NORTH RICHLAND HILLS

# TRANSPORTATION PLAN

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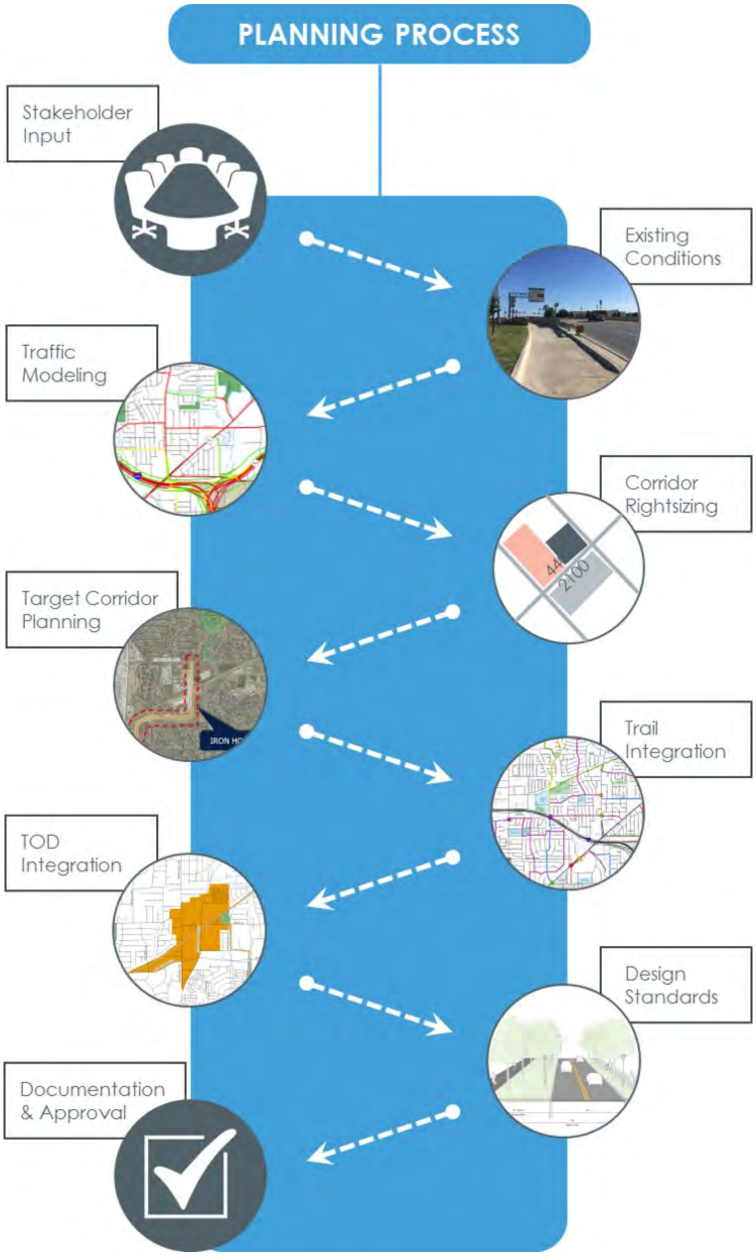
# EXECUTIVE SUMMARY

# About the Transportation Plan

The Transportation Plan (Plan), incorporated as part of the larger Strategic Plan, provides a roadmap for moving North Richland Hills' (NRH) transportation system into the next generation as the community continues to grow and mature. As an update to the City's 2007 Thoroughfare Plan, the Plan takes the step forward to incorporate all road users – people driving, walking, bicycling, and riding transit – to balance the various needs.

The City's transportation system will continue to evolve as the context and users diversify. The arrival of TEXRail, the commuter rail connecting downtown Fort Worth to Dallas-Fort Worth Airport, brings change to NRH through the development of two stations within the city – Smithfield Station and Iron Horse Station. Additionally, the rise of technology in mobility has the potential to transform the landscape of cities in the Metroplex. From transportation network companies (TNCs) – e.g. Uber, Lyft – to automation in vehicle driving and delivery, as well as shared mobility options, the users and technology interacting within the public right-of-way is becoming more complex.

**The purpose of the Plan is to serve as a guiding tool for making balanced multimodal transportation decisions for both access and mobility.** The Plan provides policy and tools to help designers, engineers, community advocates, and developers utilize and/or reshape the right-of-way to meet the needs for North Richland Hills' citizens today and tomorrow.



## Navigating the Plan

**Executive Summary** briefly summarizes the Transportation Plan recommendations.

**Chapter A. Introduction** describes the need for updating the transportation plan, highlights the Plan's organizational format, key partners in transportation implement-ation, and relevant plans, both past and present, impacting NRH transportation planning and infrastructure. The chapter also outlines the Plan's four goals.

**Chapter B. Current Context** profiles the existing issues and needs within the transportation system, including safety, congestion, and infrastructure gaps.

**Chapter C. Future Context** focuses on the anticipated future of NRH related to accessibility, mobility, operations, and the interface with land uses.

**Chapter D. Transportation Plan** describes the multimodal network (vehicular, walking, bicycling, transit, goods move-ment) needed to address the future needs of the City.

**Chapter E. Action Plan** outlines priorit-ization methodology for project implem-entation. This chapter also contains the policies, programs, and projects for short-, medium-, and long-range implement-ation.

**Appendix A:** Roadway Design Decision Process

**Appendix B:** Target Corridors

**Appendix C:** Roadway Rightsizing Guidance

**Appendix D:** Active Transportation Pattern Book

**Appendix E:** Public/Stakeholder Input

**Appendix F:** Action Plan Details

## Transportation Goals

### *Expand Mobility & Access*

- Evaluate specific existing and planned roadway corridors for future transportation needs.
- Integrate trails, transit, roadways, and sidewalks into a more comprehensive plan for all forms of transportation.
- Promote interconnected neighborhoods for all modes of travel.
- Explore use of new technologies to enhance transportation options.
- Develop policies and standards for off-street connectivity, dead-end streets, and new cul-de-sacs.

### *Focus on Implementation*

- Maintain the cleanliness and good repair of existing transportation infrastructure.
- Coordinate local and regional initiatives to leverage local transportation dollars.
- Maintain and enhance streets and transportation infrastructure in older and substandard areas.

### *Improve Economic Vitality*

- Improve access to employment, commerce, education, and community resources.
- Provide for the efficient movement of goods and services.
- Strengthen the integration of transp-ortation and land use.
- Provide and maintain infrastructure capacity in line with growth or decline demands.
- Plan for Transit Oriented Development.

### *Enhance Quality of Life*

- Focus on moving people safely and efficiently.
- Encourage transportation design standards appropriate to the neighborhood context.
- Comply with state and local air quality standards.

# Current Context

North Richland Hills, now home to nearly 70,000 residents, 1,200 businesses, and 30 major employers, is the third largest city in Tarrant County. Offering a neighborly atmosphere and family-friendly amenities, NRH is conveniently located with access to all of the Dallas-Fort Worth (DFW) region.

Three distinct districts within NRH provide significant potential impacts on the transportation system in the future. These include the HomeTown neighborhood, Smithfield TOD district, and Iron Horse TOD district. The development potential and intensity of those “urban villages” stands to influence the NRH transportation system with increased demand as well as unique modal characteristics which differ from the traditional auto-oriented development pattern.

## Roadway Network

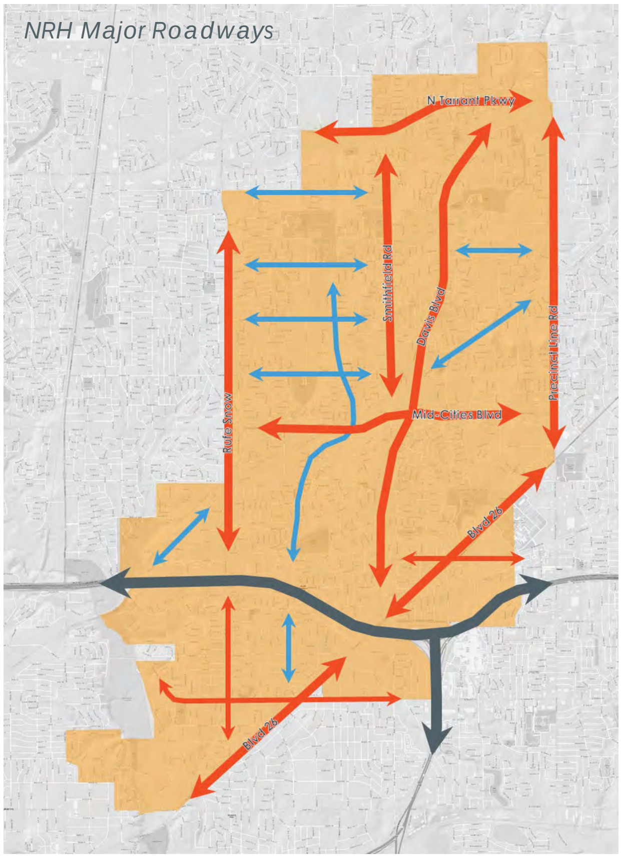
**NRH’s roadway network is nearly at a build-out condition**. The previous plan adopted in 2007 has been steadily implemented to develop a full network of roads throughout the community. The network contains an array of arterial, collector, and local roadways in addition to IH 820 and SH 121.

Oriented in a north-south, east-west grid, with the exception of Boulevard 26, NRH has a wide arterial spacing at approximately 1.5-miles. This spacing is supplemented with a strong collector roadway network that serves the local mobility and access to destinations within the neighborhoods.

*Smithfield TEX Rail Station*

*HomeTown*

*NRH Major Roadways*

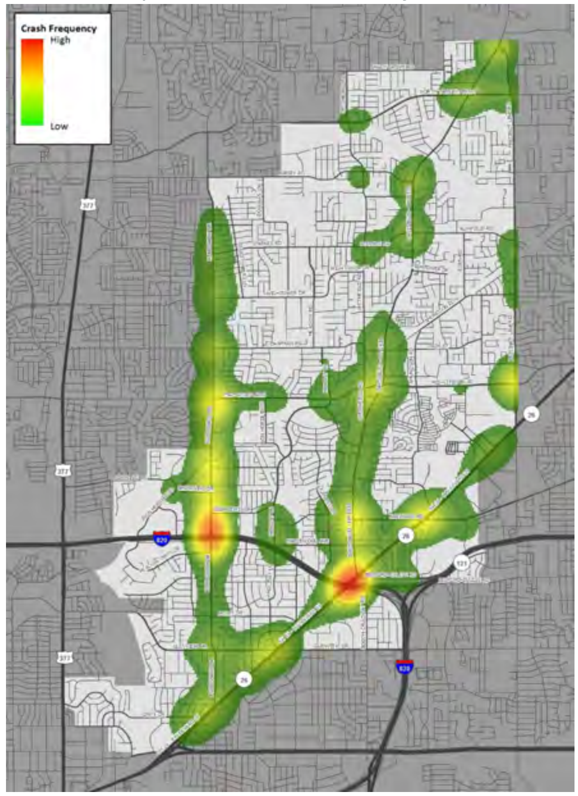


## Safety – Crash Data

Vehicle crashes are a source of significant personal distress, disruption, loss of personal property and time, and in some cases, result in injury. In the worst cases, crashes can be fatal.

Analyzing the location of crashes, both local and freeway, the data reveals a near even split of crashes between intersection and non-intersection locations. For both total crashes and fatal crashes, approximately 45% are located at intersection locations. Within NRH there has been a rise in crashes involving pedestrians in the last five years, continuously increasing from 6 in 2013 to 17 in 2017. While it is anticipated that crash rates parallel demographic growth and overall vehicle-miles traveled (VMT), **serious crashes and traffic fatalities can be minimized through proactive policies and infrastructure investments**.

*Crash Hot Spots on Local Roadway*

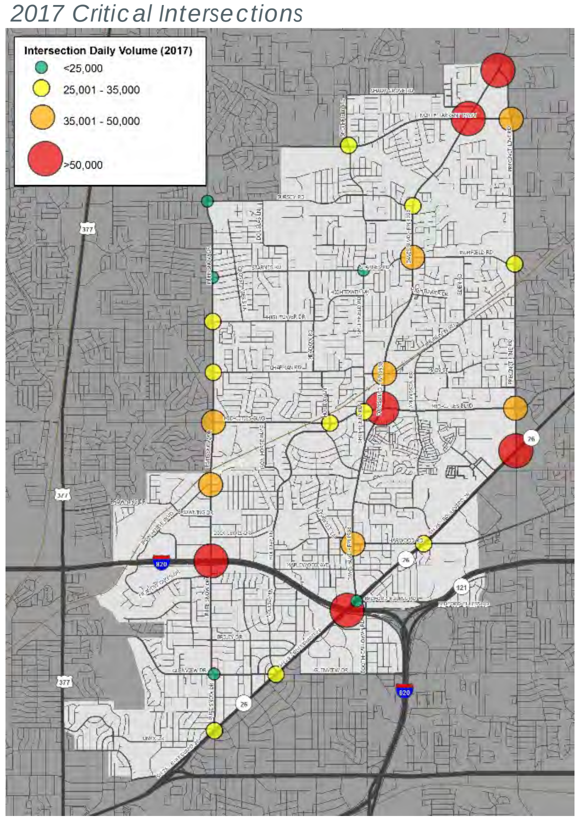



## Congestion

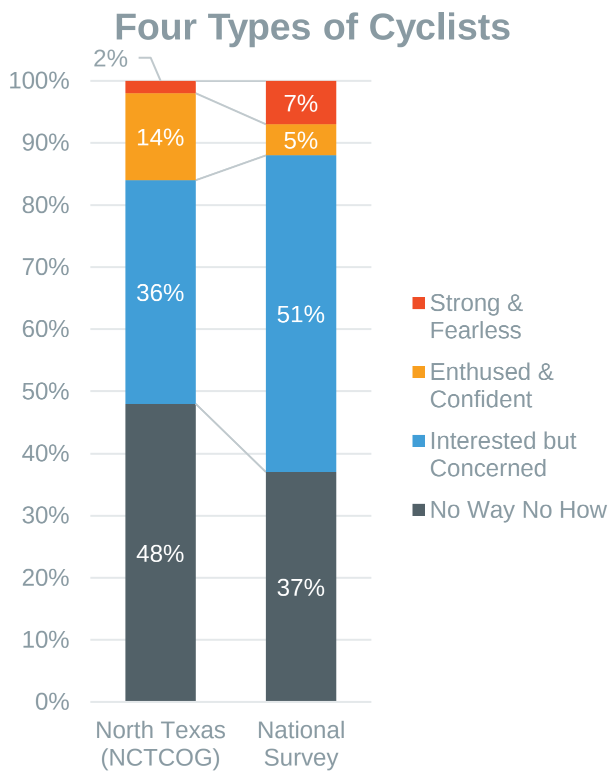
NRH is primarily an auto-oriented community with many residents commuting to employment outside the city. The management of traffic flow becomes paramount, specifically in the morning and evening peak hours, to ensure reliable commutes that help the quality of life for people living or working in NRH. Based on the 2017 NRH Citizens Survey, the **majority of residents in NRH currently view current management of traffic flow favorably**, but there are still issue areas.

| Top 5 Congested Intersections (Identified by Citizens) |
|---|
| Davis Boulevard @ Mid-Cities Boulevard |
| Rufe Snow Drive @ Mid-Cities Boulevard |
| Davis Boulevard @ N. Tarrant Parkway |
| Davis Boulevard @ Boulevard 26 |
| Rufe Snow Drive @ IH 820 |

*2017 Critical Intersections*



*Four Types of Cyclists*




*Existing Trail Inventory*

| Trail Name | Miles |
|---|---|
| JoAnn Johnson Trail | 1.65 |
| Randy Moresi Trail | 0.60 |
| North Electric Trail | 2.55 |
| Walker's Creek Trail | 2.85 |
| John Barfield Trail | 3.95 |
| Cotton Belt Trail | 4.08 |
| Calloway Branch Trail | 4.68 |
| **Total** | **20.28** |

## Active Transportation

Active transportation is considered as human-powered modes of transportation, such as walking and biking and is an essential element of a transportation network. It is important to build a transportation network that not only accommodates active transportation but plans and prioritizes it. All trips, regardless of primary mode, begin and end with the pedestrian.

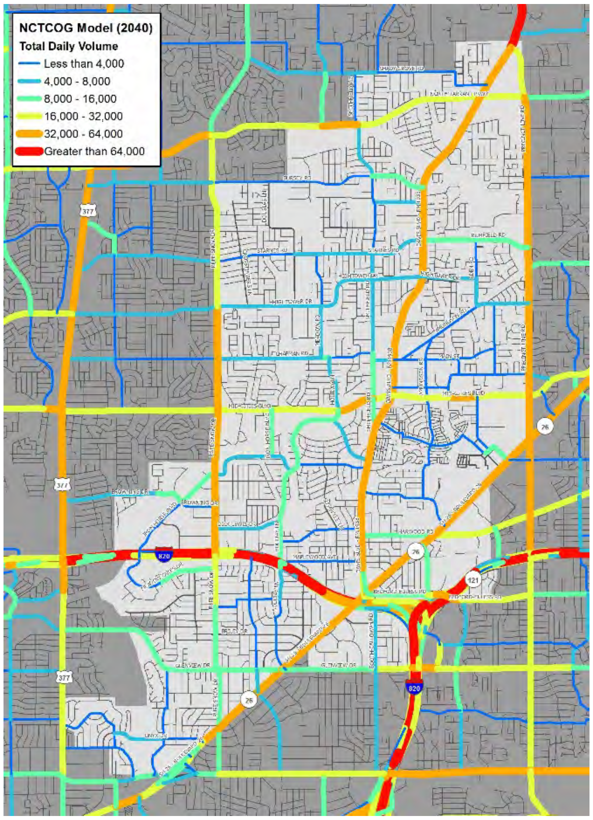
A statistically valid survey was conducted in 2017 for the North Texas region by NCTCOG capturing the general public's view on bicycling. This survey included an analysis of cyclist types in the region, defined as follows:

- Strong & Fearless: Will ride a bicycle regardless of the roadway conditions. Riding is a strong part of their identity.
- Enthused & Confident: Somewhat comfortable sharing the road with vehicle traffic. Prefers dedicated bike facilities.
- Interested but Concerned: Like riding a bicycle and would ride more if they felt safer on the roadways.
- No Way No How: Not comfortable, not interested, or not physically able to ride a bicycle.

NRH has implemented an extensive system of concrete trails for off-street travel by people walking, biking, and other non-motorized uses. These paths create a safe, comfortable experience for users of all ages and abilities.

The future context of transportation within NRH is defined by anticipated growth, travel patterns, and subsequent transportation infrastructure needs to accommodate this. This future vision is best viewed through multiple lenses to gain a comprehensive understanding of the implications of growth. One lens is the current context and characteristics of the community, as discussed previously. Next, a travel forecast model simulates increased mobility demands through demographic growth. A multimodal lens is needed to incorporate an understanding of active transportation integration, often lacking from modeling efforts. Finally, an acknowledgment to the undefined impact and influence of new mobility technologies, like connected automated vehicles (CAV) and rideshare, is needed to frame a system flexible for technological advancement.

*Modeled 2040 Daily Volumes*




## Network Operations Analysis

Looking to the future in a potential build-out condition of the City, a modeling analysis of the full thoroughfare network (alignments, lanes, etc.) with build-out demographics identified several travel characteristics. Key corridors draw concern for the poor level-of-service (LOS), including:

- Rufe Snow Drive
- Davis Boulevard
- Precinct Line Road
- North Tarrant Parkway
- Mid-Cities Boulevard.

Due to right-of-way limitations, there may not be feasible ways to significantly improve the LOS on these corridors. This LOS may rather be improved through signal synchronization, access management, and development of parallel routes. Boulevard 26 remains a significant traffic corridor that has not reached its ultimate lane configuration with TxDOT planning to widen to a 6-lane section, thereby increasing the long-term capacity. Additionally, **many corridors in NRH are experiencing low volumes and LOS providing the opportunity to rightsize the corridors and provide accommodations for multimodal elements**. These corridors include Bursey Road, Starnes Road, Hightower Drive, Chapman Road, Holiday Lane, Smithfield Road, and Amundson Drive.

| Key North-South Traffic Corridors | |
|---|---|
| Name | Forecasted Daily Volume |
| N. Rufe Snow Drive | 30,000-40,000 |
| S. Rufe Snow Drive | 15,000 |
| Davis Boulevard | 40,000-50,000 |
| Precinct Line Road | 40,000 |
| Boulevard 26 | 35,000 |
| Smithfield Road | 5,000-10,000 |
| Holiday Lane | 5,000-15,000 |

| Key East-West Traffic Corridors | |
|---|---|
| Name | Forecasted Daily Volume |
| N Tarrant Parkway | 30,000 |
| Mid-Cities Boulevard | 25,000-30,000 |
| Harwood Road | 25,000 |
| Glenview Drive | 10,000-15,000 |
| Bursey Road | 5,000 |
| Starnes Road | 5,000 |
| Rumfield Road | 10,000 |
| Hightower Drive | 5,000 |
| Chapman Road | 5,000-10,000 |

## Multimodal Basis

An efficient transportation system must serve diverse demands. It would be inadequate for parents to chauffeur kids to neighborhood destinations because of a lack of sidewalks where they would have walked or biked, or force commuters to drive cars when they would rather use public transit or ride share. Physically, socially, and economically disadvantaged people in particular need a way of getting around that does not depend on them owning and operating a vehicle. Multimodal options are important in that everyone can benefit and reach their destination.

### *Rightsizing*

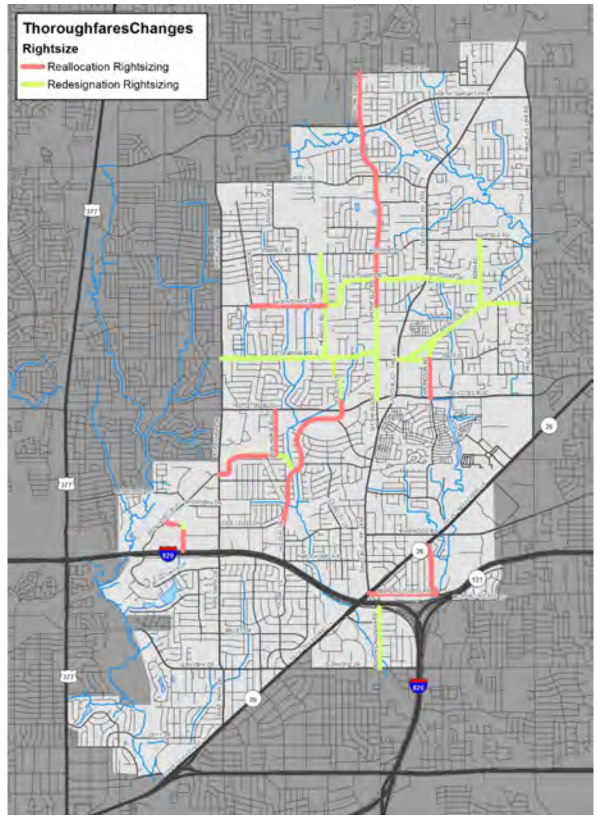
**Rightsizing is the process of reallocating pavement and right-of-way space to better serve the context of the roadway and goals of the community**. A road built many years ago in an undeveloped or developing area was sized for a predicted future condition, but now housing, shops, schools, and other destinations have matured in the community. Traffic conditions have stabilized and are more predictable and the needs of adjacent development is better known. These conditions allow the opportunity to rightsize roadways to optimize these assets for the community. Using data from the travel demand model, corridors were identified for rightsizing under two scenario types which both reduce the ultimate number of lanes on the facility.

**RIGHTSIZING**
is the process of reallocating pavement and right-of-way space to **better serve** the *context of the roadway* and *goals of the community*

1. Reallocation - Reducing the number of existing travel lanes
2. Redesignation - Preempting roadway widening by acknowledging a new ultimate sizing

It is important to note that vehicular capacity is made up of two parts: link-level segments and intersections. While roadway rightsizing reduces link segment lane configurations, **typical capacity bottlenecks are found at intersections so the reduced lane configuration between intersections does not affect true corridor capacity**.

*Roadway Thoroughfare Rightsizing*




### *Active Transportation and Transit*

Active transportation initiatives locally and regionally affect the future of the network. Locally, assistance from universities has helped the city develop **Safe Routes to Schools (SRTS)** plans and recommendations. The continuation and implementation of this program will help NRH to increase the student population walking and biking to schools within the City. Regionally, the **Regional Veloweb** of off-street shared-use paths (trails) designed for multi-use trip purposes by bicyclists, pedestrians, and other non-motorized forms of transportation serves as the regional expressway network for active transportation.

As transit continues to develop in NRH and Tarrant County, **it is important that NRH provide input and coordinate closely with Trinity Metro** on the location of transit routes and stops within the City. Accessibility to local transit should be considered by NRH to enhance service to the entire community and fully leverage the two TEX Rail stations within the City.

## New Mobility

A convergence of mobility technologies is developing in the marketplace, including:

- Data and connected technology
- Autonomous vehicles
- Shared-use mobility
- Electrification of vehicles

Advances in these key areas will change the way people travel through cities. Each trend or technology is developing at an independent rate, but the maturation of all will be transformative to the mobility environment in cities. With mobility being a pathway to opportunity, new mobility technologies emerging in the marketplace must be shaped to serve the needs of the City by providing access, safety, and affordability to all users.

Transportation Plan

North Richland Hills' (NRH) roadway system is largely built-out with most right-of-way acquired and facilities in place. Versatility is important in the future of this system as this policy document gives decisionmakers flexibility to address unforeseen issues that may arise during continued implementation phase.

## Design Decision Process

A context-sensitive approach was developed to provide flexibility in the thoroughfare network with defined movement-based functional classifications and place-based land use contexts. This duality in characterizing a roadway type allows evolution of the roadway sections and geometry with the continued maturation of the community. This is a change from the previous thoroughfare plan, which recommended specific right-of-way designations for each functional classification.

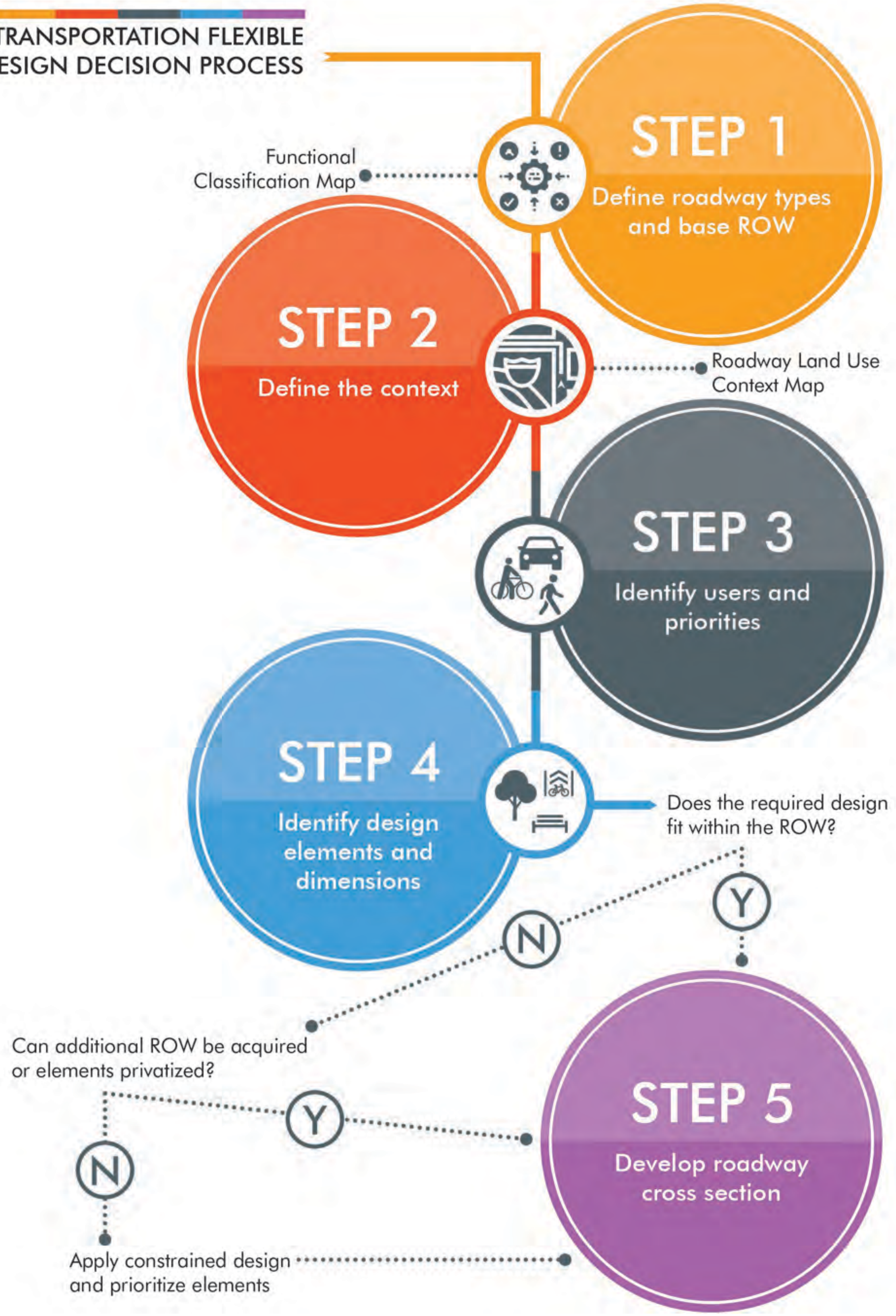
The Transportation Plan consists of foundational mapping elements, including:

- Functional Classification Map
- Land Use Context Map

Modal components, such as plans for bicycling, walking, and transit, then integrate into the design decision process for the complete multimodal implementation of transportation facilities. This plan only addresses the bicycle mode with the other modes to be evaluated in a future study.

Understanding transportation facility design as a process, the development of a street design and cross section entails the multiple elements of this Plan, including the functional classification mapping, with associated right-of-way envelope, land use context mapping, modal plans, and any additional specific design considerations. This process includes flexibility in the process, understanding that there are many demands within the right-of-way but limited space, so multiple elements must be considered and, if necessary, prioritized.

## TRANSPORTATION FLEXIBLE DESIGN DECISION PROCESS



## STEP 1

Define Roadway Types and Base ROW

### Functional Classifications

Seven thoroughfare types are proposed for the Transportation Plan. The functional classification defines the right-of-way (ROW) envelope required for the roadway. It also defines the mobility characteristics and function associated with the specific corridor in the context of the greater transportation network. This includes design speeds as well as parking permissions.

The functional classification map depicts both the functional classification as well as the link-level lane configuration. Labeled throughout the map, lane configurations, such as P6D, M4U, and C2U, identify the number of travel lanes and median type expected for the roadway.

## STEP 2

Define the Context

### Land Use Context

Transportation investments are not constrained to impacts or influence within the right-of-way. While it primarily affects mobility, connectivity, and accessibility, roadways also impact the community character and design. Pairing with the functional classifications of roadways, land use contexts are assigned to each major facility. These contexts help define the local environment surrounding a corridor so street design can be sensitive to these community characteristics, known as context sensitive design.

Contexts were divided into four (4) categories that outline characteristics of the roadway related to land use, travelway, flex zone, pedestrian realm, and the modal user hierarchy. Land use contexts are depicted in the Land Use Context map but are meant to be revised and updated as development continues. As development intensifies in key areas, land use contexts should be re-evaluated in the implementation of corridors to ensure a context sensitivity.

| FOUR CONTEXT ZONES |
|---|
| **Suburban Commercial** |
| A mix of commercial, retail, and office land uses with larger suburban building setbacks. |
| **Suburban Residential** |
| Primarily residential development with occasional neighborhood commercial or retail uses. On low volume facilities, homes may front the roadway. |
| **Transit-Oriented Development (TOD)** |
| Higher density mixed use environment with minimal building setbacks. These areas are defined by the Transit-Oriented Development Regulating Plan. |
| **Urban Village** |
| Similar to TOD areas, this context includes a mixed use of residential, commercial, retail, and office with minimal building setbacks. This includes defined areas like HomeTown as well as emerging urban centers. |

## STEP 3

Identify Users and Priorities

### User Hierarchy

Within each combination of functional classification and land use context, there must be a balance between users. As the roadway function transitions from high-speed mobility to local access and from suburban to urban, travel mode considerations shift from vehicular travel to walking and biking. For each combination of functional classification and land use context, a modal hierarchy is defined.

The prioritization of multiple travel modes and users is also dependent upon the City's modal plans. The Bicycle Facilities Plan is a key component in this Plan for multimodal design decisions. Future planning in pedestrian or transit master plans should also serve as an input into the design process. These modal plans inform the design decisions needed to balance the range of demands on the limited ROW for each corridor.

## STEP 4

Identify Design Elements and Dimensions

### ROW Zone Design Elements

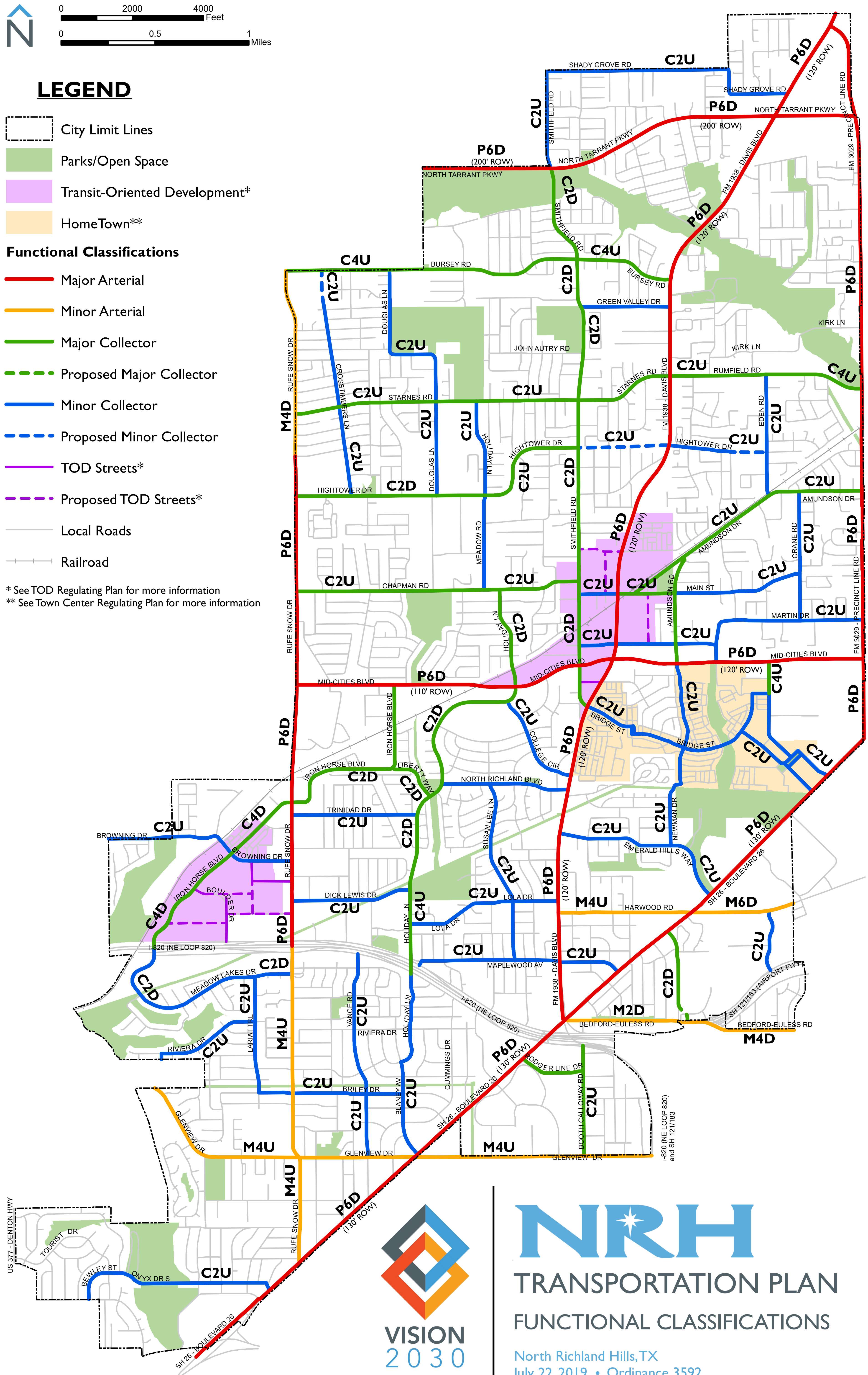
Specific design elements in the right-of-way zones impact the design of the roadway. With multimodal corridors, each mode requires special consideration of facility type and dimensions, typically defined in the modal plan. For example, bike facilities have a range of options for separation type, lane width, and even on-street versus off-street location within the right-of-way. Other design elements like intersection treatments, street lighting and furniture, driveways, and medians all also impact the design process.

## STEP 5

Develop Roadway Cross Section

### Cross Section Development

The development of cross sections follows the design decision process which precludes standard typical sections by functional classification. Rather, the development of cross sections and associated dimensions builds from a matrix of functional classification and land use context. Organized by land use context, design tables provide information to build cross sections flexible to the community context. Associated functional classifications provide the designer with a list of dimensions for key roadway features. These dimensions are split into two categories, required dimension or constrained dimensions, depending on ROW availability and multimodal demands. Design decisions are made solely by the City (staff and City leadership).



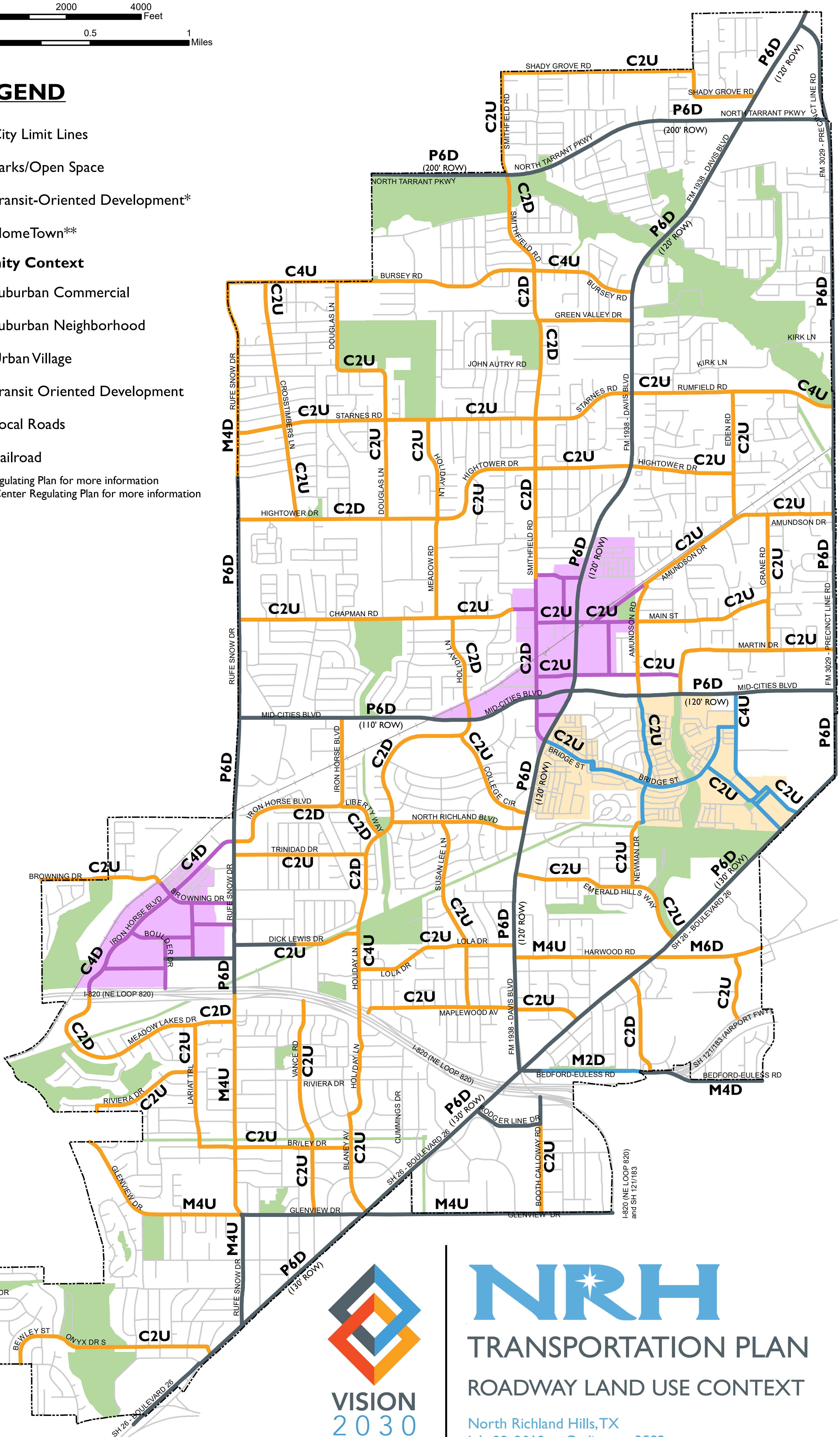

VISION 2030

# NRH TRANSPORTATION PLAN

## FUNCTIONAL CLASSIFICATIONS

North Richland Hills, TX
July 22, 2019 • Ordinance 3592

7/25/2019; Vision 2030_Transportation Plan_Functional Classification_20190722




0 2000 4000 Feet
0 0.5 1 Miles

## LEGEND

- City Limit Lines
- Parks/Open Space
- Transit-Oriented Development*
- HomeTown**

**Community Context**

- Suburban Commercial
- Suburban Neighborhood
- Urban Village
- Transit Oriented Development
- Local Roads
- Railroad

* See TOD Regulating Plan for more information
** See Town Center Regulating Plan for more information

VISION 2030

# NRH TRANSPORTATION PLAN

## ROADWAY LAND USE CONTEXT

North Richland Hills, TX
July 22, 2019 • Ordinance 3592

7/25/2019; Vision 2030_Transportation Plan_Roadway Contexts_20190722

## Bicycle Facilities Plan

The Bicycle Facilities Plan is built on the previous work by the City in the 2016 Trail and Route System Plan, which created a framework for investments in bicycle infrastructure. These routes and facilities were then evaluated for the roadway volumes and speeds as well as land use contexts to determine suitable facility recommendations. **The Bicycle Facilities Plans are broken up into two different maps – a 2030 Plan and a Vision Plan**. The key difference in the two plans is that:

- **2030 Plan** addressed recommendations that can be accomplished by the year 2030.
- **Vision Plan** provides a network of facilities that is still achievable and provides the most comfortable facility network possible with the current and predicted constraints.

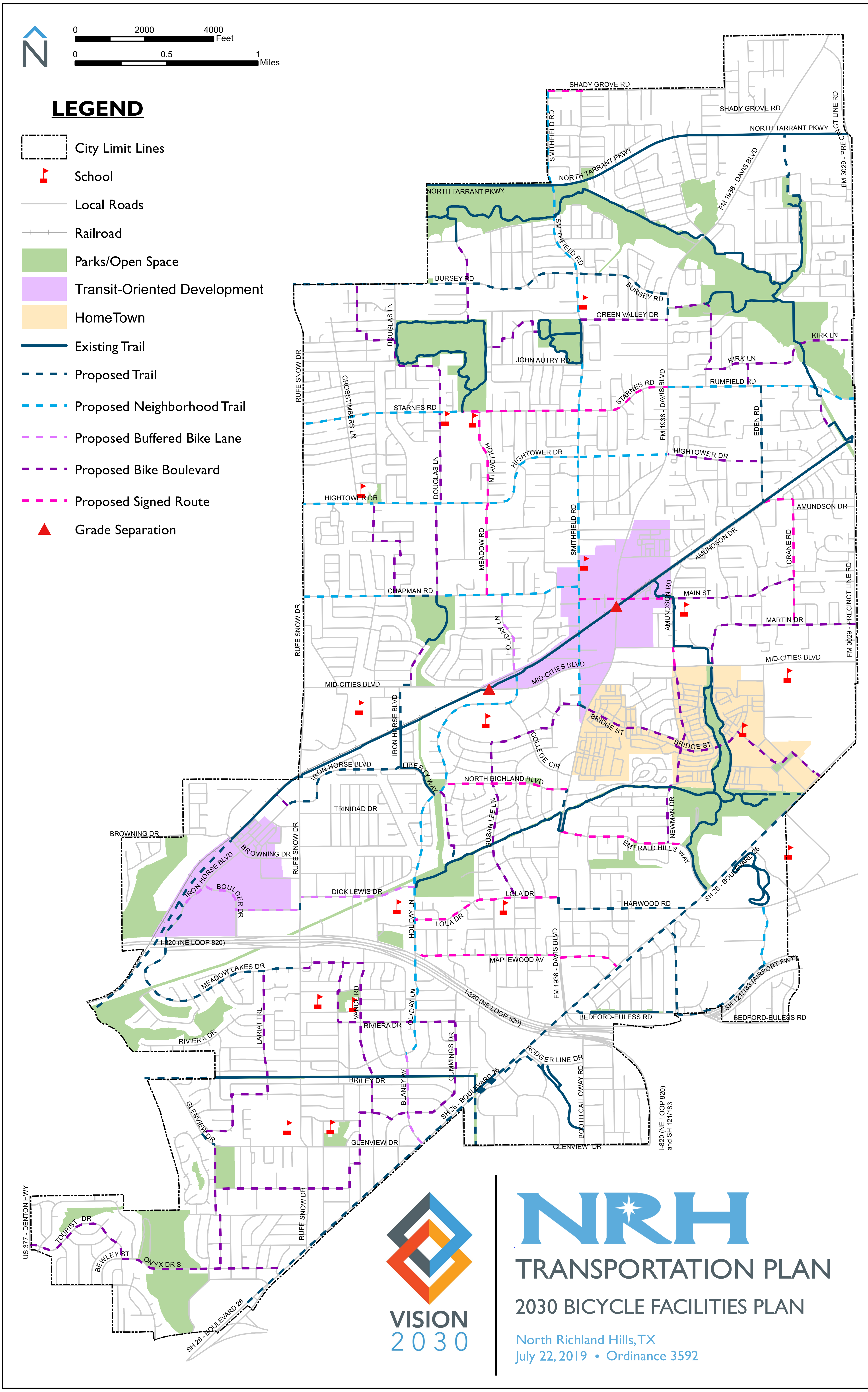
The 2030 Plan will help the City prioritize projects and see the bigger picture. It also provides the roadmap of facilities that can implement a network that can be improved over time through the identification of corridors and destinations that create a complete north-south and east-west network. The Vision Plan takes the 2030 network and raises the bar on the facility type to develop a network of trail types to separate users from vehicular traffic, increase user comfort, and increase ridership.

The Active Transportation Pattern Book, located in the appendices, provides a visual glossary of the essential building blocks of an active transportation network. It assists the city in implementing these elements to achieve safe and comfortable facilities for walking and biking.



*Proposed Bicycle Facilities Summary*

| | 2030 Plan (miles) | Vision Plan (miles) |
|---|---|---|
| Signed Route | 7.2 | 4.9 |
| Bicycle Boulevard | 20.7 | 17.0 |
| Buffered Bike Lane | 2.4 | 0 |
| Neighborhood Trail | 11.3 | 19.7 |
| Trail | 15.2 | 18.3 |



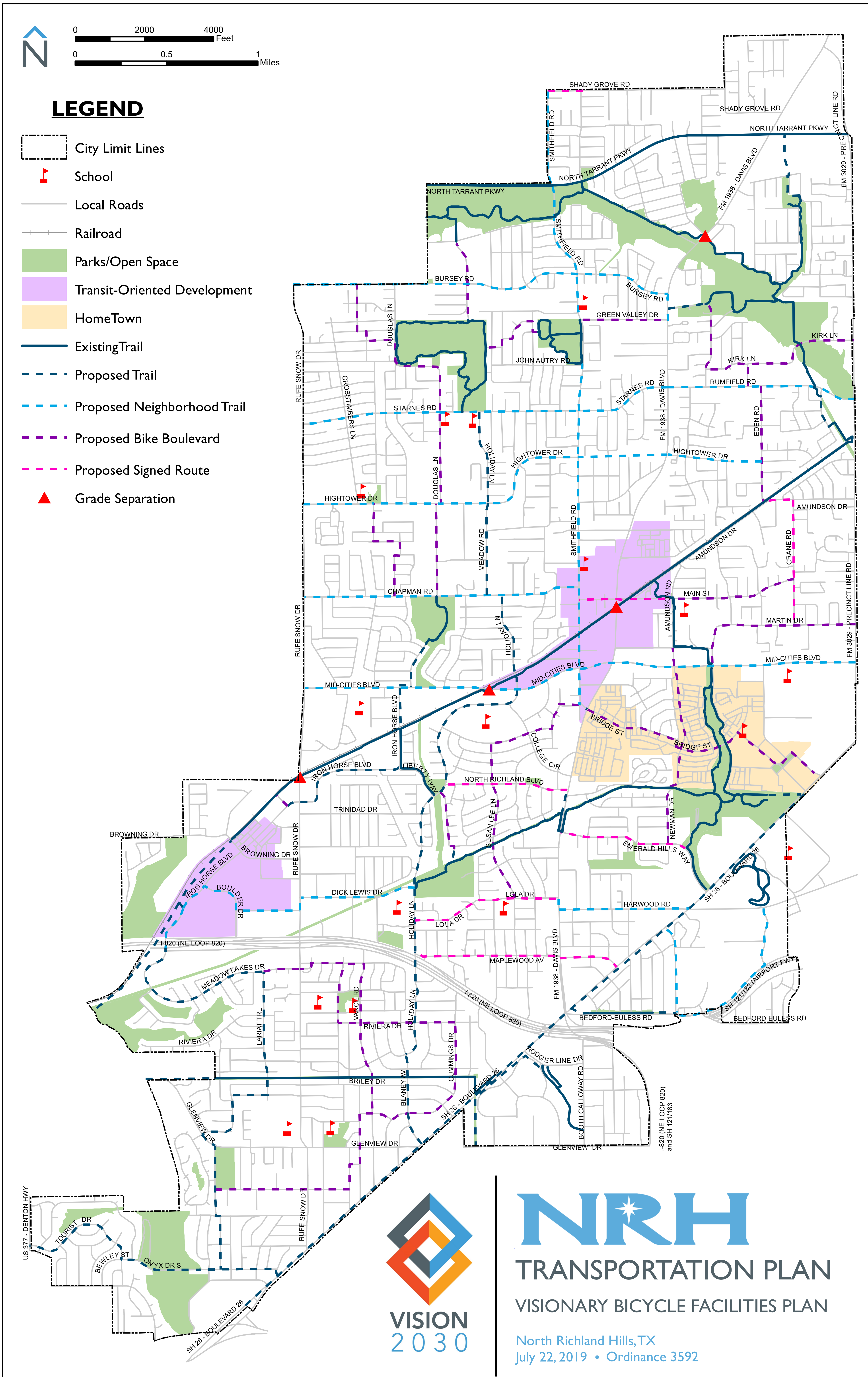

VISION 2030

NRH

# TRANSPORTATION PLAN

## 2030 BICYCLE FACILITIES PLAN

North Richland Hills, TX
July 22, 2019 • Ordinance 3592



0 2000 4000 Feet
0 0.5 1 Miles
LEGEND
City Limit Lines
School
Local Roads
Railroad
Parks/Open Space
Transit-Oriented Development
HomeTown
Existing Trail
Proposed Trail
Proposed Neighborhood Trail
Proposed Bike Boulevard
Proposed Signed Route
Grade Separation
NORTH TARRANT PKWY
SHADY GROVE RD
SMITHFIELD RD
BURSEY RD
GREEN VALLEY DR
KIRK LN
RUMFIELD RD
STARNES RD
HIGHTOWER DR
AMUNDSON DR
CHAPMAN RD
MAIN ST
MARTIN DR
MID-CITIES BLVD
BRIDGE ST
IRON HORSE BLVD
NORTH RICHLAND BLVD
BROWNING DR
DICK LEWIS DR
LOLA DR
HARWOOD RD
MAPLEWOOD AV
I-820 (NE LOOP 820)
BEDFORD-EULESS RD
RODGER LINE DR
BRILEY DR
GLENVIEW DR
SH 26 - BOULEVARD 26
RUFE SNOW DR
HOLIDAY LN
DOUGLAS LN
FM 1938 - DAVIS BLVD
FM 3029 - PRECINCT LINE RD
US 377 - DENTON HWY
SH 121/183 (AIRPORT FWY)
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TRANSPORTATION PLAN
VISIONARY BICYCLE FACILITIES PLAN
North Richland Hills, TX
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# Action Plan

The Action Plan describes ways in which NRH can take the recommendations of the Transportation Plan from vision to reality. The importance of planning cannot be overstated — **planning minimizes impacts to private property and ensures mobility continues in a coordinated and organized fashion**. The future of the City will be shaped using the strategies and recommendations developed in this Plan.

## Implementation Matrix

The implementation matrix is a tool to identify, track and monitor the progress of the recommended strategies and actions. These strategies can only be achieved through a collection of stakeholders and partnerships, working together to promote the transportation goals of the community. For each action listed, the associated transportation goal and projected timeframe for the strategy to be implemented is shown.

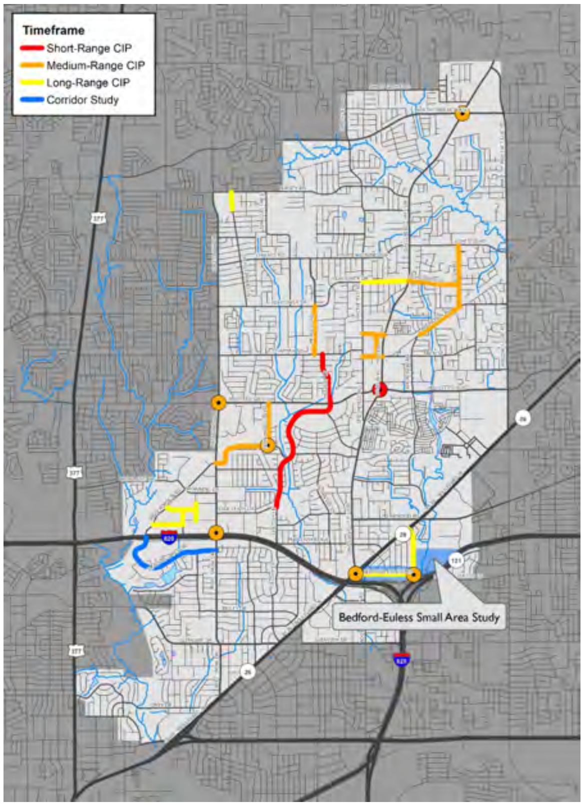
Within five (5) focus areas a set of short-, mid-, and long-range projects or specific action items are proposed.

- Operations & Maintenance
- Transportation & Land Use Interface
- Encouraging Multimodal Transportation
- Technology & Innovation
- Funding & Prioritization

The approximate established timeframes are as follows:

- On-going or Annual
- Short-Range (2019-2020)
- Medium-Range (2020-2025)
- Long-Range (2025-2030)

*Roadway CIP*



*Planning & Policy Action Plan*

| | Action Items | Timeframe | Goals: Mobility & Access | Goals: Implementation | Goals: Economic Vitality | Goals: Quality of Life | Regional Initiative |
|---|---|---|---|---|---|---|---|
| **A. Operations & Maintenance** | | | | | | | |
| A1 | Monitor Roadway and Bridge Conditions | On-going | | • | | | |
| A2 | Monitor Sidewalk and Trail Conditions | On-going | | • | | | |
| A3 | Maintain Preventative Street Maintenance Program and Evaluate Program Effectiveness | On-going | | • | • | • | |
| A4 | Assess Annually the Traffic Congestion on Major Roads and Intersections | On-going | • | • | | | |
| A5 | Assess Annually the Safety of Transportation | On-going | • | • | | | |
| A6 | Assess Annually Active Transportation (Walking and Bicycling) Conditions | On-going | • | • | | | |
| A7 | Monitor Walking and Bicycling Utilization Barriers and Develop Mitigation Measures | On-going | • | • | • | • | |
| A8 | Monitor Intersection Traffic Operations and Develop Mitigation Measures | On-going | • | • | • | • | |
| A9 | Monitor Transit Usage Barriers and Develop Mitigation Measures | On-going | • | • | • | • | |
| A10 | Traffic Signal Coordination and Corridor Optimization | On-going | • | • | • | • | |
| A11 | Manage High-Demand Parking | On-going | | • | • | • | • |
| A12 | Develop Sidewalk and Trail Maintenance Program | Short | • | • | | | |
| A13 | Create Parking Management Districts for TODs and Urban Villages | Medium | | • | • | • | |
| A14 | Promote Public-Private Partnerships (PPP) for the Upkeep and Embellishment of Non-Roadway Elements within ROW | Medium | | • | • | | |
| **B. Transportation & Land Use Interface** | | | | | | | |
| B1 | Educate Residents on Complete Streets, Rightsizing, and Their Benefits to the Community | On-going | • | • | • | • | |
| B2 | Monitor Neighborhood Traffic Calming Program | On-going | • | | • | | |
| B3 | Develop and Adopt a Complete Streets Policy, Program, and Guidelines | Short | • | • | • | • | • |
| B4 | Update Engineering Design Standards for 2030 Transportation Plan Design Decision Process | Short | • | • | | | |
| B5 | Incorporate Neighborhood Placemaking in Transportation Corridor Urban Design Program | Medium | | • | • | • | |

*Planning & Policy Action Plan (continued)*

| | Action Items | Timeframe | Goals: Mobility & Access | Goals: Implementation | Goals: Economic Vitality | Goals: Quality of Life | Regional Initiative |
|---|---|---|---|---|---|---|---|
| **C. Encouraging Multimodal Transportation** | | | | | | | |
| C1 | Accommodate Pedestrian and Bicycle Access during Construction in the Public ROW when Feasible | On-going | • | • | | | |
| C2 | Actively Engage in Planning of Regional Transit by Trinity Metro | On-going | • | | • | | • |
| C4 | Complete Missing Sidewalks and ADA-Compliant Ramps | On-going | • | • | • | | |
| C3 | Develop Parking Standards for Bicycles and Update Ordinance | Short | • | • | • | | • |
| C5 | Develop a Pedestrian Master Plan | Short | • | | • | • | |
| C6 | Establish a Local Bicycle and Pedestrian Advisory Committee (BPAC) | Short | • | • | | • | |
| C7 | Develop Bicycle Facility Implementation Process, Including Community Outreach | Short | • | • | | • | |
| C8 | Develop and Implement a Comprehensive Multimodal Wayfinding Program | Medium | • | | • | | |
| C9 | Develop a Local Transit Plan | Medium | • | | • | | |
| C10 | Continue Pedestrian and Bicycle Count Program | Medium | • | | | | • |
| C11 | Develop Funding and Implementation Strategy to Increase Sidewalk and Trail Lighting | Medium | • | • | | • | |
| C12 | Evaluate Establishing a Multimodal Mobility Hub at the Transit Stations | Medium | • | | • | • | |
| **D. Technology & Innovation** | | | | | | | |
| D1 | Develop an Open Data Platform to Increase Transparency and Encourage Civic Engagement | Short | | | • | | • |
| D2 | Develop a New Mobility and Technology Plan | Short | • | | • | • | • |
| D3 | Develop Travel Demand Management (TDM) Program | Medium | • | | • | • | • |
| D4 | Pursue PPPs with Data Analytics, Data Sharing, Ridehailing, and Other Related Companies | Medium | • | | • | | • |
| **E. Funding & Prioritization** | | | | | | | |
| E1 | Conduct Regular Surveys of Citizen Opinions on Transportation (NRH Resident Satisfaction Survey) | On-going | | • | • | • | |
| E2 | Allocate a Portion of the Available Local Funds to All Modes | On-going | • | • | | • | |
| E3 | Collaborate with TxDOT to Advance Locally Preferred Projects and Enhancements on State ROW | On-going | • | • | • | • | |
| E4 | Collaborate with Neighboring Communities to Minimize Regional Obstacles to Travel | On-going | • | • | • | | • |
| E5 | Seek NCTCOG Funding for Regional Initiatives | On-going | | • | • | | • |
| E6 | Submit NRH Transportation Plan to NCTCOG for Inclusion of Plan in Regional Travel Demand Model and TIP | Short | | • | | | • |
| E7 | Leverage Local Funds to Secure Bonds for Needed Transportation Infrastructure Improvements | Short | | • | • | | |
| E8 | Implement Project Prioritization Criteria and Methodology for Transportation Projects in Future Bonds | Short | • | • | | • | |
| E9 | Institute a Program of PPPs for the Development and Management of Non-Roadway Elements within ROW | Medium | • | • | | | |

# A. INTRODUCTION

# Overview

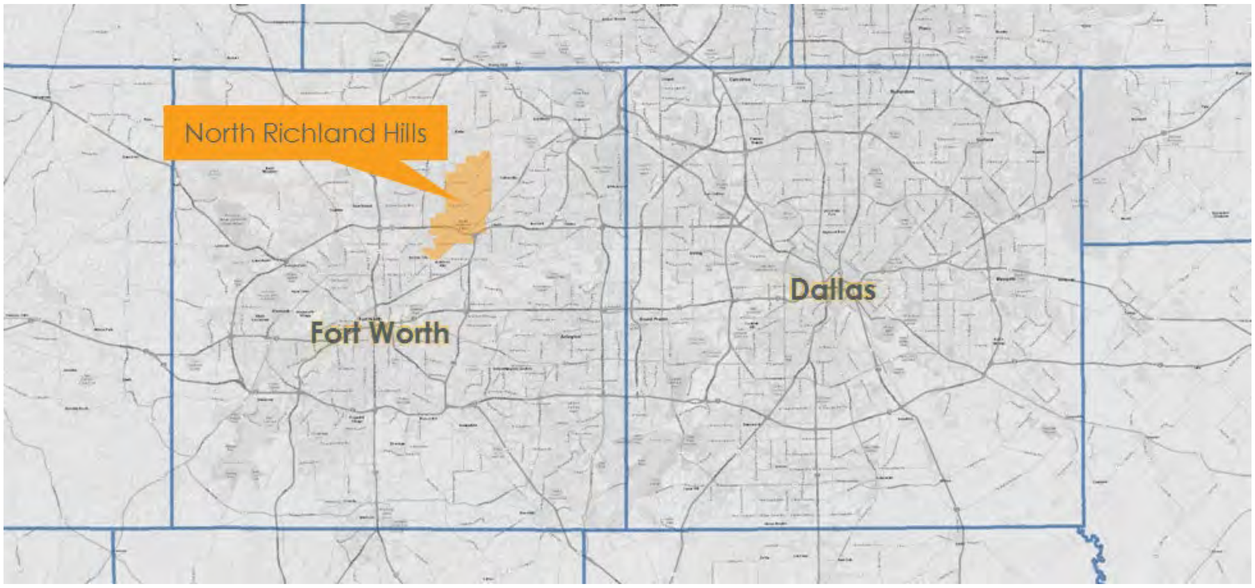
North Richland Hills, incorporated in 1953, benefits in its central location in the Dallas-Fort Worth Metroplex. The third largest city in Tarrant County, North Richland Hills (NRH) is only 10 minutes from Dallas-Fort Worth International Airport and 15 minutes from Alliance Airport as well as less than 30 minutes to either downtown Dallas or Fort Worth. For the 70,000 people who have made it their home, they have given this city its identity as a family-friendly community with a high quality of life. Traversing the city, Interstate Highway (IH) Loop 820 and Texas State Highway (SH) 121/183 (Airport Freeway) provide convenient freeway access to the surrounding region. Local amenities, including NRH2O Family Water Park and a robust trail and park system, as well as education institutions, from the public-school system to Tarrant County College's Northeast Campus, support opportunities for a high quality of life for both today and tomorrow's residents. Centrality in the region, easy access to employment centers, and numerous recreation and education resources all contribute to making NRH a great place to live and requires the continued planning and evolution of the transportation system to offer access to these opportunities.

## Purpose

The Transportation Plan (Plan), incorporated as part of the larger Vision 2030 Strategic Plan, provides a roadmap for moving NRH's transportation system into the next generation as the community continues to grow and mature. As an update to the City's 2007 Thoroughfare Plan, the Plan takes the step forward to incorporate all road users – people driving, walking, bicycling, and riding transit – to balance the various needs.

The City's transportation system will continue to evolve as the context and users diversify. The arrival of TEXRail, the commuter rail connecting downtown Fort Worth to Dallas-Fort Worth Airport, brings change to NRH through the

*Figure A-1. North Richland Hills Location Map*



development of two stations within the city – Smithfield Station and Iron Horse Station. Additionally, the rise of technology in mobility has the potential to transform the landscape of cities in the Metroplex. From transportation network companies (TNCs) – e.g. Uber, Lyft – to automation in vehicle driving and delivery, as well as shared mobility options including bikeshare, rideshare, carshare, and other means for sharing transportation, the users and technology interacting within the public right-of-way is becoming more complex.

**The purpose of the Plan is to serve as a guiding tool for making balanced multimodal transportation decisions for both access and mobility.** The Plan provides policy and tools to help designers, engineers, community advocates, and developers utilize and/or reshape the right-of-way to meet the needs for North Richland Hills' citizens today and tomorrow.

## Plan Organization

The Plan is organized into five chapters. Building from the context of the past, to the present state of the system, then toward the framework of the future and implementation, each chapter advances the timeline of transportation planning and context within North Richland Hills. Further organization and topics of each chapter is described below.

**A. Introduction** describes the need for updating the transportation plan, highlights the Plan's organizational format, key partners in transportation implementation, and relevant plans, both past and present, impacting NRH transportation planning and infrastructure. The chapter also outlines the Plan's four goals.

**B. Current Context** profiles the existing issues and needs within the transportation system, including safety, congestion, and infrastructure gaps.

**C. Future Context** focuses on the anticipated future of NRH related to accessibility, mobility, operations, and the interface with land uses.

**D. Transportation Plan** describes the multimodal network (vehicular, walking, bicycling, transit, goods movement) needed to address the future needs of the City.

**E. Action Plan** outlines prioritization methodology for project implementation. This chapter also contains the policies, programs, and projects for short-, medium-, and long-range implementation.

**Appendix A:** Roadway Design Decision Process

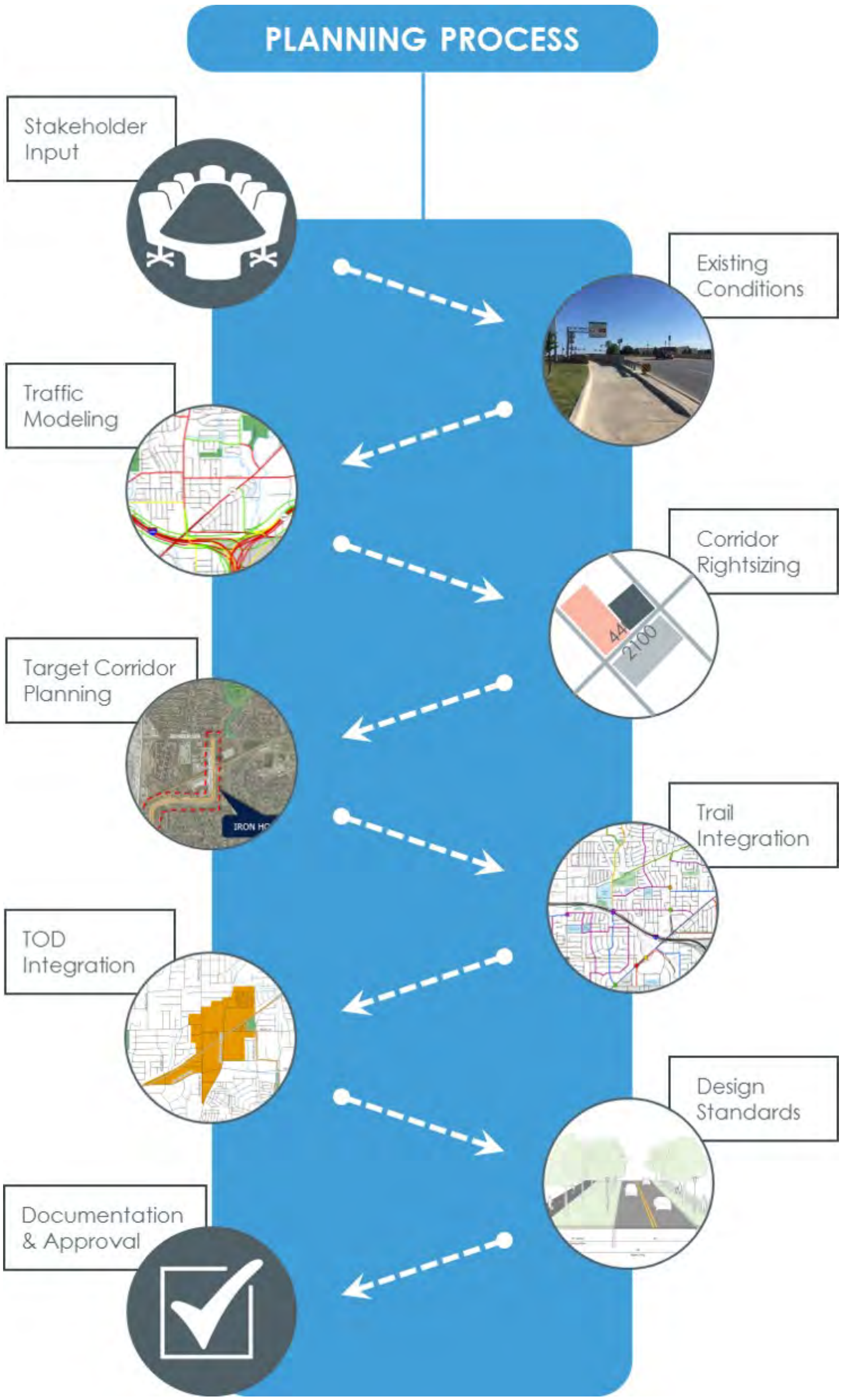
**Appendix B:** Target Corridors

**Appendix C:** Roadway Rightsizing Guidance

**Appendix D:** Active Transportation Pattern Book

**Appendix E:** Public/Stakeholder Input

**Appendix F:** Action Plan Details


PLANNING PROCESS
Stakeholder Input
Existing Conditions
Traffic Modeling
Corridor Rightsizing
Target Corridor Planning
Trail Integration
TOD Integration
Design Standards
Documentation & Approval

# Partners

Planning, funding, construction, and operations have various stakeholders throughout the transportation system in North Richland Hills requiring coordination throughout the project lifecycle, including state, regional, county, and local jurisdictions, agencies, and departments. The primary stakeholders impacted by the Plan and who will be active partners in implementing the Plan are described below.

## Texas Department of Transportation (TxDOT)

TxDOT is responsible for the planning design, construction, maintenance, and operation of the state highway system. Located within TxDOT's Tarrant District, TxDOT roadways in NRH include IH Loop 820, SH 121/183, SH 26 (Boulevard 26), Davis Boulevard (FM 1938), and Precinct Line Road (FM 3029). TxDOT prepares the Statewide Transportation Improvement Program (STIP) and the Long-Range Statewide Transportation Plan (LRSTP) which incorporate regional transportation project needs for statewide consideration and funding.

## North Central Texas Council of Governments (NCTCOG)

NCTCOG serves as the Dallas-Fort Worth region's Metropolitan Planning Organization (MPO) to assist local governments in planning for common needs and coordinating for sound regional development. NCTCOG develops the regional Transportation Improvement Program (TIP) which outlines regional transportation needs which are eligible for federal funds.

## Tarrant County

Tarrant County is responsible for the design, construction and maintenance of roadways in the unincorporated areas of the county. The County serves to connect the area regionally between cities. County bond programs, like the 2006 Bond Program, help the City expand regional roadway facilities.

*Table A-1. Key Transportation Documents and Responsible Agencies*

| | Who Develops? | Who Approves? | Time/ Horizon | Contents | Update Requirements |
|---|---|---|---|---|---|
| **CIP** | City | City Council | 1 to 5 years | Transportation investments | Every year |
| **UPWP** | FHWA/FTA/MPO | MPO | 1 or 2 years | Planning studies and tasks | At least once every 2 years |
| **MTP** | MPO | MPO | 20 years | Future goals, strategies and projects | Every 5 years (4 years for non-attainment and maintenance areas) |
| **TIP** | MPO | MPO/Governor | 4 years | Transportation investments | Every 4 years |
| **LRSTP** | State DOT | State DOT | 20 years | Future goals, strategies and projects | Not specified |
| **STIP** | State DOT | FHWA/FTA | 4 years | Transportation investments | Every 4 years |

Tarrant County and NRH have an on-going relationship working together on construction and maintenance of major facilities.

