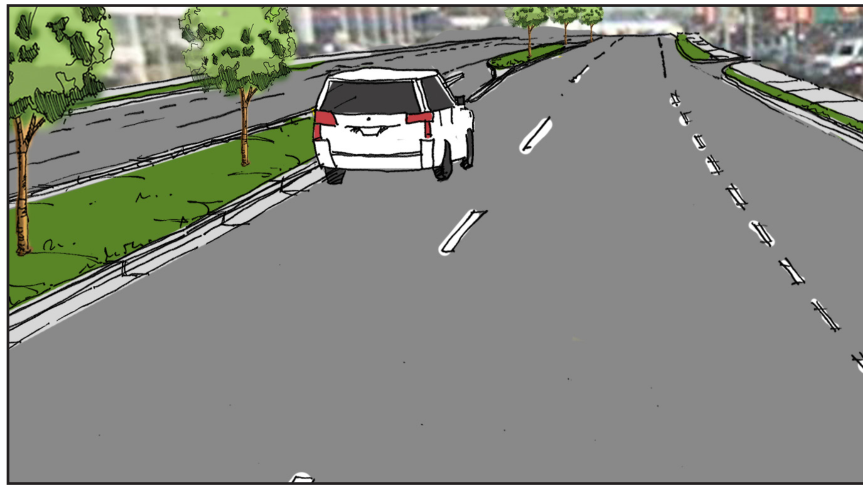

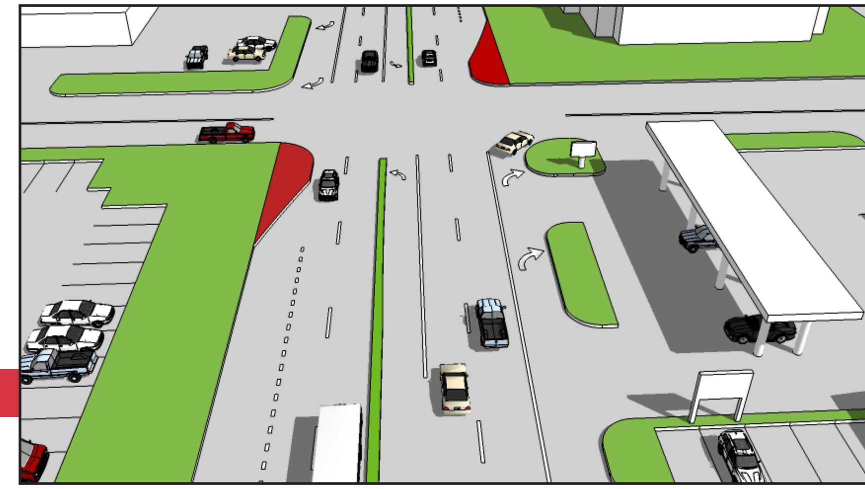

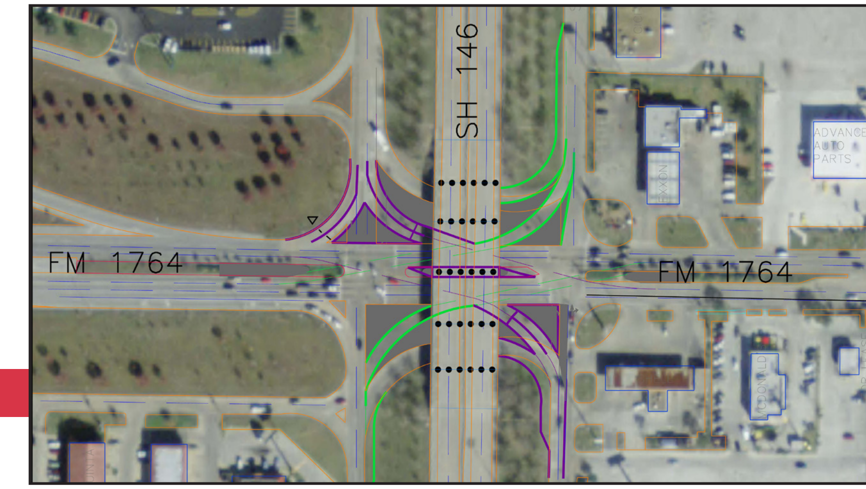

FARM 1764 ROAD

Access Management Study

HOUSTON-GALVESTON AREA COUNCIL • CITY OF TEXAS CITY • TEXAS DEPARTMENT OF TRANSPORTATION

FINAL REPORT JANUARY, 2012

Prepared by
FREESE AND NICHOLS

H-GAC has provided planning solutions for the Houston-Galveston area's 13-county region since 1974. Each year, it manages the investment in transportation improvement projects and provides a forum for interagency cooperation and public input into the stewardship of those funds. H-GAC works closely with citizens, businesses and local governments to provide leadership to manage development wisely and facilitate change constructively.

H-GAC serves Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, Walker, Waller and Wharton Counties, including more than 100 member cities.

The preparation of this document was financed in part through grants from the U.S. Department of Transportation under Section 112 of the 1973 Federal Aid Highway Act and Section 8(d) of the Federal Transit Act of 1964, as amended. The contents of this document do not necessarily reflect the official views or policy of the Federal Highway Administration, Federal Transit Administration, U.S. Department of Transportation, Texas Department of Transportation, Houston-Galveston Area Council or the City of Texas City. Acceptance of this report does not in any way constitute a commitment on the part of any of the above agencies to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws.

Table of Contents

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Jimmy Hayley, President, Texas City—LaMarque Chamber of Commerce

Special Thanks

Texas City—La Marque Chamber of Commerce
for hosting two Stakeholder Meetings with businesses in the study corridor

Lead Consultant

Kevin St. Jacques, P.E., P.T.O.E., PTP, Project Manager
Freese and Nichols, Inc.

Chapter One

Introduction

Purpose of the FM 1764 Access Management Study

Study Area

FM 1764 Access Management Goals and Issues

In 2035, more than 8.8 million people will be sharing the Houston-Galveston area's roadways. By that time, commuters will be heading to more than four million jobs.

The Regional Transportation Plan[1] prepared by the Houston-Galveston Area Council (H-GAC), predicts continuing growth for the region, with economic and social vitality that is possibly unmatched in the United States. However, moving from one place to another remains one of the area's greater challenges; and it affects health, economy, environment and infrastructure.

Access management is a critical element to keep traffic flowing. It enables H-GAC to develop and implement realistic strategies to improve the levels of efficiency, effectiveness and, most importantly, safety of our region's roadway network. Access management provides relief to many driver frustrations, offering solutions like increasing intersection capacity, spacing driveways, raising medians, encouraging alternative travel modes and focused land-use planning.

> This access-management study targets the FM 1764 corridor from SH 146 to 14th Street in Texas City.

Purpose of the FM 1764 Access Management Study

The high volume of traffic and the number of driveways in the heavily commercialized area of FM 1764 have created major traffic congestion, environmental concerns and safety issues for drivers, passengers and pedestrians. The FM 1764 Access Management Study offers publicly supported recommendations that should:

- Positively affect the corridor's safety and mobility
- Reduce both crash rates and traffic delays
- Enhance FM 1764's land use and property values

The study features low-cost, access-management tools, and identifies short-, medium- and long-range projects that create a safer, more efficient and environmentally responsible transportation system. Recommendations also will address optimization of transit operations, opportunities for pedestrian connectivity and more pleasing aesthetics and landscape treatments that can help stimulate economic vitality.

Study Area

The City of Texas City and the Texas Department of Transportation (TxDOT) both have identified FM 1764 as critical to residents' and businesses' access to areas within the community and to the region's major thoroughfares. Texas City Independent School District also considers FM 1764 a priority route for transportation between students' homes and schools, and it is a primary artery used by Connect Transit, a public transportation program sponsored by the Gulf Coast Center.

FM 1764, running through the center of Texas City, is one of three primary east-west arterial roadways serving the community's residential and commercial core. The other two east-west arterials are Loop 197 to the north and FM 1765 / Texas Avenue to the south. The study area, east of SH 146, is the most densely developed of the three arterials. West of SH 146, FM 1764 has attracted large-lot commercial development, especially west of SH 3 (see Figure 1.1).

Established industrial development along with commercial, retail, marine, educational, residential, tourism, health care, entertainment and environmental tourism growth are contributing to the heavy traffic volume along FM 1764. Commercial access, with its larger number of business driveways, has magnified the traffic congestion issue.

FM 1764
Access Management Goals

- Improve mobility and reduce delays along FM 1764
- Improve safety by decreasing crash rates along corridor
- Involve the public and corridor stakeholders in overcoming traffic issues
- Recommend practical, cost-efficient solutions that can be implemented in a timely manner
- Develop a phased implementation plan for future improvements

[1] Available at www.h-gac.com

FM 1764 Corridor Facts

- 2.16 miles
- SH 146 to 14th Street
- 6-lane divided roadway
- Continuous left-turn lane from SH 146 to 21st Street
- Raised median from 21st Street to 14th Street
- 100-foot right of way

To the east of the corridor:

- Off-system roadway east of 14th Street to Loop 197 (9th Avenue N)
- 4-lane arterial surrounded by residential development
- Enters downtown

To the west of the corridor:

- Emmett Lowry Expressway west of SH 146
- Grade-separated interchanges and access roads
- High-speed access to IH 45

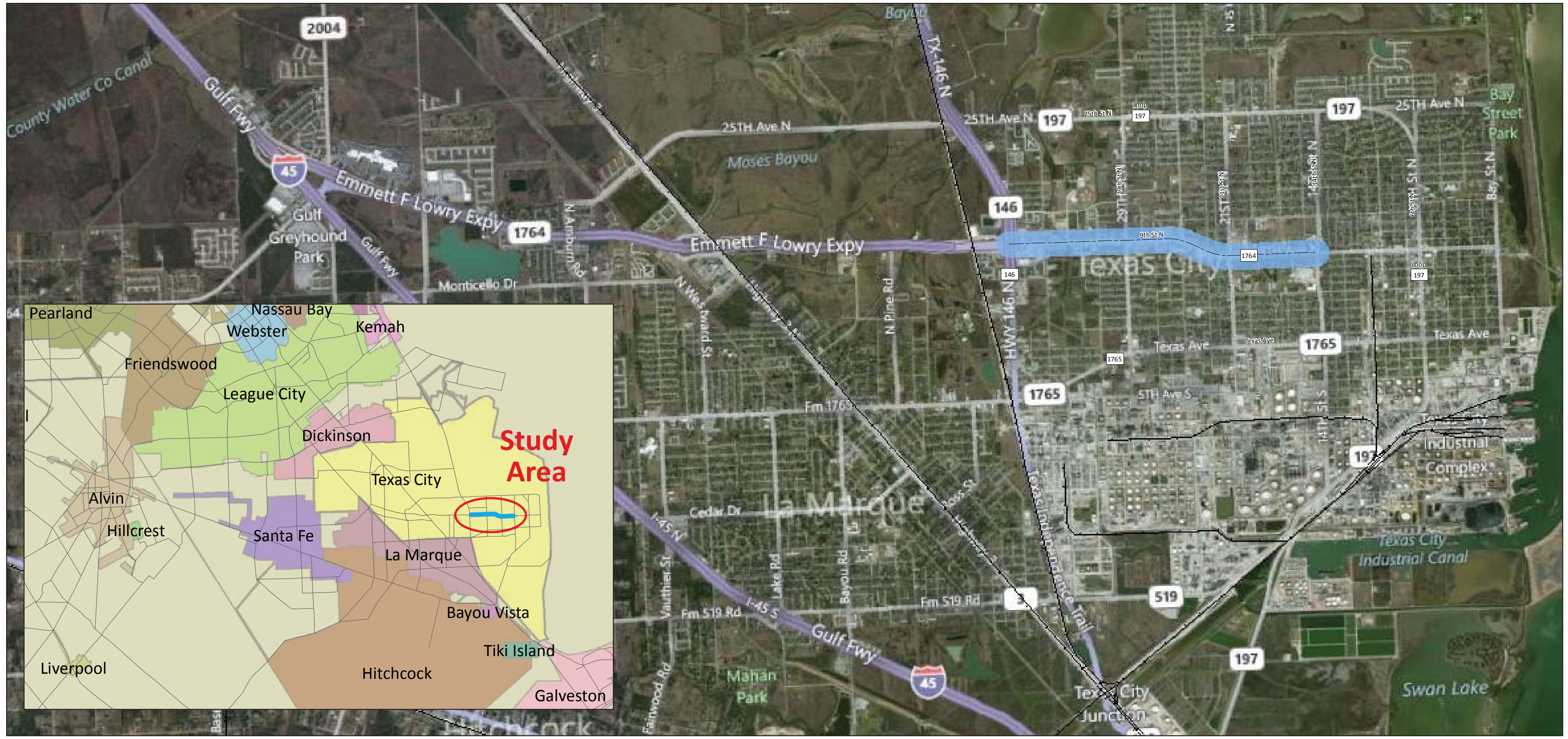


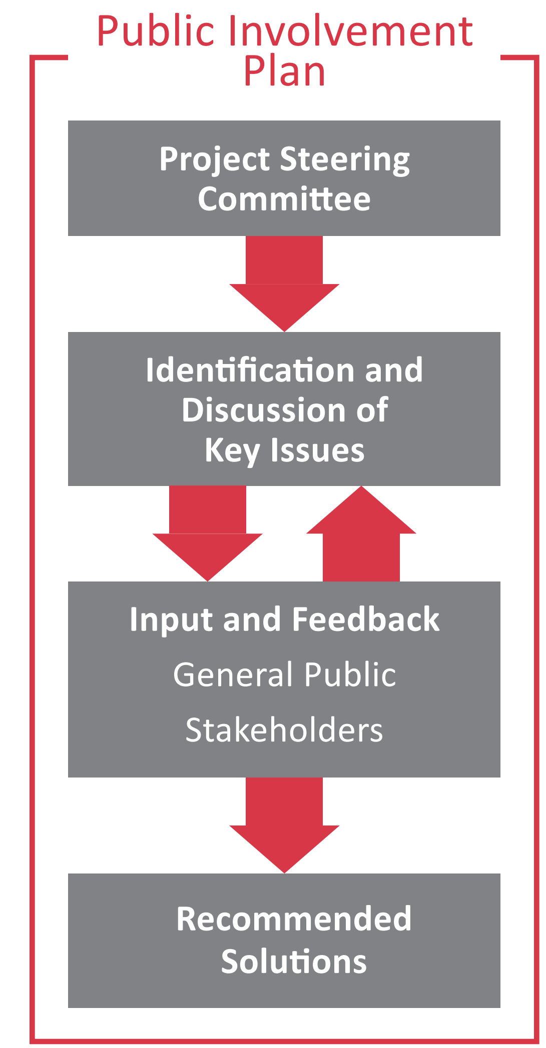
Figure 1.1

FM 1764 Access Management Goals and Issues

1. Improve Mobility in the Corridor
   ISSUE: The appearance of congestion in the corridor is a deterrent to many local residents to utilize the corridor and frequent its businesses.
2. Reduce Delays in the Corridor
   ISSUE: Delays at the SH 146 interchange are creating evasive and often undesirable travel patterns, mostly in the afternoon peak period. Some traffic queues extend near or into intersections, creating potentially hazardous conditions.
3. Reduce Crash Rates in the Corridor
   ISSUE: The number of access points and the continuous center lane contribute to higher-than-average crash rates.
4. Involve Stakeholders and the General Public
   ISSUE: The limited width of the existing right-of-way and the density of the access points will require a balance of public safety, impacts to businesses, and the interests of local citizens.
5. Develop Realistic Solutions
   ISSUE: Solutions should not require extensive redevelopment of the non-public right of way, but rather will focus on the roadway, its operations and how private access could be better managed.
6. Provide Plan for Implementation
   ISSUE: The implementation plan will be prioritized to balance the investment required for each recommendation with its impact on resolving specific corridor issues.

Chapter Two

Stakeholder and Public Involvement



The FM 1764 Access Management Study's Public Involvement Plan allowed the public and related stakeholders to share their concerns, provide input to the study process and review proposed solutions and recommendations.

Public Involvement Plan

A representative project steering committee understood the importance of addressing the concerns of residents, business owners and other stakeholders. The project team implemented a Public Involvement Plan that accomplished the following goals:

- Discussed with agencies responsible for operations and maintenance of the roadway, and with transportation services using the roadway about the issues, potential treatments and the realities of implementation
- Informed the general public on issues related to access and public safety along the FM 1764 corridor and potential solutions, then collected and considered input and feedback for the final recommendation
- Informed business- and property-owner stakeholders on issues related to access and public safety along the FM 1764 corridor and potential solutions, then collected and considered input and feedback for the final recommendation

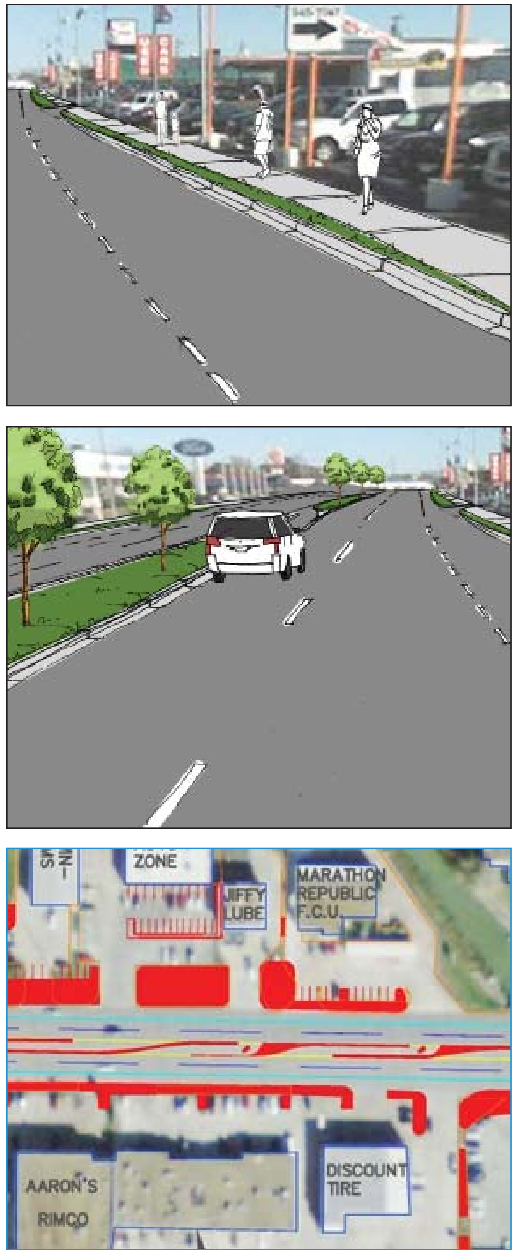
The Public Involvement Plan promoted an active and effective public dialogue. A copy of the Public Involvement Plan, as well as a summary of the public outreach and public participation activities is provided in Appendix A.

Project Steering Committee Members

- Houston-Galveston Area Council
- Texas Department of Transportation
- City of Texas City
- Texas City Police Department
- Texas City Independent School District
- Gulf Coast Center / Connect Transit
- Texas City-LaMarque Chamber of Commerce

Project Steering Committee

The project steering committee guided the access management study to facilitate development of cost-effective, doable solutions. H-GAC and the consultant team kicked off the study with discussions of committee members' current understanding and expectations of access management, actual or perceived issues in the corridor, and pending projects and initiatives. The committee refined goals and objectives for the study, resulting in those presented in Chapter 1, to focus the study on implementable solutions.



Sample access management tools, top to bottom, continuous right-turn lane, raised median with optional landscaping and driveway closures and merged parking areas.

Steering Committee Workshop

H-GAC and the consultant team conducted a two-hour workshop with the steering committee to review the findings of a corridor analysis and an initial set of recommendations for short- and long-range treatments.

The committee reviewed conceptual layouts of the potential treatments developed by the consultant team, which included continuous right-turn lanes, raised medians, driveway and parking modifications, and road diet. It provided specific feedback on the general approach to treatments, the configuration of the treatments and on local activities to customize the treatments to the corridor.

The steering committee provided feedback and clarification on moving forward with the recommendations to stakeholder and public presentations, including the guidance from TxDOT that the project would not include forced closures of driveways.

The consultant team reviewed various access management tools and identified those more applicable for the study area. This list provided a starting point for developing project solutions:

- Reconfigure the SH 146 interchange to be more efficient
- Require internal circulation / property interconnectivity
- Coordinate traffic signals, enforce minimum signal spacing
- Require/enforce driveway setbacks from intersections
- Require/enforce minimum driveway spacing
- Consolidate existing driveways
- Add channelized deceleration and turn lanes at driveways and intersections
- Construct raised median and channelized turn locations
- Create transit access
- Improve pedestrian access

See Chapter 4 for a description of the application of these tools.

Identification of Specific Issues

Input from the project steering committee, along with a corridor analysis, helped identify specific access management issues. Those issues included:

- Driveway spacing too dense, too close to corners
- Driveway design widths inconsistent, often overly wide; some slopes and radii impede turns in and out
- High number of crashes, particularly in segments without raised median
- High number of conflict points from driveways and continuous two-way, left-turn lane
- Reduced mobility (congestion and travel delay, corridor avoidance)
- Limited pedestrian facilities (sidewalks and crosswalks, pedestrian signals)
- Additional travel demands during plant maintenance turnaround and with future growth
- Economic vitality of the corridor
- Poor parcel interconnectivity east of 34th Street

Engaging Stakeholders

H-GAC and the consultant team collaborated with the Texas City-LaMarque Chamber of Commerce to engage the business community in the access management planning process. Using its member database, the Chamber distributed information to local businesses in its member newsletter and co-signed personal letters of invitation to two stakeholder meetings. The Chamber hosted both two-hour meetings at its FM 1764 location east of the study area. The stakeholder meetings were approximately one month prior to the general public meetings.

Both meetings, each with two distinct groups of participants, focused on the need for access management and education on the benefits of each recommendation. After a brief presentation, the steering committee engaged local business owners and other stakeholders in one-on-one discussions to further explain benefits and fully understand their concerns and needs.

One-on-one and group discussions were held with residents and business owners at two public meetings (see Table 2.1.)

Engaging Residents and Businesses

H-GAC and the consultant team conducted two public meetings to engage the general public in the corridor planning process, implementing a detailed public information and advertisement plan to promote attendance at the public meetings. The Chamber again provided support by including meeting details in its member newsletter. The committee also focused on participation by residents and businesses with 1/4 mile of the FM 1764 study area.

Both meetings began with a one-hour open house, where participants could talk with steering committee members, view maps of the study area and learn more about current roadway operations, traffic volumes and crash frequencies. Each also entailed an open question-and-answer session.

Both meetings also facilitated one-on-one discussions between steering committee members and participants, and included confidential surveys that allowed participants to freely share their input and opinions.

The project steering committee hosted two stakeholder meetings to engage local businesses and other stakeholders in the access management process.

Public Meeting #1

August 17, 2011

6-8 p.m.

Showboat Pavilion in downtown Texas City

Public Meeting #2

October 25, 2011

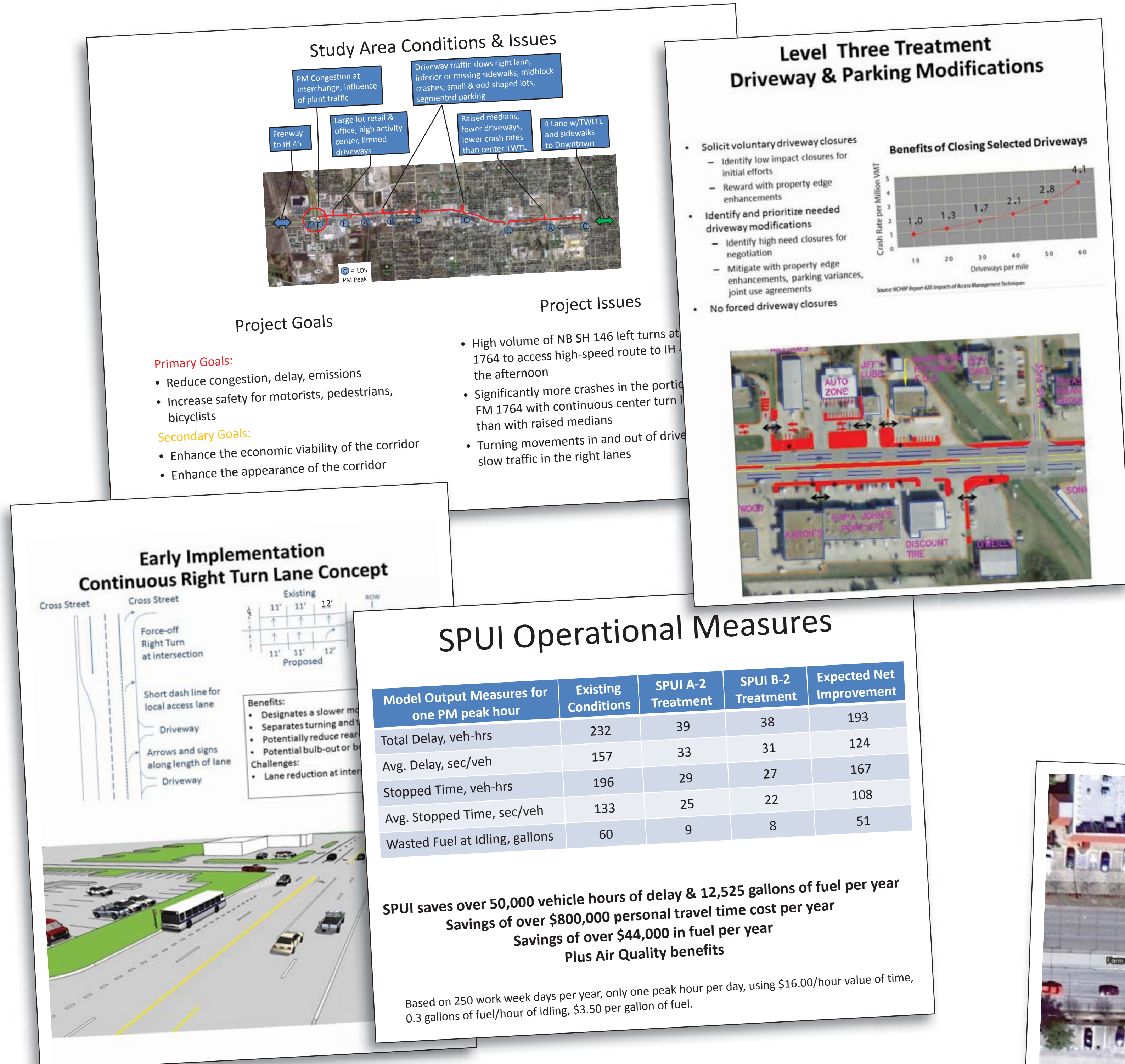
6-8 p.m.

Doyle Convention Center in the Texas City Municipal Complex

Stakeholder and Public Meeting Input

STAKEHOLDER MEETING #1	STAKEHOLDER MEETING #2	PUBLIC MEETING #1	PUBLIC MEETING #2
Congestion relief is needed at the SH 146 interchange	Consider raised medians with channelized left turns to enhance safety and improve appearance of FM 1764	RESIDENTS: safety concerns	Develop a “grander concept” for the whole corridor, examining land uses and applying Livable Communities concepts
FM 1764 is vehicle-oriented; no need for walkability enhancements beyond sidewalk improvements and safer crossings	No support for road diet concept	RESIDENTS: avoid FM 1764 except access specific businesses, or avoid completely	BUSINESS OWNERS: satisfaction with recommendations; interest in future discussions related to driveway and parking implementation
Concerns related to access and circulation limitations of raised medians; specific business issues discussed one-on-one at the map tables	Continuous right-turn lane, although relatively low-cost, not seen as having a significant impact on traffic operations or safety	BUSINESS OWNERS: concern over what the implementation of any of the improvements will do to access to their site	
No support for road diet concept	Merging of parking areas could be difficult because of owner resistance and grade differences between adjacent lots	Address the congestion at SH 146	
	Shared parking among property owners will require parking variances from the City of Texas City		
	Signal timings currently not coordinated; regular outages during power outages		

Table 2.1: Stakeholder and public meeting input



Model Output Measures for one PM peak hour	Existing Conditions	SPUI A-2 Treatment	SPUI B-2 Treatment	Expected Net Improvement
Total Delay, veh-hrs	232	39	38	193
Avg. Delay, sec/veh	157	33	31	124
Stopped Time, veh-hrs	196	29	27	167
Avg. Stopped Time, sec/veh	133	25	22	108
Wasted Fuel at Idling, gallons	60	9	8	51

Presentation Materials and Visualization Tools

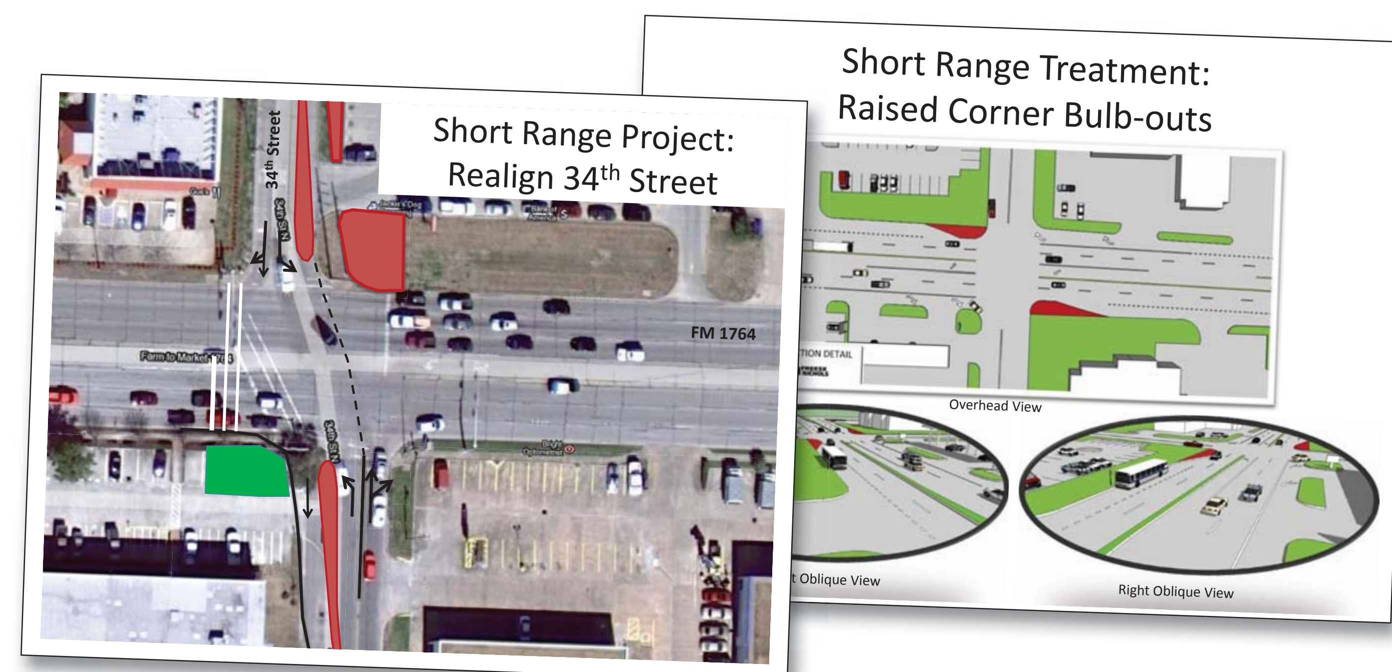
The access management study and its recommended improvements represent a significant public investment and required fully informed decisions from the project steering committee members, stakeholders and representatives of the general public.

The study process incorporated presentation materials with clear, strong graphics to assist in explaining technical access management and traffic concepts in a concise, easier-to-understand manner. Materials included large presentation boards, PowerPoint presentations, handouts and other communications tools.

