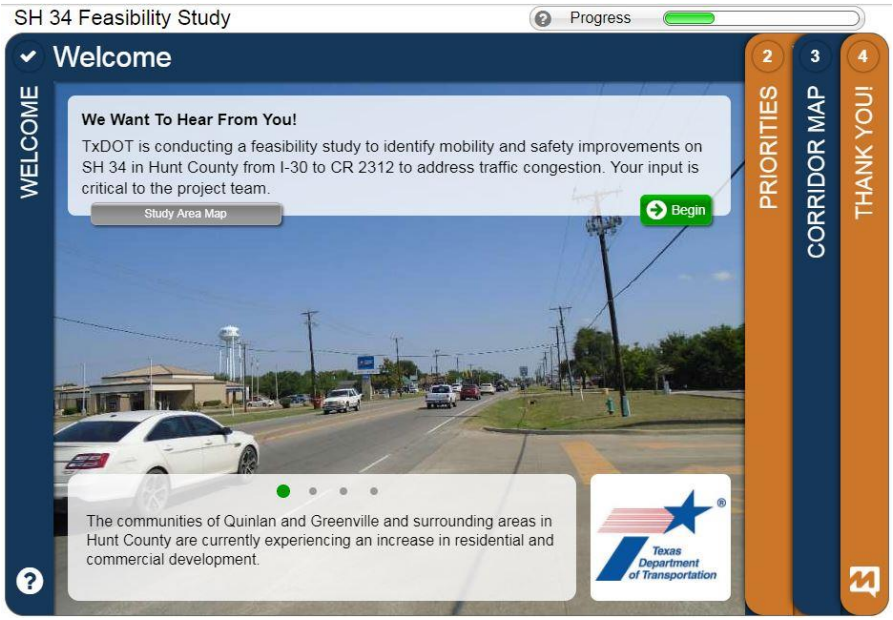


Figure 5 - Online Engagement Welcome Page

geographic area (i.e., all comments were pinned to a specific location on SH 34). Finally, the Thank You screen was used to gather open-ended comments and information about where respondents lived and how they used the SH 34 corridor.

Online Survey (Metroquest)

As part of the public involvement process for SH 34 and in an effort to solicit public input from multiple sources, TxDOT also provided an online survey (using the MetroQuest public engagement platform) to gather public comment on project corridor improvements. This survey was developed in conjunction with TxDOT's Public Involvement Section, which has a license agreement to use this survey service for the State. MetroQuest surveys were linked to the project website and also made available at the first round of public meeting on laptops. In addition, the survey remained online after the meetings for stakeholders and the general public to submit input at their convenience.

Survey Publicity

The SH 34 MetroQuest survey was initially advertised at the first round of public meetings for the project, held on August 21 in Quinlan and August 30, 2018 in Greenville. A project newsletter distributed at the meetings directed Meeting attendees to the online location of the survey at https://www.txdot.gov/inside-txdot/projects/studies/paris/sh34-feasibility-study.html. In addition, the TxDOT Paris District office ran a Facebook notice advertising the survey. TxDOT Paris District also targeted the area Chambers of Commerce, and the communities of Emory, Greenville, McKinney, Paris, Quinlan, Royse City, Sulphur Springs, Terrell, and Whitewright to participate in the survey.

The survey was available to the public between August 21 and September 17, 2018.

Screen 4: Summary of Survey Responses

A total of 273 survey submissions were received. The numbers of those completing the survey peaked on September 13, 2018 with 176 participants responding from their computers, I-pads, or mobile devices. In addition to the 273 people who participated in the survey, the site recorded another 176 site visits with no responses provided.

Of those who responded to the optional questions about where they lived and their traveling habits, the responses included 141 people who live in Quinlan, 22 in Greenville, 9 in Cash, 3 in Terrell, and 41 in a city not listed. When asked how participants use SH 34, 131 indicated they use it to commute to/from work, 52 for shopping or errands, 20 to commute to/from school, 3 for recreational reasons, and 12 for other reasons. One-hundred-five people learned of the survey via social media, 20 from a friend or neighbor, 12 via the newspaper, 7 at one of the two open houses, 7 from the TxDOT website, and 63 from another source. Of the 273 participants, 153 accessed the survey from a mobile device and 120 accessed the survey from a computer or a tablet.

Summary of Survey Findings

- Eight priorities were listed on the survey: Pedestrian Accommodation, Improve Safety, Freight Movement, Improve Connectivity, Safer School Routes, Improve Access, Address Growth, and Address Congestion. Of those eight, Congestion, Growth, and Safety were the top three issues selected by participants.
- On the roll plots, map markers for Congestion were placed over twice as many times as the next highest concern marker, Growth and Safety received almost as many comments as the concerns with congestion.

The survey confirmed that congestion was a top concern to the community and the community felt increased growth was impacting regional mobility.

Screen 2: Priorities

The Priorities screen asked participants to order the top three priorities for SH 34 improvements from a list of eight options. Respondents were also given an option to suggest an unlisted topic or to comment on a priority. The priorities were listed as:

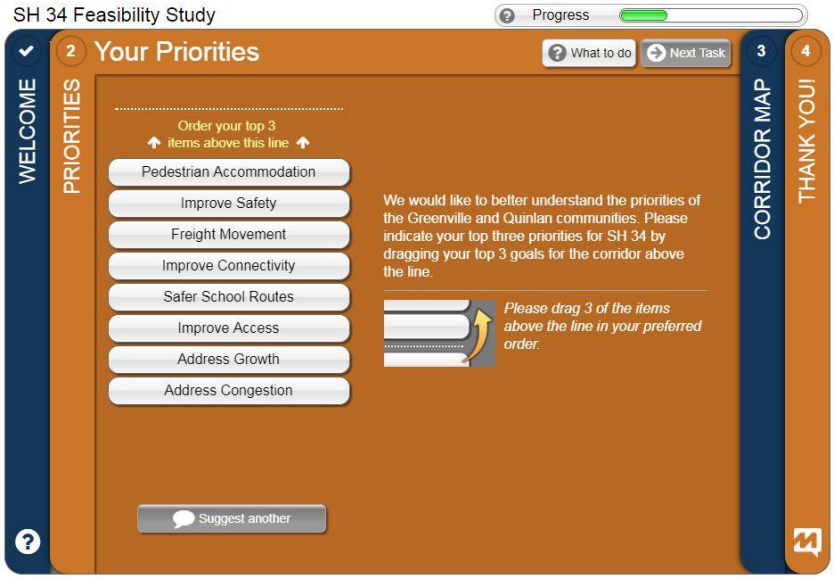


Figure 6 - Online Engagement Screen 2

- **Address Congestion:** The proposed route should reduce congestion throughout the area, now and in the future, especially during peak hours.
- **Address Growth:** The study should ensure that the area is designed to accommodate current and future growth.
- **Freight Movement:** The study should focus on facilitating the free movement of freight.
- **Improve Access:** Solutions should improve access and reduce conflict points at retail/activity centers along the corridor.
- **Improve Connectivity:** The study should identify solutions that enhance connectivity and improve mobility, both short- and long-term.
- **Improve Safety:** The study should focus on improving the reliability and safety of the corridor for pedestrians, bicyclists, and motorists.

- **Pedestrian Accommodation:** The study should address pedestrian and sidewalk accessibility especially for Quinlan and Greenville.
- **Safer School Routes:** The study should prioritize improvements that provide safe circulation for school bus routes.

273 participants ranked their top three 3 priorities in the following order (out of the list of eight priorities): Address Congestion, Address Growth, and Improve Safety most often.
The graph below shows each ranking item and how often each item was ranked, out of a total of 577 rankings.

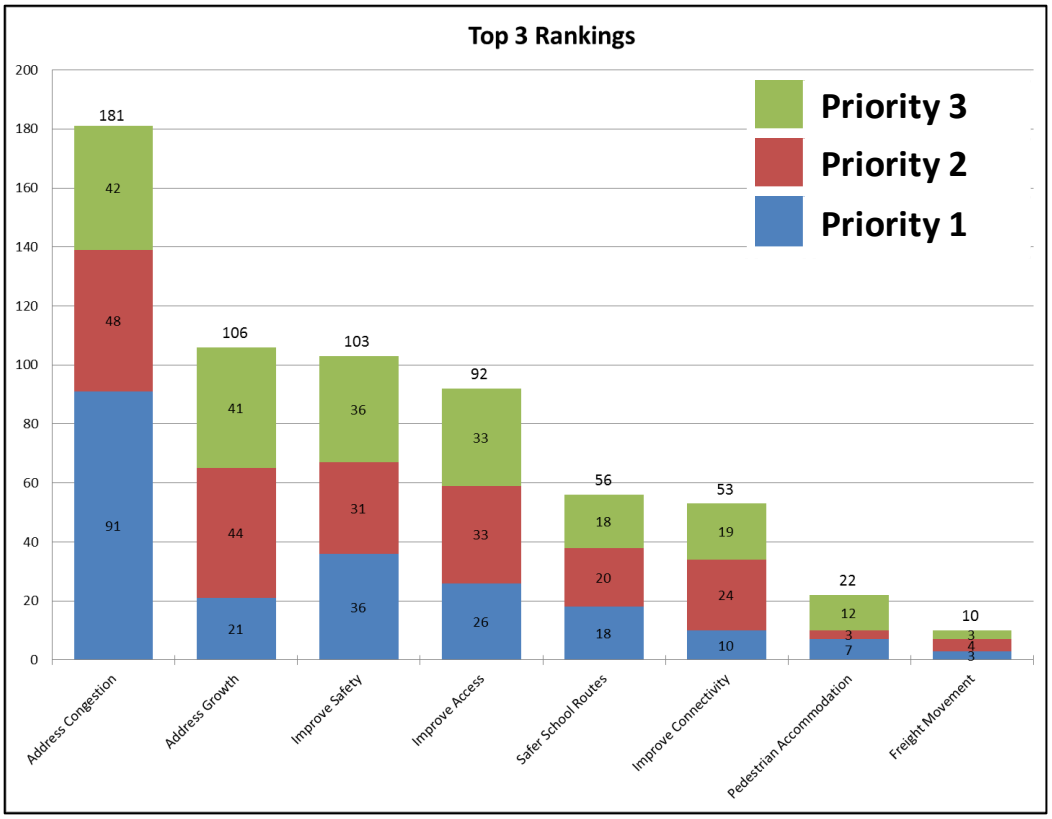


Figure 7 - Response Ranking

The table below shows the average rank for each of the priority in relation to how many times it was ranked as a Top 3 priority.

Table 3 - Priorities Ranked

Priority	Times Ranked	Average Rank
Address Congestion	181	1.729
Address Growth	106	2.188
Improve Safety	103	2
Improve Access	92	2.076
Safer School Routes	56	2
Improve Connectivity	53	2.169
Pedestrian Accommodation	22	2.227
Freight Movement	10	2

Addressing Congestion was also chosen most often as the Number One priority (proportionally to the number of times it was ranked).

Conclusion

The public involvement effort for the SH 34 Feasibility Study generated substantial interest within the community. The effort was a multi-tiered approach to connect with both area residential, business, and local government interests. The stakeholder and public meetings encouraged the community to participate in the study and to raise questions about the study findings and recommendations. The online survey provided an opportunity for the community to share their concerns and preferences and prioritize the improvements that could best address the mobility and roadway operations. Continuous updates on the Feasibility Study were provided via the TxDOT project website and distribution of the project newsletter. In the end, public and stakeholder input played a major role in crafting recommendations and the prioritization of context sensitive solutions to be implemented on SH 34 over time.