### Trinity Metro

Trinity Metro, formerly the Fort Worth Transportation Authority (FWTA), serves as the transit provider for NRH, including TEXRail and bus transit around the Tarrant County region. Trinity Metro is responsible for the planning, design, implement-ation, and operation of transit within NRH.

### Neighboring Communities

Transportation facilities extend beyond NRH into the adjacent communities. Coordination on project planning and implementation between NRH and these neighboring communities is important for maintaining a cohesive and effective transportation network.

### NRH Planning & Zoning Department

The Planning & Zoning Department is responsible for preparing, maintaining, and implementing planning documents that guides development in the City of North Richland Hills. The department sets citywide and corridor- or area-specific goals and policies to guide future growth to benefit the citizens of NRH.

### NRH Public Works Department

The Public Works Department is responsible for the City's network of infrastructure within the public right-of-way, including the design, construction, operations, and maintenance of roadways, storm drain systems, and water and sanitary sewer systems. The department also manages and implements the City's capital improvements program (CIP) which is funded through federal, state, and local sources and requires coordination with other agencies.

### NRH Parks & Recreation Department

The Parks & Recreation Department is responsible for the City's more than 800 acres of park land, 34 parks, facilities and trails and 30 miles of hike and bike trails.

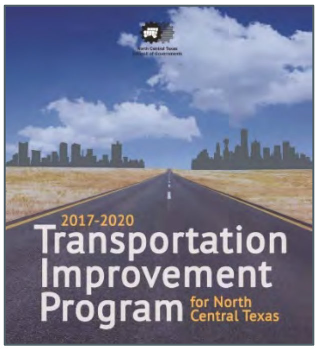
## Related Plans

Coordination with transportation planning and initiatives by Partners at the State, Regional, and local level is important to developing a comprehensive transportation plan. Programmed transportation improvements and corridor and small area visions as described below informed the planning process to retain funded projects, leverage previous planning efforts, and maintain consistency.

### 2017-2020 Statewide Transportation Improvement Program (STIP)


TxDOT's STIP incorporates metropolitan and rural area Transportation Improvements Programs (TIPs) as required under Title 23, US Code, Section 135 – Statewide Transportation Planning. The plan contains MPO and rural TIPs, for a four-year period, that list the projects and their programmed costs in a fiscally constrained model. Federal dollars cannot be expended on a project unless that project is listed in the STIP. Projects within North Richland Hills found in the STIP are described in **Chapter C**.

## 2017-2020 Transportation Improvement Program (TIP)



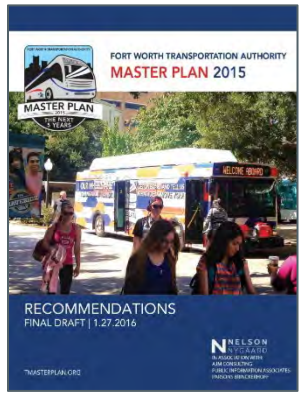

NCTCOG, Dallas-Fort Worth's MPO, develops a new TIP every two years in cooperation with TxDOT, local governments, and transportation agencies. Regional transportation projects are tracked through the TIP which stages projects with committed funds through the four-year period. Approved funding from federal, state, and local sources is listed for each project in NRH with expected timing of projects. These projects are further described in **Chapter C**.

## Mobility 2045

Mobility 2045, NCTCOG's Metropolitan Transportation Plan (MTP), is the defining vision for the multimodal transportation system in the Dallas-Fort Worth region. Adopted in June 2018, the plan identifies transportation solutions that offer the region's residents with travel choices. The plan coordinates cities, counties and other transportation partners to plan road, transit, bicycle, and pedestrian transportation improvements for the 20-year horizon of the region.

The regional projects considered in **the MTP informed priorities for NRH's Transportation Plan to integrate with regional mobility needs**. The travel demand model developed as part of Mobility 2040 served as a key tool for forecasting travel network needs in NRH. No major model changes were made within NRH in the Mobility 2045 update.

## Transit Master Plan




The 2015 Transit Master Plan is the culmination of extensive engagement by Trinity Metro to assess the market of Tarrant County for transit needs and evaluating existing service and potential improvements.

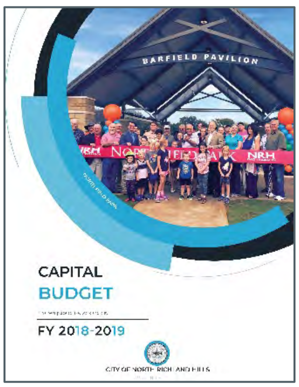
The Transit Master Plan is framed by four goals to support transit:

1. Enhance – Make transit an attractive choice.
2. Connect – Connect people and places.
3. Simplify – Make transit easier to use and more convenient.
4. Sustain – Create a system that will be successful over the long term.

The plan outlines the implementation of future transit service, including the TEXRail commuter rail, premium bus service, and new non-downtown transit centers to enhance regional connections. TEXRail offers services NRH with two stations, Smithfield and Iron Horse. Regional connections from TEXRail as well as local premium bus service increase NRH's access to employment centers.

These transit enhancements were considered in the development of NRH's Transportation Plan to consider first-mile/last-mile connections to stations, right-of-way space allocation for on-street routes, and circulation and access near transit centers.

## Capital Improvement Program (CIP)




The City's CIP outlines the local capital projects and maintenance programs. Financially constrained, the CIP is detailed in the yearly Capital Budget led by the Public Works Department. Individual projects are listed for scope of work, funding sources, and estimated schedule for completion. These projects include both major facilities, such as those included in a Transportation Plan, as well as local residential and commercial streets.

## Boulevard 26 Corridor Strategy


The Boulevard 26 Corridor Strategy was adopted in 2004 and encompasses Boulevard 26 south of Loop 820, including parts of Rufe Snow and Glenview Drives. Once a regional draw for all Northeast Tarrant County, the Boulevard 26 Corridor's market potential and vision for investment was developed in this strategy plan.

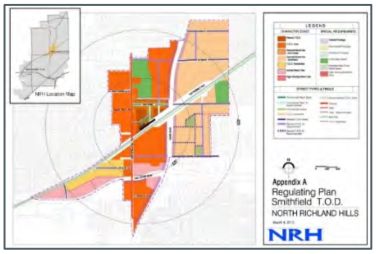
Urban village centers along the Boulevard 26 Corridor are reimagined for adjacent land uses, urban design elements, and development types. These visionary elements were incorporated in NRH's Transportation Plan through the consideration of context-sensitive flexibility in design sections for specialty areas like Boulevard 26.

## HomeTown NRH


HomeTown, the city's town center district, is a specialty area with unique zoning and development standards to the district that promote a sustainable, high quality, mixed use development scenario in an integrated manner. Thoroughfare types for the district are outlined in the adopted plan with designations distinct from the City's Thoroughfare Plan functional classific-ations. After an extensive public input process, the updated HomeTown plan was approved by the City Council in 2011.

Including avenues, commercial streets, residential streets, and roads, HomeTown's thoroughfare types were considered and incorporated into the overall NRH Transportation Plan as the city advances connectivity and integration of the roadway network between neighborhoods, including HomeTown.

## Transit Oriented Development (TOD) Code




The City of NRH developed a Transit Oriented Mixed Use Development Code, adopted by City Council in 2009 with revisions approved in 2013, to govern future development around the proposed TEXRail Smithfield and Iron Horse rail station sites. Engagement with surrounding property owners and stakeholders was vital in the development of this code as a supporting area roadway network was developed for future accessibility. Key aspects of the code include unique character districts, building and streetscape guidelines, civic and open spaces, and parking.

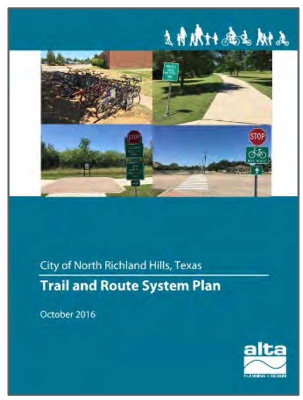
Unique street types within an area roadway network are also identified in the development code, including commercial streets, TOD boulevard, general TOD streets, and avenues. This network and thoroughfare typology was considered and incorporated into the City's Transportation Plan to better integrate the roadway network between neighborhoods surrounding the TOD districts.

## Loop 820 Corridor Plan


In anticipation of the North Tarrant Express project, which widened NE Loop 820, the City prepared a corridor plan along Loop 820 considering adjacent properties and associated land uses as well as likely changes in traffic patterns due to new ramp locations. Adopted by City Council in 2005, the plan serves as a guide for future development surrounding Loop 820 to maintain business, entertainment, and civic area vitality.

The land use, urban design, and transportation considerations for the various districts outlined in the corridor plan were considered as part of the overall NRH Transportation Plan to maintain the vision of this document developed through public input.

## Trail and Route System Plan




In 2016, the NRH Parks and Recreation Department developed the Trail and Route System Plan which builds on the extensive trail system NRH has in place and provides a framework for future investments in bicycle infrastructure. The plan focuses on improving connectivity to local destinations, tying into the regional trail network, improving safety and accessibility for all bicyclists, and improving active transportation for NRH residents. The plan outlines a vision and goals for active transportation in NRH with recommended bicycle facility routes by type.

This plan forms the basis of active transportation planning incorporated into this multimodal Transportation Plan with route types verified for conflicting traffic volumes in the planning process.

## Adjacent City Thoroughfare Plans

Thoroughfare plans in communities adjacent to NRH were considered for regional continuity and connectivity. These include:

- Keller
- Richland Hills
- Watauga
- Colleyville
- Fort Worth
- Haltom City

# Transportation Goals

The transportation network forms the skeleton of the city and must serve to support the larger vision of the community. Transportation goals were developed through input and discussion with City Council and stakeholders. While these goals are distinct from general community goals, they point back to the community goals to promote transportation as a key element of community success.

In February 2019, the NRH City Council updated the community goals which serve as the policy direction for the community. The nine goals are as follows:

1. Quality Community Development & Revitalization
2. Efficient & Effective Transportation System
3. Safety & Security
4. Financial Stability
5. Positive City Image
6. Sense of Community
7. Targeted Economic Development
8. Local & Regional Leadership
9. Efficient & Effective Delivery of City Services

These goals informed the development of the four transportation goals that highlight the City's mobility priorities. These goals help to align policies with program funding, practices, and projects.

> **A GOAL**
> *WITHOUT A*
> ***►PLAN◄***
> *IS JUST A*
> ..................
> ***–WISH–***
>
> *-Antoine de Saint-Exupéry*

**4 Transportation Goals:**

- Expand Mobility & Access
- Focus on Implementation
- Improve Economic Vitality
- Enhance Quality of Life

The goals are further illustrated as follows:

## Expand Mobility & Access

- Evaluate specific existing and planned roadway corridors for future transportation needs.
- Integrate trails, transit, roadways, and sidewalks into a more comprehensive plan for all forms of transportation.
- Promote interconnected neighborhoods for all modes of travel.
- Explore use of new technologies to enhance transportation options.
- Develop policies and standards for off-street connectivity, dead-end streets, and new cul-de-sacs.

## Focus on Implementation

- Maintain the cleanliness and good repair of existing transportation infrastructure.
- Coordinate local and regional initiatives to leverage local transportation dollars.
- Maintain and enhance streets and transportation infrastructure in older and substandard areas.

## Improve Economic Vitality

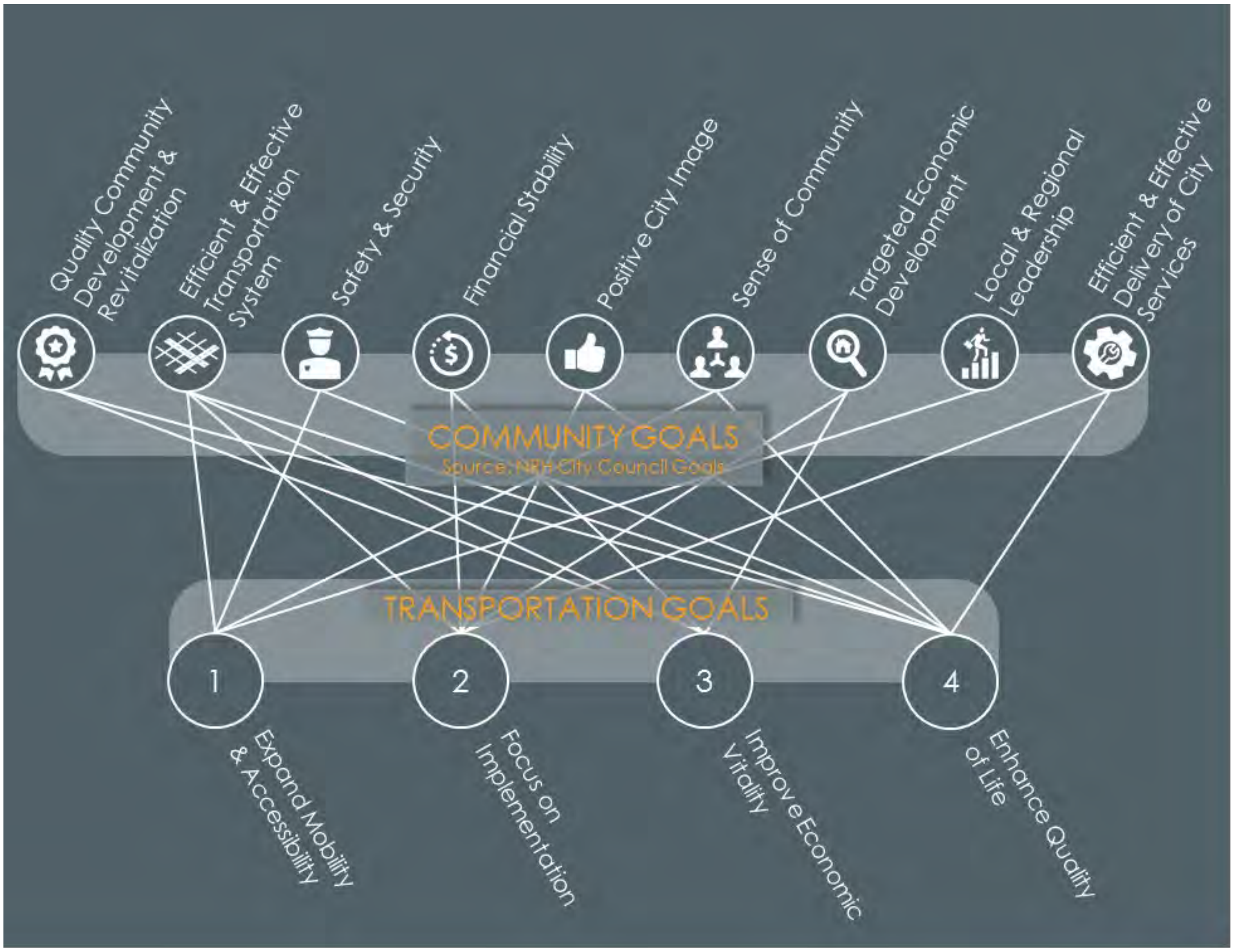
- Improve access to employment, commerce, education, and community resources.
- Provide for the efficient movement of goods and services.
- Strengthen the integration of transportation and land use.
- Provide and maintain infrastructure capacity in line with growth or decline demands.
- Plan for Transit Oriented Development (TOD).

## Enhance Quality of Life

- Focus on moving people safely and efficiently.
- Encourage transportation design standards appropriate to the neighborhood context.
- Comply with state and local air quality standards.

Associated with each goal are policies and actions. These serve as strategies that guide the advancement of the Plan to achieve the City's goals. Implementation actions are developed and described further in the document.

*Figure A-2. Transportation Goals Connected to Community Goals*



# B. Current Context

Dating back to 1848 when W.S. Peters brought 600 families into northeast Tarrant County, the North Richland Hills area remained a rural farming and ranching community for more than 100 years. Growth began to boom in 1953 when the city officially incorporated as the City of North Richland Hills (NRH) and subsequently annexed surrounding areas, such as Smithfield.

North Richland Hills, now home to nearly 70,000 residents, 1,200 businesses, and 30 major employers, is the third largest city in Tarrant County. Offering a neighborly atmosphere and family-friendly amenities, NRH is conveniently located with access to all of the Dallas-Fort Worth (DFW) region. This quality of life in the City was recognized in 2016 by *Dallas Morning News* by winning one of the 10 best neighborhoods in DFW, beating out over 300 other communities based on several factors including safety from crime, affordability of homes, good schools, well maintained and quiet neighborhoods, rising home values, pet-friendliness, places to shop and things to do, commute, walkability, trees and landscaping, and parks and greenspaces.

This rich history and culture as well as central location within the region has benefitted the City, supported by a reliable transportation system. Today, increasing demand on the roadways and continued aging of infrastructure are key concerns in the community. Additionally, the maturation of the community through redevelopment and intensifying land uses, such as the Transit Oriented Development (TOD) districts, reveals a need for multimodal mobility options which provide choice for residents and employees.

As an initial step in the transportation planning process, an assessment of the existing conditions and current context for mobility within NRH was conducted. This review, in tandem with stakeholder and public input, helps to provide an understanding of the specific issues and needs facing the community.

# Key Development Influences

Three distinct districts within NRH provide significant potential impacts on the transportation system in the future. These include the HomeTown neighborhood, Smithfield TOD district, and Iron Horse TOD district. The development potential and intensity of those “urban villages” stands to influence the NRH transportation system with increased demand as well as unique modal characteristics which differ from the traditional auto-oriented development pattern.

## HomeTown

HomeTown is a mixed-use community bound by Mid-Cities Boulevard on the north, Davis Boulevard on the west, and Boulevard 26 on the south. With many phases of the master planned development complete, Parker Boulevard, Bridge Street, and Winter Park Drive all traverse the interior of the neighborhood in addition to the Walker Creek water feature and trail bisecting it north-south. Marketed as a “live, work, play, shop and learn” community, HomeTown offers a diversity of land uses and housing types with easy access to the signature NRH2O Family Water Park, the NRH trail system, and major roadway corridors.

The Town Center Zoning & Regulating Plan, originally adopted in 1999 and updated in 2011, guides the development of the remaining acres within the neighborhood. Transportation components were considered through a Traffic Impact Analysis (TIA) in the adoption of the regulating plan to ensure adequate infrastructure exists to support the increased intensity of the development compared to surrounding neighborhoods. High pedestrian and vehicular activity, integral traffic calming (such as on-street parking, narrow streets, etc.) and high development density are major design factors. Additionally, a detailed roadway network providing connectivity internally and to the surrounding neighborhoods and major roadways is defined within the regulating plan. Right-of-way dimensions as well as roadway sections are described in the plan.

The regulating plan differs from the existing City Thoroughfare Plan in the roadway functional classification

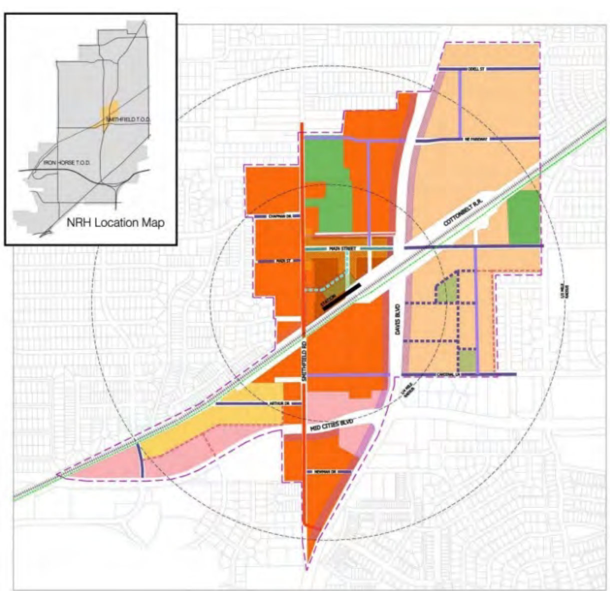
terminology. The primary roadways within HomeTown have yet to be incorporated into the citywide Transportation Plan under equivalent functional classification. As the development nears buildout and the City takes over ownership of these facilities, it is important to incorporate these roadways into citywide documents for consistency in maintenance and operations.

### Transportation Benefits of Transit Oriented Development

- Creation of sustainable development with a variety of land uses for people to live, work, and play.
- Decreasing traffic congestion by allowing destinations to be reached from the station through active transportation.
- Reducing household spending on transportation by increasing use of transit thereby reducing amount of driving.
- Driving less by commuting via transit reduces vehicles emissions, therefore improving air quality.
- Providing choice for demographics that live car-free or car-light lifestyles.

## Smithfield TOD

The Transit Oriented Mixed-Use Development Code governs future development around the proposed TEXRail station sites. Smithfield TOD is one of two NRH station sites for TEXRail, a 27-mile commuter rail project connecting downtown Fort Worth to Dallas-Fort Worth Airport. In anticipation of the rail project, NRH developed station area plans which regulate through a form-based code the land use and building aesthetics as well as defining street types.




Existing low-density development and vacant properties within the Smithfield TOD district are characterized under this plan to increase in intensity for mixed-use and transit-oriented style development. Located centrally within NRH away from freeways, the Smithfield TOD is expected to develop as a neighborhood centered on the rail station. These development patterns are conducive to increased active transportation and transit usage within the district which is exemplified by the rail station central to the district and Cotton Belt Trail paralleling the rail line. To produce this more walkable environment, roadway sections and typologies in the TOD district must be flexible and prioritize the vulnerable users to create a safe and inviting public realm along the streets.

The TOD development code differs from the existing City Thoroughfare Plan in the roadway functional classification terminology. Arterials and collectors, such as Smithfield Road and Main Street, are consistent but the context of the design must be considered for an ultimate section of these facilities. Accessibility to and from this TOD is vital to the success of the district and to benefit the surrounding neighborhoods with the potential retail and commercial amenities of the TOD.

## Iron Horse TOD

Governed under the same Transit Oriented Mixed-Use Development Code as Smithfield TOD, the Iron Horse TOD will contain a different context to development than Smithfield. Located adjacent to Interstate Highway (IH) 820, Iron Horse TOD is envisioned as mixed use but with a heavier rate of park-and-ride usage and regional retail focus. Limited crossings of the rail line in the area also create an environment where development will be focused on the same side as the rail station.

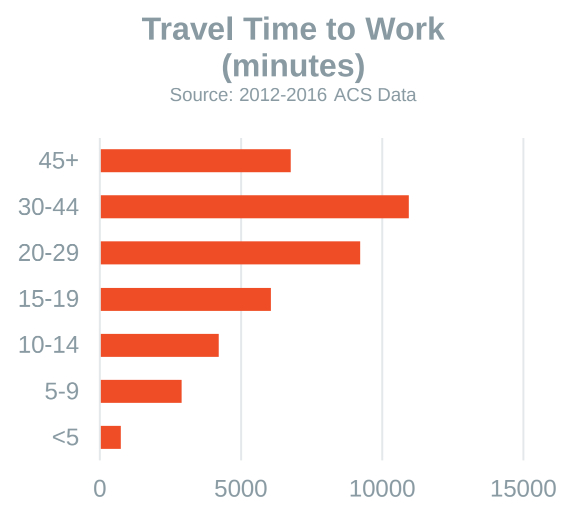

Existing vacant properties along Iron Horse Boulevard and big box retailers along the IH 820 frontage road are anticipated to develop or intensify in the future as the district grows and matures.

The major corridors within the Iron Horse TOD are currently established and on the City Thoroughfare Plan, but the context of the design and intersection accommodations must be considered for the ultimate design of these facilities.


# Current Travel Patterns

Understanding how people move within the City as well as how people move in and out of the City is important to evaluate the performance and needs of the transportation system. Both commute trips and total travel are considered to develop a comprehensive picture of dominant travel modes and regional travel needs.

*Figure B-1. ACS Travel Time to Work*

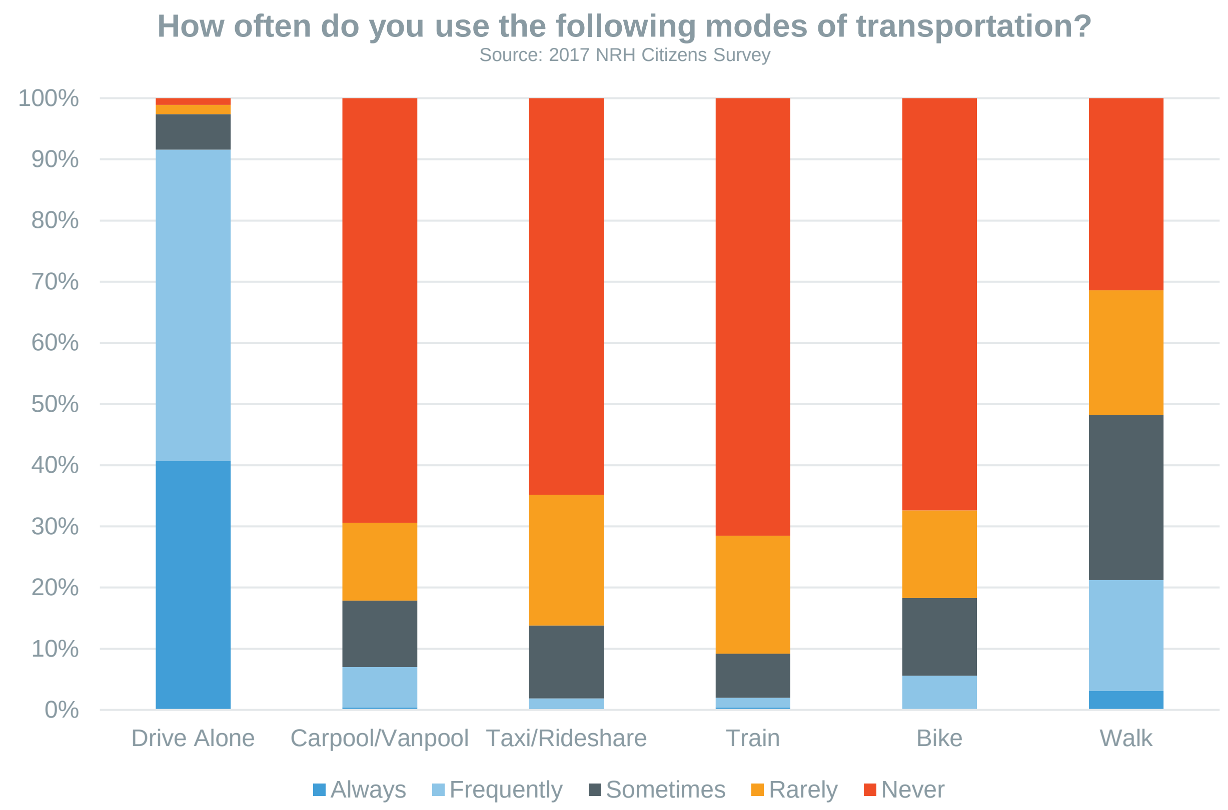



Data from the American Community Survey (ACS) describes commute travel times for residents within NRH. As expected in the region with many NRH residents commuting to other cities, approximately 43.4% of travel times are 30 minutes or longer. Under 15-minute commutes represents 19.2% of residents in NRH. The focus of long commute times, as well as commute lengths, signifies multiple considerations for NRH into the future:

1. Development of local employment to help residents both live and work in NRH;
2. Advocate for regional transportation initiatives to manage traffic congestion and alternatives, i.e. IH 820, SH 183, TEXRail;
3. Develop travel demand management initiatives, e.g. carpooling, staggered work hours.

The 2017 NRH Citizens Survey, supports the claim toward an auto-oriented

*Figure B-2. Citizens Survey Transportation Mode Use*



community. The dominant transportation mode is driving alone with carpool/vanpool and walking showing frequent use by some residents. These latter uses reflect citizens' use of alternative options for commuting and local trips, respectively.

Continued support and development of non-single-occupant-vehicular travel, including walking, biking, carpool, and transit, also effect the overall transportation patterns in the community. Emerging trends in sustainability and the intensification of development throughout Tarrant County, advancement of transit in the region, and NRH's strong trail system support future shifts in travel characteristics as average household vehicle-miles traveled (VMT) could decrease with urbanization. This is evident in NRH with the two TOD station areas and HomeTown neighborhood. The launch of TEXRail will bring new options to NRH with the potential to shift these travel patterns over the coming years.

While community-wide surveys point to the way most citizens use the transportation system, it is also important to plan for groups that may be underrepresented and have limited transportation options. This includes groups with vision or mobility impairments, populations below poverty, households without vehicles, populations with limited English proficiency, and populations above or below typical driving ages. From the 2012-2016 ACS data in Census Tracts within NRH, **Table B-1**, summarizes the presence of these populations within NRH.

Many of these groups have overlapping needs and limitations. The lack of vehicle ownership or operation covers many of these populations. Zero-vehicle households, children unable to drive, elderly people who can no longer safely drive, and people with vision impairments all lack easy access to personal vehicles and must find alternative means. It is important to note that children are completely unrepresented in traditional surveys but still have school and extracurricular activities that are often suitable for active transportation modes if it is available. Populations below poverty may own vehicles, but it is important the City consider the impact of this as housing and transportation costs are the

highest impact on these households. By supplying other effective options, the City can help serve the needs of these residents. Finally, residents with limited English proficiency often fall into some of these previous categories but may also need special consideration in transportation planning to ensure educational materials and meetings are translated. Approximately 10.0% of residents in NRH are foreign born persons, according to ACS data.

*Table B-1. Underrepresented Transportation Populations in NRH*

| Group | Presence | Percent of Total |
|---|---|---|
| Population below Poverty | 6,570 people | 7.9% |
| Zero-Vehicle Households | 1,013 households | 3.3% |
| Limited English Proficiency | 2,138 people | 2.8% |
| Children (10-19 years old) | 10,005 people | 12.0% |
| Elderly (80+) | 2,982 people | 3.6% |

*Source: 2012-2016 ACS Data*

# Roadway Network

North Richland Hills' roadway network is nearly at a build-out condition. The previous plan adopted in 2007 has been steadily implemented to develop a full network of roads throughout the community. The network contains an array of arterial, collector, and local roadways in addition to IH 820 and SH 121.

Oriented in a north-south, east-west grid, with the exception of Boulevard 26, NRH has a wide arterial spacing at approximately 1.5-miles. This spacing is supplemented with a strong collector roadway network that serves the local mobility and access to destinations within the neighborhoods.

*Table B-2. Major Roadways*

| Major North-South Roadways | | |
|---|---|---|
| Name | Current Functional Classification | Travel Lanes |
| Rufe Snow Dr. | Arterial | 4-6 |
| Davis Blvd. | Arterial | 6 |
| Precinct Line Rd. | Arterial | 6 |
| Boulevard 26 | Arterial | 4 |
| Smithfield Rd. | Collector | 2-4 |
| Holiday Ln. | Collector | 2-4 |

| Major East-West Roadways | | |
|---|---|---|
| Name | Current Functional Classification | Travel Lanes |
| N Tarrant Pkwy. | Arterial | 6 |
| Mid-Cities Blvd. | Arterial | 6 |
| Harwood Rd. | Arterial | 4-6 |
| Glenview Dr. | Arterial | 4 |
| Bursey Rd. | Collector | 2-4 |
| Starnes Rd. | Collector | 2 |
| Rumfield Rd. | Collector | 2-4 |
| Hightower Dr. | Collector | 2-4 |
| Chapman Rd. | Collector | 2 |
| Amundson Dr. | Collector | 2 |

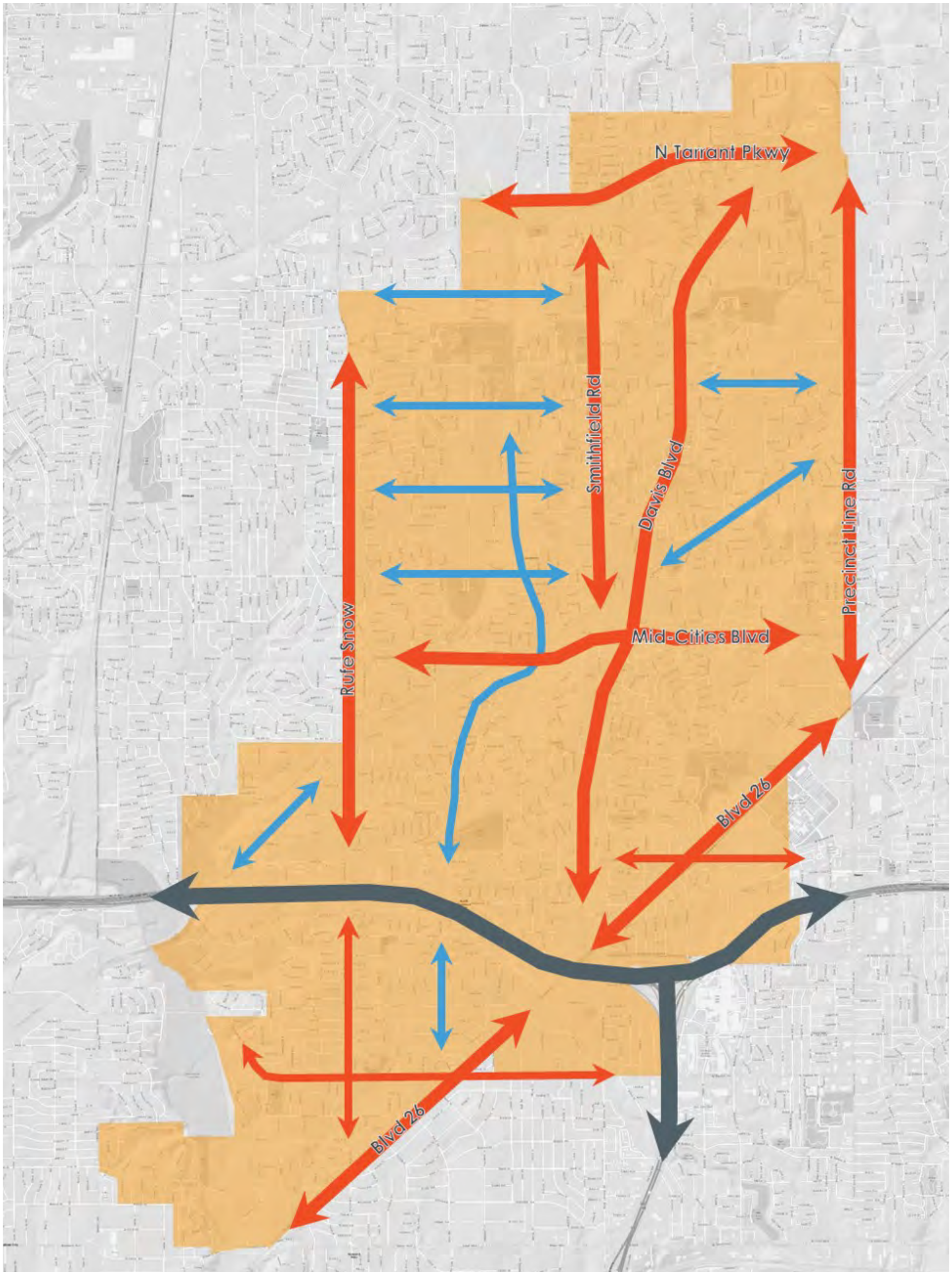



*Figure B-3. Major Roadways*

## Safety – Crash Data

Vehicle crashes are a source of significant personal distress, disruption, loss of personal property and time, and in some cases, result in injury. In the worst cases, crashes can be fatal. Analysis of crashes recorded by TxDOT's Crash Records Information System (CRIS) was conducted to determine if patterns were prominent in the City.

Over the last five years (2013-2017), on average one quarter of crashes within the City have been on freeway facilities (IH 820 and SH 121) with the remaining located on local roadways. As TxDOT maintains control over these freeway facilities, the local, non-freeway roadways will be the focus for trends and guidance for City intervention.

Total crashes on local roadways have fluctuated since 2010 with an average annual growth rate of 1.3% but showing some individual years, such as 2011 and 2015, lower than this trend. This local growth rate reflects the population growth rate of 1.5% over this same time period. While it is anticipated that crash rates parallel demographic growth and overall vehicle-miles traveled (VMT), **serious crashes and traffic fatalities can be minimized** through proactive policies and infrastructure investments.

*Figure B-4. Total Crashes, TxDOT CRIS 2013-2017*

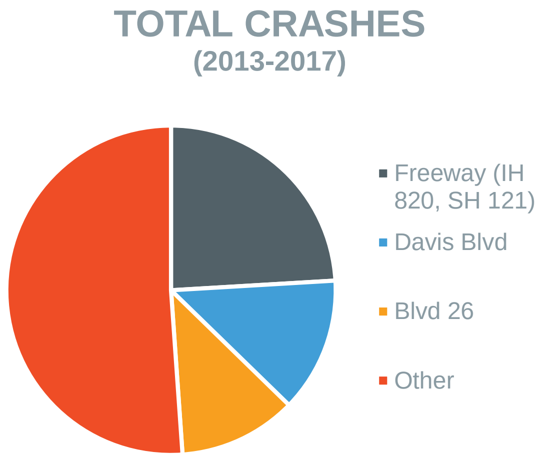
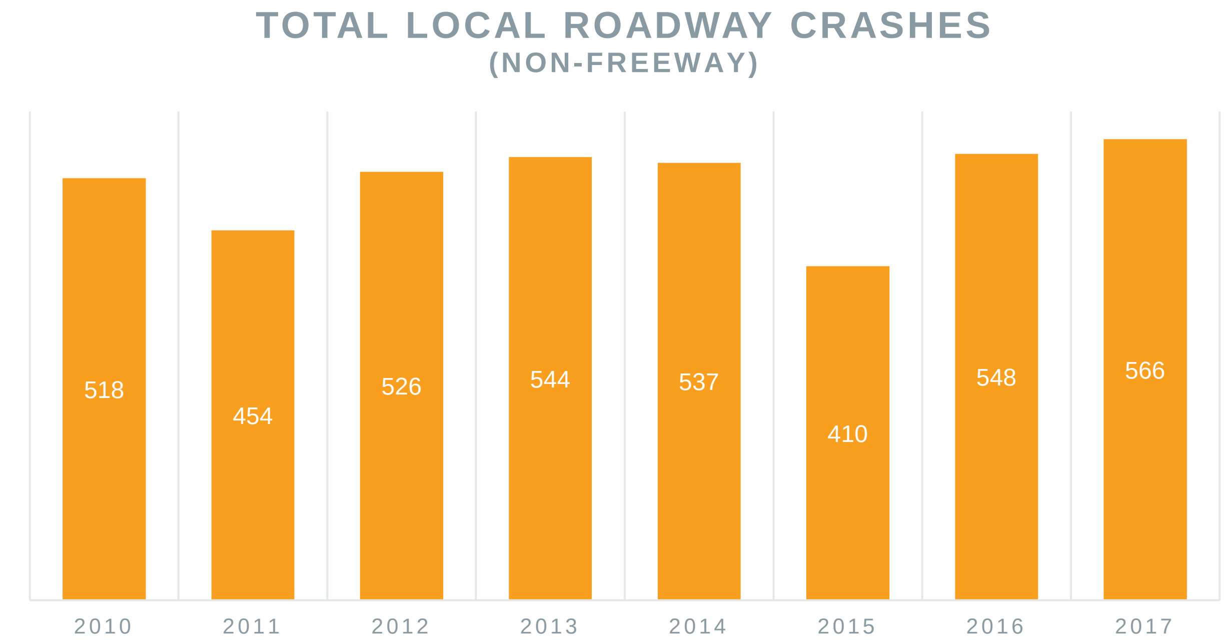


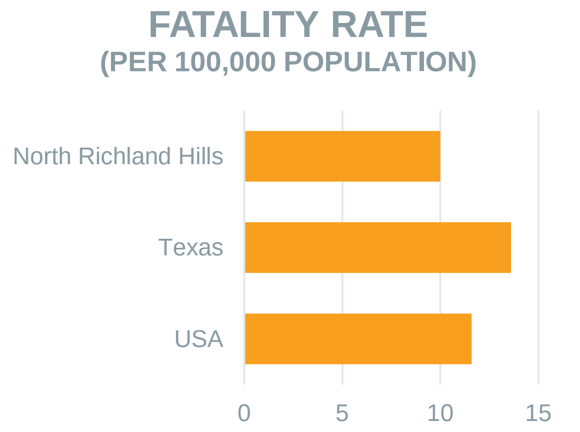

*Figure B-5. Total Local Roadway Crashes, TxDOT CRIS*



Analyzing the location of crashes, both local and freeway, the data reveals a near even split of crashes between intersection and non-intersection locations. For both total crashes and fatal crashes, approximately 45% are located at intersection locations. The crash frequency heat map, illustrated in **Figure B-8**, supports this assertion. Using CRIS data from 2013-2017, the warmer colored areas show spots of increasing frequency of crashes – significantly around freeway access points and major arterial/arterial intersections. This map also reflects the heavily traveled, high-speed corridors with numerous conflict points, such as Rufe Snow Drive, Davis Boulevard, and Boulevard 26.

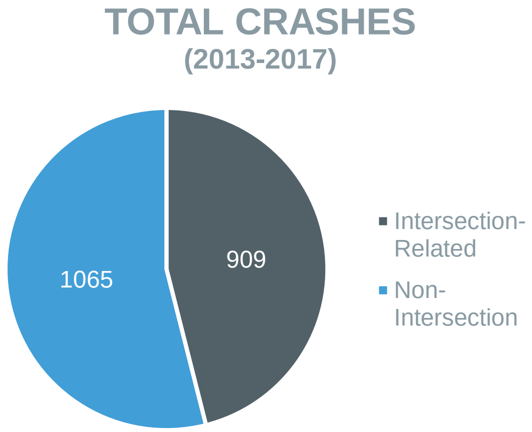
Overall on a per capita basis, North Richland Hills maintains a relatively low fatality rate for traffic crashes. Compared to national and state averages in 2016, the City has fewer fatalities per 100,000 population. This is a relative number though, as most other industrialized countries in the world maintain a lower crash rate. A strategic effort to increase safety and reduce crashes would be beneficial to the community.

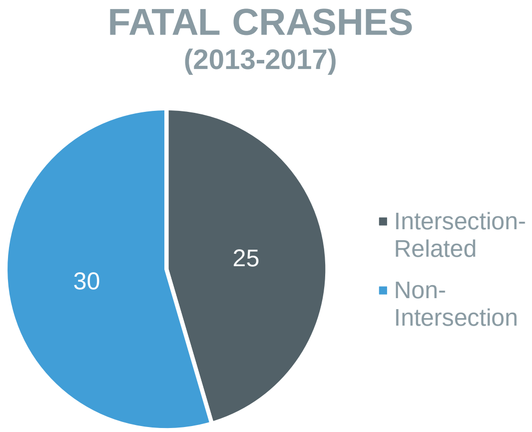
*Figure B-6. Fatality Rate Comparison*




The policy implications for the City are that high-speed, complex environments appear to be increasing crash frequency on the local roadway network. Access management may be warranted to reduce conflict points between intersections. Additionally, design speeds and posted speeds should be evaluated to ensure they consider the context of the corridors. Providing visual cues for appropriate speeds, in addition to possibly reducing posted speeds, may reduce crashes at intersections, but this must be reinforced with enforcement and education of speed risk.

*Figure B-7. Intersection-Related Total and Fatal Crashes, TxDOT CRIS 2013-2017*



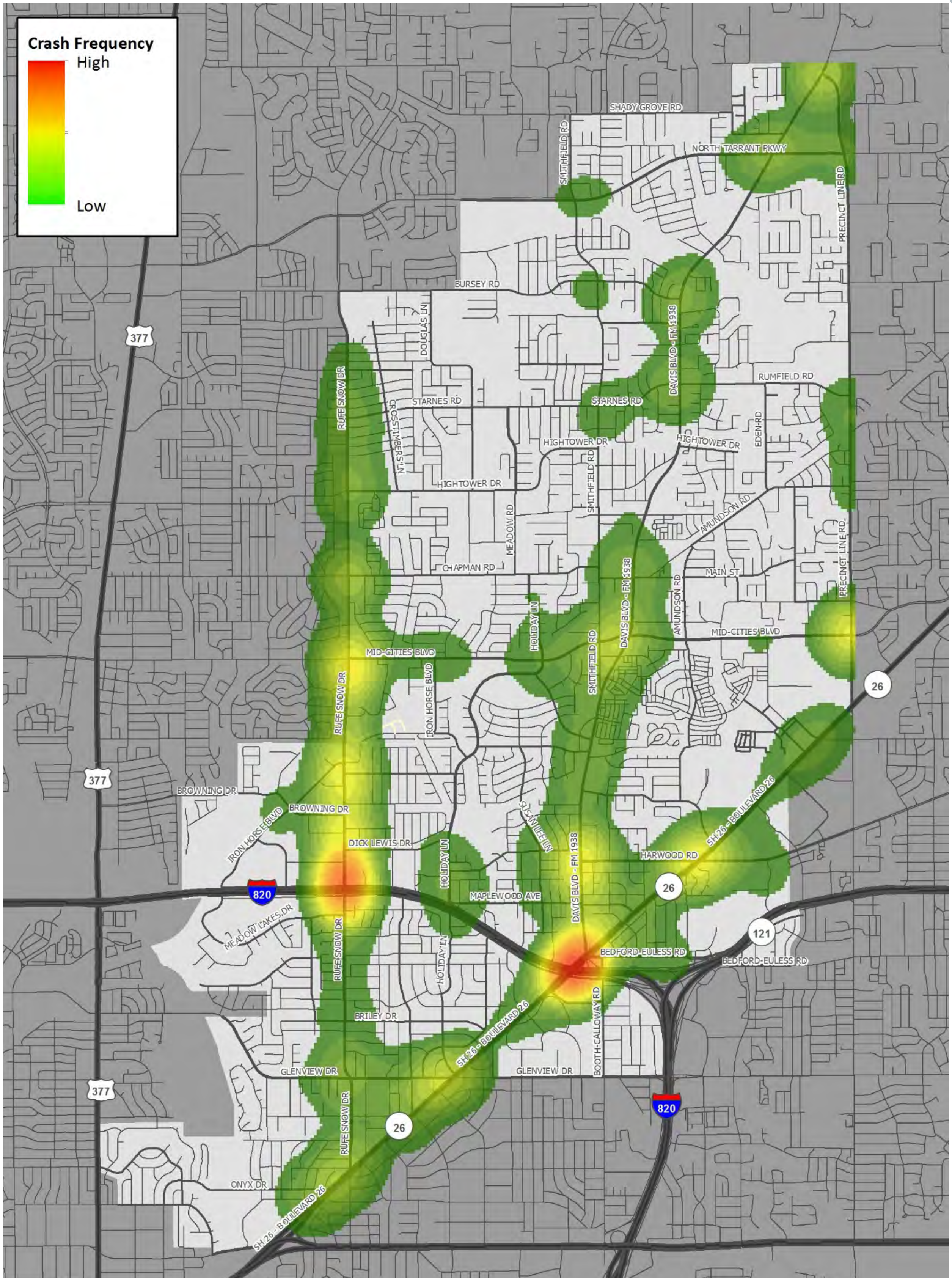



*Figure B-8. Crash Hot Spots on Local Roadways*

## Pedestrians and Cyclists

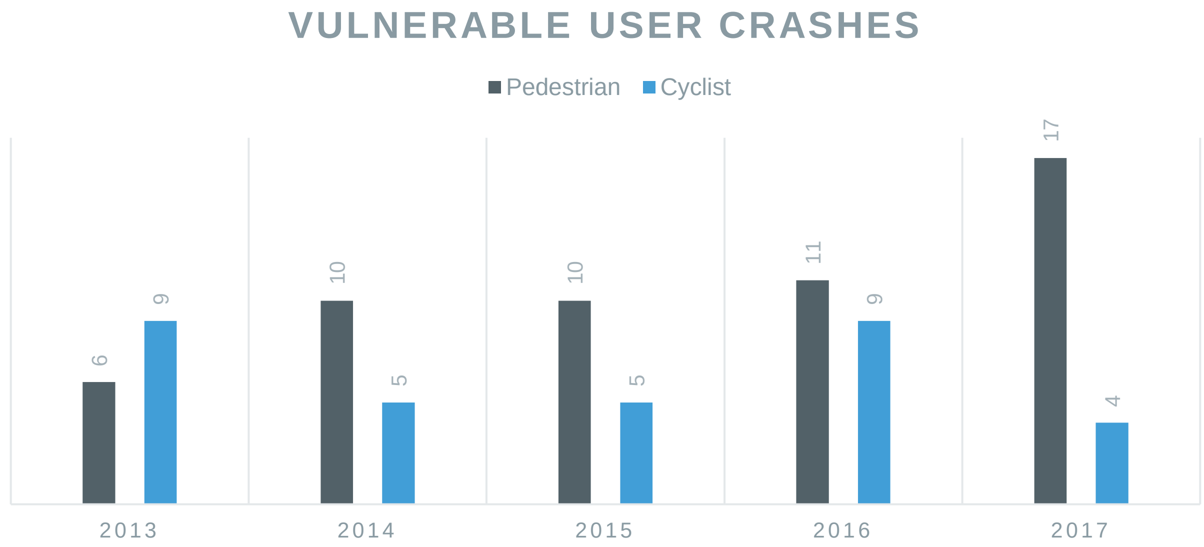
Rising pedestrian and cyclist crash rates nationwide bring special consideration to these users within the transportation system. As vulnerable users, any crash is likely to have a high severity, whether incapacitating or fatal.

Within NRH there has been a rise in crashes involving pedestrians in the last five years, continuously increasing from 6 in 2013 to 17 in 2017. These crashes have occurred in the southern sector of the City with clusters along Rufe Snow Drive between IH 820 and Mid-Cities Boulevard as well as other major arterials, such as Davis Boulevard, Boulevard 26, and Harwood Road. The high conflict areas provided by auto-oriented development surrounding these corridors with numerous driveways and limited pedestrian accommodations are reflected in the crash data.

Unlike pedestrian crash trends, traffic crashes involving cyclists has fluctuated over the last five years. These crashes are located throughout the City, but, similar to the overall traffic crashes, are typically at intersections and complex arterial locations where many driveways exist. The data reveals the crashes typically occur at intersections where there are no special bicycle facilities, such as bike lanes or trail crossings. There is also a cluster of crashes along Rufe Snow Drive between IH 820 and Mid-Cities Boulevard. The auto-oriented retail environment with numerous driveway conflict points combined with limited safe crossing locations can be attributed to this focus area of cyclist crashes.

The policy implications for the City are that roadway crossings for pedestrians and cyclists appear to be the main source of crashes for these vulnerable users. Intersection enhancements, such as lighting and crosswalks, should be considered to bring attention to these users. Safe Routes to School programs should also be continued to provide focused crossing locations as well as encourage education.

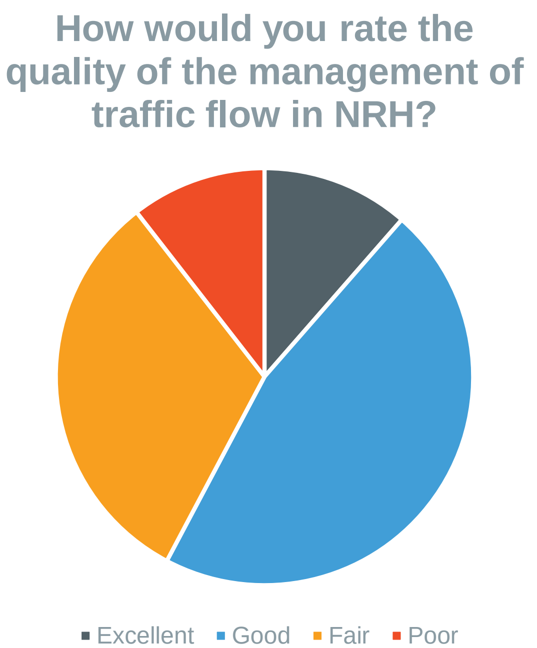
*Figure B-9. Vulnerable User Crashes, TxDOT CRIS 2013-2017*



## Congestion

NRH is primarily an auto-oriented community with many residents commuting to employment outside the city. The management of traffic flow becomes paramount, specifically in the morning and evening peak hours, to ensure reliable commutes that help the quality of life for people living or working in NRH. Based on the 2017 NRH Citizens Survey, the majority of residents in NRH currently view this management of traffic flow favorably, but there are still issue areas.

*Figure B-10. NRH Survey on Traffic Flow Quality*



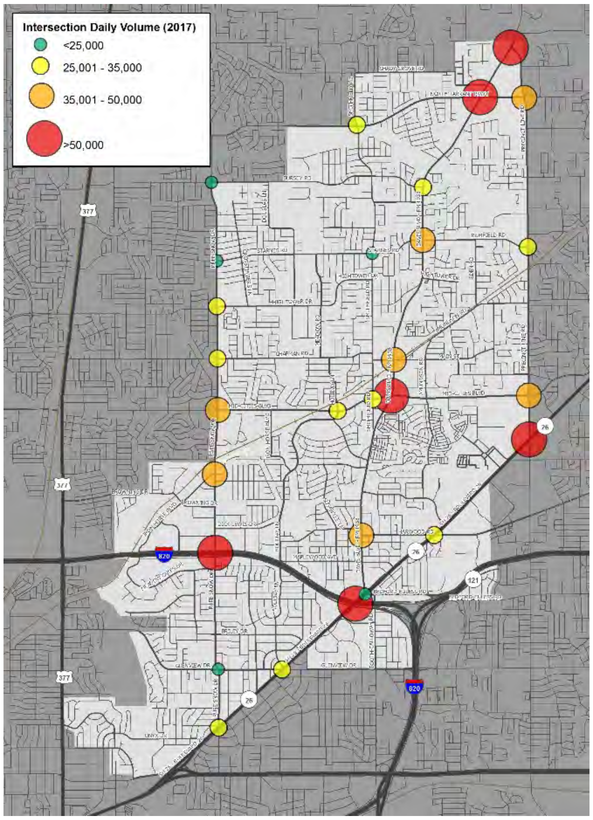

The limited capacity of a given roadway may be the most constrained at an intersection. Traffic flow is often impacted at intersections with geometric design for high traffic or signal timing. From the 2017 NRH Citizens Survey, the top five intersections where residents felt there was unnecessary delay are shown in the following table.

*Table B-3. Top 5 Congested Intersections*

| Top 5 Congested Intersections (Identified by Citizens) |
|---|
| Davis Boulevard @ Mid-Cities Boulevard |
| Rufe Snow Drive @ Mid-Cities Boulevard |
| Davis Boulevard @ N. Tarrant Parkway |
| Davis Boulevard @ Boulevard 26 |
| Rufe Snow Drive @ IH 820 |

This qualitative information from the Citizens Survey is supported by the analysis of critical intersections from the 2017 traffic volumes. **Figure B-11** illustrates these intersections and the sum of their daily approach volumes based on the NCTCOG Travel Demand Model data for 2017.

*Figure B-11. 2017 Critical Intersections*



The higher the volumes from all approaches combined, the larger the circle on the map. The higher the volume from every direction in the intersection the more important it is to make sure that traffic is moving in these locations. Intersection performance also influences factors such as travel time and air quality. Therefore, some priority must be given to improving operations at critical intersections.

It should be noted that there are five prominent high-volume intersection and corridor areas:

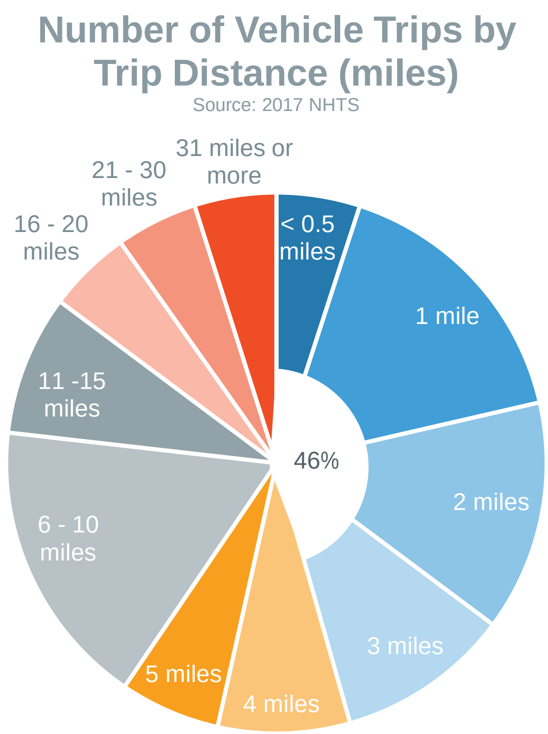
1. Rufe Snow Drive, from Mid-Cities Boulevard to IH 820
2. IH 820 at Boulevard 26 and Davis Boulevard
3. Boulevard 26 at Precinct Line Road
4. Davis Boulevard at Mid-Cities Boulevard
5. Davis Boulevard/North Tarrant Parkway/Precinct Line Road triangle

Two ongoing projects address corresponding critical areas. One is the widening of Rufe Snow Drive north of IH 820 to a six-lane divided roadway section. The other is capacity enhancements to the Davis Boulevard at Mid-Cities Boulevard intersection.

# Active Transportation

Active transportation is considered as human-powered modes of transportation, such as walking and biking and is an essential element of a transportation network. From the 2017 National Household Travel Survey, shown in **Figure B-12**, 5.0% of trips are less than a 1/2-mile and 45.6% of trips are less than 3 miles. These trip lengths are ideal for non-motorized transportation or micromobility options, such as bicycles or electric scooters.

*Figure B-12. 2017 NHTS Trip Distance Distribution*




It is important to build a transportation network that not only accommodates active transportation but plans and prioritizes it. All trips, regardless of primary mode, begin and end with the pedestrian. Common elements of an active transportation network include on-street and off-street bike trails, signed bike routes, and sidewalks.

## Bike Culture in NRH

A statistically valid survey was conducted in 2017 for the North Texas region by NCTCOG capturing the general public's view on bicycling. This survey included an analysis of cyclist types in the region, defined as follows:

- Strong & Fearless: Will ride a bicycle regardless of the roadway conditions. Riding is a strong part of their identity.
- Enthused & Confident: Somewhat comfortable sharing the road with vehicle traffic. Prefers dedicated bike facilities.
- Interested but Concerned: Like riding a bicycle and would ride more if they felt safer on the roadways.
- No Way No How: Not comfortable, not interested, or not physically able to ride a bicycle.

**Figure B-13** outlines the proportion of users within North Texas's 12 county region, as well as a comparison to the national survey. Note that fewer people are interested in bicycling in North Texas than the national average, but half of people still prefer dedicated bike facilities that protect from mixing with vehicular traffic.

This is supported by the attitudinal survey conducted as part of this plan in NRH where 67% of respondents agreed that the city needs more off-street trails and sidewalks separated from the edge of traffic for walking and biking, with only 9% disagreeing with that statement.

While this attitudinal survey pointed toward a desire for more off-street active transportation facilities, cycling is still seen generally as recreational in NRH and secondary to the needs of vehicular travel as noted in **Figure B-14** and **Figure B-15**.

*Figure B-13. Four Types of Cyclists*

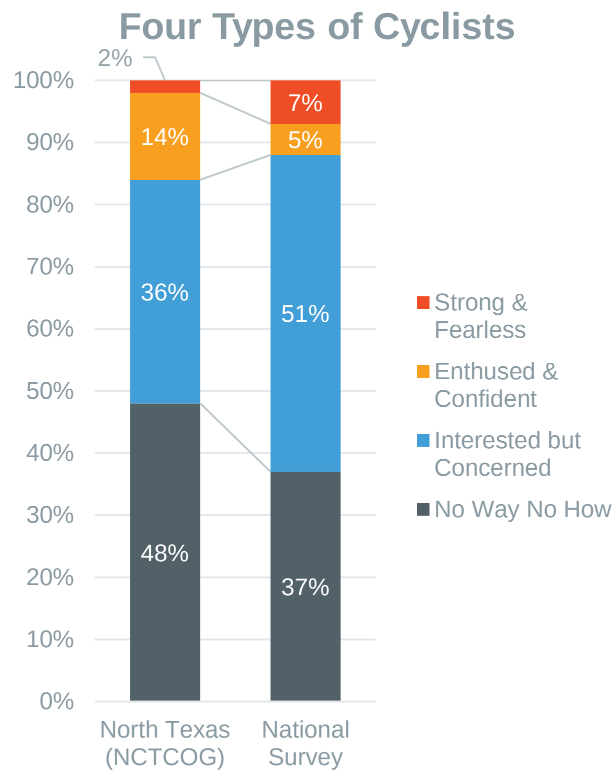



*Figure B-14. NRH Survey Right-of-Way Allocation*

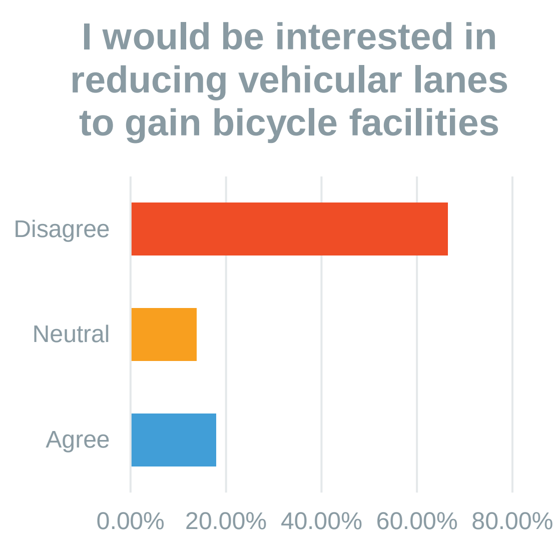
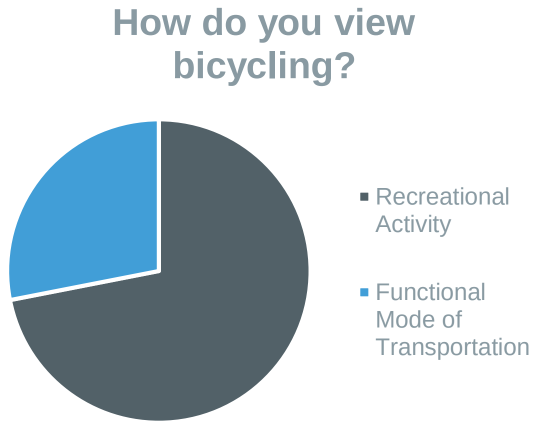


*Figure B-15. NRH Survey Views on Bicycling*




## Existing Facilities

NRH has implemented an extensive system of concrete trails for off-street travel by people walking, biking, and other non-motorized uses. These paths create a safe, comfortable experience for users of all ages and abilities. A summary of these trails is in **Table B-4**.

These trails serve as the spine of NRH's bicycle and pedestrian network creating north-south and east-west connectivity. The development of bicycle paths from these trails to major destinations like parks, schools, and shopping centers will enhance the connectivity of bicycling in the city. The sidewalk network also extends the reach of these trails for people walking. A map of existing trails and bike facilities is shown in **Figure B-16**.

*Table B-4. Existing Trails*

| Trail Name | Miles |
|---|---|
| JoAnn Johnson Trail | 1.65 |
| Randy Moresi Trail | 0.60 |
| North Electric Trail | 2.55 |
| Walker's Creek Trail | 2.85 |
| John Barfield Trail | 3.95 |
| Cotton Belt Trail | 4.08 |
| Calloway Branch Trail | 4.68 |
| **Total** | **20.28** |

A 2016 Trail and Route System Plan was developed by the City providing a framework for future investments in walking and biking infrastructure. This included the identification of opportunities and constraints to developing an active transportation network. A summary of these is shown in **Table B-5** and **Table B-6**.

As the Iron Horse and Smithfield TEXRail stations begin their first years of operation, it is important to understand also the pedestrian routes in and around the transit stations. The urban development expected to occur in these areas supports the proximity of land uses and destinations to make walking the mode of choice. To encourage this, it is important for the city to note gaps and barriers that can be solved to make walking attractive around the TODs. As part of the station analysis, NCTCOG created maps in 2016 showing pedestrian routes and disconnected facilities surrounding the Iron Horse and Smithfield stations. Areas with gaps in the sidewalk network include older areas of development, when sidewalks may not have been required, or where undeveloped land currently exists. More complete sidewalk networks are found in newer development and subdivisions but need connections to the overall system and transit stations. **Figure B-17** and **Figure B-18** show these NCTCOG study maps.

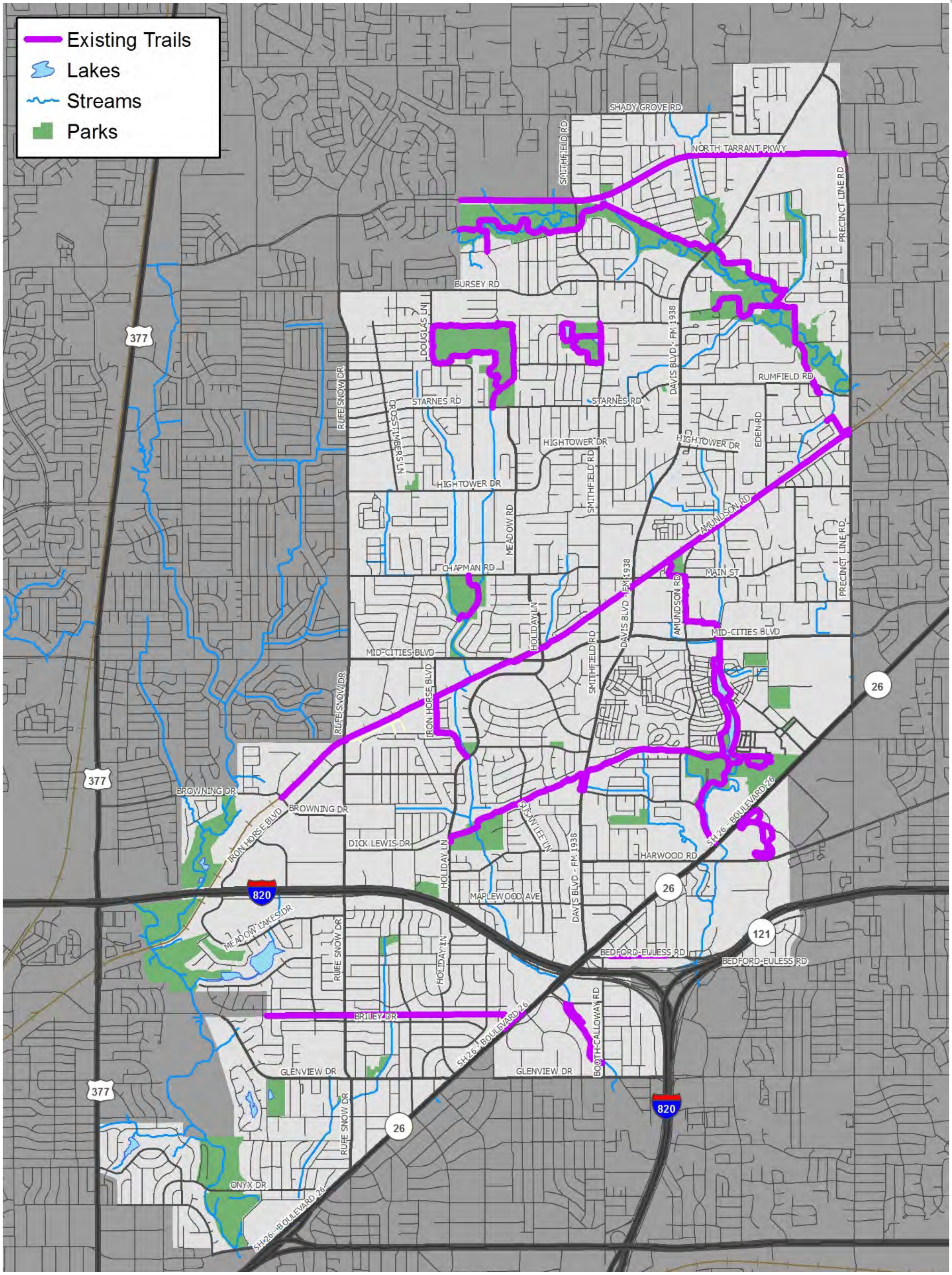



*Figure B-16. Existing Active Transportation Network*

*Table B-5. 2016 Trail and Route System Plan Summary of Opportunities*

| Opportunities |
|---|
| The existing trail network are popular corridors for walking, bicycling, and jogging in NRH, serving as a backbone for system growth. |
| The existing off-street trail network is well signed with mile markers, maps and wayfinding. |
| Partnerships with neighboring municipalities and regional agencies offer opportunities to connect to the Veloweb Regional Trail System and adjacent trail systems. |
| Branded and coordinated wayfinding signs along shared use paths and on-street bikeways can lead bicyclists to community destinations and recommended corridors. |
| Wide collector and local roadways provide unique opportunities for on-street bikeways. |
| Two future TOD stations provide a scenario where bicycle access supports intermodal transportation options. |
| Some utility corridors, waterways and drainage ditches create opportunities for future trail development. |
| The summertime ride with the Mayor events integrate several departments of city staff with local elected officials and citizens. The amount of community and knowledge building at this event provides a significant contribution to the active transportation community. |

*Table B-6. 2016 Trail and Route System Plan Summary of Constraints*

| Constraints |
|---|
| Heavy volumes of vehicular traffic, wide pedestrian crossings, and auto-oriented retail and commercial development, along several major arterials present significant barriers to active transportation travel. |
| Several existing trail crossings are unprotected and unmarked. The crossings are often mid-block due to the nature of where utility and rail corridors exist. |
| The Interstate Highway and major arterials surrounding NRH limit regional connectivity to adjacent communities. |
| The current signage and wayfinding system for the on-street bicycle routes is not easy to follow and does not identify destinations. Signed roads are no more bicycle friendly or maintained than the unmarked roads. |
| A lack of on-street bikeways limits residents' ability to access bicycle destinations not accessible by shared use paths and trails, especially for riders that are not confident sharing a road with vehicles. |

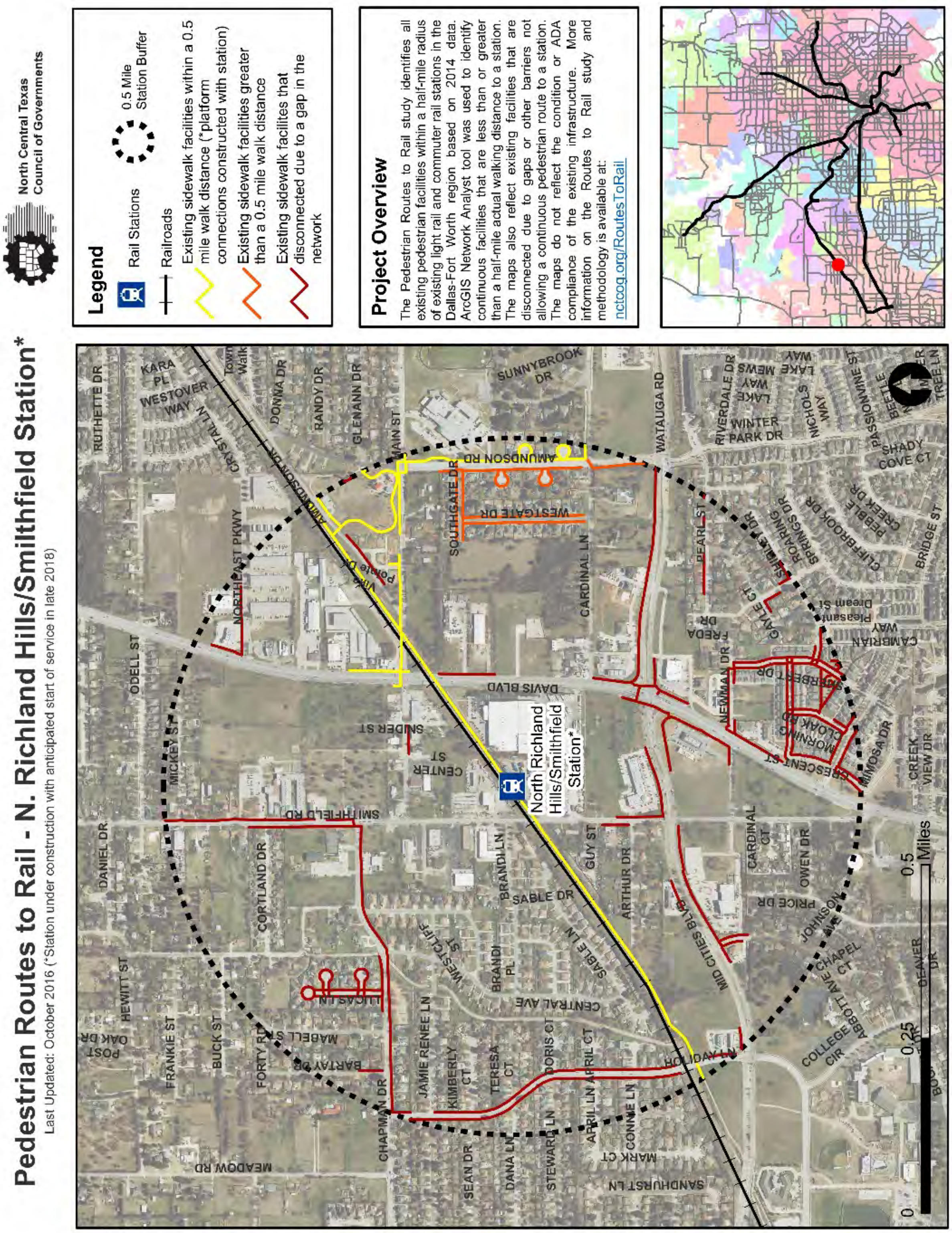



*Figure B-17. NCTCOG Smithfield Station TOD Pedestrian Routes*

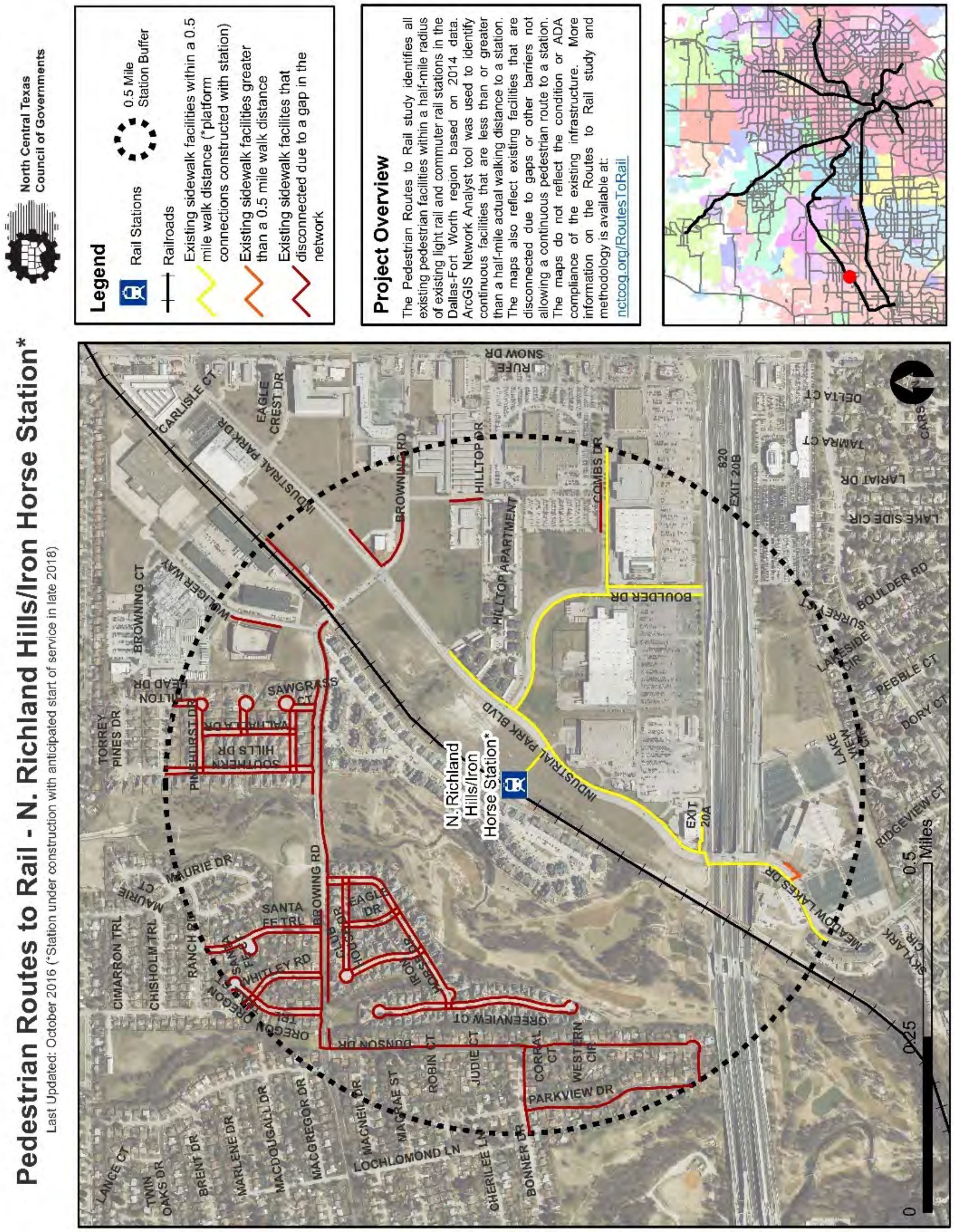



*Figure B-18. NCTCOG Iron Horse Station TOD Pedestrian Routes*

# C. Future Context

The future context of transportation within North Richland Hills (NRH) is defined by anticipated growth, travel patterns, and subsequent transportation infrastructure needs to accommodate this. This future vision is best viewed through multiple lenses to gain a comprehensive understanding of the implications of growth. One lens is the current context and characteristics of the community, as discussed in the previous chapter. Next, a travel forecast model simulates increased mobility demands through demographic growth. This is supplemented with knowledge of planned projects currently programmed for future implementation. A multimodal lens is needed to incorporate an understanding of active transportation integration, often lacking from modeling efforts. Finally, an acknowledgment to the undefined impact and influence of new mobility technologies, like connected automated vehicles (CAV) and rideshare, is needed to frame a system flexible for technological advancement.