The materials explained overall access management concepts as well as corridor-specific topics such as the study process and goals, project schedule and funding partners. This also allowed the steering committee to update technical results for each stage of the study.

Computer animation of existing and proposed traffic operations helped visualize the improved conditions, and technical team members were available at meetings to respond to participants questions and clarify the committee's understanding of their suggestions.

H-GAC and the consultant team also engaged the public using detailed aerial photos and maps. These photos and maps allowed the committee to gather specific comments on the public's knowledge of the corridor (locations of developments, high crash locations, problem intersections, etc.) and their suggested improvements. The maps and photos are a formal part of the project record and assist in the documentation of the public participation process.



Comprehensive Meeting Notification

The Federal government outlines public involvement requirements (40 CFR 1506.6) in its Code of Federal Regulations of the National Environmental Protection Act (NEPA). The outreach approach for the FM 1764 Access Management Study complied with the NEPA directives for publication and notification of public meetings. It also complied with TxDOT-Houston District's guidelines for the sequence and types of notices.

The specific outreach components included the following:

- Elected officials' notification letter from Alan Clark, H-GAC's Director of Transportation, as the first publicity item, in keeping with TxDOT-Houston District's preference for notifying elected officials about public meeting opportunities prior to any other advertisements or mailings
- Legal ad in *The Houston Chronicle*, the area's largest distribution daily newspaper, 30 days prior to the public meetings in accordance with TxDOT's preferred time line
- Display ads in Spanish placed in *La Voz*, the weekly Spanish newspaper distributed by *The Houston Chronicle*, two weeks prior to each meeting
- Postcard in English and Spanish mailed to property owners and stakeholder groups two weeks prior to the meetings (extra postcards were available at City Hall and Texas City-La Marque Chamber of Commerce reception desks)
- Website posting on H-GAC's Transportation Public Information page and on Texas City's website
- Limited English Proficiency (LEP) outreach activities, including a Spanish display ad placed in *La Voz*, and Spanish text on postcards mailed to households and businesses
- E-vites sent by the Texas City – La Marque Chamber of Commerce to members who are business owners and residents along the corridor
- Dynamic messaging signs posted by TranStar on northbound and southbound lanes of IH 45 on the days of the meetings
- Updated mailing list from the sign-in sheets of each stakeholder and public meeting (to update individuals who have expressed interested in the project)
- For the Stakeholder meetings, letters signed by Jimmy Haley, President of the Chamber of Commerce, and Doug Kneupper, City Engineer, were sent out to the Chamber member businesses and select other businesses along the corridor inviting them to the meetings. The Chamber sent out meeting reminders by email and made personal phone calls to several business owners.

H-GAC invites participation in a public meeting regarding safety and mobility improvements to SH 105. The study area covers SH 105 between Loop 336 in Conroe and US 59 in Cleveland. An open house meeting will be held to introduce study goals, present preliminary recommendations and invite feedback.

Wednesday, August 10, 2011
6 p.m. - 8 p.m.
Austin Elementary School
14796 Highway 105 East
Conroe, Texas 77306

H-GAC representatives will be available at this meeting to answer questions. For more information about access management, visit our website HERE.

Regionally Coordinated Transportation Plan - Public Comment Period and Public Meeting

H-GAC, with the assistance of transportation stakeholder groups and transit agencies, has developed an Updated Regionally Coordinated Transportation Plan for the purpose of coordinating public transportation services in the 13-county Gulf Coast Planning Region.

RCTP Public Meeting
Tuesday, August 16, 2011
5:30 p.m.- 7:00 p.m.
Presentation at 6:00 p.m.
3555 Timmons Lane
2nd Floor Conference Room A
Houston, TX 77027

A 30-day public comment period begins on Monday, August 1, 2011 and ends on Tuesday, August 30, 2011.

Comments may be emailed to publiccomments@h-gac.com, faxed to (713) 993-4508, or mailed to H-GAC Transportation Department, P. O. Box 22777, Houston, TX 77227-2777. For more information, and a downloadable copy of the Draft RCTP, please visit the project website at www.ridethegulfcoast.com.

Farm Road 1764 (FM 1764) Public Meeting

H-GAC is conducting an access management study on the FM 1764 Corridor. The study area includes FM 1764 from SH 146 to 14th Street in Texas City. The purpose of this study is to identify transportation improvements that reduce crashes, improve traffic flow, reduce motorist delay, and to address multi-modal/land use context.

Wednesday, August 17, 2011
6 p.m. - 8 p.m.
Showboat Pavilion

CHAMBER MINI EXPRESS — August 15, 2011

Public Meeting Regarding FM 1764 (Palmer Highway) August 17, 2011

WHERE: Showboat Pavilion, 416 6th Street North, Texas City

WHY: The Houston-Galveston Area Council is conducting an access management study on FM 1764 (Palmer Highway). The study area includes FM 1764 from Highway 146 to 14th Street in Texas City. The purpose of this study is to identify transportation improvements that reduce crashes, improve traffic flow, reduce motorist delay and address ...

What: Public Meeting for FM 1764 Access Management Study
When: Tuesday, October 25, 2011
6:00 – 8:00 PM
Where: Doyle Convention Center
2010 5th Avenue North
Texas City, TX 77590
Why: H-GAC is hosting the second public meeting to present recommendations regarding safety and mobility improvements to FM 1764 from SH 146 to 14th Street in Texas City, TX. H-GAC is conducting an access management study to identify transportation improvements that reduce crashes, improve traffic flow, reduce motorist delay, and to address multi-modal/land use context.
For more information: www.h-gac.com

Evento: Reunión pública para el Estudio de Adm... de Acceso de la carretera FM 1764
Fecha: Martes, 25 de Octubre, 2011
6:00 – 8:00 PM
Lugar: Doyle Convention Center
2010 5th Avenue North
Texas City, TX 77590
Para más información: www.h-gac.com

ACCESS MANAGEMENT STUDY

HOUSTON-GALVESTON AREA COUNCIL
PO Box 22777 • 3555 Timmons Ln., Suite 120 • Houston, Texas 77227-2777 • 713 627-3200

July 8, 2011

«Prefix» «First_Name» «Last_Name»
«Title»
«Company_Name_1»
«Address1»
«City» «State» «Zip_Code»

Subject: FM 1764 Access Management Study Public Meeting

Dear «Salutation»:

The Houston-Galveston Area Council (H-GAC) is hosting two public meetings to offer the community an opportunity to learn about and comment on the Access Management Study for the FM 1764 from SH 146 to 14th Street in Texas City. The purpose of this study is to identify transportation improvements that reduce crashes, improve traffic flow, reduce motorist delay, and to address multi-modal/land use context. A map of the study area is attached.

The first meeting will be held on August 17, 2011 from 6:00 p.m. to 8:00 p.m. at the Showboat Pavilion, 416 6th Street North, Texas City, TX 77590. The format for the meeting will include an initial opportunity to view informational displays and aerial maps in an open house format. The open house will be held from 6:00-7:00 p.m. and will be followed by an informational presentation at 7:00 p.m. The second meeting will be held sometime in October, and more information about this meeting will follow at a later date.

We appreciate your support and look forward to seeing you and your constituents at the meeting. If you have any questions about this Study, please contact Christy Willhite at (713) 993-4543 or by email to Christy.Willhite@h-gac.com.

Sincerely,

Alan C. Clark
MPO Director

ACC:cw

Chapter Three

Existing Conditions

Figure 3.1: FM 1764 Study Corridor and Regional Connections

Regional Connectivity

FM 1764 provides east-west conveyance to regional and sub-regional highways as depicted in Figure 3.1. To the west of SH 164, FM 1764 has grade separated interchanges and frontage roads, creating a high-speed connection to IH 45. Grade separated interchanges are provided with SH 146 and SH 3, providing higher speed and capacity roadway connections to nearby cities.

Roadway Characteristics

SH 146 to 21st Street

Between SH 146 and 21st Street, FM 1764 is a seven-lane urban roadway with a continuous, two-way, left-turn lane (CTWLTL). Major intersections have dedicated left-turn lanes, while the CTWLTL facilitates to-and-from driveway access between intersections.

21st Street to 14th Street

From 21st Street to 14th Street, FM 1764 is an urban six-lane, divided roadway with raised center median. Local officials indicated that FM 1764 east of SH 146 previously had a raised median. The current typical section details are shown in Figure 3.2.

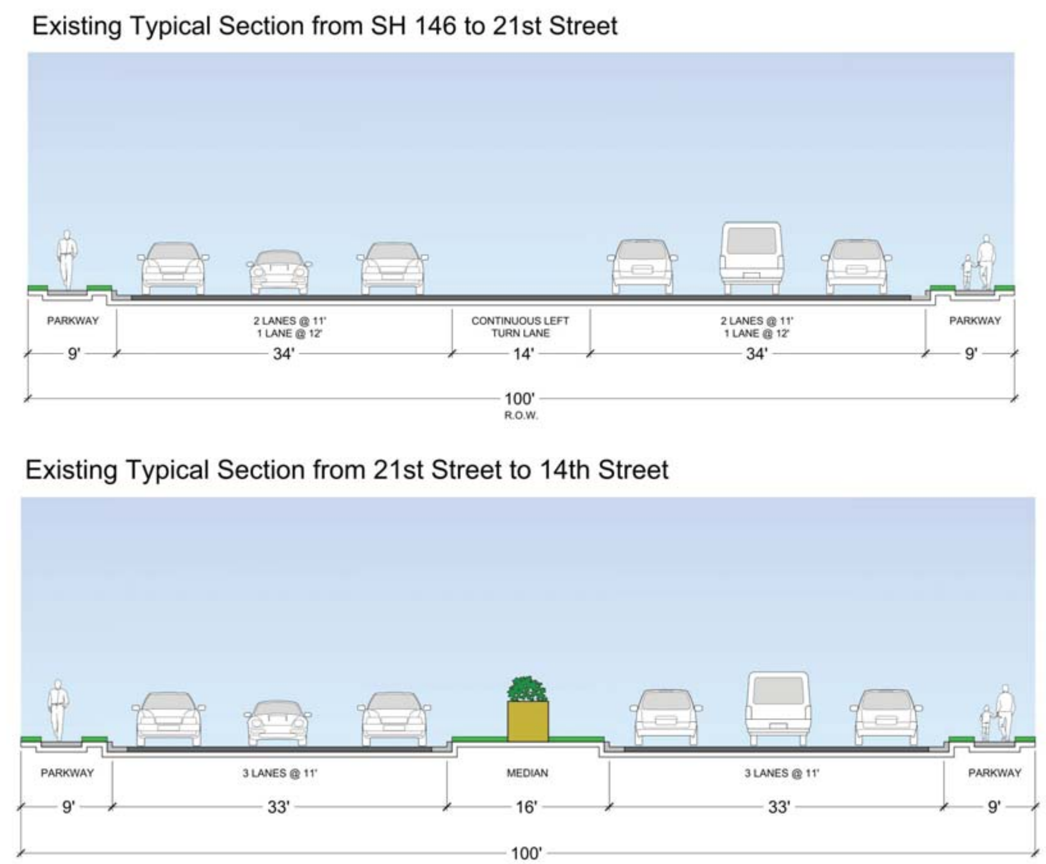


Figure 3.2: Typical section details for corridor

Planned Projects in the Area

Two projects have recently been completed or are in progress, and have direct impact on this project:

- Immediately west of the study corridor, TxDOT recently completed the final segments of FM 1764 as a limited-access highway extending from the at-grade interchange at SH 146 to a high-speed directional interchange at IH 45.
- In late 2011, TxDOT will initiate the milling and overlay of the urban section of FM 1764 from SH 146 to 14th Street, and the project should be completed by the end of 2012. There is an opportunity to modify the planned final striping of that project as part of the access management treatments recommended by this study.

Other planned projects that could potentially impact the operations in the FM 1764 study corridor include:

- The planned extension of Loop 197 – parallel to FM 1764, approximately 1 one mile to the north – with a grade-separated intersection at SH 146 and a connection to SH 3.
- The planned north-south thoroughfare between FM 1765 and Loop 197, west of SH 146 and the railroad, using the existing Pine Street alignment. This connection could attract some of the existing plant traffic in the afternoon that is currently using the SH 146/FM 1764 interchange to access FM 1764.

Crash Index

Research by the National Cooperative Highway Research Program shows a direct relationship between the number of driveways per mile and the propensity for crashes along the roadway (see Figure 3.3). As a result, a street with 60 access points per mile (e.g., westbound between 31st and 34th) will have 4.1 times as many crashes as segments with only 10 access points per mile. If the driveway density could be reduced by one third from 60 per mile to 40 per mile, the crash rate could be cut in half.

While there is great variation in the types of development and intensity of driveway activities within the national data used to generate these relationships, if driveway densities were reduced from 60 to 40 driveways per mile, the correlated 50% reduction in crash rates could save the travelers along FM 1764 significant collective social cost each year.

Land Use

FM 1764 Corridor

The FM 1764 corridor is fully developed with predominantly commercial frontage, though several lots are in transition and the overall corridor appears to be underutilized in terms of the synergy of adjoining development.

SH 146 to 34th Street

Development between 34th Street and SH 146 encompasses the entire block on both sides of FM 1764. It is more than 500 feet deep with a mixture of deep-set anchor stores and up-front outparcels of restaurants, services and an office building. The businesses on each side share a central parking lot with internal circulation to the site.

34th Street to 21st Street

Between 21st Street and 34th Street, the entire frontage is commercially developed, with relatively shallow typical-lot depths ranging from 100 to 300 feet, with many individual lots of less than 100 feet of frontage width.

The corridor between 21st Street and 34th Street has much potential for redevelopment and the merging of smaller lots to create more functional, congruent developments with internal circulation and shared parking.

21st Street to 14th Street

The eastern end of the study area, between 14th Street and 21st Street, includes the city governmental complex on the south and mostly school and church uses on the north. Commercial development begins on the northeast corner at 21st Street.

East of 14th Street

East of 14th Street, TxDOT's FM 197 becomes a city roadway – 9th Avenue North – and is fronted by residential development for several blocks between the study corridor and the downtown area.

Driveways and Access

The study area has approximately 160 driveways providing access to businesses along its 2.16-mile corridor, averaging approximately 40 access points (driveways) per mile each direction. Many sections have driveway density of 40 to 70 access points per mile (see Figure 3.4).

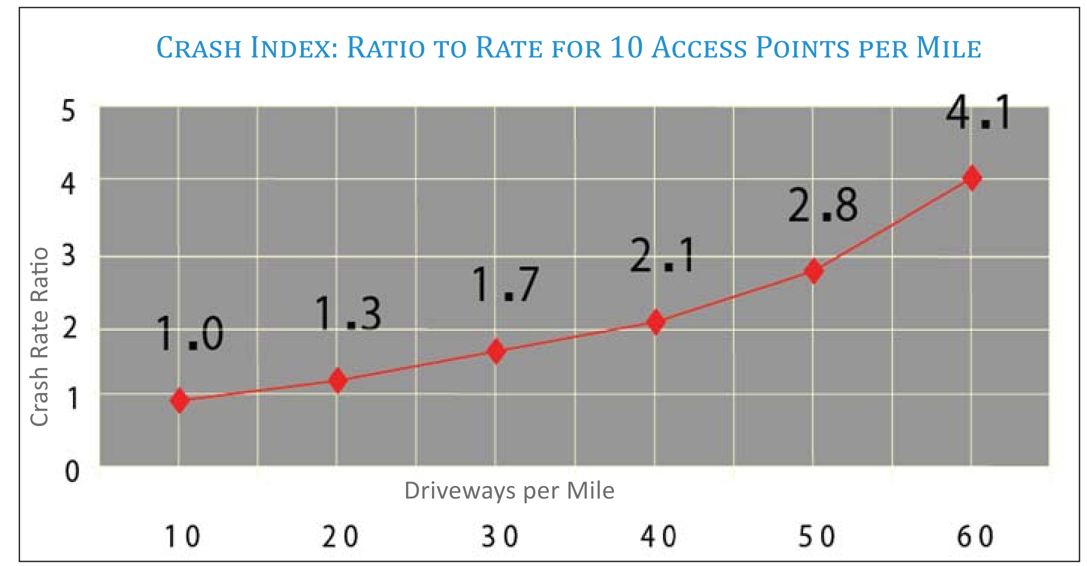


Figure 3.3: Relationship between the number of driveways and propensity for crashes

Figure 3.4: Driveway Densities along the FM 1764 Corridor

Intersections

A grade-separated intersection of SH 146 marks the western end of the study area. The interchange at SH 146 creates severe traffic congestion on the approaches to the interchange during the afternoon peak hour, with more than 350 vehicle-hours of delay during a one-hour period. Plant traffic from the southern side of Texas City contributes significantly to the volumes at the interchange, with queue lengths backing up to the beginning of the exit ramp on northbound SH 146 and traffic filtering through the north-south streets east of SH 146.

There are signalized intersections at 14th Street, 21st Street, 25th Street, 29th Street 31st Street and 34th Street. At the signalized intersections, the continuous left-turn lane becomes a dedicated left-turn lane, using the simple striping pattern of breaking the yellow lane to stripe the 4-inch white lane for the turn lane of some 100 feet in length, causing minimal constraints on driveway access across the flush TWLTL median.

The intersection with 34th Street has a 50-foot offset between the north and south legs on 34th Street, causing split-phase timing to move the north and south approaches separately, creating potentially unnecessary delays at the intersection.

Traffic Safety Characteristics

The FM 1764 corridor saw 358 crashes from 2007-2009, according to TxDOT's latest available crash data. (see Figure 3.5 and Table 3.2 for location and severity). Overall, the corridor has a crash rate of 5.1 per million vehicle miles of travel (MVMT), more than twice the statewide average of 2.24 for similar roadways (farm-to-market road in an urban environment). The study area's safest segment, between 14th Street and 21st Street has a raised median, but it remains above the state average. (see Table 3.3).

Public Cost of Motor Vehicle Crashes

National statistics[1] maintained by the Federal Highway Administration indicate an approximate social value to the various types of crashes. In 2009 dollars, these factors are approximately $4 million per fatality, $200,000 for incapacitating injuries, $37,000 for non-incapacitating and possible injury values, and $7,400 for non-injury crashes. Applying these rates to the crashes identified as occurring on the study section of FM 1764 only (including 100 feet on the side streets), between and inclusive of the frontage roads of SH 146 and 14th Street, as tabulated in Table 3.2, the 2009 social cost of the three years of accidents from 2007 through 2009 is estimated at approximately $15.4 million, or about $5.1 million per year.

[1] FHWA *Highway Safety Improvement Program, 2009.*

Public Cost of Crashes

Crash Severity	# of Incidents 2007-2009	Public Cost
Non-Injury Crashes, persons	899	$ 6,653,000
Non-Incapacitating Injuries, persons	165	$ 6,105,000
Incapacitating Injuries, persons	13	$ 2,600,000
Deaths, persons	0	$ 0
TOTAL PUBLIC COST 2007-09		**$ 15.4 Million**
AVERAGE ANNUAL PUBLIC COST, 2009		**$ 5.1 Million**

Table 3.2: FM 1764 Crash Rates, Annual Average 2007-2009

FM 1764 Crash Rates

Location	Crash Rate per MVMT
FM 1764 / SH 146-29th Street (worst segment)	7.4
FM 1764	5.1
FM 1764 / 29th-14th Street (safest segment)	3.8
Statewide Average (Source: Texas Department of Public Safety)	2.24

The crash rate is based on a comparison of the number of crashes and the annual average daily traffic (AADT) count, in vehicale miles of travel (VMT).

Table 3.3: Public Cost of Crashes in FM 1764 Study Area

Figure 3.5: Locational distribution of vehicular crashes along the FM 1764 study area

Traffic Volumes

Approximately 31,000 vehicles drive FM 1764 just east of SH 146 each day. Annual Average Daily Traffic volumes provided by TxDOT for 2009 (see Figure 3.6), are 24-hour counts, with truck and seasonal factors applied. Fortunately, traffic volumes have remained relatively the same – in the 29,000 to 31,000 range – for the last three years.

Additionally, current data collected includes: current morning and evening peak period traffic conditions, traffic-count data collected for traffic variation throughout the entire day, and the peak-period turning counts at the signalized intersections. This new data is compiled in Appendix B.

2009 TxDOT Traffic Counts (vehicles per day)		
Emmett Lowry Expressway (FM 1764)	IH 45 to SH 3	38,500
Emmett Lowry Expressway (FM 1764)	SH 3 to SH 146	35,000
FM 1764 (study area)	East of SH 146	31,000
FM 1764 (study area)	Near 25th Street	29,000
2028 H-GAC Projection for FM 1764	East of SH 146	**40,240**

Table 3.1 TxDOT Traffic Counts and H-GAC Traffic Projections

Traffic Operations

Synchro™ traffic simulation software supported the traffic operations analysis for the existing roadway traffic operating conditions in the afternoon peak hour. The software uses methodologies from the Highway Capacity Manual (HCM).

The model's simulation of significant delays and poor level of service at the western end of the study area at the SH 146 interchange were validated by afternoon peak-hour field observations of average queue lengths on approaches. East of 34th Street, the model was calibrated to simulate observed traffic operations that showed only minimal delays at the intersections.

The HCM categorizes traffic operations in terms of level of service (LOS), on a scale of A (traffic moves freely, little or no delay) through F (traffic very congested, high delays). The corridor east of 34th Street operated at LOS C or better during the peak hours as shown in Figure 3.7. The results of the analysis are included in Appendix C.

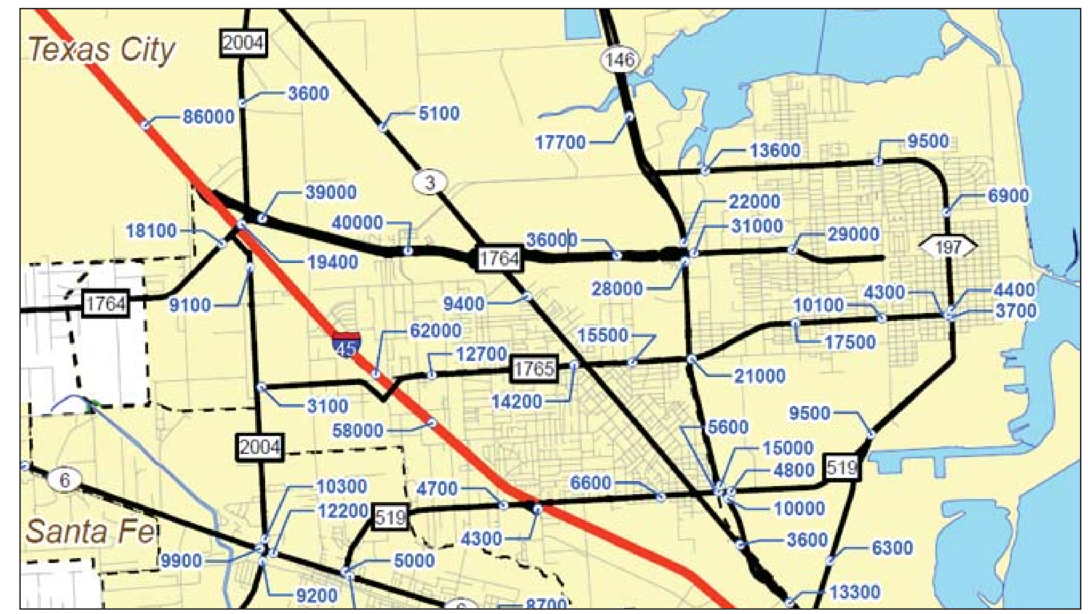


Figure 3.6: Annual Average Daily Traffic (AADT) Volumes

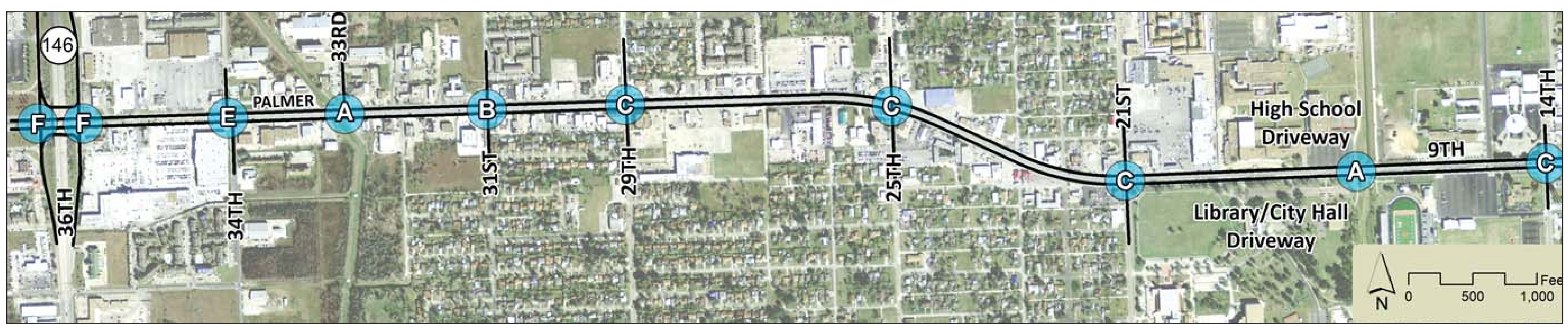


Figure 3.7: Existing Conditions 2011 PM Peak Hour Level of Service

Posted Speed Limits

The posted speed limit for the FM 1764 study area is 40 miles per hour (MPH). This speed limit may be too high for the density of driveways along the corridor and may be a contributing factor to the high crash rates in the corridor.

A traffic engineering speed study could assess the current compliance with the established speed zone, and may recommend modifications for enhanced compliance and safety. However, a more proactive setting of the speed limit at 35 MPH may be a reasonable safety measure for the roadway.

Transit Service in the Corridor

Gulf Coast Center (GCC) operates Connect Transit, a transportation program serving the rural and urban areas of Brazoria and Galveston Counties, Texas City, LaMarque, Lake Jackson and Angleton. It provides services to the general public and offers trips to the Veterans Hospital in Harris County. Connect Transit provides "demand-response" services in Galveston and Brazoria counties. These services are shared rides with pick-up and delivery from curb to curb. Current route services run along the FM 1764 study corridor (see Figure 3.8). GCC provides funding and vehicles to Texas City for special transportation to several centers serving the elderly and disabled. A fixed-route service is in planning stages for Texas City/LaMarque to enhance the mobility to persons with disabilities, economically disadvantaged persons and to the general public.

Connect Transit representatives indicated that the buses serving FM 1764 pull off the roadway into parking lots to service passengers because stopping in the far right travel lane is considered too dangerous without a pull-over bay or some other protection from through-traffic.

Pedestrian and Bicycle Infrastructure

FM 1764 is not identified as a bike route in the Houston-Galveston Regional Bikeway Plan. However, many of the intersecting roadways – 16th Street, 25th Street south of FM 1764, 14th Street south of FM 1764, SH 146, and parallel roadway facilities north on FM 1765 between 14th Street to 25th Street, 13th Avenue N. between 14th Street to 16th Street – are already a part of H-GAC Regional Bikeway plan (see Figure 3.9).

Between SH 146 and 21st Street, there are sections of FM 1764 with a high density of driveways and limited right of way, neither of which are favorable for safe bike usage. Pedestrian accommodations along FM 1764 are limited to the areas of Texas City, where there is curb and gutter sections. A sidewalk exists generally along the length of the south side of FM 1764 through the study area, but the sidewalk along the north side extends only east of 31st Street, with a few gaps in continuity. Many repairs are needed, especially at intersection corners and ramps. Several very large driveways lie across the sidewalks. West of 21st Street, there are few if any sidewalks leading to the FM 1764 corridor from the nearby neighborhoods to the north and south.

Access Management Practices

The corridor shows a lack of access management practices over the years of development of this corridor, as evidenced by the close spacing of driveways and driveways too close to intersections.

Current Texas City driveway standards define the construction standards for the driveway and its permitting. No ordinances are in place that will require removal of driveways upon redevelopment of the adjacent properties.

Development ordinances do not require parking areas to be conjoined with adjacent development. In fact, stakeholders have noted that current development criteria are requiring higher finished floors on occupied space, creating disparities in elevations between adjacent developments, making conjoining parking areas more difficult.

Figure 3.8: Gulf Coast Transit Mainland Transit System Map, showing existing fixed route service within the study area.

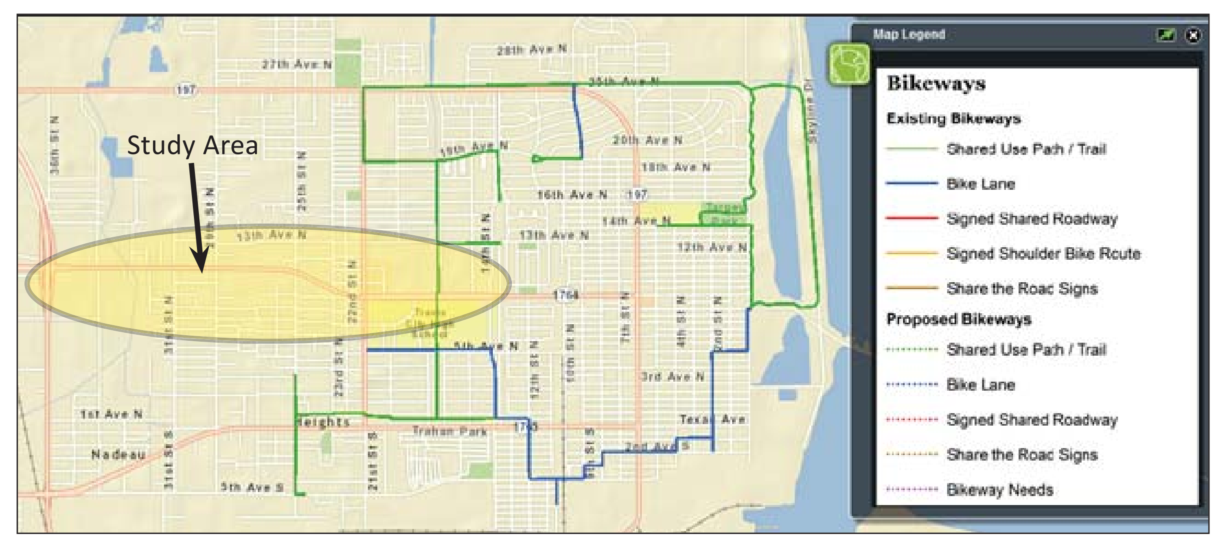


Figure 3.9: H-GAC Regional Bikeway Plan, June 2010, showing no current or planned bicycle facilities along the study corridor. A trail crosses the corridor at the signal for the school and library.

Chapter Four

Access Management Analysis

Two primary goals for this study are to improve mobility and reduce delays along FM 1764, and to improve safety by decreasing crash rates. In addition to managing roadway capacity and operational safety, a key element is the management of access points to the roadway.

SH 146 Interchange Modification

The SH 146 interchange congestion and associated vehicle delays during the weekday afternoons contributes to the aggressive driver behavior in the corridor. A proven enhancement to the existing dual-signal diamond interchange is the single-point urban interchange (SPUI). Four possible interchange alternative concepts are shown on page 24. In traffic models of the existing and proposed SPUI configurations, the SPUI configuration reduces approximately 200 vehicle-hours from the interchange operations weekday operations every weekday afternoon. Table 4.1 compares the optimized operations of the SPUI alternative A-2 to the optimized existing dual-signal diamond interchange. Details of the analysis are included in Appendix C.