Chapter 3: Existing Conditions

Regional Connectivity
Land Use/Environmental Constraints
Roadway Characteristics
Railroads
Intersections
Traffic Data
Crashes
Access Management Practices
Alternative Transportation Options
Pedestrian and Bicycle Facilities
Signage
Utilities

Regional Connectivity

SH 34 Feasibility Study area is an 18.8-mile segment of highway located in Hunt County, Texas. The section of SH 34 included in the Feasibility Study extends from IH-30 to CR 2312. The northern limit of the project connects with IH-30 in the City of Greenville and the southern limit is at the Hunt/Kaufman County Line, south of the City of Quinlan. The SH 34 project is divided into two segments: from IH 30 to FM 2101 and from FM 2101 to CR 2312. The existing conditions of each segment were studied and analyzed separately to address the specific needs along the corridor.

A map of the SH 34 corridor in relation to the surrounding roadway network is shown in Figure 8. Over time, much of the SH 34 corridor land use has transformed from vacant ranch and farming land to more densely developed residential, commercial, institutional, and recreational land uses. With the growth in development, traffic volumes have increased, leading to declining levels of service. The topography and new ongoing development limit opportunities for major mobility improvements along this segment of the SH 34 corridor. In order to ensure that SH 34 continues to serve as a vital link in the regional roadway network, it is necessary to look at ways to maximize mobility and reduce congestion along this critical corridor.

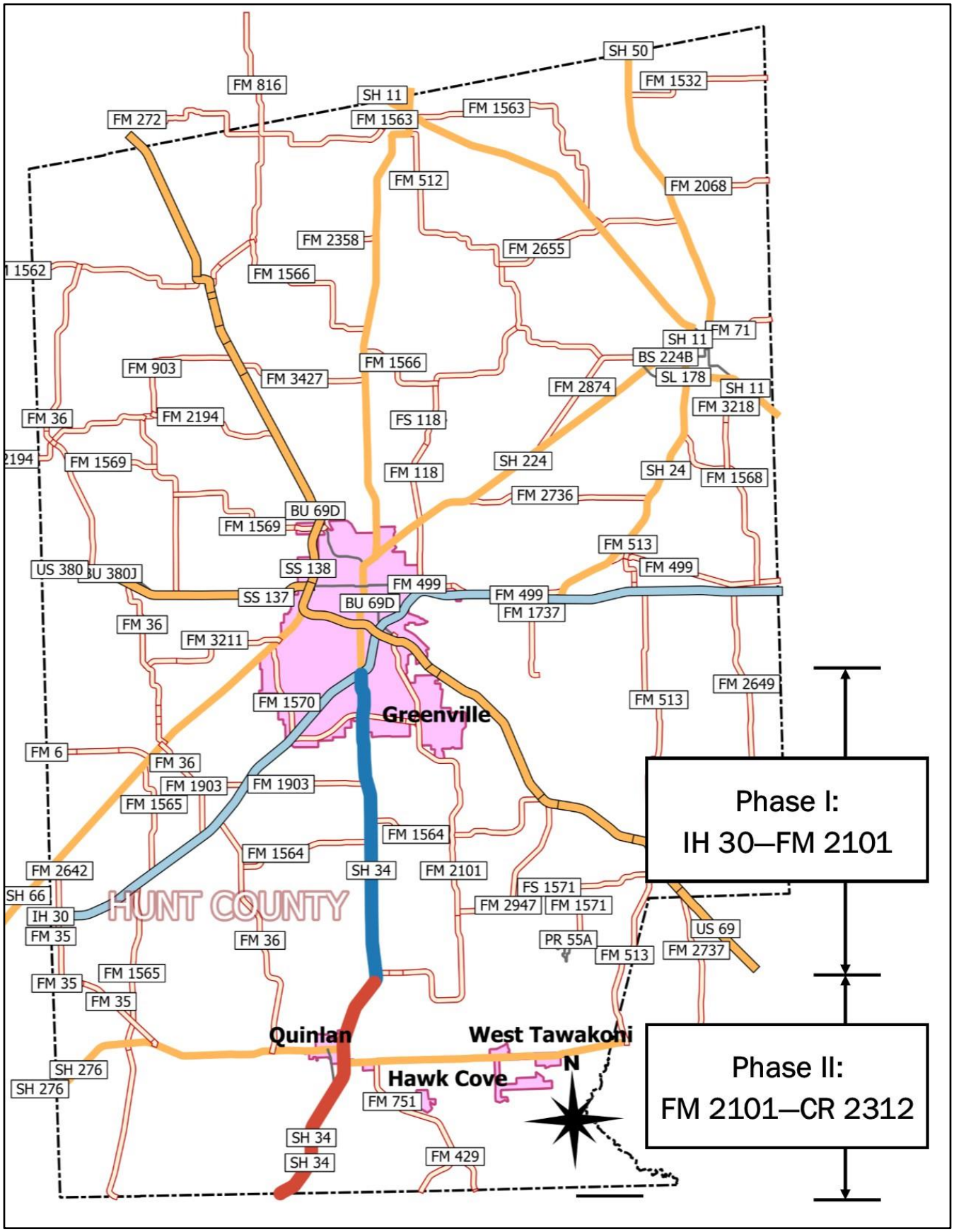


Figure 8 - Surrounding Roads, Project Alignment, and Phasing

Land Use/Environmental Constraints

Along the 18.8-mile segment of the SH 34 alignment, the road passes through the municipal limits of two cities – Greenville and Quinlan, both of which influence the land use within their jurisdiction. The alignment also passes through wetlands, south of the FM 2101. There are areas of medium to high density construction in these areas. However, the rest of the land, which belongs to the State, is sparsely developed as shown in Figure 9.

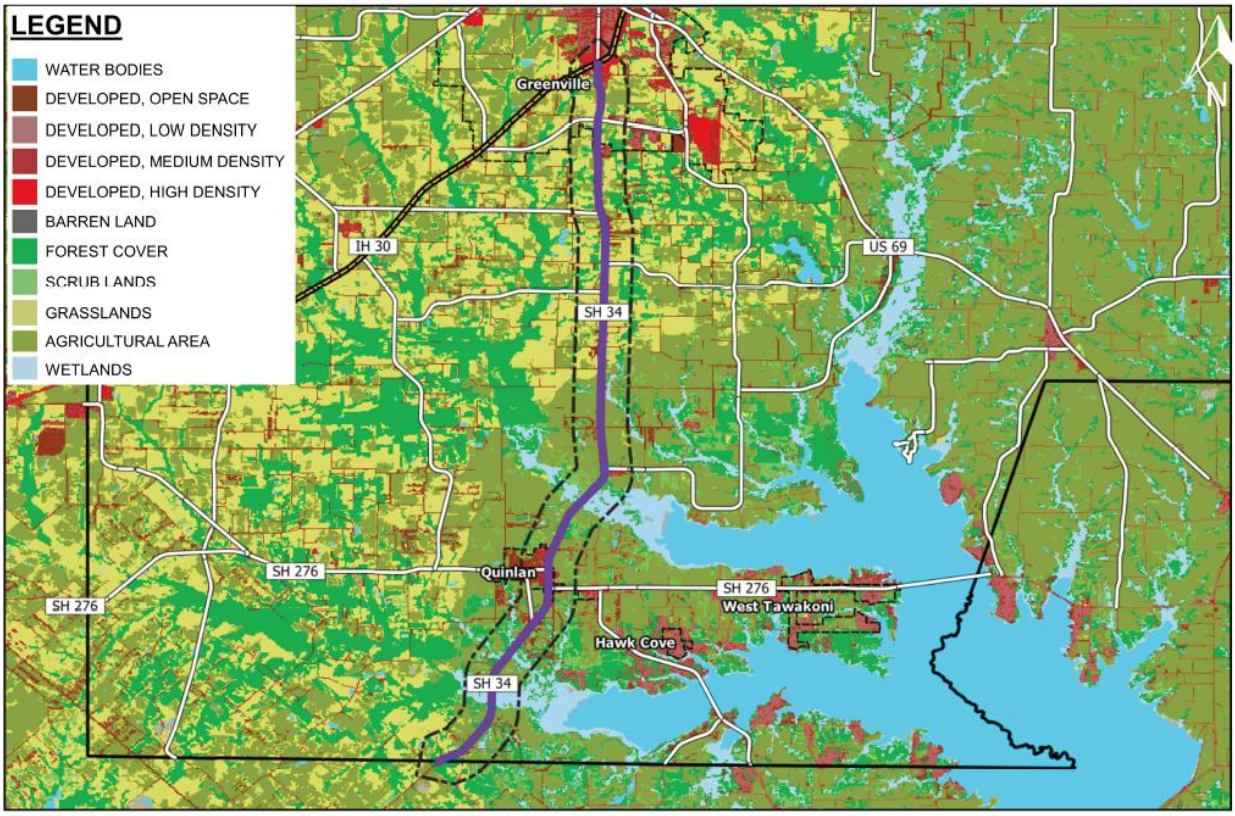


Figure 9 - Project Lane Use Map, Existing

Roadway Characteristics

Typically, the roadway cross section consists of a two-lane, two-way undivided section with varying shoulder widths surrounded by land. This describes nearly 50% of the length of the alignment. There are six bridges along the run. A typical section is shown in Figure 10 below.

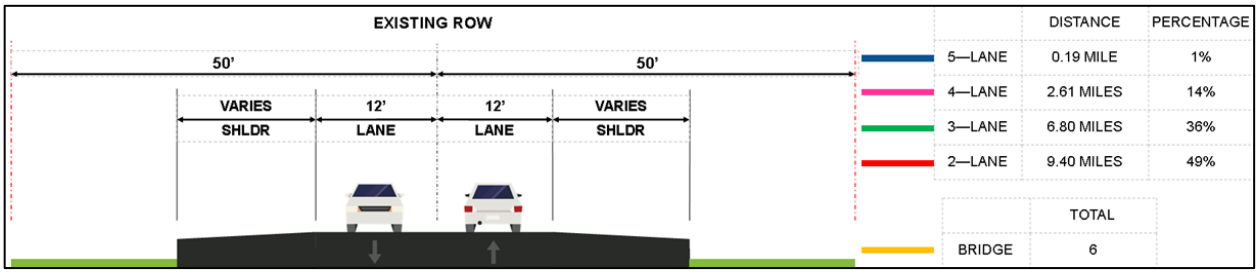


Figure 10 - Typical Roadway Section

Along the other 50% of the road, the width increases to include more lanes, usually turning lanes near intersections, and sometimes additional lanes within city limits where traffic is higher. However, the width never exceeds the existing right-of-way of 100 feet.

Railroads

No railroads are present within or adjacent to the SH 34 study area.

Intersections

A full list of signalized intersections in the study area can be seen in Table 4 below.