# Travel Forecast Modeling

A Travel Demand Model (TDM) is a computerized representation of a community or region's transportation system. TDMs use land use and demographic forecasts to simulate the movement of commuters throughout a transportation network under various conditions. Model results are used by transportation planners to display current network conditions and predict what impact changes to the system and/or the environment in which it operates will have on future travel demand. TDMs can be programmed to model all modes of travel utilized in a regional transportation system, including the roadway, transit networks, and bicycle and pedestrian travel.

For this study, the North Central Texas Council of Government's (NCTCOG) 2040 Travel Demand Model formed the basis for modeling efforts. Regional roadway, transit, and bicycle networks are integrated into this model. Local modifications allow additional granularity of the model for local demographic and roadway network expectations.

The model was used to help prioritize projects and aid in making recommendations to the future street network. The model-based analysis was completed through the following steps during the thoroughfare development process:

| **Modeling Methodology** | |
|---|---|
| **1** | Update population and employment projections by Travel Survey Zone (TSZ) to reflect 20-year anticipated growth in the City. |
| **2** | Update 2040 NCTCOG model networks to match currently adopted Thoroughfare Plan. |
| **3** | NCTCOG to run regional network with adjusted demographics and network. |
| **4** | Review performance of model outputs on thoroughfare network. |
| **5** | Adjust proposed thoroughfare network to reflect needed capacity improvements or possible capacity reductions. |

## Basic Model Theory

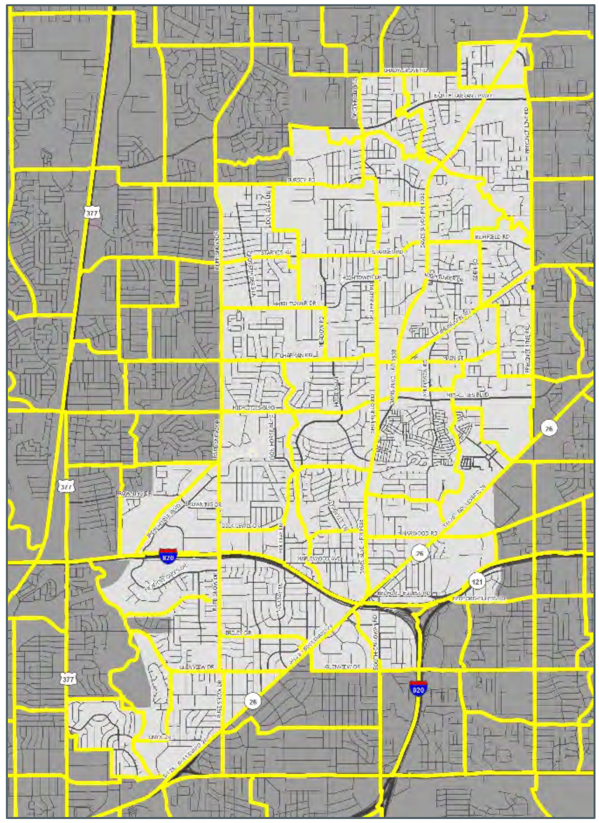
A travel forecast model is comprised of a series of mathematical models that simulate travel on the transportation system. The model divides the city into Travel Survey Zones (TSZ) which have specific demographic and land use data associated with them and are used to determine trip demand and travel patterns. The modeling process encompasses the following four primary steps:

- Trip Generation – the number of trips produced and attracted to a destination or TSZ based on trip purpose.
- Trip Distribution – the estimation of the number of trips between each TSZ, i.e., where the trips are going.
- Modal Split – the prediction of the number of trips made by each mode of transportation between each TSZ.
- Traffic Assignment – the amount of travel (number of trips) loaded onto the transportation network through path-building. This is used to determine network performance.

## Methodology

The key demographic data inputs for this TDM were population, households, and employment. Using sociodemographic projections from NCTCOG as a base, the project team evaluated revised sociodemographic projections developed in the recently completed and approved NRH Water/Wastewater Impact Fee Study. Working with the North Richland Hills City Staff, the project team identified any known future growth or development patterns that were altered as part of the land use component of the Strategic Plan. The City provided feedback on NCTCOG's 2017 and 2040 demographics (household population and employment) and helped incorporate planned residential and employment developments into the TSZs for the travel demand model.

*Figure C-1. TSZ Structure*



After considering the City's feedback, projections for NRH were refined to more accurately reflect where people were expected to live and work in 2040. The project team achieved this by increasing and redistributing the population and employment projection data across the identified TSZs, based on where growth was anticipated to occur.

Base year (2017) and projected year (2040) model runs informed the analysis of travel demand needs. TSZ boundaries, sociodemographics, and the travel network were unaltered from the NCTCOG base information. Refined population and employment projections were not dramatic but were revised for the 2040 model run. The projected year was most affected by network modifications to incorporate the buildout of the City's roadway network with associated additional linkages and ultimate lane configurations.

## Travel Demand Model Limitations

As previously noted, the NCTCOG regional travel demand model is regional in nature and not specifically calibrated to assess small area networks or specific corridors. Additionally, the level-of-service derived from the model is a volume to capacity ratio, and does not account for intersection queuing, turning movements, or other operational factors. This is acceptable for a broader view of the network performance, but highly congested arterial facilities may need additional analysis. To better assess the network, key intersections were analyzed using SYNCHRO (see analysis of Target Corridors).

## 2040 Network Additions

NRH's 2040 network includes a number of long-term network additions to improve overall connectivity within the city. The recommended improvements should be implemented as development unfolds rather than on a specific planning horizon.

### *Hightower Drive*

To match existing lane configurations, the segment of Hightower Drive from Crosstimbers Lane to Holiday Lane was expanded to reflect a 4-lane roadway section.

An extension of Hightower Drive from Smithfield Road stretching east to Eden Road was added to the network. The functional classification of the roadway will be a 2-lane collector facility, providing additional local access to Davis Blvd.

### *Smithfield Road*

Smithfield Road is a vital north-south corridor from Davis Boulevard to North Tarrant Parkway. To match the previous thoroughfare plan, an ultimate section of a 4-lane configuration was built into the travel demand model. Additionally, the connection to Davis Boulevard was realigned to tie in to Bridge Street.

These changes allowed the corridor to avoid capacity constraints within the model and reveal the potential ultimate travel demand on it. This allows the consideration of roadway rightsizing to align travel lane recommendations with this ultimate travel demand.

### *Other Modifications*

To match existing lane configurations and ultimate section expectations, the following roadway segments were modified:

- Rumfield Road – Immediately west of Precinct Line Road; expanded from a 2-lane section to reflect a 4-lane roadway section
- Meadow Lakes Drive – IH 820 to Rufe Snow Drive; narrowed from a 4-lane section to reflect a 2-lane roadway section
- Rufe Snow Drive – Glenview Drive to Boulevard 26; narrowed from a 6-lane section to reflect a 4-lane roadway section

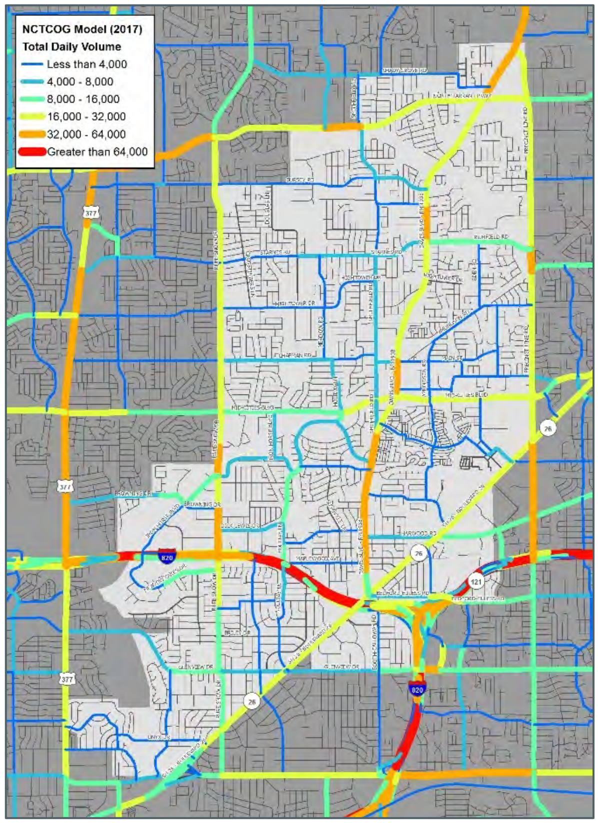
Additionally, to match existing roadway alignments, Amundson Drive was extended from Amundson Road to Main Street to reflect the existing 2-lane roadway section.

## Network Operations

The results from the NCTCOG Travel Demand Model help to identify the capacity and thoroughfare needs in the City. The goal of a thoroughfare plan is to balance the supply and demand of the roadways to ensure that the City resources are maximized and the system functions safely and efficiently. The results provide an opportunity for the transportation network to be analyzed to support adjustments where necessary. These adjustments would help to maintain the appropriate network capacity to handle the forecasted traffic volumes, as well as identify areas where other modes of transportation can be incorporated.

The two primary indicators for evaluating the future need is the forecasted traffic volumes and the congestion or level-of-

*Figure C-2. Current Modeled Daily Volume*




service (LOS). Traffic volumes help to determine the appropriate sizing of a road. Congestion on the other hand compares the projected volumes to the proposed capacity of the roadway; this is known as the Volume-to-Capacity (V/C) Ratio. The results of the V/C Ratio are presented in an A through F grading system with a LOS A roadway representing free flow conditions and LOS F representing extremely congested conditions.

### Current Conditions (2017)

A modeling analysis of current thoroughfare network conditions (alignments, lanes, etc.) with current demographics identified several travel characteristics. As expected, the freeway system handles the most traffic for the community, as seen in **Figure C-2**. The traffic is then focused on specific north-south and east-west corridors, such as Boulevard 26, Rufe Snow Drive, Davis Boulevard, Precinct Line Road, North Tarrant Parkway, and Mid-Cities Boulevard. These corridors have higher speeds with 6 travel lanes.

Also significant, traffic volumes highlighted on secondary corridors, such as Rumfield Road, Harwood Road, and Glenview Drive, serve as inter-city connectors and draw higher volumes.

Many of these congested corridors have enough demand for additional lanes but widening may not be feasible due to right-of-way (ROW) and environmental constraints or high cost of implementation. An example of this is Rumfield Road east of Davis Boulevard. Although the model indicates the demand for four (4) lanes, the limited ROW and proximity of adjacent homes limit the viability of capacity improvements along the corridor. This excess demand is considered further through relief in the form of additional parallel routes.

Congestion, as depicted through LOS, reveals the areas where demand is near or exceeds capacity of the current roadway network. Specifically considering peak period congestion, **Figure C-3** shows the morning (AM) and evening (PM) LOS for the City. Heavy volumes on Rufe Snow Drive, Davis Boulevard, and North Tarrant Parkway reveal deficiencies (LOS “F”) or maximum usage (LOS “D” and “E”) on these corridors. Environmental and ROW constraints limit the potential capacity expansion of these facilities but this realization points toward the need for

*Table C-1. Level-of-Service Descriptions*

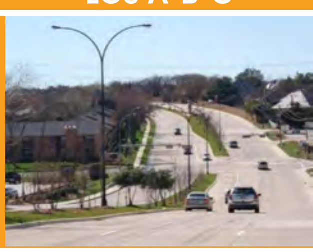
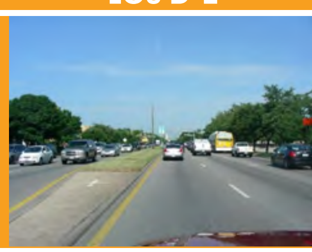
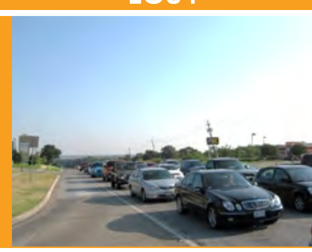
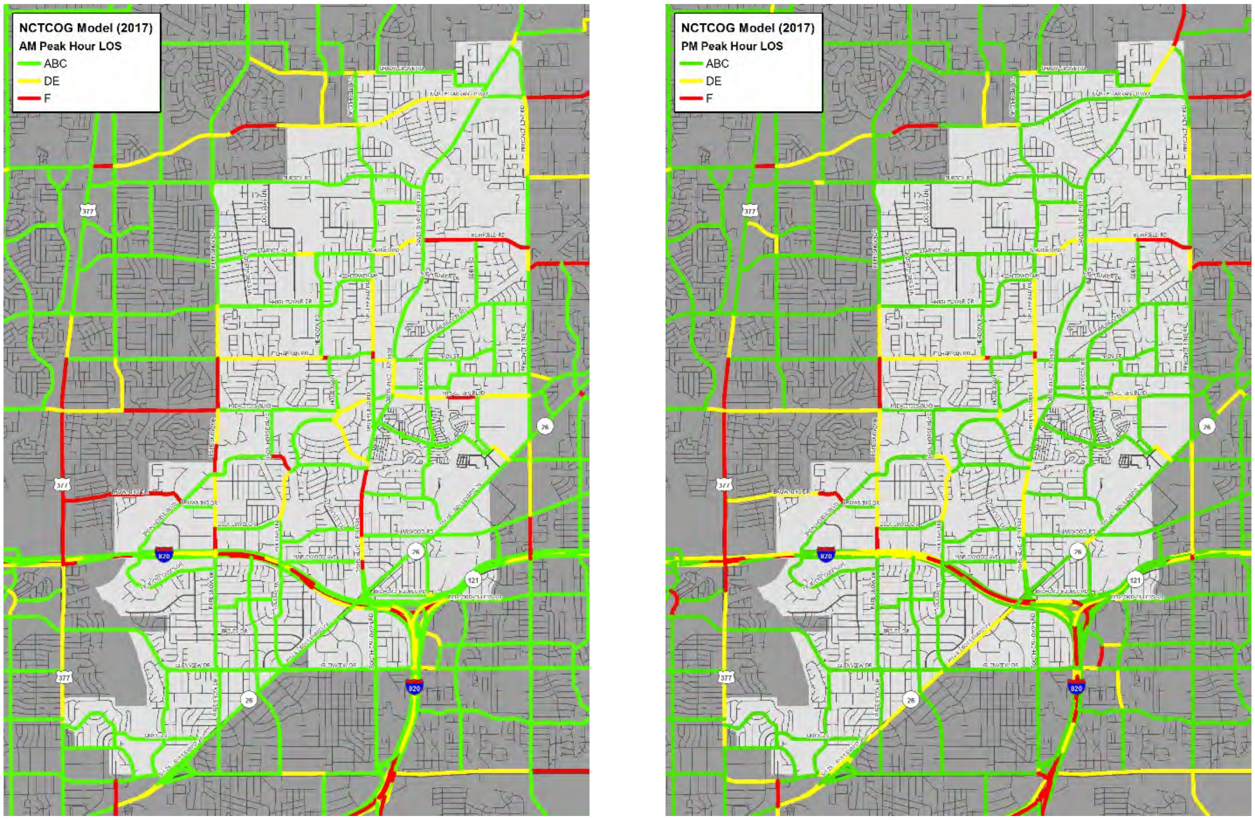
| LOS A-B-C | LOS D-E | LOS F |
|---|---|---|
|  |  |  |
| Traffic flow in this category moves at or above the posted speed limit. Travel time in this category is not hindered as a result of congestion because traffic volumes are much less than the actual capacity. | This category is slightly more congested LOS A-B-C, however traffic volumes are beginning to reach their capacity of the thoroughfare. Traffic move along at an efficient rate and posted speeds are maintained. | Congestion is apparent in this LOS category. Traffic flow is irregular and speed varies. The posted speed limit is rarely, if ever, achieved in this category. In more congested corridors traffic can be at a mere standstill with limited progression during peak hours. |

*Figure C-3. Current Modeled Congestion in Peak Hours*




future analysis to maximize the capacity potential of these corridors. This can include traffic signal synchronization, access management, and development of alternative routes to shift some traffic.

## Future Conditions (2040)

Looking to the future in a potential build-out condition of the City, a modeling analysis of the full thoroughfare network (alignments, lanes, etc.) with build-out demographics identified several travel characteristics. This included the demographic revisions as described earlier as well as network revisions, like the Hightower Drive extension and Smithfield Road lane configuration.

Key traffic corridors, as listed in **Table C-2** and **Table C-3** and seen in **Figure C-4**, remain the same from the current conditions with elevated volumes forecasted for the major north-south and east-west roadways, such as Boulevard 26, Rufe Snow Drive, Davis Boulevard, Precinct Line Road, North Tarrant Parkway, and Mid-Cities Boulevard. Inter-city connectors, including Harwood Road and Glenview Drive, also are forecasted to mature with higher volumes. The extension of Hightower Drive from Davis Boulevard to Eden Road, along with the minimal demographic growth in the northern neighborhoods, reveal traffic along Rumfield Road to remain stable into the future.

*Table C-2. Key North-South Traffic Corridors*

| Key North-South Traffic Corridors | |
|---|---|
| Name | Forecasted Daily Volume |
| N. Rufe Snow Drive | 30,000-40,000 |
| S. Rufe Snow Drive | 15,000 |
| Davis Boulevard | 40,000-50,000 |
| Precinct Line Road | 40,000 |
| Boulevard 26 | 35,000 |
| Smithfield Road | 5,000-10,000 |
| Holiday Lane | 5,000-15,000 |

*Table C-3. Key East-West Traffic Corridors*

| Key East-West Traffic Corridors | |
|---|---|
| Name | Forecasted Daily Volume |
| N Tarrant Parkway | 30,000 |
| Mid-Cities Boulevard | 25,000-30,000 |
| Harwood Road | 25,000 |
| Glenview Drive | 10,000-15,000 |
| Bursey Road | 5,000 |
| Starnes Road | 5,000 |
| Rumfield Road | 10,000 |
| Hightower Drive | 5,000 |
| Chapman Road | 5,000-10,000 |

*Figure C-4. Future Modeled Daily Volume*

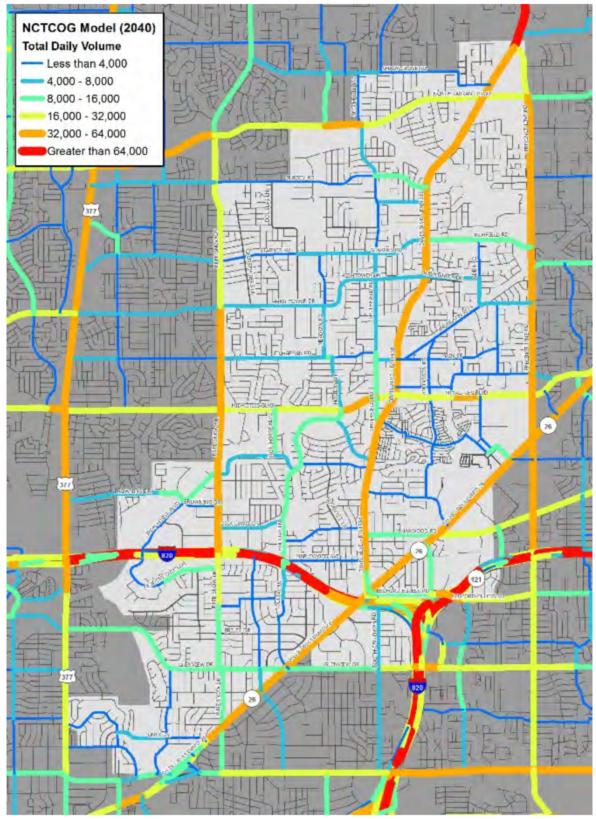
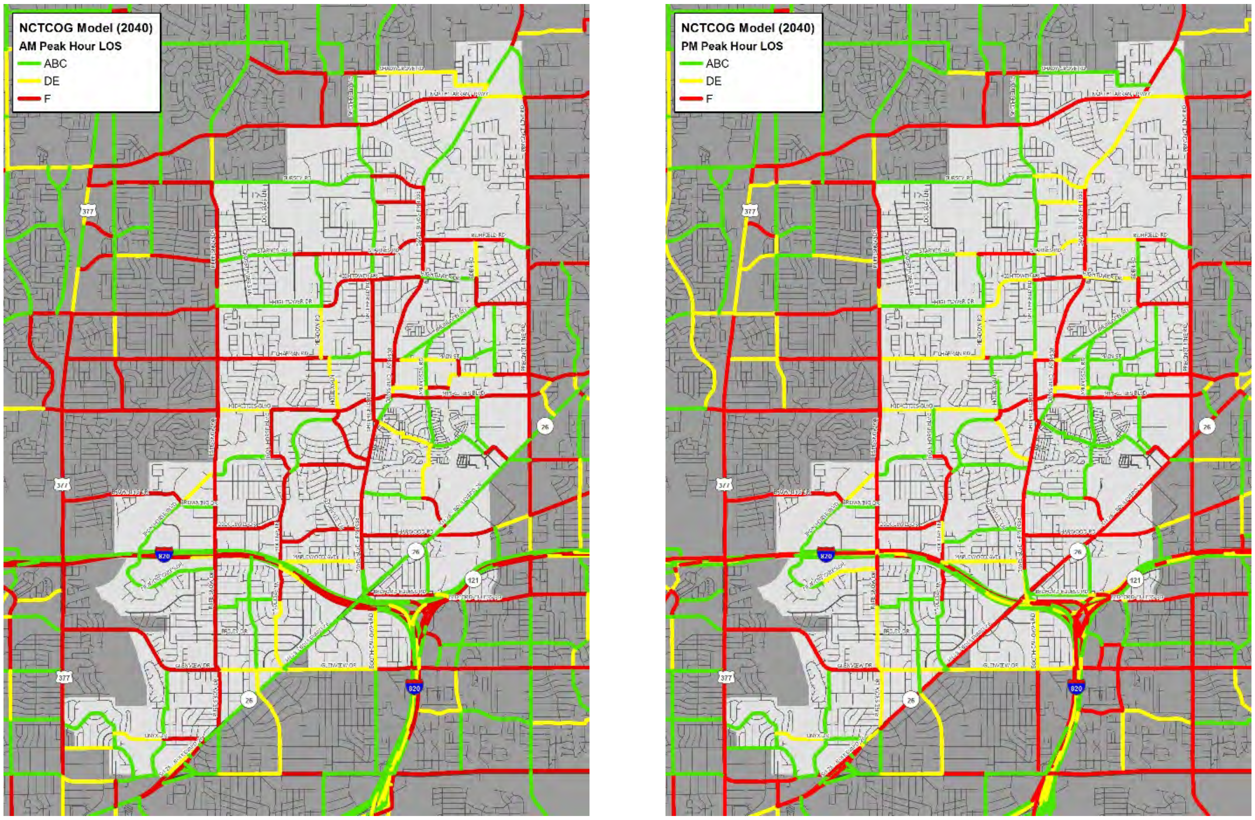


*Figure C-5. Future Modeled Congestion in Peak Hours*




In regard to LOS, some of these major corridors that are experiencing high projected daily traffic volumes are also experiencing a poor LOS. The LOS depicted in **Figure C-5** corresponds to the NCTCOG Travel Demand Model methodology for LOS determination. This is noteworthy because the peak hour calculation places a burden on lower LOS thresholds (LOS D-E, LOS F) with a passenger car equivalent (PCE) which adjusts volumes in the calculation by a premium of 18-25 percent. By analyzing the effect of this adjustment factor compared to the forecasted volumes, a more precise recommendation for ultimate corridor capacity need was determined.

Key corridors, such as Rufe Snow Drive, Davis Boulevard, Precinct Line Road, North Tarrant Parkway, and Mid-Cities Boulevard, draw concern for the poor LOS. Due to ROW restrictions and current 6-lane configuration, there may not be feasible ways to significantly improve the LOS on the corridor. As mentioned earlier, this LOS may rather be improved through signal synchronization, access management, and development of parallel routes.

Boulevard 26 remains a significant traffic corridor that has not reached its ultimate lane configuration. With 4 existing travel lanes, TxDOT has plans to widen the segment north of IH 820 to a 6-lane section, thereby increasing the long-term capacity. A 6-lane section is also anticipated south of IH 820 in the future to respond to the forecasted travel demand.

Additionally, many corridors in NRH are experiencing low volumes and LOS between A and D. These corridors, such as Bursey Road, Starnes Road, Hightower Drive, Chapman Road, Holiday Lane, Smithfield Road, and Amundson Drive, provide excellent opportunities where ROW is available to provide additional accommodations for multimodal elements.

# Multimodal Basis

An efficient transportation system must serve diverse demands. It would be inadequate for parents to chauffeur kids to neighborhood destinations because of a lack of sidewalks where they would have walked or biked, or force commuters to drive cars when they would rather use public transit or ride share. Physically, socially, and economically disadvantaged people in particular need a way of getting around that does not depend on them owning and operating a vehicle. Multimodal options are important in that everyone can benefit and reach their destination.

**RIGHTSIZING**
is the process of reallocating pavement and right-of-way space to **better serve** the *context of the roadway* and *goals of the community*

## Roadway Rightsizing

Rightsizing is the process of reallocating pavement and right-of-way space to better serve the context of the roadway and goals of the community. A road built many years ago in an undeveloped or developing area was sized for a predicted future condition, but now housing, shops, schools, and other destinations have matured in the community. Traffic conditions have stabilized and are more predictable and the needs of adjacent development is better known. These conditions, prevalent in parts of North Richland Hills, allows the opportunity to rightsize roadways to optimize these assets for the community. Using data from the travel demand model, corridors were identified for rightsizing under two scenario types which both reduce the ultimate number of lanes on the facility.

1. Reallocation - Reducing the number of existing travel lanes
2. Redesignation - Preempting roadway widening by acknowledging a new ultimate sizing

Reallocations consider ultimate vehicular demands and reallocate existing pavement and/or right-of-way space to other uses when excess vehicular capacity remains. Reallocations identified within NRH include both straight lane reductions, such as 5-lane to 3-lane conversions, and conventional 4-lane (undivided) to 3-lane rightsizing conversions. The former are straightforward in the reallocation of space with similar intersection and driveway traffic operations and reducing existing vehicular capacity by the travel lane loss. The latter, the 4 to 3 rightsizing, adds a center turn lane which provides turn movement benefits that often offset the loss in travel lanes (further described in **Appendix C**) and may not impact overall roadway capacity.

Redesignations reconsider future investments in expansion, but existing pavement conditions are unaffected. These are made to align traffic demands with roadway capacity supply, reducing excess infrastructure liabilities and reducing overall City costs. No existing vehicular capacity is lost, only potential future capacity.

It is **important** to note that vehicular capacity is made up of two parts: link-level segments and intersections. While roadway rightsizing reduces link segment lane configurations, **typical capacity bottlenecks are found at intersections so the reduced lane configuration between intersections does not affect true corridor capacity**. Intersection treatments through dedicated turn bays, traffic control devices, and signal timing and coordination can offset reduced link-level capacities of roadway rightsizing.

By analyzing the travel demand model for anticipated demand on the network in the future, major movements could be tracked to determine vehicular capacity needs that need absorbed in the collector and arterial network. For new roadways, like the Hightower extension, movement between Smithfield-Davis-Precinct Line were evaluated to appropriately size roadways for the total east-west roadway network in that area accommodate that demand.

**Table C-4** and **Figure C-6** identify the roadways considered for rightsizing and adjustments to the ultimate lane sizing which will maintain adequate vehicular capacity while providing opportunity for other uses and reducing overall City expense. Roadways highlighted in the table and figure in red are reallocation rightsizings, while those in green are redesignation rightsizings.

*Table C-4: Roadway Rightsizing*

| Roadway Rightsizing | | | |
|---|---|---|---|
| Name | Existing Lanes | **Ultimate Lanes Proposed** | 2007 Plan (Proposed) |
| **Roadway Reallocation** | | | |
| Smithfield Road (North of Turner) | 4 | 3 | 4 |
| Hightower Drive (Crosstimbers to Meadow) | 4 | 3 | 4 |
| Amundson Drive (Mid-Cities to Main) | 4 | 2 | 4 |
| Iron Horse Boulevard (Rufe Snow to Mid-Cities) | 5 | 3 | 4 |
| Holiday Lane (Dick Lewis to Mid-Cities) | 4 | 3 | 4 |
| Bedford-Euless Road (Boulevard 26 to Strummer) | 5 | 3 | 5 |
| Strummer Drive (Boulevard 26 to Bedford-Euless) | 5 | 3 | 5 |
| Boulder Drive (Iron Horse to IH 820 FR) | 4 | 2 | 4 |
| **Roadway Redesignation** | | | |
| Smithfield Road (Mid-Cities to Turner) | 2-3 | 3 | 4 |
| Holiday Lane (Starnes to Hightower) | 2 | 2 | 4 |
| Meadow Road (Hightower to Chapman) | 2 | 2 | 4 |
| Holiday Lane (Chapman to Mid-Cities) | 2 | 2 | 4 |
| Chapman Road (Rufe Snow to Smithfield) | 2 | 2 | 4 |
| Hightower Drive (Meadow to Eden) | 0-2 | 2 | 4 |
| Eden Road (Rumfield to Amundson) | 2 | 2 | 4 |
| Amundson Drive (Main to Precinct Line) | 2 | 2 | 4 |
| Main Street (Davis to Amundson) | 2 | 2 | 4 |
| Liberty Way (Iron Horse to Holiday) | 2 | 2 | 4 |
| Booth-Calloway Road (IH 820 FR to Glenview) | 2 | 2 | 4 |

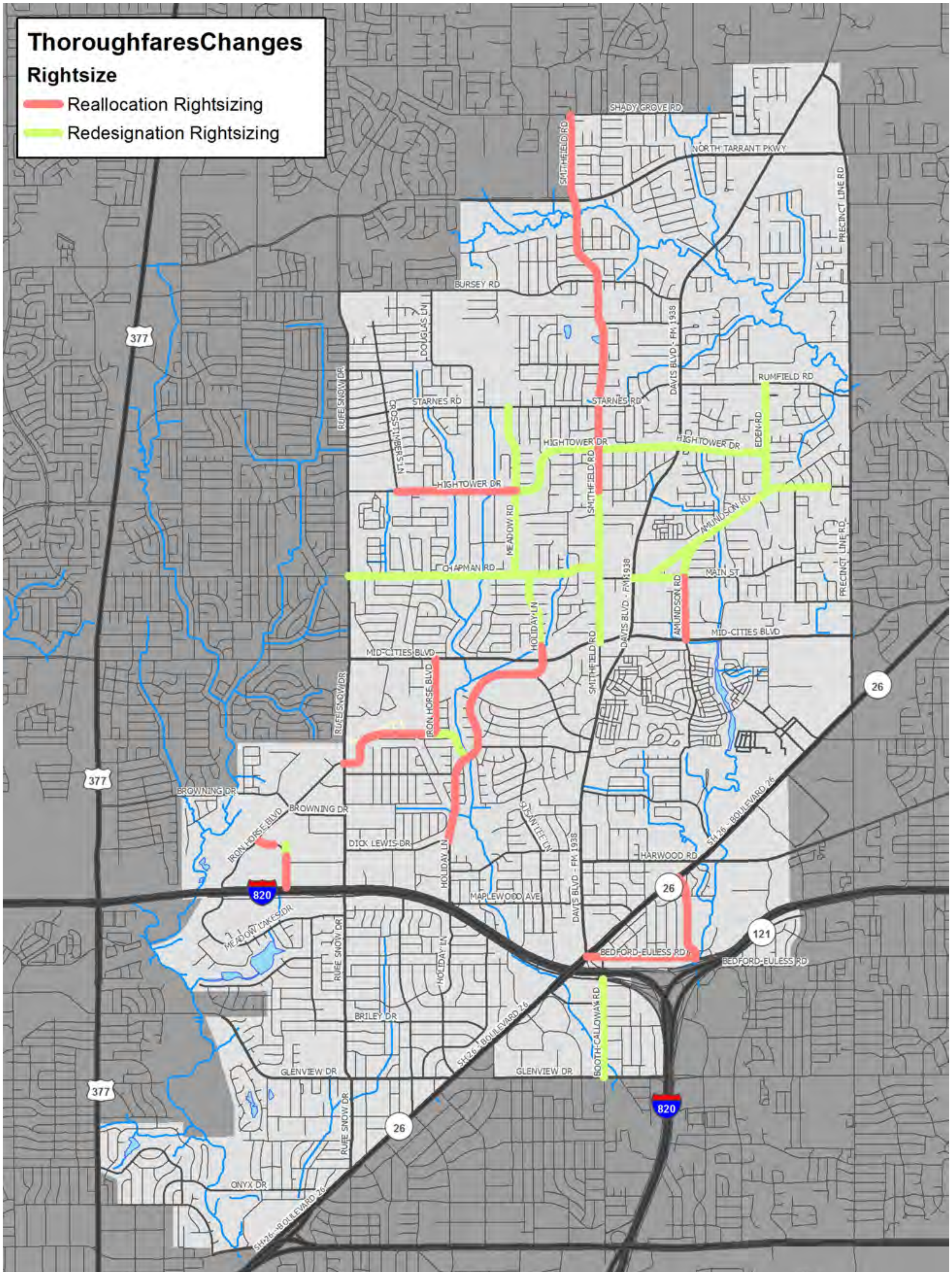



*Figure C-6: Roadway Thoroughfare Rightsizing*

## Regional Active Transportation

Active transportation refers to any non-motorized mode of travel, including walking, bicycling, skating, and scootering. An active transportation network allows people to get from point A to point B through a series of trails and bike lanes, much like a roadway system, yet without the use of a vehicle.

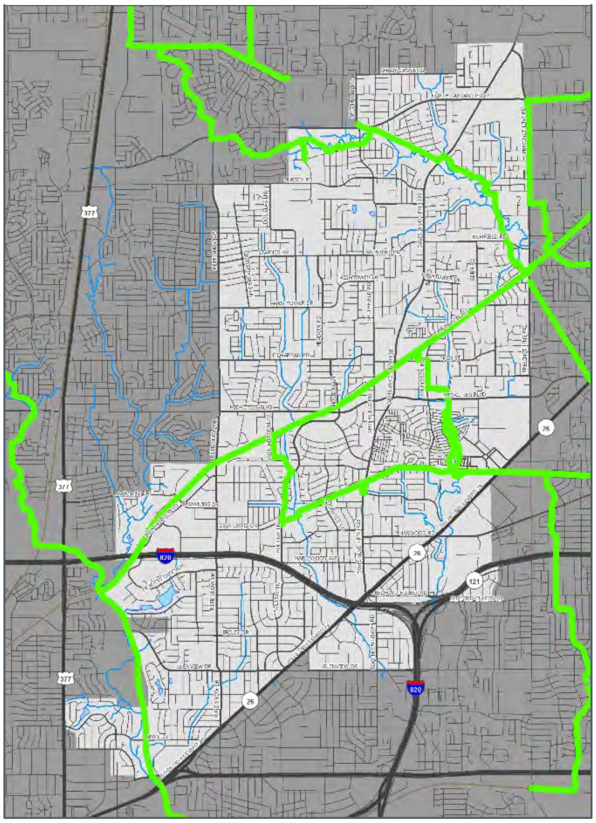
### NCTCOG 2045 Veloweb

The Regional Veloweb is a 1,883-mile network of off-street shared-use paths (trails) designed for multi-use trip purposes by bicyclists, pedestrians, and other non-motorized forms of transportation. The Veloweb serves as the regional expressway network for active transportation, and it extends the reach of the region's roadway and passenger rail transit network for non-motorized transportation.

The Veloweb will provide connectivity throughout NRH and the greater Dallas-Forth-Worth region. With more than 20 miles of shared use path in the NRH city limits, commuters can access transit locations by bicycle.

The Veloweb also provides a way to get to the TexRail stations, as they intersect them on the routes. With the robust connections by the Veloweb network, transit will be seen as a more enticing option as bicyclists can supplement their commute with a bus ride.

*Figure C-7. NCTCOG 2045 Veloweb*



## Safe Routes to School

The Federal Safe Routes to School (SRTS) Program was established in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users Act (SAFETEALU) in August, 2005. Safe Routes to School programs and initiatives seek to create safe, equitable, accessible, and convenient routes for children to walk and bike to schools. Additional goals include the increase in neighborhood awareness, walking and biking safety, the reversal of the upward nationwide trend in childhood obesity, and the promotion of physical activity and engagement. Programs are intended to utilize infrastructure enhancements to improve pedestrian mobility and safety (including bicyclists), as well as non-infrastructure strategies.

**25%** The increase in walking and biking to school as seen through successful SRTS engineering, education, and encouragement programs.

**10-14%** The amount of traffic during morning commutes associated with K-12 school vehicle trips.

Sources:
1. National Center for Safe Routes to School. (2011). How children get to school: School travel patterns from 1969 to 2009.
2. McDonald et. al. (2014). Impact of the safe routes to school program on walking and bicycling. Journal of the American Planning Association, 80(2), 153-167.

The University of North Texas and the Institute for Urban Studies at the University of Arlington (UTA) have been assisting the City of NRH in developing SRTS plans and recommendations. The initial schools for analysis included Smithfield Middle School, North Richland Middle School, Snow Heights Elementary School, North Ridge Middle School, and North Ridge Elementary School. A public outreach survey was conducted by UTA to identify barriers to walking to these schools in NRH as well as an infrastructure analysis to identify physical and traffic operations barriers. The continuation and implementation of this program will help NRH to increase the student population walking and biking to schools within the City.

## Transit

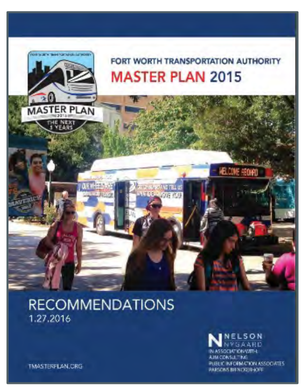
Currently, NRH does not fund or operate any fixed route form of transportation such as bus, rail shuttle, or trolley.

### TEXRail

The new commuter rail line extends from downtown Fort Worth, northeast through North Richland Hills to downtown Grapevine and then into DFW airport. NRH has two stations on the route: Iron Horse and Smithfield. Construction began in 2016 and routine operation began in January 2019.

### NCTCOG Transit

Although NRH does not operate its own transit service, the city does participate in Northeast Transportation Service (NETS) which is a demand-response small transportation provider that offers door to door service to individuals in the city who are disabled or 55 years of age and older. NRH is also serviced by Hurst-Eueless-Bedford (HEB) transit, which operates independently of the city, and is a small transportation service that focuses on transporting people to and from work and work-related activities. People in the HEB service area are provided with transportation services to the workforce solutions for Tarrant county mid-cities workforce center.



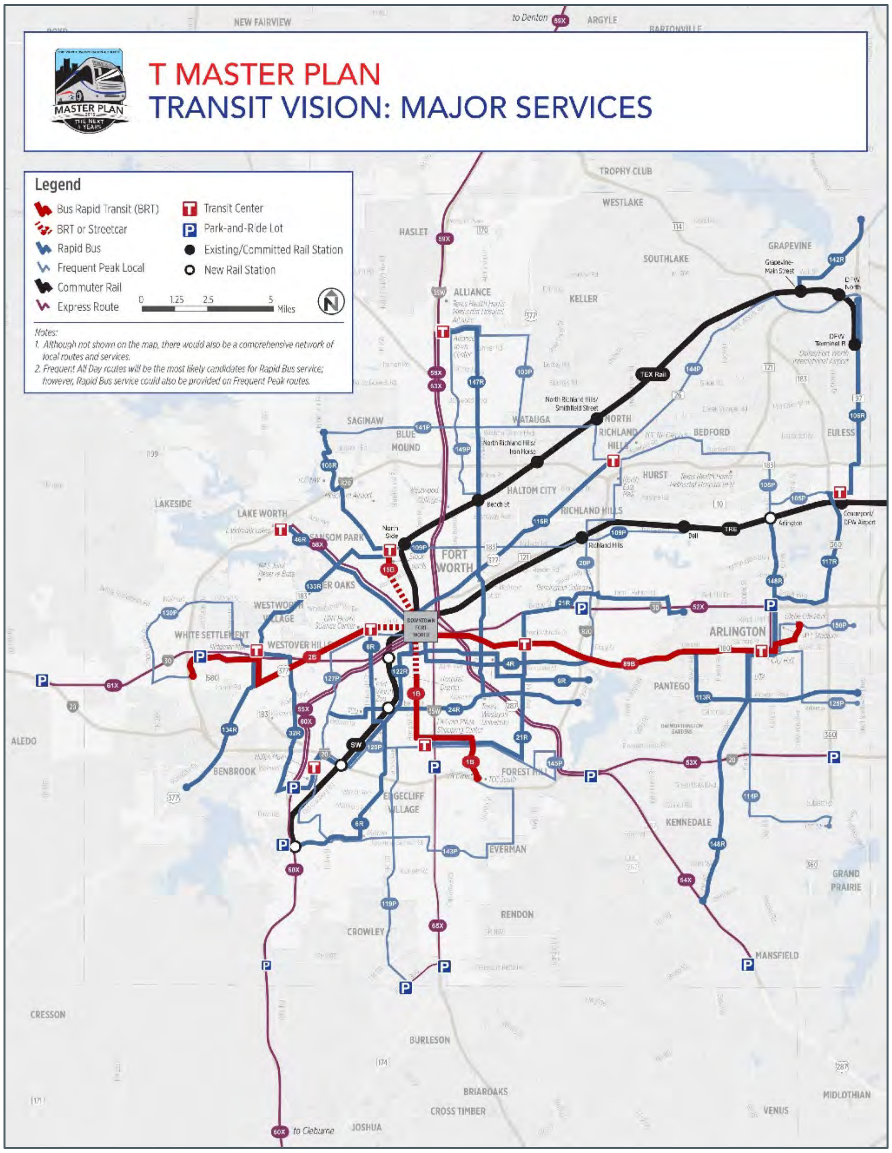

### Trinity Metro Master Plan

The Trinity Metro 2015 Master Plan provides a blueprint for transit projects in the Fort Worth-Tarrant county region over the next twenty years. Its goal is to identify opportunities to expand transit service to meet the growing needs of the region.

NRH is an area of significant growth and demand identified in the plan. Within the plan's major service vision, there is a frequent peak local bus that runs east into NRH connecting to the Smithfield TexRail station and then heading south to a transit center just north of the intersection of SH 183 and IH 820.

As transit continues to develop in Tarrant County, it is important that NRH provide input and coordinate closely with Trinity Metro on the location of transit routes and stops within the City. Accessibility to local transit should be considered by NRH to enhance service to the entire community and fully leverage the two TEX Rail stations within the City.

*Figure C-8. Trinity Metro Master Plan Transit Vision*



# New Mobility Technologies

A convergence of mobility technologies is developing in the marketplace, including:

- Data and connected technology
- Autonomous vehicles
- Shared-use mobility
- Electrification of vehicles

Advances in these key areas will change the way people travel through cities. Each trend or technology is developing at an independent rate, but the maturation of all will be transformative to the mobility environment in cities.

## Data and Connected Technology

Big Data is a term used to describe the real-time information that is transmitted from internet-enabled devices, such as: cell phones, cars, wearables, kitchen appliances, or thermostats. Individually, the data collected by a device is of limited use, such as location, speed, motion, vibration, or temperature. However, when the data of all devices in use is compiled and analyzed, it can provide powerful, real-time information about important factors that impact cities; such as congestion or electrical and water consumption.

Data collection and management have a long history in cities, but a wider variety of sources are appearing, including Bluetooth and smart phone data as well as connected Dedicated Short-Range

## Parking

The location, capacity, and demand for parking can have major impacts on traffic. Today there are numerous apps and devices related to parking. This technology includes:

- Web-connected sensors in pavement that help people find, reserve and/or book a parking spot,
- Smart-meters that allow drivers to pay and reload their parking meter via phone, and
- Sensors that count, and in some cases, display where and how many open spots are in a parking structure.

With a greater understanding of parking needs, cities can identify parking improvement projects that could help improve traffic circulation and flow along roadways.

Communications (DSRC) infrastructure. Partnerships with private companies collecting app and crowdsourced data, such as Waze and Strava, are vital to increasing the data streams available for NRH to continue making strategic decisions and tracking specific outcomes.

## Autonomous Vehicles

Autonomous, or self-driving, vehicles are beginning to emerge in pilot programs throughout North Texas and the United States. These tests are needed to understand the impact of this technology, the current shortcomings, and begin to educate the public on this technology. Autonomous vehicles are expected to enter the mainstream marketplace within the 2030 horizon of this planning study. Organizations like NCTCOG and the Texas Innovation Alliance, along with universities and research institutions, are a valuable research to municipalities, like NRH, to understand the impacts of this technology.

## Shared-use Mobility

Shared-use mobility includes an array of modes but all founded on a behavioral model of shared transportation services. This includes public transit, carsharing, ridesharing (car-pooling, van-pooling), ride-hailing (i.e. Uber, Lyft), bikesharing, scooter sharing, and shuttle services. Through this shared use of capital assets, mobility transforms into a service, i.e. mobility-as-a-service (MaaS). The combination of these shared services leads to increased mobility options and reducing car-dependence. With public transit, such as TEX Rail, in place, shared-use mobility can also provide a first-mile/last-mile solution to feed that service.

## Electric Vehicles

The electrification of vehicles, replacing the internal combustion engine, leads to reduced emissions, total cost of vehicle ownership, and energy usage in the transportation sector. While automation and shared-use mobility offer a shift in travel behavior, electrification's major impact is to the environment and supportive infrastructure. The movement toward electrification of vehicles necessitates the evaluation of economies and land uses that support driving. This includes developments such as gas stations and oil change facilities, which could become increasingly obsolete or transform to serve new needs in electric vehicles. This also includes the rise in a need for electric charging stations in parking lots and garages.

# Applicability

Mobility in a community is a pathway to opportunity. New mobility technologies emerging in the marketplace must be shaped to serve the needs of the City by providing access, safety, and affordability to all users. Cities must stand united in partnering to advance these technologies while also providing policies and actions that harness them for the good of the community.

## Mapping and Analytics

With more and more data being made available to cities, data mapping and analytics is a significant and broad area of municipal operation that stands to be greatly improved. Many applications, such as GIS, now have data collection tools related to transportation and issue reporting. In order to interpret and articulate data trends, it is important that the cities begin to create databases about mappable issues.

Crowdsourcing is a form of data collection in which, through an app linked to GIS, members of the public can upload photos, text, and create reports that are georeferenced and uploaded to the city in real-time. In addition to saving city resources, crowdsourcing can help cities continually gather information about current issues and needs.

## Mobility Hubs

"Mobility Hubs provide a focal point in the transportation network that seamlessly integrates different modes of transportation, multi-modal supportive infrastructure, and place-making strategies to create activity centers that maximize first-mile last mile connectivity." – *LADOT Mobility Hubs: A Reader's Guide*

## Mobility Hubs

Mobility hubs, developed around the intersection of different transportation modes, can help bring these new mobility technologies together and develop an atmosphere for easier multimodal travel. Through a concentration of working, living, shopping, and/or playing, it matches land use energy with transportation and placemaking functions to support diverse transportation options.

*Figure C-9. LADOT Mobility Hub Typologies; Source: LADOT Mobility Hubs A Reader's Guide*

| Mobility Hub Amenities | Bicycle Connections | | | Vehicle Connections | | | Bus Infrastructure | | Information-Signange | | | Support Services | | | | Active Uses | | Pedestrian Connections | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.1. Bike Share | 2.2. Bike Parking | 2.3. Bicycling Facilities | 3.1. Ride Share/Pick up-Drop off | 3.2. Car Share | 3.3. EV Charging Stations | 4.1. Bus Layover Zone | 4.2. Bus Shelters | 5.1. Wayfinding | 5.2. Real-time Information | 5.3. Wi-Fi / Smartphone Connectivity | 6.1. Ambassadors | 6.2. Waiting Area | 6.3. Safety and Security | 6.4. Sustainable Approach | 7.1 Retail | 7.2. Public Space | 8.1. To the Mobility Hub | 8.2. At the Mobility Hub |
| (N) Neighborhood | ● | ● | ■ | ■ | ○ | ○ | ■ | ○ | ● | ○ | ○ | ■ | ○ | ○ | ○ | ■ | ■ | ○ | ○ |
| (C) Central | ● | ● | ○ | ● | ● | ● | ○ | ● | ● | ● | ● | ○ | ○ | ● | ● | ○ | ● | ● | ● |
| (R) Regional | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ● | ● | ● |

Legend: Vital: ● Recommended: ○ Optional: ■

# D. Transportation Plan

North Richland Hills' (NRH) roadway system is largely built-out with most right-of-way acquired and facilities in place. Versatility is important in the future of this system as this policy document gives decisionmakers flexibility to address unforeseen issues that may arise during continued implementation phase.

# Design Decision Process

A context-sensitive approach was developed to provide flexibility in the thoroughfare network with defined movement-based functional classifications and place-based land use contexts. This duality in characterizing a roadway type allows evolution of the roadway sections and geometry with the continued maturation of the community. This is a change from the previous thoroughfare plan, which recommended specific right-of-way designations for each functional classification.

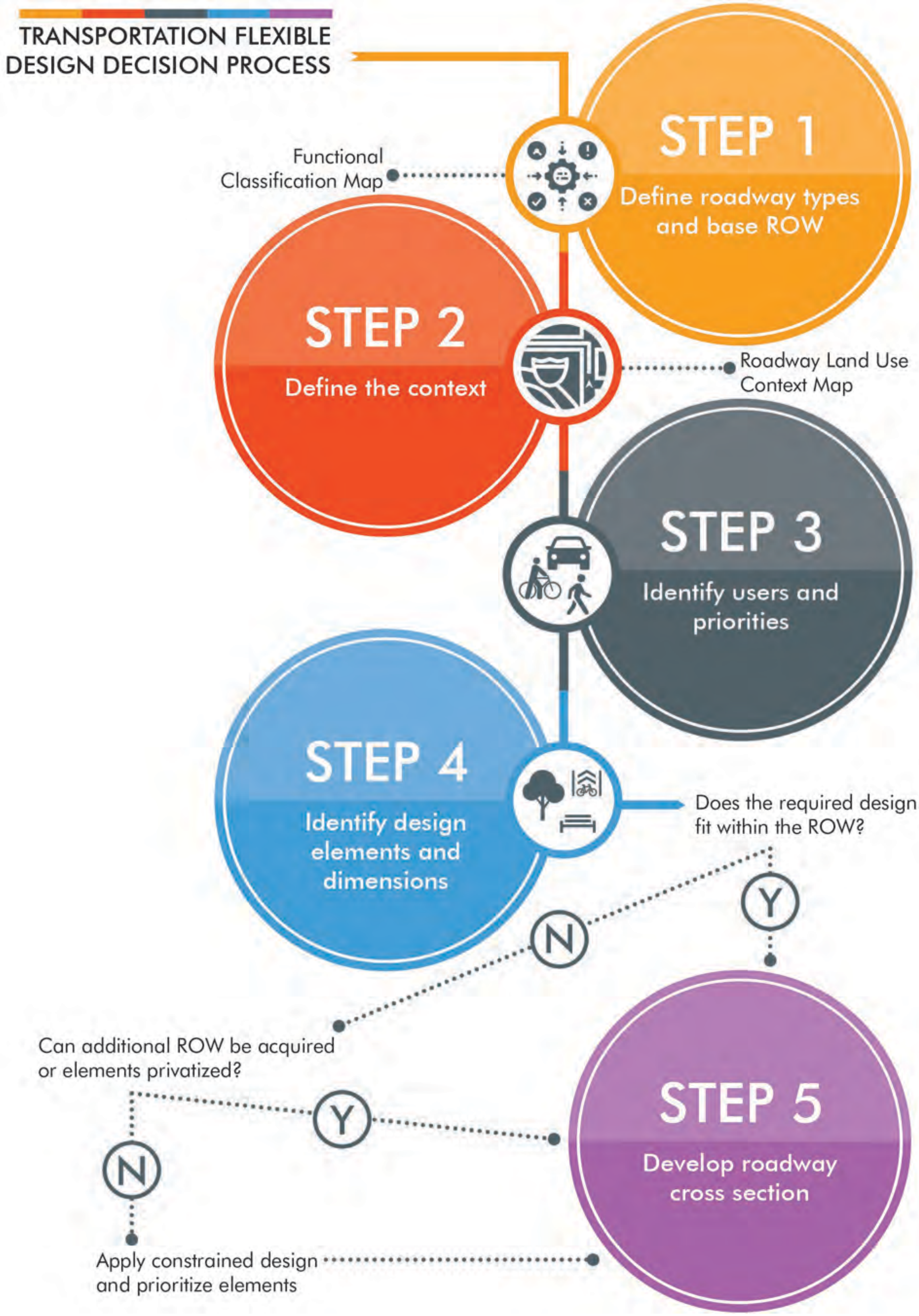
The Transportation Plan consists of foundational mapping elements, including:

- Functional Classification Map
- Land Use Context Map

Modal components, such as plans for bicycling, walking, and transit, then integrate into the design decision process for the complete multimodal implementation of transportation facilities. This plan only addresses the bicycle mode with the other modes to be evaluated in a future study.

Understanding transportation facility design as a process, the development of a street design and cross section entails the multiple elements of this Plan, including the functional classification mapping, with associated right-of-way envelope, land use context mapping, modal plans, and any additional specific design considerations. This process includes flexibility in the process, understanding that there are many demands within the right-of-way but limited space, so multiple elements must be considered and, if necessary, prioritized.

*Figure D-1. Design Decision Process*



As discussed in previous sections, intersection improvements and controls are vital in the optimal operation of roadway facilities. These are impactful to both vehicular capacity as well as continuity of comfortable facilities for active transportation users. Additional right-of-way may be necessary at intersections. A discussion of right-of-way and traffic control devices is found under the Design Guidelines section of this chapter.

A summary of the Design Decision Process and key maps is included in **Appendix A**.

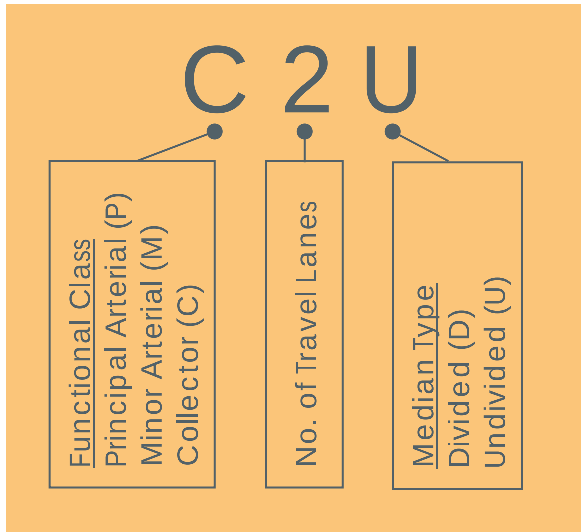
STEP 1

Define Roadway Types and Base ROW

# Functional Classifications

Seven thoroughfare types are proposed for the Transportation Plan. The functional classification defines the right-of-way (ROW) envelope required for the roadway. It also defines the mobility characteristics and function associated with the specific corridor in the context of the greater transportation network. This includes design speeds as well as parking permissions.

The functional classification map, **Figure D-2**, depicts both the functional classification as well as the link-level lane configuration. Labeled throughout the map, lane configurations, such as P6D, M4U, and C2U, identify the number of travel lanes and median type expected for the roadway. The type of medians, whether raised or two-way left turn lanes (TWLTL), are discretionary to the designer under the appropriate context sensitivity and traffic operation's needs.




The look and feel of corridors within a specific functional classification can vary to best serve the land use context of their surroundings. A typical roadway section may change from block to block, though the functional classification continues. These characteristics are associated with the land use context, described in the next section.

•**Freeways** are high-speed, limited access facilities that serve major regional movement. The freeway network includes the interstate, US, and State Highway roadways controlled by the Texas Department of Transportation (TxDOT) state DOT, including IH-820, SH 183, and SH 121.

•**Principal Arterials** serve as the primary route between key destinations within and the City and adjacent cities. Principal Arterials carry traffic across major segments of the city, with a primary function of throughput, rather than access. Examples include Boulevard 26, Mid-Cities Boulevard, and Davis Boulevard.

•**Minor Arterials** also carry traffic across major segments of the city, with a primary function of throughput, rather than access. Minor Arterials serve lower traffic than Principal Arterials and have a more limited influence segment. Examples include Harwood Road and Glenview Drive.

•**Major Collectors** serve as a conduit between local roadways and the network of arterials. Major Collector streets are differentiated from arterials by their length and degree of access to adjacent development. They are typically contiguous across one or more arterial roadways, but seldom more than one or two miles in length. Examples include Holiday Lane, Iron Horse Boulevard, and Smithfield Road.

•**Minor Collectors** also serve as a conduit between local roadways and the network of arterial streets. Minor Collector serve lower traffic volumes than Major Collectors and have more limited contiguous connections to arterials. Examples include Meadow Lakes Drive, Lola Drive, and Main Street.

•**TOD or HomeTown Streets** are roadways designated in the Regulating Plan serving a balance of all forms of mobility while maximizing convenience for residents and visitors. Roadway ROW, geometry, and amenities are defined in the Regulating Plan.

•**Local Streets** are low-speed, low-volume facilities fronting residential or commercial uses. These streets serve primarily for access to properties, rather than mobility.

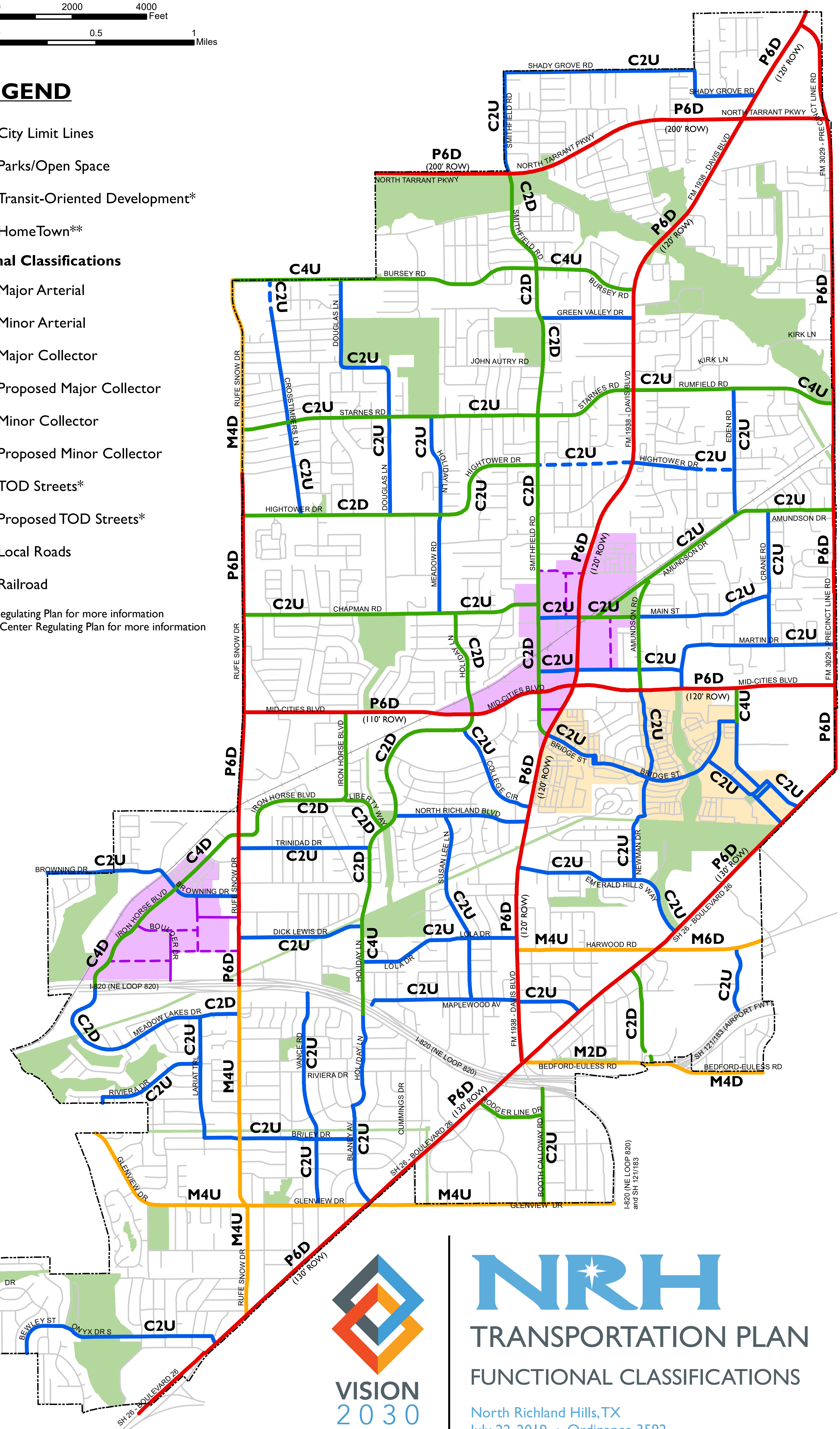
## LEGEND

- City Limit Lines
- Parks/Open Space
- Transit-Oriented Development*
- HomeTown**

**Functional Classifications**

- Major Arterial
- Minor Arterial
- Major Collector
- Proposed Major Collector
- Minor Collector
- Proposed Minor Collector
- TOD Streets*
- Proposed TOD Streets*
- Local Roads
- Railroad

* See TOD Regulating Plan for more information
** See Town Center Regulating Plan for more information




VISION 2030

# NRH
## TRANSPORTATION PLAN
### FUNCTIONAL CLASSIFICATIONS

North Richland Hills, TX
July 22, 2019 • Ordinance 3592

7/25/2019; Vision 2030_Transportation Plan_Functional Classification_20190722

## Right-of-Way

Right-of-way (ROW) is a key component in determining the feasible mobility and placemaking elements for a street design. A predictable ROW is necessary in order to require dedications from new development and determine the optimum locations for multimodal elements, like bikes, trails, and transit.

As a significant portion of the community is developed, the existing ROW along most corridors affects the possible elements of design. When limited ROW exists for the recommended modal elements and geometry, there are three options to proceed:

- **Acquire Additional ROW:** In areas of large setbacks or redeveloping properties, this option allows a wider envelope to fit all the recommended elements
- **Apply Compact Design**: Required and constrained geometric dimensions for design elements allow lane widths, sidewalks, and buffers to be minimized to fit the constrained ROW.
- **Prioritize Design Elements**: If neither additional ROW nor compact design accommodates the full multimodal demands of the corridor, then design elements can be prioritized (as discussed later in this chapter) through the project development process.

**Conventional Highway Design:**

Operating Speed ≠ Design Speed ≠ Posted Speed

**Proactive Urban Street Design:**

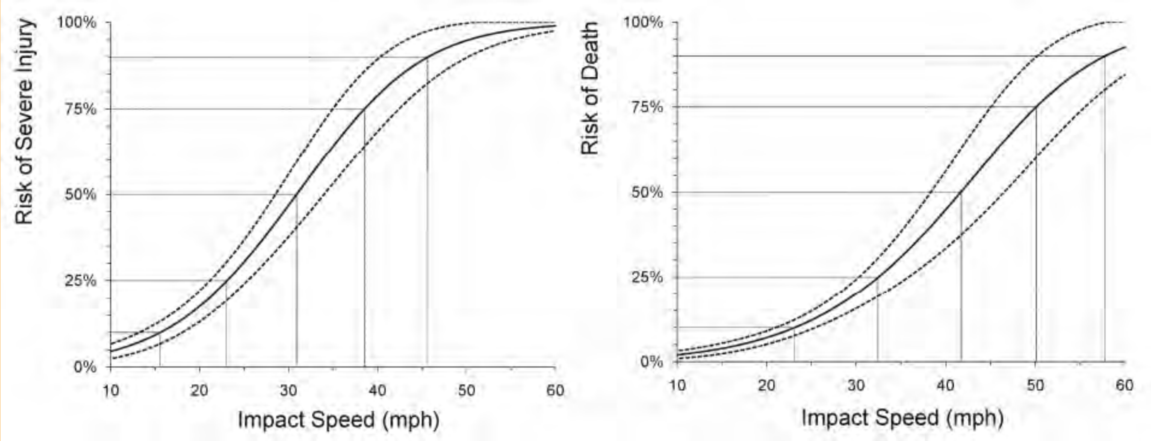
Target Speed = Design Speed = Posted Speed

## Design Speed

The City of NRH supports best management practices for safety. Embracing a proactive design approach, design speed and multimodal components are enforced through speed control mechanisms and physical separation of modes. **Table D-1** depicts the range of design speeds as well as the minimum bicycle facility type allowable for the various functional classifications.

Speed plays a critical role in the cause and severity of crashes. According to research, risk of pedestrian death is 10% at an impact speed of 23 mph. At 32 mph, the risk of death increases to 25% and doubles to 50% at just 42 mph. Pedestrians struck by vehicles traveling at 58 mph have a 90% risk of death. Risks vary also by age. For example, the average risk of severe injury or death for a 70-year old pedestrian struck by a car traveling at 25 mph is similar to the risk for a 30-year-old pedestrian struck at 35 mph. (AAA Foundation for Traffic Safety, 2011)

Design streets using target speed, the speed drivers are intended to go, rather than operating speed. This proactive design approach creates an




Impact Speed and a Pedestrian's Risk of Severe Injury or Death, September 2011
*Source: AAA Foundation for Traffic Safety*

environment where drivers respond to the street design and behave accordingly with slower speeds that are safer for vulnerable users. According to the National Association of City Transportation Officials' (NACTO) Urban Street Design Guide, "The maximum target speed for urban arterial streets is 35 mph. Some urban arterials may fall outside of built-up areas where people are likely or permitted to walk or bicycle. In these highway-like conditions, a higher target speed may be appropriate." In residential neighborhoods, designers should consider slower speeds as well to reduce to those safe for interaction with children at play and other unpredictable behavior.

Design speeds also feed into the minimum standard of protection needed for people on a bicycle to maintain safety for these users. Speed and volume best practices are discussed further in the Bicycle Facilities Plan section.