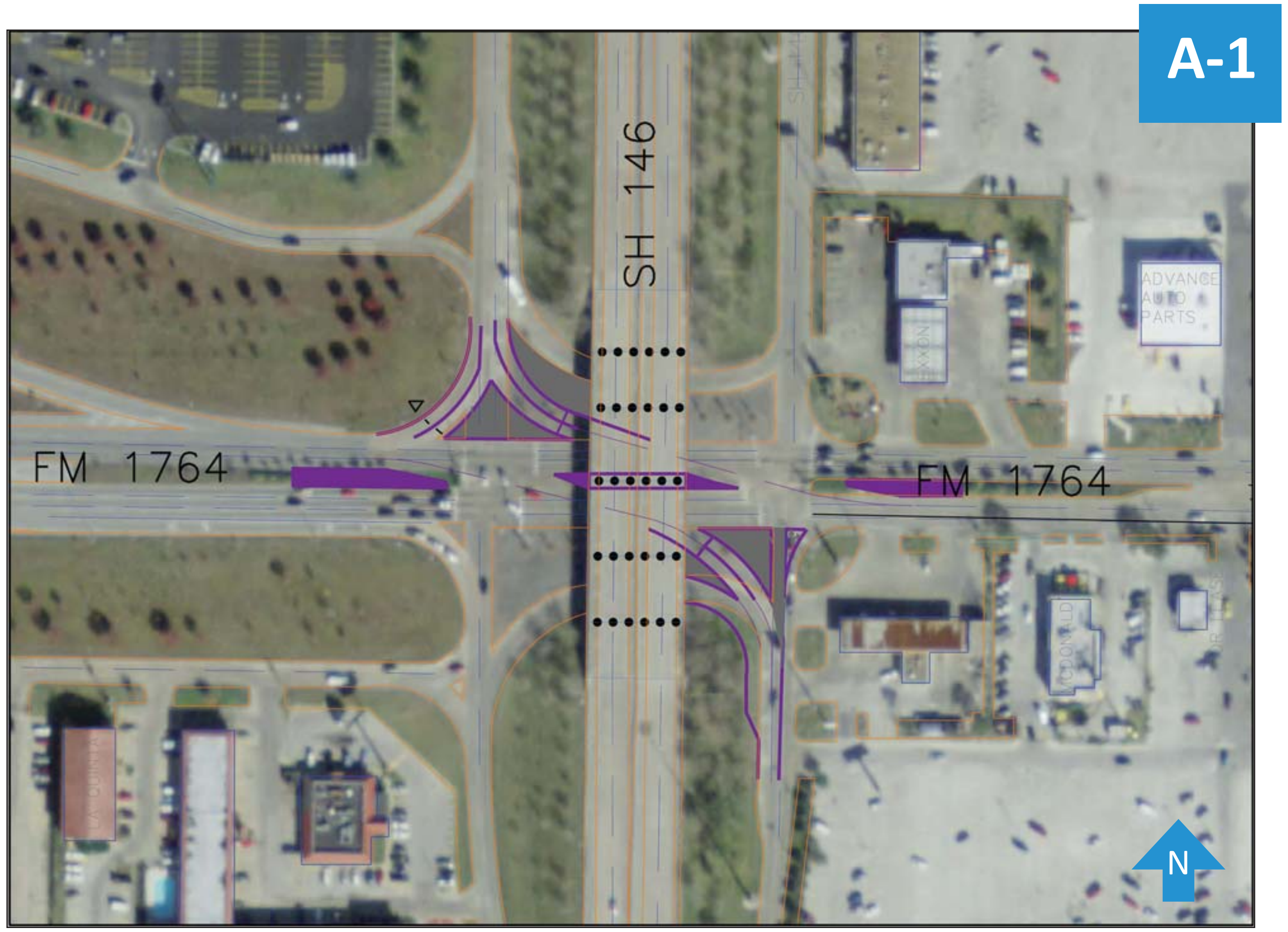
PM Peak Hour Benefits of SPUI at SH 146 Interchange

Location	Total Delay (hours)	Average Delay (veh/sec)	Level of Service
Existing Conditions, Optimized	231	157	F
SPUI A-2 Treatment, Optimized	39	33	C
Expected Net Improvement	**192**	**124**	**-**

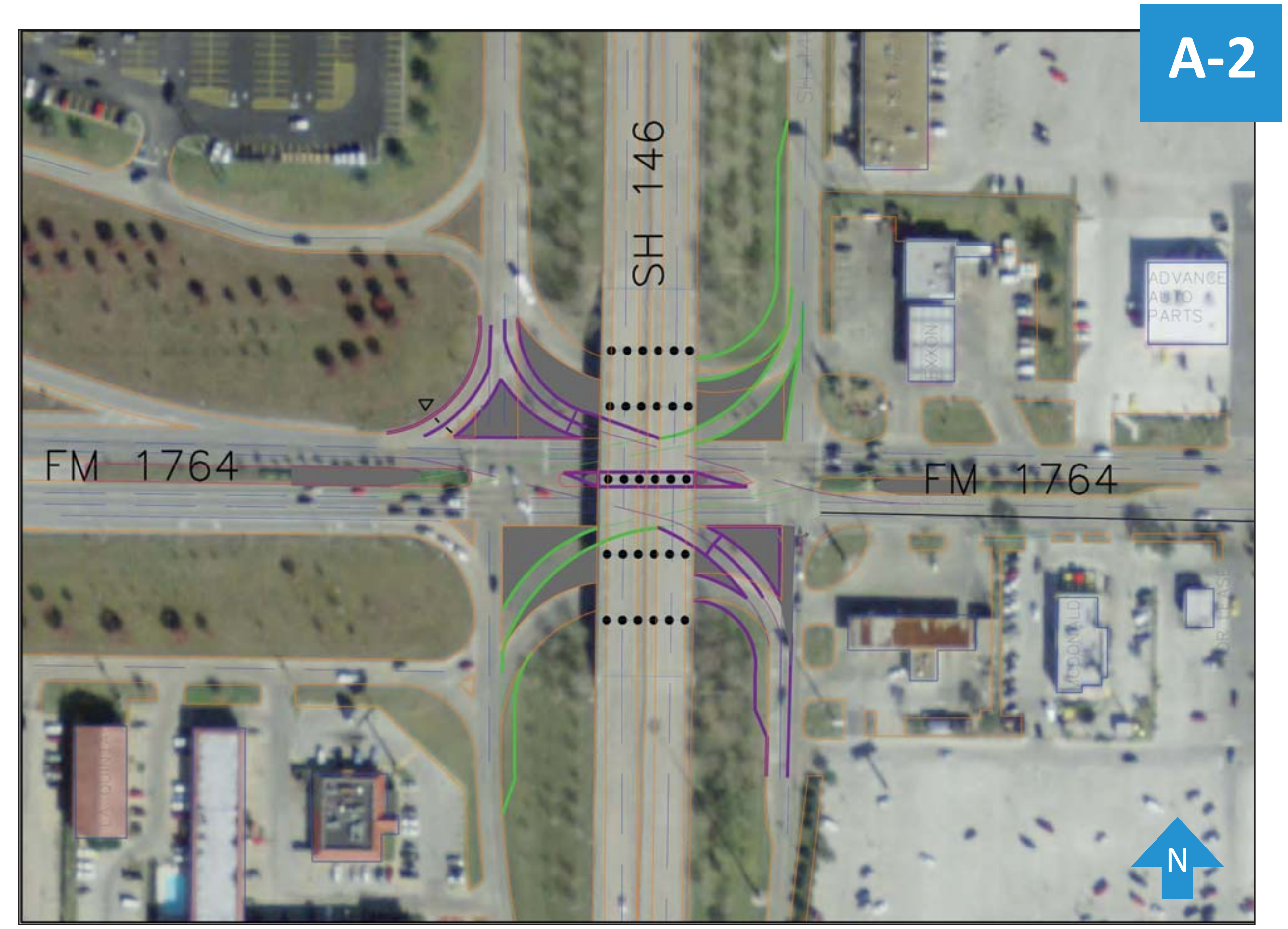
Table 4.1: Reduction in PM Peak Hour Delay anticipated from implementation of SPUI

Figure 4.1: Extensive queue lengths and delays are experienced during the PM Peak Hour at the SH 146 interchange (screenshot from FNI's TransModeler simulation)

SH 146 Interchange Alternatives

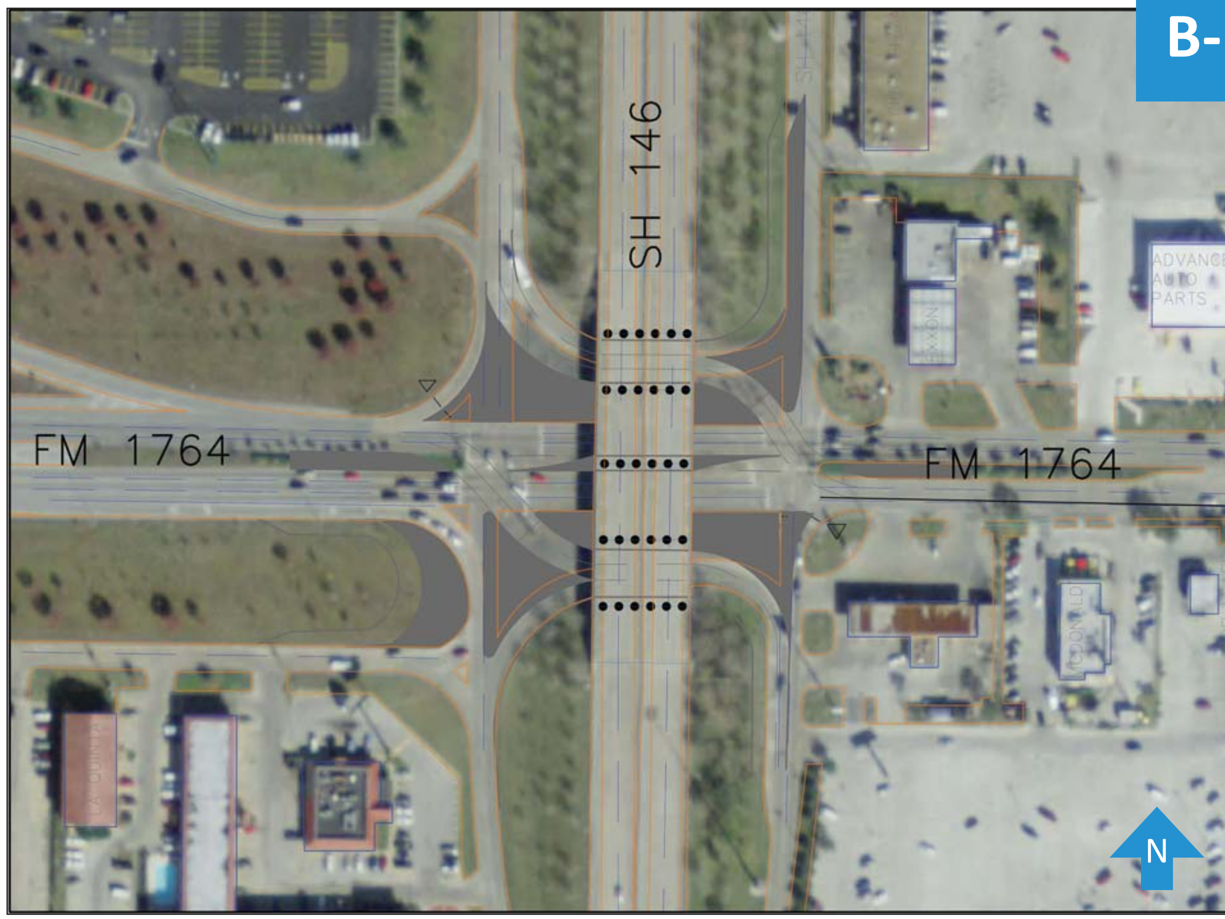


A-1: Two of the approaches, the northbound and southbound service roads, have their left turns realigned to allow them to move concurrently, reducing overlap delay. The eastbound and westbound left turns still overlap under SH 146. Operational benefits are significant, but would not alleviate the excessive queues that do not clear each signal cycle.



A-2: All four left-turn approaches, the northbound and southbound service roads and eastbound and west bound FM 1764, have their left turns realigned to allow them to move concurrently, reducing overlap delay. As will alternative A-1, northbound through movements would be provided for, but southbound through movements (very low volume) would be required to turn right and u-turn under FM 1764. This alternative is the most symmetrical of the four and significantly reduces delay such that all movements operate at good level of service during the PM Peak hour. **This is the recommended treatment.**

B-1



B-1: Similar to Alternative A-1, the northbound and southbound service roads' left turns would be realigned to allow them to move concurrently, reducing overlap delay. However, the realignment is shifted further to eliminate the use of the opposing lanes during the left turn movement. The eastbound and westbound left turns can be treated as in A-1 or as in A-2, with the A-2 configuration more effective at reducing delays.

B-2

B-2: Similar to Alternative B-1 for the northbound and southbound left turns. However, the eastbound and westbound left turns would be routed from their current movement through the interchange. Westbound FM 1764 traffic heading south on SH 146 would pass straight through the interchange and take the ramp leading to the turnaround roadway under FM 1764 and then u-turn back to tie to the southbound service road south of FM 1764, turning right to proceed south. Eastbound FM 1764 traffic heading north on SH 146 would turn right in advance of the interchange to the southbound service road and another immediate right to the turnaround roadway under FM 1764, and then back to tie to the southbound service road north of FM 1764, entering the u-turn to proceed north on the northbound service road. This alternative reduces the most delay at the interchange, but adds mileage for the eastbound and westbound left turns, and the eastbound left-turn movement through the u-turn is cumbersome.

Intersection Improvements

Modifications to intersections can improve traffic operations at that localized location and signal coordination can improve operations along the corridor.

FM 1764 at 34th Street

The north and south approaches at the FM 1764 intersection with 34th Street are offset by 50 feet, requiring the side-street green time to be allocated separately to the north approach and then the south approach phases (split-phase) of each signal cycle. During the peak periods of the day, the operational inefficiency of the split-phase operation reduces the amount of green time that is available for the heavier east-west movement. Examination of the street right of way at the intersection indicates that there is sufficient room to better align the north and south approaches to allow a more typical intersection operation (see Figure 4.2).

The realignment can also serve to improve the pedestrian crossing provisions at the intersection. Working with the property owner at the southwest corner, a better landing could be created that provides a shorter, perpendicular crossing of the west leg of the intersection. It is reported that workers at the building on the southwest corner utilize this pedestrian crossing at lunchtime to access the restaurant and other businesses north of FM 1764.

Signal Equipment and Capabilities Upgrade

The efficiency of each intersection and the corridor overall can be improved by upgrading the traffic signal controller, detection units, and system coordination to be more responsive to actual traffic conditions. Existing vehicle detection is done using loops cut into the pavement, which have been re-cut into the pavement multiple times as the loop wires tend to break over time. The vehicle detection at each intersection should be upgraded to more reliable systems, such as video, radar or other newer technologies. Communications systems should be considered to send the vehicle detection and other signal system information to a central control and monitoring station, as well as communicating between signalized intersections. The signal controller in each cabinet should be examined for the need to be upgraded to a controller that allows, at a minimum, time-based coordination using a central clock with programmed minimum and maximum timing values or, at the higher end, an adaptive control system that responds dynamically to traffic conditions locally and along the corridor throughout the day.

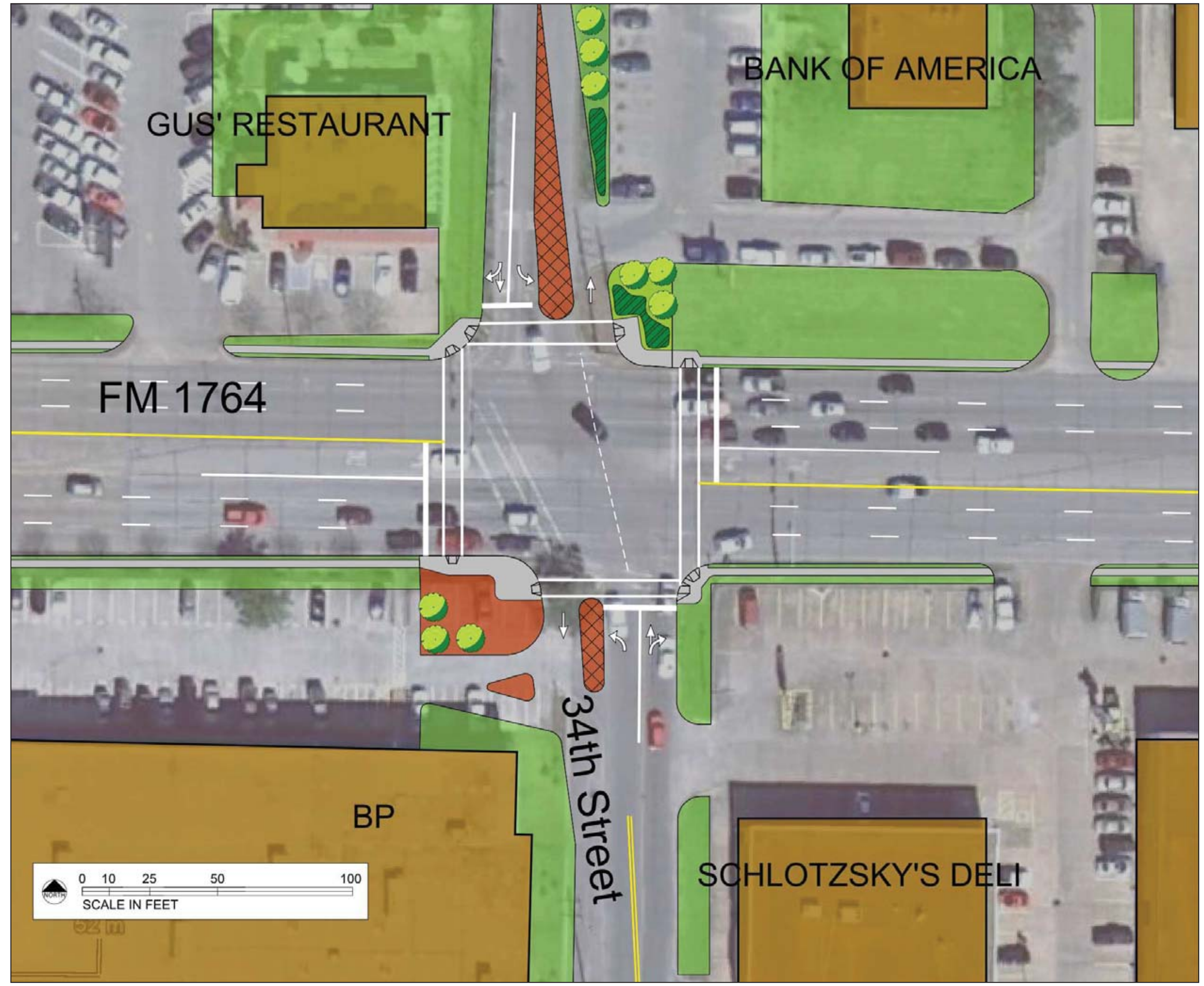


Figure 4.2: Intersection improvements—FM 1764 at 34th Street.

Continuous Right-Turn Lanes

The close spacing of driveways along the corridor causes significant slowing of the rightmost lane by traffic turning off of and onto FM 1764 at driveways and other access points. The TxDOT *Access Management Manual* (July 2011), using procedures in the Highway Capacity Manual, indicates that streets with more than 40 access points per mile can expect a reduction in free-flow speed of approximately 10 MPH. The *Access Manual* also indicates that "right-turn movements increase conflicts, delays, and crashes, particularly when a speed differential of 10 MPH or more exists between the speed of the through traffic and the vehicles that are turning right." In a footnote to the *Access Manual Table 2-3: Auxiliary Lane Thresholds,* "Continuous right-turn lanes can provide mobility benefits both for through movements and for the turning vehicles." With relatively dense driveway spacing, especially between 21st Street and 34th Street, individual deceleration lanes are not practical.

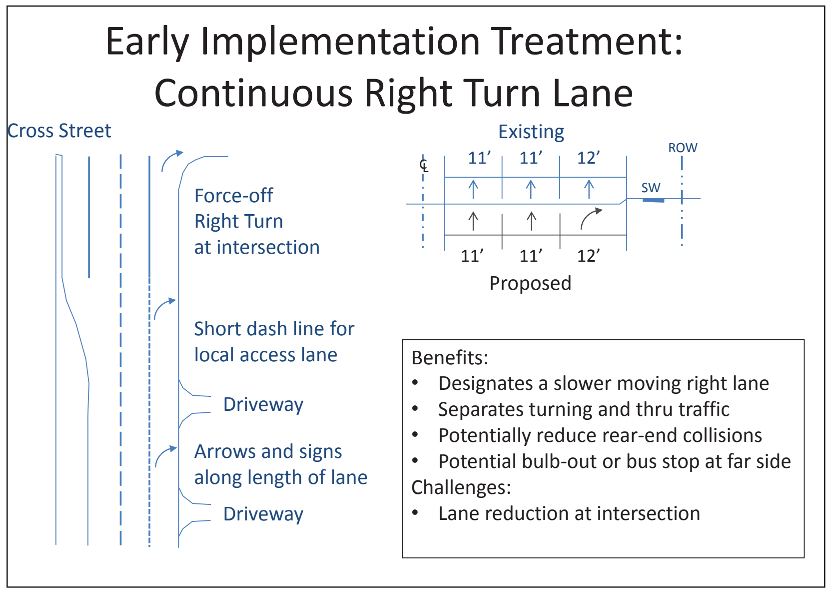


Figure 4.3: Continuous right-turn lane.

Continuous right turn lanes (CRTL) establish a separation of the through traffic from the rightmost lane (see Figure 4.3). For the FM 1764 corridor, a CRTL would be established in each direction east of 34th Street, replacing the right lane divider dashed stripe with a dotted stripe. At the signalized intersections of 21st Street, 24th Street, 29th Street, 31st Street and 33rd Street (westbound only), the rightmost lane would transition from the continuous right-turn lane for driveway access to a dedicated right-turn-only lane at the intersection. Across the intersection from the forced right turn, three options could be considered:

1. Leave the lane open as the beginning of the next continuous right turn lane – this option is the least startling to errant drivers who do not heed the forced right turn, but does less to deter through traffic in the right lane
2. Stripe a "bulb-out" at the far side corner – this option would be more of an encouragement for drivers to heed the forced right turn, but pedestrians may think that the striped bulb is a safe refuge area for crossing
3. Create a raised bulb-out at the far side corner – this option would force drivers to heed the forced right turn and would establish a refuge area for shorter street crossing

These three options could be considered as phased-in treatments for incremental implementation.

Channelized Medians

Based on numerous studies from across the nation, the TxDOT Access Management Manual concludes that "roadways with a non-traversable (raised) median have an average crash rate about 30 percent less than roadways with a TWLTL" (two way left turn lane). TxDOT is converting flush medians to raised medians on roadways throughout Texas, especially those that have transitioned from rural to urban in development density with associated traffic volume increases. The raised medians are intended to improve the safety of the roadway by eliminating the number of conflict points along the roadway, and thus improve the traffic flow characteristics of the corridor.

Discussions with TxDOT staff members of the project Steering Committee have indicated a preference for "hooded" left turn openings in the raised medians, reflected in Figure 4.4. Under this configuration, only left turns and U-turn movements could be made. This design for openings does not allow cross-movement across the median, such as would come from vehicles turning left or going straight out of driveways. These movements would need to take alternative routes to their intended destinations, including making a U-turn further along FM 1764.

Placement of the median turn lanes must consider several factors. Preferably, a hooded left turn could be provided that would directly feed a strategic driveway with cross access to adjacent development parking areas. It will be important to provide as many center left turn locations as practical to facilitate U-turns between major intersections. The recommended placements for the channelized median left turns are shown in the conceptual layouts in Appendix D.

Figure 4.4: Channelized median left-turn lane (Westheimer Road, FM 1093, Houston)

Sidewalks and Crossings

Though not a predominant user group in the corridor, pedestrians and bicyclists use the sidewalks to traverse a portion of the corridor. There are residential neighborhoods, particularly between 21st Street and 29th Street, that are within walking distance of the businesses along FM 1764. Some sidewalk segments are missing and needed, as evidenced by locations where people have worn a path in the grass, as is the case along the north side between 31st Street and 34th Street. These sidewalk needs should be addressed for the safety of the pedestrian and bicyclist roadway corridor user.

Sidewalk connections from neighborhoods to the FM 1764 corridor should be provided to encourage non-motorized travel to and from the corridor. Target streets for the addition of sidewalks include:

- 31st to the north and south
- 29th to the north and improved to the south
- 27th to the south
- 26th to the south
- 23rd to the north and south
- 22nd to the north and south

Some areas of sidewalk environment pass through an overly large driveway opening, which exposes pedestrians to a large conflict area with driveway traffic. In these locations, driveways should be considered for reduction in width and/or a change in configuration of parking access.

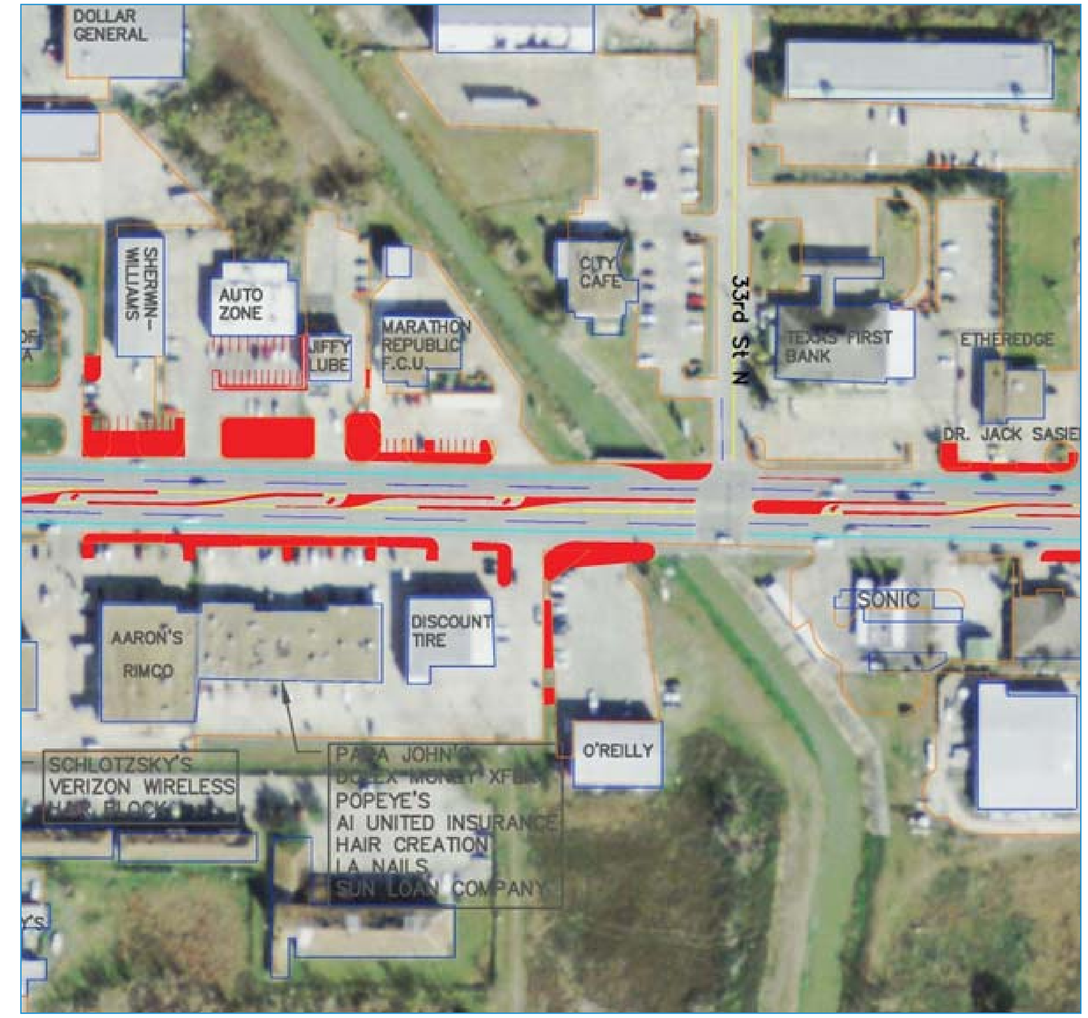


Figure 4.5: Driveway Consolidation

Managing Driveway Impacts on Capacity and Safety

Managing the access points that bring traffic to and from the adjacent development requires negotiation with property owners regarding an amenity that had been previously granted to them by the City and/or TxDOT. Managing access points is made more feasible by the provision of cross access among the adjacent property owners for access to multiple parking areas from consolidated driveways.

Driveway Consolidation

Often the closing of one or more driveways along the roadway frontage can allow for more parking on the site. However, the layout of some smaller sites relies on the provided driveways to make the on-site circulation and/or parking provisions functional. Several locations along the corridor have been identified as having the potential to enhance the site while eliminating driveways or modifying large pull-in parking openings (see Figure 4.5). These are shown in the concept illustrations in Appendix D.

TxDOT has determined that there should be no forced driveway closures as part of these access management recommendations. Each of these potential treatments should be further developed and assessed in conjunction with the property owners to determine whether the property owners would benefit from the improvement. Benefits of driveway closures to property owners include the potential to add more parking spaces, reducing the potential for driveway collisions at the street, and potentially reducing the number of conflict points with on-site circulation.

Shared Access and Cross Access to Parking

In addition to driveway consolidation, shared parking arrangements between adjacent developments can ease the impact of a loss of a driveway to one or more individual businesses, especially if each developed individually over time. It also can help create more effective parking provisions for a potentially more successful collaborative of businesses. Agreements, such as a cross-access easement (see Figure 4.6), would need to be established between property owners to effect such an arrangement.

In many instances, additional pavement must be built and signage and other obstacles removed. In some cases, a grade differential between adjoining developments must be overcome. Some adjoining businesses may not be practical candidates for shared parking, either by functional or physical constraints, while others may be a natural fit. Those businesses that are a natural fit and could benefit the most from the enhancement should be initially considered and encouraged for development of shared parking agreements and physical adaptation of parking lots.

Driveway Spacing and Location Standards

The City of Texas City should establish driveway spacing and offset-from-intersection standards by local ordinance and/or site design guidelines. Such a measure would help control the access provided when properties develop, and would eventually bring the corridor toward a better balance of throughput and local access. The establishment of the ordinance or site design guidelines would also help to classify existing driveways that are non-compliant and help to establish a list of desired driveway closures for future prioritization.