Table 4 - List of Signalized Intersections

Intersection No.	Street	Cross Street
1	SH 34	IH 30 WBFR
2	SH 34	IH 30 EBFR
3	SH 34	Traders Road
4	SH 34	FM 1570
5	SH 34	FM 1903
6	SH 34	E FM 1564
7	SH 34	W FM 1564
8	SH 34	FM 2101
9	SH 34	Panther Path
10	SH 34	SH 276
11	SH 34	E Kirby Av/Walmart Driveway
12	SH 34	E SH 276
13	SH 34	SPR 264
14	SH 34	CR 2312

Traffic Data

Data Collection

To properly evaluate existing traffic conditions at the study intersections, daily traffic counts were collected on August 28, 2018 (Tuesday) and August 30, 2018 (Thursday). Twenty-four-hour classification counts were collected at 20 locations. During the classification counts, vehicles were classified as 13 different AASHTO vehicle types based on the number of axles and vehicle configuration. The percentage of heavy vehicles was calculated using the defined classification counts. Table-5 shows the Average Daily Traffic (ADT) and percentage of heavy vehicles at each location. Heavy vehicles are defined as those in Classes 5 to 13.

Table 5 - Average Daily Traffic, and Percentage of Trucks

Study Location	ADT (veh/day)	% of Heavy Vehicles
SH 34 North of IH 30 WBFR	26395	N/A
IH 30 West of SH 34	31247	41.30
SH 34 South of Traders Road	17827	5.00
FM 1570 West of SH 34	5270	3.53
FM 1570 East of SH 34	10512	1.76
SH 34 North of FM 1903	11961	5.69
FM 1903 West of SH 34	2486	6.60
SH 34 South of FM 1903	13648	5.73
FM 1564 East of SH 34	2573	0.00
SH 34 North of W FM 1564	10442	6.90
W FM 1564 West of SH 34	1350	5.78
SH 34 North of CR 2246/CR 3503	9658	7.54
SH 34 North of CR 2261/CR 3505	9062	7.57
FM 2101 East of SH 34	2641	3.10
SH 34 North of Main Street	12006	7.57
Main Street West of SH 34	11238	3.59
SH 276 East of SH 34	18750	3.01
SH 34 South of SH 276	7984	10.05
SH 34 South of SPR 264	7467	9.66
SH 34 South of CR 2312	6151	10.93

Synchro

The study area intersections were analyzed using the traffic macroscopic analysis and signal timing optimization software, Synchro 10. In Synchro 10, the collected roadway geometry, speed limit, traffic volume, and signal timing data were incorporated to simulate existing AM and PM peak-hour conditions.

Intersection Level of Service

Level of service (LOS) is a qualitative measure of operating conditions at an intersection and

is directly related to vehicle delay at intersections, as shown in Tables 6, and 7. LOS is a letter designation ranging from A to F (free flow to heavily congested), with LOS D generally being the limit of acceptable operation. To draw a parallel, LOS is like the grading scale of a report card: A = excellent, B = good, C = average, D = below average, E = needs improvement, and F = not performing. Utilizing the intersection vehicle delays reported by Synchro, LOS was determined for intersections within the study area network. The following tables (Tables 6 and 7) define the LOS designations for signalized, and unsignalized intersections.

Table 6 - Level of Service Definitions – Signalized Intersection

LOS	Control Delay (sec/veh)	Description (Signalized)
A	≤ 10.0	Very low vehicle delays, short cycle length/exceptionally favorable signal progression
B	10.1 to 20.0	Low vehicle delays, short cycle length/highly favorable signal progression, more vehicular stops than LOS A
C	20.1 to 35.0	Favorable signal progression/moderate cycle length, potential cycle failures, significant number of vehicular stops
D	35.1 to 55.0	Ineffective signal progression, long cycle length, many vehicular stops, noticeable cycle failures
E	55.1 to 80.0	Ineffective signal progression, long cycle length, frequent cycle failures
F	>80.0	Poor signal progression, long cycle length, cycle failures during most cycles

Source: Highway Capacity Manual 2010, *Transportation Research Board, 2010*

Table 7 - Level of Service Definitions - Unsignalized Intersections

LOS	Control Delay (sec/veh)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F*	>50

Source: Highway Capacity Manual 2010, *Transportation Research Board, 2010*
**If the V/C Ratio > 1.0, LOS F is assigned an individual lane group for all unassigned intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.*

Table 8 provides the Existing Conditions (2018) AM and PM peak-hour average vehicular delay at the signalized intersections along the SH 34 corridor, and at several adjacent signalized intersections. The LOS associated with each magnitude of delay per vehicle is also provided on the chart. A color code of green, yellow, and red indicates the performance level with green being good, yellow being average, and red as failing.

Table 8 - LOS, and Delay under Existing Conditions

Intersection	AM Peak		PM Peak	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS
SH 34 at IH 30 WBFR	16.7	B	20.7	C
SH 34 at IH 30 EBFR	14.9	B	17.1	B
SH 34 at Traders Road	15.7	B	16.0	B
SH 34 at FM 1570	99.9	F	41.0	D
SH 34 at FM 1903*	27.5 (EB)	D	35.8 (EB)	E
SH 34 at E FM 1564*	14.3 (WB)	B	12.3 (WB)	B
SH 34 at W FM 1564*	16.0 (EB)	C	12.0 (EB)	B
SH 34 at FM 2101*	493.3 (WB)	F	25.2 (WB)	D
SH 34 at Panther Path	11.8	B	8.8	A
SH 34 at SH 276	27.9	C	22.8	C
SH 34 at E Kirby Avenue / Walmart Driveway	25.8	C	26.1	C
SH 34 at E SH 276	32.0	C	24.6	C
SH 34 at SPR 264	43.5	D	8.5	A
SH 34 at CR 2312*	12.0 (EB)	B	12.8 (EB)	B

LEGEND: LEVEL OF SERVICE		
A, B	C, D	E, F

Field Observations

- SH 34 at IH-30 Westbound Frontage Road (WBFR) – SH 34 at IH-30 WBFR is a signalized intersection. IH-30 WBFR is a one-way cross-street with one U-turn lane, one left turn lane, one shared left/through lane, one through lane, and one right turn lane, with a posted speed limit of 45 mph. The northbound approach of SH 34 is comprised of two left turn lanes and two through lanes with a posted speed limit of 40 mph. The southbound approach of SH-34 is comprised of two through lanes and one right turn lane with a posted speed limit of 40 mph.
- SH 34 at IH-30 Eastbound Frontage Road (EBFR) – SH 34 at IH-30 EBFR is a signalized intersection. IH-30 EBFR is a one-way cross-street with one U-turn lane, one left turn lane, one shared left/through lane, one through lane, and one right turn lane, with a posted speed limit of 55 mph. The northbound approach of SH 34 is comprised of two through lanes and one right turn lane with a posted speed limit of 40 mph. The southbound approach of SH 34 is comprised of two left turn and through lanes with a posted speed limit of 40 mph.
- SH 34 at Traders Road – SH 34 at Traders Road is a signalized T – intersection. Traders Road is a four-lane two-way street with one left and one right turn lane, and two receiving lanes. The posted speed limit on Traders Rd. is 45 mph. The NB approach of SH 34 is comprised of one through lane and one through/right lane with a posted speed limit of 40 mph. The SB approach of SH 34 is comprised of one left turn lane and two through lanes, which narrow to a single lane south of the intersection – with posted speed limit of 40 mph.
- SH 34 at FM 1570 – SH 34 at FM 1570 is a signalized plus-shaped intersection. The EB approach of FM 1570 has one through lane and a left turn pocket with a speed limit of 60 mph. The WB approach of FM 1570 has one through lane and one left and right turn pockets with a speed limit of 50 mph. Both EB and WB right turns are channelized with a refuge island. The NB and SB approaches of SH 34 have one through lane and a left turn bay with channelized right turns and posted speed limit of 50 mph.
- SH 34 at FM 1903 – SH 34 at FM 1903 is an unsignalized T-intersection with stop control on the FM 1903 EB approach. The EB approach of FM 1903 is two-lane two-way street with a speed limit of 55 mph. The NB approach of SH 34 has a left turn bay and a through lane. The SB approach has one through lane and the right-turns are channelized by a painted refuge island. The posted speed limit on the NB and SB approaches of SH 34 is 60 mph.
- SH 34 at E FM 1564 – SH 34 at E FM 1564 is an unsignalized T-intersection with stop control on the E FM 1564 WB approach. Flashing beacon assembly is operational at the intersection. The WB approach of E FM 1564 is a two-lane two-way street with a speed limit of 55 mph and right turns are channelized by painted refuge island. The NB approach of SH 34 has one shared through/right lane and right turns are channelized by a painted

refuge island. The SB approach of SH 34 has one left turn bay and a through lane. The posted speed limit on NB and SB approaches of SH 34 is 60 mph.

- SH 34 at W FM 1564 - SH 34 at W FM 1564 is an unsignalized T-intersection with stop control on the W FM 1564 EB approach. The EB approach of W FM 1564 is a two-lane two-way street with a speed limit of 55 mph and right turns are channelized by painted refuge island. The NB approach of SH 34 has one left turn bay and a through lane. The SB approach of SH 34 has one shared through lane and right turns are channelized by a painted refuge island. The posted speed limit on NB and SB approaches of SH 34 is 60 mph.
- SH 34 at FM 2101 – SH 34 at FM 2101 is an unsignalized T-intersection with stop control on FM 2101 WB approach. The WB approach of FM 2101 is a two-lane two-way street with a speed limit of 35 mph and right turns are channelized by painted refuge island. The NB approach of SH 34 has one shared through/right lane and right turns are channelized by a painted refuge island. The SB approach of SH 34 has one left turn bay and a through lane. The posted speed limit on NB and SB approaches of SH 34 is 55 mph.
- SH 34 at Panther Path – SH 34 at Panther Path is a signalized T-intersection. The EB approach of Panther Path is a two-lane two-way street with a speed limit of 30 mph. The NB approach has a left turn bay and one through lane. The SB approach has one shared through/right lane. The posted speed limit on SH 34's NB and SB approaches are 50 mph.
- SH 34 at SH 276 – SH 34 at SH 276 is a signalized T-intersection with three approaches and a driveway that is not controlled by the signal. The driveway on the east side of the intersection is a one-way in driveway. Hence there is no traffic control at the driveway. The EB approach of SH 276 is a two-way two-lane street with channelized right turns by a painted refuge island. The NB approach has a left turn lane and a through lane. The SB approach has a through lane and a right turn lane with channelized right turns by a painted island. The speed limit on all the approaches were found to be 35 mph. The driveway is on the east side of SH 34.
- SH 34 at E Kirby Avenue/Walmart Driveway - SH 34 at E Kirby Avenue/Walmart Driveway is a signalized plus intersection. The EB approach is the E Kirby Avenue which is a two-lane two-way street with speed limit of 30 mph. The WB approach is the Walmart driveway with one left turn lane and one shared through/right turn lane. The NB approach has one left and right turn lanes and a through lane. The SB approach has one left turn lane and a shared through/right lane. The speed limit on NB and SB approaches is 35 mph.
- SH 34 at E SH 276 – SH 34 at E SH 276 is a signalized T-intersection. The WB approach of SH 276 has one left turn lane and a right turn lane with channelized right turns by a painted island. The posted speed limit on E SH 276 was found to be 45 mph. The NB approach has one through lane and a right turn lane with channelized right turns. The SB

approach has a left turn lane and a through lane. The posted speed limit on NB and SB approaches is 35 mph.

- SH 34 at SPR 264 – SH 34 at SPR 264 is a signalized T-intersection. The EB approach of SPR 264 is a two-lane two-way street with channelized right turns and a speed limit of 50 mph. The NB approach has a shared left/through lane and SB approach has a shared through/right lane with channelized right turns. The posted speed limit on SH 34 approaches is 55 mph.
- SH 34 at CR 2312 – SH 34 at CR 2312 is an unsignalized T-intersection. The EB approach of CR 2312 is a one-lane two-way street with a speed limit of 30 mph. The NB and SB approaches are two-way two-lane streets with a speed limit of 65 mph. There is also a private two-directional driveway at an offset on the east side of the intersection.