*"[H]uman behavior, which governs traffic engineering, is fundamentally adaptable, not fixed.* ***People adapt to their conditions****. Changing streets change behavior, meaning that a street designed for the fastest and worst driver may very well create more drivers who feel comfortable at faster and more unsafe speeds. A* ***proactive approach*** *uses design to affect desired outcomes,* ***guiding user behavior through physical and environmental cues****."*

NACTO Urban Street Design Guide

*Table D-1. Functional Classification Design Elements*

| FUNCTIONAL CLASSIFICATION | | | NO. OF TRAVEL LANES | ROW WIDTH (FEET) | DESIGN SPEED (MPH) | MEDIAN TYPE | ON-STREET BIKE FACILITY MINIMUM STANDARD | PARKING PERMITTED |
|---|---|---|---|---|---|---|---|---|
| ARTERIAL | MAJOR | P6D | 6 | VARIABLE | 40-55 | RAISED/TWLTL* | PROTECTED | NO |
| | MINOR | M6D | 6 | 110 | 40-45 | RAISED/TWLTL* | PROTECTED | NO |
| | | M4D | 4 | 80 | 35-45 | RAISED/TWLTL* | BUFFERED | NO |
| | | M4U | 4 | 70 | 35-45 | NONE | BUFFERED | NO |
| | | M2D | 2 | 70 | 30-35 | RAISED/TWLTL* | BUFFERED | SOME |
| COLLECTOR | MAJOR | C4D | 4 | 68 | 30-35 | RAISED/TWLTL* | BUFFERED | SOME |
| | | C4U | 4 | 68 | 30-35 | NONE | BUFFERED | SOME |
| | | C2D | 2 | 68 | 30-35 | RAISED/TWLTL* | SIGNED ROUTE | SOME |
| | | C2U | 2 | 68 | 30-35 | NONE | SIGNED ROUTE | SOME |
| | MINOR | C2U | 2 | 60 | 30-35 | NONE | BICYCLE BOULEVARD | SOME |
| LOCAL | | R2U | 2 | 50 | 30 | NONE | BICYCLE BOULEVARD | YES |

*TWLTL = Two-way Left Turn Lane

## Typical Roadway Capacities

NCTCOG has established planning guidelines for threshold values of traffic carrying capacity by facility type. For general planning purposes, the capacities for roadway configurations are shown in **Table D-2**. These values can be used when considering roadways for the need for widening. They also can be used for initial assessments of the potential for lane reductions of existing roadways to add bike lanes or to rightsize a roadway during a reconstruction project.

*Table D-2. Roadway Hourly Capacities*

| Roadway Hourly Capacities (Suburban Residential Context) | |
|---|---|
| Functional Class | Hourly Capacity per Lane Divided (Undivided) |
| Freeway | 2,225 (N/A) |
| Principal Arterial | 925 (875) |
| Minor Arterial | 900 (825) |
| Collector | 575 (525) |

Source: NCTCOG Travel Demand Model description
Note: LOS for D/E threshold

STEP 2

Define the Context

## Land Use Context

Transportation investments are not constrained to impacts or influence within the right-of-way. While it primarily affects mobility, connectivity, and accessibility, roadways also impact the community character and design. Pairing with the functional classifications of roadways, land use contexts are assigned to each major facility. These contexts help define the local environment surrounding a corridor so street design can be sensitive to these community characteristics, known as context sensitive design.

## Right-of-Way Zones

As NRH continues to mature as a community, essential functions within the right-of-way become more diverse to serve existing and emerging activity. The modal elements of the Transportation Plan define investment networks that add activity to certain corridors. Since every function cannot be accommodated within the right-of-way, a framework for integration and prioritization of functions must be developed.

| CORE FUNCTIONS OF THE RIGHT-OF-WAY |
|---|
| **Mobility** |
| Accommodates the movement of people and goods towards their destinations. |
| **Access for people** |
| Allows for people to get on or off the mobility system en-route to or from a destination. Access for people can be provided in many ways: short-term on-street parking, a bus stop, or a bike rack. |
| **Access for commerce** |
| Accommodates deliveries of goods and site services. Ensuring adequate access for commerce facilitates the delivery of goods and materials while aiding service providers' access in and out of buildings. |
| **Storage** |
| Provides for on-street parking for vehicles and temporary accommodation of construction activities that intrude in the ROW. |
| **Greening** |
| Enhances environmental sustainability by planting and/or installing street trees, planter boxes, and vegetated curb extensions, adding to aesthetic conditions and the environmental health of the built environment. |
| **Activation** |
| Recognizes that placemaking is an important function of the public ROW. It creates vibrant streetscapes and serves an essential placemaking function. This can include street cafes, parklets, and food trucks. |

Three (3) basic zones, shown in **Figure D-3**, are embedded in the right-of-way:

**Travelway:** Primarily used for mobility purposes. Travel lanes can serve all modes or be dedicated to serve specific modes, such as bicycles or transit.

**Pedestrian Realm:** Comprised of sub-zones, including frontage, clear walk, and buffer zones, this area lies between the property line and the flex or travelway zones. This space includes the sidewalk, planting areas, street furniture, lighting, and other pedestrian and business amenities.

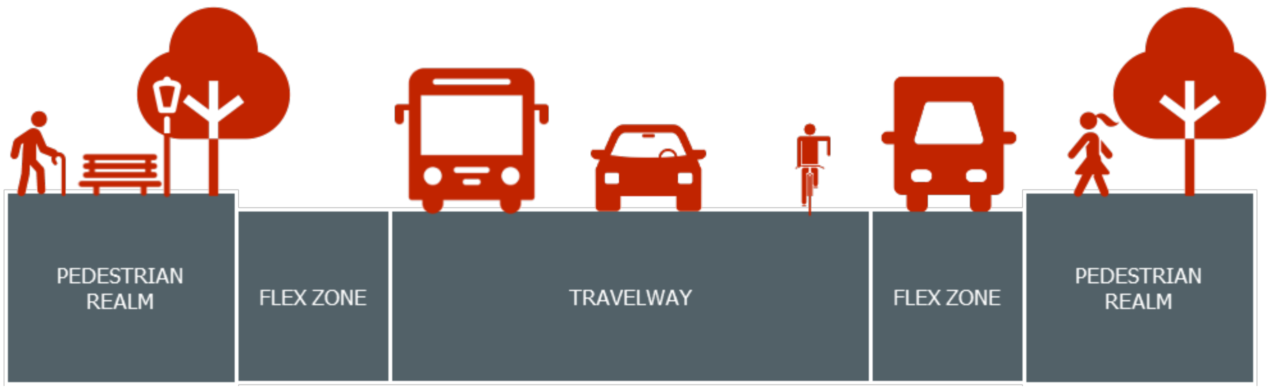
**Flex Zone:** A transition area between the travelway and pedestrian realm, this area provides space for people and goods to transition between moving vehicles and people in the pedestrian realm. This zone can contain multiple uses along a street including: on-street parking, passenger loading, commercial deliveries, and parklets, which are street-side miniature parks that provide a place for people to sit while enjoying the activity of the street.

## Right-of-Way Functions

The right-of-way has functions which are not mode-specific and can be achieved through various uses and treatments for different modes and spaces along a corridor. There are six core functions of the ROW, as shown on the right.

The right-of-way zones and associated functions integrating transportation and land use components together are shown in **Figure D-3**.

*Figure D-3. ROW Zones and Functions*




| | Definition | Travelway | Flex Zone | Pedestrian Realm |
|---|---|---|---|---|
| Mobility | Moves people and goods | ✓ | ✓ | ✓ |
| Access for People | People arrive at their destination or transfer between different travel modes | | ✓ | ✓ |
| Access for Commerce | Goods and services reach their customers and markets | | ✓ | ✓ |
| Storage | Provides temporary parking and/or storage of vehicles or equipment | | ✓ | |
| Greening | Enhances aesthetics and environmental health | | ✓ | ✓ |
| Activation | Offers vibrant social spaces | | ✓ | ✓ |

## Context Zones

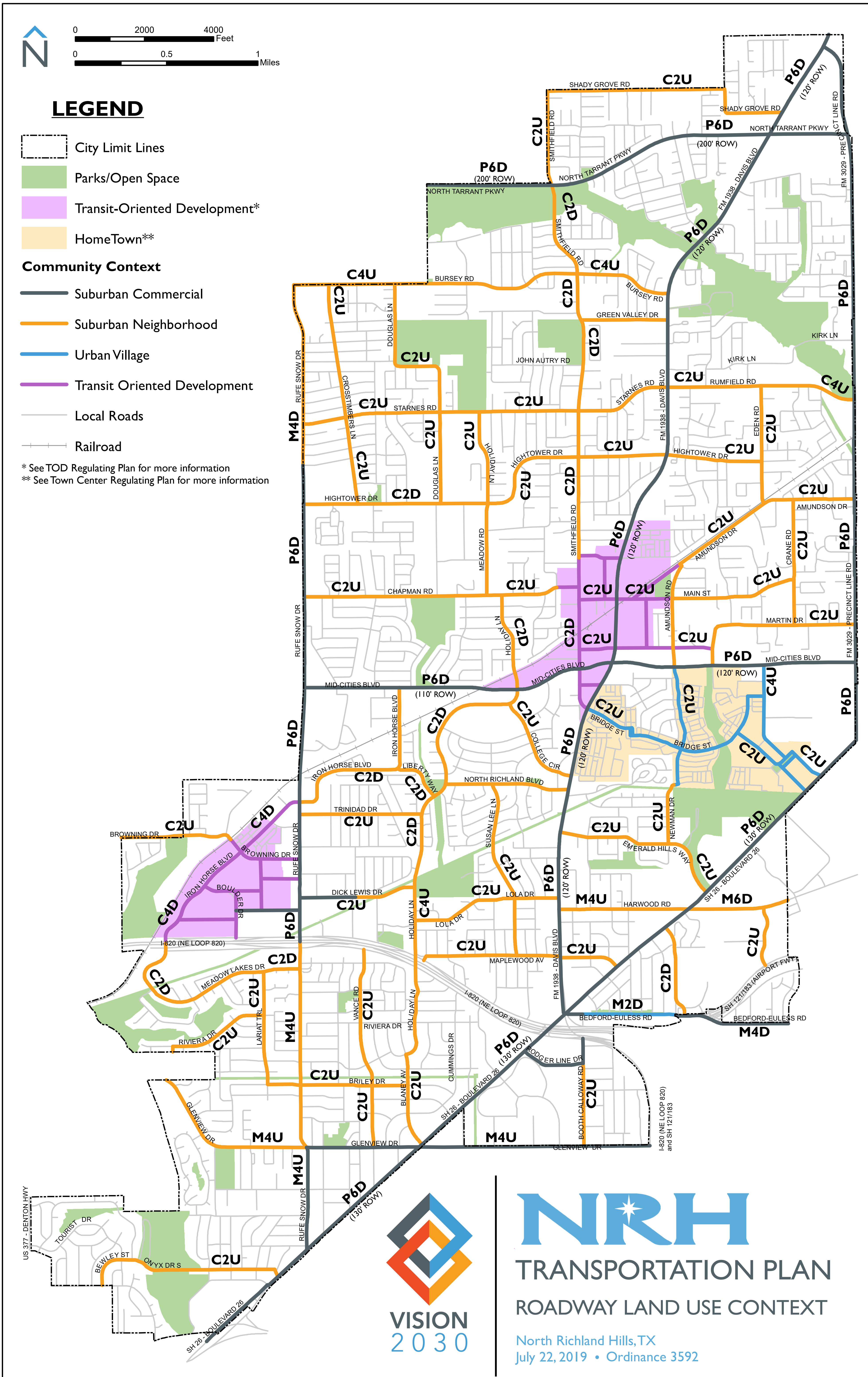
Contexts were divided into four (4) categories that outline characteristics of the roadway related to land use, travelway, flex zone, pedestrian realm, and the modal user hierarchy. The four contexts are defined in **Table D-3**, and include:

Land use contexts are defined in **Figure D-4** but are meant to be revised and updated as development continues. As development intensifies in key areas, like the City Point urban village or Bedford-Euless Road corridor, land use contexts should be re-evaluated in the implementation of corridors to ensure a context sensitivity.

| FOUR CONTEXT ZONES |
| --- |
| **Suburban Commercial** |
| A mix of commercial, retail, and office land uses with larger suburban building setbacks. |
| **Suburban Residential** |
| Primarily residential development with occasional neighborhood commercial or retail uses. On low volume facilities, homes may front the roadway. |
| **Transit-Oriented Development (TOD)** |
| Higher density mixed use environment with minimal building setbacks. These areas are defined by the Transit-Oriented Development Regulating Plan. |
| **Urban Village** |
| Similar to TOD areas, this context includes a mixed use of residential, commercial, retail, and office with minimal building setbacks. This includes defined areas like HomeTown as well as emerging urban centers. |

*Table D-3. Land Use Context Definitions*

| | Suburban Commercial | Suburban Neighborhood | Transit Oriented Development | Urban Village |
|---|---|---|---|---|
| Land Use | Mix of uses: office, retail, restaurant, commercial<br>Larger suburban building setbacks | Primarily residential<br>Occasional neighborhood retail, restaurant, commercial<br>Home frontages on low volume facilities | Mix of uses: residential, office, retail, restaurant, commercial<br>Higher densities<br>Minimal building setbacks | Mix of uses: residential, neighborhood office, retail, restaurant<br>Minimal building setbacks<br>Higher densities |
| Travelway | Mobility focus<br>Higher speeds and volumes<br>Access management<br>Raised medians<br>Transit routes<br>Freight routes | Local resident access and circulation<br>Low to moderate speeds and volumes<br>Transit routes<br>On-street bicycle facilities | Low speeds and volumes<br>Transit routes<br>On-street bicycle facilities | Low speeds and low to moderate volumes<br>Transit routes<br>On-street bicycle facilities |
| Flex Zone | No on-street parking<br>Dedicated turn lanes<br>Transit stops | On-street parking for home frontages<br>Occasional transit stops | On-street parking common<br>Freight delivery zones<br>Pick-up/drop-off zones<br>Activation spaces (food trucks, festivals) | On-street parking common<br>Pick-up/drop-off zones<br>Activation spaces (food trucks, festivals) |
| Pedestrian Realm | Sidewalks<br>Off-street bicycle facilities<br>Transit stops | Sidewalks<br>Off-street bicycle facilities (if ROW is available)<br>Transit stops<br>Plantings (street trees, rain gardens) | Sidewalks<br>Activation spaces (parklets, outdoor dining, public art)<br>Bicycle parking<br>Transit stops<br>Plantings (street trees, rain gardens) | Sidewalks<br>Activation spaces (parklets, outdoor dining, public art)<br>Bicycle parking<br>Transit stops<br>Plantings (street trees, rain gardens) |




7/25/2019; Vision 2030_Transportation Plan_Roadway Contexts_20190722

## STEP 3

Identify Users and Priorities

# User Hierarchy

Within each combination of functional classification and land use context, there must be a balance between users. As the roadway function transitions from high-speed mobility to local access and from suburban to urban, travel mode considerations shift from vehicular travel to walking and biking. For each combination of functional classification and land use context, a modal hierarchy is defined and is designated as either low-, mid-, or high-priority.

The prioritization of multiple travel modes and users is also dependent upon the modal plans set forth by the City. A later section in this chapter details the Bicycle Facilities Plan with major routes and facilities identified. Future planning in pedestrian or transit master plans in NRH should also serve as an input into the design process for each road. These modal plans inform the design decisions needed to balance the range of demands on the limited right-of-way for each corridor. As the community continues to mature, these modals plans can be developed and updated to enhance the design decision process.

The specific modal priorities for consideration are identified in Step 5: Cross Section Development.

## STEP 4

Identify Design Elements and Dimensions

# ROW Zone Design Elements

Specific design elements in the right-of-way zones impact the design of the roadway. With multimodal corridors, each mode requires special consideration of facility type and dimensions, typically defined in the modal plan. For example, bike facilities have a range of options for separation type, lane width, and even on-street versus off-street location within the right-of-way. Other design elements like intersection treatments, street lighting, street furniture, driveways, and medians all also impact the design process. These elements are discussed later chapter under Design Guidelines and Special Considerations.

STEP 5

Develop Roadway Cross Section

# Cross Section Development

The development of cross sections follows the design decision process (**Figure D-1**) which precludes standard typical sections by functional classification. Rather, the development of cross sections and associated dimensions builds from a matrix of functional classification and land use context. Design and prioritization decisions are made solely by the City (staff and City leadership) to serve both neighborhood needs as well as the development of the overall transportation network.

The following tables, organized by land use context, provide the necessary information to build cross sections flexible to the community context.

- Suburban Commercial (**Table D-4**)
- Suburban Neighborhood (**Table D-5**)
- Urban Village (**Table D-6**)
- Transit-Oriented Development (see TOD Regulating Plan)

Note that dimensions for the Transit-Oriented Development context is not provided as it is determined by the TOD Regulating Plan. Also, streets within the HomeTown district are regulated by the Town Center Regulating Plan.

By finding the appropriate context table, columns of associated functional classifications provide the designer with a list of dimensions for key roadway features within each of the three ROW zones (**Figure D-3**). These dimensions are split into two categories:

- Required
- Constrained

In the development of a roadway cross section, the designer should begin with the required dimensions. Rather than beginning with minimums, especially for bike and pedestrian infrastructure, the designer can begin from an initial design then narrow roadway elements as necessary in constrained conditions.

When constrained right-of-way conditions are present, the design decision process (**Figure D-1**) guides the designer in problem solving by

- Acquiring more right-of-way,
- Applying compact design, or
- Prioritizing modal elements.

When a larger ROW is not feasible, the designer can consider narrower element dimensions than the required widths with the constrained dimensions in the tables serving as the minimum allowable.

If a constrained design containing the full multimodal elements continues to exceed the available ROW, the modal elements can then be prioritized. At the top of each table, prioritization categories are provided for walking, biking, and driving. These are rated as low, mid, or high priority modes within the land use and mobility context of each facility type.

*Table D-4. Suburban Commercial Context Design Table*

| Suburban Commercial | MAJOR ARTERIAL | | MINOR ARTERIAL | | COLLECTOR | | LOCAL | |
|---|---|---|---|---|---|---|---|---|
| | MODAL PRIORITY | | MODAL PRIORITY | | MODAL PRIORITY | | MODAL PRIORITY | |
| | **Walk** | LOW | **Walk** | MID | **Walk** | MID | **Walk** | HIGH |
| | **Bike** | LOW | **Bike** | MID | **Bike** | HIGH | **Bike** | HIGH |
| | **Drive** | HIGH | **Drive** | HIGH | **Drive** | HIGH | **Drive** | MID |
| **Right-of-Way** | 120' to 130' | | 70' to 80' | | 68' | | 50' | |
| Travelway | | | | | | | | |
| **Total Pavement Width[1] (FOC-FOC, Excluding Parking)** | 64' to 86' | | 33' to 60' | | 30' to 60' | | 30' | |
| **No. of Travel Lanes** | 6 | | 2-4 | | 2-4 | | 2 | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **Outside Travel Land Width[1]** | 12' | 12' | 12' | 11' | 12' | 11' | 15' | N/A |
| **Travel Lanes Width** | 12' | 10' | 11' | 10' | 11' | 10' | N/A | N/A |
| **Center Turn Lane Width** | 14' | 11' | 14' | 11' | 14' | 11' | N/A | N/A |
| **Raised Median** | 18' | 14' | 18' | 14' | 18' | 14' | N/A | N/A |
| Flex Zone | | | | | | | | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **On-Street Bicycle Facilities[2]** | | | | | | | | |
| Separated Bike Lanes *(Preferred)* | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | N/A | N/A |
| Buffered Bike Lanes | N/A | N/A | 6' (Clear) 3' (Buffer) | 5' (Clear) 2' (Buffer) | 6' (Clear) 3' (Buffer) | 5' (Clear) 2' (Buffer) | N/A | N/A |
| Conventional Bike Lanes | N/A | N/A | N/A | N/A | 6' | 5' | 6' | 5' |
| Bicycle Boulevard/Signed Route | N/A | N/A | N/A | N/A | Optional | Optional | Optional | Optional |
| **Parking (Parallel)** | N/A | N/A | N/A | N/A | 8' | 7' | 8' | 7' |
| Pedestrian Realm | | | | | | | | |
| **Amenity Zone[3]** | 10' | 6' | 8' | 4' | 6' | 4' | 4' | 0' |
| **Clear Sidewalk (Shared Use Path)** | 7' (12') | 5' (8') | 7' (12') | 5' (8') | 6' | 5' | 5' | 4' |
| **Setback/Shy Distance[4]** | 4' | 2' | 1' | 0' | 1' | 0' | 1' | 0' |

[1] Two-lane undivided collector facilities shall maintain a minimum pavement width of: 30' if no parking; 36' if parking on only one side; and 40' if parking on both sides.

[2] See Pattern Book for further details on bicycle facility design

[3] Includes up to face-of-curb

[4] Space between edge of vehicle lane and sidewalk

*Table D-5. Suburban Neighborhood Context Design Table*

| Suburban Neighborhood | MINOR ARTERIAL | | COLLECTOR | | LOCAL | |
|---|---|---|---|---|---|---|
| | MODAL PRIORITY | | MODAL PRIORITY | | MODAL PRIORITY | |
| | **Walk** | MID | **Walk** | MID | **Walk** | HIGH |
| | **Bike** | MID | **Bike** | HIGH | **Bike** | HIGH |
| | **Drive** | HIGH | **Drive** | HIGH | **Drive** | MID |
| **Right-of-Way** | 70' to 110' | | 60' to 68' | | 50' | |
| Travelway | | | | | | |
| **Total Pavement Width[1] (FOC-FOC, Excluding Parking)** | 42' to 82' | | 30' to 60' | | 30' | |
| **No. of Travel Lanes** | 4-6 | | 2-4 | | 2 | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **Outside Travel Land Width[1]** | 12' | 11' | 11' | 11' | 15' | N/A |
| **Travel Lanes Width** | 11' | 10' | 11' | 10' | N/A | N/A |
| **Center Turn Lane Width** | 12' | 10' | 12' | 10' | N/A | N/A |
| **Raised Median** | 18' | 14' | 18' | 14' | N/A | N/A |
| Flex Zone | | | | | | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **On-Street Bicycle Facilities[2]** | | | | | | |
| Separated Bike Lanes *(Preferred)* | 7' (Clear)<br>6' (Barrier) | 5' (Clear)<br>2' (Barrier) | 7' (Clear)<br>6' (Barrier) | 5' (Clear)<br>2' (Barrier) | N/A | N/A |
| Buffered Bike Lanes | 6' (Clear)<br>3' (Buffer) | 5' (Clear)<br>2' (Buffer) | 6' (Clear)<br>3' (Buffer) | 5' (Clear)<br>2' (Buffer) | N/A | N/A |
| Conventional Bike Lanes | N/A | N/A | 6' | 5' | 6' | 5' |
| Bicycle Boulevard/Signed Route | N/A | N/A | Optional | Optional | Optional | Optional |
| **Parking (Parallel)** | 8' | 7' | 8' | 7' | 8' | 7' |
| Pedestrian Realm | | | | | | |
| **Amenity Zone[3]** | 8' | 4' | 6' | 4' | 4' | 0' |
| **Clear Sidewalk (Shared Use Path)** | 7' (12') | 5' (8') | 6' (10') | 5' (8') | 5' | 4' |
| **Setback/Shy Distance[4]** | 1' | 0' | 1' | 0' | 1' | 0' |

[1]Two-lane undivided collector facilities shall maintain a minimum pavement width of: 30' if no parking; 36' if parking on only one side; and 40' if parking on both sides.

[2]See Pattern Book for further details on bicycle facility design

[3]Includes up to face-of-curb

[4]Space between edge of vehicle lane and sidewalk

*Table D-6. Urban Village Context Design Table*

| Urban Village | MINOR ARTERIAL | | COLLECTOR | | LOCAL | |
|---|---|---|---|---|---|---|
| | MODAL PRIORITY | | MODAL PRIORITY | | MODAL PRIORITY | |
| | **Walk** | HIGH | **Walk** | HIGH | **Walk** | HIGH |
| | **Bike** | HIGH | **Bike** | HIGH | **Bike** | HIGH |
| | **Drive** | HIGH | **Drive** | MID | **Drive** | LOW |
| **Right-of-Way** | 70' to 110' | | 60' to 68' | | 50' | |
| Travelway | | | | | | |
| **Total Pavement Width[1] (FOC-FOC, Excluding Parking)** | 42' to 82' | | 30' to 60' | | 30' | |
| **No. of Travel Lanes** | 4-6 | | 2-4 | | 2 | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **Outside Travel Land Width[1]** | 12' | 11' | 11' | 11' | 15' | N/A |
| **Travel Lanes Width** | 11' | 10' | 11' | 10' | N/A | N/A |
| **Center Turn Lane Width** | 12' | 10' | 12' | 10' | N/A | N/A |
| **Raised Median** | 18' | 14' | 18' | 14' | N/A | N/A |
| Flex Zone | | | | | | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **On-Street Bicycle Facilities[2]** | | | | | | |
| Separated Bike Lanes *(Preferred)* | 7' (Clear)<br>6' (Barrier) | 5' (Clear)<br>2' (Barrier) | 7' (Clear)<br>6' (Barrier) | 5' (Clear)<br>2' (Barrier) | N/A | N/A |
| Buffered Bike Lanes | 6' (Clear)<br>3' (Buffer) | 5' (Clear)<br>2' (Buffer) | 6' (Clear)<br>3' (Buffer) | 5' (Clear)<br>2' (Buffer) | N/A | N/A |
| Conventional Bike Lanes | N/A | N/A | 6' | 5' | 6' | 5' |
| Bicycle Boulevard/Signed Route | N/A | N/A | Optional | Optional | Optional | Optional |
| **Parking (Parallel)** | 8' | 7' | 8' | 7' | 8' | 7' |
| Pedestrian Realm | | | | | | |
| **Amenity Zone[3]** | 8' | 4' | 6' | 4' | 4' | 0' |
| **Clear Sidewalk (Shared Use Path)** | 7' (12') | 5' (8') | 6' | 5' | 5' | 4' |
| **Setback/Shy Distance[4]** | 1' | 0' | 1' | 0' | 1' | 0' |

[1] Two-lane undivided collector facilities shall maintain a minimum pavement width of: 30' if no parking; 36' if parking on only one side; and 40' if parking on both sides.

[2] See Pattern Book for further details on bicycle facility design

[3] Includes up to face-of-curb

[4] Space between edge of vehicle lane and sidewalk

# Bicycle Facilities Plan

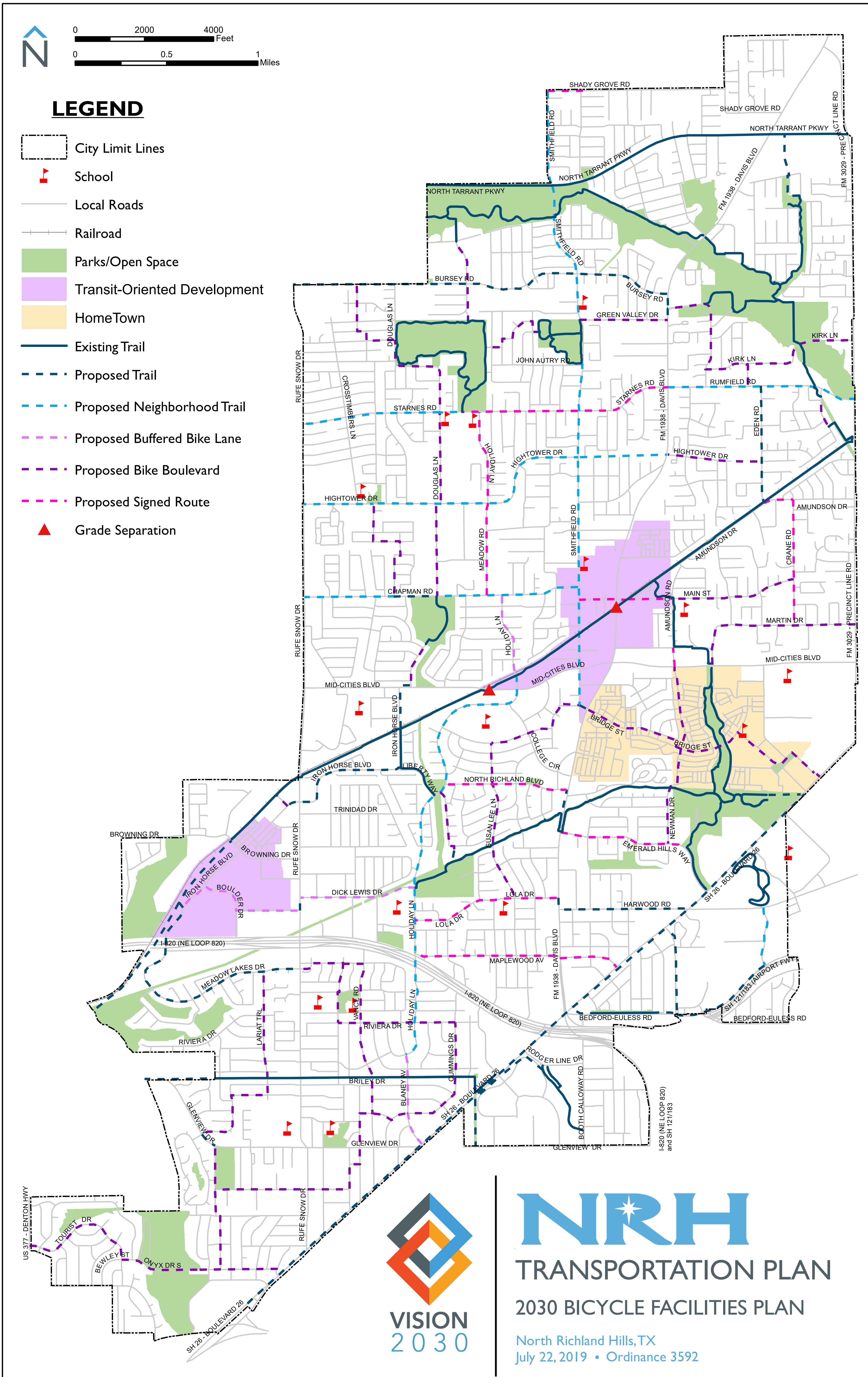
The Bicycle Facilities Plan is built on the previous work by the City in the 2016 Trail and Route System Plan, which created a framework for investments in bicycle infrastructure. These routes and facilities were then evaluated for the roadway volumes and speeds as well as land use contexts to determine suitable facility recommendations. The Bicycle Facilities Plans are broken up into two different maps – a 2030 Plan (**Figure D-5**) and a Vision Plan (**Figure D-6**). The key difference in the two plans is that the 2030 Plan addressed recommendations that can be accomplished by the year 2030, and the Vision Plan provides a network of facilities that is still achievable and provides the most comfortable facility network possible with the current and predicted constraints. The 2030 Plan will help the City prioritize projects and see the bigger picture. It also provides the roadmap of facilities that can implement a network that can be improved over time through the identification of corridors and destinations that create a complete north-south and east-west network. The Vision Plan takes the 2030 network and raises the bar on the facility type to develop a network of trail types to separate users from vehicular traffic, increase user comfort, and increase ridership.

Both plans started with the existing network of trails and bicycle facilities, the proposed trails in the NCTCOG 2045 Veloweb, and the schools, parks, transit stations, community amenities, and other key destinations. North Richland Hills and the NCTCOG region is blessed with several world-class trail facilities. Connecting to these trails with additional network in the street right-of-way will not only bolster these existing trails, but also will provide multimodal access into NRH, the TODs, and destinations off the main trails. The Cotton Belt Trail, John Barfield Trail, North Electric Trail, JoAnn Johnson Trail, and Walker's Creek Trail were all key trail corridors that the maps strove to connect with neighborhoods and key destinations to enhance their use and accessibility. There were strong desire lines along existing roadways to complete the network, but many of these corridors are on busier streets, narrow available right-of-way, and the amount of investment to make them safe routes would not be feasible by the target year of 2030. The key north-south roadway corridors are Smithfield Road and Holiday Lane. The east-west network roadways are Starnes Road, Hightower Drive, and Chapman Road. The remainder of the network is connected by on-street and off-street facilities.

The 2030 Plan expands the Veloweb network locally with additional trails, on-street buffered bike lanes, bike boulevards and signed route networks. Some of the main trail extensions were on the west end of the Cotton Belt Trail and small trail segment connections through available park and easement property. Some of the main roadway corridors have existing sidewalks that can be signed and enhanced to become a neighborhood trail system. This type of network development that utilizes existing infrastructure will allow the City to focus on making intersections and crossings improvements and save funding for bigger projects that provide more impact to the system. It also looked at where to make grade separated crossings, and the main crossings were for the Cotton Belt Trail at Mid-Cities Boulevard and Davis Boulevard.

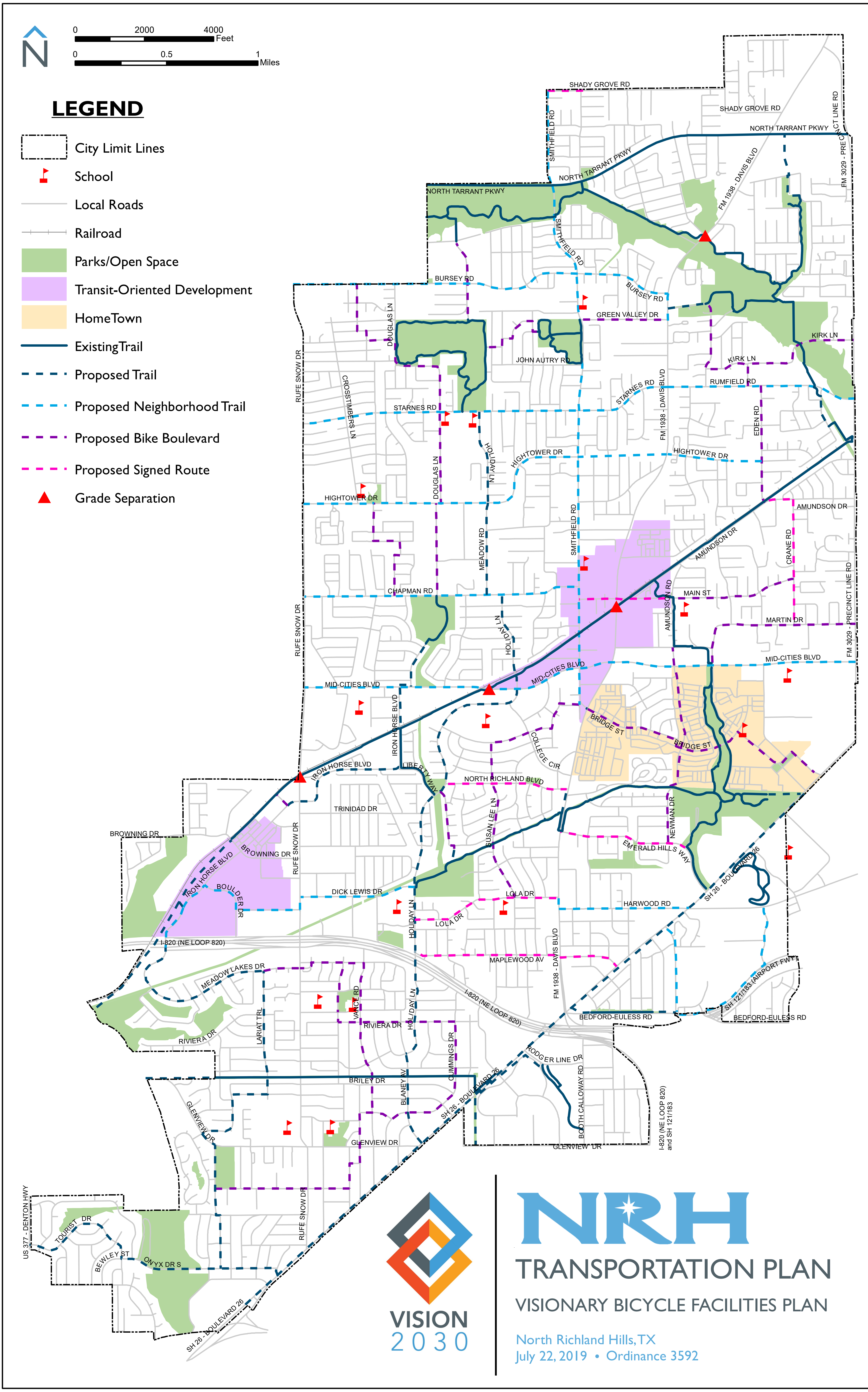
The Vision Plan took the network developed on the 2030 Plan and evaluated where it was possible to improve the 2030 recommendations to be trails and off-street facilities. This plan also looked at additional segments that could be used to close gaps and used the proper facility type to connect similar facilities. The desire was not for users to have to go from a trail, to bike boulevard, to a bike lane, and back to a trail. Rather the Vision Plan looked for corridors that could be of consistent facility type and be developed into a cohesive network. The Vision Plan also looked at other opportunities along the Cotton Belt Trail to add grade separation, and the intersections at Rufe Snow Drive and over IH 820 when the Cotton Belt trail is extended.






# NRH
## TRANSPORTATION PLAN
### 2030 BICYCLE FACILITIES PLAN

North Richland Hills, TX
July 22, 2019 • Ordinance 3592


0 2000 4000 Feet
0 0.5 1 Miles
LEGEND
City Limit Lines
School
Local Roads
Railroad
Parks/Open Space
Transit-Oriented Development
HomeTown
Existing Trail
Proposed Trail
Proposed Neighborhood Trail
Proposed Bike Boulevard
Proposed Signed Route
Grade Separation
SHADY GROVE RD
NORTH TARRANT PKWY
SMITHFIELD RD
FM 1938 - DAVIS BLVD
FM 3029 - PRECINCT LINE RD
BURSEY RD
GREEN VALLEY DR
KIRK LN
JOHN AUTRY RD
RUMFIELD RD
STARNES RD
DOUGLAS LN
CROSSTIMBERS LN
RUFE SNOW DR
HOLIDAY LN
HIGHTOWER DR
EDEN RD
AMUNDSON DR
CRANE RD
MEADOW RD
CHAPMAN RD
MAIN ST
MARTIN DR
MID-CITIES BLVD
IRON HORSE BLVD
BRIDGE ST
COLLEGE CIR
LIBERTY WAY
NORTH RICHLAND BLVD
TRINIDAD DR
SUSAN LEE LN
NEWMAN DR
EMERALD HILLS WAY
BROWNING DR
BOULDER DR
DICK LEWIS DR
LOLA DR
HARWOOD RD
SH 26 - BOULEVARD 26
I-820 (NE LOOP 820)
MAPLEWOOD AV
VANCE RD
MEADOW LAKES DR
LARIAT TRL
RIVIERA DR
SH 121/183 (AIRPORT FWY)
BEDFORD-EULESS RD
RODGER LINE DR
CUMMINGS DR
BRILEY DR
BLANEY AV
BOOTH CALLOWAY RD
GLENVIEW DR
I-820 (NE LOOP 820) and SH 121/183
US 377 - DENTON HWY
TOURIST DR
BEWLEY ST
ONYX DR S
VISION 2030
NRH
TRANSPORTATION PLAN
VISIONARY BICYCLE FACILITIES PLAN
North Richland Hills, TX
July 22, 2019 • Ordinance 3592
7/25/2019: NRH_BikeFacilitiesPlan-Vision_20190722

# Facility Types

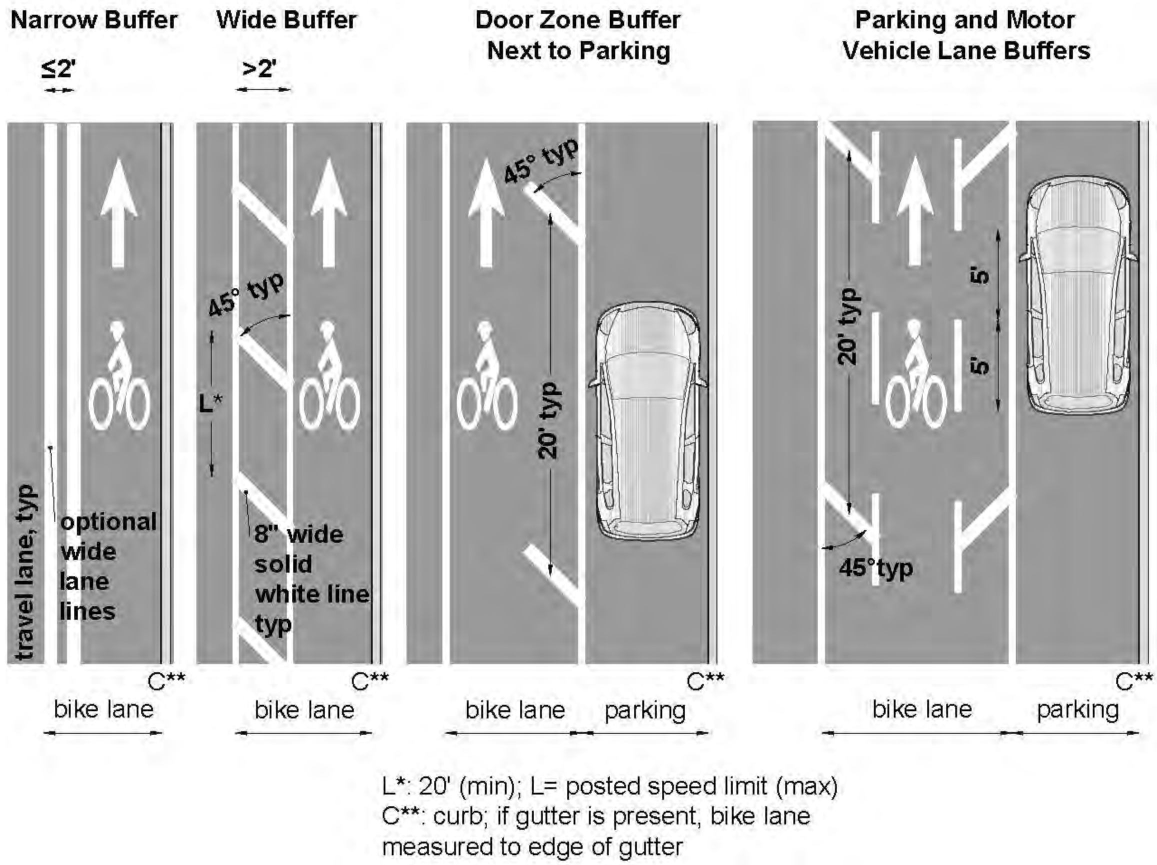
## Buffered Bicycle Lanes

Buffered bicycle lanes are created by painting or otherwise creating a flush buffer zone between a bicycle lane and the adjacent travel lane. While buffers are typically used between bicycle lanes and motor vehicle travel lanes to increase bicyclists' comfort, they can also be provided between bicycle lanes and parking lanes in locations with high parking turnover to discourage bicyclists from riding too close to parked vehicles. Buffered bike lanes are typically installed by reallocating existing street space, and it is preferable to a conventional bicycle lane when used as a contra-flow bicycle lane on one-way streets.

### *Considerations*

- Can be used on one-way or two-way streets.
- Consider placing buffer next to parking lane where there is moderate to high turnover commercial or metered parking.
- Consider placing buffer next to travel lane where speeds are 30 mph or greater or when traffic volume exceeds 6,000 vehicles per day.
- Buffered bicycle lanes allow bicyclists to pass slower moving bicyclists.
- Research has documented buffered bicycle lanes increase the perception of safety.

*Figure D-7. Buffered Bicycle Lane Options*



*Guidance*

- The minimum width of a buffered bicycle lane adjacent to parking or a curb is 5 feet exclusive of gutter (if present); a desirable width is 6 feet.
- Where there is 7 feet of roadway width available for a bicycle lane, a buffered bicycle lane should be installed instead of a conventional bicycle lane. The preferred configuration is a 5-foot or wider bicycle lane and an 18-inch or wider buffer. Typical buffer widths are 3 to 5 feet, but even a 12-18" buffer is helpful.
- The preferred minimum buffer width is 18 inches. There is no maximum width. Diagonal cross hatching should be used for buffers less than 3 feet in width. Chevron cross-hatching should be used for buffers greater than 3 feet in width.
- Buffers are to be broken where curbside parking is present to allow cars to cross the bicycle lane.
- Add total minimum width of buffer, include use of reflectors on outside stripe to improve longevity

## Bicycle Boulevard Treatments

Bicycle boulevards incorporate traffic calming treatments with the primary goal of prioritizing bicycle through-travel, while discouraging excess-ive motor vehicle traffic and maintaining relatively low motor vehicle speeds. These treatments are applied on quiet, well connected streets, often through residential neighborhoods. Treatments vary depending on context, but often include traffic diverters, speed attenuators such as speed humps or chicanes, pavement markings, and signs. Bicycle boulevards are also known as neighborhood greenways and neighborhood bikeways, among other locally-preferred terms.

Note that bicycle boulevards are not just signed bike routes. The following factors distinguish bicycle boulevards from typical local streets:

- Controlled motor vehicle volumes and speeds,
- Prioritized right-of-way for bicyclists and pedestrians at local street crossings, and
- Safe and convenient crossings at major streets.

To be considered a bicycle boulevard, traffic volumes and speeds must be low.


*Considerations*

Many cities already have signed bicycle routes along neighborhood streets that provide an alternative to traveling on high-volume, high-speed arterials. Applying bicycle boulevard treatments to these routes makes them more suitable for bicyclists of all abilities and can increase comfort and reduce crashes.

Stop signs or traffic signals should be placed along the bicycle boulevard in a way that prioritizes the bicycle movement, minimizing stops for bicyclists whenever possible. To discourage motorist use of the bicycle boulevard they are diverted out of the street every 4th or 5th block using the traffic calming tools described below;

- Street trees,
- Traffic circles,
- Chicanes, and
- Other horizontal speed controls.
- Traffic management devices such as diverters or semi-diverters can redirect cut-through vehicle traffic and reduce traffic volume, while still enabling local access to the street.

Communities should begin by implementing bicycle boulevard treatments on one pilot corridor to measure the impacts and gain community support. The pilot program should include before-and-after crash studies, motor vehicle counts, and bicyclist counts on both the bicycle boulevard and parallel streets. Findings from the pilot program can be used to support bicycle boulevard treatments on other neighborhood streets.

Additional treatments for major street crossings may be needed, such as median refuge islands, bicycle signals, RRFBs and HAWK or half signals. For more information on treatments supporting bicycle boulevards, see **Appendix D**.

### *Guidance*

- Maximum Average Daily Traffic (ADT): 3,000
- Preferred ADT: Up to 1,000
- Target speeds for motor vehicle traffic are typically around 20 mph; there should be a maximum 10 mph speed differential between bicyclists and vehicles.

### *When to Use Them*

When the operating characteristics of a bicycle boulevard are achieved, i.e. low motor vehicle traffic speeds and volumes, this facility provides comfortable conditions for a wide range of bicyclists.

Bicycle Boulevards are appropriate on local, neighborhood streets, and are often an appropriate alternative to a high-speed parallel bike lane.

### *Speed Management*

Reducing motor vehicle speeds along a bicycle boulevard helps to improve the comfort and safety of bicyclists using the corridor. Reducing traffic speeds can be accomplished by creating a sense of enclosure with horizontal or vertical treatments that require motorists to reduce speeds.

### *Traffic Calming Strategies*

Treatments vary depending on context, but often include traffic diverters, traffic circles, chicanes, pavement markings, and signage.

- Creating Enclosure
  - No Centerlines
  - “Skinny Streets”/Narrow (Yield) Streets
  - Bulb-Outs/Curb Extensions/ Neckdowns
- Horizontal Deflection
  - One-Lane Pinch-Point
  - Chicanes
  - Mini-Traffic Circles
- Vertical Deflection
  - Raised Crossings
  - Raised Intersections

## Signed Routes

Appropriate and helpful signage is essential to making users comfortable along signed roadway routes. The signs along the corridor or route is to affirm to users that they are on the correct path of travel and to remind vehicular drivers that bicyclists may be present. These routes are typically a part of a bicycle boulevard treatment, or along routes that have destinations along them or connects a gap in another bicycle network. The elements of a well-designed signage system include:

- Uniformity and Design,
- Legibility,
- Placement,
- Safety,
- Communication,
- And Advertisement.

### *Design Factors*

*Uniformity and Design*

City staff and stakeholders should work together to create a streamlined design of wayfinding signs that trail users can easily identify, understand and navigate the network.

*Legibility*


The shape, size, text, and icons on a sign should be legible for trail users of all ages, locals, and visitors. They should also be easy to understand for English and non-English speakers, as well as visually impaired persons. For important messages conveyed by text, consider including a Spanish translation.

*Placement*

Signs should be placed at entrances, intersections, and at forks in the trails to inform and guide trail users. Such signage aims to inform users of any and all directional options, nearby destinations, and attractions.

*Figure D-8. Signed Route Wayfinding Examples*

*Safety*
Reference location signs, or mile markers, represent an important safety measure for the trails system. They provide a simple, straightforward way of identifying locations in case of an emergency.

*Communication*
Signage should convey distance, direction, and destination. Trail etiquette signage conveys appropriate speed and "keep right pass left" messages.

*Advertisement*
For more people to use the trails, they need to know they exist, where they are located, and how to access them. Better wayfinding and signage can attract users and inform them of their off-street options.

## Urban Trails

### *Description*

Urban trails are the highest level of trail classification. They serve to make regional connections and accommodate for large volumes of users.

### *Design*

The standard width of an urban trail should ideally be between 12 and 16 feet; the width may go down to 10 feet in constrained conditions. Since urban trails need to be able to serve large amounts of users, and potentially emergency vehicles, the recommended surface material is either concrete or asphalt.

The shoulder width, vertical clearance, maximum cross slope, and maximum grade for urban trails are determined according to AASHTO design recommendations.

### *Dual-Track Alternative*

If a trail maintains heavy pathway volumes which dictate the need to separate wheeled users from pedestrians, an urban trail may be designed as a dual-track path. This design dedicates 10 feet of width to bicyclists and 5 feet to pedestrians.

Centerline striping, directional arrows, and mode symbols should be used on spines where directions and modes are separated. Centerlines can be painted-on or represented by a change in surface.

A shoulder path for pedestrians could also be built using decomposed granite or similar materials. This path would be beneficial for people running but would not be provide full separation of bikes and pedestrians as people using wheelchairs or other mobility devices would remain on the paved surface.

### *Trail Traffic Calming*

If bicyclists are riding too fast along trails, traffic calming techniques can be applied: speed limit signs, slow zones, a center island, and chicanes.

## Neighborhood Trails

*Description*

Neighborhood trails serve as the final connection to common destinations for bicyclists. This can be anything from a local neighborhood to downtown. A neighborhood trail is a two-way multi-use path, adjacent to the roadway, serving both pedestrians and cyclists – essentially, a wide sidewalk, or a "trail next to a road." They are typically separated from roadways and are 6 to 8 feet wide or greater, accommodating a variety of users. Typical users of neighborhood trails are bicyclists, walkers, and runners using the trail for recreation or transportation purposes.

Design considerations for these trails focus more on mobility instead of capacity to ensure that the network can be accessed by residents all over the City.

*Design*

Neighborhood Trails are to be 8 feet wide but could vary based upon available right-of-way. The surface material of concrete can be either concrete, asphalt, or crushed limestone depending on location, natural conditions, and anticipated daily usage.

The shoulder width, vertical clearance, maximum cross slope, and maximum grade for neighborhood trails are all determined according to AASHTO design recommendations.

## Method for Bikeways: Parking Removal

The removal of on-street parking provides space for bicyclists can reduce conflicts between bicyclists and motorists. Policies that may help reduce parking demand, provide more parking on side streets, or provide more shared off-street parking areas should be considered when parking is removed.

### Benefits

- Reduces conflicts with bicyclists as drivers pull into and out of parking spaces and drivers and passengers open doors of parked vehicles.
- Provides additional roadway space for bicycle facilities.
- Improves sight distance for all roadway users.

### Challenges

- Resurfacing projects that include parking removal to gain bicycle facilities are usually more challenging due to a perceived shortage of parking with its removal. In commercial areas, the parking removal also brings potential impacts on loading and freight delivery.

## Design Considerations

- On most streets with parking on both sides, removal of all on-street parking is not necessary to add bike lanes. If the street includes businesses, it is preferential to remove parking on the side of the street with fewer or no businesses.
- Parking may be alternated from one side of the street to the other with proper transitioning. This pattern may cause motorists to reduce their speed.
- For a roadway with two 10-foot parking lanes, the removal of one parking lane can provide space for a 4-foot bike lane next to a 2-foot gutter on one side of the street, and a 6-foot bike lane next to an 8-foot parking lane on the other side of the street.

## Additional Considerations

When parking lanes are converted to bike lanes, ensure that drainage grates are compatible with bicycle use, that manhole or utility covers are flush with the pavement, and that gutter joints are smooth and not a hazard to bicyclists.

Overall parking demand and space should be evaluated from the standpoint of the community's needs and values, including the value of using the street for mobility of all users, the desire to reduce

*Figure D-9. Sample illustration of a street before parking removal*

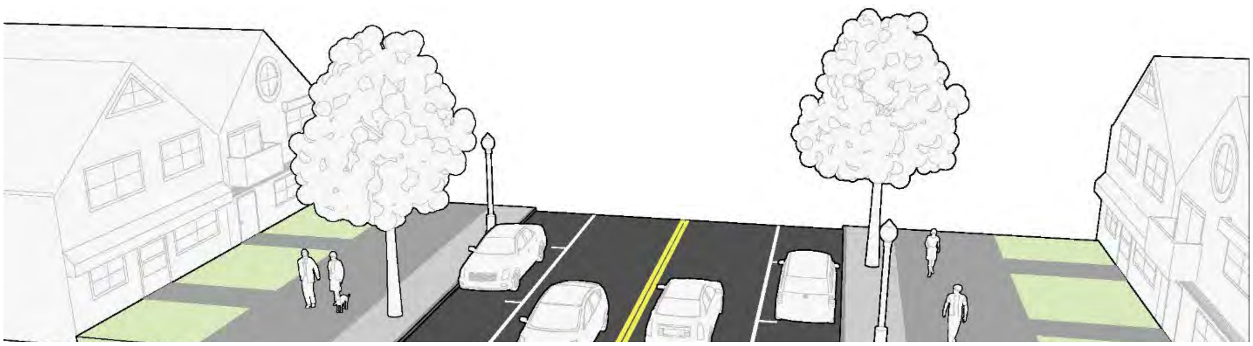
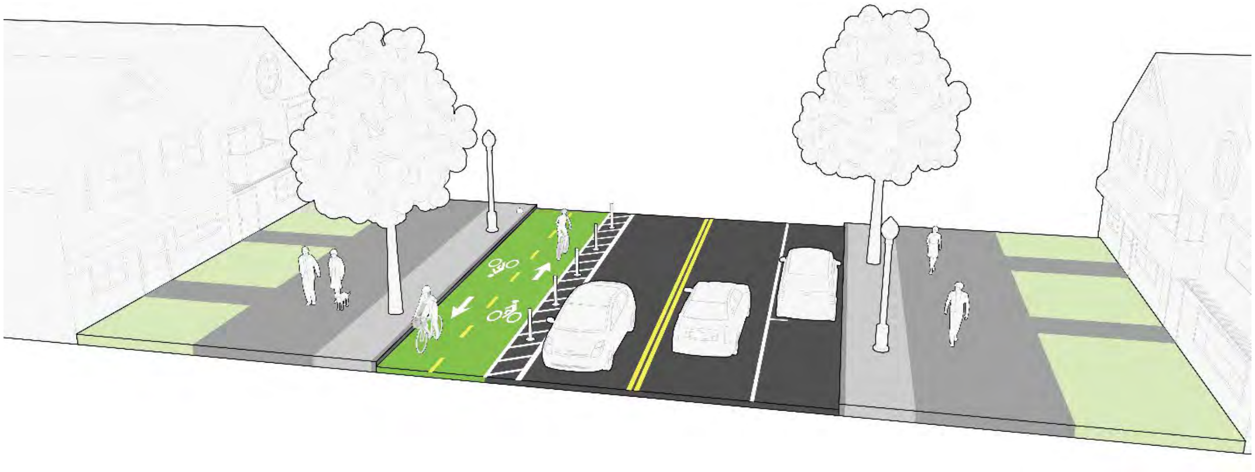


*Figure D-10. Illustration of a street after parking removal on one side to include bike lanes*

*Figure D-11. Sample illustration of a street after parking removal on one side to include a two-way separated bike lane*



single-occupancy vehicles, and the need to promote bicycling or transit.

*Specific Successes*

- The City of Austin removed on-street parking to add a two-way separated bike lane along Bluebonnet Lane.

## Summary

The two Bicycle Facilities Plans – 2030 Plan (**Figure D-5**) and the Vision Plan (**Figure D-6**) address the near-term and long-term visions for NRH. The 2030 Plan recommends facilities that can be accomplished by the year 2030 with a focus on bicycle boulevards and re-striping existing roadways for buffered on-street bike lanes. The Vision Plan provides a network of facilities that builds on the 2030 Plan and recommends higher comfort facilities which can be implemented as roadways are reconstructed or additional right-of-way is acquired. Both plans build on the existing 20-plus miles of trails in NRH with a focus on on-street routes in low-volume, low-speed neighborhoods complemented by off-street trails which serve all ages and ability levels.

A summary of the facility types and attributes is shown in **Table D-8**.

*Table D-7. Proposed Bicycle Facilities Summary*

| | 2030 Plan (miles) | Vision Plan (miles) |
|---|---|---|
| Signed Route | 7.2 | 4.9 |
| Bicycle Boulevard | 20.7 | 17.0 |
| Buffered Bike Lane | 2.4 | 0 |
| Neighborhood Trail | 11.3 | 19.7 |
| Trail | 15.2 | 18.3 |

*Table D-8a. Bicycle Facility Types (On-street)*

| | Buffered Bicycle Lane | Bicycle Boulevard | Signed Route |
|---|---|---|---|
| Description | On-street dedicated space for bicycle travel with a painted or physical buffer | On-street shared space for bicycle travel with vehicles on low-speed, low-volume roadways | On-street shared space for bicycle travel with vehicles on higher-speed and/or higher-volume roadways |
| Dimensions | 6’ bike lane (5’ minimum) 3’ – 5’ buffer typical | Shared vehicle lane | Shared vehicle lane |
| User Comfort Level | Medium Comfort (High if physical buffer present) | Medium Comfort | Low Comfort |

*Table D-8b. Bicycle Facility Types (Off-street)*

| | Urban Trails | Neighborhood Trails |
|---|---|---|
| Description | Off-street trails that serve as a spine to the bicycle network | Off-street trails that connect neighborhoods to higher level bicycle facilities |
| Dimensions | 12’ – 16’ | 8’ trail (6’ minimum) |
| User Comfort Level | High Comfort | High Comfort |

# Design Guidelines and Special Considerations

There are standards for design that are utilized by communities across the United States and have been established based on research and local experience. These are some general guidelines for implementation of the Vision 2030 Transportation Plan:

Roadway Design Guidelines

- AASHTO ***A Policy on Geometric Design of Highways and Streets***, latest edition
- NACTO ***Urban Street Design Guide***
- Transportation Research Board ***Highway Capacity Manual***, latest edition
- Texas ***Manual on Uniform Traffic Control Devices***, latest edition
- City of North Richland Hills ***Public Works Design Manual***

Bikeway Design Guidelines

- AASHTO ***Guide for the Design of Bicycle Facilities***, latest edition
- NACTO ***Urban Bikeway Design Guide***

Sidewalks and Pedestrian Design Guidelines

- AASHTO ***Guide for the Planning, Design and Operation of Pedestrian Facilities***, latest edition
- NACTO ***Urban Street Design Guide***
- City of North Richland Hills ***Public Works Design Manual***

In addition to these established design standards, there are additional guidelines for design applications to best suit the current and anticipated conditions along the roadway corridor.

## Complete Streets

The focus of a Complete Streets initiative is to consider all modes during the planning, design, construction, operation and maintenance of the city's street network. Effective complete streets policies help communities routinely create safe and inviting road networks for everyone, including bicyclists, drivers, transit operators and users, and pedestrians of all ages and abilities. Instituting a Complete Streets policy ensures that transportation planners and engineers consistently design and operate the entire roadway with all users in mind. For the Complete Streets policy to be effective, a program of supporting policies and procedures need to be put in place in all City departments, including a program of land use planning guidelines, a series of project development checklists, established responsibilities for addressing modal issues, and design and operating standards for implementation and maintenance.

Through the adoption of the Vision 2030 Transportation Plan, this document serves as the Complete Streets policy for NRH, providing a vision for how to accommodate all users within the context of the community. The flexible design decision process guides the planning and design of new and retrofit roadways to balance these users.

## Special Context Sensitive Corridors

Every corridor should be designed with complete streets principles and context sensitive solutions in mind. **Appendix B** details the following corridors which were identified at the outset of the study for heightened attention to such special considerations. Special typical sections and implementation measures were evaluated for these corridors.

- Hightower Drive
  *Smithfield Road to Davis Boulevard*
- Hightower Drive
  *Michael Drive to Eden Road*
- Eden Road
  *Rumfield Road to Amundson Drive*
- Amundson Drive
  *Main Street to Precinct Line Road*
- Meadow Road
  *Hightower Drive to Chapman Road*
- Iron Horse Boulevard
  *Rufe Snow Drive to Mid-Cities Boulevard*
- Bedford-Euless Road
  *Boulevard 26 to Strummer Drive*
- Holiday Lane
  *IH 820 to Liberty Way*

## Key Intersections

The ability for the roadway network to operate effectively relies on the ability of intersections to efficiently process traffic. Operational conditions typically break down when insufficient turn-lane capacity is available to remove turn movements from the traffic stream. To ensure the ability to provide channelized turn movements, such as a second left-turn or right-turn lane, an additional 24 feet should be provided at key major and minor arterial intersections. To determine the exact dimensional requirements of specific intersections, a traffic analysis should be conducted at the time of facility implementation.

As currently defined, divided roadways have the ability to accommodate a separate left-turn lane. By adding 24 feet of width, a second left-turn and separate right-turn bay can be added as needed to an intersection. Travel lanes of 12' provide sufficient roadway width for turn movements.

**Table D-9** identifies necessary distances by roadway class for storage and transition requirements. The distances identified allow for minimum turn-lane storage and lane transitions. In high intensity development areas, a traffic analysis should be conducted to determine appropriate intersection requirements. **Figure D-12** illustrates intersection right-of-way requirements at critical locations.

## Access Management

Complementing the roadway development concepts of Complete Streets and Context Sensitive Design is the management of access points to and from a roadway to facilitate traffic flow and safety. Access management addresses the classic trade-off between the two chief functions of major roadways: (1) accommodating higher speed and through traffic, and (2) providing access to abutting properties. Roads that are designed to move the

*Figure D-12. Critical Intersection Right-of-Way Requirements*

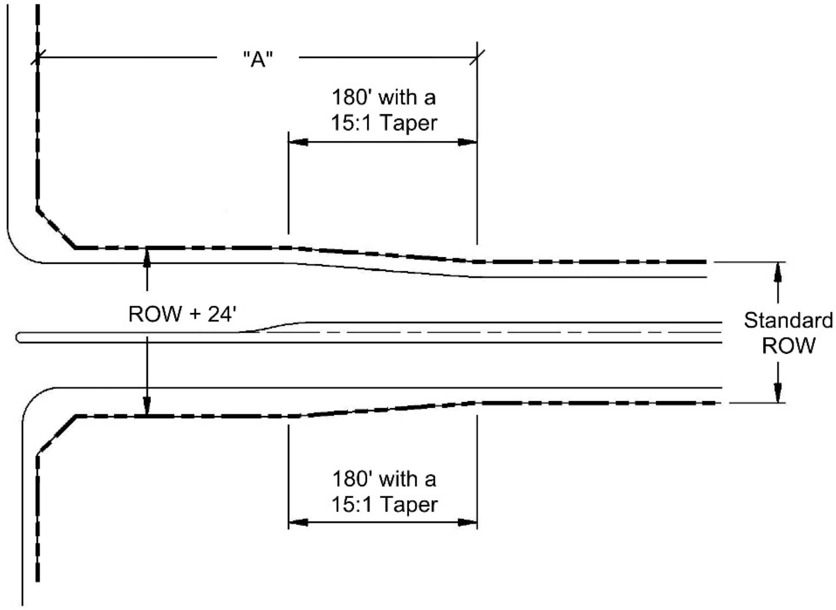



*Table D-9. Critical Intersection Right-of-Way Requirements*

| Critical Intersection Right-of-Way Requirements (Distance "A") | | | | |
|---|---|---|---|---|
| Roadway | Major Arterial | Minor Arterial | Major Collector | Minor Collector |
| Major Arterial | 380' | 380' | 330' | 280' |
| Minor Arterial | 330' | 330' | 280' | 280' |

most traffic also become almost immediately attractive for adjoining land development given the visibility and volume of passersby they offer to frontage properties. However, vehicles turning into and out of driveways – and slowing down and accelerating to do so – introduce "friction" into the system. As traffic volumes increase and more access points occur along a roadway, it becomes more challenging to prevent traffic congestion and reduced travel speeds. Once these trends set in, then the full traffic-carrying potential of a road goes to waste. Subsequently, efforts are expended to try to improve the capacity of the roadway and most often involve adding travel lanes.

Access management strategies have a broad reach, drawing principles from transportation, land use, urban design, and recreation planning to create functional and aesthetically pleasing streetscapes. The following illustration reflects the wide selection of access management policies and tools. These elements can be incorporated into plans, policies, and studies; land development regulations; and design standards and guidelines. Access management treatments predominantly include raised medians and driveway consolidation, but also can involve auxiliary lanes, pedestrian sidewalks and crossings, landscaping and signage, and bicycling and transit accommodations.

More details on access management elements are found in the Pattern Book in **Appendix D**.

## Raised Medians

Raised medians limit cross-street movements and improve traffic flow. They have been proven in studies sponsored by the Federal Highway Administration (FHWA) to reduce crashes by over 40 percent in urban areas and over 60 percent in rural areas. Medians also serve as a safe refuge for pedestrians and bicyclists crossing the street, especially compared to two-way left-turn lanes. The placement of the median opening depends on the type of thoroughfare system. Priority should be given to thoroughfares providing mobility and access throughout the entire community. Openings should only be

provided for street intersections or major developed areas. Spacing between median openings must accommodate left-turn lanes with proper deceleration and storage lengths. Median treatments can take on many different forms, including full median openings and channelized openings.

## Driveway Consolidation

Research sponsored by FHWA shows that the density and design of driveways have a direct impact on roadway safety – the more access connections, the more accidents. The purpose of driveway consolidation and spacing is to limit the number of conflict points while ensuring convenient and safe access to businesses. Driveway consolidation involves the removal of existing access connections, or driveways, for the primary purpose of improving safety. This technique will impact multiple stakeholders, typically requiring cooperative agreements between each property owner and governing agency attempting to consolidate the driveways. Each driveway presents a potential conflict point, thus a safer redesign would use an internal circulation system to funnel roadway traffic through one major access point. Driveway realignment involves the relocation of driveways, so they mirror or offset one another to minimize potential conflicts.

## Auxiliary Lanes

Deceleration and acceleration lanes at major driveways are considered “auxiliary lanes” and can provide refuge for turning vehicles while maintaining travel speeds for traffic though lanes. Auxiliary turn lanes at intersections allow turning traffic to get out of the way of through traffic and wait to turn using gaps in opposing traffic. These treatments increase the capacity and average travel speed of the roadway, while enhancing driver safety.

## Urban Design

### Pedestrian Sidewalks and Crossings

Pedestrians are a critical user group of intra-city travel, especially in urban and mixed-use centers. Well-designed pedestrian environments not only encourage walking; they separate pedestrians from vehicular traffic to increase the safety and enjoyment of this experience. Well-designed, safe, convenient, and attractive pedestrian environments will increase the viability of walking as an alternative transportation mode. Intersections are the most dangerous pedestrian environments. The location and design of crosswalks, median rests, curb ramps, and pedestrian signals help to improve the safety and accessibility of pedestrian crossings.

### Landscaping and Streetscaping

Landscaping provides functional and aesthetic benefits to the streetscape through the use of scale, shade, and color. Improvements may include shade trees, hanging flower baskets, flower boxes, decorative signage, and entry features and should be appropriate to the context of the street and adjacent land uses. Planting amenities can require higher maintenance costs than streetscape and street furniture, but they offer natural beauty and a much grander scale. Landscaping is also used as a traffic calming device to reduce the

speed of automobiles. When street trees are placed along the sidewalk edge or in the median, their presence creates the appearance of reduced area of the roadway available to vehicles. This influence has a “traffic calming” effect.

### Signage

With regard to access management, roadway signs create order to traffic flow and thus improve its efficiency by:

- Regulating and channelizing motorists along streets and highways;
- Informing motorists of conflicting routes and speeds, such as driveways, intersections, and parking areas;

- Directing motorists to streets, highways, cities, towns, villages, or other significant destinations;
- Alerting motorists of changes or hazards within the roadway; and
- Providing other information of value to road users.

## Bicycling Accommodations

Bikeway amenities alert motor vehicles and pedestrians of bicycle traffic, while also guiding cyclists to their proper location on the roadway. Bicyclists also benefit from the other access management treatments that reduce conflict points and create order and calming effects to traffic flow.

## Roundabouts

### *Roundabout Elements*

Roundabouts are a type of intersection characterized by a generally circular shape, yield control on entry, and geometric features that create a low-speed environment through the intersection. Modern roundabouts have been demonstrated to provide a number of safety, operational, and other benefits when compared to other types of intersections. On projects that construct new or improved intersections on collector or minor arterial roadways, the modern roundabout should be examined as an alternative to all-way stops or traffic signal control. The design principles and parameters for roundabouts are described in detail in the National Cooperative Highway Research Program (NCHRP) *Report 672: Roundabouts: An Informational Guide – Second Edition*.

### *Roundabout Size*

The size of a roundabout, typically measured by its inscribed circle diameter (outside to outside of pavement) is

determined by a number of design objectivesSmaller size roundabouts can be used for some local street or collector street intersections where the design vehicle may be a fire truck or single-unit truck. **Table D-10** provides common ranges of inscribed circle diameters for various roundabout categories and typical design volumes. Neighborhood traffic circles, often called mini-roundabouts, are typically built at the intersections of local streets for reasons of traffic calming and/or aesthetics. Needed right-of-way would include the roundabout pavement plus space for sidewalks, buffer and utilities.

*Figure D-13. Illustration of Roundabout Elements, FHWA*

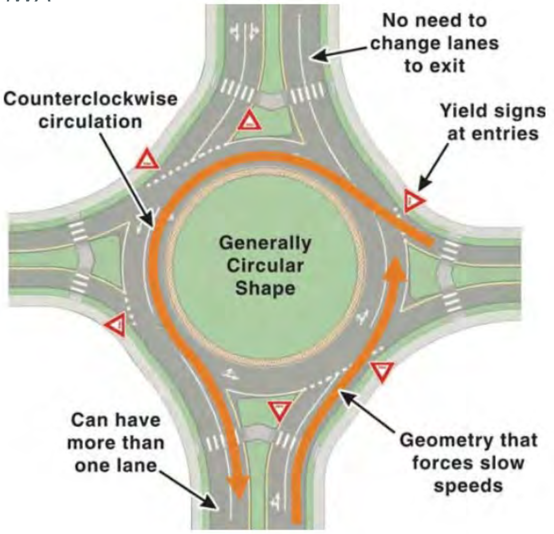


*Table D-10. Comparison of Roundabout Types, AASHTO Green Book, 7th Ed.*

| Design Element | Mini-Roundabout | Single-Lane Roundabout | Multilane Roundabout |
|---|---|---|---|
| Desirable maximum entry design speed | 15 to 20 mph | 20 to 25 mph | 25 to 30 mph |
| Maximum number of entering lanes per approach | 1 | 1 | 2+ |
| Typical inscribed circle diameter | 45 to 90 ft | 90 to 180 ft | 150 to 300 ft |
| Central island treatment | Mountable | Raised | Raised |
| Typical daily service volumes for a four-leg roundabout below which the roundabout may be expected to operate without needing a detailed capacity analysis | 0 to 15,000 | 0 to 20,000 | 0 to 45,000 (for a two-lane roundabout) |

## Demonstration Projects

Cities are constantly changing. Large scale urban transformations, such as museums, parks, and stadiums are high profile projects that typically generate attractive returns. However, such projects require a substantial investment of time and a considerable reserve of social and financial capital. Additionally, the long-term economic or social benefit of these projects is not always guaranteed. Therefore, cities around the world are embracing the incremental approach and grassroots energy of "tactical urbanism" to implement street safety and neighborhood improvement projects.