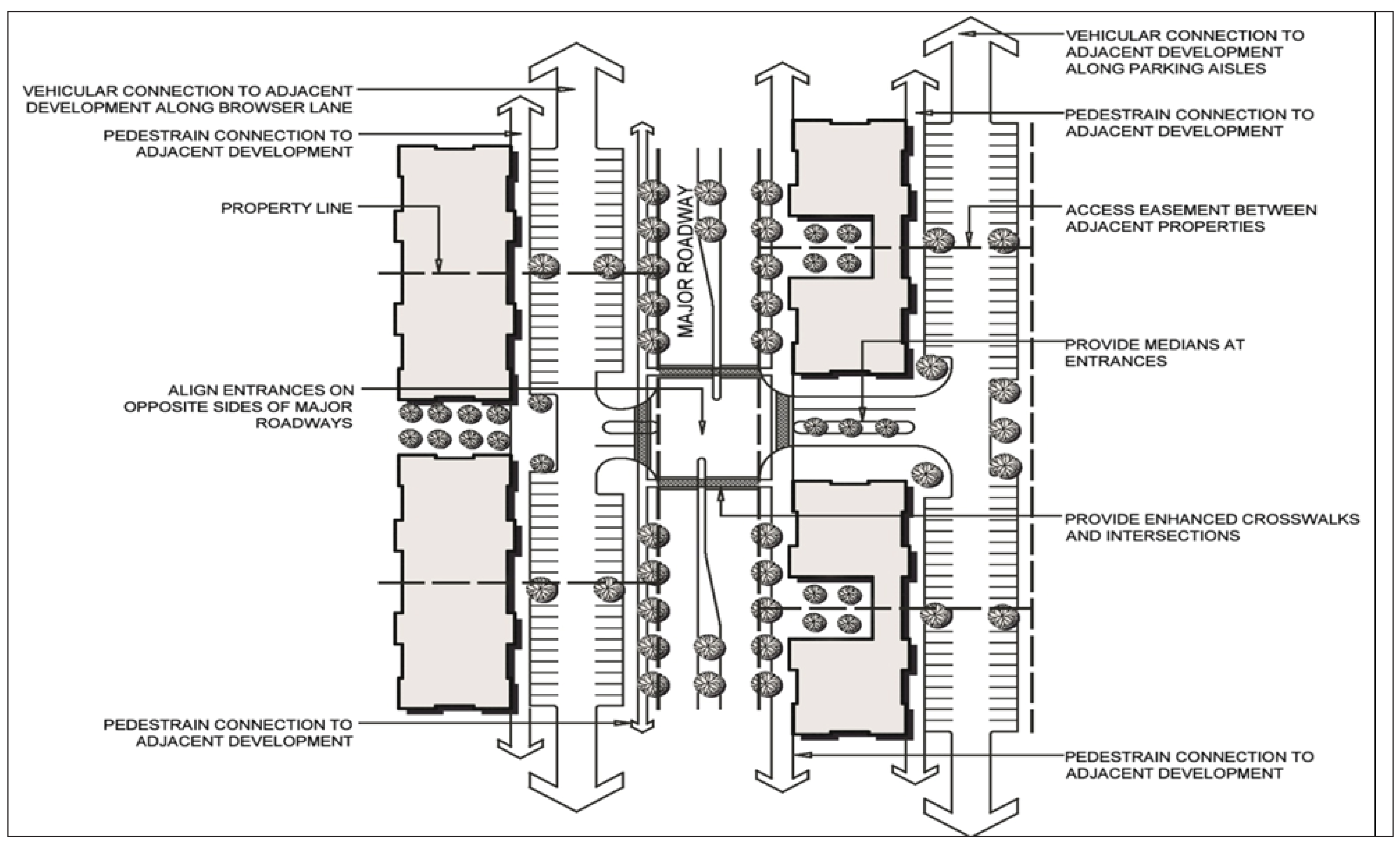


Figure 4.6: Shared access and cross access to parking

Road Diet

During the process of assessing the corridor for potential access management treatments, some corridor enhancement concepts evolved. One concept of particular importance was the road diet.

Analysis of the Continuous Right-Turn Lane treatment found that the roadway operations east of 34th Street operate at acceptable peak-hour level of service (LOS B/C) with one less through lane at the signalized intersections. The reduction of a travel lane for the purpose of reallocating the space to non-travel lane use is called a road diet.

Instead of allocating the space to the continuous right-turn lane, the space could be reallocated to provide a wider outside lane, an enhanced sidewalk zone, increasing the buffer space between the sidewalk and the travel lane, sidewalk and adjacent development, and/or increasing the width of the sidewalk. The enhanced edges of the roadway would also serve to calm traffic operations along the corridor.

The road diet conversion of the outside lane to sidewalk space could be a staged implementation, installed incrementally as adjacent development transitions from its currently automobile-oriented nature to something that might be more dense and pedestrian oriented. To complement the road diet treatment to enhance the pedestrian nature of the corridor, sidewalks should also be developed to connect the adjacent neighborhoods to the commercial corridor (see Figure 4.7).

Figure 4.7: Roadway diet; before and after

Chapter Five

Recommended Improvements

Feasible access management tools are compiled into a prioritized series of implementation actions:

- Short-Range (targeted for completion within five years)
- Medium-Range (feasible to be completed within Six to 15 years)
- Long-Range (likely to take longer than 15 years to implement)

Short-Range Projects (First Five years)

In conjunction with the ongoing TxDOT project to mill and overlay FM 1764 from SH 164 to 14th Street, a set of access management treatments is recommended for use as the revised final striping plan for the intersection. These include:

- Striping of continuous right-turn lanes with force-off right turns at signalized intersections, eastbound from 34th Street to 14th Street and westbound from 14th Street to 33rd Street
- Striping of channelized left-turn bays in the median between SH 146 and 34th Street

These improvement concepts are depicted in the concepts in Appendix D. The costs are developed in more detail in Appendix E, and are summarized in Table 5.1.

Continuous Right-Turn Lanes

The study corridor is characterized by closely spaced driveways serving small- and medium-size lots in the mostly developed corridor. The frequency of turning maneuvers in and out of the driveways, especially between 21st Street and 34th Street, tends to slow traffic operations in the rightmost lane.

Re-striping lane markings will help address safety issues associated with turning maneuvers and associated speed differentials between lanes. The re-striping will delineate the outside lane using the dotted pattern similar to those used for a lane drop on a highway, but extending the length of the segment between signalized intersections.

This treatment will direct the through movements into the two leftmost lanes and encourage turning maneuvers in the rightmost lane, effectively separating the faster through movements from the slower right-side, local-access movements. The right-turn lane would be forced off to take a right turn at the downstream signalized intersections. The striping of the continuous right-turn lanes with force-off right turns at signalized intersections would extend eastbound from 34th Street to 14th Street and westbound from 14th Street to 33rd Street (see Figure 5.1).

Figure 5.1: Continuous right-turn lane

Cross Section – The pavement design section from SH 146 to 21st Street shows the existing pavement to provide two 11-foot inner lanes and a 12-foot outer lanes. The re-striping of the lanes should retain the minimum 11-foot width of the inner lanes, per direction from TxDOT. Under this configuration, the current middle lane would become the right most through lane, so it will need to accomodate truck and bus movements.

Pavement Markings – The lane divider markings for the continuous right-turn lane would consist of 8-inch-wide by 2-foot-long white stripes with 4-foot spaces, changing to a solid 8-inch white stripe beginning 150 feet in advance of a signal controlled intersection. At the approach to the signalized intersections, a slight channelization of the right turn lane would be created using raised pavement markers, on 2-foot spacing, to taper the 12-foot turn lane to 10-feet in width over the distance of 20 feet to the stop bar.

Across the intersection from the force-off right turn, a bulb-out area would be striped with a 4-inch solid-white line to demark the turning radius needed for the side-street right turn into the middle lane on FM 1764. It would then extend along FM 1764 12-feet from the curb for approximately 10 feet, then transition the 12 feet to end at the curb over a distance of 24 feet. The space inside the bulb-out area should be striped on a 45-degree angle to FM 1764, pointing downstream, using 8-inch white stripes at 24-inches on center.

Signage – Signs would be placed at or near the beginning of the dotted lines, and at intervals of no more than 500 feet, denoting each continuous right-turn lane. The suggested sign text would be DRIVEWAYS USE RIGHT LANE (a specific use version of the R4-5 Trucks Use Right Lanes) in accordance with Section 2B.27 of the *MUTCD*.

The R3-7 (RIGHT LANE MUST TURN RIGHT) or the R3-5 (right-turn arrow with ONLY text) sign would be placed approximately 50 feet in advance of the beginning of the striped right-turn lane. Additionally, a W9-1 (RIGHT LANE ENDS) warning sign should be placed approximately 200 feet in advance of the beginning of the striped right-turn lane.

Anticipated Costs
This can be a cost-effective treatment, if done as part of the proposed FM 1764 milling and overlay, for approximately $47,500 above the cost of that project. **Responsible Agency: TxDOT.**

Anticipated Benefits
Safety benefits from the separation of vehicles can be expected to proceed expeditiously along FM 1764 from those drivers looking for a destination and preparing to enter a driveway. Exiting maneuvers also may experience an easier entry into the CRTL before merging with the through traffic. Elimination of four non-injury crashes would make this a cost-beneficial treatment, likely within the first year after implementation.

Channelized Left-Turn Lanes

Ultimate treatments proposed in the Access Management Study call for provision of raised medians with hooded left turns. As an introduction to this treatment, which would create a divided roadway along the length of the study area, channelized left-turn bays would be created using striping in the median between SH 146 and 34th Street.

The section has a portion of raised median immediately east of the SH 146 interchange and reportedly had raised medians that were removed to facilitate access to driveways. Fortunately, there are just a few primary driveways that provide access into large-lot development with shared parking access on both sides of the street. This will be a good introductory treatment to familiarize drivers with stronger channelization of the medians.

Cross Section – The existing median width is 14 feet between SH 146 and 21st Street. Channelizing the left turns will retain a width of 11 feet minimum in the turn lane, with 8-inch, turn-lane striping and as much buffer space against opposing traffic as possible.

Pavement Markings – Pavement markings would be located as shown on the concept plans. The edges of the median and the inside and outside edges of the turn lanes would be denoted using 4-inch yellow stripes. Eight-inch yellow lines at 45-degrees to FM 1764 pointing downstream and at 48-inches on center would fill the median area between the turn lanes.

Anticipated Costs
This can be a cost-effective treatment, if done as part of the proposed FM 1764 milling and overlay, for approximately $10,000 above the cost of that project. **Responsible Agency: TxDOT.**

Anticipated Benefits
The striping will help control the locations where the left turning maneuvers enter the flush median, potentially avoiding any head-on collisions. Avoiding just one such crash would make this a cost-beneficial treatment, likely within the first year after implementation.

Posted Speed Limits

With the density of driveways along the corridor, a traffic speed study would assess whether the speed limit should be reduced from 40 MPH to 35 MPH. This would be a proactive and reasonable safety measure for the corridor with so many conflict points continuously along the roadway. The study should be done after the implementation of the continuous right turns treatment, and each lane should be monitored separately.

Anticipated Costs
A traffic speed study for the corridor would cost about $10,000. New speed limit signs, if appropriate, are estimated at about $1,000 per mile each direction for a total of $3,000. **Responsible Agency: TxDOT.**

Anticipated Benefits
At lower speeds, motorists can better judge acceptable gaps for merging with and crossing traffic. At lower speeds, crash severity tends to be less critical. The value of potentially eliminating two non-injury collisions or just the reduction in severity of one crash would more than offset the cost of the study and associated signs.

Estimated Costs of Short-Range Projects

Project	Estimated Costs
Change Dashed Lane Line to CRTL dotted lines	$10,000
Stripe Force-Off Right Turns at Signalized Intersections	$13,000
Stripe Bulb-outs at 10 corners	$5,000
Stripe Median for Channelized Left Turns, SH 146 to 34th	$10,000
Contigency and Change Order Cost	$9,500
Traffic Speed Study	$10,000
New Speed Limit Signs	$3,000
ESTIMATED TOTAL FOR ALL SHORT-RANGE PROJECTS	$60,500

Table 5.1: Estimated Costs of Short-Range Projects

Medium-Range Projects (Six to 15 years)

The essential projects in the medium-range horizon include addressing the congestion at the SH 146 interchange, and enhancing the safety of the corridor by installing raised medians. Other improvements to be accomplished in this time frame include constructing raised bulb-outs to replace those striped in the early implementation project, upgrading traffic-signal detection and coordination capabilities, realigning 34th Street at FM 1764, and completing or repairing the sidewalks along FM 1764.

The short range improvements would be an enhancement to the TxDOT roadway corridor that would benefit predominantly the citizens of Texas City but also regional travelers as well. The anticipated costs of the short range program of recommendations are summarized in Table 5.2.

SH 146 Single-Point Interchange

There is an immediate need to implement improvements at the interchange of FM 1764 with SH 146 to relieve the congestion that happens every weekday afternoon on the northbound, eastbound and westbound approaches at the interchange.

Analysis results indicate that implementation of a single point urban intersection (SPUI) would eliminate approximately 200 vehicle-hours of delay time each typical weekday afternoon peak hour, for an estimated savings of over 50,000 vehicle hours of delay and 12,525 gallons of fuel burned while idling per year.

Anticipated Costs

As shown in Appendix E, the cost to convert the existing diamond interchange to a SPUI is approximately $350,000, including the additional pavement, new traffic signals, controller modifications, design and traffic control during construction. **Responsible Agency: TxDOT.**

Anticipated Benefits

Personal value of time is estimated at $20 per hour by the Houston TransStar 2009 Annual Report. The time savings is valued at more than $4,000 per day, or an annual value of more than $1 million per year.

With gas at more than $3 per gallon, the fuel savings would be more than $40,000 per year. The improvement would be considered a cost beneficial treatment within the first year after implementation.

In addition, air quality benefits from reducing 200 vehicle hours, or over 75 percent of delay at the intersection will be an important contribution to the air quality of the region. Synchro™ analysis indicates the following potential reductions, assuming a direct correlation between delay reduction and emissions savings:

- CO: 8,810 grams/hour x 75% = 6,600 grams/day or 1,650 kg/year savings
- NOX: 1,715 grams/hour x 75% = 1,286 grams/day or 321 kg/year savings
- VOC: 2,041 grams/hour x 75% = 1,530 grams/day or 383 kg/year savings

Raised Medians

Potentially, the greatest enhancement to the safety of the corridor would be the construction of raised medians (see Figure 5.2). Strategic location of hooded left-turn bays are depicted in the conceptual layouts shown in Appendix D.

A detailed design effort should be combined with involvement of the specific stakeholder business and property owners along the section of roadway under design. The raised medians can be implemented incrementally to allow for the proper execution of design and stakeholder concurrence, and to allow for accumulation of the funding needed to implement the raised medians.

Anticipated Costs

The anticipated cost of constructing the raised medians is approximately $550,000 to $650,000 per mile, depending upon the degree of landscaping, or approximately $880,000 to $1,040,000 for the 1.6-mile segment of the corridor that currently has no raised medians. **Responsible Agency: TxDOT.**

Anticipated Benefits

According to the *Transportation Research Board Access Management Manual*, the addition of raised medians to an existing flush median two-way, left-turn lane is projected to decrease the number of crashes by 15 percent.

With the average annual cost of accidents in the corridor of $5.1 million, installation of the raised medians along the length of the corridor can be expected to have a community value of approximately $765,000 per year. The improvement would be considered a cost beneficial treatment within the first two years after implementation.

Figure 5.2: Raised median with optional landscaping

Bulb-outs Downstream of CRTL Forced Right Turns

Raised bulb-outs would complement the raised medians. They were recommended initially with striping during the early implementation of the continuous right-turn lanes. Creating a raised bulb-out involves not only the design of the actual curb and surface treatment but also addressing the drainage at the corner and any nearby driveways.

A detailed design effort should be combined with involvement of the specific stakeholder business and property owners near each corner bulb-out. The raised bulb-outs can be implemented incrementally to allow for the proper execution of design and stakeholder concurrence, and to allow for accumulation of the funding needed for the raised medians. The bulb-outs can be installed in conjunction with the raised medians or separately in advance or afterward.

Anticipated Costs

The anticipated cost of constructing the ten raised bulb-outs is approximately $35,000 per bulb-out or approximately $350,000 for the corridor, as shown in Appendix E. **Responsible Agency: TxDOT.**

Anticipated Benefits

The value to constructing the raised bulb-out would include:

- Shortening the pedestrian crossing exposure by shortening the crossing length
- Shortening the length of the minimum green required to allow for the pedestrian crossing
- Strengthening the requirement of the force-off right turn
- Creating a more secure bus pullover bay

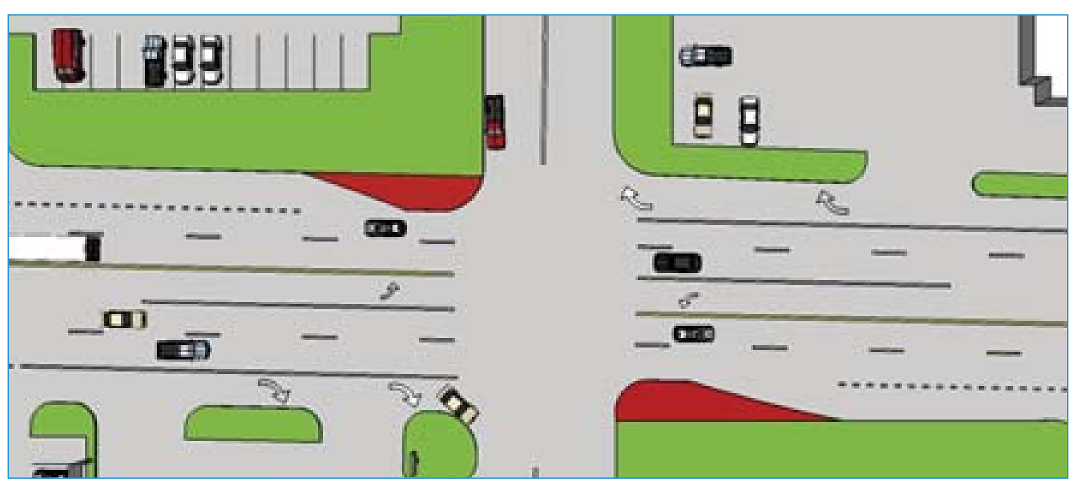


Figure 5.3: Intersection detail of force-off right turn and bulb-out

Signal Timing Coordination

Signal timing at intersections can be enhanced by detection and controller equipment and software upgrades to be more responsive to the instantaneous traffic demands. Communications between signal controllers can facilitate the progression of traffic between signalized intersections.

A signal timing plan should be developed for the corridor. Evaluation should be performed of the capabilities of each traffic controller, the detection equipment at the intersection, and the capabilities of each intersection to communicate with each other and/or to a central master controller for either time-based coordination or adaptive signal control.

Anticipated Costs

The cost to implement the upgrade is in the range of $25,000 per intersection, including detector and controller upgrades and communications equipment, totaling approximately $225,000 for the nine signalized intersections, not including design. **Responsible Agency: TxDOT.**

Anticipated Benefits

Delays along the FM 1764 corridor can also be reduced by improving vehicle detection, traffic responsive signal timing, and coordination between signals.

Sidewalks

In addition to the missing sidewalk along the north side of the street between 31st Street and 34th Street and in other locations where the safety of pedestrians and bicyclists using the roadway corridor is an issue, there are places where the sidewalk environment passes through overly large driveway openings, exposing pedestrians to a large conflict area with driveway traffic.

The design of the new sidewalks and the actual treatments across the driveway openings should be combined with involvement of the specific stakeholder business and property owners near each sidewalk improvement. The sidewalks can be implemented incrementally to allow for the proper execution of design and stakeholder concurrence, and to allow for accumulation of the funding needed to implement the sidewalks.

Anticipated Costs

The anticipated cost of constructing the needed sidewalk enhancements is roughly estimated at $331,000 for the corridor, as shown in Appendix E. **Responsible Agencies: TxDOT and City of Texas City.**

Anticipated Benefits

Completion of the sidewalks along the north side of the street is seen as a public safety issue for those trying to walk along that side of the road, as well as encouragement of non-motorized transportation (walking and bicycling) and riding transit in the corridor.

Intersection Treatments

The north and south approaches at the FM 1764 intersection with 34th Street are offset by 50 feet, requiring the side-street green time to be allocated separately to the north approach and then the south approach phases (split-phase) of each signal cycle.

Using the available street right of way on the northeast corner and acquiring a corner clip from the southwest corner at the intersection would allow sufficient room to better align the north and south approaches.

Anticipated Costs

The anticipated cost of constructing the needed roadway realignment and signal modifications plus any needed right of way is roughly estimated at $216,000 for the intersection. **Responsible Agencies: TxDOT and City of Texas City.**

Anticipated Benefits

This would allow a more typical intersection operation, and a better landing and shorter crossing for pedestrians.

Estimated Costs of Medium-Range Projects	
Project	Estimated Costs
Convert Diamond to SPUI	$ 352,000
Traffic Signal Equipment Upgrades	$225,000
Raised Bulb-outs at 10 corners	$350,000
Raised Medians and Channelized Left Turns	$880,000
Landscaping of Medians (optional)	$160,000
Sidewalk Completion and Reconstruction	$331,000
Realignment of 43rd Street	$216,000
ESTIMATED TOTAL FOR ALL MEDIUM-RANGE IMPLEMENTATION PROJECTS	$2,514,000

Table 5.2: Estimated Costs of Medium-Range Improvement Projects

Long-Range Improvements (Longer than 15 Years)

Long-range improvements are those that are expected to require extensive collaboration with and among private property owners and businesses. These projects also may be more appropriate as earlier access-management and other public infrastructure projects spur changes in development. The anticipated costs are tabulated in Table 5.3.

Driveway Consolidation and Merging Parking Areas

The approach to the closure or consolidation of driveway access to development requires the examination of how parking and circulation would work on each development site. In conjunction with the planning for location of hooded left turns as part the short-range program of improvements for raised medians, the stakeholder businesses and property owners would be involved. The City also will need to establish shared-parking ordinances and parking variance provisions to facilitate the approval process of the improvements. A concept for driveway consolidation and merging of parking areas is shown in Appendix D.

During discussions with businesses and stakeholders, the City and TxDOT should initiate talks related to the closing or relocating driveways and merging of adjacent parking areas. Model joint-use agreements for parking are available through H-GAC to facilitate these arrangements.

Anticipated Costs

Cost are further described in Appendix E. The anticipated cost of each of the consolidation of driveways and the merging of parking lots may vary considerably depending on the conditions of ownership, specific site circulation and grade attributes, and the final negotiated configuration for each treatment. As described further in Appendix E, costs were estimated for illustrative purposes for planning level estimates, and are compiled in Table 5.3.

The costs to close and/or modify driveways and construct connections to join the parking and create cross-flow between properties is a betterment of the corridor and the private development. Thus, the City and TxDOT should consider a cost sharing of the improvements on private property.

Anticipated Benefits

As described on pages 16 and 17, the reduction in the density of driveways along the corridor could save the travelers along FM 1764 significant collective social costs each year, potentially cutting crash rates in half at some locations. The merging of parking areas can help to make each property's parking more effective.

Estimated Costs of Long-Range Projects			
Project	# of Driveways at $10,000 each	# of Parking Areas at $20,000 each	Estimated Costs
SH 146 and 34th Street, EB	1	1	$ 30,000
34th and 33rd Streets, EB	4	2	$60,000
34th and 33rd Streets, WB	2	4	$100,000
33rd and 31st Streets, EB	2	0	$20,000
33rd and 31st Streets, WB	2	0	$20,000
31st and 29th Streets , EB	4	5 + Special areas	$200,000
31st and 29th Streets, WB	5	3	$110,000
29th and 25th Streets, WB	7	0	$70,000
25th and 21st Streets, EB	2	$50K Special area	$70,000
25th and 21st Streets, WB	6	0	$60,000
Just east of 21st Streets, WB	4	0	$40,000
Engineering, Survey and Contingency @35%			$273,000
EST. TOTAL FOR LONG-RANGE PROJECTS			$1,053,000

Table 5.3: Estimated Costs of Long-Range Improvement Projects (WB=Westbound, EB=Eastbound)

Implementation and Funding

Improvements and alterations identified in this study require funding by public entities. Because the study corridors are part of the TxDOT system, funding would historically be provided through the H-GAC project nomination process, and then funnel into the Statewide Transportation Improvement Plan (STIP) for TxDOT funding.

Local Matching Funds

Local matching funds for side road tie-ins to local roadway networks also could be used. All improvements in this study must be approved for implementation by TxDOT and any other entity with jurisdiction over the applicable roadways (the City of Texas City) as appropriate.

Alternate Funding Sources

Upon appropriate approvals, the recommendations of this study may be programmed per the implementation recommendations as funding is available. Since the TxDOT funding stream is not currently sufficient to cover statewide transportation improvement needs, alternate funding mechanisms must be considered for project improvements. These mechanisms may come from governmental entities, or through district overlays, associations and agreements.

Call-for-Projects

While TxDOT funding is constrained, H-GAC can fund projects through the call-for-projects process, which programs projects by funding category in the Transportation Improvement Program (TIP), as money becomes available. H-GAC's Transportation Policy Council (TPC) approves this project list, it is entered into the TIP and the list is sent to the STIP for TxDOT. Projects within this corridor are eligible for consideration as part of this process.

Other Local Funding Opportunities

Local entities in Texas have recently undertaken projects of local need or importance on the state system with local monies. Locally funded projects skip the waiting process of funding through the STIP and are completed earlier. Such funding can include regular Capital Improvements Plan (CIP) programming, inclusion in bond elections, and/or use of pass-through or State Infrastructure Bank financing. Any such funding requires sponsorship of a local political entity with jurisdiction over the roadway.

Conclusion

The Access Management Study for FM 1764 will improve traffic for years to come, and can be a catalyst for subsequent public/private partnerships in the corridor.

In addition to public meetings to seek general public input on the issues and possible improvements in the corridor, the study team sought out business stakeholder groups and coordinated closely with them to incorporate their input into the development of proposed solutions. By drawing upon many resources and fields of expertise, the study team targeted alternatives that were well-conceived, context-sensitive and feasible to implement.

Alternatives effectively dealt with safety, congestion and mobility issues of motorists on the existing roadway, and multimodal access issues related to transit, and bicycle and pedestrian user groups.

Appendices

Appendix A

Public Involvement

A public involvement plan was established for the project, describing procedures for meeting with a project steering committee, stakeholder groups and the general public to gain their input and feedback.

Project Steering Committee

A steering committee was established by H-GAC to guide the technical development of the study. This committee had representation from the funding agencies, the Chamber, and Connect Transit. The steering committee met four times over the course of the project to assess reports on progress, provide comments on the schedule, coordinate with their respective agencies, and provide technical oversight of major activities associated with the study. The meetings were face-to-face or via conference call.

The Steering Committee consisted of:

- Bill Babbington, P.E.; Area Engineer, Galveston Area Office, TxDOT
- Brendan Isidienu, P.E.; Transportation Engineer, Traffic Engineering, TxDOT
- Travis Milner; Transportation Funding Specialist, East Region, TxDOT
- Sara Moreno, P.E.; Transportation Engineer, Galveston Area Office, TxDOT
- Michael Tello, P.E; Transportation Engineer, Advanced Project Development, TxDOT
- Sanjay Upadhyay, P.E.; Transportation Engineer, Advanced Transportation Planning, TxDOT
- Ilyas Choudry, Deputy Project Manager, H-GAC
- Gina Mitteco, Bike/Ped Coordinator, H-GAC
- Bill Tobin, Transportation Program Manager, H-GAC
- Christy Willhite, Project Manager, H-GAC
- Doug Kneupper, P.E., City Engineer, City of Texas City
- Cinder Lopez, Transportation Coordinator, Texas City ISD
- Captain Ross Clements, Patrol Captain, Texas City Police Department
- Jimmy Hayley, President, Texas City Chamber of Commerce
- James Hollis, Transportation Director, Gulf Coast Center (Connect Transit)

Steering Committee Meeting Schedule:

Meeting 1 – Wednesday, April 20, 2011 at City Hall

Meeting 2 – Thursday, June 23, 2011 (Workshop) at City Hall

Meeting 3 – Tuesday, September 20, 2011 at Nessler Center

Stakeholder Meetings

Two formal stakeholder meetings were held at the Texas City – LaMarque Chamber of Commerce. The Consultant coordinated with the Chamber of Commerce to determine the meeting dates and times and to determine the target stakeholders including neighborhood leaders, businesses, and property managers. The Consultant worked with the City of Texas City and H-GAC to arrange for and advertise the meeting, and developed the approach, and preparation of presentation materials, attendance sheets, name tags, and summary documentation on the messages presented and input received at the stakeholder meetings.

Stakeholder Meeting Schedule

- Meeting 1 – July 22, 2011
- Meeting 2 –September 20, 2011

Public Meetings

The consultant planned, coordinated and assisted H-GAC with executing two public meetings, one held at the Showboat Pavilion in Downtown Texas City and one at the Doyle Convention Center. The purpose of the public meetings was to relay the purpose, process and initial concepts of the study (first meeting), and the final recommendations of the study (second meeting).

H-GAC was responsible for sending out meeting notices in postcard format (or flyers), a letter to notify public officials, media release announcements, and newspaper advertisements for each meeting, with draft text provided by the consultant. The steering committee members were asked to contribute contact information for mailings and to assist with meeting notice distribution. The distribution of flyers or post cards utilized the most cost-effective methods available to the steering committee, such as periodic mailings, newsletters, websites, etc.

The consultant provided staff, prepared a publicity schedule, meeting room layout sketch, questionnaires, sign-in sheets, comment forms, and name tags for each meeting. The Consultant also compiled comments received at the meetings, and produced documentation of the comments from each meeting.

Public Meeting Schedule

- Meeting 1 – Wednesday, August 17, 2011 (Showboat Pavilion)
- Meeting 2 – Tuesday, October 25, 2011 (Doyle Convention Center)

Public Meeting Mailing List

The consultant created a project mailing list including contacts with federal, state, and local elected officials, government agencies, emergency services, independent school districts, organizations, media, churches, local plants, and adjacent landowners. The mailing lists were reformatted for consistency, checked for duplicates, and verified elected official information was up-to-date. The consultant provided electronic mailing list spreadsheets to H-GAC for each public meeting for use in advertising. Depending on final agreements, mailing lists for stakeholders provided by the Cities, Counties, and H-GAC were handled differently. A compiled list of all names and addresses of persons notified of the public forums, including those of all adjacent property owners, was included in the public forum documentation deliverable. Prior to each mailing, the consultant revised the mailing list based on returned postcards from the previous mailing and updated the mailing list with newly-elected officials, individuals that provided comments, attended meetings, or expressed interest in the project.

Mailing List Contacts

Elected Officials (Federal)

- Ron Paul, District 14, US Congress
- John Cornyn, US Senate
- Kay Bailey Hutchison, US Senate

Elected Officials (State)

- Craig Eiland, District 23, Texas House of Representatives
- Mike Jackson, District 11, Texas Senate

Elected Officials (County)

- Mark Henry, County Judge, Galveston County
- Patrick Doyle, Commissioner, Precinct 1, Galveston County
- Stephen D. Holmes, Commissioner, Precinct 3, Galveston County

Elected Officials (City)

- Matthew T. Doyle, Mayor, City of Texas City
- Mike Land, Mayor Pro-tem, City of Texas City
- Donald B. Singleton, Commissioner, District 1, City of Texas City
- Scooter Wilson, Commissioner, District 2, City of Texas City
- Dedrick D. Johnson, Sr., Commissioner, District 3, City of Texas City
- Rick Wilkenfeld, Commissioner, District 4, City of Texas City
- Dee Ann Haney, Commissioner-at-Large, City of Texas City

Emergency Services

- Freddie Poor, Sheriff, Galveston County
- Derreck Rose, Constable, Precinct 3, Galveston County
- Paul Adkins, Sergeant, Texas City Station, Texas Dept. of Public Safety
- John Simsen, Emergency Management Coordinator, Galveston County Office of Emergency Management
- Joseph "Brud" Gorman, Fire Chief, City of Texas City
- Robert Burby, Police Chief, City of Texas City

Agencies

- Donald R. Carroll, City Planner, City of Texas City
- Mike Fitzgerald, County Engineer, Galveston County
- Layne Harding, Road Administrator, Galveston County Road & Bridge Department
- Bill Mathis, Executive Director, Port of Texas City
- Col. Christopher W. Sallese, District Engineer, US Army Corps of Engineers, Galveston District

Independent School District

- Jack Haralson, Facilities & Planning Director, Texas City ISD
- Cinder Lopez, Transportation Coordination, Texas City ISD

Organizations

- Aaron Chang, BikeHouston
- Don Gartman, Galveston County Economic Alliance
- Jimmy Hayley, Texas City Chamber of Commerce
- Robin Holzer, Citizen's Transportation Coalition
- Texas City Evening Lions Club
- Texas City Rotary Club

Media

- Galveston County Daily News
- The Post Newspaper
- Houston Chronicle
- Municipal Cable Channel
- La Voz Newspaper (Spanish)

Churches

- Baypoint Community Church
- St. Mary's of the Miraculous Medal
- First Baptist Church of Texas City

Adjacent Landowners

- Homeowners (from Galveston Central Appraisal District records)
- Businesses (from Galveston Central Appraisal District records)

Plant Managers

- Paul Cartlidge, Ascend Performance Materials
- Victor Alvarado, BP Chemicals
- Keith Casey, BP Refinery
- Larry Schmid, Dow Chemical Company
- Larry Johnson, Enterprise
- John Harvey, Ineos Olefins and Polymers USA
- Cathy Culpepper, Ineos Nova
- Jay Bizarro, ISP Technologies, Inc.
- Connie Bradley, Marathon Petroleum
- Kyle Oppliger, Nu Star Energy
- Don Watts, Nu Star Energy
- Rance Fromme, Oiltanking Texas City, L.P.
- Erv Myers, Oxbow Carbon & Minerals LLC
- Charles Lau, Praxair, Inc.
- Todd Salemo, Praxair, Inc.
- Casey Borowski, Sea Lion Technology
- Shahbaz Ahmed, Sea Lion Technology
- Walt Treybig, Sterling Chemicals
- Sal Viscontini, Valero Refining Company

Publicity Schedule

A publicity schedule was prepared for both public meetings including the publicity item, target date for sending or publishing the item, and the Consultants deadline for providing information to H-GAC.