Crashes

Crash data provided by TxDOT was summarized for the period between January 2013 and December 2017. Of the more than 343 crashes along the study segment of SH 34 during that period, fourteen crashes involved fatalities. The study corridor was divided into six segments to examine the crash rates and impacts along the corridor more closely.

Crash Frequency and Crash Rates

As seen in the crash data on SH 34 segment 1 Figure 11, a total of 114 crashes took place in the study area over the 5-year period (27, 19, 26, 24, and 18 crashes in the years 2013, 2014, 2015, 2016, and 2017, respectively). This translates to a crash rate of 166 crashes/million vehicle miles traveled (MVMT). Generally, the state-wide average for a similar roadway is 211 crashes/MVMT by highway system: and 151 crashes/MVMT by road type. The data suggests that the crash rate along the corridor study area is higher than the state standard for a similar road type. The segment experienced the greatest number of crashes in the five-year period. Comments from the public confirm that the number of crashes in this segment of the roadway is a major concern.

Crashes on SH 34 segment 2 are presented in Figure 11. It shows that a total of 58 crashes occurred over the 5-year period (15, 10, 10, 16, and 7 crashes in the years 2013, 2014, 2015, 2016, and 2017, respectively). The crash rate was found to be 127 crashes/MVMT, whereas the state-wide average is typically 211 crashes/MVMT by highway system and 151 crashes/MVMT by road type. The crash rate along segment 2 more closely resembles the state average.

Crashes on SH 34 segment 3 are presented in Figure 11. It shows that a total of 34 crashes occurred over the 5-year period (3, 8, 9, 6, and 8 crashes for the years 2013, 2014, 2015, 2016, and 2017, respectively). The crash rate was found to be 95 crashes/MVMT, whereas the state-wide average was 211 crashes/MVMT by highway system and 151 crashes/MVMT by road type. This segment experienced the lowest number of crashes and is below the state average. The segment is located in the middle of the study corridor and not as close to the more developed communities as the other segments.

Crashes on SH 34 segment 4 also are presented in Figure 11. It shows that a total of 40 crashes occurred over the 5-year period (9, 6, 8, 8, and 9 crashes in the years 2013, 2014, 2015, 2016, and 2017 respectively). The crash rate was found to be 109 crashes/MVMT, whereas the state-wide average was 211 crashes/MVMT by highway system and 151 crashes/MVMT by road type. This segment experienced fewer crashes than three of the other segments. The average crashes/MVMT is lower than the state average. However, the number of crashes was 15% greater than segment just to the north.

Crashes on SH 34 segment 5 are presented in Figure 11. It shows that a total of 57 crashes occurred over the 5-year period (14, 10, 13, 15, and 5 crashes in the years 2013, 2014, 2015, 2016, and 2017 respectively). The crash rate was found to be 123 crashes/MVMT, whereas the state-wide average was 211 crashes/MVMT by highway system and 151 crashes/MVMT by road type. The crashes in segment 5 are comparable to the state average

and are the fourth greatest along the 6 segments. The city of Quinlan is within this segment.

Crashes on SH 34 segment 6 are presented in Figure 11. It shows that a total of 40 crashes occurred over the 5-year period (8, 9, 11, 7, and 5 crashes in the years 2013, 2014, 2015, 2016, and 2017, respectively). The crash rate was found to be 143 crashes/MVMT, whereas the state-wide average was 211 crashes/MVMT by highway system and 151 crashes/MVMT by road type. The crashes in this southern segment are less than the state average. This segment is south of Quinlan and located in a less developed area.

Figure 11 - Crashes (2013 - 2017) on SH 34

Access Management Practices

TxDOT requires specific spacing between roadway connections in metropolitan areas that is dependent on the speed limit of the highway. On SH 34, the speed limit is greater than or equal to 50 mph throughout the study area, and as a result, TxDOT requires the minimum spacing to be 425 feet between connections. Throughout the corridor, there are numerous driveways and cross streets that intersect SH 34; many are spaced significantly closer than the specified minimum of 425 feet. Some of these driveways are designed with center islands to allow only right-turn movements to enter and exit, but many are full-purpose. Even those driveways designated as right in/out are frequently ignored by drivers who make illegal left turns in and out of driveways, causing a serious safety problem. There is a turning lane through some of the length of the road. This lane is also used as an acceleration/deceleration lane, which frequently leads to conflicting uses and a growing number of crashes.

Alternative Transportation Options

Alternative forms of transportation are important for numerous reasons, including the reduction of vehicular traffic along the roadways. Therefore, alternative transportation options, such as transit services, are important factors to consider when examining methods of improving mobility and decreasing congestion.

Along SH 34, transit opportunities within the corridor are limited and further analysis will be required to determine the impact of transit improvements on traffic conditions and area mobility. The existing conditions data does not reflect public transit activity. This is in part due to rural nature of the corridor.

Pedestrian and Bicycle Facilities

It is TxDOT's policy to proactively plan, design, and construct roadways to safely accommodate bicyclists and pedestrian mobility. SH 34's alignment passes largely through rural, sparsely populated areas where pedestrians, and bicyclists are very few in number. However, even within the limits of Greenville, and Quinlan, the road does not have bike lanes or sidewalks.

Currently pedestrians are accommodated through the use of existing shoulders and crosswalks, or on separate sidewalks or bike paths/lanes outside of the existing right-of-way. Except for a few designated pedestrian crossings, shoulders along SH 34 are the only places available for bicyclists and pedestrians to use. Existing shoulder widths on SH 34 vary from four to eight feet at certain locations.

Pedestrians also use this road for short local trips. There are several local schools located within the project limits, such as DC Cannon Elementary, Butler Intermediate School, and Thompson Middle School. People often walk along the shoulder of SH 34, especially right after school and during sporting events. All future improvements to SH 34 that are programmed and funded will adhere to TxDOT's bicycle and pedestrian accommodation policy resulting in improved safety conditions along the roadway.

Signage

Signage is used to assist motorists while they drive along roadways. For example signage can be used to guide drivers to local areas of interest, direct traffic to major highways, designate jurisdictional boundaries, display speed limits, and reinforce driving laws (i.e., “left lane for passing only”). Because of the value that different signs have in helping drivers navigate safely, it is important that these signs be consistent, appropriately placed, and easily read and understood.

Signage along SH 34 is consistent and includes street signs at intersections, as well as signs indicating the upcoming street at the next intersection.

Utilities

It is common practice for utility companies to place their utility lines either overhead or underground along or across the right-of-way of existing roadways. Utility lines, including electrical distribution, transmission pipelines, water lines, gas lines, telephone lines, fiber optic lines, and wastewater, are often present near roadways. The presence of utility lines along the SH 34 right-of-way is an important factor that must be taken into consideration during the planning phase of any improvements to SH 34 due to the potential costs associated with relocating these types of utilities. Utility base maps are attached in the supporting exhibit documents.

A detailed existing traffic operational analysis is included in Appendix B.

Chapter 4: Future Conditions

Methodology
No-Build Scenario – Existing Conditions
No-Build Scenario – Level of Service
Short-Term Conditions – Build
Mid-Term Conditions – Build
Long-Term Conditions – Build
Alternative Evaluations and Scoring

Methodology

As part of the Feasibility Study, the following scenarios were analyzed using Synchro 10, a traffic analysis software based on the methodologies contained in the Highway Capacity Manual, for both AM and PM peak-hour time periods:

- Existing conditions (2018)
  - No-build
  - Build (with short-term improvements)
- Mid-term conditions (2038)
  - No-build
  - Build (with mid-term improvements)
- Long-term conditions (2048)
  - Build Option

Traffic Volume Forecasting

Peak-hour traffic forecasts for the SH 34 corridor were developed by applying growth rates to the existing AM and PM peak-hour intersection turning movement counts. The growth rates were based on previously developed year 2020 traffic volume projections and daily traffic volume forecasts from TxDOT and the North-Central Texas Council of Governments (NCTCOG). Daily traffic volume projections developed by TxDOT and NCTCOG show average annual growth rates that are approximately 2% in the study area.

Based on the NCTCOG and TxDOT projections, along with previous year daily traffic comparisons, a 2% annual growth rate was projected between 2018 and both project analysis years (2038 and 2048) for most of the corridor. This results in an overall growth of 49% percent between 2018 and 2038, and an aggregate 81% percent growth between 2018 and 2048.

No-Build Scenario – Existing Conditions

In the no-build version of the Existing Conditions system, no improvements were made to any street. The conditions, as known from the corridor, were input to the software for analysis.

General Characteristics

The no-build option leaves the existing number of main lanes and turning lanes at intersections in the current configuration. Planned development in the area will add new residential and commercial driveways, and intersections along the corridor.

Construction Cost

The construction cost would be zero dollars. Therefore, the least expensive option is the no-build option.

Construction Time

The construction time would be zero years for the no-build option.

Construction Disruption

There would be no construction disruption for the no-build option.

Community Impacts

The no-build option could have negative community impacts due to increased congestion resulting in time lost traveling to and from all work and personal activities. There would be increased frustration with TxDOT and local municipalities to resolve the community's concerns with congestion, high crash rates, and difficult access to properties.

Environmental Impacts

There would be moderate negative environmental impacts for the no-build option. Traffic growth would exceed existing capacity leading to increased traffic congestion and higher frequency of stop-and-go. Both these factors would increase vehicular emissions.

Drainage Impacts

With no construction for the no-build option, the drainage patterns would remain the same along SH 34. Therefore, there would be no drainage impacts.

Right-of-way Impacts

With no construction for the no-build option, the right-of-way would remain the same along SH 34. Therefore, there would be no right-of-way impacts.

Mobility Benefits

The no-build option would not allow for any mobility benefits. Roadway users would experience increased travel time to and from all work and personal activities. Accessing properties would be increasingly difficult.

Safety Benefits

The no-build option would not allow for any safety benefits. The center two-way left-turn lane has already begun to show signs of exceeding its usefulness with increased head-on collisions. Roadway users could potentially be involved in more crashes that involve access to and from adjacent properties due to fewer acceptable gaps in the opposing traffic stream, resulting in some drivers taking unnecessary chances.

No-Build Scenario – Level of Service

For the no-build scenario, it was assumed that no improvements would take place either at intersections, or the main lines in any year – 2018, or the future. It is the "worst case scenario." It also provides a base condition to contextualize how conditions could improve should minimal improvements be made, or if all of the proposed improvements were implemented in the future (2038, or 2048).

As is clear from the results presented in Table 9, all the intersections would see a decline in the LOS grade. Those at F in the Existing Conditions remain at F, while the others decline. The modal LOS grade would become F across almost all cases – AM or PM peak, in 2038, and in 2048. While the traffic is assumed to increase only at 2% per annum (49% overall), the delays in 2038 would increase at 5% per annum (235%) overall, as compared to the current Existing Conditions. In 2048, this increase would become 5% per annum (542%) as compared to the current Existing Conditions. Therefore, some measures will have to be taken to mitigate the future impacts.