Tactical urbanism is a term used to describe a collection of low-cost, temporary changes to the built environment intended to improve local neighborhoods and public places. From plazas and parklets to open streets events and piloting complete streets designs, these initiatives are a deliberate, phased approach to instigating change

in the public realm. Demonstration and pilot projects can prove concepts, shape design, and build momentum for long-term action. Tactical urbanism efforts can occur through formalized strategies, such as New York's Pavement to Plazas program. Cities in Texas have also used this approach in reclaiming pavement space for other uses. In Dallas, Marilla Street lacked adequate pedestrian facilities but through a tactical urbanism approach, small-scale improvements were made and feedback taken from the community to move toward long-term construction projects to enhance walkability on the corridor. Other communities like Austin, San Marcos, and Houston have also taken this approach on projects to quickly test and implement design solutions and gain momentum for long-term goals. Taking this approach would allow the city to test new concepts before making major political and economic commitments.

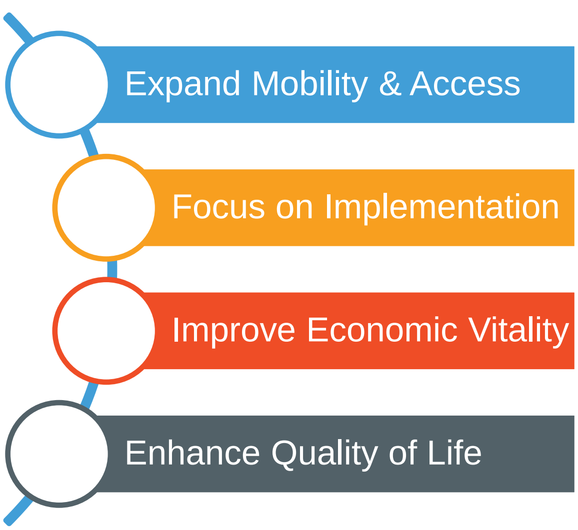
# E. ACTION PLAN

The Action Plan describes ways in which North Richland Hills (NRH) can take the recommendations of this Transportation Plan from vision to reality. The importance of planning cannot be overstated — planning minimizes impacts to private property and ensures mobility continues in a coordinated and organized fashion. The future of the City will be shaped using the strategies and recommendations developed in this Plan.

# Project Prioritization

Funding is not immediately available to implement all the projects recommended in this Plan. Prioritization criteria should be developed by the City to identify projects that are most critical to the needs of NRH. Projects and actions identified in the timeline are based on anticipated need from mobility needs and anticipated level of effort to implement. Implementation of projects in the Thoroughfare Plan and Bicycle Plan will occur over the next 10+ years.

*Figure E-1. NRH Transportation Goals*




## Prioritization Factors

The project prioritization criteria should allow current and future projects to be scored based on how well they satisfy the objectives of the four transportation goals. A sample list of criteria is shown in **Table E-1**.

### Mobility & Access

- This goal seeks to prioritize projects that maximize the efficiency of the network and improve access and connectivity across all modes of transportation.

### Implementation

- This goal seeks to prioritize projects that preserve existing infrastructure, effectively use available funds, and are shovel-ready.

### Economic Vitality

- This goal seeks to prioritize projects that strengthen and increase economic opportunity by connecting people to employment, schools, and commercial districts while preserving the efficient movement of goods.

### Quality of Life

- This goal seeks to prioritize projects that enhance the health, safety, and wellbeing of people and the environment in NRH.

*Table E-1. Sample Prioritization Criteria*

| Evaluation Criteria (Transportation Goals) | Description | Measure | |
|---|---|---|---|
| **Mobility & Access** | Traffic operations | Roadway or Intersection LOS | F |
| | | | D/E |
| | | | C |
| | | | A/B |
| | Improved neighborhood connectivity | Proposed Plan | Yes |
| | | | No |
| | Improved pedestrian crossings | Existing Quality | Does not Exist |
| | | | Poor |
| | | | Fair |
| | | | Good |
| | Improved bicycle facility | Existing Quality | Does not Exist |
| | | | Poor |
| | | | Fair |
| | | | Good |
| **Implementation** | System preservation/maintenance | Existing Quality (Pavement) | Does not Exist |
| | | | Poor |
| | | | Fair |
| | | | Good |
| | Funding identified or available | On NCTCOG or City plan | Yes |
| | | | No |
| | Donation/Matching Fund Offers (Public or Private) | Availability | Yes |
| | | | No |
| | Right-of-way acquisition | Cost (Dollars) | $ |
| | | | $$ |
| | | | $$$ |
| | Construction cost | Cost (Dollars) | $ |
| | | | $$ |
| | | | $$$ |
| **Economic Vitality** | Growth centers | Serves growth area | Yes |
| | | | No |
| | Regional transportation facility (freight) | Proposed Plan | Yes |
| | | | No |
| | Connectivity to activity centers (TODs, urban villages, etc.) | Proposed Plan | Yes |
| | | | No |
| **Quality of Life** | Crash history (safety) | Crash Rate | xxx |
| | | | xx |
| | | | x |
| | | | 0 |
| | Promote environmental stewardship | Increase Tree Canopy; Improve Air/Water Quality | xxx |
| | | | xx |
| | | | x |
| | Increase roadway footprint | Roadway Width Increase | No increase/reduction |
| | | | 1-2 additional travel lanes |
| | | | 3+ additional travel lanes |
| | Multimodal benefits | Proposed Plan | Yes |
| | | | No |

# Funding Sources and Strategies

The purpose of a multimodal funding strategy is to match federal, state, regional and local revenue sources with NRH's projects and programs that will further the City's transportation goals. Many transportation projects will rely on multiple funding sources to address a range of project types and sizes. It is important to identify and secure the most reliable funding sources and allocate them in the most effective way possible for these projects.

Project priorities must be structured to take advantage of the varying sources as efficiently as possible recognizing the competing needs for transportation elsewhere in the North Texas region. The program must also be flexible over time as revenue pools may change over time, so it is essential to monitor and update the funding assumptions from federal and state sources on a nearly continuous basis.

**Table E-2** summarizes the federal, state, regional and local funding sources currently available to the City of NRH for bicycle and pedestrian improvements.

## FUNDING

Implementation projects from the Transportation Plan must be structured to take advantage of **multiple funding sources** as efficiently and effectively as possible, recognizing the competing needs for transportation elsewhere in North Texas.

*Table E-2. Funding Sources for Bicycle and Pedestrian Improvements*

**Funding Sources**

Bicycle and Pedestrain

| Funding Source | Eligible Applicants | Funding Levels | Eligible Elements | Funding Cycles/ Timelines | Deadlines | Other |
|---|---|---|---|---|---|---|
| Surface Transportation Block Grant (STBG) | Cities<br>Counties<br>Transit Agencies<br>MPOs<br>State Agencies<br>Non-Profits | Based on Populatoin | Bicycle facilites<br>Bicycle and pedestrain safety programs<br>Traffic calming<br>Bridges (BP)<br>Traffic signalization<br>Planning<br>Convert abandoned rail corridors to trails<br>Landscaping and pedestrian amenities | Annual | TBD | Recreational trails are eligible<br>Funds cannot be used on a Local road or rural minor collector |
| Category 4B: STBG Transportation Enhancements | Cities<br>Transit Agencies<br>School Districts<br>Non-Profits | Based on Populatoin | Bicycle facilites<br>Bicycle and pedestrain safety programs<br>Traffic calming<br>Bridges (BP)<br>Traffic signalization<br>Planning<br>Convert abandoned rail corridors to trails<br>Landscaping and pedestrian amenities | Annual | TBD | Must meet state environmental and design standards<br>Must have MPO concurrence<br>20 % match requirement |
| Category 4C: STBG Metropolitian Mobility/ Rehabilitation | Cities<br>Transit Agencies<br>School Districts<br>Non-Profits | Based on Populatoin | Planning<br>Specifications and cost estimates<br>ROW acquisition | Annual | TBD | Cannot be used on local road or rural minor collectors<br>Funding made through metropolitan mobility/ rehabilitation programs |
| Congestion Mitigation and Air Quality (CMAQ) | Cities<br>Counties<br>MPOs<br>State Agencies<br>Non-Profits | $2.4 Billion Annually - Based on region population | Bike and pedestrian facilities<br>Intersection improvements<br>Traffic signalization<br>Bicycle safety projects<br>Electric and natural gas vehicle infrastructure | Annual | TBD | Facilities must be primarily for transportation and not recreational<br>Project must have an air quality benefit<br>Projects must be located in a non-attainment area |
| Enhanced Mobility of Seniors and Individuals with Disabilities Program | Transit Agencies | $2.77M Annually<br>45% available for nontraditional projects such as BP | Curb-cuts<br>Sidewalks<br>Pedestrain signals<br>Signage | Annual | TBD | N/A |
| Better Utilizing Utilizing Investments to Leverage Development (Build) Discretionary Grants (former TIGER Grant) | Cities<br>Counties<br>MPOs | $5M ($6.25M Including Match) - $25M | Bicycle facilities<br>Pedestrain walkways<br>Lighting<br>Bridges (BP)<br>Planning | Annual | TBD | 20% match requirement |
| Transportation Alternatives (TA) or Set-Aside | Cities<br>Transit Agencies<br>School Districts<br>Non-Profits | $844M annually<br>$76M Texas annually | Sidewalks<br>Crosswalks<br>Bicycle infrastructure<br>Trail infrastructure<br>Safe Routes to School programming<br>Convert abandoned rail corridor to trails<br>Streetscape improvements<br>Recreational trails<br>Traffic signalization<br>Bridges (BP) | Annual<br>Curently Open for 2019 Projects | Closes March 1, 2019 | 20% match requirement |
| TxDOT TA/ Safe Routes to School Call for Projects | Cities (SRTS)<br>Counties (SRTS)<br>Transit Agencies<br>School Districts<br>Non-Profits | $8.7M SRTS<br>$10.6M TA | Sidewalks improvements<br>Shared-use paths<br>Bicycle infrastructure<br>Safety improvments for non-motorized transportation | Opens February 8, 2019 | April 12, 2019 - Preliminary App.<br>Aug 15, 2019 - Detailed App.<br>Oct 30, 2019 - Detailed App. for FY 21/22 Projects | 20% match requirement (TA)<br>Adminisered through the MPO<br>Communities with less than 200,000 residents (TA) |
| Texas Parks and Wildlife | Cities<br>Non-Profits | $200K for non-motorized<br>$400K for motorized | Motorized (off-road) trails<br>Non-motorized trails<br>Improving existing trails<br>Developing trail heds<br>Acquiring trail corridors | Annual | February 1 Deadline | 20% match requirement |

# Implementation Matrix

The implementation matrix is a tool to identify, track and monitor the progress of the recommended strategies and actions. These strategies can only be achieved through a collection of stakeholders and partnerships, working together to promote the transportation goals of the community. For each action listed, the associated transportation goal and projected timeframe for the strategy to be implemented is shown.

The list of actions was developed from transportation needs identified in the study. They have been curated to achieve specific transportation goals for the City. Some actions are policy-based and some are physical projects to be constructed. Additional details on the actions can be found in **Appendix F** to streamline the chapter. These actions focus on a 2030 horizon.

Within five (5) focus areas – Operations & Maintenance, Transportation & Land Use Interface, Encouraging Multimodal Transportation; Technology & Innovation; and Funding & Prioritization – a set of short-, mid-, and long-range projects or specific action items are proposed.

## Timeframe

To assist with planning and implementation, the strategies are assigned a projected timeframe for implementation to commence. The assignment of short- and mid-range attributes to these items indicate the relative importance of their implementation. As opportunities for funding and partnerships arise, the relative importance of any one project may move within these relative priorities. The implementation plan should be flexible to allow such instances. The approximate established timeframes are as follows:

### *On-going or Annual*

Implementation of these strategies are done on an on-going or annual basis. These are typically activities involving monitoring or reporting transportation conditions.

### *Short-Range (2019-2020)*

Implementation of these strategies can begin soon after plan adoption. These strategies are considered “low hanging fruit” because they are more attainable and do not require large amounts of funding or special consulting.

### *Medium-Range (2020-2025)*

Implementation of these strategies will likely be just as important as Short-Range Strategies but are not as attainable within the first five years. They require planning to prepare but should be implemented in a five- to ten-year timeframe.

### *Long-Range (2025-2030)*

These strategies have no specific timeframe but should be continually addressed by City leadership. Long-Range projects may be further defined to identify interim Short- and Mid-Range projects to facilitate ultimate implementation. As conditions change, the status of these long-term projects should be adjusted.

**Table E-3**, **Table E-4**, and **Figure E-2** show the actions and CIP identified for implementation in the Transportation Plan.

*Table E-3. Planning & Policy Action Plan*

| | Action Items | Timeframe | Goals: Mobility & Access | Goals: Implementation | Goals: Economic Vitality | Goals: Quality of Life | Regional Initiative |
|---|---|---|---|---|---|---|---|
| **A. Operations & Maintenance** | | | | | | | |
| A1 | Monitor Roadway and Bridge Conditions | On-going | | • | | | |
| A2 | Monitor Sidewalk and Trail Conditions | On-going | | • | | | |
| A3 | Maintain Preventative Street Maintenance Program and Evaluate Program Effectiveness | On-going | | • | • | • | |
| A4 | Assess Annually the Traffic Congestion on Major Roads and Intersections | On-going | • | • | | | |
| A5 | Assess Annually the Safety of Transportation | On-going | • | • | | | |
| A6 | Assess Annually Active Transportation (Walking and Bicycling) Conditions | On-going | • | • | | | |
| A7 | Monitor Walking and Bicycling Utilization Barriers and Develop Mitigation Measures | On-going | • | • | • | • | |
| A8 | Monitor Intersection Traffic Operations and Develop Mitigation Measures | On-going | • | • | • | • | |
| A9 | Monitor Transit Usage Barriers and Develop Mitigation Measures | On-going | • | • | • | • | |
| A10 | Traffic Signal Coordination and Corridor Optimization | On-going | • | • | • | • | |
| A11 | Manage High-Demand Parking | On-going | | • | • | • | • |
| A12 | Develop Sidewalk and Trail Maintenance Program | Short | • | • | | | |
| A13 | Create Parking Management Districts for TODs and Urban Villages | Medium | | • | • | • | |
| A14 | Promote Public-Private Partnerships (PPP) for the Upkeep and Embellishment of Non-Roadway Elements within ROW | Medium | | • | • | | |
| **B. Transportation & Land Use Interface** | | | | | | | |
| B1 | Educate Residents on Complete Streets, Rightsizing, and Their Benefits to the Community | On-going | • | • | • | • | |
| B2 | Monitor Neighborhood Traffic Calming Program | On-going | • | | • | | |
| B3 | Develop and Adopt a Complete Streets Policy, Program, and Guidelines | Short | • | • | • | • | • |
| B4 | Update Engineering Design Standards for 2030 Transportation Plan Design Decision Process | Short | • | • | | | |
| B5 | Incorporate Neighborhood Placemaking in Transportation Corridor Urban Design Program | Medium | | • | • | • | |

*Table E-3 (continued). Planning & Policy Action Plan*

| | Action Items | Timeframe | Goals: Mobility & Access | Goals: Implementation | Goals: Economic Vitality | Goals: Quality of Life | Regional Initiative |
|---|---|---|---|---|---|---|---|
| **C. Encouraging Multimodal Transportation** | | | | | | | |
| C1 | Accommodate Pedestrian and Bicycle Access during Construction in the Public ROW when Feasible | On-going | • | • | | | |
| C2 | Actively Engage in Planning of Regional Transit by Trinity Metro | On-going | • | | • | | • |
| C4 | Complete Missing Sidewalks and ADA-Compliant Ramps | On-going | • | • | • | | |
| C3 | Develop Parking Standards for Bicycles and Update Ordinance | Short | • | • | • | | • |
| C5 | Develop a Pedestrian Master Plan | Short | • | | • | • | |
| C6 | Establish a Local Bicycle and Pedestrian Advisory Committee (BPAC) | Short | • | • | | • | |
| C7 | Develop Bicycle Facility Implementation Process, Including Community Outreach | Short | • | • | | • | |
| C8 | Develop and Implement a Comprehensive Multimodal Wayfinding Program | Medium | • | | • | | |
| C9 | Develop a Local Transit Plan | Medium | • | | • | | |
| C10 | Continue Pedestrian and Bicycle Count Program | Medium | • | | | | • |
| C11 | Develop Funding and Implementation Strategy to Increase Sidewalk and Trail Lighting | Medium | • | • | | • | |
| C12 | Evaluate Establishing a Multimodal Mobility Hub at the Transit Stations | Medium | • | | • | • | |
| **D. Technology & Innovation** | | | | | | | |
| D1 | Develop an Open Data Platform to Increase Transparency and Encourage Civic Engagement | Short | | | • | | • |
| D2 | Develop a New Mobility and Technology Plan | Short | • | | • | • | • |
| D3 | Develop Travel Demand Management (TDM) Program | Medium | • | | • | • | • |
| D4 | Pursue PPPs with Data Analytics, Data Sharing, Ridehailing, and Other Related Companies | Medium | • | | • | | • |
| **E. Funding & Prioritization** | | | | | | | |
| E1 | Conduct Regular Surveys of Citizen Opinions on Transportation (NRH Resident Satisfaction Survey) | On-going | | • | • | • | |
| E2 | Allocate a Portion of the Available Local Funds to All Modes | On-going | • | • | | • | |
| E3 | Collaborate with TxDOT to Advance Locally Preferred Projects and Enhancements on State ROW | On-going | • | • | • | • | |
| E4 | Collaborate with Neighboring Communities to Minimize Regional Obstacles to Travel | On-going | • | • | • | | • |
| E5 | Seek NCTCOG Funding for Regional Initiatives | On-going | | • | • | | • |
| E6 | Submit NRH Transportation Plan to NCTCOG for Inclusion of Plan in Regional Travel Demand Model and TIP | Short | | • | | | • |
| E7 | Leverage Local Funds to Secure Bonds for Needed Transportation Infrastructure Improvements | Short | | • | • | | |
| E8 | Implement Project Prioritization Criteria and Methodology for Transportation Projects in Future Bonds | Short | • | • | | • | |
| E9 | Institute a Program of PPPs for the Development and Management of Non-Roadway Elements within ROW | Medium | • | • | | | |

*Table E-4. CIP Action Plan*

| Project | Limits | Description | Goals: Mobility & Access | Goals: Implementation | Goals: Economic Vitality | Goals: Quality of Life | Regional Initiative |
|---|---|---|---|---|---|---|---|
| **Short-Range (2019-2020)** | | | | | | | |
| Davis Boulevard | @ Mid-Cities Boulevard | Evaluate intersection performance upon construction completion (Resident Survey) | | • | • | | • |
| Access Management Standards | Citywide | Develop access management standards for mobility corridors | • | | • | | |
| Bedford-Euless Road | Boulevard 26 to Strummer Road | Small area study | | | • | • | |
| Meadow Lakes Drive | IH 820 to Rufe Snow Drive | Corridor study | • | | | • | |
| Holiday Lane | Dick Lewis Drive to Chapman Road | Rightsizing retrofit; 4 lanes to 3 lanes with on-street bike lanes | • | • | • | • | |
| **Medium-Range (2020-2025)** | | | | | | | |
| Iron Horse Boulevard | Rufe Snow Drive to Mid-Cities Boulevard | Rightsizing retrofit; including bike crossing @ Rufe Snow | • | • | • | • | |
| Strummer Road | @ Bedford-Euless Road | Intersection enhancement/realignment | • | • | • | | |
| Iron Horse Boulevard | @ Liberty Way | Intersection enhancement (roundabout) | | • | | • | |
| Meadow Road | Chapman Road to Hightower Drive | Reconstruction to address drainage and pedestrian needs | | • | | | |
| Hightower Drive | Davis Boulevard to Michael Drive | Striping to allocate pavement space and support extension | | • | | • | |
| Hightower Drive Extension | Michael Drive to Eden Road | Extension of roadway with development | • | • | | | |
| Eden Road | Rumfield Road to Amundson Drive | Reconstruction to address drainage and pedestrian needs | | • | | • | |
| Amundson Drive | Amundson Road to Eden Road | Reconstruction to address pedestrian needs; intersection enhancement @ Amundson Road | | • | • | | |
| Main Street & Snider Extension | Main, Smithfield Road to Davis Boulevard<br>Snider, Main Street to Northeast Parkway | Reconstruction of Main Street, extension of Snider for TOD support | • | • | • | • | |
| Davis Boulevard | @ N. Tarrant Parkway | Intersection analysis and mitigation (Resident Survey) | | • | • | | • |
| Davis Boulevard | @ Boulevard 26 | Intersection analysis and mitigation (Resident Survey) | | • | • | | • |
| Rufe Snow Drive | @ IH 820 | Intersection analysis and mitigation (Resident Survey) | | • | • | | • |
| Rufe Snow Drive | @ Mid-Cities Boulevard | Intersection analysis and mitigation (Resident Survey) | | • | • | | • |
| **Long-Range (2025-2030)** | | | | | | | |
| Bedford-Euless Road | Boulevard 26 to Strummer Road | Reconstruction and rightsizing | | • | • | • | |
| Strummer Road | Bedford-Euless Road to Boulevard 26 | Rightsizing retrofit | • | • | • | | |
| Iron Horse Boulevard | Rufe Snow Drive to Mid-Cities Boulevard | Reconstruction with full Target Corridor greenway recommendations | • | • | • | • | |
| Crosstimbers Lane Extension | Old Mill Road to Bursey Road | Extension of roadway with development | • | | | | |
| Hightower Drive Extension | Smithfield Road to Davis Boulevard | Extension of roadway with development | • | | | | |

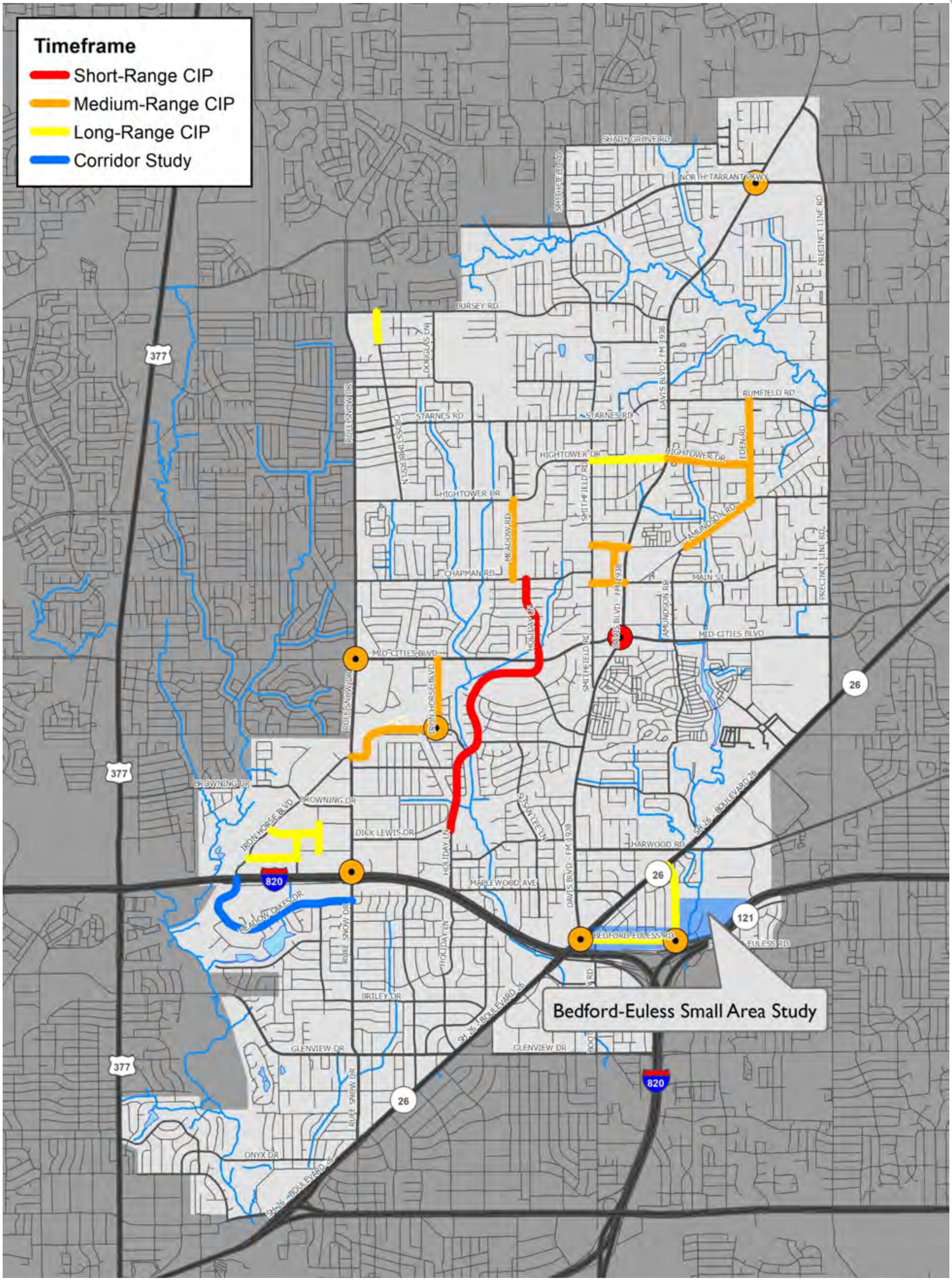



*Figure E-2. Roadway CIP*

# Appendix A:

# Design Decision Process

A context-sensitive approach was developed to provide flexibility in the thoroughfare network with defined movement-based functional classifications and place-based land use contexts. This approach is discussed in **Chapter D** of the report. This appendix summarizes the process with the core maps and tables to reference through the design process.

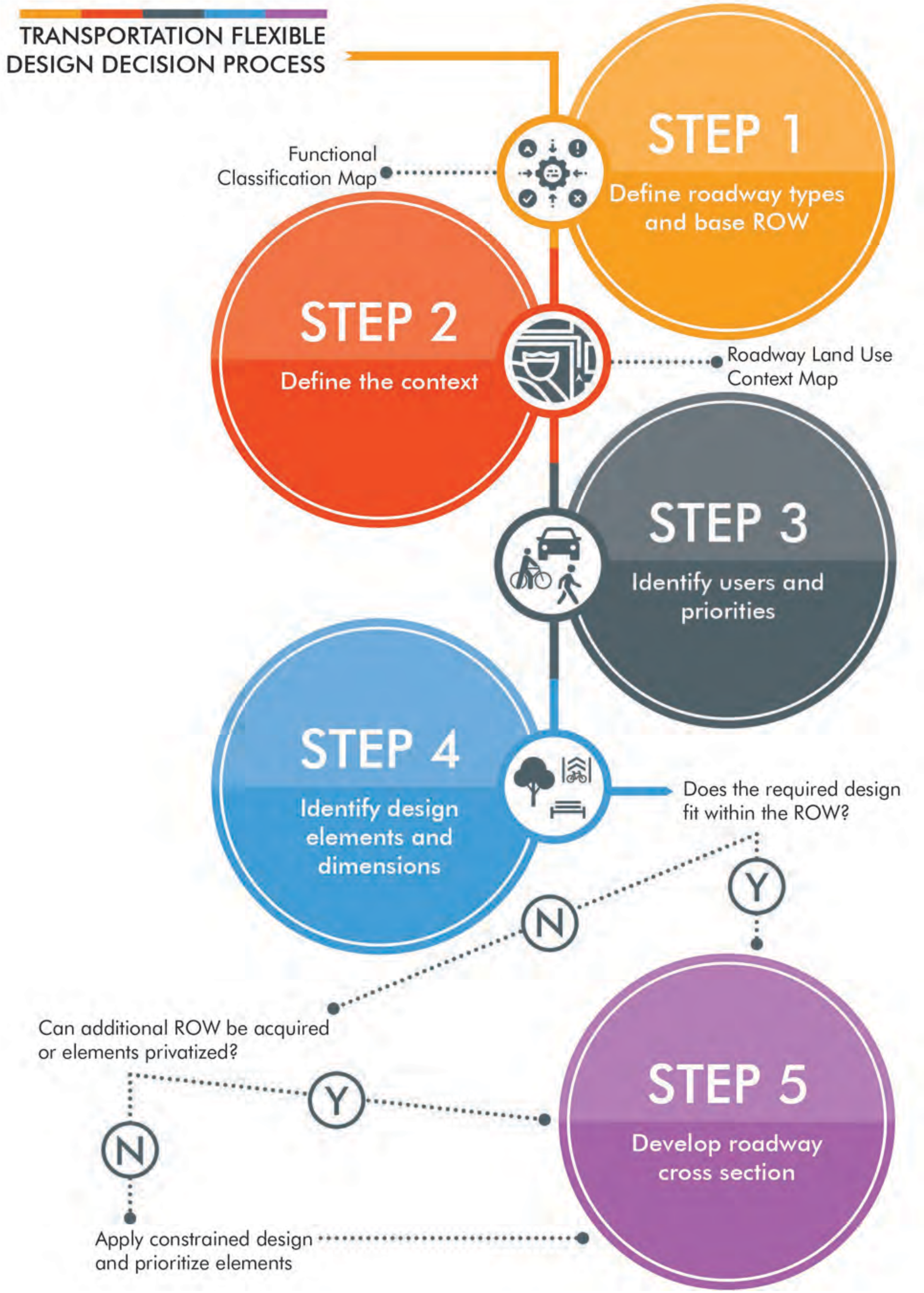
The Transportation Plan consists of foundational mapping elements, including:

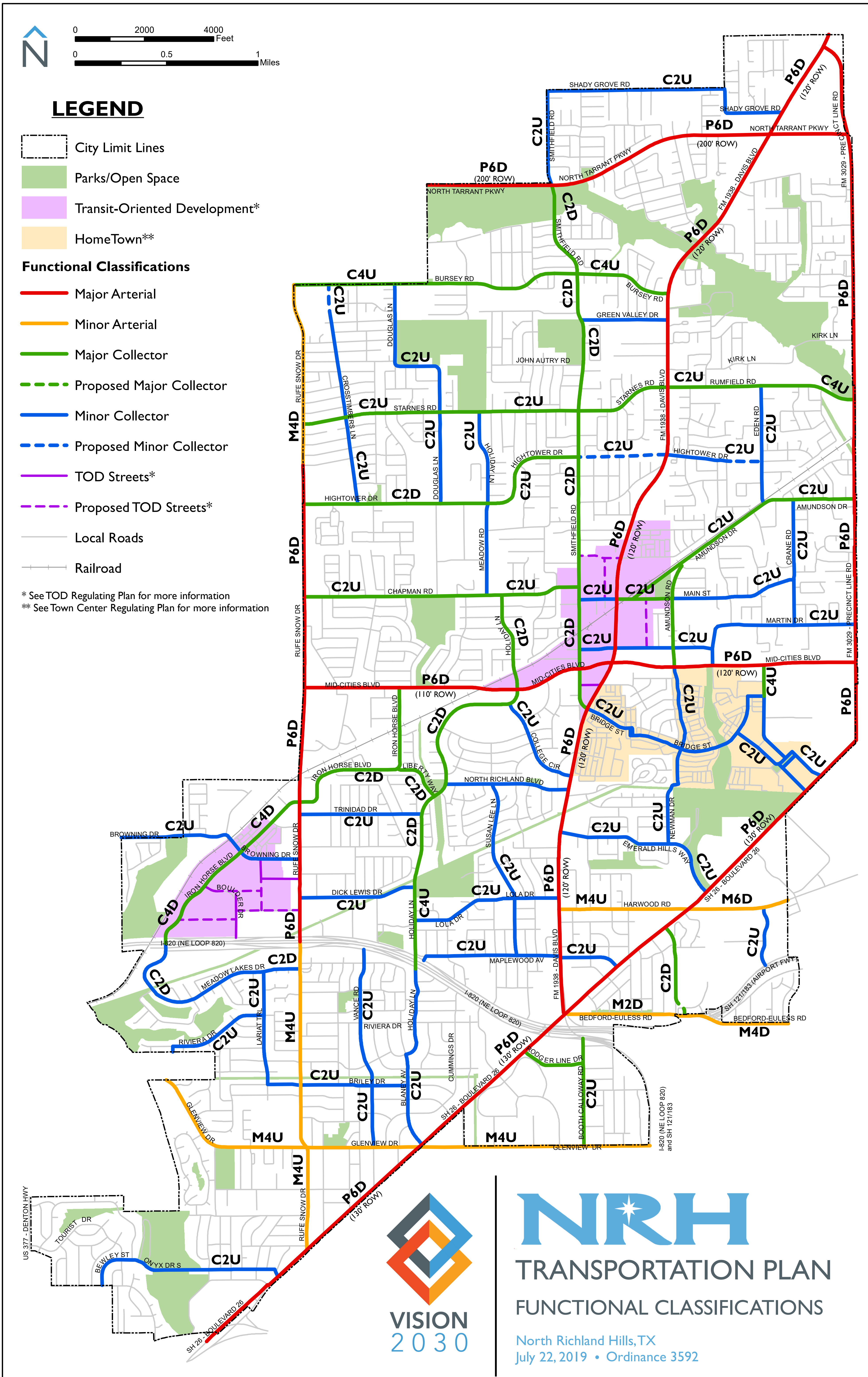
- Functional Classification Map
- Land Use Context Map

Modal components, such as plans for bicycling, walking, and transit, then integrate into the design decision process for the complete multimodal implementation of transportation facilities. This plan addresses the bicycle mode with the other modes to be evaluated in a future study. The bicycle plan is split into two maps making recommendations for near-term plans envisioned by 2030 and a long-term, visionary plan to work towards as right-of-way and funding allow:

- 2030 Bicycle Facility Plan
- Vision Bicycle Facility Plan

Understanding transportation facility design as a process, the development of a street design and cross section entails the multiple elements of this Plan, including the functional classification mapping, with associated right-of-way envelope, land use context mapping, modal plans, and any additional specific design considerations. This process includes flexibility in the process, understanding that there are many demands within the right-of-way but limited space, so elements must be prioritized. Design and prioritization decisions are made solely by the City (staff and City leadership) to serve both neighborhood needs as well as the development of the overall transportation network.


TRANSPORTATION FLEXIBLE
DESIGN DECISION PROCESS
STEP 1
Define roadway types and base ROW
Functional Classification Map
STEP 2
Define the context
Roadway Land Use Context Map
STEP 3
Identify users and priorities
STEP 4
Identify design elements and dimensions
Does the required design fit within the ROW?
Y
N
Can additional ROW be acquired or elements privatized?
Y
N
Apply constrained design and prioritize elements
STEP 5
Develop roadway cross section



N
0 2000 4000 Feet
0 0.5 1 Miles
LEGEND
City Limit Lines
Parks/Open Space
Transit-Oriented Development*
HomeTown**
Functional Classifications
Major Arterial
Minor Arterial
Major Collector
Proposed Major Collector
Minor Collector
Proposed Minor Collector
TOD Streets*
Proposed TOD Streets*
Local Roads
Railroad
* See TOD Regulating Plan for more information
** See Town Center Regulating Plan for more information
VISION 2030
NRH
TRANSPORTATION PLAN
FUNCTIONAL CLASSIFICATIONS
North Richland Hills, TX
July 22, 2019 • Ordinance 3592
7/25/2019; Vision 2030_Transportation Plan_Functional Classification_20190722

| FUNCTIONAL CLASSIFICATION | | | NO. OF TRAVEL LANES | ROW WIDTH (FEET) | DESIGN SPEED (MPH) | MEDIAN TYPE | ON-STREET BIKE FACILITY MINIMUM STANDARD | PARKING PERMITTED |
|---|---|---|---|---|---|---|---|---|
| ARTERIAL | MAJOR | P6D | 6 | VARIABLE | 40-55 | RAISED/TWLTL* | PROTECTED | NO |
| ARTERIAL | MINOR | M6D | 6 | 110 | 40-45 | RAISED/TWLTL* | PROTECTED | NO |
| ARTERIAL | MINOR | M4D | 4 | 80 | 35-45 | RAISED/TWLTL* | BUFFERED | NO |
| ARTERIAL | MINOR | M4U | 4 | 70 | 35-45 | NONE | BUFFERED | NO |
| ARTERIAL | MINOR | M2D | 2 | 70 | 30-35 | RAISED/TWLTL* | BUFFERED | SOME |
| COLLECTOR | MAJOR | C4D | 4 | 68 | 30-35 | RAISED/TWLTL* | BUFFERED | SOME |
| COLLECTOR | MAJOR | C4U | 4 | 68 | 30-35 | NONE | BUFFERED | SOME |
| COLLECTOR | MAJOR | C2D | 2 | 68 | 30-35 | RAISED/TWLTL* | SIGNED ROUTE | SOME |
| COLLECTOR | MAJOR | C2U | 2 | 68 | 30-35 | NONE | SIGNED ROUTE | SOME |
| COLLECTOR | MINOR | C2U | 2 | 60 | 30-35 | NONE | BICYCLE BOULEVARD | SOME |
| LOCAL | | R2U | 2 | 50 | 30 | NONE | BICYCLE BOULEVARD | YES |

*TWLTL = Two-way Left Turn Lane

0 2000 4000 Feet
0 0.5 1 Miles

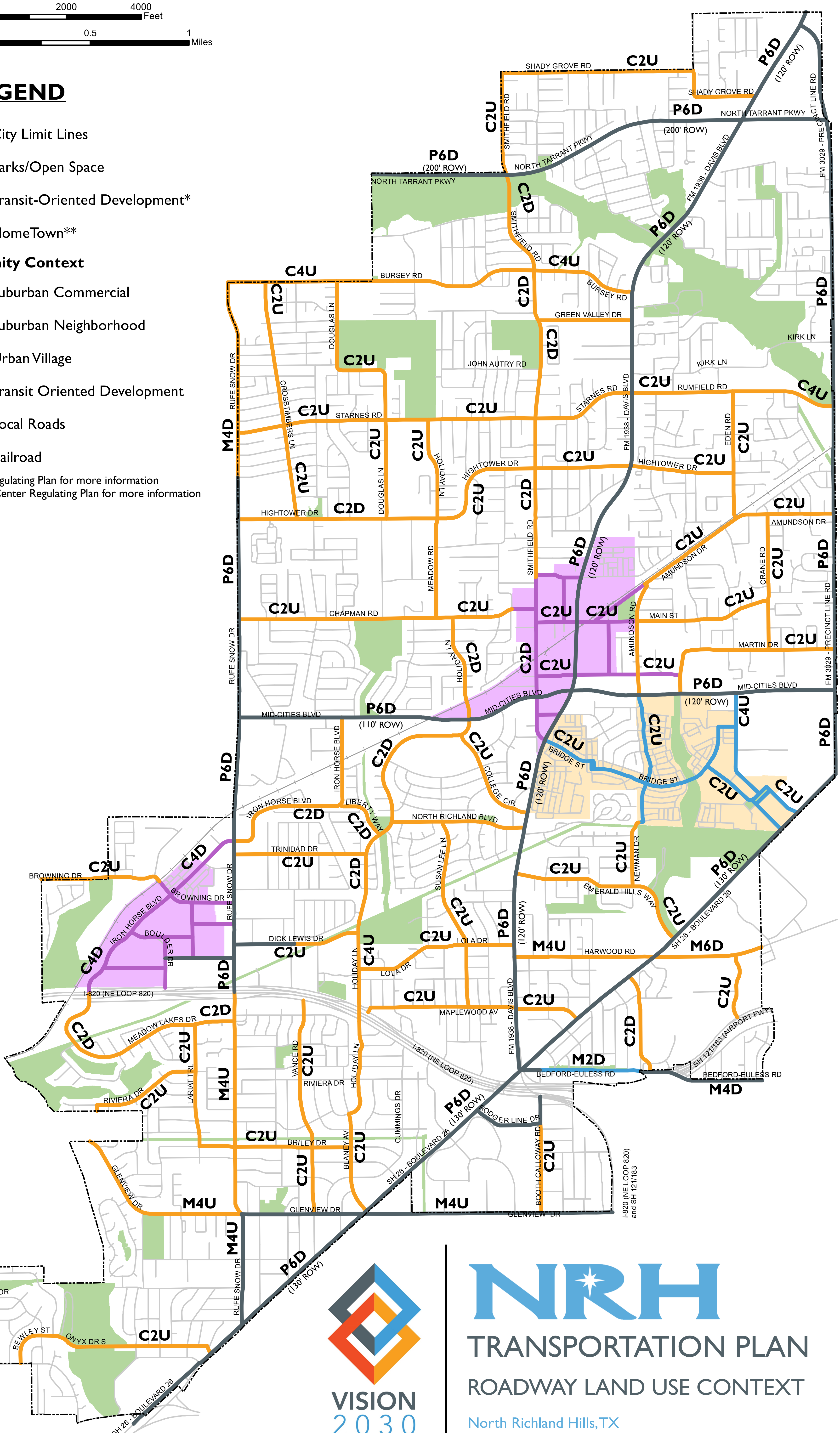
## LEGEND

City Limit Lines
Parks/Open Space
Transit-Oriented Development*
HomeTown**

**Community Context**

Suburban Commercial
Suburban Neighborhood
Urban Village
Transit Oriented Development
Local Roads
Railroad

* See TOD Regulating Plan for more information
** See Town Center Regulating Plan for more information



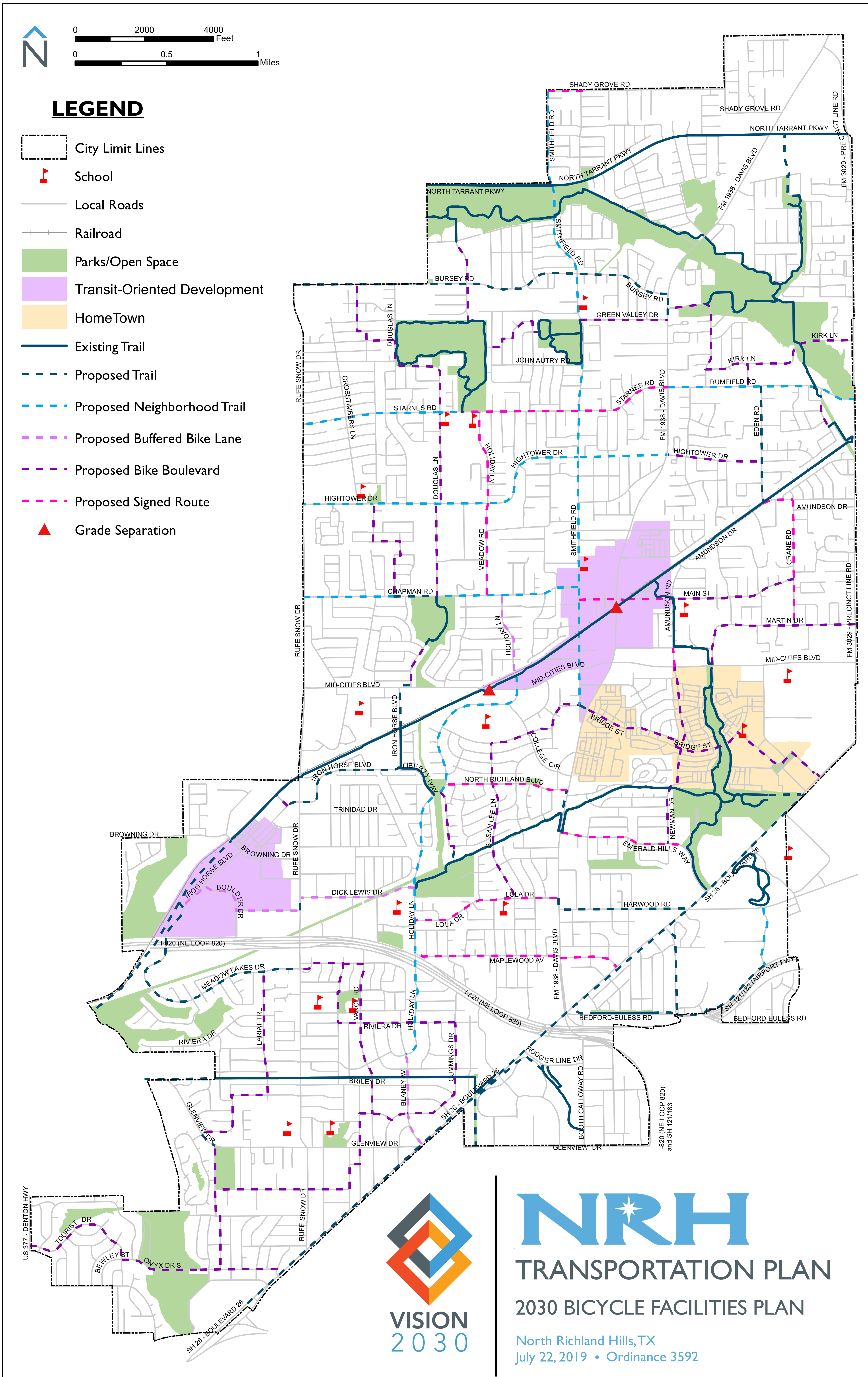

VISION 2030

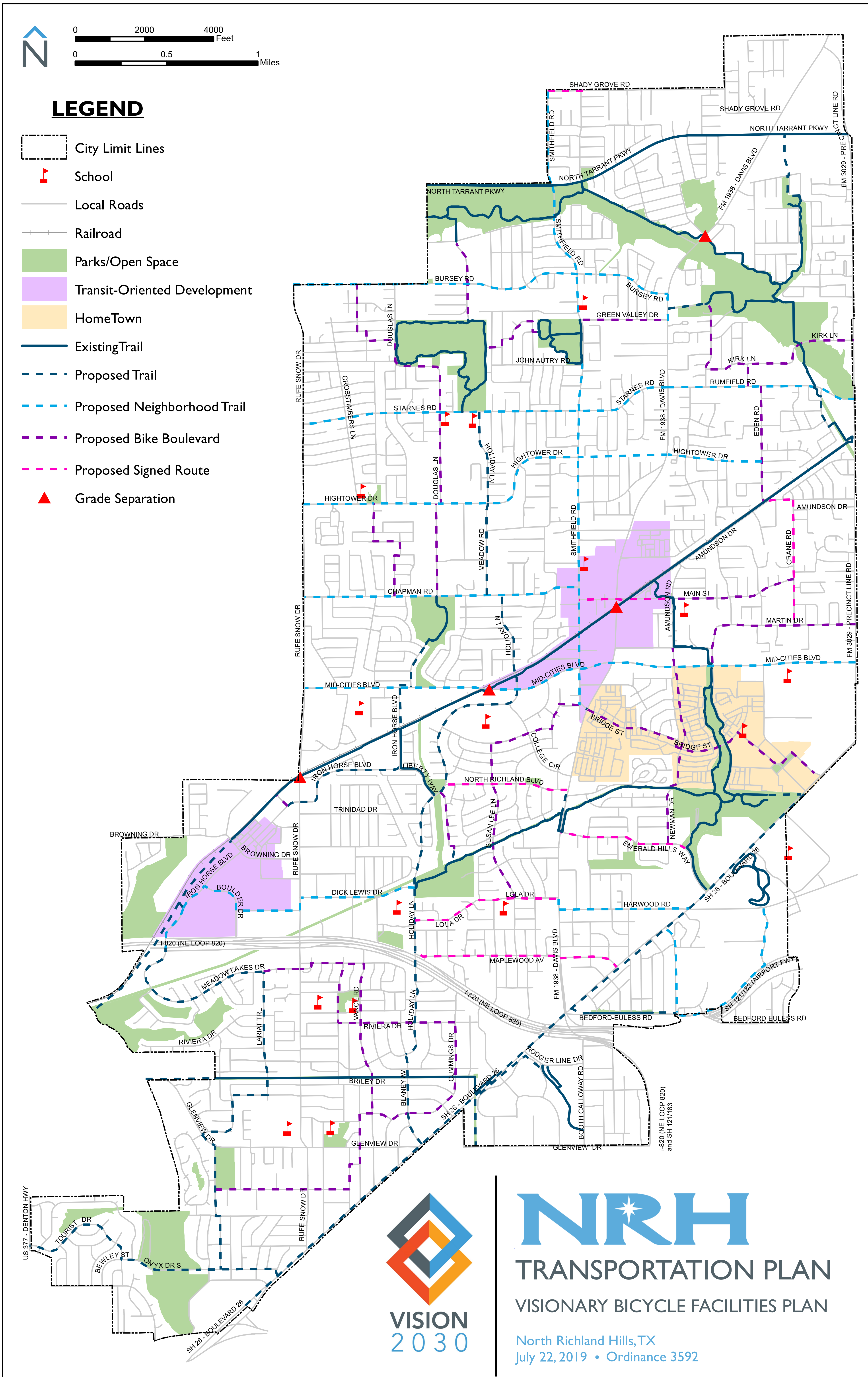
# NRH
## TRANSPORTATION PLAN
### ROADWAY LAND USE CONTEXT

North Richland Hills, TX
July 22, 2019 • Ordinance 3592

7/25/2019; Vision 2030_Transportation Plan_Roadway Contexts_20190722

| | Suburban Commercial | Suburban Neighborhood | Transit Oriented Development | Urban Village |
|---|---|---|---|---|
| Land Use | Mix of uses: office, retail, restaurant, commercial<br>Larger suburban building setbacks | Primarily residential<br>Occasional neighborhood retail, restaurant, commercial<br>Home frontages on low volume facilities | Mix of uses: residential, office, retail, restaurant, commercial<br>Higher densities<br>Minimal building setbacks | Mix of uses: residential, neighborhood office, retail, restaurant<br>Minimal building setbacks<br>Higher densities |
| Travelway | Mobility focus<br>Higher speeds and volumes<br>Access management<br>Raised medians<br>Transit routes<br>Freight routes | Local resident access and circulation<br>Low to moderate speeds and volumes<br>Transit routes<br>On-street bicycle facilities | Low speeds and volumes<br>Transit routes<br>On-street bicycle facilities | Low speeds and low to moderate volumes<br>Transit routes<br>On-street bicycle facilities |
| Flex Zone | No on-street parking<br>Dedicated turn lanes<br>Transit stops | On-street parking for home frontages<br>Occasional transit stops | On-street parking common<br>Freight delivery zones<br>Pick-up/drop-off zones<br>Activation spaces (food trucks, festivals) | On-street parking common<br>Pick-up/drop-off zones<br>Activation spaces (food trucks, festivals) |
| Pedestrian Realm | Sidewalks<br>Off-street bicycle facilities<br>Transit stops | Sidewalks<br>Off-street bicycle facilities (if ROW is available)<br>Transit stops<br>Plantings (street trees, rain gardens) | Sidewalks<br>Activation spaces (parklets, outdoor dining, public art)<br>Bicycle parking<br>Transit stops<br>Plantings (street trees, rain gardens) | Sidewalks<br>Activation spaces (parklets, outdoor dining, public art)<br>Bicycle parking<br>Transit stops<br>Plantings (street trees, rain gardens) |


0 2000 4000 Feet
0 0.5 1 Miles
LEGEND
City Limit Lines
School
Local Roads
Railroad
Parks/Open Space
Transit-Oriented Development
HomeTown
Existing Trail
Proposed Trail
Proposed Neighborhood Trail
Proposed Buffered Bike Lane
Proposed Bike Boulevard
Proposed Signed Route
Grade Separation
SHADY GROVE RD
NORTH TARRANT PKWY
SMITHFIELD RD
FM 1938 - DAVIS BLVD
FM 3029 - PRECINCT LINE RD
BURSEY RD
GREEN VALLEY DR
KIRK LN
RUMFIELD RD
JOHN AUTRY RD
STARNES RD
DOUGLAS LN
CROSSTIMBERS LN
RUFE SNOW DR
HOLIDAY LN
HIGHTOWER DR
EDEN RD
AMUNDSON DR
AMUNDSON RD
CRANE RD
MEADOW RD
CHAPMAN RD
MAIN ST
MARTIN DR
MID-CITIES BLVD
IRON HORSE BLVD
BRIDGE ST
COLLEGE CIR
LIBERTY WAY
NORTH RICHLAND BLVD
TRINIDAD DR
SUSAN LEE LN
NEWMAN DR
EMERALD HILLS WAY
BROWNING DR
BOULDER DR
DICK LEWIS DR
LOLA DR
HARWOOD RD
SH 26 - BOULEVARD 26
I-820 (NE LOOP 820)
MAPLEWOOD AV
MEADOW LAKES DR
VANCE RD
RIVIERA DR
LARIAT TRL
CUMMINGS DR
BEDFORD-EULESS RD
SH 121/183 (AIRPORT FWY)
RODGER LINE DR
BOOTH CALLOWAY RD
BRILEY DR
BLANEY AV
GLENVIEW DR
I-820 (NE LOOP 820) and SH 121/183
US 377 - DENTON HWY
TOURIST DR
BEWLEY ST
ONYX DR S
VISION 2030
NRH
TRANSPORTATION PLAN
2030 BICYCLE FACILITIES PLAN
North Richland Hills, TX
July 22, 2019 • Ordinance 3592
7/25/2019: NRH_BikeFacilitiesPlan-2030_20190722




# NRH TRANSPORTATION PLAN

## VISIONARY BICYCLE FACILITIES PLAN

North Richland Hills, TX
July 22, 2019 • Ordinance 3592

# Design Element Zones & Dimensions

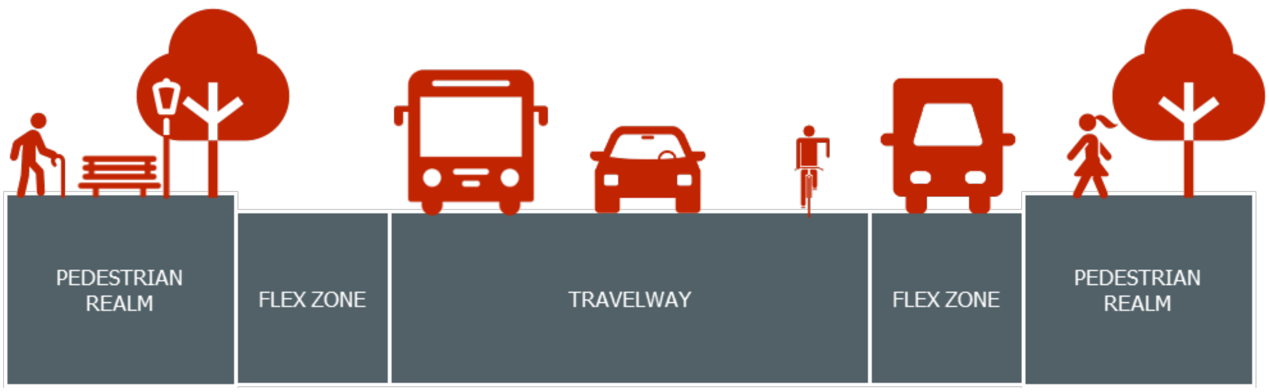
As NRH continues to mature as a community, essential functions within the right-of-way become more diverse to serve existing and emerging activity. The modal elements of the Transportation Plan define investment networks that add activity to certain corridors. Since every function cannot be accommodated within the right-of-way, a framework for integration and prioritization of functions must be developed.

Three (3) basic zones are embedded in the right-of-way:

**Travelway:** Primarily used for mobility purposes. Travel lanes can serve all modes or be dedicated to serve specific modes, such as bicycles or transit.

**Pedestrian Realm:** Comprised of sub-zones, including frontage, clear walk, and buffer zones, this area lies between the property line and the flex or travelway zones. This space includes the sidewalk, planting areas, street furniture, lighting, and other pedestrian and business amenities.

**Flex Zone:** A transition area between the travelway and pedestrian realm, this area provides space for people and goods to transition between moving vehicles and people in the pedestrian realm. This zone can contain multiple uses along a street including: on-street parking, passenger loading, commercial deliveries, and parklets.




The design elements and dimensions are determined by a combination of the functional classification, land use context, and modal plans, specifically the bicycle plan in this study. The tables on the following pages provide these element dimensions.

| Suburban Commercial | MAJOR ARTERIAL | | MINOR ARTERIAL | | COLLECTOR | | LOCAL | |
|---|---|---|---|---|---|---|---|---|
| | MODAL PRIORITY | | MODAL PRIORITY | | MODAL PRIORITY | | MODAL PRIORITY | |
| | **Walk** | LOW | **Walk** | MID | **Walk** | MID | **Walk** | HIGH |
| | **Bike** | LOW | **Bike** | MID | **Bike** | HIGH | **Bike** | HIGH |
| | **Drive** | HIGH | **Drive** | HIGH | **Drive** | HIGH | **Drive** | MID |
| **Right-of-Way** | 120' to 130' | | 70' to 80' | | 68' | | 50' | |
| Travelway | | | | | | | | |
| **Total Pavement Width[1] (FOC-FOC, Excluding Parking)** | 64' to 86' | | 33' to 60' | | 30' to 60' | | 30' | |
| **No. of Travel Lanes** | 6 | | 2-4 | | 2-4 | | 2 | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **Outside Travel Land Width[1]** | 12' | 12' | 12' | 11' | 12' | 11' | 15' | N/A |
| **Travel Lanes Width** | 12' | 10' | 11' | 10' | 11' | 10' | N/A | N/A |
| **Center Turn Lane Width** | 14' | 11' | 14' | 11' | 14' | 11' | N/A | N/A |
| **Raised Median** | 18' | 14' | 18' | 14' | 18' | 14' | N/A | N/A |
| Flex Zone | | | | | | | | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **On-Street Bicycle Facilities[2]** | | | | | | | | |
| Separated Bike Lanes *(Preferred)* | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | N/A | N/A |
| Buffered Bike Lanes | N/A | N/A | 6' (Clear) 3' (Buffer) | 5' (Clear) 2' (Buffer) | 6' (Clear) 3' (Buffer) | 5' (Clear) 2' (Buffer) | N/A | N/A |
| Conventional Bike Lanes | N/A | N/A | N/A | N/A | 6' | 5' | 6' | 5' |
| Bicycle Boulevard/Signed Route | N/A | N/A | N/A | N/A | Optional | Optional | Optional | Optional |
| **Parking (Parallel)** | N/A | N/A | N/A | N/A | 8' | 7' | 8' | 7' |
| Pedestrian Realm | | | | | | | | |
| **Amenity Zone[3]** | 10' | 6' | 8' | 4' | 6' | 4' | 4' | 0' |
| **Clear Sidewalk (Shared Use Path)** | 7' (12') | 5' (8') | 7' (12') | 5' (8') | 6' | 5' | 5' | 4' |
| **Setback/Shy Distance[4]** | 4' | 2' | 1' | 0' | 1' | 0' | 1' | 0' |

[1]Two-lane undivided collector facilities shall maintain a minimum pavement width of: 30' if no parking; 36' if parking on only one side; and 40' if parking on both sides.

[2]See Pattern Book for further details on bicycle facility design

[3]Includes up to face-of-curb

[4]Space between edge of vehicle lane and sidewalk

| Suburban Neighborhood | MINOR ARTERIAL | | COLLECTOR | | LOCAL | |
|---|---|---|---|---|---|---|
| | MODAL PRIORITY | | MODAL PRIORITY | | MODAL PRIORITY | |
| | **Walk** | MID | **Walk** | MID | **Walk** | HIGH |
| | **Bike** | MID | **Bike** | HIGH | **Bike** | HIGH |
| | **Drive** | HIGH | **Drive** | HIGH | **Drive** | MID |
| **Right-of-Way** | 70' to 110' | | 60' to 68' | | 50' | |
| Travelway | | | | | | |
| **Total Pavement Width[1] (FOC-FOC, Excluding Parking)** | 42' to 82' | | 30' to 60' | | 30' | |
| **No. of Travel Lanes** | 4-6 | | 2-4 | | 2 | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **Outside Travel Land Width[1]** | 12' | 11' | 11' | 11' | 15' | N/A |
| **Travel Lanes Width** | 11' | 10' | 11' | 10' | N/A | N/A |
| **Center Turn Lane Width** | 12' | 10' | 12' | 10' | N/A | N/A |
| **Raised Median** | 18' | 14' | 18' | 14' | N/A | N/A |
| Flex Zone | | | | | | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **On-Street Bicycle Facilities[2]** | | | | | | |
| Separated Bike Lanes (*Preferred*) | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | N/A | N/A |
| Buffered Bike Lanes | 6' (Clear) 3' (Buffer) | 5' (Clear) 2' (Buffer) | 6' (Clear) 3' (Buffer) | 5' (Clear) 2' (Buffer) | N/A | N/A |
| Conventional Bike Lanes | N/A | N/A | 6' | 5' | 6' | 5' |
| Bicycle Boulevard/Signed Route | N/A | N/A | Optional | Optional | Optional | Optional |
| **Parking (Parallel)** | 8' | 7' | 8' | 7' | 8' | 7' |
| Pedestrian Realm | | | | | | |
| **Amenity Zone[3]** | 8' | 4' | 6' | 4' | 4' | 0' |
| **Clear Sidewalk (Shared Use Path)** | 7' (12') | 5' (8') | 6' (10') | 5' (8') | 5' | 4' |
| **Setback/Shy Distance[4]** | 1' | 0' | 1' | 0' | 1' | 0' |

[1]Two-lane undivided collector facilities shall maintain a minimum pavement width of: 30' if no parking; 36' if parking on only one side; and 40' if parking on both sides.

[2]See Pattern Book for further details on bicycle facility design

[3]Includes up to face-of-curb

[4]Space between edge of vehicle lane and sidewalk

| Urban Village | MINOR ARTERIAL | | COLLECTOR | | LOCAL | |
|---|---|---|---|---|---|---|
| | MODAL PRIORITY | | MODAL PRIORITY | | MODAL PRIORITY | |
| | **Walk** | HIGH | **Walk** | HIGH | **Walk** | HIGH |
| | **Bike** | HIGH | **Bike** | HIGH | **Bike** | HIGH |
| | **Drive** | HIGH | **Drive** | MID | **Drive** | LOW |
| **Right-of-Way** | 70' to 110' | | 60' to 68' | | 50' | |
| Travelway | | | | | | |
| **Total Pavement Width[1] (FOC-FOC, Excluding Parking)** | 42' to 82' | | 30' to 60' | | 30' | |
| **No. of Travel Lanes** | 4-6 | | 2-4 | | 2 | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **Outside Travel Land Width[1]** | 12' | 11' | 11' | 11' | 15' | N/A |
| **Travel Lanes Width** | 11' | 10' | 11' | 10' | N/A | N/A |
| **Center Turn Lane Width** | 12' | 10' | 12' | 10' | N/A | N/A |
| **Raised Median** | 18' | 14' | 18' | 14' | N/A | N/A |
| Flex Zone | | | | | | |
| | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED | REQUIRED | CONSTRAINED |
| **On-Street Bicycle Facilities[2]** | | | | | | |
| Separated Bike Lanes *(Preferred)* | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | 7' (Clear) 6' (Barrier) | 5' (Clear) 2' (Barrier) | N/A | N/A |
| Buffered Bike Lanes | 6' (Clear) 3' (Buffer) | 5' (Clear) 2' (Buffer) | 6' (Clear) 3' (Buffer) | 5' (Clear) 2' (Buffer) | N/A | N/A |
| Conventional Bike Lanes | N/A | N/A | 6' | 5' | 6' | 5' |
| Bicycle Boulevard/Signed Route | N/A | N/A | Optional | Optional | Optional | Optional |
| **Parking (Parallel)** | 8' | 7' | 8' | 7' | 8' | 7' |
| Pedestrian Realm | | | | | | |
| **Amenity Zone[3]** | 8' | 4' | 6' | 4' | 4' | 0' |
| **Clear Sidewalk (Shared Use Path)** | 7' (12') | 5' (8') | 6' | 5' | 5' | 4' |
| **Setback/Shy Distance[4]** | 1' | 0' | 1' | 0' | 1' | 0' |

[1]Two-lane undivided collector facilities shall maintain a minimum pavement width of: 30' if no parking; 36' if parking on only one side; and 40' if parking on both sides.

[2]See Pattern Book for further details on bicycle facility design

[3]Includes up to face-of-curb

[4]Space between edge of vehicle lane and sidewalk

## Right-of-Way Prioritization

Right-of-way (ROW) is a key component in determining the feasible mobility and placemaking elements for a street design. A predictable ROW is necessary in order to require dedications from new development and determine the optimum locations for multimodal elements, like bikes, trails, and transit.

The existing ROW envelopes along most corridors in NRH affects the possible elements of design. When limited ROW exists for the recommended modal elements and geometry, there are three options to proceed:

- **Acquire Additional ROW**
  In areas of large setbacks or redeveloping properties, this option allows a wider envelope to fit all the recommended elements
- **Apply Constrained Design**:
  Required and constrained geometric dimensions for design elements allow lane widths, sidewalks, and buffers to be minimized to fit the ROW constrained ROW.
- **Prioritize Design Elements**:
  If neither additional ROW nor compact design accommodates the full multimodal demands of the corridor, then design elements can be prioritized through the project development process.

Constrained dimensions are provided on the earlier tables to provide guidance for minimum widths of design elements. If a constrained design, containing the full multimodal elements, continues to exceed the available ROW, the modal elements can then be prioritized. At the top of each table, prioritization categories are provided for walking, biking, and driving. These are rated as low, mid, or high priority modes within the land use and mobility context of each facility type.

# Appendix B:

# Target Corridors

Target corridor planning was undertaken through this study to assess needs of specific corridors at a local level. Using more fine-grained analysis tools, like Synchro modeling, and application of active transportation and land use context-sensitivity best practices, traffic operations were assessed for these corridors as well as recommendations for roadway rightsizing, necessary network connections, major traffic control elements, and urban design elements. The following table details the corridors analyzed with the following pages describing the analysis and recommendations.

| Target Corridor | From | To |
|---|---|---|
| **Hightower Drive** | Smithfield Road | Davis Boulevard |
| **Hightower Drive** | Michael Drive | Eden Road |
| **Eden Road** | Rumfield Road | Amundson Drive |
| **Amundson Drive** | Main Street | Precinct Line Road |
| **Meadow Road** | Hightower Drive | Chapman Road |
| **Iron Horse Boulevard** | Rufe Snow Drive | Mid-Cities Boulevard |
| **Bedford-Euless Road** | Boulevard 26 | Strummer Drive |
| **Holiday Lane** | IH 820 | Liberty Way |

# Hightower Drive

## (Smithfield Road to Davis Boulevard)

### Background

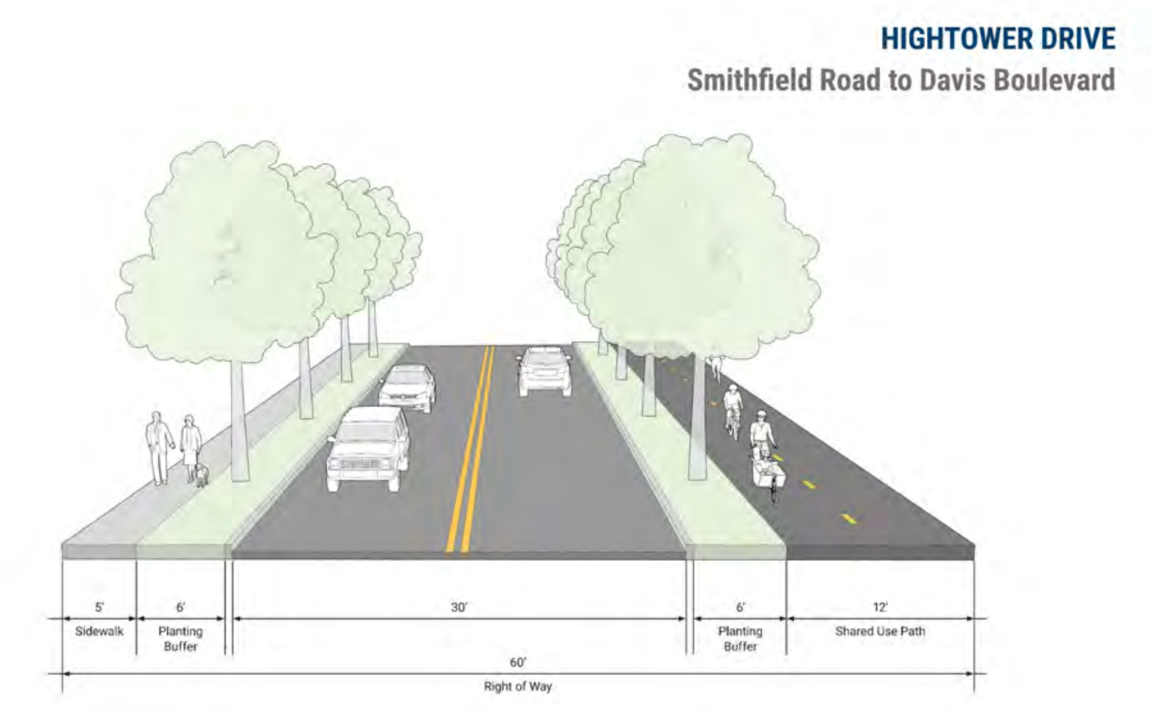
Hightower Drive exists currently as an east-west corridor connecting west to US 377 and IH 35W with an eastern terminus at Smithfield Road. Serving as a collector class facility providing access to adjacent houses, neighborhoods, and schools, Hightower Drive functions primarily for local mobility. An extension of Hightower Drive to the east toward Davis Boulevard and ultimately Eden Road has been anticipated in previous transportation planning efforts in NRH. The ultimate need, sizing, and timing of the corridor extension were considered as part of this study with Hightower Drive analyzed in two segments – Smithfield Road to Davis Boulevard and Michael Drive to Eden Road.

### Analysis & Discussion

The extension of Hightower Drive from Smithfield Road to Davis Boulevard serves primarily to increase local east-west access to Davis Boulevard, a major north-south mobility corridor. Existing east-west connections between Smithfield Road and Davis Boulevard (Starnes Road, Turner Drive, Odell Street, Main Street, proposed Northeast Parkway) provide existing capacity to serve this need. A screen line analysis of the 2040 NCTCOG Travel Demand Model revealed these existing east-west corridors provide sufficient capacity currently and in the near-future for this travel pattern. For the long-term, this facility should remain on the Transportation Plan to enhance overall network connectivity, especially when considered in tandem with the Hightower extension to Eden Road.

Existing residential development is in place adjacent to the proposed corridor with houses backing to the corridor right-of-way but not facing it. A narrow roadway section is recommended as on-street parking is not needed due to the lack of home frontages. This narrow section also supports the vision to focus on local access and circulation while minimizing cut-through traffic. An analysis of forecasted 2040 volumes revealed a 2-lane roadway provides sufficient capacity long-term with daily volumes under 7,500 vehicles per day and peak directional traffic under 500 vehicles per hour. A 32-foot pavement section is recommended with an off-street bicycle facility implemented through a shared use path.

| Recommended Roadway Section | |
|---|---|
| **Functional Classification** | Minor Collector |
| **Right-of-Way** | 60’ |
| **Lanes** | 2 |
| **Median** | None |
| **Parking** | No |
| **Intersections** | Left-turn bays at Smithfield Road and at Davis Boulevard |
| **Special Comments** | Shared use path on one side |



## Implementation Recommendations

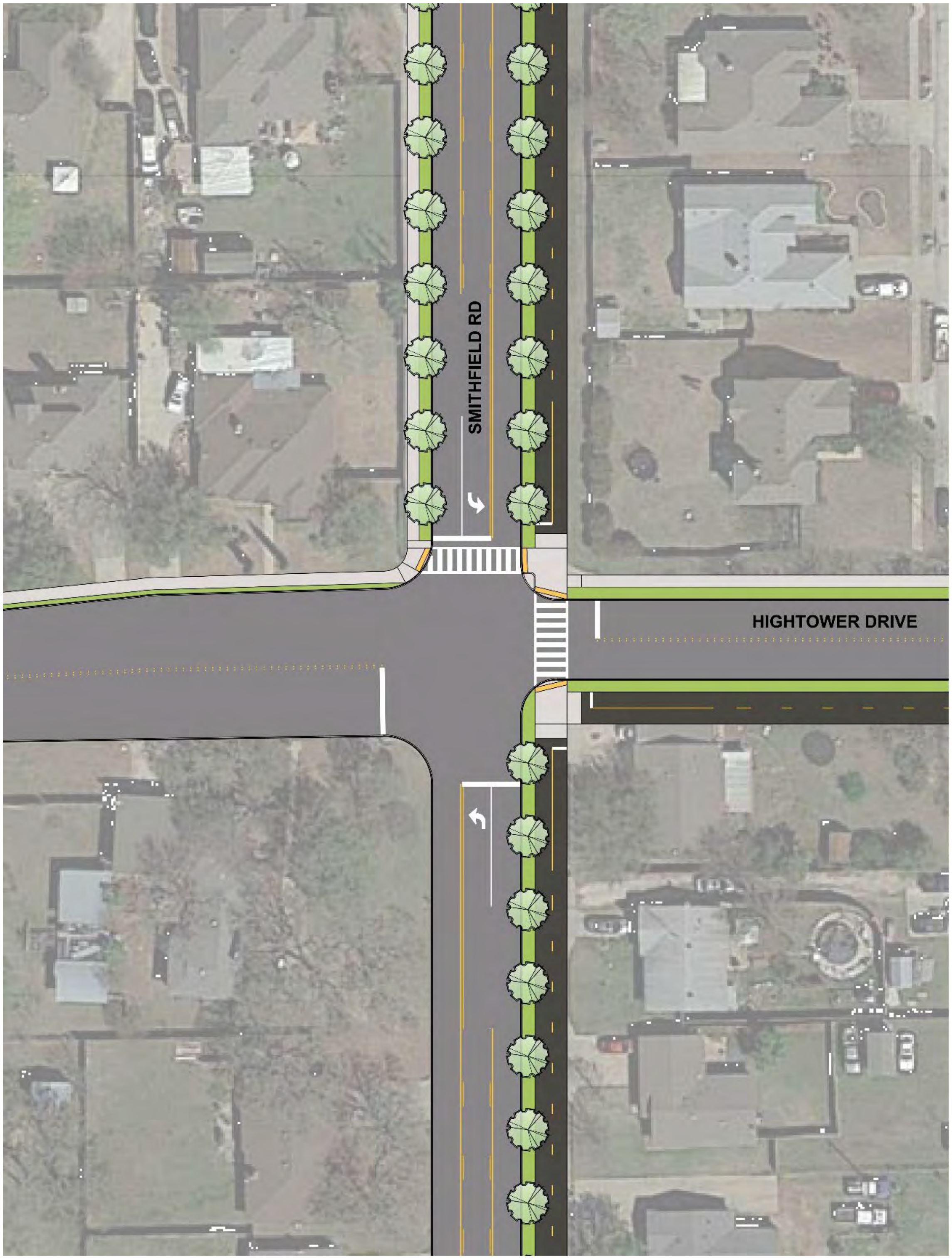
Implementation Timeframe: Long-term (10+ years)

With the supporting east-west connections currently in place, the implementation of the Hightower Drive extension to Davis Boulevard is recommended in the long-term. Its implementation should be development-driven through the future development of the undeveloped north parcel on the eastern half of the corridor.