Stakeholder Meeting #1 held on July 22, 2011

A stakeholder meeting for the FM 1764 Access Management Study was held approximately one month in advance of the first public meeting to provide an opportunity for business owners and operators along Palmer Highway to hear a briefing on the study and review some of the early findings and initial recommendations. This discussion session allowed for open dialog about the issues and implications of potential treatments.

The meeting was held on Friday, July 22, 2011 at 9 a.m. and hosted by the Texas City – La Marque Chamber of Commerce at their office at 9702 Emmett F. Lowry Expressway in Texas City. Using the Chamber's database, letters of invitation, signed by Jimmy Haley of the Chamber and Doug Kneupper of the City, were mailed out one week in advance to the 36 Chamber Members along the study corridor. In addition to the several Chamber, City and H-GAC staff, Stakeholders that attended the meeting on July 22 included:

- Ken Clark, Benny's Liquor
- Cynde & Mike Whitson, Schlotzsky's
- Susan Myers, Texas City ISD

A PowerPoint presentation was made, similar to the presentation that would be given at the Public Meeting and layout maps of the potential treatments were laid out on tables for viewing. Comments from the meeting included:

- When refineries let out, drivers will cut through parking lots such as the Kroger parking lot to prevent waiting 3-4 cycles of traffic light.
- If the hooded left turns aren't raised, people will drive over them.
- TxDOT will construct raised medians at the hooded left turns, and the City has a contract with TxDOT for landscaping.
- To prevent traffic stacking up at hooded left turns, the interchange should be improved first.
- Stakeholders prefer that TxDOT schedule construction at night.
- Need to look at one-way traffic on side street by Shipley Donuts.
- Drivers currently cut through the bowling alley parking lot.
- Frequent crashes on private property near Pizza Hut and BP.
- Power outages cause the traffic lights to go out frequently.
- The Chamber prefers that TxDOT start with the Interchange improvements at SH 146, then work east.
- The Chamber will spread the word for businesses to attend the public meeting on August 17th.

Public Meeting #1 Documentation – August 17, 2011

ADVERTISING/NOTIFICATION

Newspaper Advertisements

- *Houston Chronicle* Legal Notice - published July 24, 2011
- *La Voz* Display Ad - published July 31, 2011

Electronic Notifications

- *The Vision* Newsletter - sent by H-GAC August 1, 2011
- YourHoustonNews.com blog - posted on August 4 and 7, 2011
- Chamber Email Notification - sent to members on August 8, 2011 and August 15, 2011
- Email Reminder to Elected Officials - sent by H-GAC August 8, 2011
- H-GAC Website Notice - screenshot (pdf) printed August 10, 2011

Social Media Notifications

- Facebook Notification - posted on August 11, 2011

Notifications by Mail

- Elected Official Letter with Mailing List - mailed by H-GAC on July 8, 2011 (15 contacts)
- Public Meeting Postcards - mailed by H-GAC on August 3, 2011 (1,009 contacts)
- Postcard Mailing List with Address Updates

Media Release

- Media Release and Mailing List - distributed by H-GAC on August 3, 2011 to local Media Outlets

Messaging Signs

- Dynamic Messaging Signs - placed by TxDOT Area Office on August 17, 2011

Attendance

- Nine from general public, landowners and representing landowners

Format

Open house with manned Issues table, static displays and computer simulation of SH 146 interchange improvements, and static displays and layout plans of concepts for proposed treatments. Followed by formal presentation by Christy Willhite and Kevin St. Jacques on the goals and objectives, issues, and initial concepts for improvements, with open question and answer period. Afterward, the open house format was again available. Attendees were asked to complete a questionnaire before they left the event.

Comments

Two local residents completed the survey questionnaire. The following is a summary of their responses:

Of the tools presented here today, which would you like to see used in the corridor?

# of Responses	Item
0	Raised median
2	New SH 146 interchange operation
0	Center two-way, left-turn lane
2	Improve traffic signal timing/progression
0	Six-lane roadway section
2	Left- and right-turn lanes
0	Four-lane roadway section
2	Driveway reconfiguration
1	Sidewalks
2	Merge adjacent parking areas
0	Intersection pedestrian crosswalks
2	Limit driveway access to FM 1764

Which locations along the corridor do you think have the most safety issues?

- Between 25th and SH 146
- 29th Street north & south turn lanes at Palmer Hwy
- 34th Street north & south turn lanes at Palmer Hwy

What transportation-related issues along the FM 1764 corridor concern you the most?

- Traffic Lights synchronized better
- Peak Hour congestion

Stakeholder Meeting #2 Documentation – September 20, 2011

A stakeholder meeting for the FM 1764 Access Management Study was held approximately one month in advance of the second public meeting to provide an opportunity for business owners and operators along Palmer Highway to hear a briefing on the study and review some of the early findings and initial recommendations. This discussion session allowed for open dialog about the issues and implications of potential treatments.

The meeting was held on Tuesday, September 20, 2011 at 9 a.m. and hosted by the Texas City – La Marque Chamber of Commerce at their office at 9702 Emmett F. Lowry Expressway in Texas City. Using the Chamber's database, letters of invitation, signed by Jimmy Haley of the Chamber and Doug Kneupper of the City, were mailed out one week in advance to the 36 Chamber Members plus 17 additional business and/or property owners along the study corridor. Additionally, an article was put into the Chamber newsletter, a mass email was sent out to all Chamber members, and some personal phone calls were made to encourage attendance. In addition to the several Chamber, City and H-GAC staff, Stakeholders that attended the meeting on September 20 included:

- Lena Brown, Baskin Robbins
- Cinder Lopez, Texas City ISD Transportation
- Kedge Cook, Cook Ford
- Bill Henry, Etheridge Real Estate
- Fred Virani and Robert Thalsi, Palmer Shell

A PowerPoint presentation was made, similar to the presentation that would be given at the Public Meeting and layout maps of the potential treatments were provided in 11x17 handouts for viewing and future reference. Comments from the meeting included:

Medians

Left-hand turn lane makes sense.

Continuous Right-turn Lane

- Repainting the roads for the right-turn lane might be in the pipeline.
- Who monitors the right turn lane? Sounds like a lot of money without significant improvement. (This improvement may be combined with a TxDOT repaving project, so the cost would be minimal.)

Road Diet

- Will the Road Diet create a problem with traffic? (Kevin: will not create significant congestion, but will slow traffic slightly due to turns in and out of driveways which would occur in the rightmost through lane, compared to the CRTL. The road diet is good for pedestrians, bicyclists, and enhancing the appearance of the corridor, which may in turn create a traffic calming effect on the roadway.)
- Don't see much gain for using the Road Diet, since you lose the extra flow.
- Would you normally consider the Road Diet when you have declining vehicle traffic? (Kevin: Not declining, but stable. The corridor is fairly mature, so it might benefit. This would be a transition concept from vehicle-oriented to walking/biking friendly development along the corridor. Even reducing to 2 lanes, there is enough capacity for the vehicle traffic. Road Diet is one long-term aspect that is worthy of future consideration.)
- In the 2600 block of Palmer, the current pedestrian traffic is not likely to spend any money in the corridor.
- Removing the right lane to benefit pedestrians seems like a bad idea.
- The Mayor of Texas City is not in favor of the Road Diet.

Close Driveways and Merge Selected Parking Areas

- Driveways are built at different elevations in the corridor. Who pays to merge them? (Usually some form of public private partnership.)
- Need to look at parking requirements. (Yes, develop cooperative use agreements and shared parking ordinance. Requires some flexibility from the City.)
- Are U-turns better than a regular left turn? (Both have similar exposure to oncoming traffic. Left turns tend to try to execute their turn faster and can misjudge the gap needed. U-turns tend to look for bigger gaps in on-coming traffic. The joining of parking lots in adjacent parcels will be important to allowing more traffic to turn left into development and circulate off-street to the desired business.)
- Is this similar to what Clear Lake did to Bay Area Blvd? (Yes)
- Are we attempting to re-route traffic off of FM 1764? Attempting to make other routes appear more attractive to pass-through traffic, and make this corridor feel safer and more attractive to shop? (No, we are attempting to accommodate the traffic that wants to use Palmer Highway and access its businesses.)

General Comments

- Why not use signs to route people to 34th Street? It would eliminate traffic from 146 to 31st. (Didn't observe this to be a heavy traffic route, but will look at it. Again, not our intention to shift traffic off Palmer Highway if that is where they want to go.)
- Are the lights on Palmer timed? Is that an option? (They are not synchronized except by reference to a non-coordinated clock. That is one of the recommendations that will be included in the plan.)
- Something needs to be done to deal with power outages. It's an ordeal to get the traffic lights back on after an outage. (Another recommendation will be to include Battery Backup for each signal controller.)
- Do most folks talk about safety or time at the lights as their concern? (Safety has been the most frequent issue from local residents we have heard from – they feel the traffic on Palmer Highway is rather aggressive and makes them not want to go there.)
- What's the timeline to implement improvements? (Perhaps 2-5 years for the short-term. TxDOT is already looking at some things, but will depend on funding.)
- Not happy about the signage on 25th Street. Way too many signs – try not to do on Palmer Highway as part of treatments.

- When is the draft report being released? (We are working on our internal Draft Report now and will incorporate the comments from the public meeting on October 25 and make available to public on H-GAC website shortly thereafter.)
- Texas City did a beautiful job on 6th and finished it quickly.

Public Meeting #2 Documentation – October 25, 2011

ADVERTISING/NOTIFICATION

Newspaper Advertisements

- *Houston Chronicle* Legal Notice - published September 25, 2011
- *La Voz* Display Ad - published October 16, 2011

Electronic Notifications

- *The Vision* Newsletter - sent by H-GAC October, 2011
- Texas City Website Notice – October 2011
- H-GAC Website Notice - posted on September 22, 2011
- Email reminder to Elected Officials - Sent by H-GAC on October 18, 2011

Notifications by Mail

- Elected Official Letter with Mailing List - mailed by H-GAC on September 20, 2011 (15 contacts)
- Public Meeting Postcards - mailed by H-GAC on October 11, 2011 (1,023 contacts)
- Postcard Mailing List with Address Updates

Media Release

- Media Release and Mailing List - distributed by H-GAC on October 11, 2011 to local Media Outlets

Messaging Signs

- Dynamic Messaging Signs - placed by TxDOT Area Office on October 25, 2011

Attendance

Four from general public, landowners and representing landowners

Format

Open house with manned Issues table, static displays and computer simulation of SH 146 interchange improvements, and static displays and layout plans of concepts for proposed treatments. Instead of the planned presentation, the open house activity was followed by informal discussion with the two remaining attendees and the 11 members of H-GAC and TxDOT staff, consultants and Steering Committee present. Discussions focused initially on the goals and objectives, issues, and initial concepts for improvements, with subsequent open discussion of a variety of issues. Afterward, the open house format was again available. Attendees were asked to complete a questionnaire before they left the event; two questionnaires were completed.

Comments

One local resident and one business owner completed the survey questionnaire. The following is a summary of their responses:

Of the tools presented here today, which would you like to see used in the corridor?

# of Responses	Item
1	Raised median
1	New SH 146 interchange operation
1	Center two-way, left-turn lane
2	Improve traffic signal timing/progression
1	Six-lane roadway section
1	Left- and right-turn lanes
1	Four-lane roadway section
1	Driveway reconfiguration
1	Sidewalks
1	Merge adjacent parking areas
1	Intersection pedestrian crosswalks
1	Limit driveway access to FM 1764

Which locations along the corridor do you think have the most safety issues?

- Between 34th and SH 146
- Between 31st and 33rd Street
- The entire corridor is a hazard both for private autos as well as for pedestrian and bicycle traffic

What transportation-related issues along the FM 1764 corridor concern you the most?

- There are too many single occupant vehicles
- Need covered bus stops

Appendix B

Traffic Data

2011 Traffic Count Data Collected as part of the Study

Traffic count data was collected along the study corridor and along the parallel FM 1765 corridor to assess the significance of current traffic characteristics and to form a baseline for analysis.

Vehicular tube counters were set out at strategic locations along FM 1764 and FM 1765 to collect eastbound and westbound traffic counts, tabulated every 15 minutes, beginning at midnight on the morning of April 6, 2011 and continuing for 48 hours to midnight on the evening of April 7, 2011.

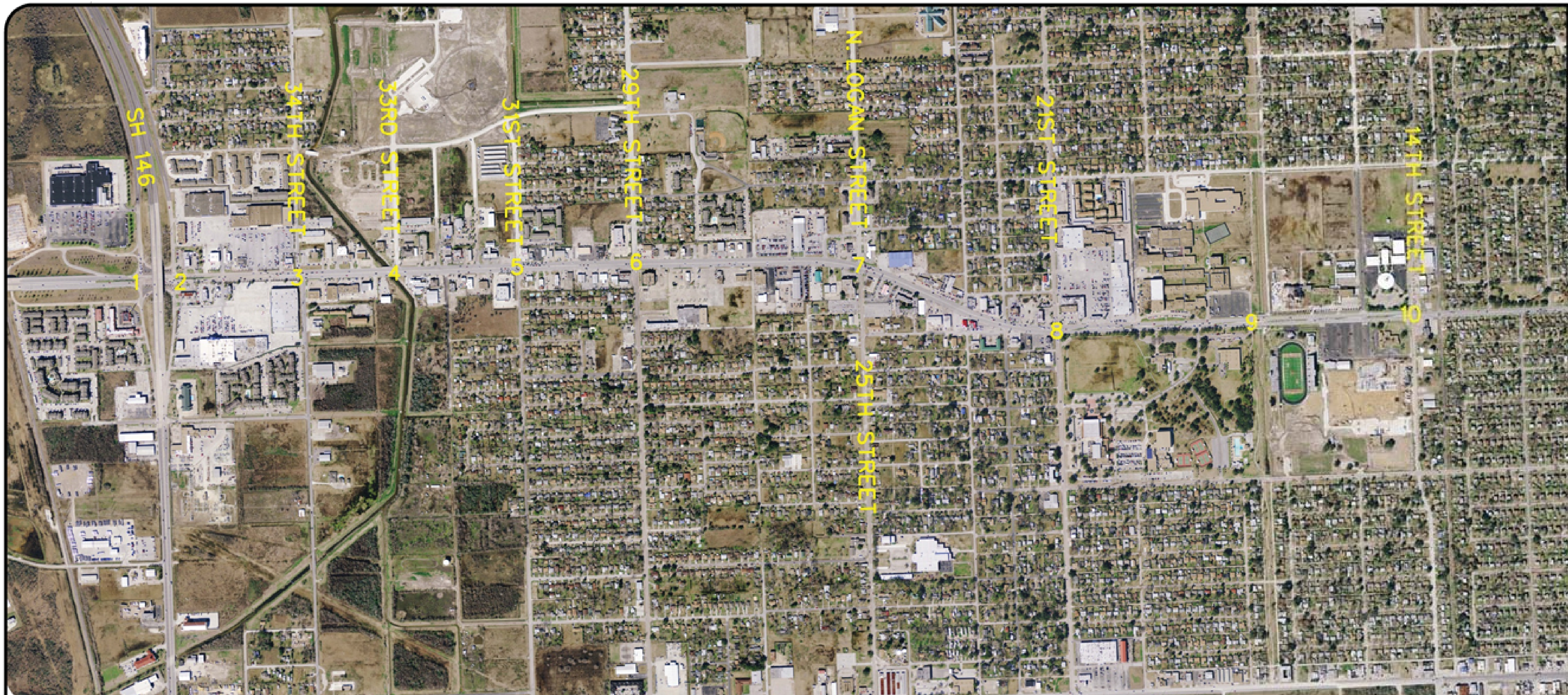
Directional turning movement counts (TMC) were made at the signalized intersections along the FM 1764 corridor from SH 146 to 14th Street, inclusive. These locations included the intersections of FM 11764 with:

- SH 146 Southbound Service Road
- SH 146 Northbound Service Road
- 34th Street
- 33rd Street
- 31st Street
- 29th Street
- 25th Street
- 21st Street
- Driveway at Library/School
- 14th Street

TMC data was recorded for two-hour periods during the AM peak period, midday and PM peak period, then post analyzed to determine the critical one hour volumes during each of those periods.

Comparison of 2011 ADT Counts for Study vs. 2009 AADT from TxDOT

Notably, the 2011 ADT counts area 10% to 15% higher than the 2009 AADT volumes from TxDOT. Vehicular tube counters record the number of compressions of the road tube. Reporting of the ADT typically just assumes one vehicle for every two tube compressions and in doing so assumes a negligible percentage of trucks in the traffic mix. AADT counts are factored down by the percentage of heavy trucks in the mix of traffic, and also, being an annual average, considers the traffic volumes on weekends as well as weekdays in computing its average value. Thus, use of the 2011 ADT counts and TMC counts in the analysis are more representative of the critical time periods for capacity analysis of congestion and mitigation measures



INTERSECTION	CROSS STREET	EBL	EBT	EBR	NBL	NBT	NBR	WBL	WBT	WBR	SBL	SBT	SBR
1	SB SH 146		1,335	266				271	1,852		170	80	379
2	NB SH 146	321	1,191		742	90	77		1,360	99			
3	34TH STREET	78	1,105	34	133	55	109	55	1,349	77	132	27	114
4	33RD STREET	21	1,359						1,459	18	16		33
5	31ST STREET	25	1,274	36	54	9	49	26	1,396	14	9	4	10
6	29TH STREET	87	1,070	81	204	102	76	43	1,092	42	50	61	117
7	LOGAN / 25TH STREET	38	927	70	205	148	59	19	862	60	57	55	80
8	21ST STREET	130	502	151	247	240	80	27	388	36	28	110	210
9	HIGH SCHOOL ENTRANCE	10	611	2	10	0	16	1	363	9	1	0	2
10	14TH STREET	44	268	160	164	126	24				13	113	138

HOUSTON-GALVESTON AREA COUNCIL
F.M. 1764 ACCESS MANAGEMENT STUDY
F.M. 1764 TURNING MOVEMENT COUNTS

HOUSTON-GALVESTON AREA COUNCIL

F.M. 1764 ACCESS MANAGEMENT STUDY

F.M. 1764 AVERAGE DAILY TRAFFIC

SEGMENT	FROM	TO	DIRECTION	ADT
0		SH 146	EB	22,279
1	SH 146	34TH STREET	EB	18,758
2	34TH STREET	33RD STREET	EB	17,389
3	33RD STREET	31ST STREET	EB	21,805
4	31ST STREET	29TH STREET	EB	16,867
5	29TH STREET	25TH / LOGAN STREET	EB	15,564
6	25TH / LOGAN STREET	21ST STREET	EB	13,995
7	21ST STREET	HIGH SCHOOL ENTRANCE	EB	8,167
8	HIGH SCHOOL ENTRANCE	14TH STREET	EB	7,688
9	14TH STREET		EB	4,284

SEGMENT	FROM	TO	DIRECTION	ADT
8	14TH STREET	HIGH SCHOOL ENTRANCE	WB	4,745
7	HIGH SCHOOL ENTRANCE	21ST STREET	WB	4,916
6	21ST STREET	25TH / LOGAN STREET	WB	12,017
5	25TH / LOGAN STREET	29TH STREET	WB	14,041
4	29TH STREET	31ST STREET	WB	15,761
3	31ST STREET	33RD STREET	WB	16,344
2	33RD STREET	34TH STREET	WB	15,578
1	34TH STREET	SH 146	WB	16,168
0	SH 146		WB	20,194

Texas Department of Transportation

Houston-Galveston Area Council

FREESE NICHOLS

Appendix C

Existing and Proposed Network Analysis

Traffic Operations Analysis

Traffic operations were analyzed to assess the existing congestion levels and anticipated traffic congestion for future conditions. The corridor was modeled initially using Synchro™ software, a simulation model that utilizes the methods contained in the *Highway Capacity Manual* to assess the delays to vehicles and estimates the Level of Service (LOS) of individual movements, by approach and by intersection. The following definitions of Level of Service contained in the *Highway Capacity Manual 2010* were used:

- LOS A – Little or no vehicular interaction, 0 to 10 seconds of delay per vehicle
- LOS B – Minimal vehicular interaction, 10 to 20 seconds of delay per vehicle
- LOS C – Moderate vehicular interaction, 20 to 35 seconds of delay per vehicle
- LOS D – Significant vehicular interaction, 35 to 55 seconds of delay per vehicle
- LOS E – Inhibited Flow, significant vehicular interaction, 55 to 80 seconds of delay per vehicle
- LOS F – Congested Flow, significant vehicular interaction, over 80 seconds of delay per vehicle

The threshold between LOS D and LOS E is typically considered as the demarcation between acceptable and unacceptable congested conditions during peak hours, with LOS F being undesirable.

Existing Conditions

The existing traffic operations along the corridor appear to operate at LOS D or better throughout the day with the exception of the evening peak period. From about 5-6 p.m. during the evening peak hour, the interchange of FM 1764 with SH 146 operates at a LOS F, with queues extending back on the northbound service road to the gore with the SH 146 overpass, eastbound FM 1764 to the bridge over SH 3 and the railroad, and westbound FM 1764 back nearly to 34th Street. The rest of the intersections along FM 1764 appear to operate well, with Level of Service C or better.

Future Growth under Existing Roadway Conditions

According to H-GAC projections, traffic volumes along FM 1764 are anticipated to grow by some 20 to 25 percent by 2028. This level of traffic increase can be accommodated by the current roadway, but will make currently poor LOS conditions even worse at the SH 146 interchange, especially during the afternoon peak hour.

Synchro™ Analysis of 2011 Existing Conditions

Intersection with FM 1764	Average Delay (Seconds per Vehicle)	Intersection Capacity Utilization	Level of Services
SH 146 SB SR	226	96%	F
SH 146 NB SR	223	100%	F
34th Street	78	69%	E
33rd Street	6	41%	A
31st Street	15	49%	B
29th Street	21	63%	C
25th Street	31	60%	C
21st Street	33	54%	C
High School/Library & City Hall	6	26%	A
14th Street	33	37%	C

Table C.1: Results of Synchro™ Analysis of 2011 Existing Conditions afternoon peak-hour operations

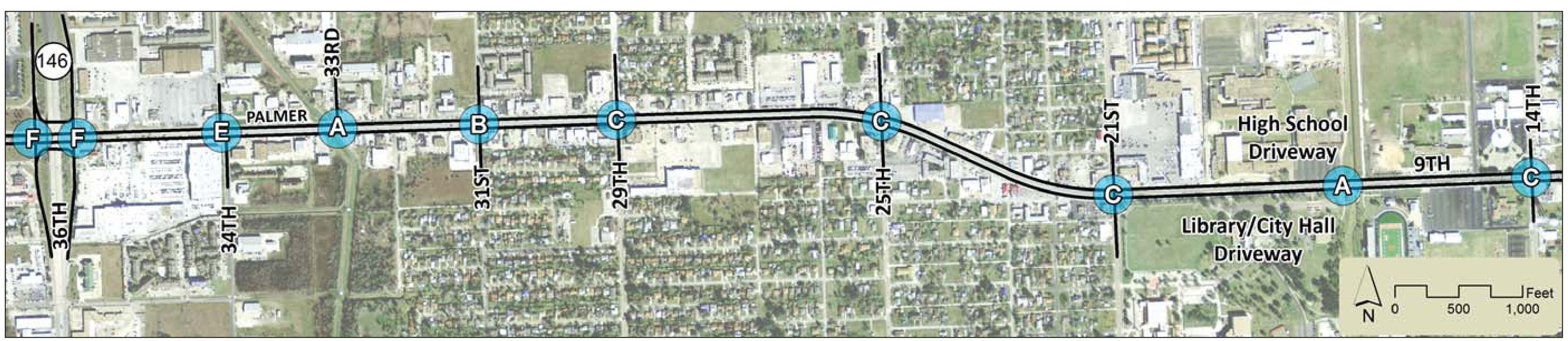


Figure C.1: Existing Conditions, 2011 afternoon peak-hour Level of Service

Treatment Concepts for the SH 146 Interchange

Several Single Point Urban Interchange (SPUI) concepts were developed to improve the operations of the interchange of FM 1764 at SH 146, four more promising concepts (see Figure C.2 – following page). After initially screening the various concepts, two of the SPUI configurations were deemed most feasible:

- A-2 the full SPUI
- B-1, a variation on A-2 which channelizes the NB and SB left turns using the existing U-turn area

Both produce very similar results in the model. For the more complex analysis of the SPUI operations, the microsimulation model TransModeler™ from Caliper Corporation was utilized. For comparison with the operations of a diamond interchange, the existing intersection operations were optimized within the model but with no changes in the existing lane provisions, the results are shown in Table C.2.

Capacity Analysis of CTRL, Force-off RTs and Road Diet

Three scenarios were assessed that propose to enhance the safety of travel along the corridor, but which would have an impact on the capacity of the eastbound and westbound approaches at the intersections east of 34th Street beginning with 33rd Street. The conditions are represented in detail in Appendix D as theS hort-Range and Medium-Range Implementation Concepts.

- Continuous Right-Turn Lane (CRTL) Concept – encourages thru traffic to use the two leftmost lanes and the driveway traffic to use the rightmost lanes. Good for separation of travel speed expectations, but limits through movements.
- Force-off Right Turns at Signal Controlled Intersections - requires thru traffic to use the two leftmost lanes and the driveway traffic to use the rightmost lanes. Reinforces the speed separation of the CRTL treatment, but reduces the eastbound and westbound approach capacities by one lane.
- Road Diet – A concept was explored for reducing the travel lanes from three in each direction to two in each direction, with raised medians in either case.

The comparison of the existing conditions operations and the operations under the CTRL, with force-off right turns at signalized intersections east of 34th Street, are summarized in Table C.3. The assessment of the road diet condition was modeled to operate similar to the CTRL condition, but can be expected to operate at a somewhat lower level of service along the roadway since the turns would operate from the rightmost of two lanes in each direction. Detailed information on the in and out activity at each driveway during the peak hour would be needed to perform a detailed assessment of the road diet.

SH 146 Interchange Performance

	Total Delay (veh-hrs)	Avg Delay (sec/veh)	Total Stopped Time, veh-hrs	Avg. Stopped Time (sec/veh)	LOS
Existing, Optimized	349	211	310	187	F/F
SPUI A-2	39	33	29	25	C
SPUI B-1	37	30	27	22	C

Table C.2: SH 146 Interchange Performance

Synchro™ Analysis of 2011 Existing Conditions

Intersection with FM 1764	Existing Conditions / Existing Timing			CRTL with Force-off Right Turns (Existing Timing)		
	Avg Delay (sec/veh)	Intersection Capacity Utilization	Level of Services	Avg Delay (sec/veh)	Intersection Capacity Utilization	Level of Services
SH 146 SB SR	226	96%	F	226	96%	F
SH 146 NB SR	223	100%	F	224	100%	F
34th Street	78	69%	E	80	69%	E
33rd Street	6	41%	A	7	54%	A
31st Street	15	49%	B	19	61%	B
29th Street	21	63%	C	28	72%	C
25th Street	31	60%	C	32	63%	C
21st Street	33	54%	C	33	55%	C
High School/Library & City Hall	6	26%	A	6	35%	A
14th Street	33	37%	C	33	37%	C

Table C.3: Results of Analysis of Lane Modifications for CTRL and Road Diet

SH 146 Interchange Alternatives

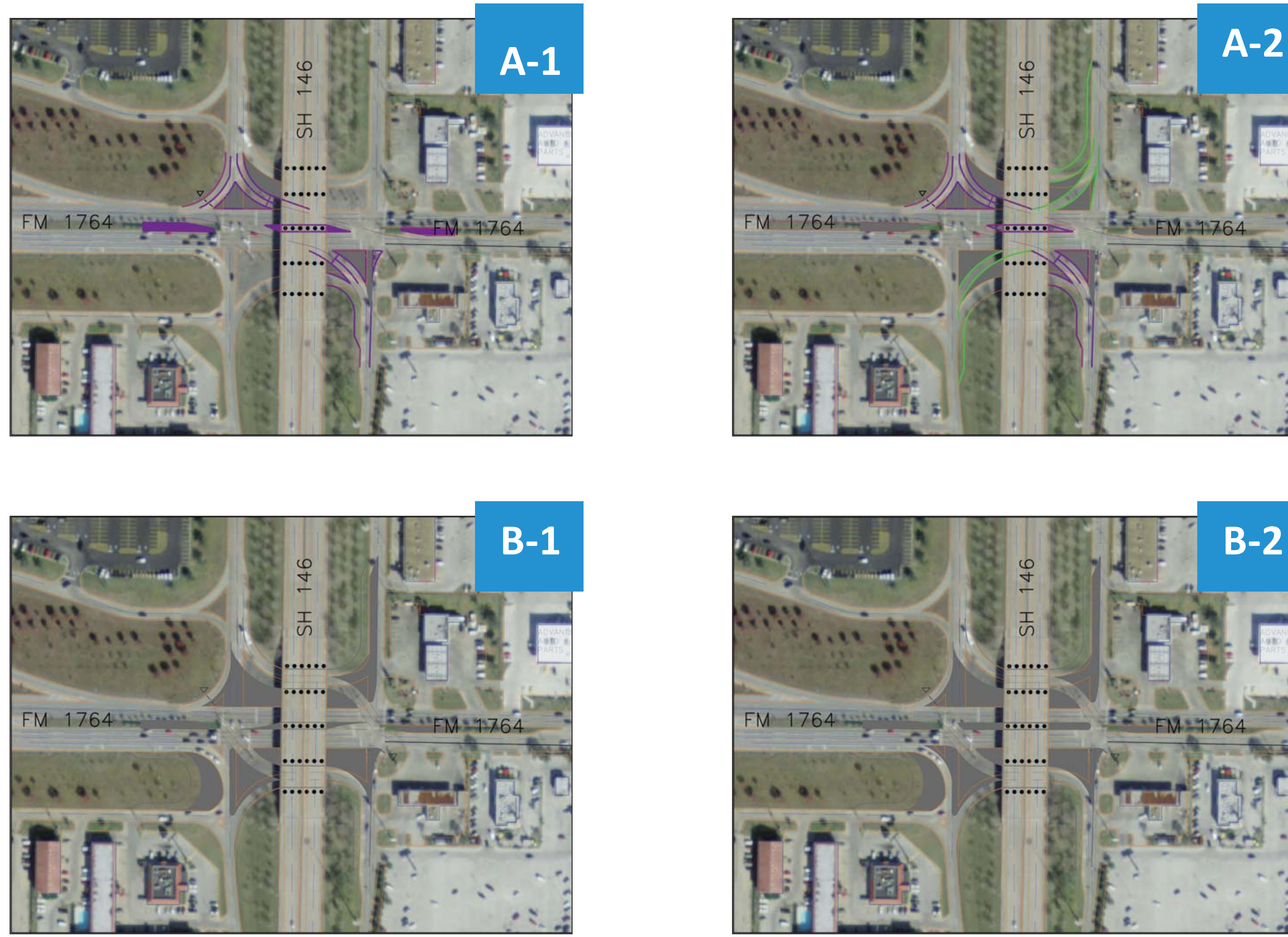


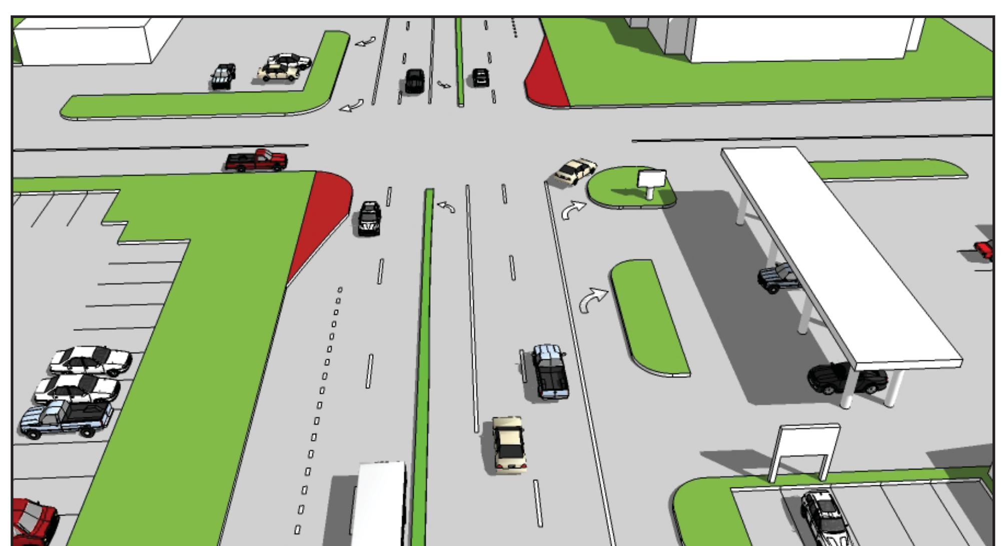
Figure C.2: SPUI configurations considered