Table 9 - Level of Service and Delays - No Build Scenarios

Intersection	Year 2038				Year 2048			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
SH 34 at IH 30 WBFR	C	21.6	C	31	C	25.5	D	44.7
SH 34 at IH 30 EBFR	B	18.6	D	43.6	C	22.6	E	74.1
SH 34 at Traders Road	C	20.6	C	27.3	C	25	D	52.2
SH 34 at FM 1570	F	227.7	F	127.1	F	296.8	F	203
SH 34 at FM 1903*	F	184.8	F	350.8	F	578	F	793.8
SH 34 at E FM 1564*	D	28.9	E	36.5	F	105.6	F	180.4
SH 34 at W FM 1564*	E	37.3	C	23.9	F	98.2	E	48.9
SH 34 at FM 2101*	F	3045.5	F	77.6	F	6709.9	F	196.9
SH 34 at Panther Path	B	17.2	B	12.4	C	25.6	B	15.7
SH 34 at SH 276	F	90.7	E	72	F	136.4	F	113.5
SH 34 at E Kirby Avenue / Walmart Driveway	F	85.7	E	74.1	F	128.3	F	113.7
SH 34 at E SH 276	F	128.4	F	104.8	F	187.2	F	153
SH 34 at SPR 264	F	682.3	B	16.1	F	860.4	C	24
SH 34 at CR 2312*	B	14.4	C	17	C	16.2	C	18.1

LEGEND: LEVEL OF SERVICE		
A, B	C, D	E, F

Short-Term Conditions – Build

As was evident in the no-build scenario, there is an urgent need to enact some improvements on the ground to alleviate the worsened conditions anticipated in 2038 and 2048. Therefore, below are the proposed short-term improvements that can be implemented with little change to the overall road. These are mostly improvements of the signals, and at five intersections. Low-cost, easily implementable improvements for the short-term build conditions scenario were developed and were input to Synchro to calculate the new Levels of Service. Table 10 provides a list of the recommended short-term improvements along with AM and PM peak-hour intersection delays and LOS.

The short-term improvements proposed are:

1. At SH 34 @ FM 1570:
    a. Addition – Northbound through lane
    b. Addition – Southbound through lane
    c. Removal – Island on eastbound approach
    d. Pavement Marking – Re-stripe to provide additional shared through/right lane
2. At SH 34 @ FM 1903:
    a. Addition – Eastbound right-turn lane
    b. Addition – New Traffic Signal
3. At SH 34 @ FM 2101:
    a. Addition – New Traffic Signal
4. At SH 34 @ East SH 276
    a. Change – Modify existing traffic signal as per CSJ 290-07-001 Quinlan by-pass project)
5. At SH 34 @ SPR 264
    a. Addition – Northbound left-turn lane
    b. Change – Modify existing traffic signal to accommodate the left-turn lane

Table 10 - Level of Service and Delays - Short Term Improvements

Intersection	Existing Conditions				Year 2038				Year 2048			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
SH 34 at IH 30 WBFR	B	16.7	C	20.7	C	21.6	C	31	C	25.5	D	44.7
SH 34 at IH 30 EBFR	B	14.9	B	17.1	B	18.6	D	43.6	C	22.6	D	41.4
SH 34 at Traders Road	B	15.7	B	16	C	20.6	C	27.3	C	25	D	52.2
SH 34 at FM 1570	C	27.2	C	24.2	D	43.5	D	54.8	D	51.4	E	62.7
SH 34 at FM 1903*	A	6.7	A	9.9	B	11.1	B	18	B	14.3	D	43.1
SH 34 at E FM 1564*	B	14.3	B	12.3	D	28.9	E	36.5	F	105.6	F	180.4
SH 34 at W FM 1564*	C	16	B	12	E	37.3	C	23.9	F	98.2	E	48.9
SH 34 at FM 2101*	B	16.8	A	7	D	49	B	10.2	F	85.1	B	12.2
SH 34 at Panther Path	B	11.8	A	8.8	B	17.2	B	12.4	C	25.6	B	15.7
SH 34 at SH 276	C	28	C	22.8	F	84.4	E	65.6	F	128.2	F	110.9
SH 34 at E Kirby Avenue / Walmart Driveway	C	25.8	C	26.1	D	53	E	68.4	F	85.5	F	88.7
SH 34 at E SH 276	D	47.3	C	33.8	F	122.1	E	63.4	F	239.2	F	134.7
SH 34 at SPR 264	C	23.4	A	7.9	E	65.1	B	12.3	F	120.8	B	15.6
SH 34 at CR 2312*	B	12	B	12.8	B	14.4	C	17	C	16.2	C	18.1

LEGEND: LEVEL OF SERVICE		
A, B	C, D	E, F

The table above represents the output (LOS and delay) based on implementation of the short-term improvements now (2018, marked as Existing Conditions in the table), 2038, or 2048. While the conditions would still worsen over time, they would be better compared to the outcome in the No-Build scenario. Implementing the short-term improvements in the short term (base year 2018), we can see the following improvements:

1. In 2018, none of the intersections would be at LOS F; the average delay would lessen from 40 seconds to 18 seconds in 2018.
2. In 2038, the modal LOS would improve from F to B; the average delay would improve to 38 seconds as opposed to a No-Build Scenario of 200 seconds.
3. In 2048, the average delay would decrease from 402 seconds to 68 seconds.
4. The number of consecutive sections at LOS E or LOS F are reduced.

Detailed traffic analyses for future conditions are included in Appendix B, along with the traffic signal warrant analysis for SH 34 and FM 1903 is included in Appendix B as well.

General Characteristics

The short-term option is composed of intersection improvements that add additional turn lanes, signal timing/phasing changes, and lane restriping. This added capacity at the intersections allows more traffic to flow through the intersection, thereby reducing travel times on both SH 34 and the secondary roadways. The additional capacity also allows for

easier and safer access to and from SH 34. Development in the area will add new residential and commercial driveways and intersections along the corridor.

Construction Cost

The construction cost for the short-term option would be minimal and therefore is relatively inexpensive. The typical cost for these improvements is $2 million.

Construction Time

The construction time for the short-term option would average around six months per project. Due to the varying lengths of time needed by each intersection, users of SH 34 should expect multiple projects spanning several years.

Construction Disruption

The construction disruption would be minimal for the short-term option. Users along SH 34 would endure small impacts while the side street users could experience slightly longer disruption times due to limited lanes and staged construction leading to access restrictions to SH 34.

Community Impacts

The short-term option would have both positive and negative community impacts. The positive impacts include less time to access SH 34 and less congestion along SH 34 although these benefits would be temporary. Eventually, the volume of traffic demand along SH 34 would reach a point that the completed intersection improvements would no longer control the delays. This is evident from the table above since in 2048, the modal LOS does not improve as compared to the No Build Scenario. The negative community impacts include the limited benefit of the improvements and the eventual decreased property values due to congested access; decreased quality of life due to time lost traveling to and from all work and personal activities; and increased frustration with TxDOT and local municipalities to resolve their concerns with congestion, high crash rates, and difficult access to properties.

Environmental Impacts

Short-term improvements are proposed at five intersections: FM 1570, FM 1903, FM 2101, East SH 276, and Spur 264.

At the SH 34 FM 1570 intersection, all improvements would be conducted within the existing ROW. One business, Alliance Bank, is located on the southwest corner of the intersection (See Figure 2.1) in Appendix D). All environmental constraints were identified via desktop review. Further investigation of the environmental constraints would occur during the NEPA phase of the proposed project.

At the SH 34 FM 1903 intersection, all improvements would be conducted within the existing ROW. One business, The Henry Group, is located at the northwest corner of the intersection. No environmental constraints were identified (See Figure 2.2 in Appendix D). All environmental constraints were identified via desktop review. Further investigation of the environmental constraints would occur during the NEPA phase of the proposed project.

At the SH 34 FM 2101 intersection, all improvements would be conducted within the existing ROW. One public facility, the Boles Campus of Arms of Hope, is located at the northeast corner of the intersection. Portions of the existing ROW are within the 100-year floodplain (See Figure 2.3 in Appendix D). All environmental constraints were identified via desktop review. Further investigation of the environmental constraints would occur during the NEPA phase of the proposed project.

At the SH 34 East SH 276 intersection, all improvements would be conducted within the existing ROW. Five businesses are located adjacent to the intersection. E-Z Mart is located on the northeast corner and both Popeyes and Shell Gas Station are located on the southeast corner. In addition, Soulman's Bar-B-Q is located on the northwest corner, and Winslow's is located at the southwest corner. No environmental constraints were identified (See Figure 2.4 in Appendix D). All environmental constraints were identified via desktop review. Further investigation of the environmental constraints would occur during the NEPA phase of the proposed project.

At the SH 34 Spur 264 intersection, all improvements would be conducted within the existing ROW. Two schools are located adjacent to the intersection: WH Ford Highschool, which is located on the northwest corner, and Quinlan ISD Special Services Center, which is located on the northeast corner. No environmental constraints were identified (See Figure 2.5 in Appendix D). All environmental constraints were identified via desktop review. Further investigation of the environmental constraints would occur during the NEPA phase of the proposed project.

Drainage Impacts

With minimal construction for the short-term option, the drainage patterns would remain essentially the same along SH 34, so there would be no drainage impacts. Most likely, culverts would remain the same size and only be extended as needed. Driveway pipes near the intersection may need to be relocated if the ditch needs to be adjusted.

Right-of-way Impacts

With minimal construction for the short-term option, the right-of-way would be adjusted, as needed, to allow for corner clips at intersections. These clips would be necessary to maintain the sight distances for vehicle accessing SH 34.

Mobility Benefits

The short-term option would allow for temporary mobility benefits due to operational improvements at the SH 34 intersections. Eventually, roadway users would experience more time lost traveling to and from all work and personal activities, and increasing difficulty accessing properties.

Safety Benefits

The short-term option would allow for minimal safety benefits. Increasing the number of lanes at the intersections would provide safer turning movements to and from SH 34. This would be temporary as the traffic demand will increase due to population growth and development. The intersection improvements do not address safety issues along SH 34.

The center two-way left-turn lane has already begun to show signs of exceeding its usefulness and has experienced increased collisions. Motorists could potentially be involved in more crashes that involve access to and from properties due to limited opportunities of open space.

Mid-Term Conditions - Build

General Characteristics

The mid-term improvements are suggested as part of the long-term improvements. Since the short-term improvements are not able to address the long-term congestion problem, several long-term solutions are suggested in later sections of this document. These include the acquisition of new right-of-way along the alignment to widen the road. There are, however, six bridges along the alignment that can be treated independently from the rest of the road and could provide congestion relief as part of a phased approach to implementing improvements. Reconstruction of these bridges are the first phase of the long-term improvements. The mid-term improvements are, therefore, the widening and reconstruction of the six bridges along the alignment. Since this intervention is part of the larger aim of widening the whole road, the Synchro model is not run for LOS/delay outcomes separately.

The six bridges are located towards the southern end of the corridor, south of FM 2101. Two of these are located south of the city of Quinlan and are slightly longer than the other four. The average length of each bridge is 369 feet between FM 2101 and the city of Quinlan; and 575feet south of Quinlan.

Construction Cost

The total construction cost (not including the cost of right-of-way and utility relocation) for the mid-term improvements is $48 million. This works out to an average of $8 million per bridge.

Presence of utility lines also determines the cost of construction. At FM 2101 there are three utilities that maybe required to be relocated or adjusted. These are: Over-Head Fiber Optic Cables (FOC) by Peoples, and Farmers, underground FOC by Zayo, and a natural-gas pipeline. At South of Quinlan, there are the following utilities: Over-Head FOC by Frontier, Peoples, and Farmers, underground FOC by Zayo, a natural-gas pipeline, and a 6” water pipeline.