The existing City-owned right-of-way along much of the corridor allows interim measures to be put in place until the ultimate roadway section requires implementation. An interim trail is possible within this right-of-way from Smithfield Road to Timberlane Drive to provide a green space for the neighborhood. The trail could be extended to Davis Boulevard to increase the connectivity of the bike network, but steep grading (25-30% maximum, with extended areas of 10%+) presents a barrier to this full extension.

A diagram showing a conceptual layout of the intersection of Hightower Drive at Smithfield Road is shown on the next page.

## Example Intersection Layout (Hightower Drive @ Smithfield Road)



# Hightower Drive

## (Michael Drive to Eden Road)

### Background

Hightower Drive exists currently as an east-west corridor connecting west to US 377 and IH 35W with an eastern terminus at Smithfield Road. Serving as a collector class facility providing access to adjacent houses, neighborhoods, and schools, Hightower functions primarily for local mobility. In addition to the extension of Hightower Drive to the east toward Davis Boulevard, an extension of Hightower from Michael Drive to Eden Road has been anticipated in previous transportation planning efforts within the City. This latter part represents the completion of a connection between Davis Boulevard and Eden Road. From Davis Boulevard to Michael Drive, Hightower has been constructed with adjacent residential development. The ultimate need, sizing, and timing of the corridor extension were considered as part of this study.

### Analysis & Discussion

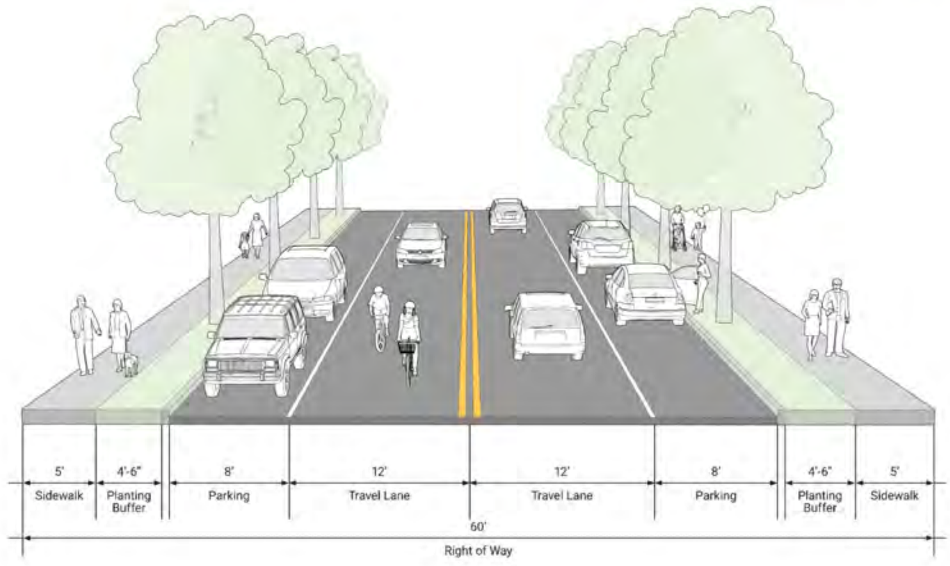
The extension of Hightower Drive from Michael Drive to Eden Road serves primarily to increase local access to Davis Boulevard, a major north-south mobility corridor. Limited connections exist linking neighborhoods east of Davis to Davis Boulevard (Rumfield Road, Main Street). A screen line analysis of forecasted 2040 volumes revealed additional capacity is needed in the mid-term future to support access to Davis Boulevard. This extension also serves a vital role adding connectivity to the area between Davis Boulevard and Precinct Line Road as the railroad bisects it with Eden Road serving as the only midway crossing. By adding this link, an alternate route is formed to allow local neighborhood connection north-south across the railroad, helping to relieve Davis Boulevard. This is especially relevant for access to Smithfield Middle School and the future Smithfield TOD for the neighborhood north of the railroad/Amundson Drive.

Large-lot existing residential development is in the proposed path of the corridor extension. The roadway section is recommended as a typical 40' collector with on-street parking marked on both sides, but this should be flexible toward proposed development initiatives. The pavement should be narrowed if on-street parking is not needed. Maintaining a narrow section supports the vision to focus on local access and circulation while minimizing cut-through traffic. An analysis of forecasted 2040 volumes revealed a 2-lane roadway provides sufficient capacity long-term with daily volumes under 5,500 vehicles per day and peak directional traffic under 400 vehicles per hour. A 40-foot pavement section is recommended with a shared-lane, on-street bicycle facility signed along the roadway.

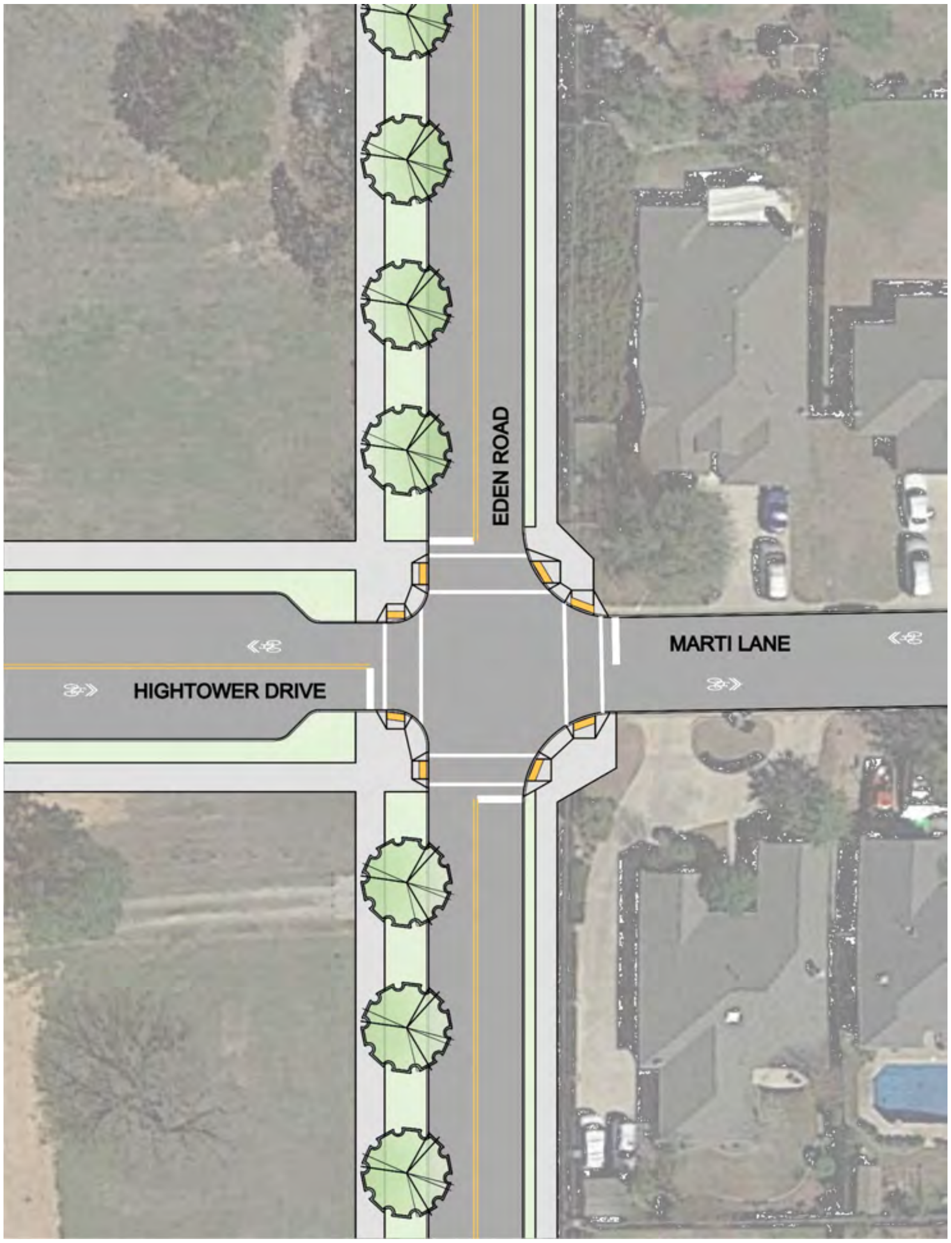
It should also be noted that the pavement space on the existing section of Hightower Drive from Davis Boulevard to Michael Drive should be more visually delineated through striping for on-street parking. Intersection bulb-outs should also be considered to visually narrow the road for traffic calming and protection of pedestrians. This delineation will help tie the existing section of Hightower to the proposed extension.

| Recommended Roadway Section | |
|---|---|
| **Functional Classification** | Minor Collector |
| **Right-of-Way** | 60’ |
| **Lanes** | 2 |
| **Median** | None |
| **Parking** | Yes, both sides |
| **Intersections** | No additional pavement at intersections |
| **Special Comments** | Wide sidewalks<br>Bicycle boulevard; signed on-street bicycle facilities |

**HIGHTOWER DRIVE**
**Michael Drive to Eden Road**



### Example Intersection Layout (Hightower Drive @ Eden Road)




## Implementation Recommendations

Implementation Timeframe: Mid-term (2-10 years)

With limited supporting connections east of Davis Boulevard, the implementation of the Hightower Drive extension to Eden Road is recommended in the mid-term. Its implementation should be development-driven through the future development of the undeveloped parcels surrounding the proposed alignment.

# Eden Road

## (Rumfield Road to Amundson Drive)

### Background

Eden Road exists currently as a north-south corridor connecting Rumfield Road to Amundson Drive, including a vital railroad crossing. In its current state, Eden is a two-lane asphalt roadway with open swale drainage and a rural aesthetic. Residential subdivision development borders the east side of the roadway with large-lot residences dotting the west side. Continued subdivision development is anticipated in this area through infill of these large lots over time. The future of this corridor is guided both through the continued land development as well as the extension of Hightower Drive from Davis Boulevard to Eden Road. Previous planning efforts in NRH identified Eden Road as a four-lane facility. The ultimate sizing and aesthetic of the corridor were considered as part of this study.

### Analysis & Discussion

An analysis of forecasted 2040 volumes revealed ultimate traffic demand on Eden Road warrants only a two-lane section with daily volumes under 6,000 vehicles per day and peak directional volumes under 500 vehicles per hour. As a highly local facility, heavy truck traffic will be limited to occasional delivery vehicles. This analysis captures the extension of Hightower Drive to forecast volumes at a conservative level for roadway sizing.

Ultimately, drainage issues in the area necessitate a closed drainage system with curb and gutter. To maintain the “rural” feel, it is recommended to consider laydown curbs to reduce the visual impact. The additional space gained through underground drainage allows the implementation of a shared use path on the west side of the roadway. This will provide a needed safe north-south crossing of the railroad with access to the Cotton Belt Trail, including a safe route to school for students living north of the railroad and attending Smithfield Middle School.

An intersection analysis of Eden Road at Amundson Drive was performed and detailed in the next section. The result recommends the signalization of the intersection, driven by the extension of Hightower Drive and the subsequent new travel pattern through this intersection. Initial analysis revealed no additional turn lanes are needed at this intersection in the future, but further analysis is needed with the continuation of development in the area and observance of travel pattern changes with the Hightower extension.

| Recommended Roadway Section | |
|---|---|
| **Functional Classification** | Minor Collector |
| **Right-of-Way** | 60’ |
| **Lanes** | 2 |
| **Median** | None |
| **Parking** | No |
| **Intersections** | Signalization at Amundson Drive<br>Left-turn bay not anticipated, but subject to further evaluation with completion of Hightower extension |
| **Special Comments** | Shared use path on one side<br>Laydown curb |

**EDEN ROAD**

**Rumfield Road to Amundson Drive**

## Implementation Recommendations

Eden Road's reconstruction and the Hightower Drive extension are linked in improving accessibility throughout the neighborhoods east of Davis Boulevard surrounding the railroad. The extension of Hightower Drive will bring new travel patterns to the area, specifically drawing toward Eden Road and its railroad crossing, and provide the impetus for Eden Road's reconstruction south to Amundson Drive. Future development of the parcels on the west side, including those driving Hightower Drive's extension, drive the implementation of the corridor's ultimate vision. Right-of-way dedications and proportional infrastructure dedications should also help implement the corridor's vision, especially the shared use path.

# Amundson Drive

## (Main Street to Precinct Line Road)

### Background

Amundson Drive exists currently as a southwest-northeast corridor connecting Main Street, near Davis Boulevard and the railroad, with Precinct Line Road. It generally parallels the railroad and the Cotton Belt Trail north of Main Street. East of Eden Road, Amundson breaks from the parallel path of the railroad and heads east toward Precinct Line Road. The corridor has a unique character as development is single-sided with the railroad and trail on the opposing side. It serves primarily as a collector class facility providing access to adjacent houses, neighborhoods, and schools. It also ties directly into the Smithfield TOD on the west end near Main Street. Previous planning efforts in NRH identified Amundson Drive as a four-lane facility. The ultimate sizing and aesthetic of the corridor were considered as part of this study.

### Analysis & Discussion

An analysis of forecasted 2040 volumes revealed ultimate traffic demand on Amundson Drive warrants only a two-lane section with daily volumes under 8,000 vehicles per day and peak directional volumes under 600 vehicles per hour. As a highly local facility, heavy truck traffic will be limited to occasional delivery vehicles. This analysis captures the extension of Hightower Drive and subsequent travel patterns along Amundson-Eden-Hightower to forecast volumes at a conservative level for roadway sizing.

The roadway design sections were analyzed in two sections – from Main Street to Eden Road and from Eden Road to Precinct Line Road. The former maintains single-sided development with the Cotton Belt Trail and railroad tracks on the opposing side. The latter represents a more typical suburban environment with residential development approaching a major arterial. From Main Street to Eden Road, neighborhood connections to the trail is vital and can be addressed through urban design concepts, such as visual contrast “splitter” islands, sidewalk landings on the south side to bring attention to the crossing, and gateway markers on the north side to enhance the pedestrian connection and reduce the roadway scale in the wide right-of-way. From Eden Road to Precinct Line Road, the roadway section converts to a more typical section with curb and gutter and standard sidewalks on both sides.

Creating access across Amundson Drive for pedestrians is an important element of the ultimate design for Amundson Drive. This provides safe access for residents in the adjacent neighborhoods to the trail as well as safe crossings for children walking or biking to school in the area, specifically those attending Smithfield Middle School to the south. Enhanced design elements can bring attention to these crossings. Recommended enhancements include:

- Small, visual contrast “splitter” islands (flush or raised) at residential street intersections
- Pedestrian-scaled intersection lighting

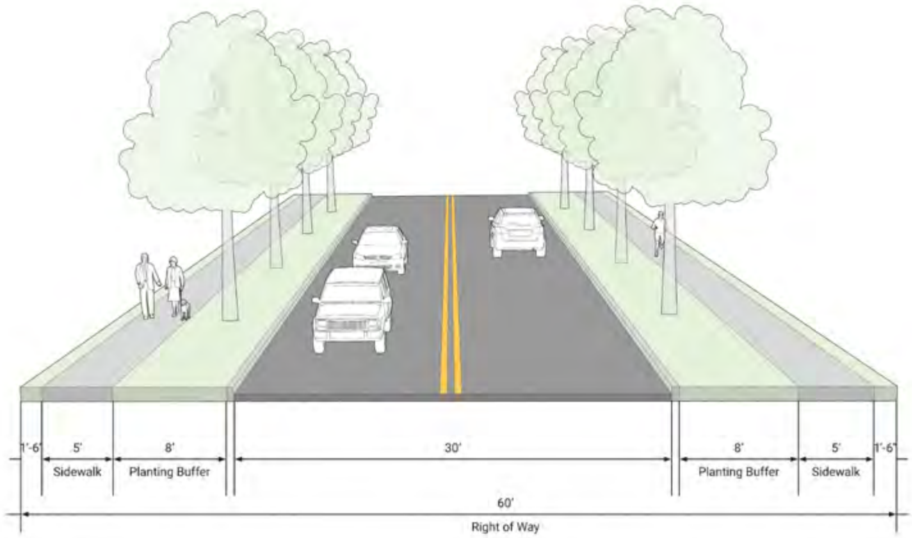
- Motion activated crosswalk or median island delineator lights
- Pedestrian crossing signs in advance of intersections
- Contrasting crosswalk pavements and markings to delineate pedestrian crossings
- Sidewalk landings to position pedestrians within easy and expected begin points for crossing the roadway
- Neighborhood-oriented gateway markers at intersections to enhance crossing locations as well as narrow roadway scale

The ultimate amentization of the trail through periodic pedestrian lighting and site furnishings will support neighborhood ownership of this segment of the trail paralleling Amundson Road. The further definition of the trail as a neighborhood green space will be a benefit to the neighborhoods with enhancements along Amundson providing the safe gateway to this space.

The available right-of-way and geometric complexity at the intersection of Amundson Drive-Amundson Road-Donna Drive lead to a conclusion that a modern roundabout would be an optional intersection treatment for the intersection. The realignment of Amundson Drive to parallel the railroad until Main Street as the primary alignment has created an intersection with multiple phases of movement for northbound Amundson Road with operations that can be confusing to drivers at the intersection along the Amundson Drive, Amundson Road, and Donna Drive. Excess pavement and a vacant triangular corner at the intersection provide an opportunity to create an eastern gateway into the Smithfield TOD as well as simplify intersection operations by constructing a roundabout at this location.

| Recommended Roadway Section | |
|---|---|
| **Functional Classification** | Major Collector |
| **Right-of-Way** | 60’ |
| **Lanes** | 2 |
| **Median** | None |
| **Parking** | No |
| **Intersections** | Roundabout at Amundson Road/Donna Drive<br>Maintain flared lane configuration at Precinct Line Road |
| **Special Comments** | Bicycle facilities provided through paralleling Cotton Belt Trail |

## AMUNDSON DRIVE
East of Eden Road




## Implementation Recommendations

A public process should be undertaken to create an identity for this corridor regarding gateways and art enhancements. The continued vitality of the neighborhood and pedestrian enhancements of the area will rely on the ownership of these amenities by the area.

Incremental steps toward this vision can be taken as the existing pavement section represents the ultimate pavement width configuration as well.

# Meadow Road

## (Hightower Drive to Chapman Road)

### Background

Meadow Road exists as a two-lane north-south extension of Holiday Lane north of Chapman Road. Surrounded by large-lot residences in a rural feel, Meadow stretches from Chapman Road to Hightower Drive. North of Hightower Drive, the corridor continues under the name Holiday Lane to North Ridge Elementary School and Adventure World Playground. South of Chapman Road, an offset continuation of the corridor under the name of Holiday Lane ultimately to Richland High School and IH 820. Meadow serves a vital link between the segments of Holiday Lane to provide local mobility for inter-neighborhood movement and school access. Previous planning efforts in NRH identified Meadow Road as a four-lane facility. The ultimate sizing and aesthetic of the corridor were considered as part of this study.

### Analysis & Discussion

An analysis of forecasted 2040 volumes revealed ultimate traffic demand on Meadow Road warrants only a two-lane section with daily volumes near 4,000 vehicles per day and peak directional volumes under 400 vehicles per hour. As a highly local facility, heavy truck traffic will be limited to occasional delivery vehicles. The near-buildout conditions of the area surrounding Meadow Road also suggest minimal traffic volume increases in the future so that current operations would be generally maintained. The widening of the facility would encourage further use of this facility degrading the aesthetic of the neighborhood.

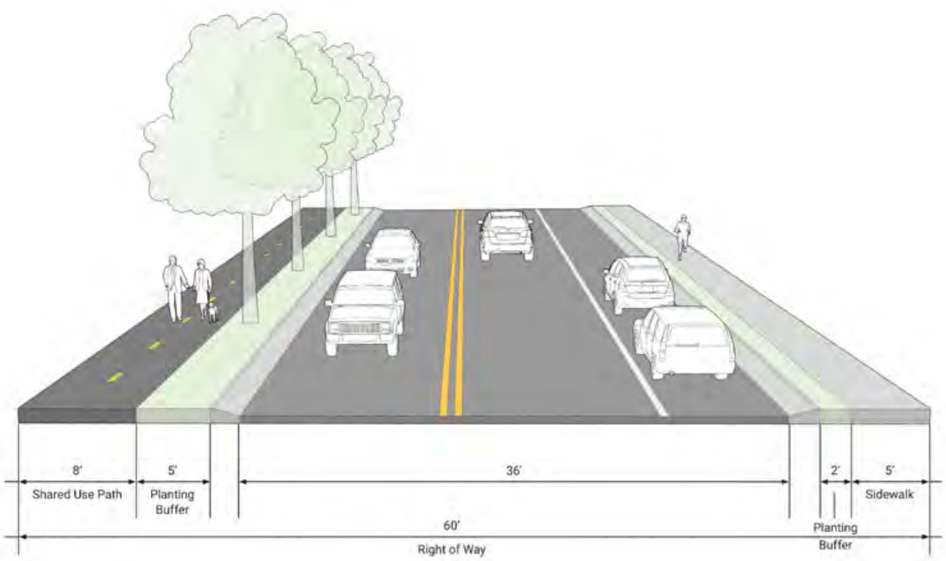
Ultimately, drainage issues in the area necessitate a closed drainage system with curb and gutter. To maintain the “rural” feel, it is recommended to incorporate laydown curbs to reduce the visual impact. The additional space gained through underground drainage allows the implementation of a shared use path on one side of the roadway. This will provide a safe off-street path for walking and biking for residents and children attending nearby schools while preventing impact to the vehicular movement. Pavement width will allow parking on one side of the roadway. It is recommended to stagger which side the parking is located along the corridor to create a chicane effect thereby slowing vehicles. The deep residential lots with extended driveways and off-street parking allow this minimizing of on-street parking accommodations.

An intersection analysis of Meadow Road at Chapman Road was performed in conjunction with the paired intersection of Holiday Lane at Chapman Road and detailed in the next section. The result recommends the continued signalization of the offset intersections which will maintain a desired level of operation.

| Recommended Roadway Section | |
|---|---|
| **Functional Classification** | Minor Collector |
| **Right-of-Way** | 60’ |
| **Lanes** | 2 |
| **Median** | None |
| **Parking** | One side |
| **Intersections** | Maintain offset intersection and signalization at Chapman Road; add eastbound Chapman Road left-turn bay |
| **Special Comments** | Shared use path on one side<br>Laydown curb<br>On-street parking on one side |

## MEADOW ROAD

**Hightower Drive to Chapman Road**



## Implementation Recommendations

Significant changes in land use are not anticipated along this corridor, so this will not provide an impetus for implementation. Meadow Road's reconstruction serves as an enhanced maintenance project by replacing the deteriorating asphalt pavement while also improving drainage conditions through an underground storm drain system. This reconstruction is dependent on the life-cycle of the current roadway and its need for replacement. Increased bicycle or pedestrian demand along Meadow Road and/or Little Ranch Road would also signify a need for this roadway improvement to provide safer facilities for these users.

# Iron Horse Boulevard

## (Rufe Snow Drive to Mid-Cities Boulevard)

### Background

Iron Horse Boulevard inherits a background as the previously named Industrial Boulevard due to the historic expectation of industrial land uses along the corridor from Rufe Snow Drive to Mid-Cities Boulevard. Remnants of this past exist with the Prestige Ameritech facility located on the southwest corner of Iron Horse and the railroad, but today the corridor has seen an influx of residential homes bordering it from Rufe Snow Drive to the railroad. North of the railroad, institutional land uses exist with a future land use expectation for continued institutional uses in addition to some new neighborhood commercial uses. Once planned to serve industrial uses in its current five-lane, 90-foot right-of-way, Iron Horse Boulevard now primarily serves local neighborhood access and circulation to feed residents into the major north-south and east-west corridors of Rufe Snow Drive and Mid-Cities Boulevard. The segment of Iron Horse from Liberty Way to Mid-Cities Boulevard also serves as the path for the Calloway Branch Trail, providing access to the Cotton Belt Trail which pass through the Iron Horse Corridor. The Calloway Branch Trail currently exists on the east side of Iron Horse Boulevard from Liberty Way to the Cotton Belt Trail with city plans to extend it to Mid-Cities Boulevard to cross and connect with Buckingham Trail. The ultimate need, sizing, and timing of the corridor extension were considered as part of this study. The ultimate sizing and aesthetic of the corridor were considered as part of this study as it matures into a residential corridor.

### Analysis & Discussion

An analysis of forecasted 2040 volumes revealed ultimate traffic demand on Iron Horse Boulevard warrants only a two-lane section with daily volumes under 11,000 vehicles per day and peak directional volumes generally under 600 vehicles per hour. One directional peak hour volume in the model peaks near 800 vehicles per hour which is high for a single lane, but with a supporting roadway network this volume can be dispersed on adjacent facilities. This volume is also not a certainty as travel patterns respond to local conditions which the model lacks in nuance. If needed, this volume can still be handled within a two-lane section through focused intersection treatments as intersections are the typical bottlenecks in the system. With limited industrial uses and primarily local travel, heavy truck traffic will have limited volumes and impact on the overall operations of the roadway. The roadway section should accommodate these vehicles these movements, specifically turning movements and at intersections, to allow this continued use.

As a deteriorating five-lane roadway, the rightsizing of the roadway to a two-lane roadway with median, which allows dedicated turn bays, allows flexibility in the reuse of space. The recent residential development in the area has provided a basis for bicycle and pedestrian amenities through street trees and sidewalks. By narrowing the pavement space, this allows the continued evolution of the corridor into a residential corridor by creating a parkway with a wide landscaped median in addition to wider outside parkways to separate pedestrians from vehicle movement.

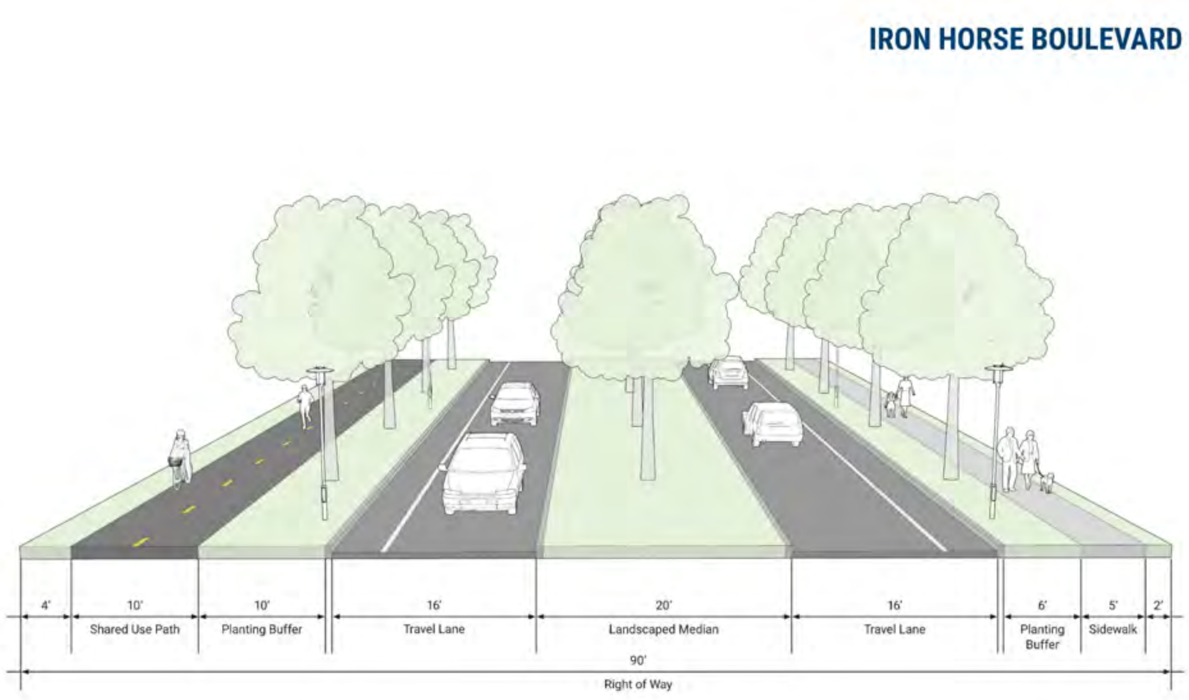
The Calloway Branch Trail designates the bicycle path along Iron Horse Boulevard north of Liberty Way and the Cotton Belt Trail provides a paralleling east-west path to Rufe Snow Drive, but the continuation of a shared use path in the wide outside parkway west of Liberty Way and through the Rufe Snow Drive intersection would allow a safe signalized crossing from bicycles and pedestrians wishing to move toward the Iron Horse TOD.

While a parkway environment created through a wide landscaped median is envisioned, a center turn lane is also an option. The raised landscaped median offers the visual break to naturally calm traffic and create a park-like atmosphere throughout the corridor, but it could also be a barrier to turning movements of truck traffic. Wide 16-foot lanes, striped for 12-foot travel lanes with a 4-foot shoulder, are recommended to provide flexibility for heavy trucks and emergency vehicles. This shoulder can also act as a de facto bike lane for confident cyclists.

Dedicated turn lanes should be maintained at the major intersections at Rufe Snow Drive and Mid-Cities Boulevard. As the bottleneck of the system, these intersections will allow the desired operational conditions to continue with less travel lanes through the efficient use of space for turn bays.

An intersection analysis of Iron Horse Boulevard at Liberty Way was performed and detailed in the next section. Due to the unique geometry of the intersection, the result recommends a roundabout at this intersection which will maintain a desired level of operation. This roundabout would need to be designed to accommodate large trucks and would require right-of-way acquisition on the undeveloped northwest corner of the intersection. Through the roundabout design, better connectivity can be created in the trail and sidewalk network to connect the neighborhoods west of Liberty Way to the Calloway Branch Trail.

| Recommended Roadway Section | |
|---|---|
| **Functional Classification** | Major Collector |
| **Right-of-Way** | 90’ |
| **Lanes** | 2 |
| **Median** | Yes, landscaped median (two way left-turn lane optional) |
| **Parking** | No |
| **Intersections** | Roundabout at Liberty Way<br>Dedicated turn bays at Rufe Snow and Mid-Cities Boulevard |
| **Special Comments** | Shared use path on one side<br>Supplemental bicycle facilities provided by Calloway Branch Trail and Cotton Belt Trail<br>Striped shoulder to accommodate industrial activity |



## Implementation Recommendations

As a deteriorating five-lane roadway, the rightsizing of the roadway to a two-lane roadway with median provides an opportunity to reimage the corridor through reconstruction. Street trees and sidewalk installed by recent development should be retained, where possible, and enhanced through the reconstruction of the roadway.

As a trial program of the roadway rightsizing to determine traffic operations that need special consideration in design, the outside travel lanes of the current 5-lane section can be striped off as on-street buffered bike lanes.

# Bedford-Euless Road

## (Boulevard 26 to Strummer Road)

### Background

Bedford-Euless Road exists as an east-west corridor serving as a backage road to IH 820/SH 183. Historically a corridor of freeway commercial, the reconstruction of IH 820 has shifted traffic away from Bedford-Euless Road through direct connections with Davis Boulevard and Boulevard 26. Terminating on the west at Boulevard 26 and Davis Boulevard, Bedford-Euless Road provides a route for westbound traffic from the freeway to reach these major mobility corridors. To the east, Bedford-Euless Road continues through Hurst, Bedford and Euless eventually terminating at SH 360.

Locally within NRH, Bedford-Euless Road provides access to the freeway system through its intersection with on-ramps, off-ramps, and frontage roads. Bedford-Euless Road also provides access to the North East Mall on the east side of IH 820. From Boulevard 26 to Strummer Road, the segment specifically analyzed in this study, Bedford-Euless Road exists as a five-lane roadway with a greenway on the north side of the right-of-way through much of its length. The shift in travel patterns from the reconstruction of IH 820 has left a remnant of commercial businesses and restaurants on the south side of Bedford-Euless Road west of SH 183. To the north of Bedford-Euless Road lies the greenway buffering a residential neighborhood. Also adjacent to the corridor is a shopping center on the northeast corner of Bedford-Euless Road and Strummer Drive with most of its frontage along Airport Freeway, the SH 183 frontage road. Much of this commercial-retail-restaurant along Bedford-Euless from Boulevard 26 to Strummer Road is in decline due to the changed travel patterns. The ultimate sizing and aesthetic of the corridor were considered as part of this study.

### Analysis & Discussion

The analysis and recommendation for Bedford-Euless Road must be viewed through multiple lenses, that of traffic operations for roadway sizing but also from a land use perspective as the ultimate roadway must support the potential revitalization of the area.

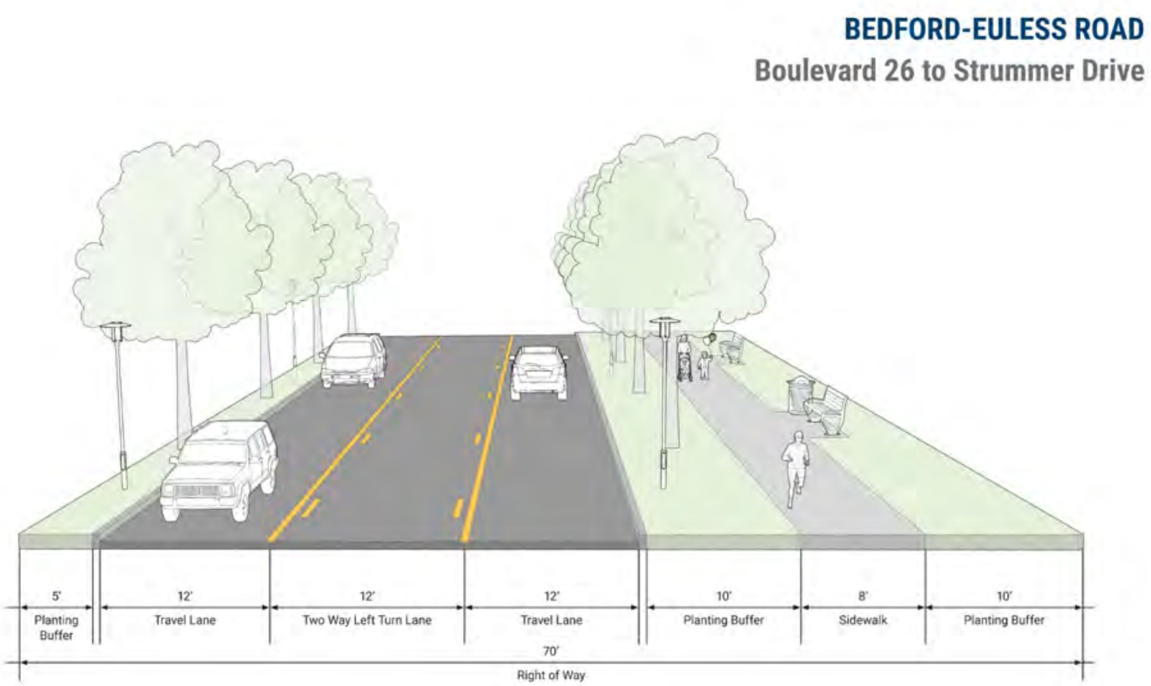
An analysis of forecasted 2040 volumes revealed ultimate traffic demand on Iron Horse Boulevard warrants only a two-lane section with center turn lane with daily volumes under 11,000 vehicles per day and peak directional volumes generally under 700 vehicles per hour. This modeling assumes the revitalization of this area thereby producing a conservative estimate of traffic generation. Volumes may also estimate high as the 2040 forecasts congestion along the freeway system which pushes traffic to backage facilities such as Bedford-Euless Road. Traffic volume estimates begin increasing to the east of Strummer Drive necessitating a larger cross section for the roadway which currently exists.

Land use planning is also vital to support the reinvigoration of this area along with the reimaging and rightsizing of the roadway itself. Reduced traffic combined with limited population tied to the area limits the potential redevelopment of the commercial businesses. As part of the future land use planning, an urban village is proposed at the northeast corner of Bedford-Euless Road and Strummer Drive. The redevelopment of this site should be evaluated with the linear stretch of businesses on Bedford-Euless Road to add population to the area through multifamily housing and/or office tenants which would support further commercial and restaurant activity. For the businesses along Bedford-Euless Road, the small parcel sizes also limit future potential, so parcel consolidation should be considered with a form-based code put in place to bring redevelopment closer to the street frontage. Shifting the narrowed roadway to the north within the ROW is also recommended to maximize the lot sizes on the south and provide space for a walkable landscaped promenade.

For the aesthetics of the corridor reimaging, Bedford-Euless Road has a juxtaposed demand from the north and south sides for residential and commercial, respectively. The greenway trail should be extended to Strummer Drive to complete the landscape buffer/artwalk between residential uses and the commercial strip on the south side of the roadway. Intersection enhancements at the residential street intersections are envisioned as intersection tables to promote the walkable feel of the area, calm traffic speeds, and promote pedestrian movement from the north to businesses on the south. Gateway treatments, promoting easy access to the area and defining a corridor identity, are also envisioned on each end of the corridor.

An intersection analysis of Bedford-Euless Road at Strummer Drive was performed and detailed in the next section. Access to the freeways is paramount along Bedford-Euless Road from Strummer Drive to the east where three signalized intersections exist today within close proximity. It is recommended Strummer Drive be realigned to the east to connect with the signalized intersection at the IH 820 on-ramp. This implementation should be driven by the redevelopment of the site as a potential urban village.

| Recommended Roadway Section | |
|---|---|
| **Functional Classification** | Minor Arterial |
| **Right-of-Way** | 70’ |
| **Lanes** | 2 |
| **Median** | Yes, two way left-turn lane |
| **Parking** | No; optional dependent on south parcel development |
| **Intersections** | Realign Strummer Drive to intersection at IH 820 on-ramp<br>Potential intersection tables for traffic calming |
| **Special Comments** | Shift roadway centerline north within ROW<br>Bicycle facilities provided through paralleling trail |



## Implementation Recommendations

The reinvigoration of the area requires two major components for success – land use coordination and transportation investment. While interim measures can be done, it is recommended to develop the public realm of commensurate quality to the desired development outcome. Transformative levels of improvements, possibly engaging public-private partnership (PPP) funding, are recommended in concert with land use strategies.

It is recommended that a follow-on small area plan be the next step in the revitalization of this area to better understand parcel ownership makeup and land use specifics for feasibility of redevelopment. Land use aspects of the area need to be in place prior to major transportation investment by the City in order to fully realize the potential revitalization of the area.

# Holiday Lane

## (IH 820 to Liberty Way)

### Background

Holiday Lane from IH 820 to Liberty Way is best understood in two segments – from IH 820 to Dick Lewis Drive and from Dick Lewis Drive to Liberty Way. The corridor, as a whole, serves as a collector class facility providing local access to adjacent houses, neighborhoods, and schools. North of IH 820, Holiday Lane provides a continuous route between the two major arterials in Rufe Snow Drive and Davis Boulevard. From IH 820 to Dick Lewis Drive, the Richland High School borders the roadway on the west generating peak traffic during school rush hours and necessitating high levels of circulation. From Dick Lewis Drive to Liberty Way, the context becomes solely residential with traffic, including walking and biking, directed toward the high school. The roadway between IH 820 and Liberty Way exists as a four-lane undivided roadway within a 68-foot right-of-way. The ultimate sizing and incorporation of bicycle and pedestrian amenities along this corridor were considered as part of this study.

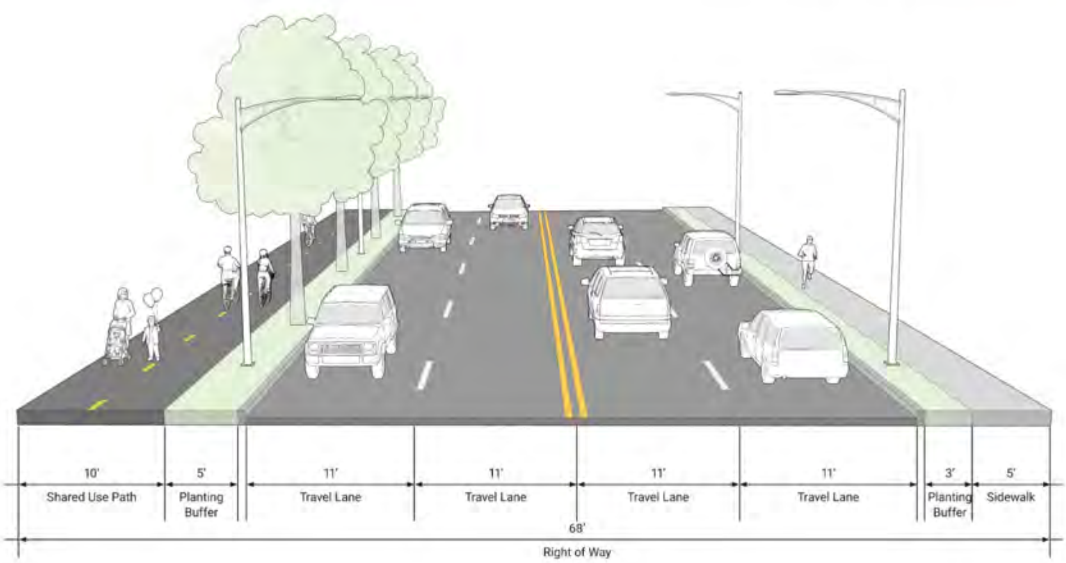
### Analysis & Discussion

An analysis of forecasted 2040 volumes revealed ultimate traffic demand on Holiday Lane allows a two-lane section with center turn lane with daily volumes near 15,000 vehicles per day and peak directional volumes peaking near 900 vehicles per hour. As a local facility, heavy truck traffic will be limited. School traffic, especially oriented toward access and circulation around the high school, modified the final recommendation for facility sizing. It was determined that it was not feasible to operate a three-lane roadway south of Dick Lewis Drive and maintain access and circulation around the school. North of the school, traffic begins to taper with reductions in driveway access points. Therefore, it is recommended that north of Dick Lewis Drive, Holiday Lane be narrowed to a two-lane roadway with center turn lane. This rightsizing of Holiday Lane is also recommended from Liberty Way to the north to provide lane continuity up to the railroad/Cotton Belt Trail. South of Dick Lewis Drive, the four-lane undivided section should be retained.

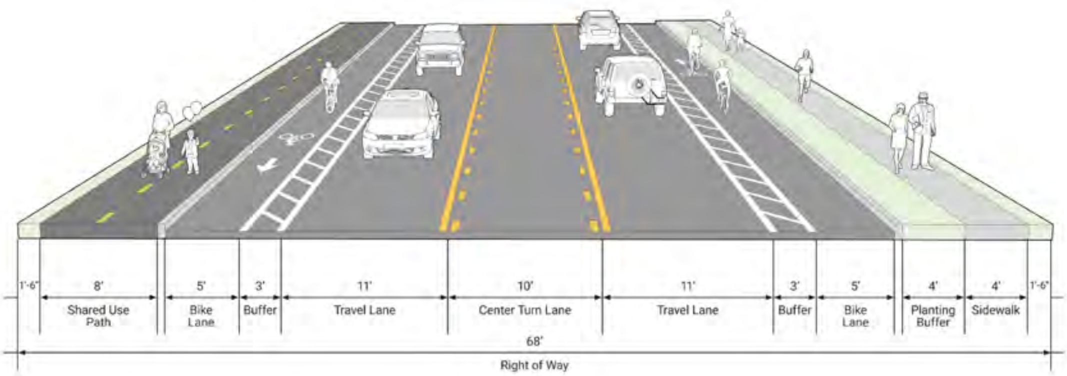
The incorporation of bicycle and pedestrian amenities served as the second major focus in the analysis of this corridor. As a continuous route with lower speeds and volumes compared to the paralleling arterials, Holiday Lane has been shown as a popular route for recreational cyclists and students walking or biking to school. It is also seen locally as a good route to cross IH 820. The 68-foot right-of-way with existing four-lane pavement width minimizes the ability to construct substantial active transportation facilities. The rightsizing of Holiday Lane north of Dick Lewis Drive to a three-lane section allows the recovery of space for an off-street shared use path on the west side to connect with the Calloway Branch Trail at Liberty Way and lead directly to the school. To the south of Dick Lewis Drive, the existing four-lane pavement width shall remain, but it is recommended that the shared use path be continued on the west side through a partnership with the school district. As a benefit to the school and its students' safe access, a shared use path with an appropriate buffer between it and the vehicular travelway along the frontage of Richland High School would likely border the school property boundary and possibly overlap.

| Recommended Roadway Section | | |
|---|---|---|
| | **North of Dick Lewis Drive** | **South of Dick Lewis Drive** |
| **Functional Classification** | Major Collector | Major Collector |
| **Right-of-Way** | 68’ | 68’ |
| **Lanes** | 2 | 4 |
| **Median** | Yes, two way left-turn lane | None |
| **Parking** | No | No |
| **Intersections** | Dedicated turn bays at Dick Lewis Drive for High School<br>Maintain lane configuration at IH 820 intersection | |
| **Special Comments** | Continuous shared use path on west side | |

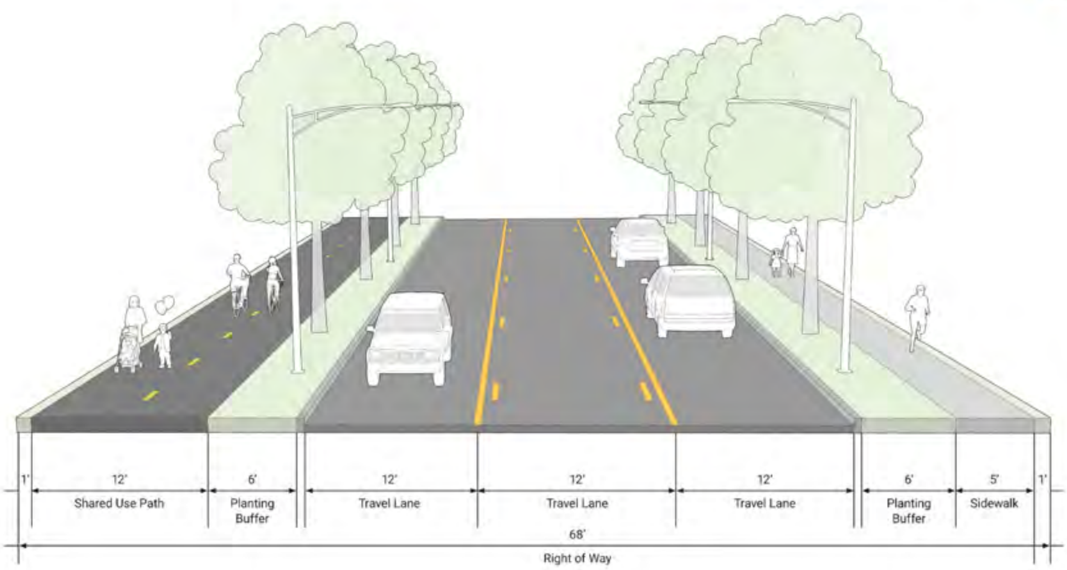
**HOLIDAY LANE**
**Interstate 820 to Dick Lewis Drive**



## HOLIDAY LANE
### Dick Lewis Drive to Liberty Way
2030 Plan (Rightsizing)




## HOLIDAY LANE
### Dick Lewis Drive to Liberty Way
Visionary



## Implementation Recommendations

Interim measures on Holiday Lane north of Dick Lewis Drive can be made through the restriping of the roadway for three-lanes with outside conventional bike lanes (2030 Plan). The widening of the sidewalk on the west side can be done as well to maximize the safe space for people walking. Long-term, the pavement should be narrowed to allow for a wider off-street shared use path with a landscape buffer from traffic (Visionary Plan). This reconstruction will provide improved access to the high school as well as improved connectivity between the North Electric Trail and Calloway Branch Trail.

South of Dick Lewis Drive, the existing pavement cross-section of Holiday Lane should remain. The implementation of a shared use path on the west side should be pursued through coordination with the school district. Access points into the school and crossings of the driveways will be important design considerations in its implementation.

# APPENDIX C:

# ROADWAY RIGHTSIZING GUIDANCE

# NRH Rightsizing

Rightsizing is the process of reallocating pavement and right-of-way space to better serve the context of the roadway and goals of the community. A road built many years ago in an undeveloped or developing area was sized for a predicted future condition, but now housing, shops, schools, and other destinations have matured in the community. Traffic conditions have stabilized and are more predictable and the needs of adjacent development is better known. These conditions, prevalent in parts of North Richland Hills, allows the opportunity to rightsize roadways to optimize these assets for the community. The North Richland Hills Transportation Plan includes two types of rightsizing which both reduce the ultimate number of lanes on the facility,

1. Reallocation - Reducing the number of existing travel lanes and reallocating pavement and/or right-of-way to other uses appropriate to the context of the neighborhood, and
2. Redesignation - Preempting roadway widening by acknowledging a new ultimate sizing.

**RIGHTSIZING**
is the process of reallocating pavement and right-of-way space to **better serve** the *context of the roadway* and *goals of the community*

Reallocations consider ultimate vehicular demands and reallocate existing pavement space to other uses when excess capacity remains. Reallocations identified within NRH include both straight lane reductions, such as 5-lane to 3-lane conversions, and conventional 4-lane (undivided) to 3-lane rightsizing conversions. The former is straightforward in the reallocation of space with similar intersection and driveway traffic operations and reducing existing vehicular capacity by the travel lane loss. The latter, the 4 to 3 conversion, adds a center turn lane which provides turn movement benefits that often offset the loss in travel lanes (further described in next section) and may not impact overall roadway capacity.

Redesignations reconsider future investments in expansion, but existing pavement conditions are unaffected. These are made to align traffic demands with roadway capacity supply, reducing excess infrastructure liabilities. No existing vehicular capacity is lost, only potential future capacity.

It is **important** to note that vehicular capacity is made up of two parts: link-level segments and intersections. While roadway rightsizing reduces link segment lane configurations, typical capacity bottlenecks are found at intersections so the reduced lane configuration between intersections does not affect true corridor capacity. Intersection treatments through dedicated turn bays, traffic control devices, and signal timing and coordination can offset reduced link-level capacities of roadway rightsizing.

# Reallocation: 4-Lane Undivided Roadway to 3-Lane Conversion

Summarized from FHWA's Road Diet Resources:
Road Diet Informational Guide, 2014, https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/ch2.cfm#s211
Road Diet Mythbusters, 2016, https://safety.fhwa.dot.gov/road_diets/resources/pdf/roadDiet_MythBuster.pdf

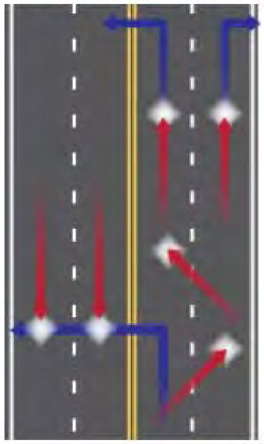
| Benefits of Road Diets |
|---|
| Improved Safety |
| Operational Benefits |
| Pedestrian and Bicyclist Benefits |

## Improved Safety

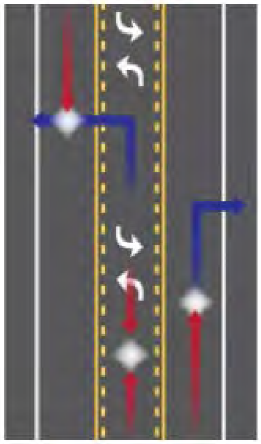
"Road Diets improve safety by reducing the speed differential. On a four-lane undivided road, vehicle speeds can vary between travel lanes, and drivers frequently slow or change lanes due to slower or stopped vehicles (e.g., vehicles stopped in the left lane waiting to turn left). Drivers may also weave in and out of the traffic lanes at high speeds. In contrast, on three-lane roads with two-way left-turn lanes (TWLTL) the vehicle speed differential is limited by the speed of the lead vehicle in the through lane, and through vehicles are separated from left-turning vehicles. Thus, Road Diets can reduce the vehicle speed differential and vehicle interactions, which can reduce the number and severity of vehicle-to-vehicle crashes. Reducing operating speed decreases crash severity when crashes do occur." (FHWA, 2014)

A 4-lane undivided roadway to 3-lane conversion reduces conflict points and turn movement safety issues, as illustrated in the figures below. The reduction in conflicts and unsafe maneuvers also helps maintain capacity for traffic operations of the thru travel lane.

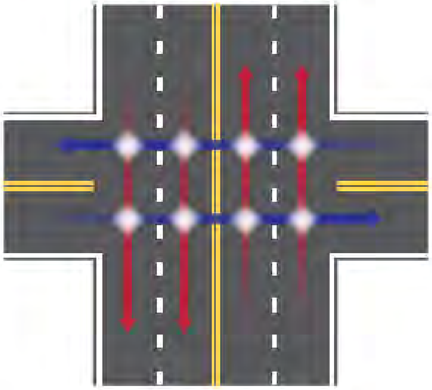
Four-Lane Undivided



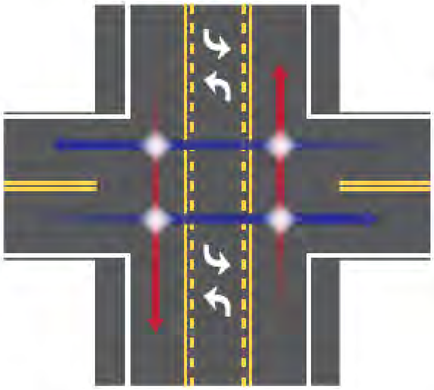
Three-Lane



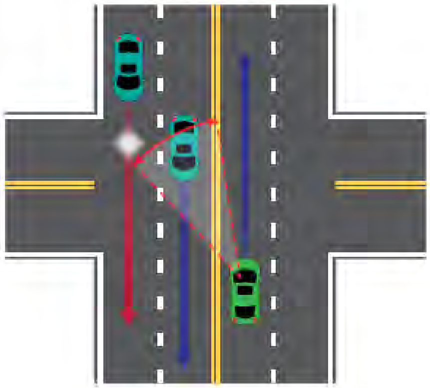
Four-Lane Undivided



Three-Lane



Four-Lane Undivided
(Outside Lane Traffic Hidden by Inside Lane Vehicle)



Three-Lane
(No Hidden Vehicles)

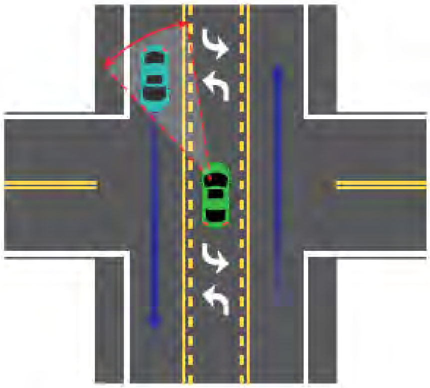


Image Source: FHWA's Road Diet Informational Guide

## Operational Benefits

"Additionally, a Road Diet can provide the following operational benefits:

- Separating Left Turns. Separating left-turning traffic has been shown to reduce delays at signalized intersections.
- Side-street Traffic Crossing. Side-street traffic can more comfortably enter the mainline roadway because there are fewer lanes to cross. This can reduce side-street delay.
- Speed Differential Reductions. The reduction of speed differential due to a Road Diet provides more consistent traffic flow and less "accordion-style" slow-and-go operations along the corridor.

UNDER MOST AVERAGE DAILY TRAFFIC (ADT) CONDITIONS TESTED, **ROAD DIETS HAVE MINIMAL EFFECTS ON VEHICLE CAPACITY**, BECAUSE LEFT-TURNING VEHICLES ARE MOVED INTO A COMMON TWO-WAY LEFT-TURN LANE.

*FHWA Summary Report: Evaluation of Lane Reduction "Road Diet" Measures*

On some corridors the number and spacing of driveways and intersections leads to a high number of turning movements. In these cases, four-lane undivided roads can operate as de facto three-lane roadways. The majority of the through traffic uses the outside lanes due to the high number of left-turning traffic in the inside shared through and left-turn lane. ***In these cases a conversion to a three-lane cross section may not have much effect on operations***." (FHWA, 2014)

"Often, ***signalized intersections are the most significant constraint on roadway capacity***. Converting four through lanes to two through lanes makes it possible to install dedicated turn lanes at the intersection. If the intersection experiences a large number of turning vehicles, this design can help reduce intersection delay. Alternative intersection configurations, like roundabouts, can offer even more opportunities for enhanced traffic operations." (FHWA, 2016)

*Table AB-1. FHWA Average Daily Traffic (ADT) Volume Threshold Guidelines (for 4-Lane Roadways)*

| Less than 10,000 ADT | 10,000-15,000 ADT | 15,000-20,000 ADT | Greater than 20,000 ADT |
|---|---|---|---|
| A great candidate for Road Diets in most instances. Capacity will most likely not be affected. | A good candidate for Road Diets in many instances. Agencies should conduct intersection analyses and consider signal retiming in conjunction with implementation. | A good candidate for Road Diets in some instances; however, capacity may be affected depending on conditions. Agencies should conduct a corridor analysis. | Agencies should complete a feasibility study to determine whether the location is a good candidate. Some agencies have had success with Road Diets at higher traffic volumes. |

Source: FHWA's Road Diet Mythbusters

East Boulevard; Charlotte, NC

## Pedestrian and Bicyclist Benefits

"Road Diets can be of particular benefit to nonmotorized road users. They reallocate space from travel lanes– space that is often converted to bike lanes or in some cases sidewalks, where these facilities were lacking previously. These new facilities have a tremendous impact on the mobility and safety of bicyclists and pedestrians as they fill in a gap in the existing network." (FHWA, 2014)

"With the addition of a pedestrian refuge island – a raised island placed on a street to separate crossing pedestrians from motor vehicles – the crossing becomes shorter and less complicated. Pedestrians only have to be concerned with one direction of travel at a time. Refuge islands have been found to provide important safety benefits for pedestrians." (FHWA, 2014)

"For bicyclists, the biggest benefit of Road Diets is through the addition of bicycle facilities. A Road Diet can transform a street that was formerly difficult for a bicyclist to travel along to a comfortable route that attracts many more bicyclists. When bicycle lanes are striped, bicyclists are more visible and motorists know where to look for them, speeds are reduced, and bicycle safety can be improved. In some cases, buffered bicycle lanes are added by providing a visual or even physical barrier between modes of travel (e.g., adding flexible delineators on the lane line between motor vehicles and bicycles.) This further enhances the comfort of the route and may encourage increased usage." (FHWA, 2014)

East Boulevard; Charlotte, NC

Even without a dedicated bicycle lane or buffer, a motorist on a three-lane roadway is able to move over closer to the center lane on a three-lane roadway when approaching a bicycle. A motorist on a four-lane undivided roadway will have less opportunity to move over to the left as it is an active travel lane." (FHWA, 2014)

## Synergies and Trade-offs: Road Diet Installation Observations

| Road Diet Feature | Primary/Intended Impacts | Secondary/Unintended Positive Impacts | Secondary/Unintended Negative Impacts |
|---|---|---|---|
| **Bike Lanes** | Increase mobility and safety for bicyclists, and higher bicycle volumes<br>Increased comfort level for bicyclists due to separation of vehicles | Increased property values | Could reduce parking, depending on design |
| **Fewer Travel Lanes** | Reallocate space for other uses | Pedestrian crossings are easier, less complex<br>Can make finding a gap easier for cross-traffic<br>Allows for wider travel lanes | Mail trucks and transit vehicles can block traffic when stopped<br>May reduce capacity<br>If travel lanes are widened, can encourage increased speeds<br>Longer queue dissipation time for at-grade railroad crossings |
| **Two-Way Left Turn Lane (TWLTL)** | Provide dedicated left turn lane | Makes efficient use of limited roadway area | Could be difficult for drivers to access left turn lane if demand for left turns is too high |
| **Pedestrian Refuge Island** | Increased mobility and safety for pedestrians | Makes pedestrian crossings safer and easier<br>Prevents illegal use of the TWLTL to pass slower traffic or access an upstream turn lane | Can effectively increase congestion by preventing illegal maneuvers |
| **Buffers (grass, concrete median, plastic delineators)** | Provide barriers and space between travel modes | Increases comfort level for bicyclists by increasing separation from vehicles<br>Barrier can prevent users entering a lane reserved for another mode | Grass and delineator buffers will necessitate ongoing maintenance |

Source: FHWA's Road Diet Informational Guide

# Traffic Operations Considerations

Summarized from FHWA's Road Diet Resources:
Road Diet Informational Guide, 2014, https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/ch3.cfm#s33

## Level of Service

FOR ROAD DIETS WITH ADTS **ABOVE APPROXIMATELY 20,000 VEHICLES**, THERE IS A GREATER LIKELIHOOD THAT TRAFFIC CONGESTION WILL INCREASE TO THE POINT OF DIVERTING TRAFFIC TO ALTERNATE ROUTES.

*FHWA Summary Report: Evaluation of Lane Reduction "Road Diet" Measures and Their Effects on Crashes and Injuries*

"Level of Service (LOS) is a qualitative measure of traffic conditions using a quantitative stratification of a performance measure or measures. Consider LOS for two components: intersections and arterial segments. Corridors with closely spaced signalized intersections may have a larger impact on the Road Diet operation due to queuing affecting adjacent signalized intersections. This impact could be mitigated by signal timing and coordination between adjacent signals, allowing the corridor to be "flushed" with each green cycle." (FHWA, 2014)

"The LOS on urban arterials would provide a more accurate view of conditions for roads with longer distances between signalized intersections or no signalized intersections in the corridor. The arterial LOS as measured by vehicle speed is affected by signal spacing, access point frequency, number of left turning vehicles, and number of lanes." (FHWA, 2014)

## Peak Hour and Peak Direction

"One study conducted a sensitivity analysis to determine at what hourly volume the arterial LOS would decline. It found that a two-way peak hour volume of 1,750 vehicles per hour (875 each direction) was the threshold when a decrease in LOS was observed. It also found this could be mitigated by signal timing optimization." (FHWA, 2014)

"The peak hour volume in the peak direction will be the measure of volume driving the analysis and can determine whether the Road Diet can be feasibly implemented. This is the traffic volume that would be used in calculating LOS analysis for intersections or the arterial corridor."

- Probably feasible at or below 750 vehicles per hour per direction (vphpd) during the peak hour.
- Consider cautiously between 750 – 875 vphpd during the peak hour.

- Feasibility less likely above 875 vphpd during the peak hour and expect reduced arterial LOS during the peak period.

(FHWA, 2014)

## Parallel Roadways

"Road Diets can cause some diversion of traffic to parallel routes. A determination will be needed to establish whether the parallel routes would be desirable by through vehicle drivers on the corridor of interest. This can be established through discussions with those that travel the roadway or the application of appropriate simulation software. The distance between parallel arterials should also be considered. It is less likely that vehicles will divert to parallel routes that are farther away or that are just as congested. The other consideration is vehicles shifting to parallel non-arterial streets as "cut-through" traffic. Collecting before-and-after traffic data can inform the practitioner if this is occurring. Some community members may be more sensitive to this, so having data can help clearly define whether this is a problem. If there is an increase in cut-through traffic, traffic calming or other mitigation measures on parallel streets may be warranted." (FHWA, 2014)

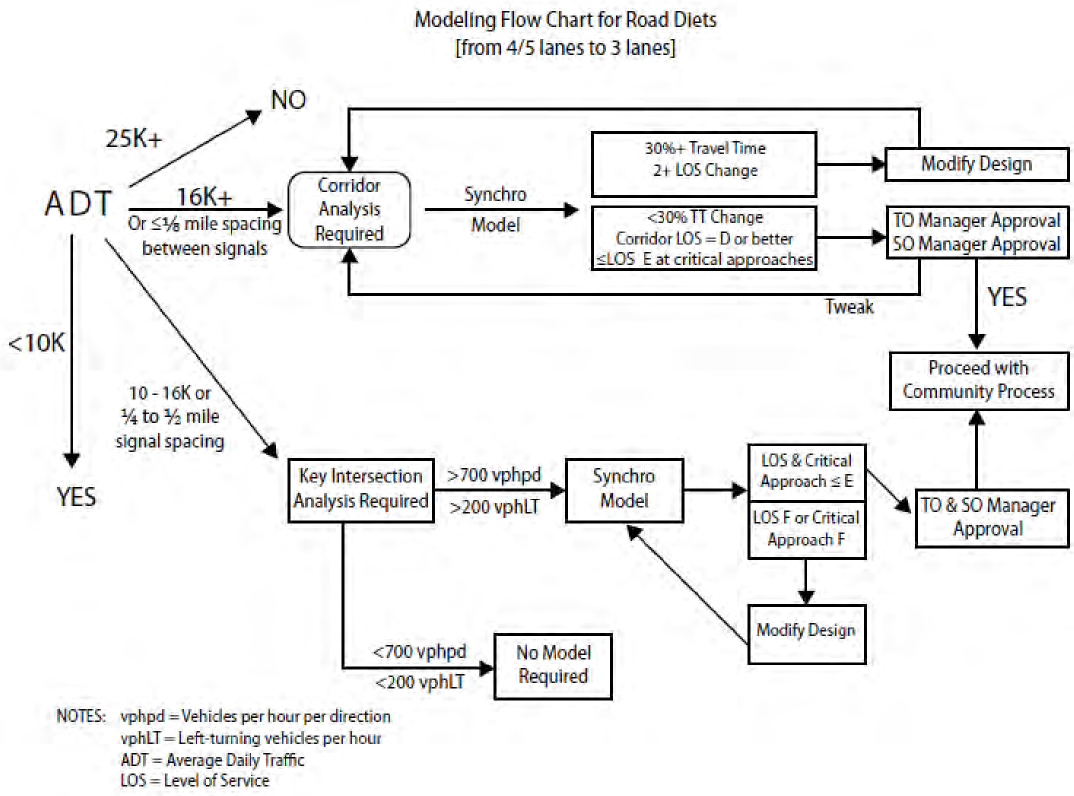



*Figure 1. City of Seattle Modeling Flow Chart for Road Diet Feasibility Determination*

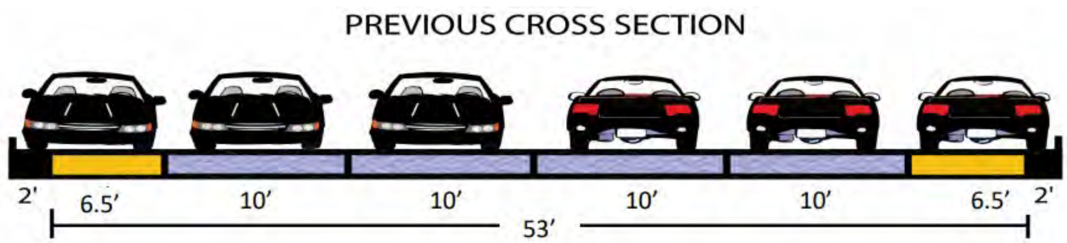
Source: FHWA's Road Diet Informational Guide

# Case Studies

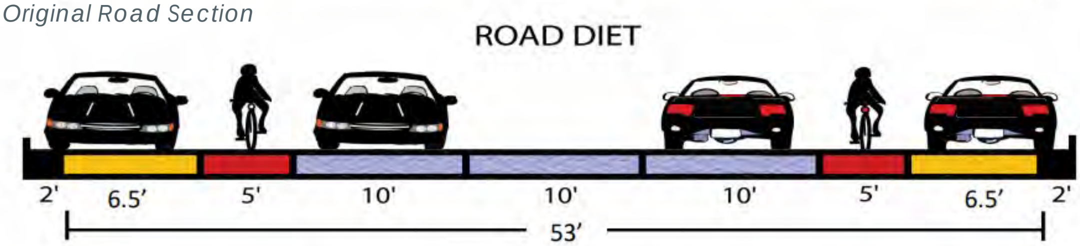
## Edgewater Drive – Orlando, Florida

**Road Diet with an Extensive Evaluation Criteria**

| Objective | Features | Results |
|---|---|---|
| » Make street friendlier to bicyclists<br>» Bring the street back to its main street identity<br>» Lower speeding | » Transfer of street from State to City's jurisdiction<br>» Synchro traffic analysis<br>» Trial design along with a resurfacing project<br>» Public process before and after trial design<br>» 4-lane to 3-lane conversion | » Decreased speeding<br>» 34% reduction in crashes<br>» Decreased crash frequency<br>» Increase in pedestrian and bicycle volumes<br>» No measured impact on bus operations<br>» Increase in parking utilization |




*Original Road Section*




*Road Section after Rightsizing*

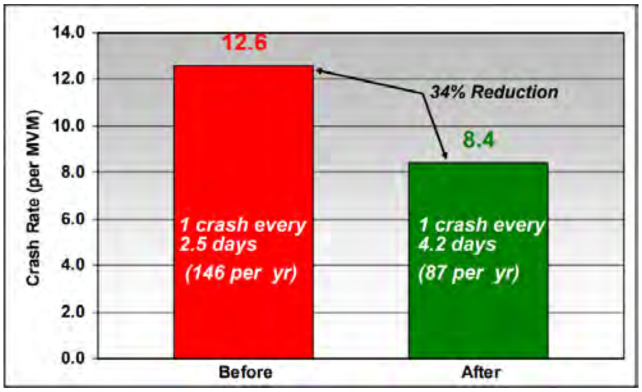
## Background

Edgewater Drive is the main street in College Park, a pre-world war two neighborhood. Throughout the years it had lost its main street character. In 1999, the College Park Neighborhood Horizon Plan called for Edgewater Drive to become friendlier to pedestrians and bicycles and support its main street status by a lane reconfiguration. A 1.5-miles section of the street, from Par Street to Lakeview Street, was to be resurfaced by FDOT and this was an opportunity to study a potential road diet. The city performed public workshops and traffic analysis before the street ownership was transferred from the State to the City to enable a trial phase in temporary tape and complete a before and after analysis. The road was converted from two travel lanes in each direction to one lane in each direction and a two-way left turn lane and bike lanes. After 7 months of trial phase during which data was collected and presented to the public, the city added permanent striping.