Appendix D

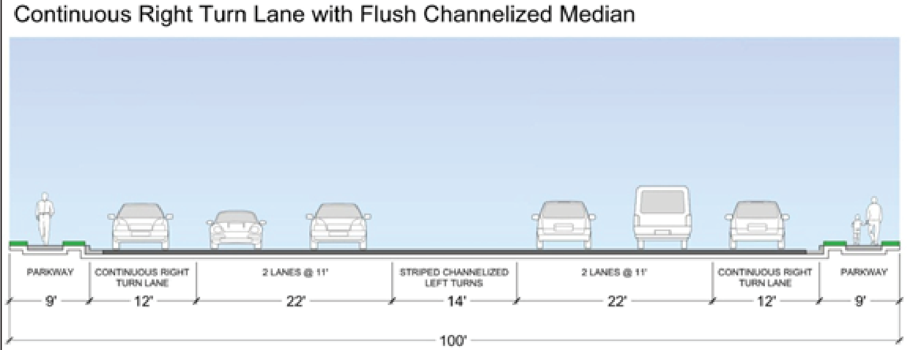
Conceptual Designs and Phasing Plan

Conceptual designs were developed for three scenarios:

1. **Short-Range, within 5 years (pages D4-D13)** – In conjunction with the programmed milling and overlay of the FM 1764 pavement between SH 146 and 14th Street in 2011-2012, a set of striping treatments are proposed for incorporating into the final striping plan after completion of the pavement overlay. These improvements include:
   A. In lieu of the usual dashed lane divider striping the right-most lane east of 34th Street, striping of an 8-inch dotted line to denote the intention for through traffic to use the left two lanes and leave the rightmost lane for turning in and out of driveways. This separation of travel speed expectations by lane along the corridor is expected to alleviate some of the friction of driveway entry and exit traffic with through traffic and thus reduce the propensity for collisions.
   B. At the approach to the signalized intersections, stripe a force-off right turn lane to enforce the intention for through traffic to use the left two lanes.
   C. At the far side of the intersection beyond the force-off right turn, stripe a bulb-out of the curb line to reinforce the intention for through traffic to use the left two lanes to leave the right lane for turns.
   D. Establish the channelization of left turns from the center turn lane in the segment between SH 146 and 34th Street, as a precursor to raised medians.
2. **Medium-Range, 6 to 15 years (pages D14-D19)** – In keeping with the high priority of improving safety and mobility in the corridor, the medium range set of treatments focus on strong channelization of movements along the corridor and addressing the congestion at the SH 146 interchange.
   A. Raised medians with channelized and hooded left turns to enhance the safety of turning traffic.
   B. Raised bulb-outs at the far side of the intersections with force-off right turns to create a refuge area for bus stops and to shorten the crossing distance for pedestrians.
   C. Single Point Urban Interchange at SH 146 to eliminate the excessive delay, especially on the east, west and south approaches to the interchange in the PM peak.
   D. Realignment of 34th Street at FM 1764 to eliminate requirement for split phase operation of north and south approaches.
3. **Long-Range, more than 15 years (pages D20-D25)** – The third set of improvements addresses private development, their driveway access to FM 1764 and improvements to circulation off-street by co-joining their parking areas. As such, it is anticipated that these treatments will require a fair amount of time to collaborate with property and business owners, develop agreements between the city and property owners for driveway closures and among the various property owners for the sharing of parking, and to assemble the funding for public incentives to facilitate the improvements.

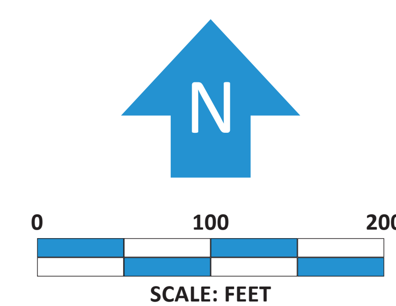


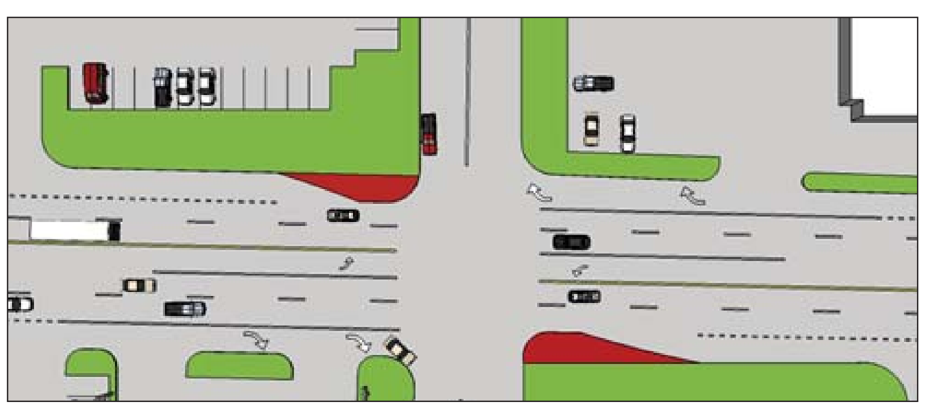
Continuous Right Turn Lane with Flush Channelized Median



SHORT-RANGE PROJECT:

- Continuous Right-Turn Lane east of 34th Street
- Force-off right turn at signalized intersections
- Striped Bulb-outs downstream of force-off right turns
- Striped center left turn lanes west of 34th Street

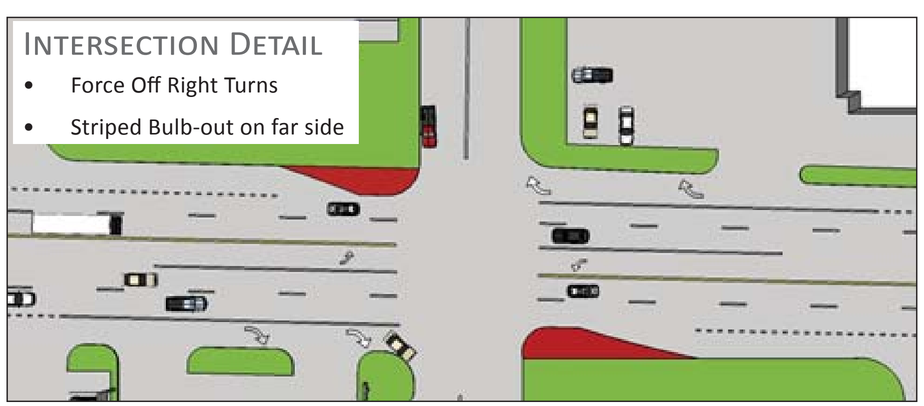




SHORT-RANGE PROJECT:
- Continuous Right-Turn Lane east of 34th Street
- Force-off right turn at signalized intersections
- Striped Bulb-outs downstream of force-off right turns
- Striped center left turn lanes west of 34th Street

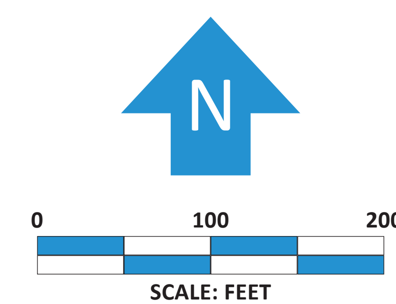
N

0 100 200
SCALE: FEET

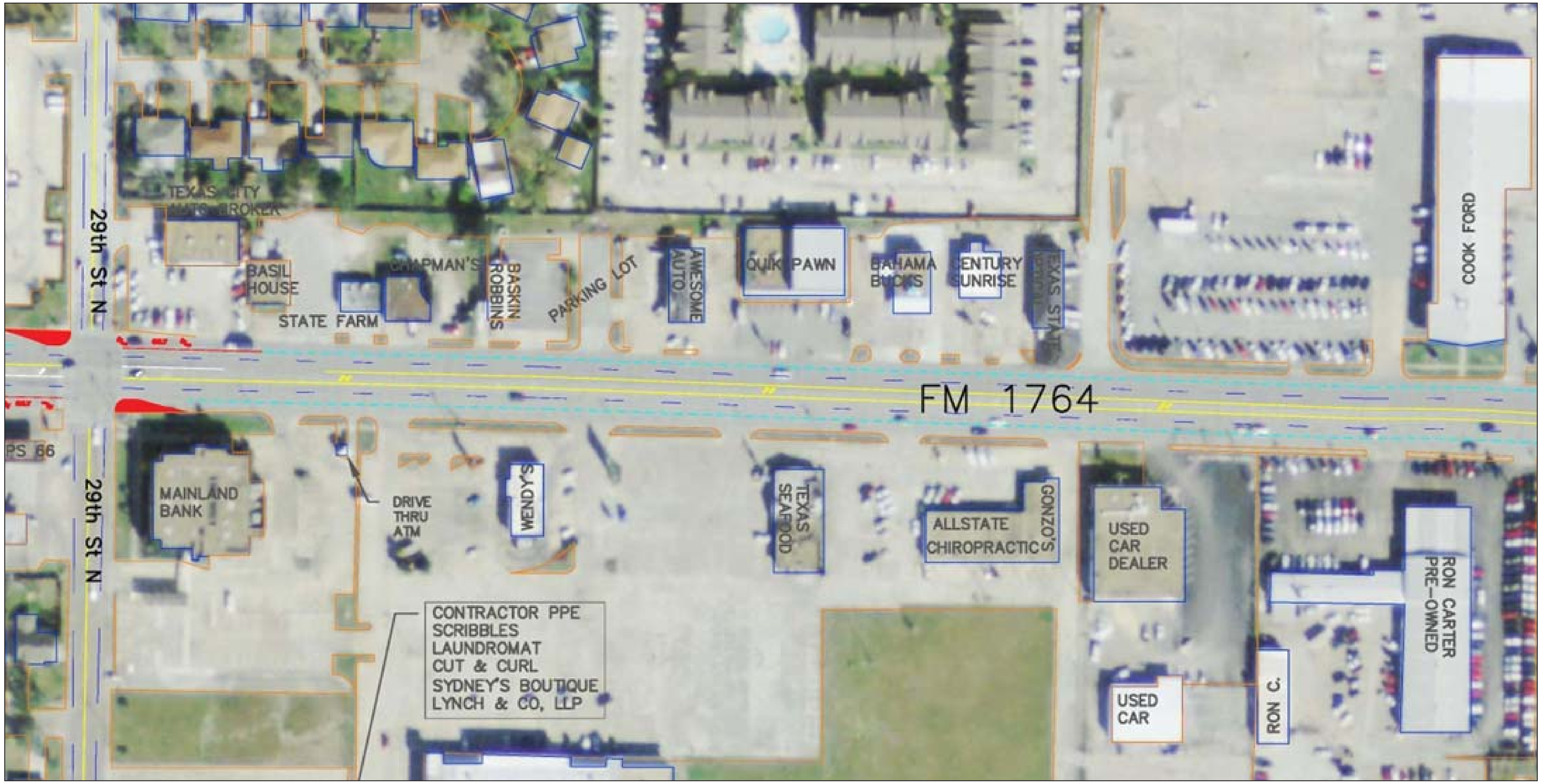


SHORT-RANGE PROJECT:

- Continuous Right Turn Lane east of 34th Street
- Force-off right turn at signalized intersections
- Striped Bulb-outs downstream of force-off right turns
- Striped center left turn lanes west of 34th Street

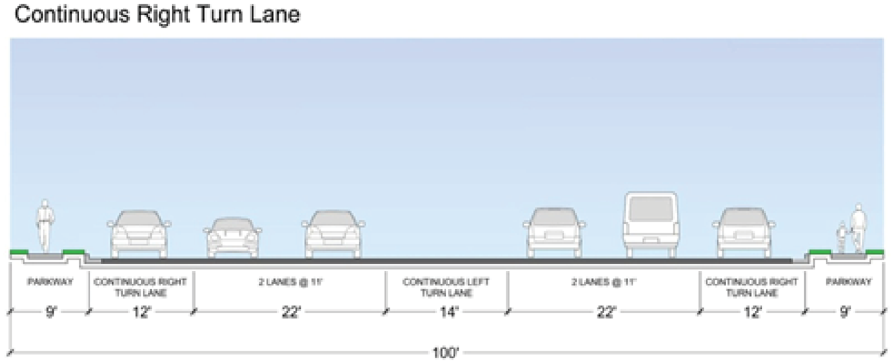


MATCH LINE C



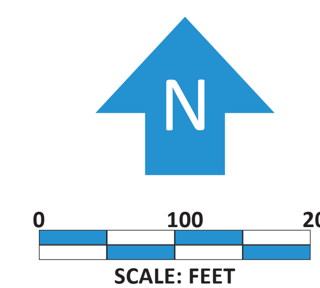
MATCH LINE D

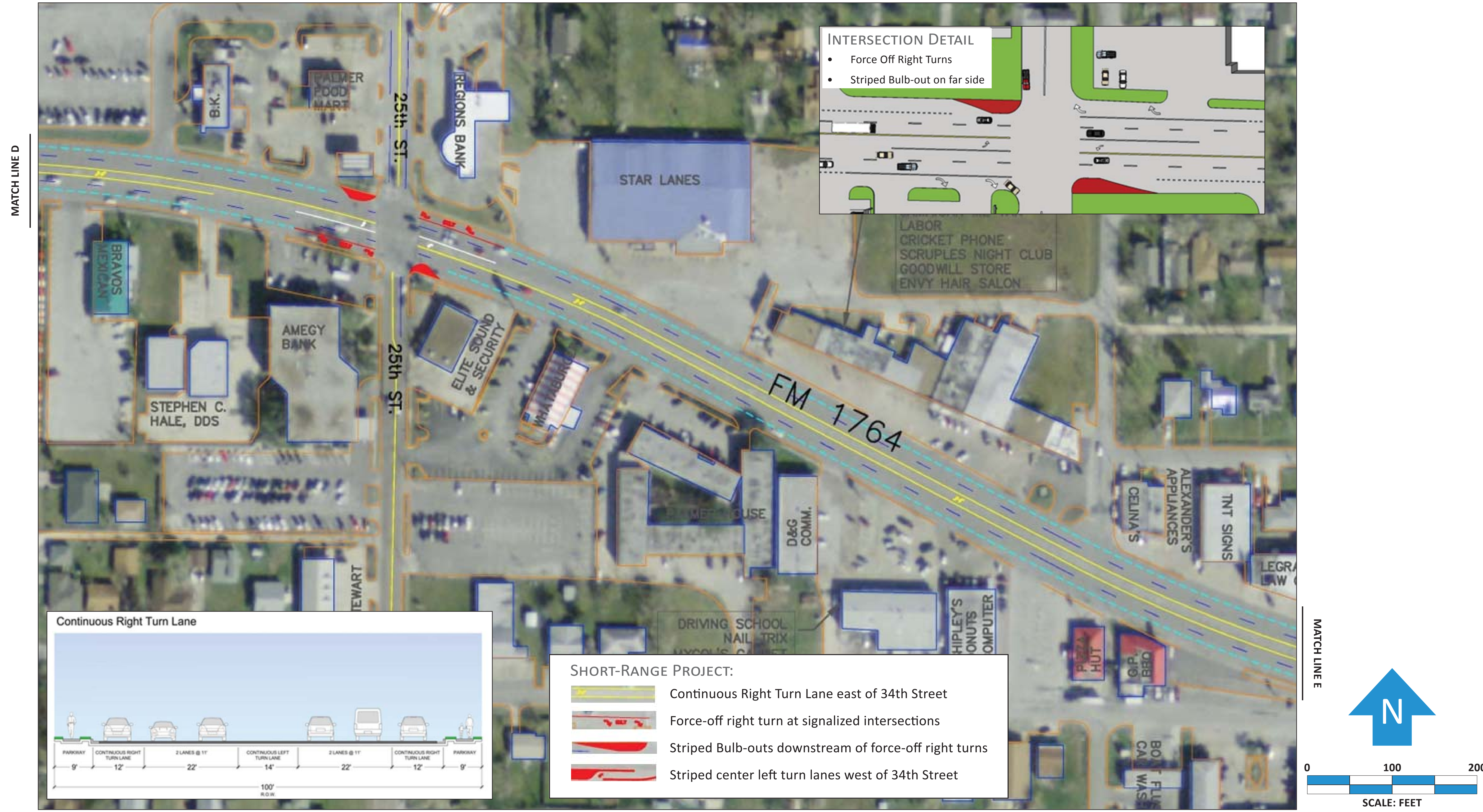
Continuous Right Turn Lane



SHORT-RANGE PROJECT:

- Continuous Right-Turn Lane east of 34th Street
- Force-off right turn at signalized intersections
- Striped Bulb-outs downstream of force-off right turns
- Striped center left turn lanes west of 34th Street




MATCH LINE D
MATCH LINE E
FM 1764
25th ST.
STAR LANES
REGIONS BANK
AMEGY BANK
STEPHEN C. HALE, DDS
ELITE SOUND & SECURITY
LABOR
CRICKET PHONE
SCRUPLES NIGHT CLUB
GOODWILL STORE
ENVY HAIR SALON
DRIVING SCHOOL
NAIL TRIX
D&G COMM.
CELINA'S
ALEXANDER'S APPLIANCES
TNT SIGNS
PIZZA HUT
INTERSECTION DETAIL
Force Off Right Turns
Striped Bulb-out on far side
Continuous Right Turn Lane
PARKWAY
CONTINUOUS RIGHT TURN LANE
2 LANES @ 11'
CONTINUOUS LEFT TURN LANE
9'
12'
22'
14'
100' R.O.W.
SHORT-RANGE PROJECT:
Continuous Right Turn Lane east of 34th Street
Force-off right turn at signalized intersections
Striped Bulb-outs downstream of force-off right turns
Striped center left turn lanes west of 34th Street
N
0
100
200
SCALE: FEET

SHORT-RANGE PROJECT:

- Continuous Right Turn Lane east of 34th Street
- Force-off right turn at signalized intersections
- Striped Bulb-outs downstream of force-off right turns
- Striped center left turn lanes west of 34th Street

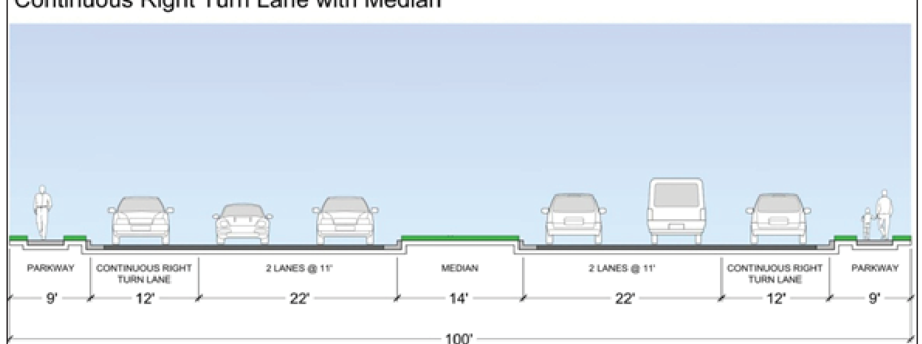
N

0 100 200
SCALE: FEET

MATCH LINE F

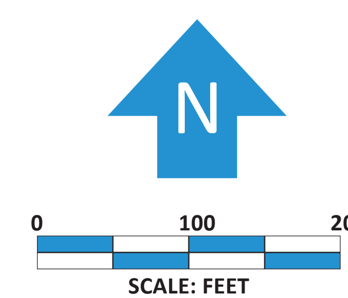
MATCH LINE G

Continuous Right Turn Lane with Median



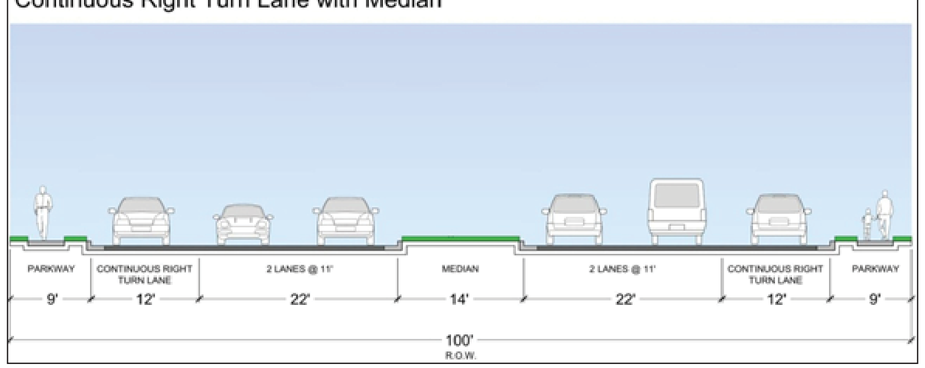
SHORT-RANGE PROJECT:

- Continuous Right-Turn Lane east of 34th Street
- Force-off right turn at signalized intersections
- Striped Bulb-outs downstream of force-off right turns
- Striped center left turn lanes west of 34th Street



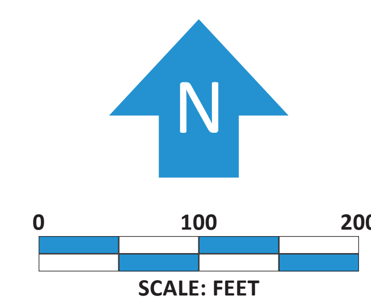
MATCH LINE G

Continuous Right Turn Lane with Median

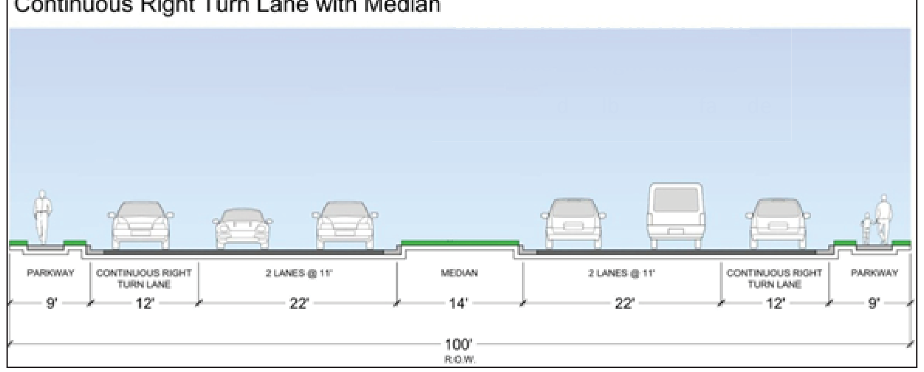


SHORT-RANGE PROJECT:

- Continuous Right-Turn Lane east of 34th Street
- Force-off right turn at signalized intersections
- Striped Bulb-outs downstream of force-off right turns
- Striped center left turn lanes west of 34th Street



Continuous Right Turn Lane with Median



MEDIUM-RANGE PROJECT:

- Keep Continuous Right-Turn Lane east of 34th Street
- Keep force-off right turn at signalized intersections
- Raised bulb-outs downstream of force-off right turns
- Raised center left-turn lanes SH 146 to 21st Street

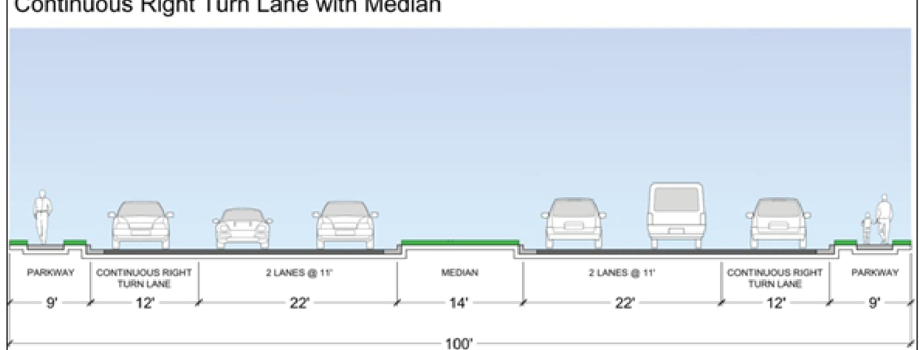
N

0 100 200

SCALE: FEET

MATCH LINE A

MATCH LINE B



Continuous Right Turn Lane with Median

MEDIUM-RANGE PROJECT:

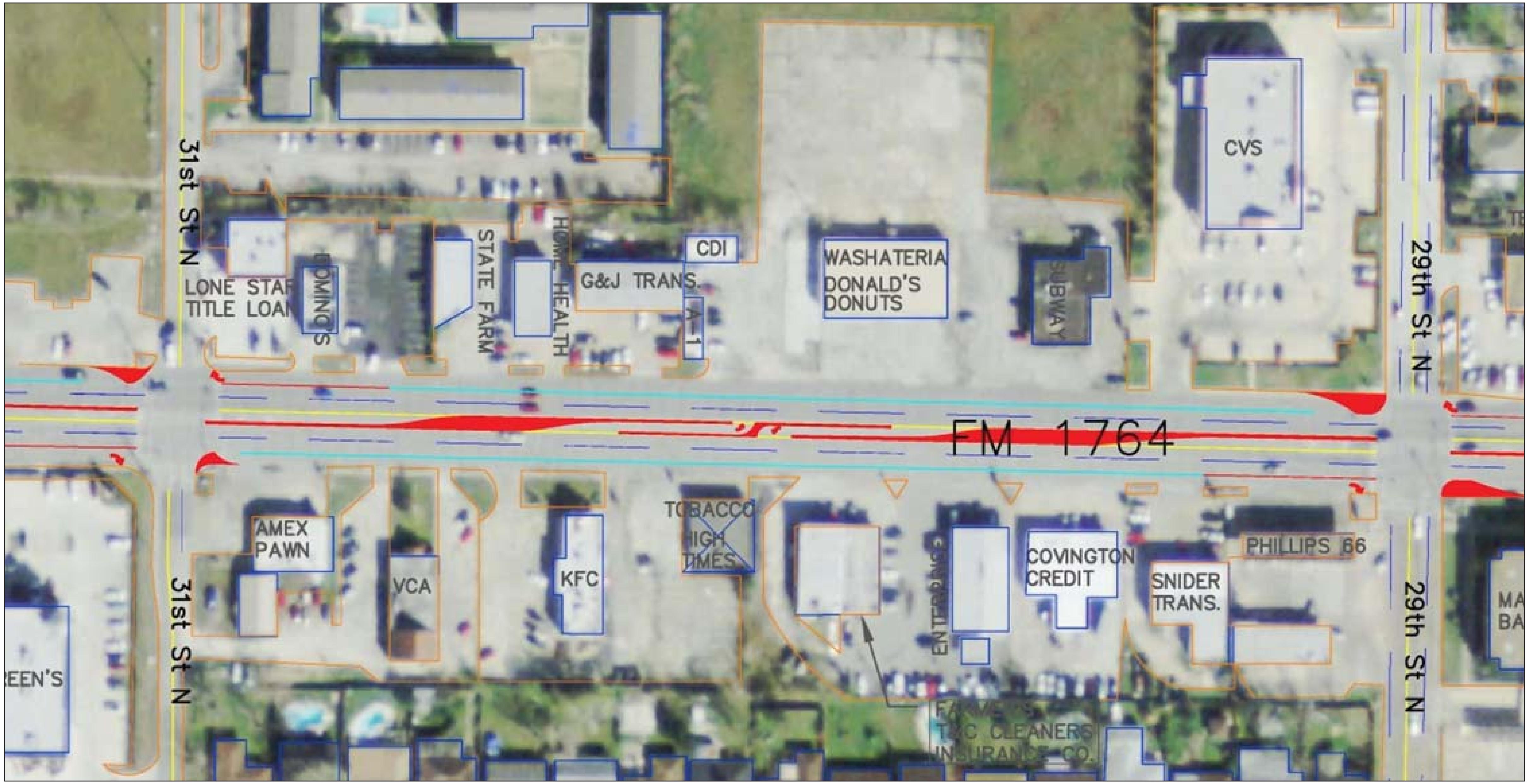
- Keep Continuous Right-Turn Lane east of 34th Street
- Keep force-off right turn at signalized intersections
- Raised bulb-outs downstream of force-off right turns
- Raised center left-turn lanes SH 146 to 21st Street

N

0 100 200

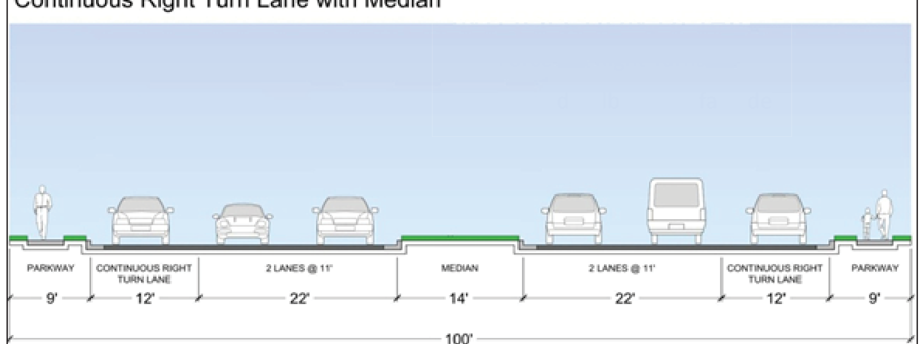
SCALE: FEET

MATCH LINE B



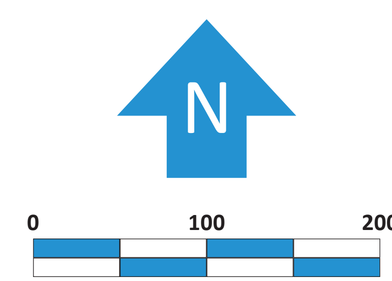
MATCH LINE C

Continuous Right Turn Lane with Median



MEDIUM-RANGE PROJECT:

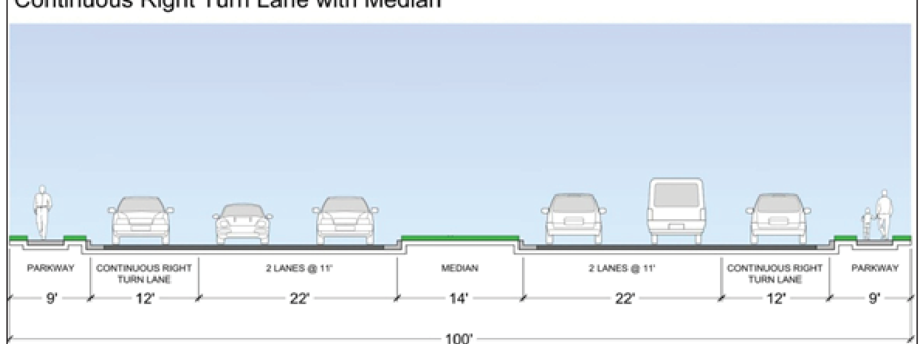
- Keep Continuous Right-Turn Lane east of 34th Street
- Keep force-off right turn at signalized intersections
- Raised bulb-outs downstream of force-off right turns
- Raised center left-turn lanes SH 146 to 21st Street



MATCH LINE C

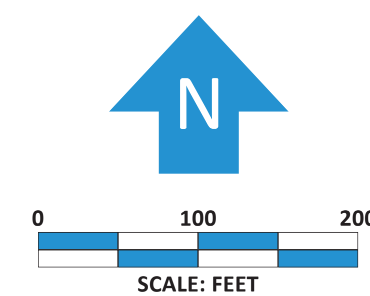
MATCH LINE D

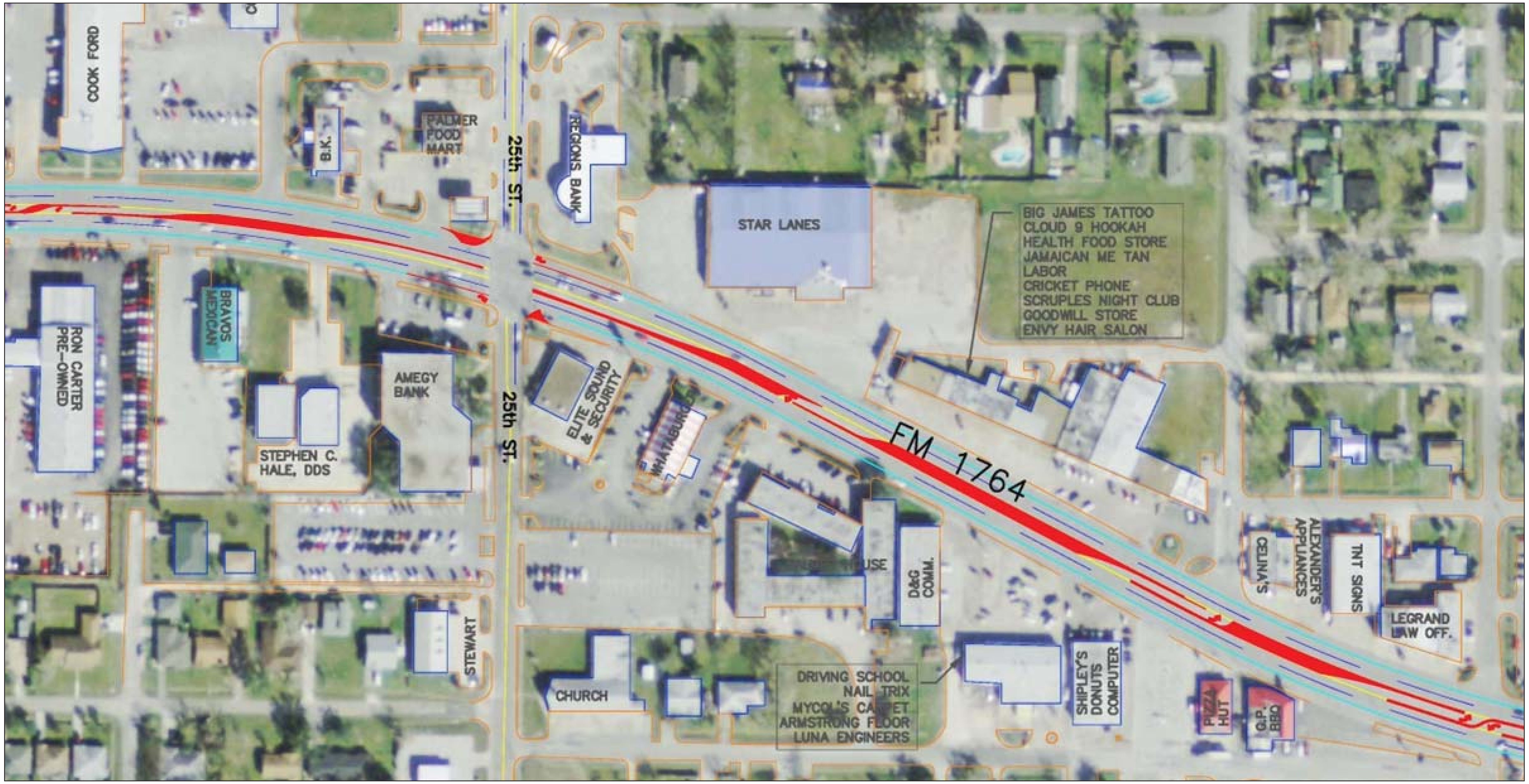
Continuous Right Turn Lane with Median



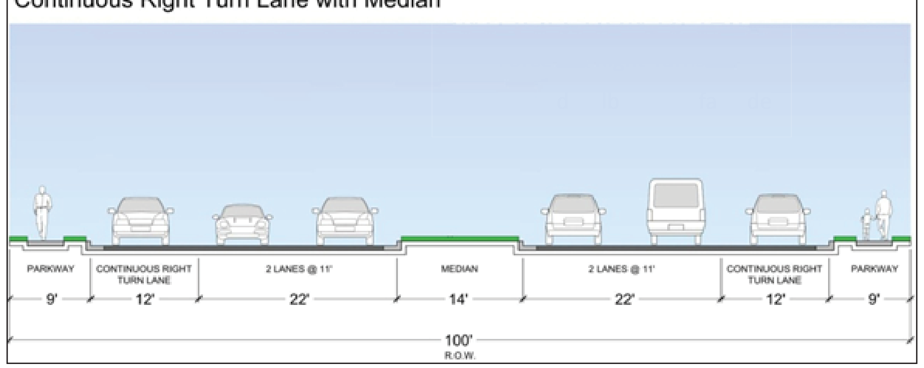
MEDIUM-RANGE PROJECT:

- Keep Continuous Right-Turn Lane east of 34th Street
- Keep force-off right turn at signalized intersections
- Raised bulb-outs downstream of force-off right turns
- Raised center left-turn lanes SH 146 to 21st Street





Continuous Right Turn Lane with Median



MEDIUM-RANGE PROJECT:

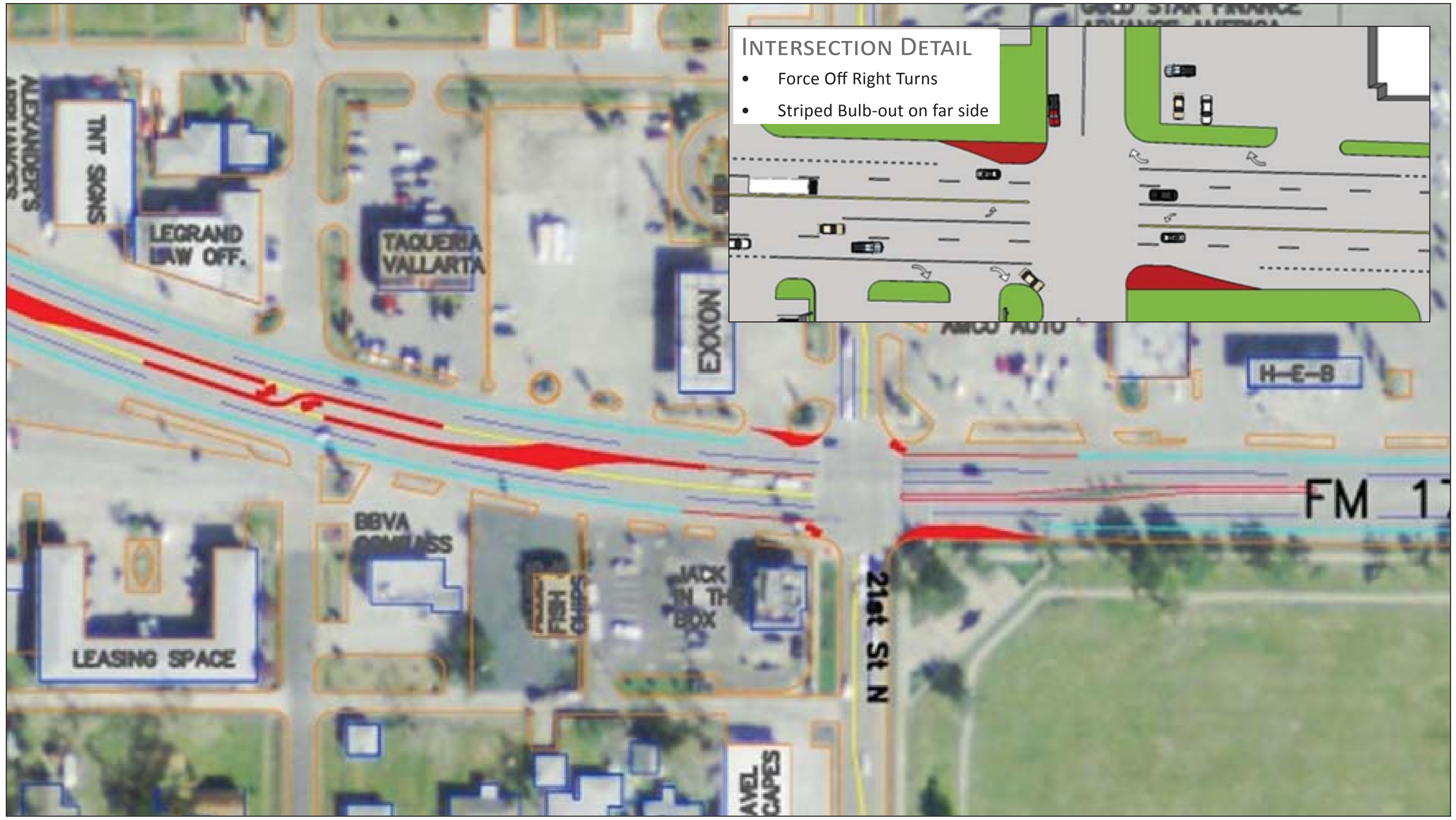
- Keep Continuous Right-Turn Lane east of 34th Street
- Keep force-off right turn at signalized intersections
- Raised bulb-outs downstream of force-off right turns
- Raised center left-turn lanes SH 146 to 21st Street

N

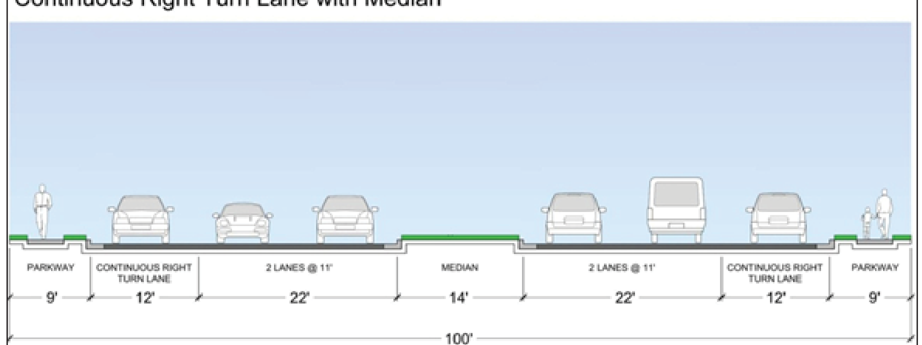
0 100 200

SCALE: FEET

MATCH LINE E

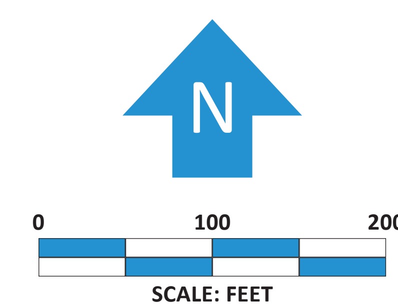


Continuous Right Turn Lane with Median

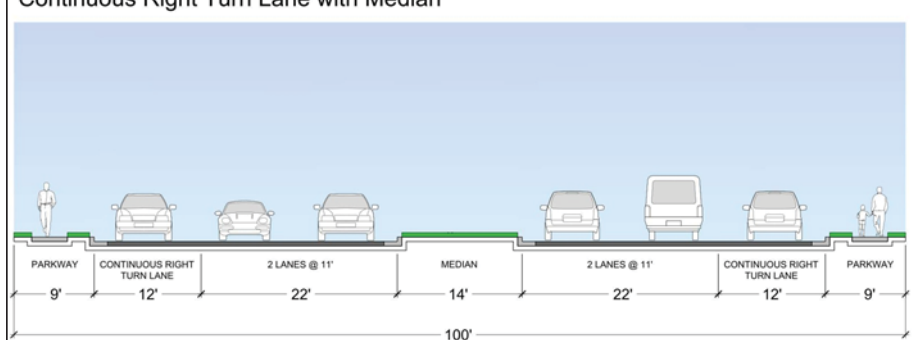


Medium-Range Project:

- Keep Continuous Right-Turn Lane east of 34th Street
- Keep force-off right turn at signalized intersections
- Raised bulb-outs downstream of force-off right turns
- Raised center left-turn lanes SH 146 to 21st Street

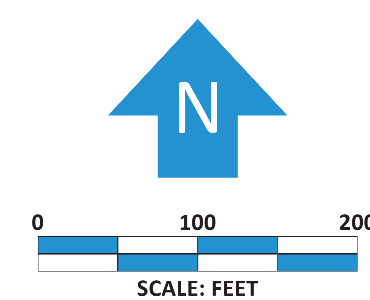


Continuous Right Turn Lane with Median

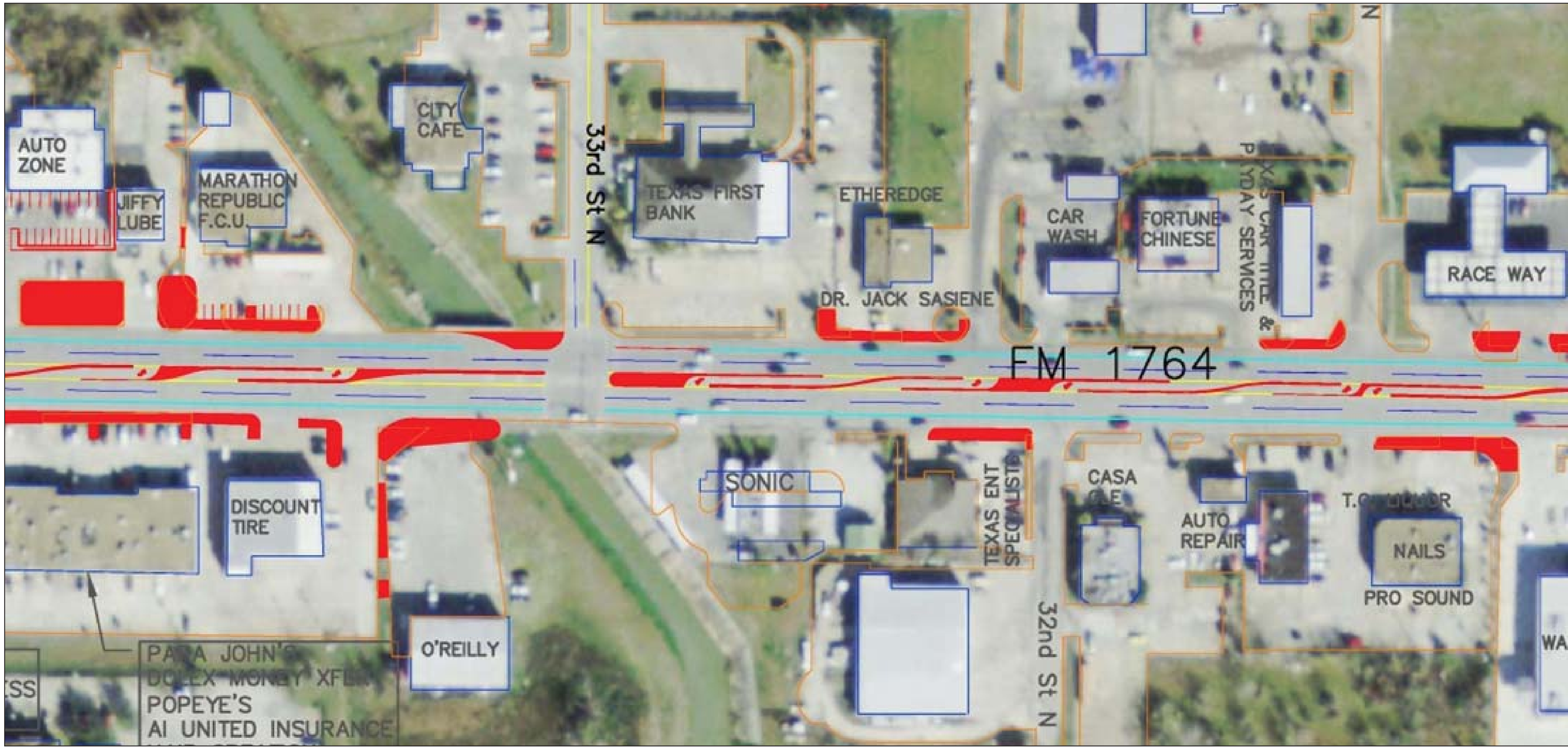


LONG-RANGE PROJECT:

- Implement driveway consolidations
- Implement merging of parking areas

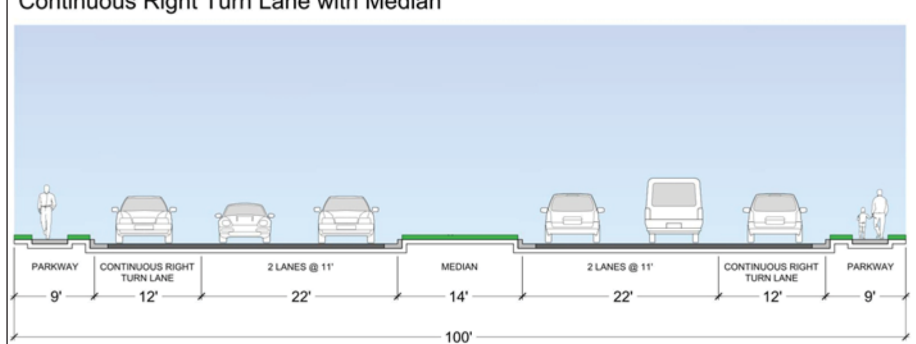


MATCH LINE A



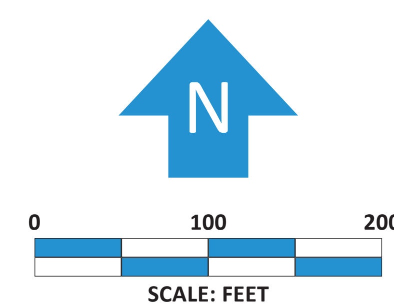
MATCH LINE B

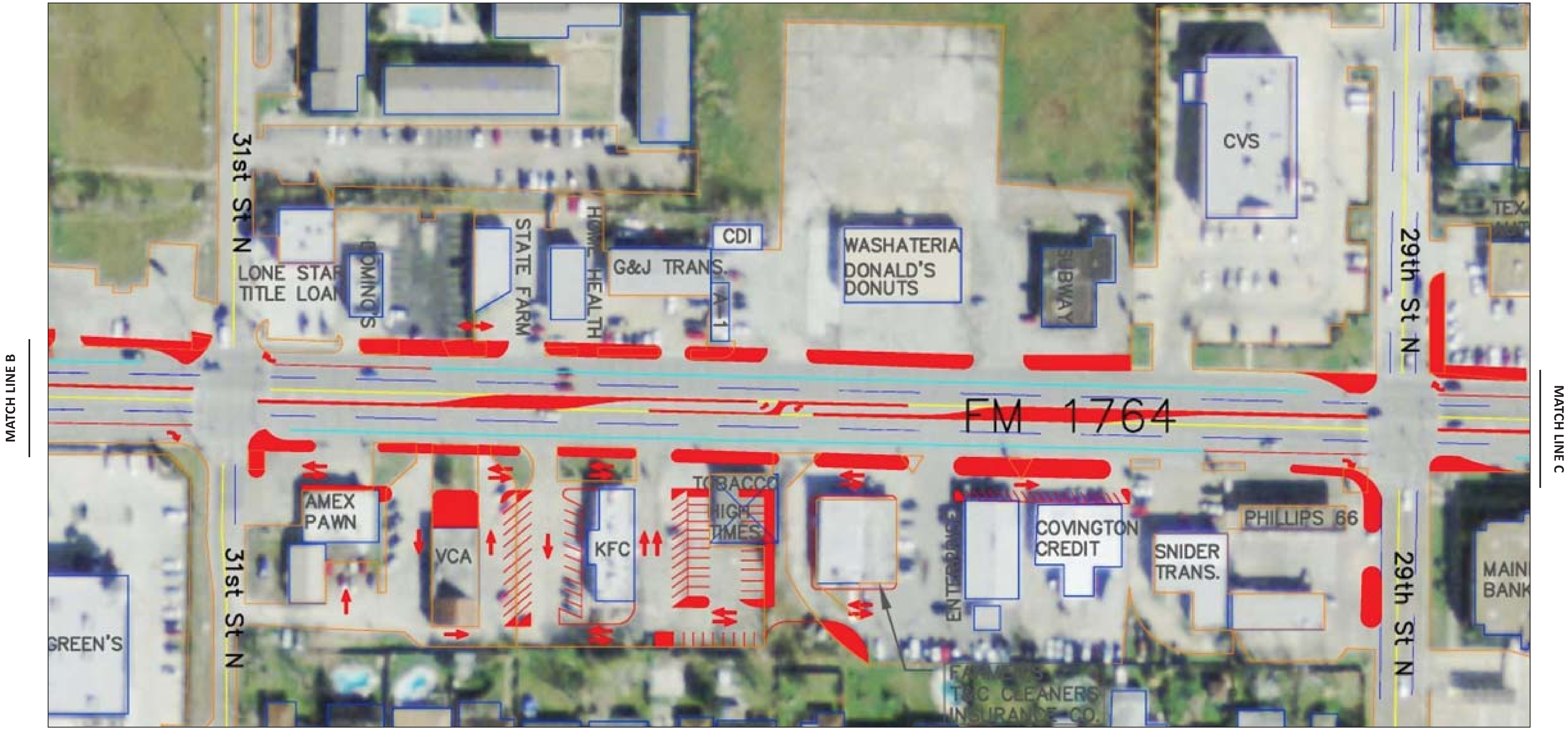
Continuous Right Turn Lane with Median

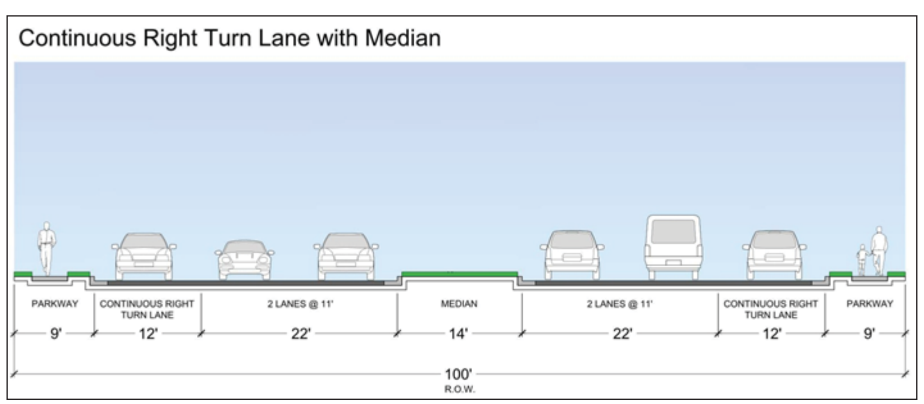


LONG-RANGE PROJECT:

- Implement driveway consolidations
- Implement merging of parking areas

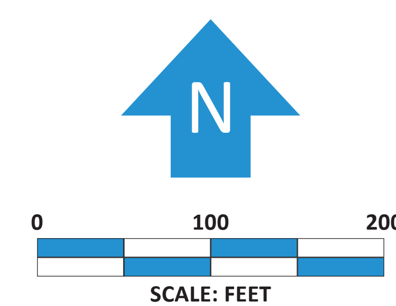


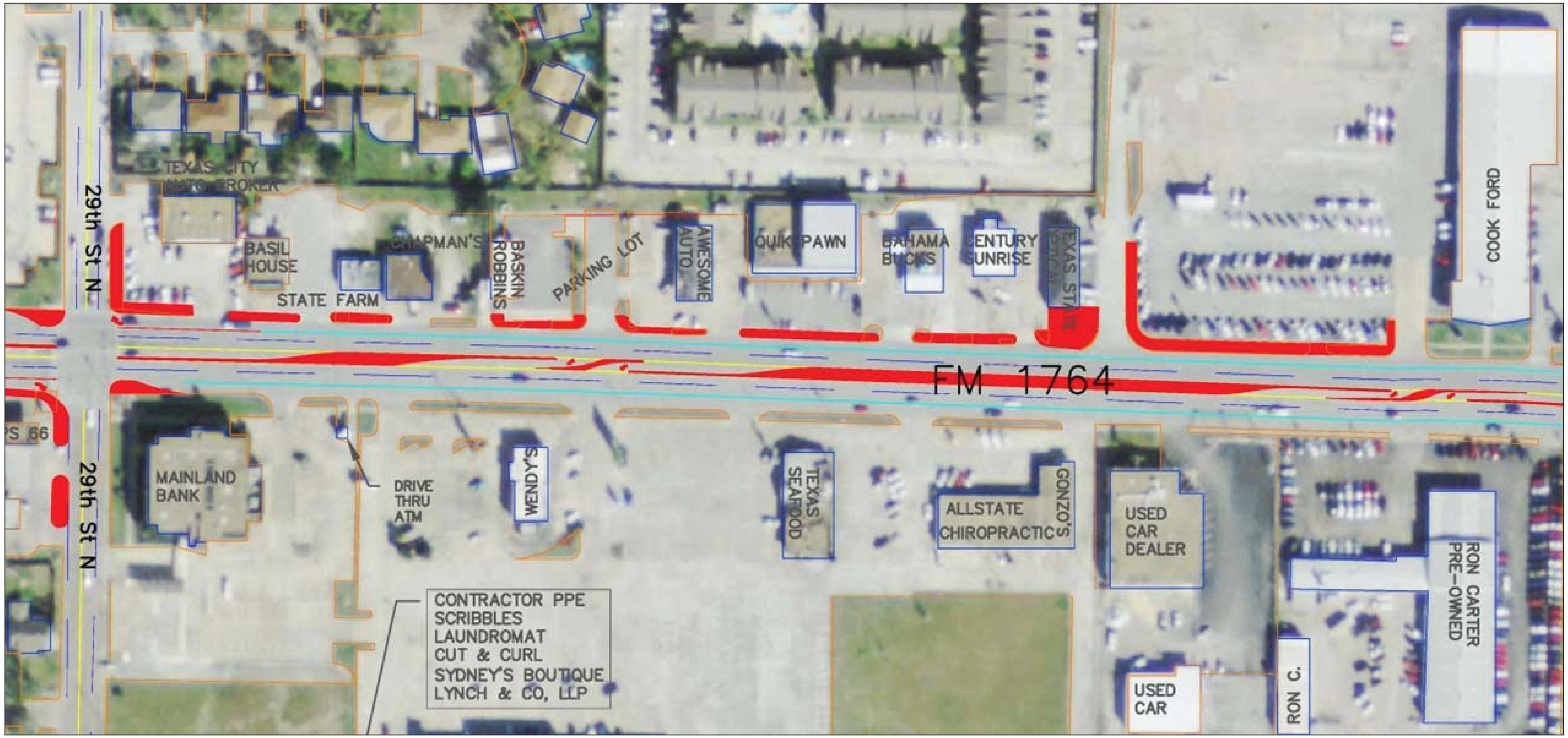


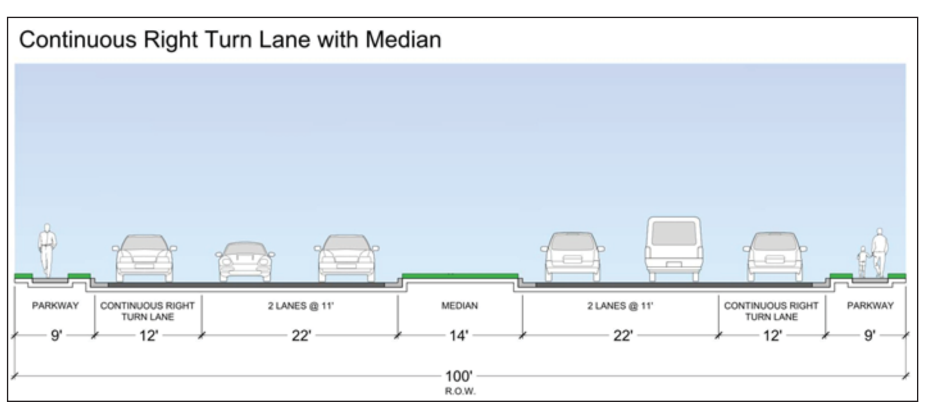


LONG-RANGE PROJECT:

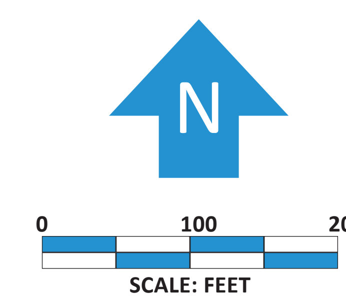
- Implement driveway consolidations
- Implement merging of parking areas