Construction Time

Construction will begin when the requisite permits and funds become available. It is safe to predict that once the construction begins, implementing the projects will take a few years.

Construction Disruption

Mid-term construction will cause significant disruption due to the creation of a traffic choke point along the road. A reduction in the number of lanes due to construction could lead to access restrictions to all the streets that cross SH 34 near the bridge sites.

Community Impacts

There will not be a significant impact to the community at large as a result of the widening

of the bridges. Residents in specific areas, near the bridge sites, and those running trucks along the route will benefit significantly upon completion of construction. In this stretch of the road, the percentage of heavy vehicles is high. A wider bridge, however, would allow trucks to pass without significantly hindering traffic on other lanes. This would be a positive impact.

Environmental Impacts

Mid-term improvements include the replacement of two bridges within the project area (See Appendix D). To determine potential environmental constraints, we looked 500-feet past the northern and southern limits of the two bridges. The first bridge crosses a tributary to the South Fork Sabine River, while the second bridge crosses over the South Fork Sabine River. See Table 11 below for a list of constraints for the mid-term improvements. All environmental constraints were identified via desktop review. Further investigation of the environmental constraints would occur during the NEPA phase of the proposed project.

Table 11 - Preliminary Environmental Constraints for Mid-Term Improvements

Mid-Term Improvements		
Feature	Acreage	Number of
Floodplain	14.61	N/A
NWI	0.30	N/A

Drainage Impacts

Under the mid-term option for improvements, the drainage patterns would remain mostly the same as the existing conditions along SH 34, including drainage boundaries, roadside ditches, and pavements. The six culverts and bridges would need to be extended to accommodate the future widening. There is no drainage impact at this stage.

Right-of-way Impacts

New right-of-way will be needed to accommodate the widened bridges. The four bridges between FM 2101 and Quinlan are currently two-lane, two-direction undivided carriageways that are 42 ft wide. They will be widened into 84-ft roadways. The other two bridges are already 68 ft wide and will also be widened to 84 feet. In total, (80,350 ft^2) 1.844 acres of new area will be added to the right-of-way, creating 1.3 lane-miles in total.

Mobility Benefits

The mid-term option would provide some mobility benefits. Once the construction of the additional lane is complete, users traveling the SH 34 corridor would experience improved travel times. There could be some choke points where the widened bridge narrows down to the existing width of the roadway.

Safety Benefits

Only improving the bridges along the alignment will not improve safety conditions on the road overall. While in some sections the chances of an accident will be reduced, the reduction in the number of lanes occurring at the end of the bridges will increase the chances of accidents as vehicles from different lanes merge. This might negate the effect of widening the section. Overall, no improvement in safety is expected due to the mid-term improvements.

Long-Term Conditions - Build

From the results of the improvements made in the short-term section, it is clear that, while these improvements can alleviate the anticipated conditions, they cannot solve the supply side problem –a lack of roadway to carry enough volume of future traffic. Therefore, the following long-term improvements are proposed to meet the future travel demand and capacity needs in the corridor. These long-term improvements would widen the entire length of the highway – including the six bridges *en route* and allow for a higher throughput in the future. The improvements are:

1. At SH 34 @ SH 276:
    a. Addition – EB right-turn lane, completed by 2048
2. At SH 34 @ E SH 276:
    a. Addition – WB left-turn lane, complete by 2048
    b. Addition – WB (Exclusive) right-turn lane, complete by 2048
    c. Addition – SB left-turn lane, complete by 2038

    This is the only project that must be completed by 2038 for the combined effect of the other projects to show improvements to the overall network.
    d. Addition – Acceleration lane for NB right-turn lane, complete by 2048.

In addition to these specific changes, the cross-section of the road would be widened to add lanes as well. The new cross-sections are diagrammed below:

All these modifications were input to the model in Synchro and the output is in Table 12:

Table 12 - Level of Service and Delays - Long-Term Improvements

Intersection	Existing Conditions				Year 2038				Year 2048			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
SH 34 at IH 30 WBFR	B	16.7	C	20.7	C	21.6	C	31	C	25.5	D	44.7
SH 34 at IH 30 EBFR	B	14.9	B	17.1	B	18.6	D	43.6	C	22.6	D	40.9
SH 34 at Traders Road	B	15.7	B	16	C	20.6	C	27.3	C	25	D	52.2
SH 34 at FM 1570	C	27.2	C	24.2	D	43.5	D	54.8	D	46.5	D	53.8
SH 34 at FM 1903*	A	5.3	A	6.7	A	6.4	A	9.2	A	7.6	B	11.5
SH 34 at E FM 1564*	B	10.8	A	9.9	B	14	C	17.6	C	17.9	D	32.7
SH 34 at W FM 1564*	B	12.4	B	10.9	C	19.9	C	18.4	D	29.5	D	30
SH 34 at FM 2101*	B	13.5	A	5.8	C	30.1	A	7.2	D	53.9	A	7.7
SH 34 at Panther Path	A	8.7	A	6.8	B	11.3	A	7.7	B	12.7	A	7.8
SH 34 at SH 276	B	18.9	B	17.6	D	50.5	D	39.6	C	24.6	C	28.8
SH 34 at E Kirby Avenue / Walmart Driveway	B	17.5	B	18.3	C	22.3	C	25.7	C	30.8	D	38.5
SH 34 at E SH 276	D	47.3	C	33.6	D	37	D	41.3	D	48.3	D	47.5
SH 34 at SPR 264	A	9.4	A	6.7	B	18.3	A	8.7	C	25	A	10
SH 34 at CR 2312*	B	11.1	B	10.7	B	12.8	B	12	B	14.2	B	12.2

LEGEND: LEVEL OF SERVICE		
A, B	C, D	E, F

The table above represents the output (LOS, and Delay) should the long-term improvements be implemented now (2018, marked as Existing Conditions in the table), 2038, or 2048[1]. When the long-term improvements are implemented, the condition of the road would not deteriorate into the unacceptable region of LOS E or F. As compared to the no-build condition, the following improvements would be realized:

1. In 2018, none of the intersections would be at LOS F; the average delay would lessen from 40 seconds to 15 seconds in 2018.
2. In 2038, the modal LOS would improve from F to B; the average delay would improve to 24 seconds from a No-Build scenario of 200 seconds.
3. In 2048, the modal LOS would improve from F to D; the average delay would decrease from 402 seconds to 29 seconds.
4. The rate of growth of delay over the three years under consideration would be 2%, which is in line with the rate of growth of traffic, i.e., 2%.

A detailed future traffic operational analysis can be found in Appendix B.

[1] Even when they are implemented in 2048, the improvement mentioned in 2c of this section much be finished by 2038

General Characteristics

The long-term improvement options assume that the short-term improvements have already been constructed. Over time, congestion along SH 34 is still projected to occur, resulting in a reduced LOS because of a lack of supply, i.e., a lack of lanes available for maintaining throughput to match the volume of vehicles along the road. Therefore, TxDOT proposes to add new lanes along the entire length of the highway such that it becomes a consistent five-lane highway throughout, except for the last 1.6 miles, where it will become a divided four-lane highway. The additional lanes will be configured to a five-lane section as shown in Figure 12 below.

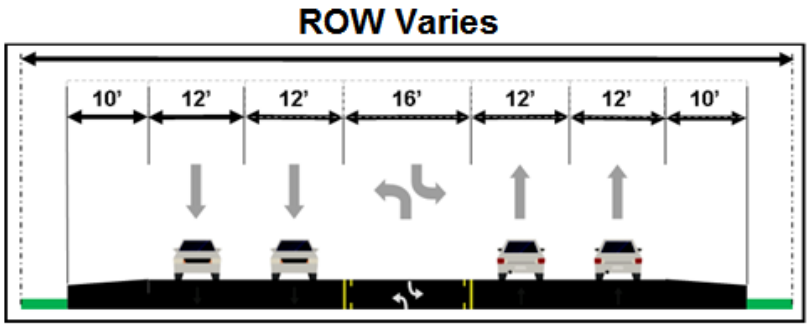


Figure 12 - Proposed Right-of-Way Section 1

This is important particularly for the roads stretching through urban areas in the cities of Greenville, and Quinlan. There are multiple roads that connect to the study area along SH 34 and the roadway widening would increase the general safety of the road if a turning lane were provided for vehicles to make a turn onto any of the connecting roads. For the southernmost 1.6 miles, the proposed road configuration will be as shown in Figure 13.

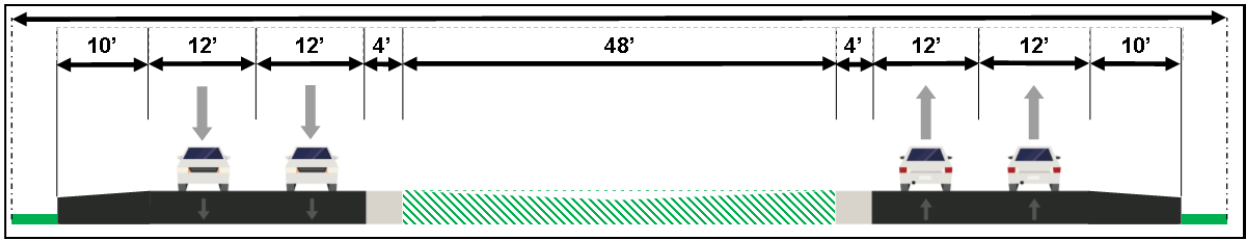
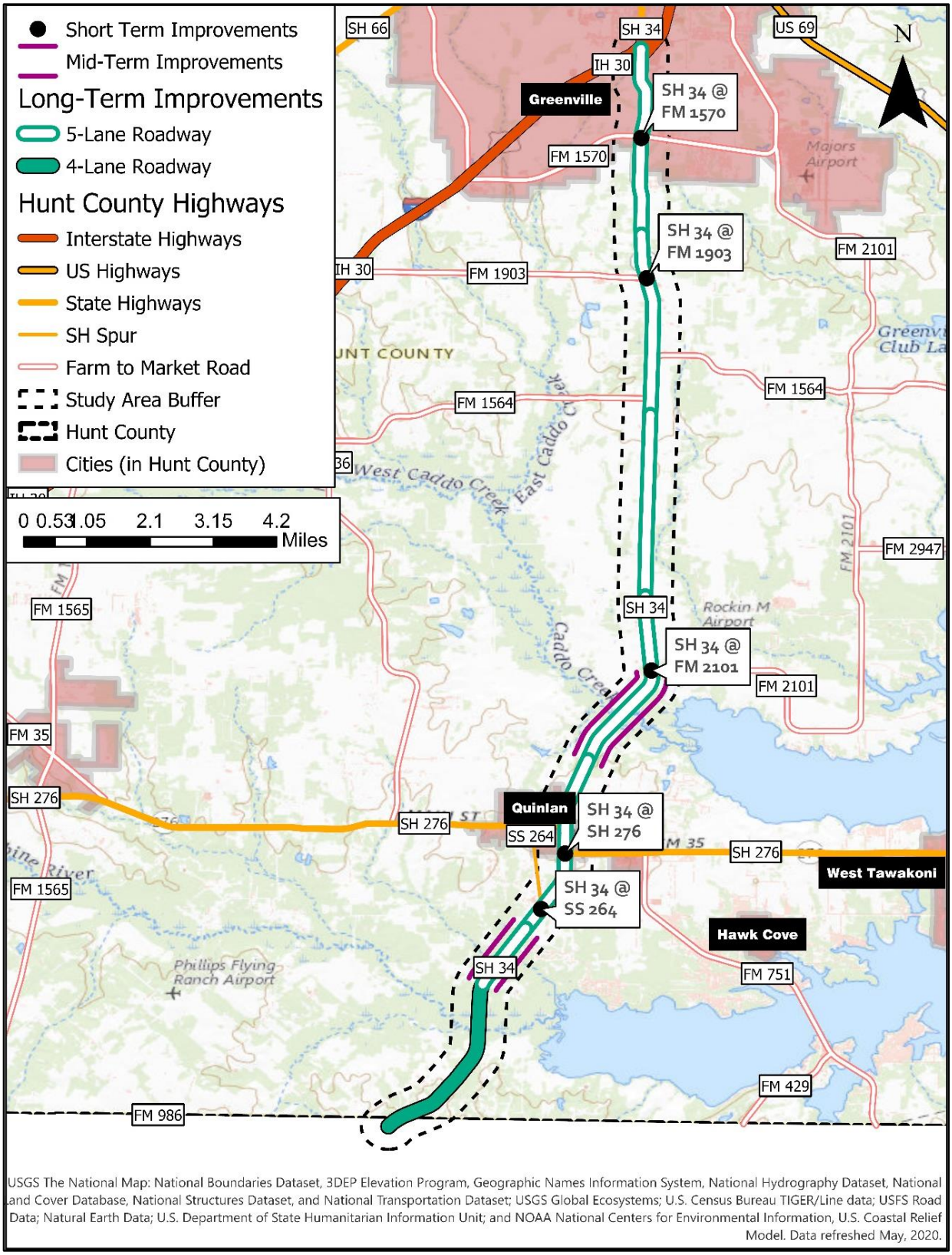