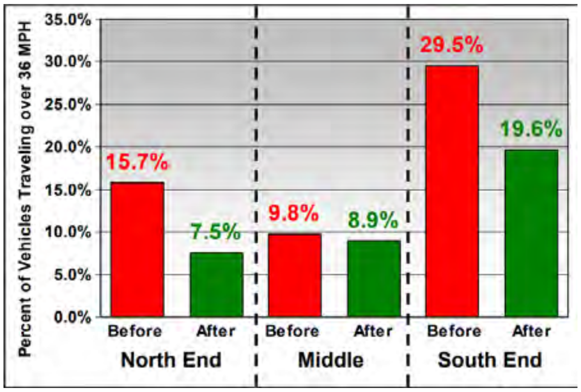
Road Before and After Restriping

## Evaluation Criteria

Evaluation had a major role in the Edgewater rightsizing process. During the trial phase, the city developed extensive performance measures to evaluate the new configuration, ensure it supports the project goals, and receive approval from residents and business owners. The evaluation criteria include, crash rate, injury rate, speeding analysis traffic volumes, on-street parking utilization, pedestrian and bicycle volumes, and travel times.




Crash Rate Change




Difference in Speeds

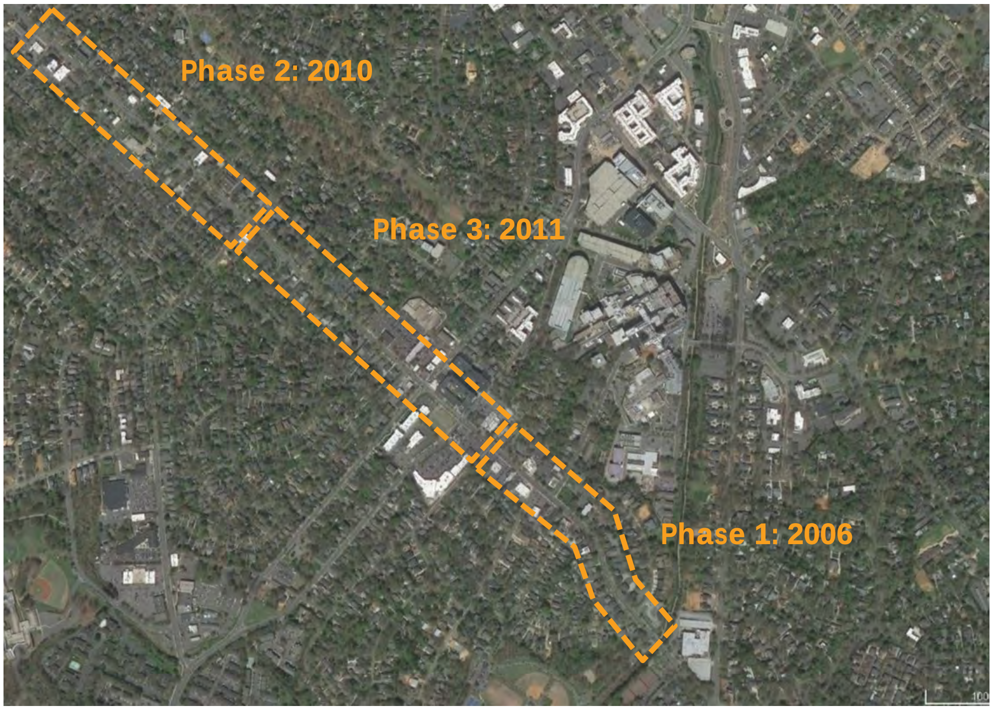
## Results

On the quantitative end, the reconfiguration led to an overall of 4% reduction in traffic on Neighborhood Streets, 1% to 10% reduction in excessive speeding, 30% increases in bicyclists and 23% increase in pedestrian volumes, 34% crashes reduction. As for qualitative results, there was an increase in pedestrian satisfaction as 55% feel that crossing was difficult compared to 71% before the rightsizing, and an increase in parking satisfaction as 47% feel comfortable parking compared to 28% before the rightsizing. In addition, the corridor has gained 77 new businesses and 560 news jobs since the rightsizing was implemented while the value of property adjacent to the corridor rose by 80%.

## East Boulevard – Charlotte, North Carolina

### Rightsizing in Three Phases

| Objective | Features | Results |
|---|---|---|
| » Make the street a main street<br>» Reduce high travel speeds<br>» Make walking and biking more comfortable and safer | » Surveys and public meetings to introduce rightsizing projects<br>» Corridor divided into 3 phases<br>» Synchro traffic simulations to study impacts of conversions<br>» 4-lane to 3-lane conversion | » Travel times remained constant for Phase 1 and 2<br>» 85th percentile speed declined from 43 to 40 miles per hour<br>» Increased safety for bikers and pedestrians |




*Phasing Plan*

## Background

East Boulevard is a commuter route that witnessed high-speed travel and high level of rear-end, side-swipe and left-turn collisions. Given the corridor is an arterial that runs through a walkable historic district and connect a mix of uses residential and commercial as well as a regional park, it created a barrier for pedestrians and bicyclists. Therefore, the City of Charlotte undertook a complex, three-phase roadway rightsizing over a 1.5-mile segment of East Boulevard to moderate travel speeds, increase pedestrian comfort and safety, and help to bring about the community's vision for the corridor. The project was implemented in phases over 5 years that resulted in reducing the vehicle lanes from 4 to 3 on the first and third phases and 5 to 3 on the second. In addition, the project widened sidewalks and added pedestrian refuge islands and mid-block crossings.

*Phase 1 – Before*

*Phase 2 – Before*

*Phase 1 – After*


*Phase 2 – After*

## Phasing

The fact that this project was implemented over three phases helped with increasing the approval from the public and business owners. After the first two phases were implemented, East Boulevard users and the neighborhood residents were able to experience firsthand the benefits of the road rightsizing.

## Results

In addition to creating more efficient traffic functions and maintaining constant travel times, speeds dropped in phases 1 and 2 by around 3 to 4 miles per hour, while crashes decreased from 2.64 to 1.67 crashes per month in Phase 1 and 1.97 to 1.86 crashes per month in Phase 2. These improvements have led to increase in safety and a 47% increase in non-residential property values in the Phase 2 section, which raised annual tax revenues by $530,000.

## US 395/Main Street – Bridgeport, California

### Rightsizing with a Nine Week Turnover

| Objective | Features | Results |
|---|---|---|
| » Create a vision for Main Street<br>» Create a more welcoming street<br>» Increase safety for pedestrians<br>» Calm traffic as it passes through the community | » Design Idea Book<br>» Well-attended public workshops<br>» 9 weeks for implementation<br>» 2015 Caltrans Excellence in Transportation Award<br>» 5-lane to 3-lane conversion | » Back-in angled parking<br>» Bike lanes<br>» Sense of place |

*Main Street Location*

*Rendered Section of Rightsizing Configuration*

## Background

Bridgeport, California is a small rural community situated close to several tourist attractions in the Eastern Sierra Nevada. Five-lane highway, US 395 cuts through the community leading to high speed traffic that impacts safety and turns the community into a passing opportunity rather than a destination. A team of county experts and planning professionals collaborated with the community in a charrette. The charrette was very well attended, and it resulted in designing a roadway rightsizing for Main Street that will reduce the number of lanes and create a safer pedestrian environment, calm traffic as it passes through the community, and generally create a better environment for Main Street businesses. Two months after the charrette, a new striping design was implemented, and it included 3 traffic lanes, back-in angled parking, and bike lanes. The team has also provided the community with a Design Idea Book that offers strategies on how to accommodate new development while preserving the historic character.


*Before and After Restriping*


*Back-In Angled Parking in the New Configuration*


*Example New Parking Sign*

## Fast Turnover

The project took only nine weeks to go from public engagement to implementation. The community's ideas were translated right away to turn their Main Street from wide highway into a space safe for them to walk and bike and park safely. Using low cost material like paint and having a wide consensus helped with making the pace go faster. This has encouraged the community to continue following recommendations from the Idea Book.

## Results

The design brought back the sense of place to the Main Street where it is slower paced and safer for users. Introducing the bike lanes and back-in angle parking made the street more welcoming for walking and biking.

# APPENDIX D:

# ACTIVE TRANSPORTATION PATTERN BOOK

# Chapter 1

# INTRODUCTION

North Richland Hills contains a diverse range of built environments and has a range of needs for pedestrian and bicycle transportation facilities. This Pattern Book is intended as a visual glossary of the essential building blocks of an active transportation network. The City may implement these elements to meet their needs to achieve safety and comfort for people walking and bicycling. It provides best practices and specific design examples for a variety of treatments.

This Pattern Book is organized into six sections: the Pedestrian Realm, Roadway Elements, Intersections and Crossings, Wayfinding, and End-of-Trip Facilities. Each section includes a number of relevant topics and each topic identifies the use of the element, design recommendations, and other considerations where appropriate. This document is intended to be a road map for the future of North Richland Hills' public rights-of-way. It derives from a vision of a ***world-class walkable, bicycle friendly, transit-served city*** in which people live, do business and exchange ideas. It is intended to broaden the range of design options for streets in North Richland Hills, recognizing that streets and public rights-of-way comprise a significant portion of the city's area and as such must maximize the public benefit they offer. This document seeks to balance the needs and safety of all street users and is based on an understanding that streets are about much more than just transportation – they serve many social, recreational and ecological needs that must also be considered when determining the best design.

The Pattern Book is a policy and design resource intended to provide guidance to city departments, design professionals, private developers, and neighborhood groups throughout the city. It will serve as a comprehensive resource for promoting clear communication of expectations regarding the use and quality of North Richland Hills' streets by pedestrians, transit users, drivers, bicyclists, residents, workers, and business owners. This resource should assist project implementation by streamlining the design and review processes.

The Pattern Book is the product of a joint effort between the key project stakeholders including the residents of North Richland Hills' neighborhoods, city leadership, and city staff. Over the course of a year, the team visited sites throughout the city, reviewed existing conditions, and assessed past and current standards for street materials, lighting and geometric design. The Pattern Book includes potential new treatments, based on national best practices, that may be utilized including sustainability.

While the Pattern Book is consistent with, and builds upon, existing engineering and environmental standards and requirements (including the Manual on Uniform Traffic Control Devices (MUTCD), National Association of City Transportation Officials (NACTO) and AASHTO Policy on Geometric Design of Highways and Streets ("Green Book")), creativity that tailors design to the particular needs of local neighborhood context is encouraged. Therefore, the Pattern Book remains flexible, and all designs will be subject to case–by–case staff approval based on established engineering standards and professional judgment.

The intent of this Pattern Book is to allow North Richland Hills to return to a system of streets that balances vehicle mobility needs with the needs of other street users and the community-serving functions that streets have traditionally played. This is consistent with the stated desire for citizens who participate in the project's process to have the choice to safely walk, bike, ride transit or drive.

# Chapter 2

# PEDESTRIAN REALM

One of the goals of this Pattern Book is to improve the experience of the many people who walk in North Richland Hills by providing the necessary physical space to make walking safe and comfortable. Sidewalks should not be treated as an amenity, but as the foundation of North Richland Hills' transportation network. Walking is a component of every trip, long or short, and sidewalks are an essential piece of transportation infrastructure. As such, sidewalks should align as much as possible with the natural path of pedestrian travel, parallel to the street and aligning with crosswalks at intersections.

It is also important to pedestrians and property owners that the quality of North Richland Hills' streets as public spaces is improved. Sidewalks are spaces where people meet for face-to-face activities, support businesses, or walk for recreation. To encourage people to use these spaces, sidewalks must be safe, comfortable, and attractive for people of all ages and abilities. Parkway or pedestrian realm space must do a multitude of things such as support healthy trees, provide space for people to rest or wait and treat stormwater. This Pattern Book recognizes these multiple functions and sets high standards for accessibility, safety and aesthetics in sidewalk design.

## Sidewalks

Sidewalks are one of the most vibrant and active sections of the overall right-of-way. **They can play a critical role in the character, function, enjoyment and accessibility of neighborhoods and businesses. People in North Richland Hills value walkability in their community and neighborhoods and wish to see this quality preserved and enhanced**. The function and design of the sidewalk significantly impact the character of each street. Extending from curb to building face or property line, parkways or pedestrian realms are, of course, the place typically reserved for pedestrians, but they also accommodate street trees, stormwater best management practices (BMPs), street lights, street furniture, bicycle racks, and transit stops. They are a place of transition and economic exchange as restaurants engage the public space and retailers attract people to their windows and shops.

North Richland Hills has two types of development patterns. Many streets have a more typical suburban development pattern and curve through quiet residential areas with developed tree canopies. The land use is generally of lower intensity with greater separation and more open space. The sidewalk network is generally complete; however curvilinear streets create atypically shaped intersections with increased crossing distances and decreased pedestrian visibility. Though the neighborhood residential streets are lower volume and tree-lined, a handful of very broad corridors with large sized blocks cuts across neighborhoods carrying heavily concentrated traffic.

The other development pattern in the city is the arterial and highway areas that connect North Richland Hills to other parts of the Metroplex. These corridors of vehicular mobility also play a key role in the economic and development growth of the city. Development nodes, strip mall and retail shopping districts have been built at key intersections and interchanges, and this development pattern is projected to continue. The sidewalk and trail portions in these corridors are more critical than in the other areas because the larger, faster roads are a greater barrier and safety concern for vulnerable users of the streets. Providing comfortable crossings at intersections and ADA accessible connections along the arterial corridors is a vital piece of the sidewalk network.

## Sidewalk Zones

Sidewalks are not a singular space but are comprised of distinct usage zones. Sidewalks typically are located in the right-of-way that extends from the curbline to the property line behind it. They can be broken up into four primary zones, each of which perform a unique function in the overall operation of the street and interface with adjacent private property uses. The ideal sidewalk consists of four parts: 1) the frontage zone, 2) the clear walk zone, 3) the planting/furnishing zone, and 4) the step zone if on-street parking is present. Although boundaries between zones may blur and blend, the overall function of each zone generally remains consistent.


## Frontage Zone

The Frontage Zone is the area of sidewalk that immediately abuts the private property along the street. In residential areas, the Frontage Zone may be within the private property and occupied by front porches, stoops, lawns, or other landscape elements that extend from the front door to the sidewalk edge. The Frontage Zone of commercial properties may include architectural features or projections, outdoor retailing displays, café seating, awnings, signage, and other intrusions into or use of the public right-of-way. Frontage Zones may vary widely in width from just a few feet to several yards; in North Richland Hills, most development tends to have very deep setbacks, meaning a very large Frontage Zone.

## Clear Walkway

Also known as the "walking zone," the Pedestrian Clear Zone is the portion of the sidewalk space used for active travel. For it to function, it must be kept clear of any obstacles and be wide enough to comfortably accommodate expected pedestrian volumes including those using mobility assistance devices, pushing strollers or pulling carts. To maintain the social quality of the street, the width should accommodate pedestrians passing singly, in pairs, or in small groups as anticipated by density and adjacent land use.

The Pedestrian Clear Zone should have a smooth surface, be well lit, provide a continuous and direct path with minimal to no deviation, and meet all applicable accessibility requirements. ***Although currently legal throughout the city and in Texas, bicycling on sidewalks is generally discouraged.***

## ADA Requirements

The Clear Walk Zone must meet the accessibility standards in the Federally Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG). The surface material should be smooth, stable, and slip resistant with minimal gaps, rough surfaces and vibration-causing features. The Clear Walk Zone must have a 4 feet minimum clear width with a 2 percent maximum cross slope.

## Driveways

The design of driveways should provide a continuous and level Clear Walk Zone across the vehicular path and encourage vehicles to yield to pedestrians on the sidewalk. Driveways across public sidewalks are needed to link streets to off-street parking facilities and loading zones, however, driveways can create conflicts and require special treatments in order to maintain a safe and comfortable walking environment.

## Curbside Buffer Zones

The Amenity Zone, or "landscape zone," lies between the curb and the Pedestrian Clear Zone. This area is occupied by a number of street fixtures such as street lights, street trees, bicycle racks, parking meters, signposts, signal boxes, benches, trash and recycling receptacles, and other amenities. In certain commercial areas (TOD, HomeTown), it is typical for this zone to be hardscape pavement, pavers, or tree grates. In residential or lower intensity areas, it is commonly a planted strip. Stormwater Best Management Practices are commonly located in the Amenity Zone.

## Green and Blue Stormwater Infrastructure

Trees, shrubs, grasses and other plantings play an important role in making streets comfortable and sustainable. They can help define the character of a street or plaza, provide shade and cooling in strategic locations, reduce energy consumption in buildings, and absorb and cleanse stormwater. They absorb greenhouse gases and help filter airborne pollutants. When selected appropriately, plants can also clean soil contamination and contribute to native wildlife systems.

Maintaining landscape plantings on North Richland Hills' streets is challenging. Sidewalk space is at a premium and the hard surfaces required to support concentrated activity can be hostile to street trees and other plantings. Soil compaction, water limitations, lack of space above or below ground, utility conflicts, temperature fluctuations, physical damage and litter all put stress on plants. These guidelines seek to balance the benefits of a healthy greenscape with the realities of limited space and the ongoing need for care and maintenance by a limited number of city staff.

Green infrastructure is a strategically planned and managed network of wilderness, parks, conservation easements, greenways, trees and plantings that supports native species, maintains natural ecological processes, sustains air and water resources and contributes to the health and quality of life for the community. In the right-of-way, green infrastructure refers to vegetated stormwater management practices.

Blue infrastructure refers to the practice of diverting rainwater from the city's separate stormwater system into ponds, fields and other more natural settings. In the right-of-way, blue infrastructure refers to non-vegetated stormwater management practices, like permeable pavement.

## Green and Blue Stormwater Infrastructure Considerations in Street Design

- Trees should not be planted in loading zones or within 10' of bus stop landing pads.
- Tree limbs should be pruned to maintain the clear walk zone, sight lines, maximize visibility of the street wall and provide access to utilities.
- Similar to street trees, green and blue stormwater infrastructure elements have environmental and aesthetic benefits. With careful design, elements can be modified to fit within physical constraints, integrated into medians or added to the curbside buffer or frontage zones of sidewalks.
- Drainage patterns and designing elements that tie into existing pipes can present significant challenges when integrating green and blue infrastructure into street designs. For example, medians are usually at the crown of the roadway, with water draining away from them.
- Lighting should be located in concert with street trees – often alternating trees and lights – so that trees do not block the illumination.
- Light poles should not impede the pedestrian way.

## Street Trees

Trees play an important role in making streets comfortable and sustainable. Used appropriately, they can help define the character of a street.

Trees provide the shade that reduces energy use and mitigates the urban heat island effect, a role that is particularly important given the North Texas climate. Their leaves capture rainwater and evaporation cools the ambient urban air temperature. Trees capture gaseous pollutants and particulates in the tree canopy surface, removing as much as 60% of the airborne particulates at street level.

Trees are part of the urban forest contributing to natural diversity. They provide habitat for a range of living creatures in the urban context, including people. Psychologically, trees have been found to reduce stress and improve concentration.

This may partly explain why studies have found that tree lined retail corridors do better than counterparts lacking street trees. Consumers spend more time on tree lined streets more often than on those streets without trees and spend more time and money there. Research has found that trees on streets and in front yards increase property values, with increases generally in the range of 7% for homes in areas with good tree cover.

A tree’s ability to grow is directly related to the volume of rooting soil available. Providing sufficient rooting soil in a dense, urban environment can be costly, but is worthwhile given the critical benefits that trees provide. Tree roots do not survive well in highly compacted soil because it lacks the void spaces needed for air and water to circulate. Roots in compacted soil will migrate toward the surface for air and water, causing sidewalks to crack and heave.

### Street Trees and Urban Design

Street trees are both a transportation and urban design tool. As vertical elements in the streetscape, trees help to frame and define the street wall, accentuate spaces and focus view corridors. Canopy trees provide an enclosure to the street that reinforces the sense of intimacy and scale. This enclosure can have positive effects in slowing traffic and increasing driver awareness.

Street trees improve walkability by providing necessary shade and filtered light. They provide interest and intrigue to pedestrians walking along a block face. Street trees are an opportunity to express the image of a community through plant selection and arrangement. Trees also provide seasonal interest and variation.

### Selecting the Right Tree

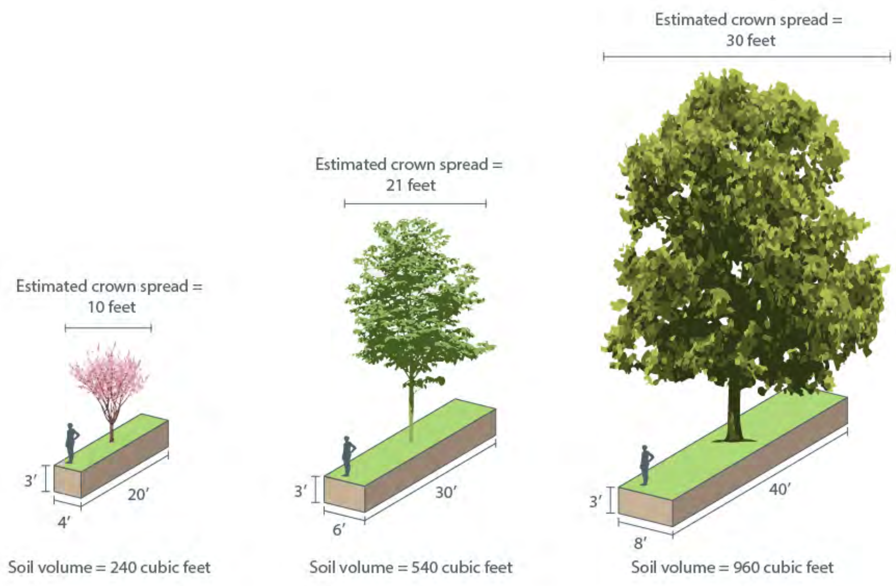
Trees come in a wide variety of shapes and sizes. The biodiversity of the urban forest is an increasingly important aspect of maintaining healthy tree coverage. Using a range of tree species beyond those typically found on the streets is strongly encouraged.

In order to select an appropriate street tree for a specific street, the species must have the appropriate scale and form for the context of the street and the adjacent land uses and, most import-antly, the appropriate amount of soil volume to thrive. Other considerations include: sun exposure and culture; whether the trees growth might interfere with sidewalks surfaces, site distances, or other site amenities; if overhead and subsurface utilities might impede growth; the desired quality of light and shade;

mature canopy size in relation to adjacent buildings; and frequency of curb-running vehicles such as buses.

## Design

- Tree species must remain constant along the entire length of a block face.
- Planting strips for existing conditions should be a minimum of 4' in continuous width.
- Planting strips and tree wells should be planted with hardy evergreen ground cover or grass sod or covered with a tree grate. The grate's size, shape, material and design should be approved by design review where part of a development of master planned area.
- In densely urban areas or those with limited sidewalk width, tree grates are preferred. Size of tree wells with grates should be a minimum of 4' by 6'. Larger dimensions may be required if deemed appropriate for the development of a master planned area or required as part of the Site Plan process.
- Tree wells should support a subsurface tree trench, which is a channel that connects several tree wells underground and can collect stormwater. Trenches should be large enough to provide sufficient arable soil volume and adequate moisture for individual trees and should hold a minimum volume of 300 cubic feet per tree. Continuous trenches which link individual wells should be provided where possible.
- Street trees should be sited to prevent roots from damaging the sidewalk. Laying pea gravel under the sidewalk creates room for roots to expand, while reinforcing concrete sidewalks with rebar will prevent roots from lifting them. Additionally, tree wells should be



| | Small Deciduous or Ornamental Trees | Medium Deciduous Trees | Large Deciduous Trees |
|---|---|---|---|
| Mature Height | 10’-30’ | 30’-50’ | 50’ |
| Planting Strip Width* | 4’ minimum | 6’ minimum | 8’ minimum |
| Spacing between trees | 15’ minimum<br>20’ recommended | 25’ minimum<br>30’ recommended | 30’ minimum<br>40’ recommended |
| Soil volume minimum | 240 $ft^3$ per tree | 540 $ft^3$ per tree | 700 $ft^3$ per tree; 960 $ft^3$ preferred per tree |

*Narrower planting strips can be achieved if minimum soil volumes are met.

large enough to accommodate future root growth.

- For areas with medium and high residential density, consider low growing shrubs, such as euonymus, that can better withstand the impacts from dogs.
- As street trees mature, they must be limbed up to a height of 7’ from finished grade in order to provide clearance for pedestrians.
- Ornamental trees should be specified where overhead utilities are present directly over the tree planting area.
- Trees with dense, persistent foliage below a height of 9 foot can block views and sightlines for street users and are not to be used as street trees.

## Maintenance

For established street trees, standard maintenance consists of structural pruning on a regular cycle (typically every 3-5 years depending on the species, size, and location of the tree) and regular inspection by a certified arborist (recommended every 1-2 years) to assess the condition of the tree and determine the presence of any disease or damage that could lead to failure of the tree. Seasonal maintenance includes watering to ensure establishment of plant material; mulching to minimize water use, discourage weeds and protect against erosion; and pruning low shrubs and groundcover to control overgrowth onto sidewalks.

## Street Lights

Street lights add comfort and safety to the street, while providing character and scale. Street lighting is typically oriented into the vehicle or pedestrian travel ways, however additional street lighting can highlight public art, architectural features or be an artistic expression itself.

Street lighting can also be an expression of street type. Higher activity commercial streets typically have a higher level of street lighting overall, while lower-intensity areas such as residential streets and parkways will generally have less frequent street lights and lower lighting levels.

Lighting levels should be consistent along the street without pools of light and dark. Lighting should be managed to reduce energy consumption and light pollution. The spectrum of light should ideally mimic sunlight as possible as this is more pleasing to the human eye.

### Design

- In general, lighting should reflect the character and urban design of the street type to create a recognizable hierarchy of roads and spaces.
- Comply with lighting requirements in areas with existing design guidelines.
- Lighting is typically located in the Amenity Zone of the street. Depending on conditions, lighting may be permitted in medians, however this is less common and often restricted.
- Light poles are typically located 18" away from the front of curb.
- Lighting should be oriented toward travelers both in the roadway and on the sidewalk. Adequate lighting at intersections and crossings is essential.
- Pedestrian scale lighting (lower than 20') should be used alone or in combination with roadway scale lighting in high-activity areas to encourage nighttime use and as a traffic calming device.
- Critical locations such as ramps, crosswalks, transit stops and seating areas that are used at night must be visible and lit.
- Lighting may either alternate on either side of a street or be arranged parallel. Parallel arrangements are more formal and common in retail nodes.

# Chapter 3

## ROADWAY ELEMENTS

A streetscape consists of a variety of components and contexts that when combined properly create a dynamic, engaging space. Understanding and providing space for the various components is essential in creating a successful street. The previous section of this Pattern Book discussed the edges of the streetscape and the pedestrian realm, but from a spatial context, the roadway area between the curbs is the largest area and has the biggest impact on how a streetscape looks and how it is experienced by all users. The roadway elements of the street make up the vehicular realm and consist of everything from on street parking, bicycle facilities, bus loading and unloading zones, to medians, and the travel lanes. The width and alignment of these roadway elements help dictate the speed and driver behavior along the street and can contribute to feelings of hostility and danger, regardless of how statistically safe the street is. Streets within North Richland Hills should be classified and designed, based on their function for all users, rather than just the needs of just automobiles. Bicycles and pedestrians are exceedingly more vulnerable in the built environment than drivers and those riding transit. As the city improves the quality of life and maximizes economic development opportunity, it should seek ways to expand what its public infrastructure can offer residents and businesses. The vehicular realm and the pedestrian realm should seamlessly fuse their associated materials and finishes to create a thriving public space.

# Travel Lane Widths

## Overview

Lane width has many implications in street design from slowing traffic to increasing opportunities for active transportation. The width of travel lanes should be determined by a combination of factors including the physical dimensions of cars and trucks, adjacent land uses, desired speeds, and type of roadway. Drivers are typically inclined to travel at higher speeds on roads with wider lanes. As speed and volumes increase, additional lane width is often considered desirable to accommodate the variations in lateral placement of the vehicle within a lane. Greater lane widths also help accommodate wider vehicles such as trucks, buses and recreational vehicles (RVs).

## Design

The recommendation of this Pattern Book is that the minimum travel lane width should be 10 feet, the typical condition is 11 feet, and the maximum should be 12 feet on Industrial streets where heavy truck traffic is expected. However, each design decision will need to be based on local conditions.

Narrower lane widths are most appropriate in urban areas as space is limited and streets tend to have higher levels of pedestrian activity. In this context, narrower lane widths encourage lower speeds, shorten pedestrian crossing distances and may enable the provision of on-street parking and transit stops. Residential streets do not typically require wide travel lanes and the higher travel speeds that wide lanes tend to encourage are directly in conflict with the walkability, safety, and ambiance desired in residential areas.

## Considerations

In considering the use of narrower lanes, however, designers should recognize that narrow travel lanes reduce vehicle separation from other vehicles and from bicyclists. They can also create complications for buses, trucks and other large vehicles by forcing these vehicles to infringe on multiple lanes when turning. The cumulative relationship between the components of the street must be taken into account. Using minimum dimensions for different, adjacent elements should be avoided. For example, when parking lanes and vehicular travel lanes are adjacent, the cumulative width must be no less than 18 feet.

# Medians

## Overview

A median can be used to narrow the roadway, reduce motor vehicle speeds and improve pedestrian crossings. Medians also provide locations for utilities, opportunities to introduce green elements in the right-of-way and can be used to absorb stormwater and reduce the heat island effect.

## Design

Medians with crosswalks and pedestrian refuges improve pedestrian safety and access by reducing crossing distances and enabling pedestrians to cross roadways in two stages. Islands with crossings should be designed with a stagger, or a “z” pattern, forcing pedestrians to face oncoming traffic before progressing through the second phase of the crossing. Center islands with crosswalks should meet all accessibility requirements:

- 6 feet in width minimum for pedestrian refuge island;
- 8 feet in width is preferred to provide adequate refuge for pedestrians with strollers or bicycles;
- The sidewalk across the median should be 5 feet wide.
- Medians can reduce the risk of head-on collisions by limiting left turn opportunities to the most desirable locations such as a signalized intersection.
- Medians should be carefully designed to ensure proper drainage and maximize the potential for on-site stormwater retention and infiltration.
- Sidewalks should not be reduced in width and bicycle lanes should not be eliminated in order to provide space or additional width for medians.
- Medians can be combined with mid-block pedestrian crossings to reduce crossing distances.
- Medians must meet the width and soil volume minimums to accommodate street trees.

## Bicycle Facilities

The bicycle route network in North Richland Hills is envisioned as a combination of shared-use paths and bike lanes, striped bicycle lanes and shared-use streets with visual pavement markings. Because North Richland Hills’ streets vary in width and many serve multiple purposes, the construction of bicycle routes may need to use a variety of design features to fit within existing constraints.

This section of the Pattern Book details bicycle facilities and provides North Richland Hills with a broader design framework for constructing formalized bicycle facilities. Although additions to the bicycle system are recommended in the North Richland Hills Plan, this section establishes broader guidance should changes be made to the recommendations in later revisions of the North Richland Hills Plan or should North Richland Hills wish to study individual route opportunities (especially on streets that are generally in the same corridor as a recommended route but that use a different specific alignment). This guidance is intended to be used as a toolkit, allowing a project designer to select facilities that are appropriate to the street's other uses and design elements, to the type of route being constructed, and to the surrounding land uses and community characteristics.

## Standard Bicycle Lanes

### *Overview*

Bicycle lanes provide an exclusive space for bicyclists in the roadway. Bicycle lanes are established through the use of lines and symbols on the roadway surface. Bicycle lanes are for one-way travel and are normally provided in both directions on two-way streets and/or on one side of a one-way street. Bicyclists are not required to remain in a bicycle lane when traveling on a street and may leave the bicycle lane as necessary to make turns, pass other bicyclists, or to properly position themselves for other necessary movements. Bicycle lanes may only be used temporarily by vehicles accessing parking spaces and entering and exiting driveways and alleys. Stopping, standing and parking in bike lanes is prohibited.

### *Design*

- Bicycle lanes can be used on one-way or two-way streets with single or multiple lanes.
- Bicycle lanes may be placed adjacent to a parking lane or against the curb if there is no parking. Conventional bicycle lanes are located on the right side of the roadway.
- Bicycle lanes are typically installed by reallocating existing street space (i.e., narrowing other travel lanes, converting travel lanes and/or reconfiguring parking lanes).
- The minimum width of bicycle lanes is 5'. Bicycle lanes may be 6', but if more street width is available, the street should be evaluated for other treatments.
- When bike lanes are adjacent to parking, the combined width (from face of curb) of parking and bicycle lane should be at least 12'.
- Bike lanes are indicated by a solid white line along the left side of the lane. Use dotted or dashed line marks to indicate areas of bicycle/vehicle conflict.

### *Considerations*

- Bicycle lane design should consider parking configurations and turnover, the presence of medians, the continuity of the facility and the configuration and complexity of turning movements at intersections.
- If bicycle lanes are adjacent to guardrails, walls or other vertical barriers, additional bicycle lane width is desired to account for bicyclist "shy" distance from the

edge. Similarly, provide additional space if bicycle lanes are at sidewalk level and adjacent to the curb and travel lanes.

- Ensure gutter seams, drainage inlets and utility covers are flush with the roadway surface. Where possible, these features should be kept out of the bike lane.
- Where wider lanes are possible, consider providing a buffered bicycle lane, discussed later in this section.
- On constrained corridors with high parking turnover, consider designing pavement markings to guide bicyclists outside of the door zone of parked vehicles. Treatments include installing a buffer on the parking side of the bicycle lane, door zone, hatch marks, or using parking T's instead of a longitudinal parking line.
- Consider using colored pavements to highlight areas where conflicts might occur, such as at intersection and driveway crossings.
- It is critical that bicycle lanes receive the same treatment as the remainder of a street surface with regard to cleaning. In addition, bicycle lanes need to have regular cleaning of storm drains, especially during spring and autumn seasons when fallen leaves or other tree debris may collect in drains and cause pooling or flooding of stormwater in curbside bicycle lanes.

## Buffered Bicycle Lanes

Buffered bicycle lanes are created by painting or otherwise creating a flush buffer zone between a bicycle lane and the adjacent travel lane. While buffers are typically used between bicycle lanes and motor vehicle travel lanes to increase bicyclists' comfort, they can also be provided between bicycle lanes and parking lanes in locations with high parking turnover to discourage bicyclists from riding too close to parked vehicles.

Buffered bicycle lanes are distinct from separated bicycle lanes (discussed below) in that they have no vertical barrier between travel lanes and/or parking. Like separated bicycle lanes, buffered bicycle lanes have been found to dramatically increase bicycling comfort for a wide range of community bicyclists.

### *Design*

- The recommended minimum width of a buffer is 3 feet; however width may vary depending upon the available space and need for separation. Total assembled width of bicycle travel way (lane) and buffer should be at least 7 feet.
- Buffers should be painted with solid white lines and channelization markings.
- Buffers can be useful on multi-lane streets with higher speeds but are not required in these locations.

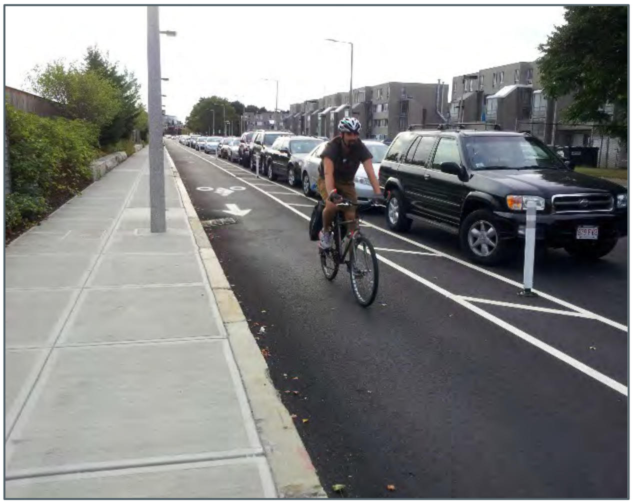
*Considerations*

- Where only one buffer can be installed on a constrained corridor with on-street parking, the buffer should typically be placed between the bicycle lane and parking lane, depending upon roadway speeds and parking turnover.
- Generally speaking, there is no upper limit for buffer width and buffers of 5 to 6 feet are common where travel lanes are converted to buffered bicycle facilities, However, wide buffers without vertical separators may invite illegal use for vehicle travel. It is best to divide the buffer space in half to allow the painted buffer to be on each side of the bike lane, as opposed to all on one side.
- Consider using removable vertical elements such as flexposts, rubber curbing, or planters to further establish the bicycle facility. (See below under separated bike lanes.)
- Because they do not require construction of a separating element, buffered bicycle lanes may be established through simple street resurfacing and may enable trial or phasing prior to the installation of separated facilities.
- Buffered bicycle lanes, like separated bicycle lanes, may transition at intersections to provide adequate visibility and safety.

## Separated Bicycle Lanes

*Overview*

Separated bicycle lanes, also known as cycle tracks, are exclusive bicycle facilities physically separated by a vertical element from the adjacent motor vehicle lanes. Separation can be achieved through a vertical curb, a parking lane, flexposts, plantings, removable curbs or other measures. Buffered bike lanes that do not include a vertical element are not considered separated bike lanes.



There are four basic configurations for separated bike lanes:

- Sidewalk level bike lanes
- Bike lanes constructed at an intermediate level between the sidewalk and the street
- Street level bike lanes separated from traffic or parking by a curb
- Street level bike lanes separated from traffic by parking or other vertical objects

Separated bike lanes dramatically increase rider comfort and decrease

| | One-Way | | Two-Way | |
|---|---|---|---|---|
| | Minimum | Preferred | Minimum | Preferred |
| **Separated Bike Lane Width** | 5’ | 7’ | 8’ | 12’ |

1. Dimensions are for bike lane only and do not include sidewalk or street buffer.

2. Minimum width will not accommodate passing. 6.5 feet is required for two bicyclists to pass one another. Edge condition impacts ability to comfortably pass or ride two abreast. The minimum width is discouraged when a separated bike lane is located between raised curbs. If width is constrained, designer should consider options that allow bicyclists to use the buffer space to pass another user. Width may include gutter pan.

3. Passing may occur in opposing lane.

stress. They are usable by a broad spectrum of bicyclists including very young riders and more cautious bicyclists. Separated bike lanes may be used on many different street types and are especially welcome on higher speed, higher volume roadways. Studies show that bicyclists prefer separation from motor vehicles on most types of roadways and can contribute to expanding bicycle mode share. Separated bike lanes can be one-directional or two-directional; may be provided on both sides of two-way streets or on one side of one-way streets.

### *Design*

Separated bike lanes are appropriate on streets with operating speeds of 25 mph and higher and volumes that exceed 4,000 vehicles per day.

Separated bike lanes can be useful on streets that provide connections to off-street trails, since bicyclists on these streets may be more accustomed to riding in an area separated from traffic.

Intersection design for separated bike lanes is complex and requires careful attention to conflicts with turning vehicles. For more information, see the NACTO *Bikeway Design Guide*.

Adjacent to on-street parking, a minimum 2- to 3-foot buffer should be provided between parking and the separated bike lane; the buffer serves as a pedestrian loading and unloading zone and helps keep bicyclists out of the door zone of parked vehicles.

For street level separated bike lanes without a raised median, vertical objects are needed in the street buffer to provide separation. Examples of vertical objects include flexible delineator posts, parking stops, planter boxes, concrete barriers or rigid bollards. They must be supplemented with a painted median to mark the buffer. The horizontal placement of vertical objects within the buffer should consider the need for shy distance to the bike lane and to the travel lane. Preference should be given to locating the vertical object to maximize the width of the bicycle lane.

It may be necessary to utilize more frequently spaced vertical objects where motor vehicle encroachment in the bike lane is observed or anticipated. Where on-street parking is located adjacent to the street buffer, it may not be necessary to provide vertical objects to improve separation, except in locations where parking is absent, such as near intersections. Exceptions include locations where on-street parking is prohibited for portions of the day, commercial areas where on-street parking turnover is high, or locations where parking demand is low.

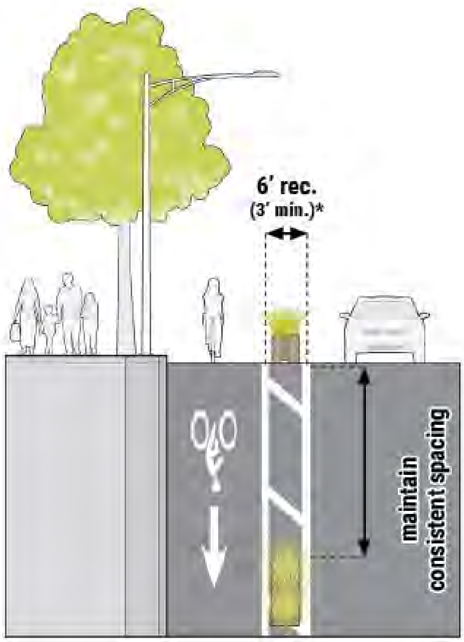
Capital costs for vertical objects are typically lower than raised medians, making them ideal for retrofit projects. However, vertical objects may require routine maintenance and replacement, increasing long-term costs. Some vertical objects may be temporarily removed to accommodate standard sweeping. Most vertical objects are non-continuous, which facilitates positive drainage along the established roadway crown to existing catch basins.

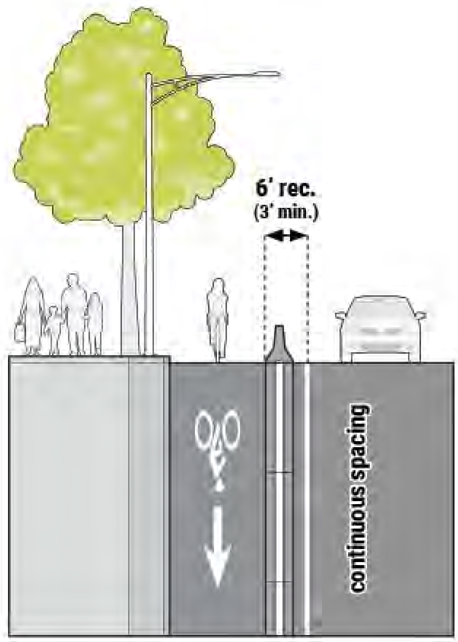
Ensuring the vertical separation is visible to approaching bicyclists and motorists should be considered. Vertical objects in the street buffer are considered delineators and must be retroreflective, per the MUTCD.

*Considerations*

- Separated bike lanes require increased parking restrictions approaching intersections compared to standard bicycle lanes to provide for visibility at intersection transitions.
- Vertical curb separation should be considered where on-street parking is not present. Stormwater drainage will need to be considered with this option. Street level separated bike lanes may be combined with islands at corners and crossings.
- At transit stops, separated bike lanes should be routed between the stop's passenger waiting area and the sidewalk to reduce conflicts while passengers are boarding and alighting. Signage and/or markings may be added to alert transit riders and bicyclists of the conflict zone as pedestrians cross the bike lane from the sidewalk to the transit stop.
- The presence of drainage and utility structures along the curb may reduce the effective width of a separated bike lane.
- Maintenance should be considered, including street sweeping

## Vertical Objects in the Street Buffer Zone




**Planter Boxes**

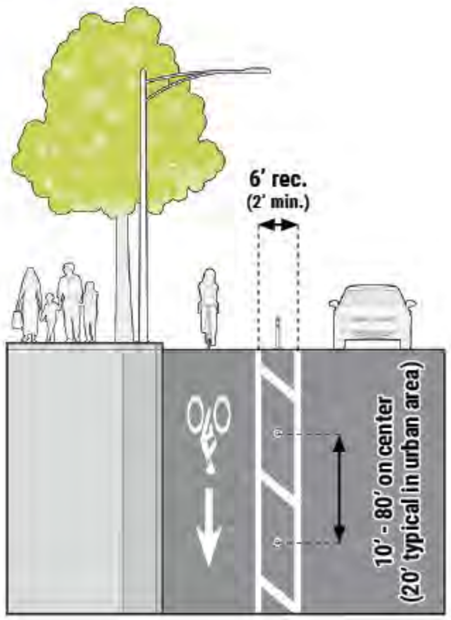
* Buffer may need to be wider when adjacent to on-street parking to accommodate an open motor vehicle door.

- Removable
- May be closely spaced for near-continuous vertical separation
- Can be used to enhance community aesthetics
- May serve as a gateway treatment
- May be incompatible with clear zone requirements for roadways with higher motor vehicle speeds
- Plants require routine care, increasing long-term maintenance costs

**Concrete Barriers**

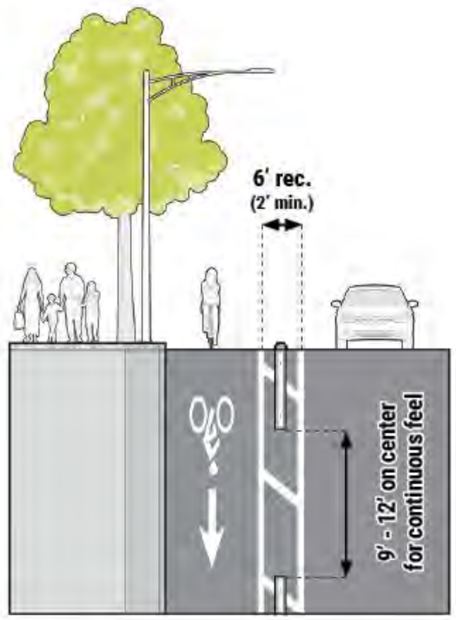
- Provides continuous vertical separation
- Highly durable
- Recommended for locations where physical protection from motor vehicles is needed, for example on bridges with high speed traffic
- May need crash cushion at barrier ends
- Incompatible with on-street parking

## Vertical Objects in the Street Buffer Zone



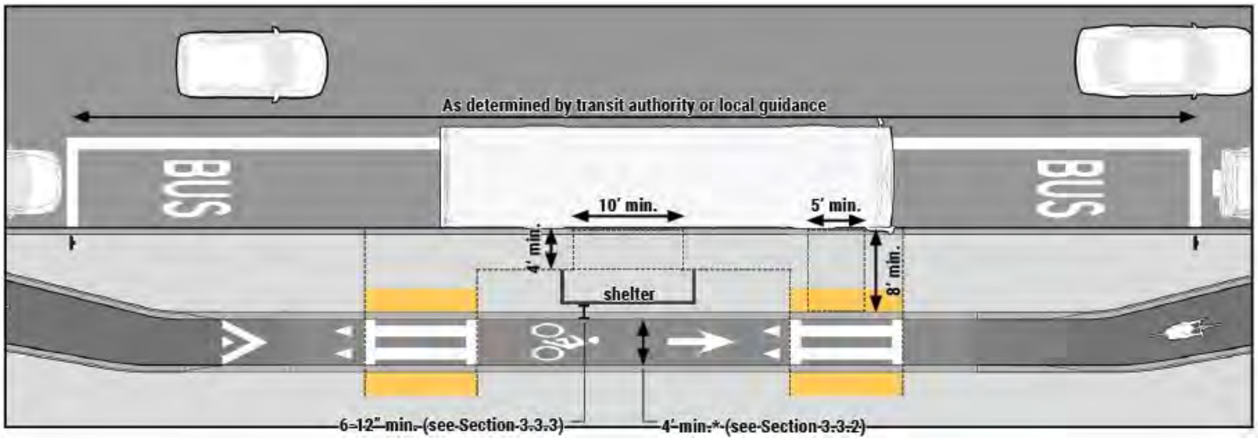

### Flexible Delineator Posts

- Removable
- Lowest initial capital costs
- May require closer spacing where parking encroachment is likely
- Small footprint compatible with variety of buffer designs
- Low durability
- May need routine replacement, increasing long-term maintenance costs.




### Parking Stops

- Maintain consistent spacing between parking stops
- Removable
- Highly durable
- May need supplemental vertical objects or on-street parking to increase visibility




## Separated Bicycle Lanes and Bus Stops

### *Overview*

Separated bike lanes can be integrated with a variety of bus stop designs. They are compatible with mid-block, near-side and far-side bus stop locations. Where feasible, separated bike lanes should be routed behind bus stops to eliminate conflicts between buses and bicyclists. This recommended configuration—referred to as "a floating bus stop"—-repurposes the street buffer into a dedicated passenger platform between the motor vehicle lane and the bike lane.

Bus passengers must cross the separated bike lane when entering and exiting the platform. Designers can communicate expectations for people bicycling and taking transit by following these principles to the maximum extent feasible:

- Guide bus passengers across the bike lane at clearly marked locations.
- Provide clear direction to people bicycling when they are expected to yield to pedestrians crossing the bike lane at bus stops.

Designers should consider in-lane bus stops to preserve space for the street buffer, maintain separated bike lane width, and simplify bus re-entry into traffic. Where on-street parking is present, a curb extension is required to provide an in-lane stop.

Bus stops are natural locations for bike parking. Bike racks increase the catchment area of bus stops, providing a longer-range and faster first- and last-mile connection compared to walking.

### *Design*

All bus stops should include a common set of required design elements to provide accessible, high-quality transit service. Elements that may influence separated bike lane design are highlighted in this section. Designers should consult local guidelines for more detail, including for the design of amenities beyond the scope of this Pattern Book (e.g., trash receptacles, informational signage, etc.).

- Preserve a clear boarding and alighting area that connects to a pedestrian access route. Advanced lateral deflection of the bike lane may be necessary to accommodate the boarding and alighting area.
- Maintain a pedestrian access route between the sidewalk, the boarding and alighting area, and shelters and benches. Two

pedestrian crossings are recommended, but not required.

- Include a rear door clear zone connected to a pedestrian access route. It is preferable to have a continuous clear zone to connect the boarding and alighting area and the rear door clear zone.
- Additional design elements are recommended to improve operations at bus stops.
- Transition the bike lane to sidewalk level in constrained situations or to provide level pedestrian crossings. Locate bicycle transition ramps near crosswalks and outside of any lateral shift of the bike lane.
- Locate shelters and other vertical objects that are 36 in. or higher a minimum of 6-12 in. from the bike lane edge.
- Place railings or planters (3 ft. maximum height) at the back of the platform for high ridership stops or along two-way separated bike lanes to channelize pedestrians to designated crossings. Ends of railings should be flared inward toward the bus stop and away from the bike lane for a safer bicycling environment.

## Contrasting Green Color Pavement

### *Overview*

The use of contrasting green color is used primarily to highlight areas with a potential for bicycle-vehicle conflicts, such as intersection crossings where a bicyclist is susceptible to conflicting left or right turning traffic or merge areas where right turning vehicles must cross a through bicycle movement to enter a right turn lane.

### *Design*

- Green pavement markings enhance the conspicuity of a conflict area within a bicycle lane approaching an intersection or within an extension of a bicycle lane through an intersection.
- The material used for green color can be paint, colored asphalt or concrete, or other marking materials with the proper chromaticity and slip resistance.
- If a pair of dotted lines is used to extend a bicycle lane across an intersection or driveway, or a ramp, green colored pavement should be installed in the same dotted pattern as the white edge lines.

- Green color may also be utilized to enhance the conspicuity of a bicycle lane or shared lane marking symbol by outlining the symbol in a green box.

## Off-Street Paths

Off-street paths, often referred to as shared-use paths or trails, are facilities that provide off-street space intended for use by bicyclists and/or pedestrians. They often parallel roadways and are typically separated from the roadway by green space or a physical barrier. Off-street paths may be designated for one-way or two-way travel. Most off-street paths accommodate both bicyclists and pedestrians within the same space, however paths may also be designated for exclusive use by bicyclists or pedestrians.

A defining feature of off-street paths is that they place bicyclists and pedestrians in an off-street location, where they become subject to all applicable laws pertaining to pedestrian movement at intersections and driveways.

### *Applicability and Use*

- Off-street paths are desirable along high volume or high-speed roadways, where accommodating bicyclists within the roadway in a safe and comfortable way is impractical.
- Off-street paths typically have a lower design speed for bicyclists than in-street facilities do and may not provide appropriate accommodation for bicyclists who desire to travel at greater speeds. In addition, greater numbers of driveways or intersections along a corridor can further decrease bicycle travel speeds and traffic signals can increase delay for bicyclists on off-street paths compared to bicyclists using in-street bicycle facilities such as bike lanes.
- Many bicyclists express a strong preference for the separation from motorized vehicles provided by off-street paths when compared with on-street bike lanes. This may be especially true of less experienced or slower bicyclists. Off-street paths should not be considered a substitute for accommodating bicycles within the roadway.
- Off-street paths have a relationship with roadways similar to that of sidewalks to roadways, in that they function as parallel facilities located in close proximity to vehicle travel lanes. Conflicts with vehicles turning across the path of bicycles and pedestrians at driveways and intersections are an inherent drawback of off-street paths. Off-street paths are commonly used along recreational corridors, scenic corridors, or parkways, and may be part of a broader trail system.
- Off-street paths may be used to provide two-way bicycle and pedestrian travel adjacent to one-way roadways.

### *Design Considerations*

- Off-street paths intended for use by bicycles should be designed to meet adopted guidelines. This includes widths, clearance, design speed, stopping and sight distance.
- Off-street paths intended for use by pedestrians must meet accessibility requirements under the Americans with Disabilities Act (ADA). Grades may meet but not exceed the grade of the adjacent roadway.

- Crossings must be designed in a way that facilitate sight distance for drivers, bicyclists, and pedestrians, provide stacking room for vehicles waiting to enter the roadway or cross the off-street path, and allow bicyclists and pedestrians to anticipate and react to vehicular turning movements.
- Off-street paths should be designed to maintain constant cross slope and running slope through driveways.
- The desired buffer width between the off-street path and the roadway is a minimum of 5 feet, with a desired minimum of 6 feet, which may be planted.
- One-way paths may be used in park settings to minimize conflicts between users where there are high volumes of bicyclists or pedestrians. Because pedestrians walk at relatively slow speeds, one-way pedestrian paths are generally not encouraged.
- When one-way paths for bicycles are desired, consideration should be given to discourage wrong way cycling.
- When one-way paths for bicycles are provided within roadway corridors, the paths in opposite directions should be provided in pairs. Generally, a pair of one-way off-street paths will be provided on opposite sides of the roadway to allow bicyclists to travel adjacent to motorized traffic in the same direction.
- If an off-street path is for the exclusive use of bicyclists, a sidewalk or other pedestrian facility should be provided to ensure that pedestrians do not encroach into the facility intended for exclusive bicycle use.
- On a one-way path, an off-street facility should transition to an on-road bike lane or separated bike lane configuration in advance of an intersection or driveway. This allows bicyclists to take advantage of the comfort of off-street paths in mid-block locations with the operational benefits of in-street cycling at intersections.
- Enhanced traffic control devices such as bike signals at intersections may be appropriate in some locations.
- At intersections with low-volume minor roadways, the crossing of an off-street path and/or sidewalk may be raised, in the form a raised crosswalk, table for intersection to serve as a traffic calming feature for motor vehicles. Raised paths through intersections are more difficult to construct and maintain as grades present issues for ADA compliance and drainage.

## Signed Route, Neighborhood Bikeway, Neighborways or Bike Boulevards

### *Overview*

What most influences the way people drive is not the speed limit, a caution sign, or the threat of a ticket. Rather, drivers take their cues from the design of the street. Narrower lanes, trees, wayfinding signage, pavement markings, people walking, and biking give the impression that pedestrians and bicyclists are a priority, so drivers slow down.

Neighborhood slow streets are a network of quiet, often residential streets that are designed for slower speeds. These streets are designed to give priority to pedestrians and bicyclists. They are excellent places to play, walk a dog, or ride a bicycle that connect across neighborhoods and the city.

### *Design*

- Design features that reduce operating speeds are used to maintain low speeds (20 mph or less) on neighborhood slow streets.
- Neighborhood slow streets are best accomplished in neighborhoods with a grid street network (where motor vehicle through-traffic can be directed to parallel routes) but can also be accomplished by combining a series of road and trail segments to form one continuous route.
- Ideally, neighborhood slow streets should not carry more than 1,000 motor vehicles per day to be comfortable for pedestrians and bicyclists. Traffic management devices are typically used to discourage motor vehicle through-traffic while still enabling local traffic access to the street.
- Neighborhood slow streets should be long enough to provide connectivity between neighborhoods and common destinations such as schools or parks.

### *Considerations*

At major street crossings, neighborhood slow streets may need additional treatments other than marked crosswalks for pedestrians and bicyclists. Treatments can include signage, median refuge islands, curb extensions, advisory bike lanes, rapid flash beacons, pedestrian-actuated signals and/or bicycle signal heads.

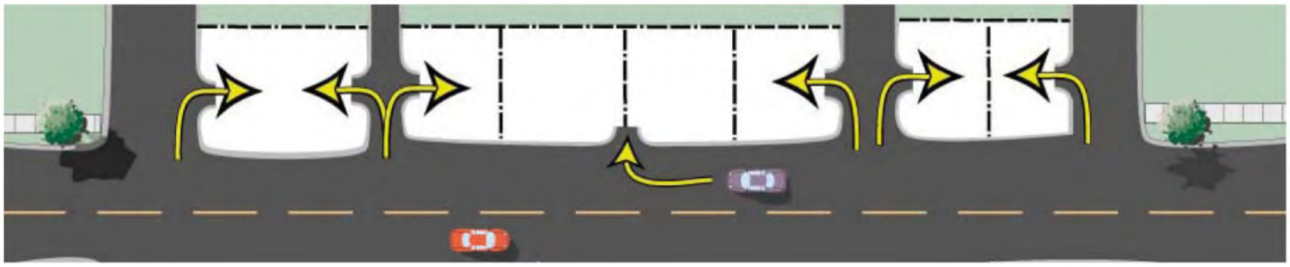
# Access Management

## Overview

Access management is a transportation approach that continues to grow in popularity throughout the United States. This popularity has occurred because access management techniques, when applied properly, can improve safety and vehicle mobility. The mainstream of the practice, however, has developed primarily within rural and suburban communities where goals of increasing vehicle speeds and reducing congestion are overriding concerns. Within cities, these concepts can often be misapplied and cause more harm than good to the urban environment. It is imperative, therefore, that a city such as North Richland Hills have a set of tailored access management strategies that recognize the city's unique context and goals.

A major challenge in street design is balancing the number of access points to a street. There are many benefits of well-connected street networks, however, most conflicts between users occur at intersections and driveways. The presence of multiple driveways in addition to the necessary intersections creates many conflicts between vehicles entering or leaving a street and bicyclists and pedestrians riding or walking along the street. When possible, the number of new driveways should be minimized and existing driveways should be eliminated or consolidated. Where possible, raised medians should be placed to limit left turns into and out of driveways and reduce potential conflicts.

Access management through limiting driveways and providing raised medians has many benefits:



- The number of conflict points is reduced, especially by replacing center-turn lanes with raised medians since left turns by motorists account for a high number of crashes with bicyclists and pedestrians.
- Pedestrian crossing opportunities are enhanced with a raised median.
- Universal access for pedestrians is easier, since the sidewalk is less frequently interrupted by driveway slopes.
- Fewer driveways result in more space available for higher and better uses.
- Improved traffic flow may reduce the need for road widening, allowing part of the right-of-way to be recaptured for other users.

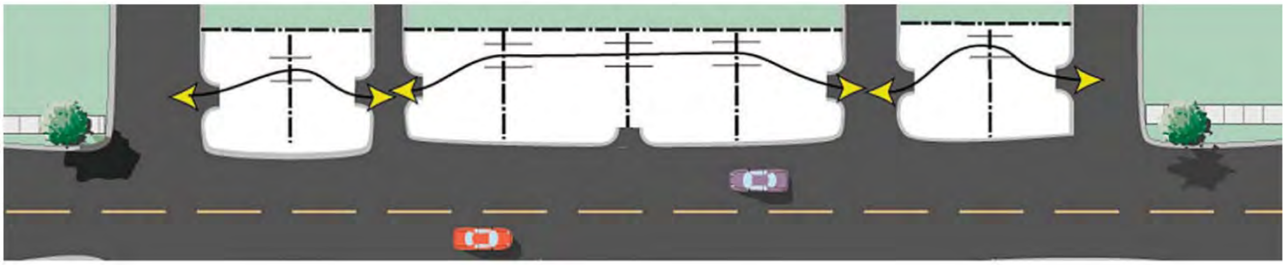
## Considerations

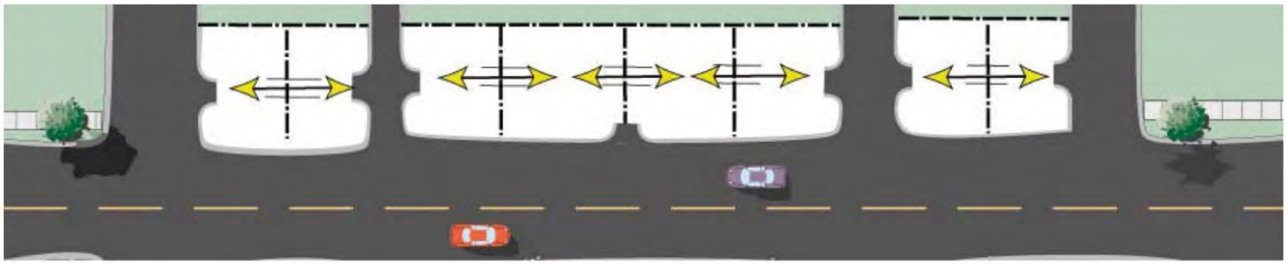
Access management can have a variety of effects on all transportation modes, as well as on adjacent land uses. When investigating an access management strategy, the following issues should be considered and addressed:

- Streamlining a street may increase motor vehicle speeds and volumes, which can be detrimental to other users.
- Reduced access to businesses may require out-of-direction travel for all users, including walkers and bicyclists.
- Concrete barriers and overly-landscaped medians act as barriers to pedestrian crossings. Medians should be designed with no more than normal curb height and with landscaping that allows pedestrians to see to the other side.
- Adjacent land uses can experience decreased access. This can impact businesses as well as residents. Careful planning of access management must consider this.

Where angle parking is proposed for on-street parking, designers should consider the use of reverse-in angle (or front out) parking in place of front-in angled parking. Motorists pulling out of reverse-in angled parking can better see the active street they are entering. This is especially important to bicyclists. Moreover, people exiting cars do so on the curb side and are not likely to step into an active travel lane.

Another tool for on-street parking is the park assist lane. Often when on-street parking is provided on busy roads, drivers find it difficult to enter and leave their parked vehicle. Where space is available, consideration should be given to adding a park assist lane between the parking lane and travel way to provide 3 feet of space so car doors can be opened and vehicles can enter or depart with a higher degree of safety and less delay. Bike lanes can serve this function as well. Parking assist lanes also





narrow the feel of the travel lane and slow traffic.

## Tools for Effective Access Management

Access management must consist of more than just access denial. In many cases, designers mistakenly believe that simply adding a median along a corridor to prevent left turns is the extent of access management. As envisioned in North Richland Hills, access management is a much more complete system of community mobility creation and management. The following are a set of basic access management principles that should be followed when designing high capacity corridors in North Richland Hills:

- **Assure a Supporting Street and Circulation System:** Well-planned communities provide a full network of local, collector, and primary streets to accommodate circulation and access to land uses. Interconnected street networks support all modes of transportation and provide mobility for bicyclists, pedestrians, and drivers. It is important to design and manage streets according to the primary functions that they are expected to serve.
- **Manage Conflict Points:** Drivers make more mistakes and are more likely to have collisions when they are presented with more conflict points than necessary. Conversely, simplifying the tasks of walking, biking and driving contributes to improved mobility and greater safety. A less complex environment is accomplished by limiting the number and type of conflicts between vehicles, pedestrians, and bicyclists and by providing clear and simple directions to users. Drivers, in particular, need sufficient time to address one set of potential conflicts before facing another. The necessary spacing between conflict areas increases as travel speed increases, to provide drivers adequate perception and reaction time.
- **Promote Intersection Hierarchy:** North Richland Hills' transportation network should provide effective transitions from one type of facility

to another. Just as freeways connect to arterials through an interchange that is designed for the transition, the concept of connecting streets results in a series of intersection types that range from the junction of two major arterials, to a residential driveway connecting to a local street. The areas close to an intersection are critical to its safe operation and should be simplified to provide clear and visible guidance to all users. For example, on-street parking or driveway access connections too close to intersections can cause serious conflicts that result in crashes and congestion. Proper spacing of intersections and signals on major streets enhance the ability to coordinate signals and create adequate and safe movement opportunities for bikes and pedestrians.

- **Limit Direct Access to Primary Streets (Based on Scale):** Streets that serve higher volumes of regional through traffic and have greater numbers of vehicle travel lanes may need more access control to preserve their function. Frequent and direct driveway access is more compatible with the function of local and collector roadways. At the greatest extreme, commercial strip development with separate driveways for each business forces even short trips onto arterial roadways, thereby reducing safety and impeding mobility. The spacing of intersections and long-term elimination of driveways on major streets will likely be a key part of an access management strategy.
- **Strategically Manage Turning Vehicles:** Research has shown that the majority of access-related crashes involve left turns. Therefore, it may be beneficial on some streets to provide non-traversable medians and other techniques that minimize left turns. Medians channel turning movements on major roadways to controlled locations and left turning lanes can provide a protected area for turning vehicles on high vehicular volume streets. This may reduce the severity and duration of conflict between turning vehicles and through traffic and improve the safety of some intersections.

It is worth noting that none of the above principles assume that automobile speeds are a primary expected outcome. The application of these principles, like all other design processes described within this Pattern Book, must take into account the goals of the particular neighborhood and context. Sometimes these goals may include improving automobile throughput on a given corridor; in other cases, the safety of bikes and pedestrians may be paramount; in yet others, an improved commercial environment along a street may be primary.

Building a complete network of streets with a well-planned hierarchy is always the best option. Sometimes, however, we are forced to make decisions regarding the retrofit of communities for whom reality has overtaken initial planning assumptions. Issues such as property rights, neighborhood “cut-throughs” and relative costs can all make the creation of effective network a daunting task. The following are some tools that might be used in retrofit areas where the creation of a full network might be a challenging or long-term proposition.

## Supporting Network

Connected street networks are critically important to design. While this Pattern Book describes how particular streets will be configured to serve their users, the application of design criteria relies on many system-wide factors such as how thoroughly a network of streets is connected. Smaller block sizes (along with building to the street and utilizing rear access) are design patterns that best utilize valuable land efficiently. These patterns have the additional advantages of making walking easier and keeping traffic off of already busy streets. Generally, smaller blocks add travel alternatives and spare main roads and intersections from carrying all of a city's traffic, but they also provide many advantages to multimodal transportation concerns and parking. Network, as characterized by regular intersections, turning opportunities, and redundant paths, actually generates efficiency and enriches a transportation system's effects on the community it serves in a number of ways:

<u>Shared Driveways</u> - The concept of shared driveways encourages access along the side street for corner parcels and joint access driveways when side street access is not available.

<u>Cross-Access Connections</u> - Cross-access connections allow motorists to complete short trips between adjacent uses without having to return to the primary arterial. Connections are provided through aisles and alleys that connect adjacent parcels and parking lots to one another. By minimizing the number of vehicles turning off and onto the arterial, through traffic is able to flow in a more efficient manner. In addition, cross-access connections that are coordinated and well planned may begin to form a second parallel roadway.

<u>Cross-Access Connections</u> - Reverse "frontage road" provides cross access easements in the rear of the parcels, creating a second parallel roadway. Wherever possible, access is provided from the side street instead of the primary arterial. By encouraging driveway access from the side street, the number of "friction points" along the primary arterial is drastically reduced.

# Transit Stops

## Overview

Providing safe and comfortable walking and bicycling connections to transit stations and bus stops allows non-drivers to increase the distances they can conveniently travel and increases the effectiveness of transit. Bikes-on-Buses and expanded short- and long-term bicycle parking at transit stations can encourage first-mile/last-mile bicycle connections to transit. Connecting transit stops and stations with a network of trails, sidewalks, and bicycle facilities is an important element of an active transportation network. Safe and convenient routes that serve pedestrians and bicyclists should be viewed as essential support strategies in increasing transit ridership.

Planning for first mile/last mile connections should consider:

- Bicycle access on transit vehicles, including bikes-on-buses
- Low-stress pedestrian and bicycle routes to transit stations and stops
- Direct bicycle access (without dismounting) to long-term, short-term, and sheltered bike parking

Sidewalks provide space for passengers to wait at bus stops and accommodate bus shelters and other transit stops. Shelters and other features improve operations, ridership and the value of transit to the community.

## Design

All transit stops should be fully ADA accessible for passengers. Transit stops may also be located on curb extensions and floating islands where on-street parking is present.

The area on the sidewalk where passengers load and unload at bus doors is called the landing zone (also known as the landing pad), which should be free from all obstructions including sign posts and bus stop amenities. The landing zone should be a minimum of 5 feet wide and 8 feet deep.

A well placed and configured transit stop offers the following characteristics:

- Clearly defines the stop as a special place
- Provides a visual cue on where to wait for a transit vehicle
- Does not block the path of travel on the adjacent sidewalk
- Allows for ease of access between the sidewalk, the transit stop, and the transit vehicle

## Considerations

- Consolidate streetscape elements to create a clear waiting space and minimize obstructions between the sidewalk, waiting area, and boarding area
- Use special paving treatments or curb extensions (where there is on-street parking) to distinguish transit stops from the adjacent sidewalks
- Integrate transit stops with adjacent activity centers whenever possible to create active and safe places
- Avoid locating bus stops adjacent to driveways, curb cuts, and land uses that generate a large number of automobile trips (gas stations, drive-thru restaurants, etc.)
- Transit stops are required by the Americans with Disabilities Act (ADA) to be accessible. Specifically, ADA requires a clear loading area (minimum 5 feet by 8 feet) perpendicular to the curb with a maximum 2 percent cross-slope to allow a transit vehicle to extend its lift to allow people with disabilities to board. The loading area should be located where the transit vehicle has its lift and be accessible directly from a transit shelter. The stop must also provide 30 by 40 inches of clear space within a shelter to accommodate wheelchairs. The greater use of low-floor transit vehicles may make this requirement moot; but it will still be necessary to provide enough room so wheelchair users can access all doors.

# Driveways

## Overview

Numerous areas in North Richland Hills developed during an era of suburbanization when the provision of driveways for each parcel was in vogue. This type of access creates safety issues for drivers, pedestrians and bicyclists and results in unnecessary delays for automobiles. While the city has largely discontinued these practices for new development, there are numerous areas where retrofit consolidation of driveways will be necessary. The following are some approaches that can be utilized to maintain access while creating more effective networks.

Driveways provide access to properties from public streets. Driveways occur wherever there are land uses that require vehicle access from the street network. Driveways often cross sidewalks, bike and parking lanes, and affect moving traffic. These crossings can create conflicts between various users. To the extent possible, the number of driveways should be minimized, particularly along commercial corridors, in order to minimize conflicts. As an access management principle, driveways should be avoided within the functional area of an intersection to reduce the potential for conflicts with turning vehicles and pedestrians in the crosswalk.

## Design

As a general rule, driveways should be designed to look like driveways, not roadway intersections, and incorporate the following design principles:

- Sidewalks should be continuous across driveways at a continuous grade and cross-slope. The driveway flares should be contained within the boulevard space and not intrude on the pedestrian travel way.
- The pedestrian zone should be consistent with ADA guidelines to ensure that all pedestrians using wheeled mobility devices can safely cross the driveway.
- A standard driveway has a 4-foot flare on each side to prevent high speed turning movements.
- Driveway width should be minimized to the extent appropriate for traffic conditions, use, type and location.
- Driveways should be located outside the functional area of the intersection, with an absolute minimum of 100 feet from intersections in commercial corridors and 40 to 60 feet in residential corridors.
- The functional area of an intersection includes areas upstream and downstream of the intersection. In contrast with the physical area of an intersection, the functional area varies depending on several site-specific variables including: amount of queuing at an intersection; distance traveled during perception-reaction time; and declaration distance.
- In locations where a driveway must function as a leg of an intersection, it should be designed with pedestrian safety features such as crosswalks, small corner radii, and pedestrian signal indications if part of a signalized intersection.
- Truncated domes should not be used where driveways cross the

sidewalk zone unless the driveway is functioning as a leg of an intersection and curb ramps are present.

- Site obstructions (signs, landscaping, decorative fencing, signal boxes, building features etc.) should be carefully located to maximize visibility between turning motorists and pedestrians at driveways.

## Crime Prevention through Environmental Design

In order to attract users and create a pleasant walking or biking experience, safe infrastructure is paramount. Off-road trails and separated bicycle lanes are the gold standard for safety. The growing popularity of trails and urban bicycle facilities are creating a shift from seeing bicycle facilities as "nice to have" to being "critical community assets". As bicycle networks expand in response to this shift, safety should be top of mind for planners. A well-used and thoughtfully designed bicycle or pedestrian facility is a safe facility. The success and usefulness of a facility can be directly tied to crime prevention and perceptions of safety just as much as statistical safety.