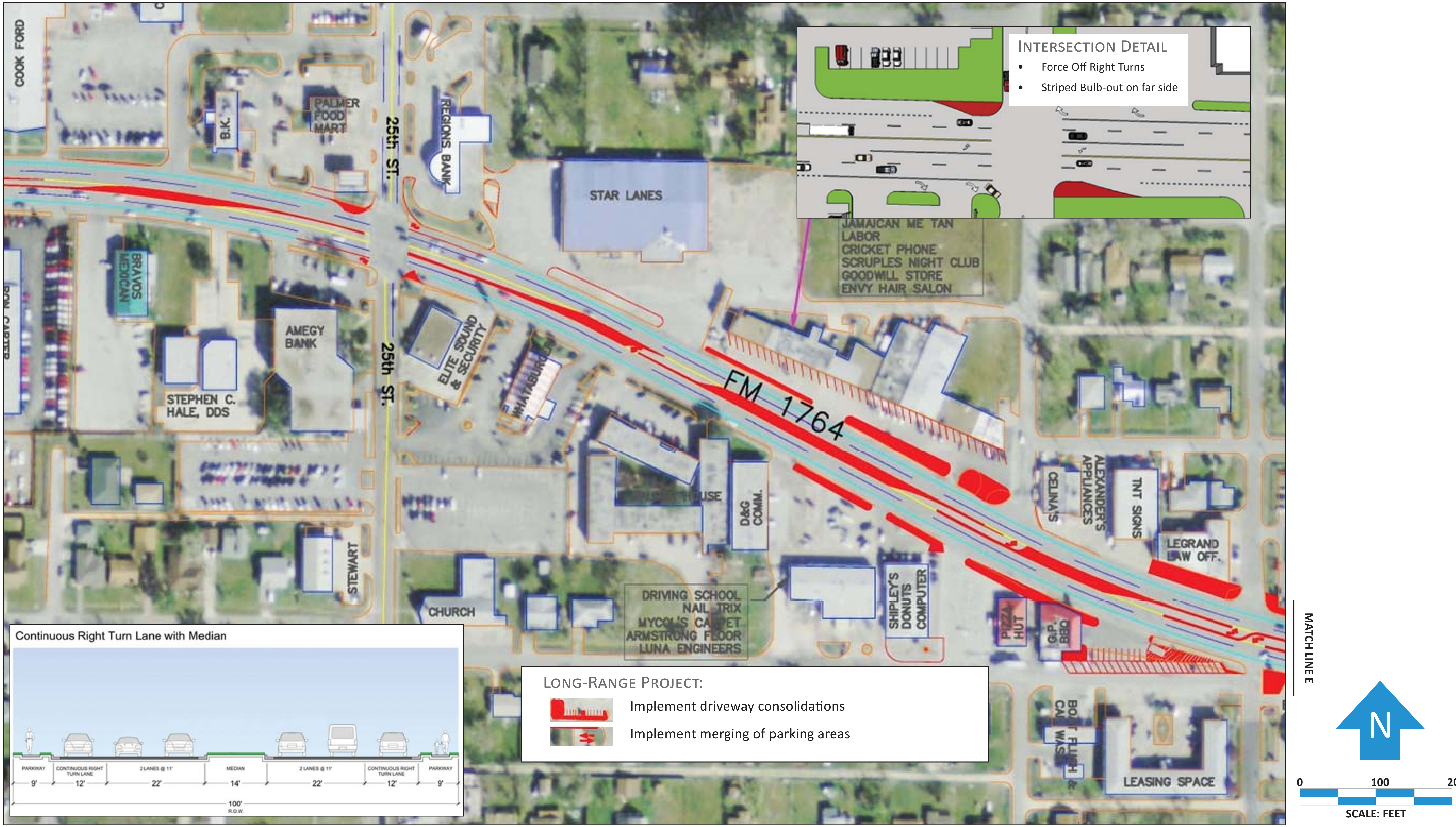


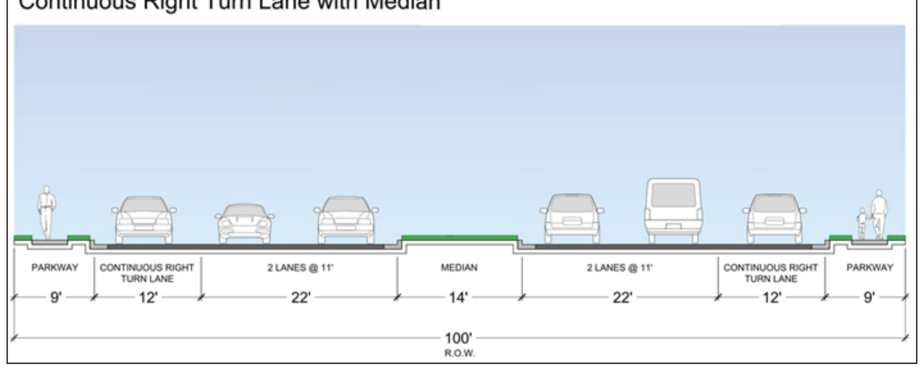




LONG-RANGE PROJECT:
- Implement driveway consolidations
- Implement merging of parking areas

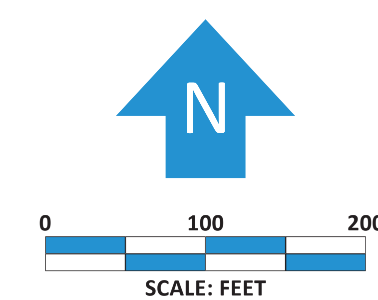



MATCH LINE D
MATCH LINE E
COOK FORD
B.K.
PALMER FOOD MART
25th ST.
REGIONS BANK
STAR LANES
BRAVOS MEXICAN
AMEGY BANK
STEPHEN C. HALE, DDS
ELITE SOUND & SECURITY
WHATABURGER
FM 1764
JAMAICAN ME TAN
LABOR
CRICKET PHONE
SCRUPLES NIGHT CLUB
GOODWILL STORE
ENVY HAIR SALON
D&G COMM.
CELINAS
ALEXANDER'S APPLIANCES
TNT SIGNS
LEGRAND LAW OFF.
STEWART
CHURCH
DRIVING SCHOOL
NAIL TRIX
MYCOL'S CARPET
ARMSTRONG FLOOR
LUNA ENGINEERS
SHIPLEY'S DONUTS
COMPUTER
PIZZA HUT
G.P. BBQ
LEASING SPACE
INTERSECTION DETAIL
Force Off Right Turns
Striped Bulb-out on far side
Continuous Right Turn Lane with Median
PARKWAY 9'
CONTINUOUS RIGHT TURN LANE 12'
2 LANES @ 11' 22'
MEDIAN 14'
2 LANES @ 11' 22'
CONTINUOUS RIGHT TURN LANE 12'
PARKWAY 9'
100' R.O.W.
LONG-RANGE PROJECT:
Implement driveway consolidations
Implement merging of parking areas
N
0 100 200
SCALE: FEET



LONG-RANGE PROJECT:

- Implement driveway consolidations
- Implement merging of parking areas



Appendix E

Detailed Costs

Planning Level Cost Estimates of Proposed Improvements

To assist in considerations for implementation of recommended improvements, planning level cost estimates were made for the Short-Range and Long-Range proposed improvements.

Short-Range Projects

The proposed early implementation access management projects include:

1. Striping of continuous right-turn lanes, eastbound from 34th Street to 14th Street and westbound from 14th Street to 33rd Street
2. Force-off right turns at signalized intersections:21st Street (each way), 25th Street (each way), 29th Street (each way), 31st Street (each way) and 33rd Street (WB only) for a total of nine locations
3. Striping of bulb-out island downstream of the force-off right turns, for a total of nine locations, using 4-inch solid white lines to denote the outside edge and 8-inch white diagonal lines at 24 inches o.c.
4. Striping of channelized left turn bays in the median between SH 146 and 34th Street, using 4-inch solid white lines to denote the outside edge and 8-inch white diagonal lines at 24 inches o.c.

The net new costs of these improvements to the programmed milling and resurfacing project by TxDOT are estimated as follows and as listed in Table E.1.

1. Change to programmed 4-inch white dashed outside lane line, each direction, to 8-inch white dotted lines east of 34th Street. Total length approximately 10,000 feet at a net upcharge of approximately $1.00 per linear foot = $10,000
2. Change to 4-inch dashed lines to 8-inch solid white line for 150 feet plus arrows and ONLY words at force-off right turns. Two arrows and ONLY words @ $125 each plus $150 for solid 8-inch line totals $650 per location for a total estimated cost for 9 locations of $6,000.
3. Approximately 60 LF of curvilinear 4-inch white stripe at $4.00 per LF and 70 LF of 8-inch white stripe at $2.50 per LF = approx.. $500 per bulb-out location for 9 locations = approx. $4,500.
4. Approx.500 LF of 4-inch yellow stripe per left turn bay for 4 turn bays or 2,000 LF of curvilinear striping at $4.00 per LF = $8,000. Plus 8” yellow diagonal stripes of approximate total length of 600 LF at $2.50 per LF = $1,500. Total for the median striping of approximately $9,500.

Total estimated cost of improvements as a change order to the ongoing TxDOT project is approximately $47,500. A speed study and potential change to speed limit signage are also recommended to be completed in the Short-Range projects

Estimated Costs of Short-Range Projects

Overlay Additional Cost Item	Estd Qty[3]	Price/unit[1]	Item Cost
Delete 4-inch white dash[2]	-10,000 LF	$ 1/LF	-$10,000
Add 8-inch dotted & solid	10,000 LF	$ 2/LF	$20,000
Arrows & ONLY markings	27 EA	$ 125/EA	$4,000
Special use signs @ 400 feet oc + 9 R3-5 signs	59 EA	$ 150/EA	$9,000
Striping for Bulb-outs, (130 LF 4-inch stripe)	9 EA	$ 500/EA	$5,000
4-inch striping for median LTs	500 LF	$ 4/LF	$8,000
8-inch striping for median LTs	600 LF	$ 2.50/LF	$2,000
Contingency	1	20%	$7,600
Process Change Order	1	5%	$1,900
TOTAL Cost of Continuous Right-Turn			**$47,500**

Table E.1: Total estimated cost of Short-Range projects, except for the speed study and its implementation cost

Notes:

1. Unit costs approximate from TxDOT Bid Tabulations, 2011, considering work as a modification to an ongoing project.

2. Project currently calls for typical dashed land divider striping, so a credit was including for deleting the need for the dashed striping. Surface preparation was considered same for either striping type.

3. EA = Each, LF = Linear Foot, SY = Square Yard, LS = Lump Sum

Medium-Range Projects (Six to 15 Years)

The proposed Medium Range projects include:

1. Single Point Urban Interchange (SPUI) at SH 146
2. Signal detection and controller upgrades to facilitate responsive coordinated timing and operation at 14th, 21st, 25th, 29th, 31st, 33rd, 34th Streets and SH 146
3. Converting the striped bulb-outs downstream of the forced right turns to raised bulb-outs, 5 each direction for total of 10 locations
4. Converting the striped channelized medians between SH 146 and 34th Street to raised medians, and Implementing raised medians between 34th Street and 21st Street
5. Re-align 34th Street at intersection
6. Repair damaged sidewalks , install missing sidewalks, demarcate pedestrian passage across wide driveway openings

The anticipated costs of these improvements are estimated at a planning level without the benefit of design as follows:

1. The cost to convert the existing diamond interchange to a SPUI (A-2) is listed in detail in Table E.2 and includes:
   A. Demolish portions of existing U-turns to accommodate directional turns
   B. Remove SB pavement south of FM 1764
   C. New pavement to add NB & SB directional turns
   D. New pavement to add EB & WB directional turn left bays
   E. Trim center median at bridge columns
   F. New signal poles, heads & controller modifications

Estimated Cost of SH 146 at FM 1764 Intersection Conversion

SPUI Cost Item	Est'd Qty	Price/unit	Item Cost
Demolish Existing Pavement, SY	200	$ 10/SY	$2,000
Additional Base and Pvmnt, Curb, SY	2,200	$ 75/SY	$ 165,000
Modify Center Island Ends, SF	200	$ 50/SF	$10,000
Traffic Signal Poles & Fndn, EA	6	$ 4,500/EA	$27,000
Traffic Signal Heads, EA	24	$ 500/EA	$12,000
Remove Exist. Traffic Signals, Fndn	4	$ 1,000/EA	$4,000
Traffic Controller Modification, LS	1	$ 5,000/EA	$5,000
Conduit & Wiring, LF	1,000	$3/LF	$3,000
Striping, LF	5,000	$ 1/LF	$5,000
Signs and Misc., LS	1	$ 10,000	$10,000
Traffic Control, Mobilization	1	10%	$24,000
Engineering and Surveying	1	15%	$36,000
Contingency	1	20%	$48,000
TOTAL Cost of SPUI			**$352,000**

Table E.2: Estimated cost of SH 146 at FM 1764 intersection conversion

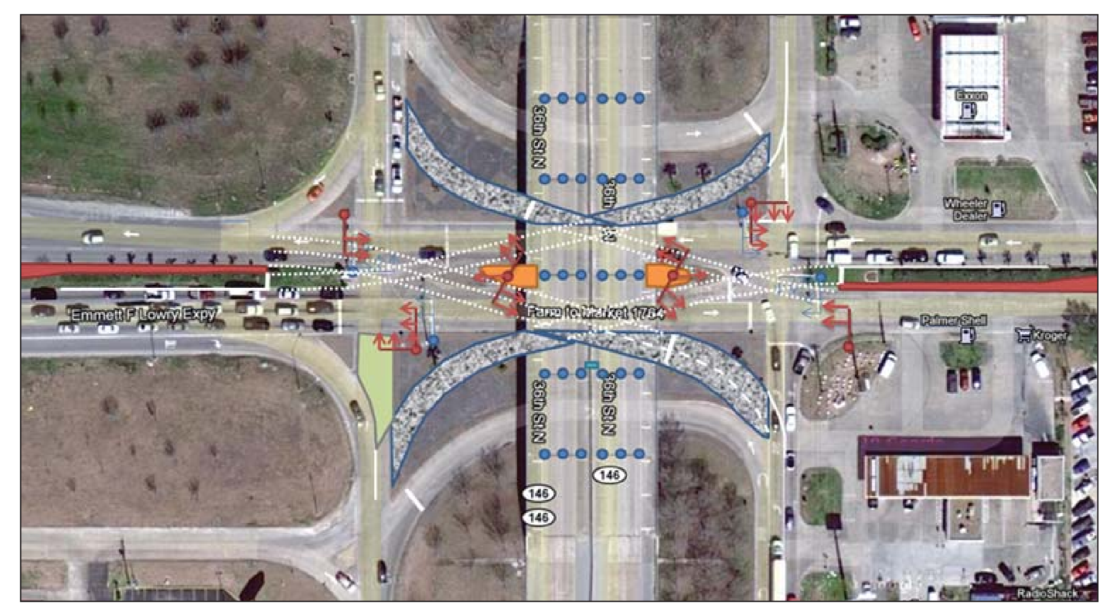


Figure E.1: Improvements needed for SPUI

2. A thorough assessment of the traffic signal equipment at the intersection will need to be conducted. From a cursory visual assessment, the cost to implement the signal upgrades would typically include:
    A. Detection equipment (VIVDS cameras, or radar, or thermal) at about $4,000 each approach
    B. Controller upgrade at about $5,000
    C. Communications equipment (radio and antenna) at about $9,000
    D. Contingency for signal modifications and replacements at $7,000

The total per intersection is estimated at $25,000. Total for nine signals in study area is approximately $225,000. Additional cost may be required for design and inspection.

3. The anticipated cost of constructing each raised bulb-out is approximately $35,000 per bulb-out, for a total of approximately $350,000 for the 10 locations based on:
    A. 337 SF per bulb-out for pavers on top of exist. pvmt @ $10/SF = $3,500
    B. 100 LF of curb work @20/LF = $2,000
    C. Contingency for rework pavement for drainage, signs, striping, ect. = $10,000
    D. Contractor mobilization = $2,500 per location
    E. Surveying and engineering @ 17,000 per location

6. The anticipated cost of constructing the raised medians can consider low and high treatments:
    A. The raised medians could be created with curbs dowelled into the existing pavement and brick pavers laid on top of the existing pavement. On a planning level, without final determination of median opening locations, costs were estimated on a per mile basis as follows:
        i. Curb Work @ $10/LF, 10,000 LF per centerline mile = $100,000/mi
        ii. Pavers @ $10/SF assuming 35% coverage of 14 ft width = $260,000/mi
        iii. Traffic control and mobilization @ $50,000/mi
        iv. Surveying and engineering @ 15%
        v. Contingency @ 20%

    This level of treatment would cost approximately $550,000 per mile or a total of $880,000 for the 1.6 miles of the corridor without existing raised medians.

    B. To include landscaping in the median would raise cost of the treatment for sod, planting, trees and irrigation. The value of the landscaping is estimated at approximately $100,000 per mile, or approximately $160,000 for the corridor.

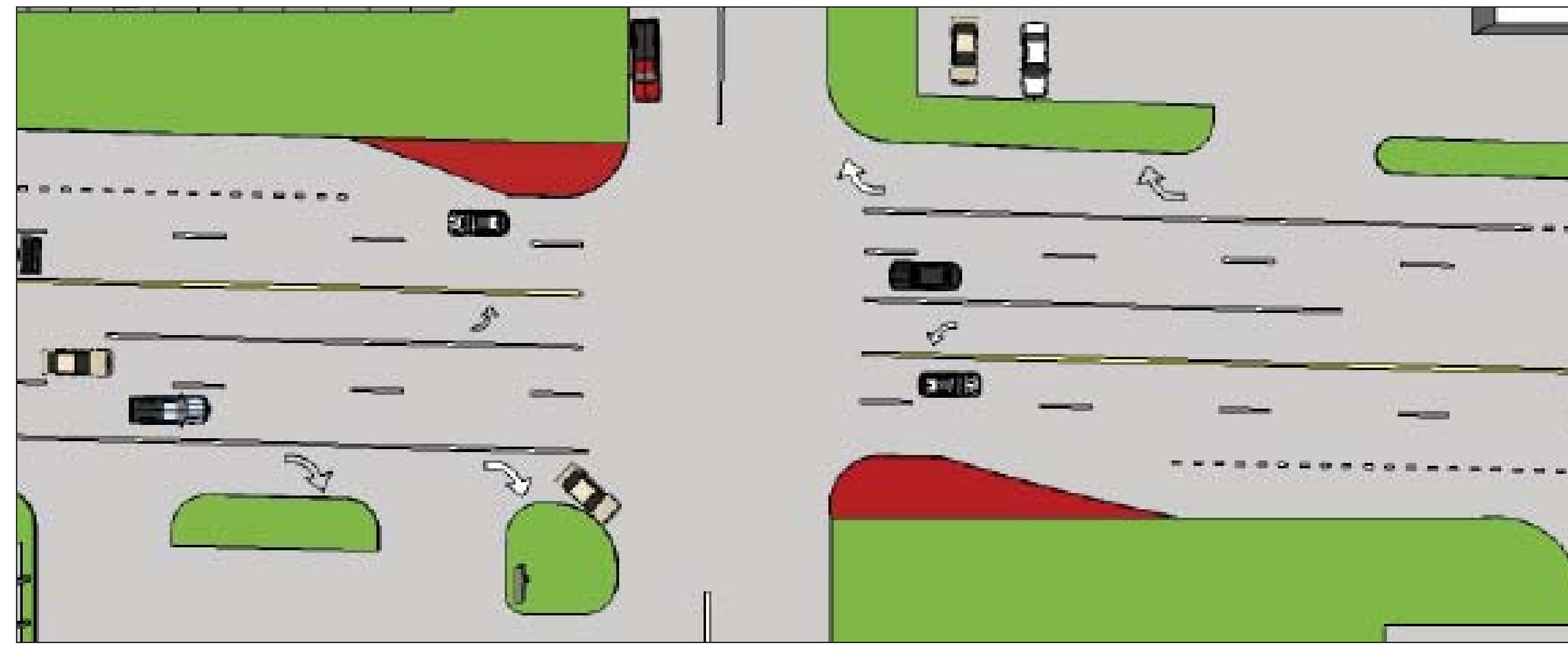


Figure E.2: Raised Bulb-Out (red)

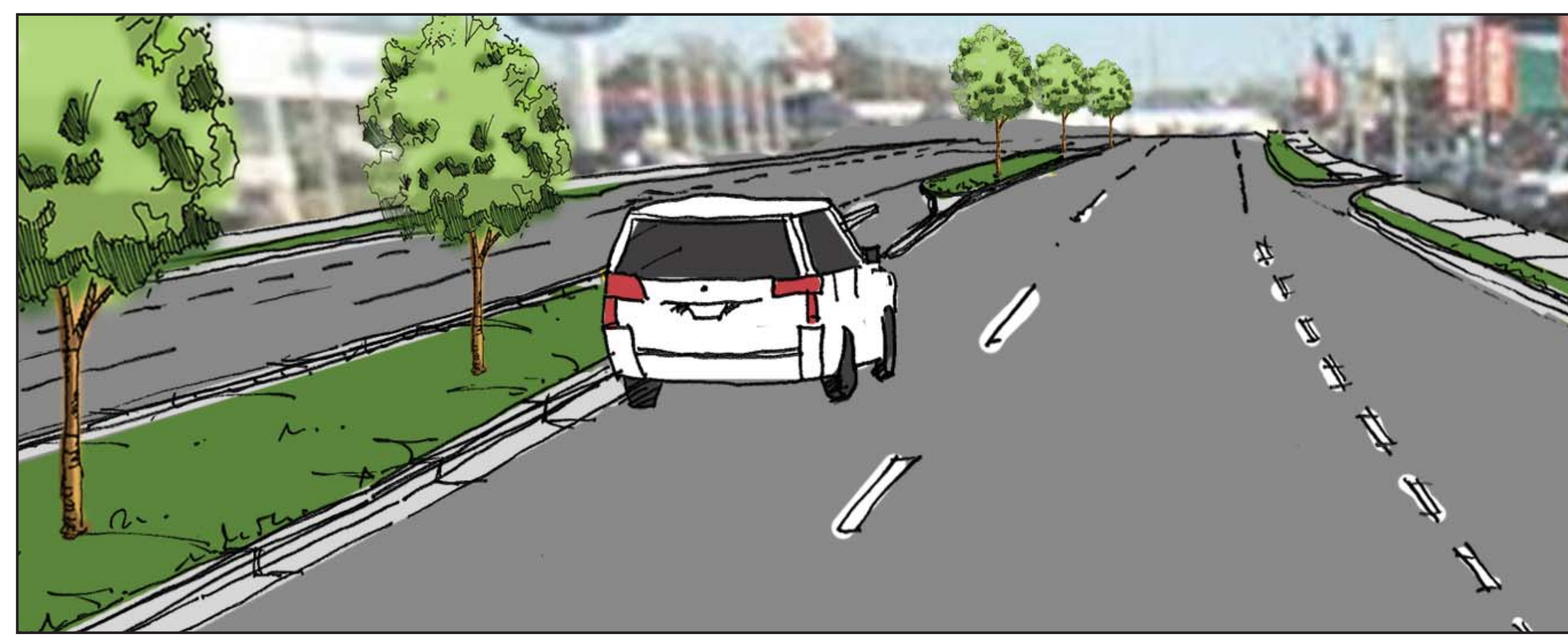


Figure E.3: Raised Medians

5. The anticipated costs of constructing the needed alignment improvements at 34th Street are roughly estimated at $216,000 for the intersection as shown in Table E.3. These are planning level estimates only and must be fully developed based upon Right of Way boundary determinations and engineering design.

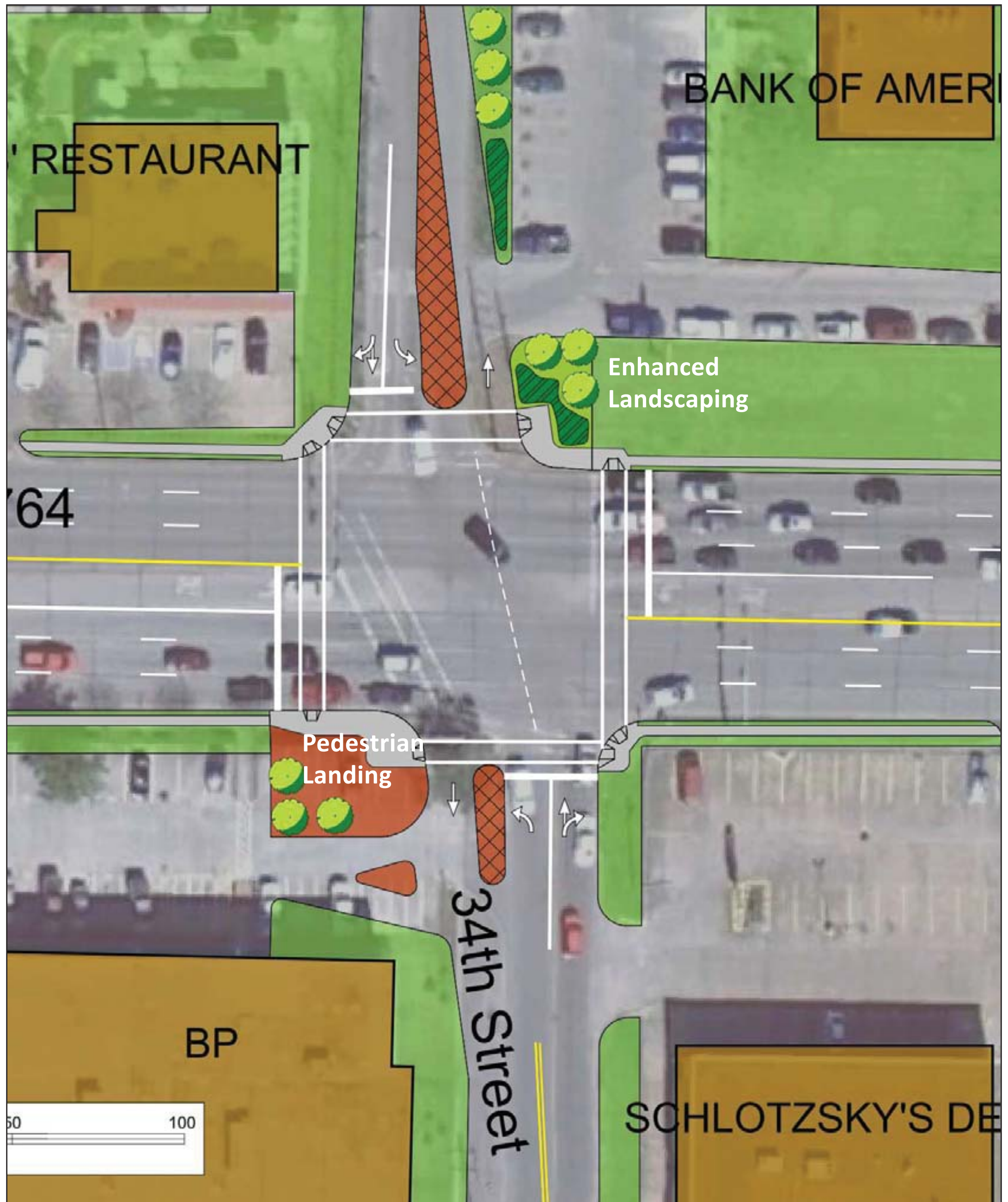


Figure E.4: 34th Street alignment improvements

Estimated Costs of Improvements to Intersection at 34th Street

Element	Quantity	$ Per Unit	Estimated Cost
A. Widening of the Roadway at the NE Quadrant, Enhance Landscaping			
Demolition, SY	110	100	$11,000
Base, SY	130	20	2,600
Pavement, SY	120	50	6,000
Curb, LF	200	10	2,000
Driveway, Each	1	2,000	2,000
Divider Island, SF	500	10	5,000
Landscaping	Lump Sum	5,000	5,000
Mobilization & Traffic Control	10%	of total	2,860
Subtotal item A			$ 36,430
B. Purchase ROW to widen roadway at the SE quadrant			
Purchase ROW, SF	200	100	$ 20,000
C. Widen Pavement and Create Pedestrian Landing on SE Corner			
Demolition, SY	110	100	$ 11,000
Base, SY	130	20	2,600
Pavement, SY	120	50	6,000
Curb, LF	300	10	3,000
Drainage Inlet, Each	1	5,000	5,000
Driveway, Each	1	2,000	2,000
Divider Islands, SF	400	10	4,000
Landscaping	Lump Sum	25,000	25,000
Mobilization & Traffic Control	10%	of total	3,360
Subtotal item C			$ 61,930
D. Signals, Pedestrian Crossings and Landings			
Ramps and Landings, Each	4	3,000	$ 12,000
Striping, LF	800	2	1,600
New Signal Poles & Heads	2	7,000	14,000
Conduit, wiring, etc	Lump Sum	2,000	2,000
Mobilization & Traffic Control	10%	of total	11,789
Subtotal item D			$ 41,389
E. Engineering & Surveying	15%		$ 23,962
F. Contingency	20%		$ 31,950
TOTAL Cost of 34th Street Improvements			**$215,661**

Table E.3: Estimated Cost of Imtersection Improvements at 34th Street

6. The anticipated cost of constructing the needed sidewalk enhancements includes the following at a unit cost that approximates the level of difficulty of the work. A 35% collection for engineering and surveying (15%) and contingency (20%) is added:

   A. New 5-foot sidewalk north side 34th to 33rd,700 LF @ $40/LF+35% ES&C= $38,000

   B. New 5-foot sidewalk north side 33rd to 31st ,800 LF @ $40/LF+35% ES&C = $43,000

   C. New 5-foot sidewalk north side 31st to 29th,400 LF @ $50/LF+35% ES&C = $27,000

   D. New 5-foot sidewalk north side 29th to 25th,600 LF @ $50/LF+35% ES&C = $40,000

   E. New 5-foot sidewalk north side 25th to 21st ,1100 LF @ $60/LF+35% ES&C = $89,000

   F. Sidewalk repairs south side, 500 LF @ $60/LF+35% ES&C = $40,000

   G. Ramp repairs to meet ADA, estimated 10@$4,000 ea+35% ES&C = $54,000

Costs are roughly estimated at $331,000 for the corridor. A complete conditions assessment should be performed to determine the need for replacement of any existing sidewalk and the provision of accessible ramps and signals.

The extension of sidewalks from FM 1764 into the neighborhoods where there are currently no sidewalks should be studied further for desirability by residents and practicality of design and cost.

Estimated Costs of Medium-Range Improvement Projects

Major Improvement	Estimated Cost
Convert Diamond to SPUI	$ 352,000
Traffic Signal Equipment Upgrades	225,000
Raised Bulb-outs at 10 corners	350,000
Raised Medians and Channelized Left Turns	880,000
Landscaping of Medians	160,000
Realignment of 34th Street	216,000
Sidewalk Completion and Reconstruction	331,000
TOTAL Cost of Medium-Range Improvements	**$2,514,000**

Table E.4: Estimated Costs of Medium-Range Improvement Projects

Long Range Projects (over 15 years)

The proposed Long Range projects include driveway and parking area modifications:

1. Modify 1 driveways and 1 parking areas between SH 146 and 34th Street, EB
2. Modify 4 driveways and 2 parking areas between 34th and 33rd Streets, EB
3. Modify 2 driveways and 4 parking areas between 34th and 33rd Streets, WB
4. Modify 2 driveways and 0 parking areas between 33rd and 31st Streets, EB
5. Modify 2 driveways and 0 parking areas between 33rd and 31st Streets, WB
6. Modify 4 driveways and 5 parking areas between 31st and 29th Streets , EB
7. Modify 5 driveways and 3 parking areas between 31st and 29th Streets, WB
8. Modify 7 driveways and 0 parking areas between 29th and 25th Streets, WB
9. Modify 2 driveways and 1 parking areas between 25th and 21st Streets, EB
10. Modify 6 driveways and 0 parking areas between 25th and 21st Streets, WB
11. Modify 4 driveways and 0 parking areas just east of 21st Streets, WB

The anticipated costs of these improvements are estimated for illustrative purposes only, on an order of magnitude basis at a planning level without the benefit of design, using a value of $10,000 per driveway closure and $20,000 per merging point of adjacent parking areas.

The total order of magnitude cost of treatments to modify driveways and merge parking areas in the corridor is estimated at $1,053,000 as shown in Table E.5. Additional efforts would need to be expended to negotiate the driveway closures, develop shared parking agreements between property owners, and to develop conceptual design of the treatments.

Estimated Costs of Long-Range Improvement Projects

Major Improvement	# Driveways @ $10K each	# Parking Areas @ $20K each	Estimated Cost
SH 146 and 34th Street, EB	1	1	$ 30,000
34th and 33rd Streets, EB	4	2	60,000
34th and 33rd Streets, WB	2	4	100,000
33rd and 31st Streets, EB	2	0	20,000
33rd and 31st Streets, WB	2	0	20,000
31st and 29th Streets , EB	4	5 + $40K Special Area	200,000
31st and 29th Streets, WB	5	3	110,000
29th and 25th Streets, WB	7	0	70,000
25th and 21st Streets, EB	2	$50K Special Area	70,000
Contingency, 20%	6	0	60,000
Just east of 21st Streets, WB	4	0	40,000
Engineering & Surveying, 15%			117,000
Contingency, 20%			156,000
TOTAL Cost of Long-Range Improvements			**$1,053,000**

Table E.5: Estimated Costs of Long-Range Improvement Projects