Figure 13 - Proposed Right-of-Way Section 2

This configuration allows for future expansions into the depressed median, should the need arise. However, as indicated in Table 5, the percentage of heavy vehicles increases substantially in the southern run of the road. A wide, depressed median allows for separation between opposing lanes of traffic to reduce the chances of accidents, therefore, making the road safer. The alignment of the roads is shown in Figure 14.



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed May, 2020.

Figure 14 - Location of Sections 1 and 2 Along Alignment

Alternative Evaluation and Scoring

Locating Additional Lanes from IH-30 to CR 2312

The SH 34 Feasibility Study also addresses creating a paradigm to determine how the existing road can be widened. There are three options for widening:

Option A: Eastside Widening – whether additional land should be acquired to the east of the existing alignment

Option B: Westside Widening – whether additional land should be acquired to the west of the existing alignment

Option C: Center Widening – whether additional land should be acquired to either side of the existing alignment.

Three options were evaluated for providing additional capacity between IH 30 and CR 2312 and a decision matrix approach was used as a qualitative exercise to score the alternatives. The option with the highest score is viewed as the preferred alternative. In the following sections, the ten scoring criteria are discussed:

1. Construction Cost
2. Construction Time
3. Displacements, and Construction Disruption
4. Community Impacts
5. Environmental Impacts
6. Drainage Impacts
7. Right-Of-Way Impacts
8. Mobility Benefits
9. Safety Benefits
10. Additional Lane Benefits

To aid in the analysis, the criteria were combined into the following four broad categories. In the absence of consistently quantifiable data, other than displacements, it was proposed that the relative weights of these four categories be the number of criteria that are combined into them:

1. Ease of Acquisition – Cost, Time, and Right-of-Way Impacts 3/10 = 0.30
2. Community Benefits – Displacements/Disruption, Community Impacts 2/10 = 0.20
3. Environmental Benefits – Environmental and Drainage Impacts 2/10 = 0.20
4. Ease of User Access – Mobility, Safety, and Additional Lane Benefits 3/10 = 0.30

For scoring the alternatives in each category, a five-point Likert Scale was used. Using this methodology, and the information in the following sections, the scores were assigned in Table 13 below:

Table 13 - Alternatives Evaluation

	Weight	Option A	Option B	Option C
Acquisition	0.30	2.33	3.00	4.00
Community	0.20	2.50	3.00	3.50
Environment	0.20	2.00	2.50	2.00
User Access	0.30	2.67	2.67	2.67
TOTAL	–	2.40	2.80	**3.10**

Starting from an average of 3 in all categories, points were either granted to deducted based on relative benefits in the four categories. A summary is provided in Table 14, and descriptions are in the following section:

Table 14 - Summary of Scoring Results

Category	OPTION A	OPTION B	OPTION C
Acquisition			
Cost	2	3	5
Time	2	3	4
Right of Way	3	3	3
Community			
Displacements/Disruption	2	3	4
Community Impact	3	3	3
Environmental			
Environmental Impact	1	2	1
Drainage Impact	3	3	3
User Access			
Mobility	2	2	2
Safety	3	3	3
Additional Lane Benefit	3	3	3

Construction Cost

For the long-term improvements, the total cost of construction is estimated to be $76 million, and the acquisition of right-of-way is expected to cost $17 million. Counting from the number of displacements involving buildings we see that Option A would require land from 66 plots which are designated buildings, while Option B would require land from 50 such plots. These are both higher than Option C where buildings are only on nine of the plots. Therefore, we must rate Option C higher than average, at 5. And Options A, and B at a lower than average, 2, and 3, respectively.

Construction Time

Knowing the number of displacements in each alternative, we could differentiate in the points awarded. Options A, and B require 73, and 55 displacements, respectively. Option C requires only 24. The average number of displacements is 51. Therefore, we can award 3 points to Option B, and using this as the base, 4 points to C, and 2 points to A.

Number of Displacements, and Construction Disruption

Displacements are defined for such parcels where the right-of-way either touches a building or passes closer than ten feet from it. In the process of land acquisition, several properties will have to be displaced. We know from data that this number ranges from 24 to 74 depending on where the land is acquired from. While a majority of these plots are those involving some sort of built structure, a few of them are also existing surface infrastructure: parking lots, or gas stations, for example. Based on the number of plots being displaced, the scores awarded are 2 for Option A, 3 for Option B, and 4 for Option C.

During the environmental and schematic design phase, the preferred alignment would be reviewed to minimize the number of potential displacements and parcel impacts.

Community Impacts

Options A, B, and C disrupt the community is similar ways. Disruptions to access from either side is disadvantageous because of the sporadic nature of development that are outside the cities of Greenville, and Quinlan. For the locations within city limits of Greenville, and Quinlan, the impact will be larger in magnitude, but not relatively better on either side. In total there is no discernable advantage in any one option over the other. All options are therefore awarded 3 points.

Environmental Impacts

Potential Environment Constraints in Study Area

The following sections identify and describe potential environmental constraints in the quarter-mile-radius study area, and include environmental constraints such as land use,

historic properties, cemeteries, school, residential and commercial properties, archeological sites, gas and oil wells, water wells, pipelines, stream crossings, National Wetlands Inventory Database, and potential threatened and endangered species impacts.

Land Uses

The majority of the land use within the study area is undeveloped which is frequently used for agricultural purposes, followed by residential. After residential, the majority of land use within the study area is commercial, with the commercial sites scattered across the project limits, but also concentrated at the north end of the project limits. There are approximately 13 places of worship, six public facilities, and six schools within the study area. In addition, there are five cemeteries within the study area: Quinlan Cemetery, Boyle Cemetery, Odd Fellow Cemetery, Mount Bethel Cemetery, and Simmons Cemetery. Mapped land use within the study area is shown in Appendix D.

State and City Parks

Data obtained from the Texas Parks and Wildlife Department (TPWD) and Texas Natural Resources Information System identified that there were no state or city parks located within the study area.

Section 4(f)

Section 4(f) of the U.S. Department of Transportation Act of 1966 protects public owned parks, recreation areas, wildlife and waterfowl refuges, or significant historic sites. The Lake Tawakoni Wildlife Management Area is located west of SH 34 within the study area. This wildlife management area is most likely subject to Section 4(f) of the DOT Act of 1966. Therefore, it is considered an environmental constraint. Should proposed improvement require ROW or affect the use of the wildlife management area, then Section 4(f) would apply and an evaluation would be conducted to determine that there is no feasible and prudent alternative to the use of the land from the property and the action includes all possible planning to minimize harm resulting from such use.

Oil and Gas Wells

Oil and gas well data were obtained from the Railroad Commission of Texas (RRC). Approximately eight natural gas wells were identified and mapped as well as twelve petroleum storage tanks, and two private well sites (see Appendix D). Table 15 shows the impact of Options A to C. Of the 8 existing Natural Gas Wells, none of the three Options affects any of them.

Petroleum Pipelines

Petroleum pipeline data were obtained from the RRC. The study area contains approximately eight natural gas pipeline segments (see Appendix D). Table 15 shows the impact of Options A to C. Of the 8 existing pipelines, three are affected by each of the Options.

Water Wells

Water well data obtained from the TWDB and MPGCD identified six groundwater wells in the study area (see Appendix D). Table 15 shows the impact of Options A to C. Of the 52 existing Water Wells, Option A affects zero, B affects two, and C affects one of them.

Historic Properties and Potential Historic Properties

The Texas Historic Sites Atlas was reviewed to identify the presence of properties listed on the National Register of Historic Places (NRHP) or designated as National Historic Landmarks (NHLs), designated as standing structure State Antiquities Landmarks (SALs) or Recorded Texas Historic Landmarks (RTHLs), or Official Texas Historical Markers (OTHMs). TxDOT's Google Earth database layers of historic-age bridges and previously identified NRHP-eligible properties were also reviewed. There are also no historic-age bridges or structures within the study area.

Archeological Historic Properties and Potential Archeological Historic Properties

The Texas Historical Commission's Archeological Sites Atlas was reviewed for information on previous investigations, previously documented archeological sites, and cemeteries within the study area. According to the ATLAS, there are three archeological surveys recorded within the study area. In addition, there are four historic aged cemeteries located within the study area: Boyle Cemetery, Odd Fellow Cemetery, Mount Bethel Cemetery, and Simmons Cemetery (see Appendix D). Considerations will be made to avoid cemeteries during the schematic design phase with detailed design survey and topographic information. Table 15 shows the impact of Options A to C. Of the 5 existing Acheological Surveys, each of the three Options affects one of them.

Streams

Five bodies of water were identified in the study area: South Fork Sabine River, Mustang Branch, Farber Creek, Caddo Creek, Jones Creek, as well as one lake: Lake Tawakoni (see Appendix D). Table 15 shows the impact of Options A to C. Of the 110 existing Streams, Option A affects 12, Option B affects 11, and Option C affects 10 of them.

100-Year Floodplain

Portions of Caddo Creek, Jones Creek, and Sabine Creek are part of the 100-year floodplain (See Appendix D).

National Wetlands Inventory Features

National Wetlands Inventory data were obtained from the U.S. Fish and Wildlife Service and mapped in the study area. National Wetlands Inventory features in the study area include approximately 33.3 acres of freshwater emergent wetlands, 303.2 acres of freshwater forested/shrub wetlands, 31.3 acres of riverine, and 60.6 acres of freshwater ponds. These features do not necessarily meet the Clean Water Act definition of wetlands (see Appendix D). Field surveys would need be conducted during subsequent phases of study development.

Threatened and Endangered Species

Information and data were obtained from the TPWD and U.S. Fish and Wildlife Service for threatened and endangered species in Hunt County. The Natural Diversity Database (NDD) search from TPWD identified no known element of occurrence records for threatened or endangered species within the study area.

Potential Hazardous Materials Sites

Potential hazardous materials sites were identified within the study area based upon a regulatory database search conducted in August 2018. A copy of the database search report is included in Appendix D. Approximately 42 potential hazardous materials sites were identified within 500 feet of the existing road.

According to the radius report, approximately 33 petroleum storage tanks were identified within 500 feet of the existing roadway. In addition, the report identified two Tier II Chemical Reporting Program Facilities, 13 Leaking Petroleum Storage Tanks, 12 Industrial and Hazardous Waste Sites, one Affected Property Assessment Reports, two Voluntary Cleanup Program Sites, and two Dry Cleaner Registration Database.

It is anticipated than an initial site assessment would be conducted during the NEPA phase of the project.

Long-Term Solutions

Long-term improvements are proposed across the corridor (See Appendix D). See Table 15 below for a list of constraints for the long-term improvements for all three corridor footprints. All environmental constraints were identified via desktop review. Additional research, surveys, or coordination may be required depending on the environmental constraint and the type(s) of improvements proposed for the project. Further investigation of the environmental constraints would occur during the NEPA phase of the proposed project.

While scoring these projects and considering the information just described, any loss to the environment was deemed less than ideal. Therefore, relatively speaking, the best score that could be awarded was a 2. However, since the land to the east of the current alignment has more streams, commercial structures, and petroleum storage tanks, as seen in Table 15 below , Option A was rated a little lower as a 1. Options B and C were rated 2. Another consideration before finalizing environmental score is the number of cemeteries. As compared to Option B, Options A, and C have more cemeteries. Therefore, Option C is also marked at 1. The final scores are: Options A, and C – 1; Option B – 2.

Detailed environmental constraints report and maps are attached in Appendix D.

Table 15 - Preliminary Environmental Constraints for Long-Term Improvements

Study Area		
Feature	Acreage	Number of
Existing Right-of-way	277.87	N/A
Open Water	57.25	N/A
Floodplain	6343.72	N/A
NWI	428.58	N/A
NDD	363.02	N/A
Streams	N/A	118
Natural Gas Wells	N/A	8
Commercial Structures	N/A	263
Places of Worship	N/A	13
Schools	N/A	6
Cemeteries	N/A	5
Archeological Surveys	N/A	5
Water Wells	N/A	52
Gas Pipelines	N/A	8
Petroleum Storage Tanks	N/A	12

Western (Option B)		
Feature	Acreage	Number of
Proposed Right-of-way	57.6	N/A
Open Water	0.03	N/A
Floodplain	1.67	N/A
NWI	0.30	N/A
NDD	3.70	N/A
Streams	N/A	11
Natural Gas Wells	N/A	0
Commercial Structures	N/A	3
Places of Worship	N/A	0
Schools	N/A	0
Cemeteries	N/A	0
Archeological Surveys	N/A	1
Water Wells	N/A	2
Gas Pipelines	N/A	3
Petroleum Storage Tanks	N/A	0
Residential Structures	N/A	6

Center (Option C)		
Feature	Acreage	Number of
Proposed Right-of-way	56.79	N/A
Open Water	0.00	N/A
Floodplain	1.69	N/A
NWI	0.30	N/A
NDD	3.32	N/A
Streams	N/A	10
Natural Gas Wells	N/A	0
Commercial Structures	N/A	8
Places of Worship	N/A	0
Schools	N/A	0
Cemeteries	N/A	2
Archeological Surveys	N/A	1
Water Wells	N/A	1
Gas Pipeline	N/A	3
Petroleum Storage Tanks	N/A	1
Residential Structures	N/A	0

Eastern (Option A)		
Feature	Acreage	Number of
Proposed Right-of-way	57.42	N/A
Open Water	0.01	N/A
Floodplain	1.62	N/A
NWI	0.51	N/A
NDD	3.66	N/A
Streams	N/A	12
Natural Gas Wells	N/A	0
Commercial Structures	N/A	21
Places of Worship	N/A	0
Schools	N/A	0
Cemeteries	N/A	2
Archeological Surveys	N/A	1
Water Wells	N/A	0
Gas Pipeline	N/A	3
Petroleum Storage Tanks	N/A	2
Residential Structures	N/A	4

SH 34 Feasibility Study | Chapter 4: Future Conditions

Drainage Impacts

For the long-term improvements, a hydrology and hydraulic analysis and drainage study was completed. The capacity of existing culverts was evaluated. The size and length of ditches and culverts was also calculated for the proposed condition. The impact and mitigation due to proposed roadway improvements and increased flows was calculated. The discharges at the outfall to the downstream and channels do not increase compared to existing conditions. Therefore, no impacts to the drainage are expected in any of the alternatives.

Therefore, all the scenarios could be awarded the average, 3 points each. Detailed drainage impact information is found in Appendix C.

Right-of-way Impacts

In all the three options, right-of-way would be impacted due to the additional right-of-way acquisition that would be required. Other than a pond located along the eastern edge of the expanded ROW, other features are unremarkable. 42' of ROW would be required to widen the existing roadway to accommodate future traffic growth, address congestion and safety issues. The number of parcels vary from 24 to 73. Therefore the impact in alternative varies slightly. Based on ROW, each alternative is awarded 3 points.

This factor has been combined with cost, and time in the Ease of Acquisition parameter in the decision matrix.

Mobility Benefits

The long-term option would result in potential mobility benefits. If the construction of the bridges and additional lanes were completed, users traveling the SH 34 corridor would experience improved travel times, and lesser congestion. Adding a continuous turning lane would improve safety and throughput by reducing the variation in speed.

Since all construction will obstruct mobility in the short term, all three alternatives have been penalized one point, and are awarded 2 points.

Safety Benefits

The long-term option also would potentially provide many safety benefits. Converting the interior lane into a turning lane and creating a depressed median in areas with high truck movement would provide a safe space for through and turning vehicles. It would decrease head-on collisions, and side-collisions of vehicles at the frequent road intersections along the alignment. If there are any obsolete roadway elements along the roadway, these items could be upgraded. Additional controlled-access lanes could remove commuter and long-distance traffic from local traffic, reducing crashes from traffic using SH 34.

New facilities shall improve the safety for all people. Therefore, we can begin by awarding the neutral i.e., 3 points to all the options.

Additional Lanes Benefit Analysis

The intersection delay results were converted to annual delay to provide a comparison between scenarios that combine the AM and PM peak period results. The annual delay savings were calculated based on the following assumptions:

- AM peak period delay savings realized over three hours (6:00 – 9:00 a.m.)
- PM peak period delay savings realized over three hours (4:00 – 7:00 p.m.)

The above assumptions are conservative, as off-peak period delay savings were not included. Construction of additional lanes, therefore, leads to a saving of time in the AM Peak, and PM Peak hours.

Upon conclusion of the project, everyone will benefit from the additional facilities – signals, left-turn lanes, and wider roads. Therefore, notwithstanding questions about land acquisition, all development will benefit people equally. All alternatives are awarded 3 points.

Boles Home Alternative Evaluation

Near FM 2101 in Quinlan, TX along the section on SH 34 which is proposed to be redeveloped as part of this project, is Boles Children's Home. The existing geometry of SH 34 near Boles Children's Home is a sharp horizontal curve. This leads to unsafe conditions near the site. Alternatives on how to flatten the curve and reduce the impact of the road on Boles Children's Home was assessed by comparing the Base case (proposed alignment) against two alternatives. The three alternatives are:

- Base Condition (BASE): Widen existing SH 34. This needs a curve radius of 1600 ft, minimal ROW widening, and utilizes existing super elevation of 5.5%
- Alternative 1 (ALT#1): Adds approximately 2000 ft of alignment adjacent to existing ROW. Needs a curve of radius 2840 ft, requires additional ROW widening, and proposes a super elevation of 4%
- Alternative 2 (ALT#2): Adds approximately 5000 ft of alignment adjacent to existing ROW. Needs a curve of radius 7000 ft, requires additional ROW widening, and proposes a super elevation of 2%

The criteria for assessing the three alternatives, and assessment labels are in Table 16 below.

Table 16: Criteria, Description, and Assessment of Boles Home Alternatives

Category	BASE	ALT #1	ALT #2
Acquisition			
Cost (in millions of USD)	$16.54	$16.63	$16.90
Right of Way	Moderate	Moderate	Low
Community			
Displacements/Disruption	High	Moderate	Low
Community Impact	Moderate	Moderate	Moderate
Environmental			
Drainage Impact	Low	Moderate	High
User Access			
Safety	Low-Moderate	High-Moderate	High

- Cost – This includes the cost of acquiring ROW and relocating the utilities. The marginal extra cost in construction Alternative 1 or 2 is not very high. Alternative 2 is only 2% costlier than the Base case.
- Right-Of-Way Benefits – In the base case, 1.8 acres of land is required limited to front of properties. In Alternative 1, 3.5 acres of land needs to be acquired including an additional impact to 2 owners, and 3 parcels. In Alternative 2, 10.7 acres of land needs to be acquired impacting 6 owners, and 10 parcels.
- Construction Disruption – The Base case is the most disruptive since reconstruction within the existing corridor would increase delays along the route to/from Bole Home properties. In the two alternatives, since the new alignment would be offset from the existing ROW, reconstruction would not affect access to/from the properties.
- Community Impacts – In the base case, widening corridor at its existing location would increase inconvenience due to increased traffic at high speeds. The alternatives would only marginally change the situation by shifting the traffic slightly away from the property.
- Drainage Impacts – In the Base condition, existing drainage patters would remain similar when existing alignment is widened. For the two alternatives, drainage would need to be determined. This adds to the uncertainty and increases work.
- Safety Benefits – All reconstruction and widening improves safety. Alternative 2 flattens the curve even more and re-aligning the corridor to be offset from the Boles Home properties improves the safety furthermore.

Detailed analysis and exhibits can be found in Appendix F attached with this report.

Chapter 5: Recommended Improvements

Recommendations

Recommendations

All proposed improvements would reduce delay along the corridor compared to the no-build conditions. Although the short-term improvements, which are low-cost and easily implementable, do reduce delay, they do not address the capacity constraints anticipated to occur in the design year of 2048.

Since traffic volumes increase substantially between 2018, 2038, and 2048, peak period traffic congestion will noticeably worsen. The mid-term improvements, which provide for bridge widening, would improve the level of service, and greatly increase safety. Moving into the next phase of improvements, widening the roadway to a five-lane section for most of the corridor would also reduce delays and address congestion.

In the long term, improvements are needed to provide relief from congestion and allow the corridor to handle the expected future growth in traffic volume. Based on the analysis, it was determined that Option C (widening right-of-way by purchasing land on either side of the center of the alignment) would be the best alternative. Option C requires less number of displacements and, as a result, could be the most cost-effective option, with the fewest community impacts.

In addition, near Boles Home, at FM 2101 in Quinlan, alternative analysis was conducted to flatten the curve. Alternative 1 was found to reduce disruption to the property, and improve traffic safety as compared to the current/long-term alternative. Therefore, the Alternative 1 alignment is recommended.

The mid- and long-term improvements will result in regional economic benefits by providing increased roadway capacity and improved safety and will promote regional economic growth in the 2038 and 2048 analysis years. Further analysis will be required to determine the economic benefit of reducing costs due to delays, crashes, other corridor- related situations. Overall, the proposed improvements would provide significant relief from congestion and would allow the corridor to accommodate expected future growth in traffic volume.

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