Studies have shown that trails, sidewalks, and bike lanes themselves do not generate crime. However, in many communities, crime and safety are serious, pervasive issues, and even the perception of a lack of safety may influence bicycle/pedestrian facility use. The concept of Crime Prevention through Environmental Design (CPTED) refers to a multi-disciplinary approach of deterring criminal behavior through environmental design in which a collaborative process is used by planners, community members and law enforcement officials during the planning, building and programing of a facility. CPTED takes into account all potential users' perceptions of what a safe place is and pairs it with proven design and programming standards that reduce the risk of criminal behavior, including:

- Maintenance of open sight lines along the facilities
- Provision of adequate lighting
- Connections to well used community destinations
- Provision of clear signage so users know and can report their location in an emergency
- Regular patrols by law enforcement
- Ensuring any off-street facility is included and recognized in the 911 emergency locator system
- Marketing and programming that is attractive to residents and visitors

Community outreach and facility programming can be the most effective deterrent to crime and negative perceptions of safety. When communities host events on facilities they become shared spaces which hold value. Volunteer service days, neighborhood picnics, and educational tours are just some of the programming and outreach elements that help foster a shared sense of ownership of a trail, sidewalk, or bike facility. The community should be involved in the design process to influence amenities that attract a diversity of users. Such amenities may include but are not limited to:

- Public gathering spaces
- Fitness stations

- Sport fields
- Playgrounds
- Public art
- Benches and rest areas
- Community gardens
- Water stations
- Interpretive signage
- Access points at residential and commercial areas

# Chapter 4

# INTERSECTIONS AND CROSSINGS

Intersections are places where a high level of activity occurs and there is great potential for conflict. They are transportation hubs that must move people and goods as safely and efficiently as possible in sometimes complex and challenging environments. Intersections must be safe, accessible, and multimodal nodes that balance the needs of all users and enhance the quality of life. The majority of motor vehicle crashes involving bicycles and pedestrians occur at intersections, so safe design is imperative. The completion of North Richland Hills' bicycle system will require that continuity through difficult intersections (complicated geometries and large stretches between approaching and departing legs, etc.) be provided.

## Corners and Curb Radii

### Overview

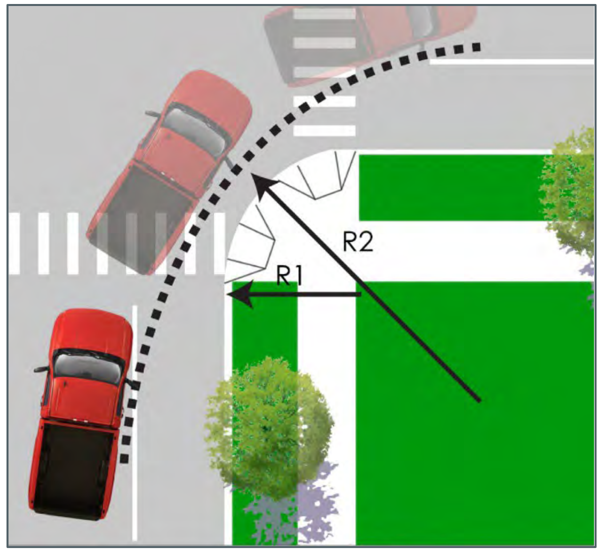
The AASHTO Green Book provides guidance on turn radii at corners for different types of vehicles (large trucks, school buses, etc). However, designing for the largest vehicle that might use an intersection results in large curb radii that can encourage drivers to make higher speed turns, lengthen crossing distances for pedestrians, and leave less space for sidewalks and other uses. Where large vehicles need to be accommodated, designers should consider the following factors to increase the effective curb radius without increasing the actual, physical curb radius:

- Cross-street lane width. On streets with heavy bus or truck traffic, wider lanes may be needed to provide adequate turning space while maintaining a tight corner radius. However, on streets with moderate heavy vehicle traffic, designs that assume the turning vehicles will encroach into the opposite travel lane on the receiving street may be acceptable.

- Placement of stop lines on non-divided cross-streets. On cross-streets where traffic volumes do not create pressure to locate vehicle stop lines as close to the intersection as possible, moving the stop line back from the intersection can add cushion space for large vehicles to make right or left turns.
- On-street parking or near-side bus stops. Multiple travel lanes, space used for buses, bike lanes and on-street parking can help a large vehicle make a wider turn at an intersection, especially when coupled with the ability to bend outside of the immediate lane width on the street receiving the turn movement. The diagram in Figure 36 illustrates this concept. The curb radius allows shorter crossing distances for pedestrians, while, the effective radius defines the path that vehicles may follow from one travel lane to another. In this example, on-street parking allows vehicles to navigate a wider path without colliding with the corner curb. This is important with large trucks and other heavy vehicles as it can keep a smaller radius and give pedestrians a shorter crossing distance.

## Curb Radii

Curb returns or radii are the curved connection of curbs at the corners formed by the intersection of two streets, which guide vehicles in turning corners. The shape of a corner curb radius has a significant effect on the overall operation and safety of an intersection.




### Applicability and Use

The shape and dimensions of curb radii vary based on street type, transportation context, and design vehicle (vehicle type used to determine appropriate turn radius at an intersection). Smaller corner radii increase pedestrian safety by shortening crossing distances, increasing pedestrian visibility, and decreasing vehicle turning speed. Smaller corner radii also provide better geometry for installing perpendicular curb ramps for both crosswalks at each corner, resulting in simpler, more appropriate crosswalk placement that is in line with the approaching sidewalk.

### Design

Factors to consider when designing curb radii:

- Curb radius: the actual radius proscribed by the curb line at an intersection.
- Effective radius: The radius available for the design vehicle to make the vehicle turn, accounting for the presence of parking, bike lanes, medians, or other features.
- Curb radii can be designed:

- To allow for the selected design vehicle to complete a turn fully within its designated travel lane or lanes.
- To accommodate a vehicle turn by allowing for a particular vehicle type to complete a turn with some latitude to partially use adjacent or opposing lanes on the origin or destination streets.

*Considerations*

The effective turning radius (rather than the actual curb radius), should typically be used to determine the ability of vehicles to negotiate a turn. Determination of the design vehicle should consider and balance the needs of the various users of a street--from pedestrians and bicyclists to emergency vehicles and large trucks--considering the volume and frequency of these various users. The design vehicle should be selected according to the types of vehicles using the intersection with considerations to relative volumes and frequencies. The designer should balance designing for a larger vehicle versus accommodating the needs of large vehicles, which may allow encroachment into another lane. A typical curb radius of 20 feet (smaller radii may be considered) should be used wherever possible including where:

- There are higher pedestrian volumes
- There are few larger vehicles
- Bicycle and parking lanes create a larger effective radius.

Factors that may affect the curb radii must be taken into consideration:

- The street type
- The angle of the intersection
- Bump-outs
- The number and width of receiving lanes
- Large vehicles
- Effective turning radius

## Curb Extensions

### Overview

Curb extensions, also known as neckdowns, bulb-outs, or bump-outs, are created by extending the sidewalk at corners or mid-block. Curb extensions are intended to increase safety, calm traffic, and provide extra space along sidewalks for users and amenities.

Curb extensions have a variety of potential benefits including:

- Additional space for pedestrians to queue before crossing
- Improved safety by reducing motor vehicle speeds and emphasizing pedestrian crossing locations
- Less pedestrian exposure to motor vehicles by reducing crossing distances
- Space for ADA compliant curb ramps where sidewalks are too narrow
- Enhanced visibility between pedestrians and other roadway users
- Restricting cars from parking too close to the crosswalk area
- Space for utilities, signs, and amenities such as bus shelters or waiting areas, bicycle parking, public seating, street vendors, newspaper stands, trash and

recycling receptacles, and planting, and landscape elements

## Design

- Curb extensions should be considered only where parking is present or where motor vehicle traffic deflection is provided through other curbside uses.
- Curb extensions are particularly valuable in locations with high volumes of pedestrian traffic, near schools, at unsignalized pedestrian crossings, or where there are demonstrated pedestrian safety issues.
- A typical curb extension extends the approximate width of a parked car, or about 6’ from the curb.
- The minimum length of a curb extension is the width of the crosswalk, allowing the curvature of the curb extension to start after the crosswalk which should deter parking; NO STOPPING signs should also be used to discourage parking. The length of a curb extension can vary depending on the intended use (i.e., stormwater management, transit stop waiting areas, restrict parking).
- Curb extensions should not reduce a travel lane or a bicycle lane to an unsafe width.
- Curb extensions at intersections may extend into either one or multiple legs of the intersection, depending on the configuration of parking.
- Street furniture, trees, plantings, and other amenities must not interfere with pedestrian flow, emergency access, or visibility between pedestrians and other roadway users.
- Curb extensions may be located at corners or midblock locations.

## Considerations

- The turning needs of larger and emergency vehicles should be considered in curb extension design.
- Care should be taken to maintain direct routes across intersections aligning pedestrian desire lines on either side of the sidewalk. Curb extensions often make this possible as they provide extra space for grade transitions.
- Consider providing a 20’ long curb extension to restrict parking within 20’ of an intersection.
- In order to move traffic more efficiently, curb extensions should not be installed on arterials with peak hour parking restrictions.
- When curb extensions conflict with turning movements, the width and/or length should be reduced rather than eliminating the extension wherever possible.
- Emergency access is often improved through the use of curb extensions as intersections are kept clear of parked cars.
- Curb extension installation may require the relocation of existing storm drainage inlets and above ground utilities. They may also impact underground utilities, parking, delivery access, garbage removal, and street sweepers. These impacts should be evaluated when considering whether to install a curb extension.

# Crossing Islands

## Overview

As the number of travel lanes increases, pedestrians feel more exposed and less safe entering the intersection. Crossing islands are raised islands that provide a pedestrian refuge for crossing multilane roadways. They enable pedestrians to find gaps in traffic and allow a two-stage crossing movement. At mid-block crossings, islands should be designed with a stagger, or in a “z” pattern, forcing pedestrians to face oncoming traffic before progressing through the second phase of the crossing.

## Design

Crossing islands should:

- Be used in locations where there is a demand for pedestrians to cross the road, but where the numbers of pedestrians are not high enough to warrant a signalized pedestrian crossing.
- Include at-grade pedestrian cut-throughs as wide as the connecting crosswalks, detectable warnings, and be gently sloped to prevent standing water and ensure adequate drainage.
- Be at least 6’ wide, preferably 8–10’. Where a 6¬’ wide median cannot be attained, a narrower raised median is still preferable to nothing. The minimum protected width is 6‘, based on the length of a bicycle or a person pushing a stroller. The refuge is ideally 40 feet long.
- Accommodate turning vehicles. Crossing islands at intersections or near driveways may affect left-turn access.
- Have a “nose” which extends past the crosswalk. The nose protects people waiting on the crossing island and slows turning drivers.
- Include curbs, bollards, or other features to protect people waiting.
- Include street lights, signs, or reflectors to highlight or illuminate islands and ensure that motorists see them.
- Be enhanced using plantings or street trees. Plantings may require additional maintenance responsibilities and need to be maintained to ensure visibility.

## Considerations

- Crossing islands should be considered where crossing distances are greater than 50’.
- To guide motorists around crossing islands, consider incorporating diverging longitudinal lines on approaches to crossing islands.

- If there is enough width, center crossing islands and curb extensions can be used together to create a highly visible pedestrian crossing and effectively calm traffic.
- Where possible, stormwater management techniques should be used on crossings islands with adequate space. Plantings should be low growing to maximize visibility and ideally should require minimum maintenance.

## Raised Crossings and Intersections

### Overview

Raised crossings and intersections create a safe, slow-speed crossing and additional public space at minor intersections. They are created by raising the level of the roadway to the same level as the sidewalk. Raised intersections are a similar concept to speed tables, but are applied to the entire intersection. These treatments provide an array of benefits especially for people with mobility and visual disabilities because there are no vertical transitions to navigate.

Raised crossings and intersections:

- Make it physically more difficult for drivers to go through crossings and intersections at unsafe speeds.
- Improve drivers' awareness by prioritizing pedestrian crossings and helping define locations where pedestrians are expected.
- Eliminate standing water and debris collection at the base of ramps.
- Increase visibility between drivers and pedestrians by raising pedestrians in the motorists' field of vision and give pedestrians an elevated vantage point from which to look for oncoming traffic.
- Create pedestrian crossings which are more comfortable, convenient and accessible since transitioning between the sidewalk and roadway does not require negotiating a curb ramp.

### Design

- Raised crossings and intersections are appropriate in areas of high pedestrian demand. They should also be considered in school zones and locations where pedestrian visibility and motorist yielding have been identified as concerns.
- Care should be taken to maintain direct routes across intersections aligning pedestrian desire lines on either side of the sidewalk.
- Raised crossings can be provided along side streets of major thoroughfares to slow traffic exiting the main street.
- Raised crossings should provide pavement markings for motorists and appropriate signage at crosswalks per the MUTCD.
- Design speeds and emergency vehicle routes must be considered when designing approach ramps.
- Raised crossings and intersections require detectable warnings at the curb line for persons with visual disabilities.

### Considerations

- Raised crossings are particularly valuable at unsignalized mid-block locations, where drivers are less likely to expect or yield to pedestrians.

- Raised intersections and crossings can be used as gateway treatments to signal to drivers when there are transitions to a slower speed environment that is more pedestrian-oriented.
- High-visibility or textured paving materials can be used to enhance the contrast between the raised crossing or intersection and the surrounding roadway.
- Designs should ensure proper drainage. Raised intersections can simplify drainage inlet placement by directing water away from the intersection. If the intersecting streets are sloped, catch basins should be placed on the high side of the intersection at the base of the ramp.

## Crosswalk Design

Well-designed crosswalks are an important component of a pedestrian-friendly city. Safety for all pedestrians, especially for those with limited mobility and disabilities, is the single most important criteria informing crosswalk design.

### Standard Crosswalks

*Overview*

The recommendation of this Pattern Book is to use the standard style crosswalk, with 8” wide stripes parallel to the path of travel. For areas with high pedestrian traffic and locations with unsignalized crossings, crosswalks should be the high visibility ladder treatment. These would have the current parallel bars and add 24” bands every 24”.

*Design*

- Crosswalks should be at least the width of the approaching sidewalk or trail. In areas of heavy pedestrian volumes, crosswalks can be up to 25 feet wide.
- Crosswalks should be aligned with the approaching sidewalk and as close as possible to the parallel street to maximize the visibility of pedestrians while minimizing their exposure to conflicting traffic.
- Designs should balance the need to reflect the desired pedestrian walking path with orienting the crosswalk perpendicular to the curb; perpendicular crosswalks minimize crossing distances and therefore limit the time of exposure.
- ADA-compliant curb ramps should direct pedestrians into the crosswalk. The bottom of the ramp should lie within the area of the

crosswalk (flares do not need to fall within the crosswalk).

- Stop lines at stop-controlled and signalized intersections should be striped no less than 4 feet and no more than 30 feet from the approach of crosswalks.

*Considerations*

Legal crosswalks exist at all locations where two streets cross, including T-intersections, regardless of whether pavement markings are present. Motor vehicles are legally required to yield to pedestrians at intersections even when there are no pavement markings.

Crosswalks should be used only at locations where significant pedestrian activity is occurring or anticipated to help ensure that motorist associate crosswalk and pedestrian activity. In order to create a convenient, connected, and continuous walking network, the first step is to identify a location for a marked crosswalk. Begin by identifying desire lines and destinations such as schools, parks, civic buildings, retail areas, and transit stops. Then, identify where it is safest for people to cross. These observations should inform location and prioritization of crossing improvements.

Marked crosswalks help guide pedestrians to locations where they should cross the street as well as inform drivers of pedestrian movements. In addition to intersections, marked crosswalks are used in locations where pedestrians may not be expected, such as at mid-block crossings or uncontrolled crossings (crossings where motorists do not have signals or stop signs).

As with any installation of traffic control devices, the most essential tool for crosswalk installation is the use of engineering judgment. Engineering judgment should be used and, if applicable, an engineering study performed when considering the marking of crosswalks.

## Marked Crosswalks at Controlled Locations

Intersection controls are one of the most important factors in intersection design. The goal of controlling intersections is to provide the safest, most efficient means to move people across an intersection, whether walking, riding a bicycle, taking transit, or driving. Specific attention should be given to vulnerable users, such as pedestrians and bicyclists.

Engineering judgment should be used to establish the most appropriate controls on a site-specific basis. The following factors should be considered when determining intersection controls:

- Vehicular, bicycle, and pedestrian traffic volumes on all approaches
- Number and angle of approaches
- Approach speeds
- Sight distance available on each approach
- Reported crash experience

Depending on the type of intersection and the selected control devices, it may not always be appropriate to mark crosswalks at all legs of an intersection. Alternate treatments may be necessary to optimize safety and visibility, which are discussed in the sections that follow.


## Marked Crosswalks at Stop-Controlled Intersections

Stop-controlled approaches are easiest for pedestrians to cross because motorists and bicyclists must stop and yield the right of way to pedestrians. Stop-controlled intersections also help reduce pedestrian delay. However, the use of stop signs must balance safety with efficient traffic flow for all modes, including bicycles and transit vehicles. Stop sign installation requires specific warrants be met as determined by the MUTCD.

For neighborhood residential streets, marked crosswalks should be used at locations where pedestrian crossings are more frequent, such as school walking routes, park entrances, or other locations. Stop lines should be striped at stop-controlled intersections no less than 4’ and no more than 30’ from the approach of crosswalks, unless determined otherwise by an engineering study.

## Signalized Intersections

This Pattern Book’s goal is to prioritize the safety, comfort, and convenience of all users at signalized intersections. All signalized intersections should contain indications for motor vehicles and pedestrians, in addition to signals for bicyclists and transit where appropriate. By optimizing signal phasing and timings, multiple modes are able to safely move through the intersection with limited conflicts, low delay, and more comfort.

## Signal Timing for Pedestrians

Pedestrian signal heads should be provided at all signalized intersections for all crosswalks. Additionally, it is highly recommended to install crosswalks on all legs of a signalized intersection unless it is determined to be unnecessary due to pedestrian travel patterns. Signal timing for pedestrians should be provided at all newly constructed signalized intersections and incorporated into all signalized intersection improvements. For information on requirements for accessible pedestrian signals, see Accessible Pedestrian Signals later in this chapter.

The following design goals can help improve pedestrian crossing safety and comfort at signalized intersections:

- Reduce vehicle speeds
- Minimize crossing distance
- Minimize delay for WALK indication
- Minimize conflicts with turning vehicles
- Provide sufficient signal time to cross the street

*Considerations*

- One of primary challenges for traffic signal design is to balance the goals of minimizing conflicts between turning vehicles with the goal of minimizing the time required to wait at the curb for a WALK indication.
- Intersection geometry and traffic controls should encourage turning vehicles to yield the right-of-way to pedestrians.
- Requiring pedestrians to wait for extended periods can encourage crossing against the signal. The 2010 Highway Capacity Manual states that pedestrians have an increased likelihood of risk-taking behavior (e.g., jay-walking) after waiting longer than 30 seconds at signalized intersections.
- Opportunities to provide a WALK indication should be maximized whenever possible. Vehicular movements should be analyzed at every intersection in order to utilize non-conflicting phases to implem-ent Walk Intervals. For example, pedestrians can always cross the approach where vehicles cannot turn at a four-leg intersection with the major road intersecting a one-way street when the major road has the green indication.

## Rectangular Rapid-Flash Beacons (RRFB)

### Overview

At some uncontrolled crossings, particularly those with four or more lanes, it can be difficult to achieve compliance with laws that require motorists to yield to pedestrians. Vehicle speeds and poor pedestrian visibility combine to create conditions in which very few drivers are compelled to yield.

One type of device shown to be successful in improving yielding compliance at these locations is the Rectangular Rapid Flash Beacon (RRFB). RRFBs are a pedestrian crossing sign combined with an intensely flashing beacon that is only activated when a pedestrian is present. RRFBs are placed curbside below the pedestrian crossing sign and above the arrow indication pointing at the crossing. They should not be used without the presence of a

pedestrian crossing sign. The light-emitting diode (LED) flickers at a rate of 190 flashes per minute. The beacons are activated by a pedestrian call button.

Another LED panel should be placed facing the pedestrian to indicate that the beacon has been activated. The pushbutton and other components of the crosswalk must meet all other accessibility requirements.

## Considerations

- RRFBs are considerably less expensive to install than mast-arm mounted signals. They can also be installed with solar-power panels to eliminate the need for a power source.
- RRFBs should be limited to locations with critical safety concerns and should not be installed in locations with sight distance constraints that limit the driver's ability to view pedestrians on the approach to the crosswalk.
- RRFBs should be used in conjunction with advance yield pavement lines and signs, which are discussed on the previous page.
- Usually implemented at high-volume pedestrian crossings but may also be considered for priority bicycle route crossings or locations where bike facilities cross roads at mid-block locations.


## HAWK Signals

"HAWK" stands for High-intensity Activated Crosswalk and is also referred to as a pedestrian hybrid beacon. A HAWK signal is a push button-activated pedestrian signal that increases pedestrian safety at crossings while stopping vehicle traffic only as needed. The following describes how a HAWK signal works:

- The signal remains dark until a pedestrian activates the walk indication by pushing a button.
- The signal will then flash yellow to warn drivers that a pedestrian will be entering the crosswalk.
- A steady yellow indication follows the flashing indication advising drivers to stop if safe to do so.
- The signal then turns solid red, requiring vehicles to stop at the stop line. The pedestrian will see the walk indication and proceed into the crosswalk.
- Once the walk time is completed, the signal will flash red. This lets the driver know that once they come to a complete stop they may proceed

through the intersection if there are no pedestrians in the crosswalk.

- The HAWK will return to the dark or "off" position until the push button is activated again.

## Considerations

- HAWK signals must be accompanied by the following crossing treatments:
- Crosswalk pattern to match the intensity of the crossing, likely a higher-visibility crosswalk
- Advanced stop bar placed 20 to 50 feet from crosswalk
- MUTCD R10-23 signs mounted both on the mast arm and the supporting pole.

The HAWK Signal indicates a preferred crossing location and thus does not improve crossing at all quadrants of an intersection as a signalized intersection would. It does not improve movement through the intersection for cyclists in on-street lanes as they are subject to motor vehicle indications.

# Bicycle Accommodations at Intersections

The majority of motor vehicle crashes involving bicycles in urban areas occur at intersections. In -Texas, on-street bicycles are operating vehicles and are required to follow the same rules of the road as motorists. Good intersection design makes bicycling more comfortable and attractive, reduces conflicts with motor vehicles and pedestrians, and contributes to reduced crashes and injuries. The following principles are applied to intersection design in order to accommodate bicyclists:

- Provide a direct, continuous facility to the intersection
- Provide a clear route for bicyclists through the intersection
- Reduce and manage conflicts with turning vehicles
- Provide signal design and timing to accommodate bicyclists, based on an engineering study.
- Provide access to off-street destinations.

Intersection improvements for bicycles should be considered during all roadway improvement projects, street redesign, and safety improvements or upgrades.

## Bicycle Lanes at Intersections

### *Overview*

Bicycle lanes provide a dedicated space for bicyclists to predictably ride along roadways and through intersections. When designing intersections for bicyclists, the approaches should be evaluated and designs should maintain continuity of bicycle facilities to the maximum extent feasible.

Streets with dedicated bicycle lanes should continue striping through unsignalized and complicated intersections to provide additional guidance and safety measures for bicyclists. This design principle is especially important at intersections where there are conflicting vehicular movements, unsignalized crossings, and/or crossings of more than four travel lanes. Signalized intersections may not require striping through each intersection and should be evaluated on a case-by-case basis.

*Design*

- Standard details for bicycle lane markings at intersections are provided in the NACTO Urban Bikeway Design Guide. Additional guidance can also be found in the MUTCD and AASHTO "Bike Guide."
- Dedicated bicycle lanes should be provided on intersection approaches where space is available.
- At intersections with a dedicated right turn lane, bicycle lanes should be provided to the left of the right turn only lane unless bicycle signals and dedicated phasing is provided.

*Considerations*

- Bicycle lane markings, including green-colored pavement, shared lane markings, dashed bicycle lane lines, and signage may be provided through intersections per engineering judgment.
- Selective removal of parking spaces may be needed to provide adequate visibility and to establish sufficient bicycle lane width at approaches to intersections.
- Shared lane markings may be used where space is not available for bicycle lanes at intersections, however this should only be done if no other design is possible.
- Although the minimum recommended width of a bicycle lane within the intersection is 5', 4' bicycle lanes can be provided in extremely constrained conditions.
- Bicycle lanes at the entrance and exit of a circular intersection should allow direct access to a shared use bicycle/pedestrian path around the perimeter of the intersection via curb ramps; ramps should be provided for bicyclists to mount the sidewalk prior to the intersection. Designs should also enable bicyclists to mix with traffic and proceed through the intersection.

## Bicycles at Signalized Intersections

*Overview*

Bicycles have different operating characteristic than motor vehicles and special consideration is necessary in designing traffic signals that accommodate both motorists and bicyclists. Bicyclists generally have the disadvantage of slower acceleration rates than motorists, and traffic signal design should include adjustment of minimum green intervals, clearance time and extension time to account for this disadvantage. Signal progression should be designed in order to balance the needs of all users, with appropriate design speeds and traffic signal coordination settings. Appropriate signal timing also can reduce delay, discourage bicyclists from running red lights and minimize conflicts.

The AASHTO Guide for the Development of Bicycle Facilities provides a specific formula to estimate minimum green time for bicycles from a standing position. It is based on the average adult bicyclists who can operate at 10 miles per hour. A slower speed or extended time may be appropriate at locations with young children, such as near schools.

*Design*

- Where actuated signals are present, the signal system should automatically detect bicycles as well as motor vehicles. In order for bicyclists to prompt the green phase at these intersections, bicycle detection devices should be installed.

- Detection devices can also include:
- Video detection
- Infra-red detection
- Microwave detection
- Magnetometers (special locations such as on or under bridges)
- Detection devices should be located within bicycle lanes or bicycle boxes, marked with a bicycle detector symbol, and supplemented by appropriate signage.
- When it is not feasible for the detection device to be located within the bicycle lane or bicycle box, detection devices should be located prior to the stop bar and span an appropriate distance to provide for left, though, and right turning bicyclists.

*Considerations*

- Reference the latest edition of the AASHTO Bike Guide and the NACTO Urban Bikeway Guide for more details on the signal timing needs of bicycles at intersections. The AASHTO Bike Guide provides the technical information necessary to calculate minimum green time and other aspects of signal design to accommodate bicycles. The NACTO Urban Bikeway Design provides less technical detail, but provides information regarding bike signal heads
- Where right-turn-only lanes for motor vehicles exist, bicycle lanes should be designed to the left of the turn lane.
- Special attention should be given to signal timing at locations with higher vehicular speeds and longer crossing distances. At these locations, bicyclists are more likely to have different signal timing needs than motorists, such as extending the green time to allow bicyclists to clear the intersection before the yellow/red phases. The AASHTO Bike Guide contains detailed guidance for bicyclists' signal timing needs at wide intersections.
- Bicycle signal heads provide dedicated signal indications to bicyclists and should be positioned to maximize visibility to bicycle traffic. They should be coordinated with pedestrian and non-conflicting vehicular movements to increase safety and minimize overall delay.
- Bicycle signal heads will be installed on a case-by-case basis determined by an engineering study.
- Bicycle detection devices, particularly loop detectors, need regular testing to ensure the equipment is working correctly.

# Chapter 5

# WAYFINDING

The ability to navigate through North Richland Hills is informed by landmarks, natural features, signs, and other visual cues. Wayfinding is a cost-effective and highly visible way to improve the bicycling and pedestrian environment by familiarizing users with the bicycle network, helping users identify the best routes to destinations, addressing misperceptions about time and distance, and helping overcome a barrier to entry for infrequent bicyclists and pedestrians (e.g., “interested but concerned” cyclists).


A bikeway wayfinding system is typically composed of signs indicating the following:

- Direction of travel, location of destinations, and travel time/distance to those destinations;
- Pavement markings indicating to bicyclists that they are on a designated route or bike boulevard and reminding motorists to drive courteously;
- Maps providing users with information regarding destinations, bicycle facilities, and route options.

## General Principles

- Messages must be clear and concise
- Related signs should be combined to limit visual clutter
- Signs should be limited in number and content as to not overpower the reader
- Signs should be placed in such a way that primary regulatory signs are not overlooked
- Groups of wayfinding signs should have a graphically standardized appearance
- Signs must be maintained to ensure current information and adequate condition
- Destination names will be kept generic to the extent possible to avoid advertising
- Private campus areas, such as a college campus, may provide its own internal system of wayfinding to facilitate site circulation. These systems should be developed independently from city or county

wayfinding systems within the public right-of-way.

## General Wayfinding

Primary signing may be accomplished through street name signs. Street name signs follow MUTCD standards. Street name signs are posted on one of the quadrants at residential intersections. At collector and arterial street intersections signs are posted on diagonally opposite corners. Signs may be mounted on stand-alone posts, light poles, or on signal mast arms. The signs list the street name, generalized street address range for that block and, if on a bike route, a bike symbol. Street signs are installed in conjunction with street reconstruction and are replaced to maintain good visibility.

### Design

Refer to Manual on Uniform Traffic Control Devices (MUTCD and TX MUTCD) standards for sign installation, such as mounting height, lateral placement from edge of path or roadway and other guidance.

- Mounting height should generally be above the eye of the intended user.
- Font size should be legible to the intended user
- Signs should be combined horizontally or vertically, where possible
- Lines of sight and visibility should be reviewed when placing signs
- A sign should be as simple and as short as possible to convey the intended message
- Pavement markings can also be used to assist with wayfinding in some locations and can also be a placemaking tool
- Wayfinding may be part of a broader district wayfinding/ branding initiative.


## Pedestrian Wayfinding

- Pedestrian wayfinding is primarily provided near major attractions, such as theaters or event centers.
- Pedestrian wayfinding may be useful in areas where large volumes of pedestrians may be walking to transit stops.
- Signs should meet all needs for public accessibility

## Bicycle Route Wayfinding

This guidance is appropriate for on-street bicycle routes or sidepaths adjacent to roadways.

- Route identification signs may be placed generally every ½ mile at the far side of intersections with major bike routes and at decision points.
- MUTCD D11-1c series Bicycle Route Signs with route name, such as “RIVER BIKEWAY,” in place of “BIKE ROUTE” or M1-8 series signs should be used to identify bicycle routes.
- Decision signs should be placed in advance of intersections with other major bike routes and at decision points.
- Decision signs should include destinations and directional arrows, and may include distance
- D1-3 series Destination Supplemental Signs should be used and, where feasible, consolidated with route identification signs to minimize size and clutter.
- Destinations should be listed with the closest destinations towards the top of a sign assembly, with a maximum of three destinations used on any single sign.


## Trail Wayfinding

This guidance is appropriate for trails located on independent rights-of-way.

- • Where bikeways managed by multiple agencies or from multiple systems share a common segment, wayfinding signs appropriate for either agencies or systems may be used.
- • Wayfinding or route identification signs should be posted at all major decision points along the trail (feeder trail intersections, forks in the trail, etc.) and after all roadway crossings (local streets and arterials).
- • Street name signs should be installed at all locations where trails intersect streets. This type of sign should have a sign blade for both the street name and the trail name.
- • Wayfinding signs may be part of a larger regional network and/ or branding system.

# Chapter 6

# END-OF-TRIP FACILITIES

Bicycle parking and end-of-trip facilities are essential elements in a multimodal transportation system. Each year in the United States more than 200,000 bicycles are reported stolen, according to Federal Bureau of Investigations data and a lack of secure bicycle parking has long been named on surveys as an influential factor in the decision not to bicycle. The provision of end-of-trip facilities, such as lockers, showers, and repair stations, is associated with higher rates of bicycling.

## Bike Parking

### Overview

Providing ample, well-designed bicycle parking is a key component of the city's strategy to increase bicycling. Good bicycle parking designs maximize capacity, maintain an orderly appearance, and are secure and simple to use. Bicycle racks should be permanently affixed to a paved surface; movable bicycle racks are only appropriate for temporary use.

Bicycle parking types generally be categorized as long-term parking, short-term parking, and event parking.

**Short-term bike parking –** Sometimes called visitor parking, short-term parking is intended for shorter stays at locations such as businesses and other institutions.

**Long-term bike parking** – Long-term parking is intended for residents in multi-unit buildings, employees, transit users, and others making longer stays. Long-term parking types include the following:

**Bicycle Cages** – Bicycle cages are controlled-access, enclosed fenced areas that contain a number of bicycle racks. They may be part of a basement, garage, or another room, or may be a stand-alone, outdoor, covered structure. They typically require administration by building or transit management to issue key fobs or access codes.

**Bicycle Stations –** Bicycle parking stations, also known as bicycle transit centers, bike stations, or cycle stations, are buildings or structures specifically designed for bicycle parking. They may be staffed or unstaffed and may provide additional end-of-trip services, such repair stations, bike shops, vending machines, lockers or showers. Business

models vary from publicly subsidized to user fees, with many stations using a mix of funding.

**Temporary event parking –** Bike parking for special events, such as large rides, concerts, sports events, and festivals, where more people than usual are expected to arrive by bicycle. Temporary event parking may be supervised (e.g., valet) or unsupervised.

Bicycle parking should adhere to these basic principles:

- **Quality –** Bicycle racks should be designed, built, located, and installed to ensure safety, security, and convenience.
- **Location –** Bicycle parking should be located close to destinations, building entrances, and bicycle routes and facilities.
- **Access –**Just as motor vehicle operators drive into their parking spaces, bicycle parking should be designed so that bicyclists may dismount as close to the rack as possible. Site design should result in racks that are well-spaced from one another and other objects so that users can easily reach and use them.
- **Bicyclist Safety –** The location, lighting, and visibility of bicycle parking should provide personal safety for people locking and unlocking their bikes.
- **Bicycle Security –** Bicycle parking should deter theft of, and minimize damage to, parked bicycles.

## Design

A typical bicycle parking space is 2 feet by 6 feet and racks should be placed 4 feet apart to allow users to easily maneuver and lock and unlock their bike. Some bike parking spots should at each location should accommodate larger bikes and additional equipment, such as bicycle trailers.

The location of short-term bicycle parking should:

- Be easily accessible by bike to bicycle facilities, such as the street or shared use paths.
- Be within 50 feet of building entrances, preferably within 25 feet.
- Be placed in locations with high levels of pedestrian traffic and visible to passers-by and people entering buildings to promote usage and enhance security.
- Be covered, if practical, where visitors may leave their bikes for a longer amount of time.
- Allow reasonable clearance for opening of passenger-side doors of parked cars.
- Not impede movement by pedestrians, including those with visual impairments and users of walkers and wheelchairs.
- Not impede routine maintenance activities.

- Not block pedestrian access to buildings, bus boarding, or freight loading.
- Not block pedestrian lines of sight, in the case of larger structures such as lockers and cages.
- Short-term and long-term bicycle racks should meet the following criteria:
- Support the bicycle at two points above its center of gravity.
- Be intuitive for first-time users.
- Accommodate high security U-shaped bike locks.
- Accommodate bicycles and attachments of a variety of shapes and sizes.
- Not contain protruding elements or sharp edges.
- Not bend wheels or damage other bicycle parts.
- Not require the user to lift the bicycle off the ground.

### Considerations

The quantity of needed bicycle parking may be assessed proactively or reactively.

A proactive approach provides parking sufficient to accommodate all residents, employees, customers, students, or other visitors to a location or uses a future benchmark, such as a community's bicycling mode share goal, to estimate future demand. This is especially important in locations where later retrofits may be difficult.

A reactive approach assesses the need for bike parking based on local bicyclist feedback, requests for parking, demand demonstrated at locations where the presence of parked bicycles nears, meets, or exceeds existing bike rack capacity (e.g. bikes parked to signs), and systematic counts of bike rack capacity during peak times.

## End-of-Trip Facilities

### Overview

End-of-trip facilities, such as lockers for storing helmets and clothes, changing rooms, showers and bicycle repair stations with air pumps and tools to complete simple repairs support the needs of bicyclists after they arrive at their destinations. They address potential concerns, such as physical appearance and hygiene and the operating condition of the bicycle. End-of-trip facilities should be well maintained and attractive to users. Wayfinding should be provided and information about the facilities should be included in employee, tenant, and building occupant welcoming packets.

### Locker Rooms & Showers

Locker rooms provide a space to store helmets, a change of clothes, and other supplies. Lockers should be secure and designed to ensure proper ventilation. Locker use should be monitored on a regular basis to ensure cleanliness and availability.

Showers allow bicycle commuters and others to clean up and change after their ride. In the case of commuters, this allows the maintenance of a professional appearance.


## Repair Stations

Repair stations allows bicyclists to complete routine maintenance tasks.

*Design*

- Repair stands may be installed indoors or outdoors.
- A basic repair stand should support a bicycle off of the ground by the seat post.
- Basic tools may be attached to the stand with tamper-proof hardware or provided in the room, if the room is access controlled.
- An air pump may be attached to the stand with tamper-proof hardware.

Sufficient space to maneuver and work on the bicycle should be provided. Recommended dimensions are 90 to 120 inches in length with the repair stand located at least 12 inches from the wall and 48 inches of work space in front of the stand.

# Appendix E:

# Public & Stakeholder Input

Public and stakeholder input was garnered through multiple avenues for the North Richland Hills (NRH) Transportation Plan, many of which took advantage of larger citywide initiatives like the Vision 2030 Strategic Plan and the biannual Community Survey. Input summarized in this Appendix include results from the following engagements:

- NRH Transportation Plan Online Community Survey (attitudinal survey)
- NRH 2017 Resident Satisfaction Survey (statistical survey)
- Stakeholder Input Meeting with the Strategic Plan Committee and City Council

## NRH Transportation Plan Online Community Survey

An online public questionnaire was completed in July 2018 surveying citizens regarding the North Richland Hills (NRH) transportation system. This attitudinal survey supplemented the 2017 Resident Satisfaction Survey which had a broad range of questions including some transportation-specific questions. The transportation survey received responses from 173 individuals.

Note: Responses documented are unedited.

## NRH 2017 Resident Satisfaction Survey

In late 2017, the City conducted a statistically valid survey for the community regarding key measures of quality of life, satisfaction with city services, identification and prioritization of city resources, and identification of areas to maintain and improve city services. A total of 1,044 responses were received with 565 received via the mailed survey and 479 via the online survey.

## Stakeholder Input Meeting

On January 22, 2018, the planning team met with the Strategic Plan Committee and City Council to provide an overview of the transportation planning process and garner input regarding

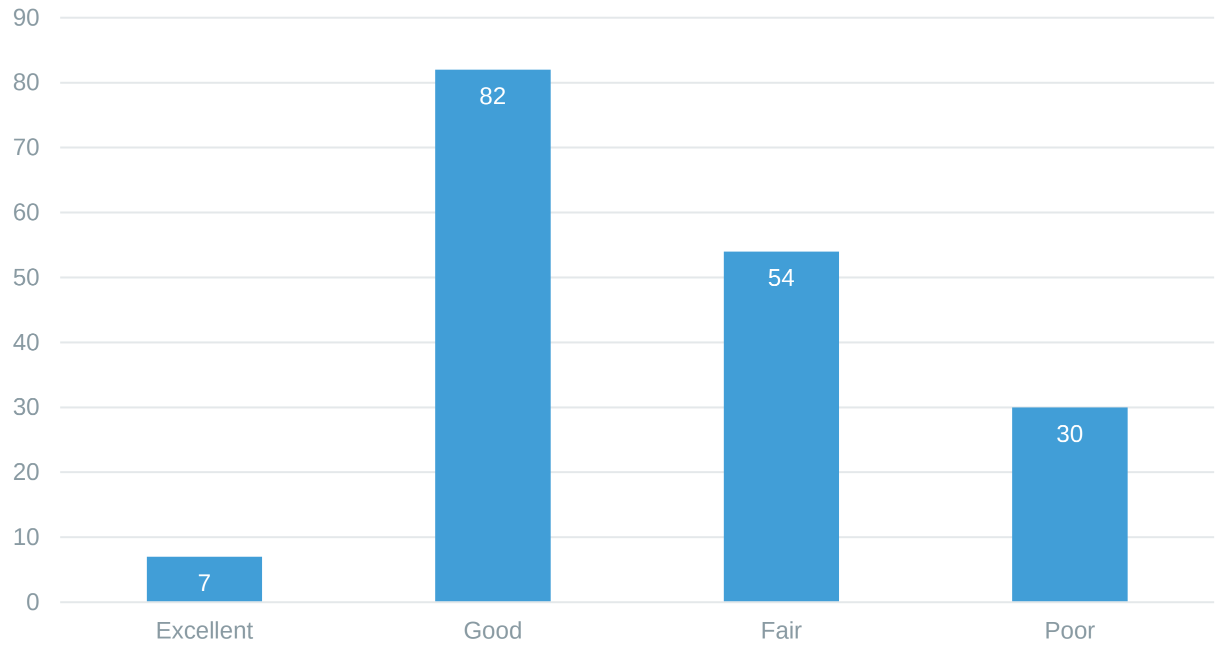
- Transportation goals,
- Strengths, weaknesses, issues, and needs in the NRH transportation system,
- Transportation connections for active transportation and TOD integration, and
- Target corridor issues and needs.

This meeting also included a briefing from the students at the University of Texas at Arlington (UTA) working on a Safe Routes to School (SRTS) study in NRH.

The following pages detail the input gathered through these public and stakeholder engagements.

# NRH Transportation Plan Online Community Survey

**1. How would you rate North Richland Hills in terms of overall transportation system?**




**2. What are some of the best aspects of transportation in North Richland Hills?**

- Multiple major North-South corridors
- Upcoming TEXRail, walking paths
- Multiple north south options (Rufe Snow, Davis, Precinct), pending commuter rail
- Cotton belt bike path and future texRail.
- It works for the people that live in hometown.
- More efficient roadways, quality of construction.
- Good central location and reasonable access to freeways. Fairly quick to downtown Fort Worth.
- The city attempts to stay on the greatest areas of congestion, and make solutions. There is a program to update city streets. Train service should be a great asset.
- access to rail
- NIce roads and when construction complete should be much better.
- Located on major highway and soon to have rail serice
- Davis Blvd high speed limit (50 mph) where this is available
- Light traffic
- Tollways
- There is constant road improvement.
- Easy to get around unless your in a construction zone.

- The roads are kept up well
- Large artery-type roads carry most traffic and keep off of smaller residential roads. Well marked street names, well light intersections at night. Signal box art is amazing.
- Mutli-lane roads that allow you quick access around the city (i.e. Hwy 26, Davis, Rufe Snow, Mid-Cities Blvd)
- There aren't any.
- Access to highways
- Easy to get to highway
- Pretty decent roads without a great deal of traffic.
- Low traffic
- Large roads are well organized to make my way around the city
- Train stations
- Rail coming. That's about it.
- Good main roads: Rufe Snow, Davis Blvd, Mid Cities, Pct line & Blvd 26. This makes getting around easier.
- Easy access to major highways & expressways, good traffic flow on Rufe Snow & major streets in NRH
- Linear parks and bike trail connectivity.
- I'm excited about the TEXRail and can't wait to utilize it.
- Development of rail
- I am not aware of any public transportation in NRH. I know the train is coming, but not here yet
- 50 MPH Speed Limits on Davis and Precinct Line and the incoming TEXRail
- What transportation system? No buses, no metro, no public transit. Only cars and walking.
- TxRail is coming
- Not sure.
- Good road conditions
- Surface roads
- The roads are in decent shape.
- Centrally located
- Clear signage and well maintained roads
- Bike trails, crappy crossings, no lighting
- Roads are kept up
- The number of major thoroughfares
- Lots of back roads
- Wide roads, lights well timed
- Upcoming TexRail! Improved 183/820 highway is also nice
- Well, I think good roadways are enough
- Main thoroughfares are nice and wide and well signaled. Speed limits are mostly appropriate, not too fast or slow.
- Most of the roads are paved.
- Good through streets like Davis, Precinct, Mid-Cities, 26, Rufe Snow, North Tarrant, Glenview--the capacity has, for the most part, kept up with growth.
- Easy Access to highways
- good N-S and E-W throughways
- Trains to the airport, and the other way to Fort Worth.
- New TRE station
- Easy to get to 820 and 121
- I can't think of any
- Bike paths
- Good bike lanes in some areas
- no laws prohibiting uber or lyft
- Roads are generally in good condition.
- easy access to city off of freeways
- Good freeways
- Most of the busy roads are large enough to handle the traffic.
- Davis Blvd
- No buses and roads are being improved
- NETS for qualified people
- Easy to get around

- Traffic flow
- Close to highway
- Streets are clean and well lit
- easy on/off freeway
- Only Uber, lyft or taxi available
- The opportunity to use TexRail in the future
- The future Commuter Train System. Many FREEways for driving.
- you tel me, I know of none
- Not sure there is a "Best Aspect". Too much ongoing construction, no public transportation, biking to work is not an option for most residents.
- I cant think of anything that I would classify as the best.
- Traffic lights have cameras to sense waiting traffic and minor intersections go to flashing red and yellow at midnight.
- Most roads are well maintained
- Wide lanes, good speed limits
- The current availability is perfect and one reason we chose to live here.
- TRE is close
- Everything is close by
- There is no transportation system. No buses to get around town.
- I have never seen any city bus transportation in our city
- Many east-west crosstown streets
- bike trails
- Traffic moves. Most roads in good shape.
- Traffic upgrade projects when finished
- Good bike trails, good residential roads
- Road access is generally good.
- Decent streets
- There is really no way to get around except for your own car. Walking is feasable only in a few areas, same with bicycles. There are walking, biking paths, but only for exercise.
- Freeway entrance and exit on Davis Road.
- A few volunteer sites are available in NRH
- Most roads are good and traffic signals seem to function fine
- Rebuilding, widening, realignment and improvement of major arterials (ex. Smithfield and Rufe Snow Drive)
- The city actually cares about the transportation and is doing something about it as the budget permits.
- They should get better after the current widening projects are complete.
- Access to freeway.
- We have a lot of access in and out of the city
- There are several ways to get somewhere in about the same amount of time.
- streets are clearly marked. lights are usually changed to cause traffic to move quickly and smoothly.
- There is NO public transportation.
- Good road system and maintaince.
- Access to regional highways to DFW area.
- Recreation bike trails
- Bike trails
- Widening major streets
- Good roads
- In general, streets are in good condition and MOST people adhere to traffic laws.
- Access to major highways.
- There are none.
- Ability to get to all services/stores/doctors.
- NRH Senior Center car rides
- Constant improvement, decent timing on stop lights, good ideas, good reaction to needs.
- Roadway condition
- Good trail system
- Some roads are adequately constructed to handle current and future needs. Almost

all seem to be too small to be able to handle current needs.

- Don't know. I didn't realize NRH had transportation. Been here 1 year.
- Attention to improvement.
- Good traffic flow
- Easy to travel
- Roads are in good condition
- No pot holes. Roads are maintained very well.
- The biking and walking trails we do have are fantastic!
- trails, road improvments, access to/from the freeway, upcoming rail access
- Looks as though some improvement has started
- roads are in good repair and labeled. love the flashing turn signals that have been added.
- personal transportation
- Davis and Hwy 377 recent expansions have helped North and South traffic. Rufe Snow Road is still a mess.
- If you have a car then transportation and parking at not a problem at all. If you don't have a car in NRH you are basically up a creek!
- Good streets; good access to freeways
- new train station coming
- We have some of the best auto throughfairs in NE Tarrent county. As the population grows the ability to continue the auto flows through our various streets and highways.
- Road maintenance is good.
- I love having quick access to 820
- Can get places in the mid cities using several routes if one is backed up
- I have multiple ways of getting anywhere I need to go.
- Turn lanes on most major streets, reasonable speed limits
- Investing in a commuter train stop in North Richland Hills that connects Fort Worth with the DFW airport.
- I wasn't aware that NRH HAS a transportation system. I've never seen an NRH Bus and we've lived here for quite a while. I've never even seen a bus stop. So, I'm not sure how to answer this question regarding it's "best" aspects.
- Several different main roads to get around on.
- Wide streets, good traffic flow, appropriate speed limits on major roads
- The main thourough fairs (is that up to the county? Davis,NTParkway, etc) are nice roads, as seem to the the majority fo the feeder roads and neighborhood streets.
- Access to major highways.
- Roads are in good condtion
- Roads are in decent condition
- Some bike routes. The future prospect of the two train stations.
- Roads are in good repair

## 3. What are your main transportation concerns or barriers you see toward mobility in North Richland Hills?

- Multiple projects overlapping that are limiting mobility currently
- Congestion, unfinished sidewalks, lack of bike lanes, dark walking paths.
- Pedestrian connectivity, synchronized signalization
- Bus service connecting to the train would be good.
- Lack of enforcement of current ordinances, crosswalks aren't pedestrian friendly because they all involve dealing with left turn arrow traffic, a local bus system is needed teens should be able to get themselves to the library.
- Not enough safe routes for bicycles and pedestrians. Speeders through the neighborhood with new connecting streets and think we have highways, not enough crossing signals, or inoperable.
- Improvements to 183 were grossly inadequate and did not solve the problem of this key artery.  Without public transportation, non-drivers are at a huge disadvantage.  Area could use a regional circulator bus system to mall, train station, major shopping, key intersection points.
- Some older street widths are locked in, due to development. Delayed improvements, while temporary cause traffic backups.
- Rush hour congestion
- need for more public transportation
- More and more redlights going up which really slows down traffic especially trying to get to highways. Need round abouts or other methods to keep traffic moving.
- Not enough sidewalks. Everything is primarily geared for car access.
- Traffic light timing is not related to traffic patterns at all. It seems completely chaotic and unrelated to the number of cars travelling in certain directions at certain times.
- Better public transportation
- No tollway exit at rufe snow. Inaccessibility of iron horse exit
- The highway intersection of 820 and 183 is awful. That is only getting worse by the day and is a constant headache at all times day and night.
- Main streets that are in need of replacement. Need to improve streets in a more timely manner. Seems every street in the city is under construction.
- There are not many sidewalks in my area or around 26, so I'm wearing riding my bike for transportation.
- A tendency to lean on traffic lights at intersections that don't necessarilly need it, there are better/more creative ways to control traffic on smaller roads.
- Congestion due to growth and the need for road construction to accommodate traffic
- Lack of sidewalks in residential areas, speeding traffic in locations without sidewalks, not bike or walking friendly.
- Lack of public transportation
- None at this time. However, if commuter traffic increases with new rail transportation, I see the possibility of high levels of congestion.
- I'd like to see Hightower cut through the large hill on Davis Blvd. It opens up a needed avenue to the west side of NRH. My parents and grandparents live that direction.
- No busses
- Why have construction on every main road in north Richland Hills all at the same time? The new turning area from Davis onto Main Street is an accident waiting to happen. The lane isn't long enough for cars turning so they stick out or slam on brakes infeont of the left lane on Davis. The rufe snow construction is absolutely terrible. Driving on the new concrete is bumpy.

Should definitely not have taken this long for such poor quality.

- Public transportation is lacking. Continued construction and poorly engineered signaling programs makes simple travels challenging
- Loop 820. I would like to see the promised 3rd free lane built to help eliminate the bottle necks that STILL exist!
- No public bus system & Ability of present streets to handle traffic of future developments
- Loss of shoulders on major arterials has eliminated biking as an option. Only hardcore bikers dare to travel on them. Medians are needed on all major roadway intersections for safe crossings.
- I'd love to see additional trails for biking/walking.
- I do not have anything. I believe the City has done a good job. (Rufe Snow project has been very challenging. My opinion is the contractor could have been held more accountable.)
- Would love to see buses available
- Please remove the ugly and obstructed bushes/trees on the NRH2O side of Parker at HWY 26. These make is difficult to see oncoming traffic when turning left onto HWY 26 from the HomeTown area. Also, please remove all Red Light Cameras, if that hasn't already been done.
- Stoplights need to be coordinated..no reason to have to stop at every light
- Congestion at major intersections
- No one in the city seems to know how to sync red lights. Need medians on Rufe Snow Drive. Road projects take too long to complete.
- potholes, excessive wait times at certain stoplights, construction not well planned at certain intersections
- Population growth and having the infrastructure to keep up
- Lack of complete, coherent sidewalks
- There are not enough sidewalks in the neighborhoods. Too many people are walking on the street. NRH is not a pedestrian friendly city.
- There needs to be more/better sidewalks throughout the city.
- Traffic on Blvd 26 has increased significantly in the area of 26/820 making it difficult to get onto Blvd 26.
- traffic lights are not linked
- Construction takes too long D
- Although North Richland Hills does have several good major roads, work needs to begin on more now to keep up with the population explosion.
- Major streets are always under construction
- Construction
- Current traffic congestion from construction; future traffic congestion from commercial developments
- I don't like seeing a lot of public transportation, unfortunately it brings higher crime rates
- No real concerns, within NRH. The regional highway network is the main problem.
- The total lack of mass transit (with the possible exception of the TRE and the airport train) is maddening. If you can get to the station, you can go to Fort Worth or Arlington (sort of), Irving or Dallas. Toll roads are disgrace citizens are being doubled billed due to failure in planning and leadership.
- Congestion-- there are a ton of people cutting through town now that cause a lot of congestion. When the train stations open up I'm concerned the street capacity won't be able to handle the added influx of traffic.
- Access to public transportation like a train
- increase of traffic, particularly close to I820
- Unsafe trail crossings on Rufe Snow and other crossings

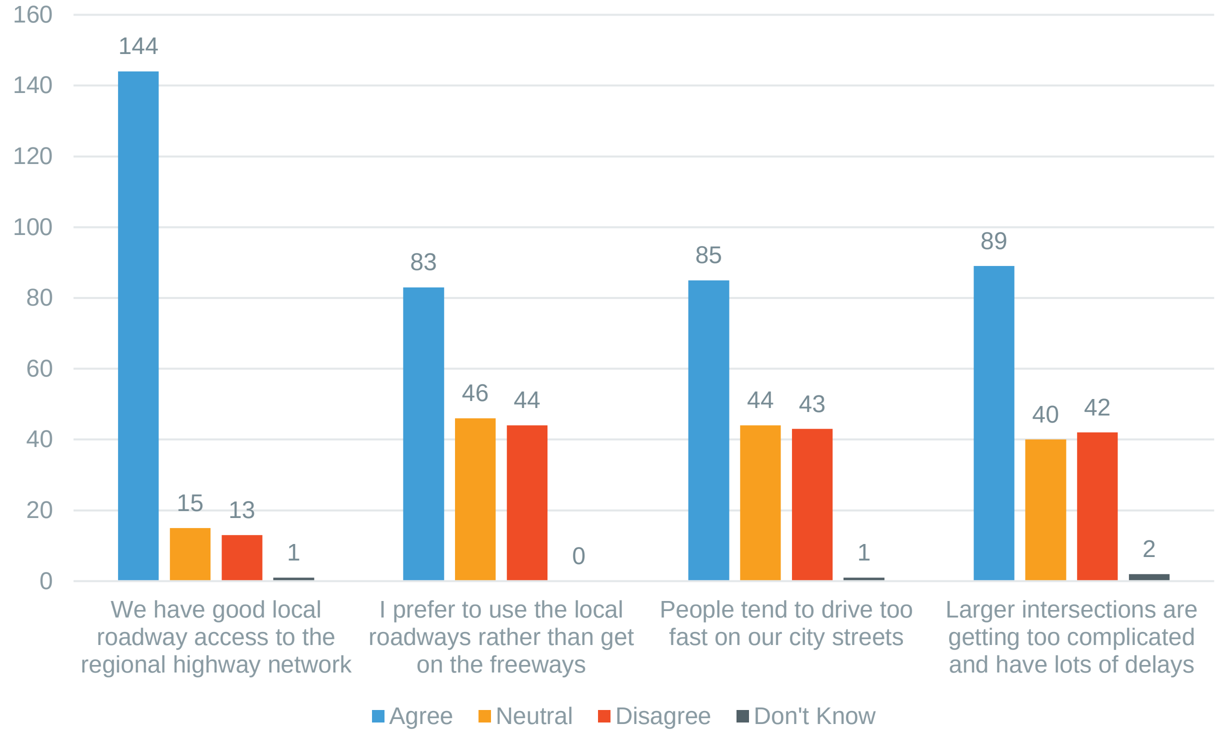
- Several roads need serious work. Glenview and Onyx South by Fossil Creek have patches so poorly applied they could destroy a tire or a rim..
- The timing of the lights on Davis
- The major roads are overcrowded, roads need improving.  We need mass transit through the DFW are including Denton.
- too many people
- none
- continued Road improvements in the Growing parts of the city
- I'm concerned about the horns I'm hearing behind my home all day every day now from the train testing...hoping that will not be permanent because it will affect my property value.
- Congestion at 820 and 183 junction westbound.
- Most  neighborhood roads are in such poor condition and desperately in need of repaving. Some that come to mind. Champman Drive. Hightower Road, smithfeild, any city surface street that has been neglected for too long. It really is embarrassing how bad some of our streets are.
- Getting the road repairs completed and better patrol for speeding.
- Lack of public transportation for all
- Poor road construction planning, lack of sidewalks, minimal safe bicycle access
- none
- mass transportation as population increases
- Too much congestion and traffic. Too many construction projects at one time in the same area. Smithfield/Chapman/Davis/Rufe Snow is irritating and backed up due to traffic and construction. I can't even get out of my neighborhood without construction backup. It's surrounded me .
- Construction seems to take longer than it should.
- Not enough public transportation
- stop lights are not in sync
- No bus service
- Red light cameras, excessive traffic, traffic signals, especially those at the intersection of Davis/Grapevine Hwy/Bedford Euless Rd, as well as the signals at the intersections of Bedford Euless Rd/Hwy 820, Rufe Snow & Hwy 820 traffic signals that aren't synced to allow better traffic flow
- Little or no public transportation in the city limits
- too many streets torn up at one time!
- So many major roads are under construction and have been for a long time. I'm always taking back roads and neighborhood streets to get places.
- Quality of roads is very poor. The roads causing a surge in auto maintenance with tierods, tires, suspention and alighnment repair.
- I wish some T-intersections had a free lane to pass even on red. Ex: Smithfield at Chapman, Chapman at Holliday
- Cars parked in the street on major thoroughfares.
- Constant construction, too many lights
- Road conditions especially residential, Syncing of traffic lights, too many major roads under construction at once
- None
- Roads aren't equipped for the population.
- Nothing
- None. Let us take a bus to the mall instead of driving. Let's reduce our emissions.
- Is there any Senior transportation available here
- Last mile connections from train stations to local employment and retail centers
- no buses
- To much road construction, some roads in bad condition, to much construction traffic.

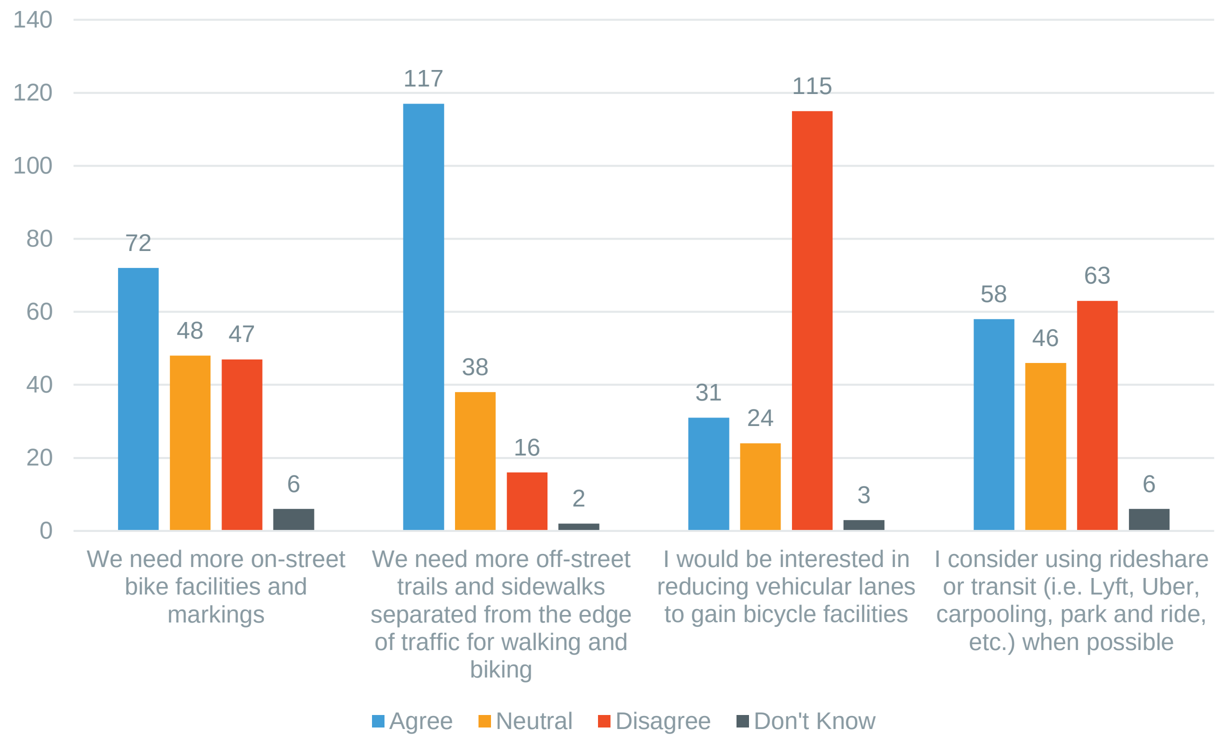
- Traffic upgrade projects mid-construction
- Rude Snow!
- Entry onto Davis Blvd. from Steeple Ridge is dangerous because there is no traffic light or other means of control.
- Lack of sidewalks and space for bicyclists
- A bus service would be nice down major roads that would take you to train terminals or shopping areas.
- No public transportation, Bicycle trails all end on public streets and streets are not marked for bicycles.
- Little availability for public transportation, especially for older residents.
- Rufe Snow project was/is a disaster. Projected finish 12/17???? City may have been over its head on this one. I think a full throated apology is appropriate.
- Minor arterials and neighborhood streets are being neglected and getting rough. Holes and cracks make cycling difficult and unsafe. The designated bike routes (and signage) are WAY out of date and need to be revised. Davis Blvd and Mid-Cities are not appropriate as designated bike routes, auto traffic is too heavy for safe cycling.
- The time it takes to finish current and future projects during times when budget could be increasing or decreasing.
- There is nothing but cars, and some bicycle trails. Along Davis just north of Main street there is no Safe way to reach our wonderful trails, in other words no bike lane nor sidewalk. PLEASE make the businesses put in a sidewalk to get from the neighborhoods south to the trails.
- Have never seen any city buses. Not sure if the city has any.
- Condition of streets.
- I see increasing traffic at all major intersections at rush hours and 820 has become a mess since the new construction was completed
- My only complaint would be there seems to be no flow-through with signal lights. Meaning, you can hit almost every light going from N. Tarrant to 183 on Precinct.
- Too much construction online thorough fairs and last too long. No bus line or mass transit. .
- Need public transportation. Buses.
- Bus System
- Local roadways becoming more congested even after expansions.
- More bike along major routes such as a side walk with ramps/ trail all along David Blvd up to North Tarrant and one crossing loop 820.
- Needs more train
- speed limits on some critical east/west streets (Bursey Rd as an example) are very slow (30mpr). Traffic lights are not timed to reflect smooth traffic flow: we have sat along Rufe Snow at red lights when NO VEH is crossing a side street on a green light. Seems like signals might be timed to just slow traffic down. Completion of Rufe Snow widening is taking forever!
- No public transportation to locations (for medical care and shopping) in NRH and other sites in NE Tarrant County
- Too many ongoing major road repair projects with no end in sight. Adversely affects residents and businesses.
- Complex toll road system.
- The lengthy highway construction jobs like rufe snow and mid cities and davis
- Massive increase in vehicles. Infrastructure is NOT keeping up, with resultant horrible traffic!!!
- No bus service
- Light at Davis and bridge is way too long. Construction at mid-cities and Davis has gone on way too long.
- School zones need to be marked up a little bit more. Got one by my house that really sneaks up on you, especially getting in there from the intersection.
- Increase in population with no relief for roadway congestion

- No public transportation
- Rufe Snow is a mess and it is ridiculous that construction has taken longer than a year and a half and still no end in sight. Temporary lane opens and closures are not well planned and the temp lanes are HORRIBLE.
- Convenience and times. Where does transportation offer area to go?
- Attention to improvement.
- Traffic and growth
- Lack of public transportation
- 1.The new toll road did nothing to ease traffic on 820 as promised. It is very disconcerting that we had put up with all that construction only to be left with the exact same number of (free) lanes and the same traffic jams unless you can afford to pay. 2.Intersection of Hwy 26/Bedford Euless/Davis,trying to get on west bound 820 anytime after 3pm. 3. Dangerous lights on the Iron Horse bridge. I know one was removed, But I don't understand the purpose of the light that you can't see until you are a few feet away. 4. Since I live in Meadowlakes.... The new Rufe Snow/ Meadow Lakes intersection is OK, but I would like the middle lane to add a left turn option. One left turn lane is not enough. The middle lane could be straight or turn.
- I wish we had more biking and walking trails on the South side of the City.
- Mis-timed intersection light sequences. Left turn lights remaining green when there is clearly no traffic utilizing the arrow. Same thing that a lft turn light will go through its sequence even if there was never a car in the left turn lane. The Rufe Snow debacle.
- The thru traffic to get to Keller/Southlake we really need a freeway (as much as I'd really hate it but it would really help traffic especially on Davis).
- Need better roads
- 820 at any time of day - but everybody knows that.
- constant construction; no mass transit at convenient times; lack of east-west corridor north of main st and south of starnes
- Rufe Snow Road Project. Chapman Road Access to Rufe Snow is restricted to 1 lane still.
- Lack of infrastructure. Impatience of citizens used to just jumping in their car and going. The HOT summers (who wants to wait outside for a train or bus when it's 105 degrees?)
- Congestion
- gettingvtoo old to drive
- Being able to maintain and issue good contracts to provide maintenance, enhance designs, routs, etc.
- Elevated population and resulting increase in traffic and grid lock. Once you are north of Mid Cities Blvd. there is not a good east - west corridor until you get to Southlake. The inability to get from one point to another due to traffic flow and the excessive number of traffic lights.
- Increase in traffic...with Babes Chicken opening soon at 820 and Rufe Snow, I foresee more congestion at that intersection
- Many streets need repaving and some traffic lights need retiming
- Increasing development where the streets do not support more traffic
- Congestion on Rufe Snow. NRHills needs another north/south corridor, possibly using Holiday Lane as its base for widening.
- It would be nice to have a bus system, I am epileptic and my Wife has to drive me everywhere. An actual Bus System would give me a lot more freedom.
- Over development of land bringing more congested road ways. And a ton of construction
- No bus service
- Increasing traffic due to population growth in N TX

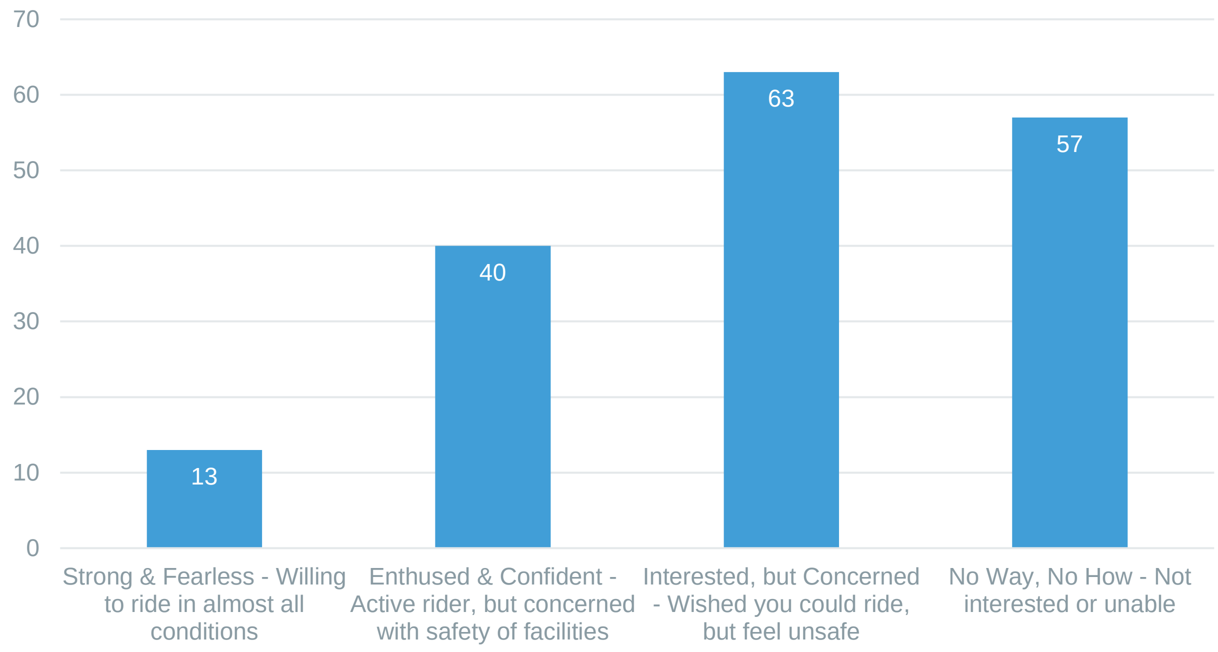
- I dont see any barriers at this time.
- Congestion as the city population grows. Construction narrowing down major road ways.
- Not enough ramps for sidewalks or sidewalks.
- No rail, no bus, no senior transport,lacking sidewalks
- Lack of public transportation
- The only North South bike route only goes to Grapevine. Nothing to Southlake or the to west. No bike routes connecting NRH to Fort Worth. Many schools don’t have safe routes for their students.
- Over population and the resulting increase in automotive traffic

## 4. How do you feel about your ability to get around the city?

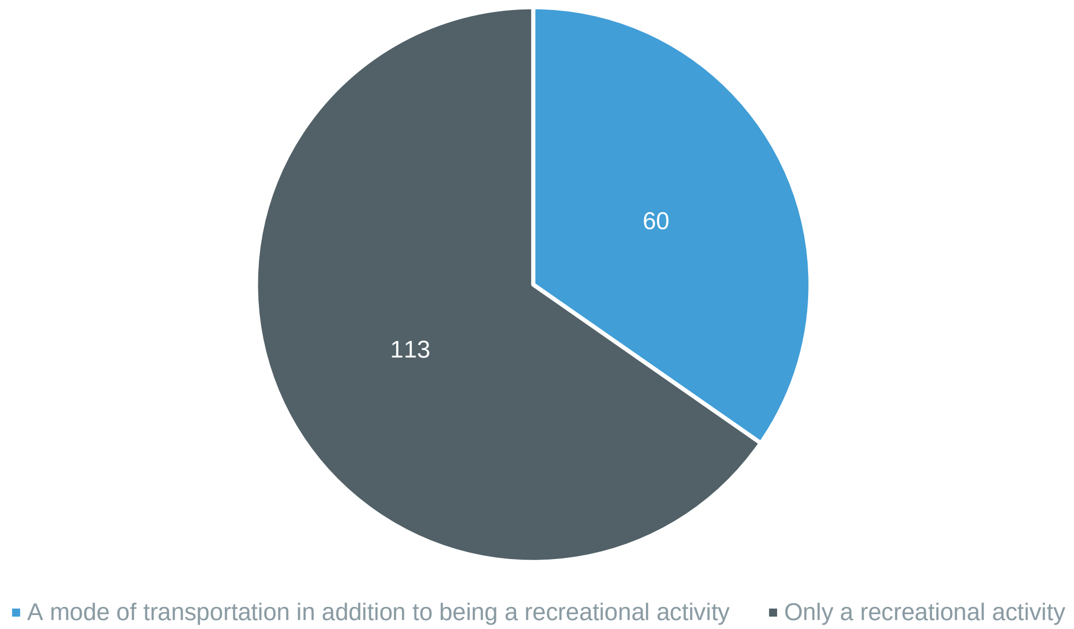


5. **Which phrase best describes your bicycling skill level?**




6. **Do you view bicycling as a mode of transportation (commuting, running errands, going to a restaurant, etc.) or only as a recreational activity?**



### 7. How would you like to see North Richland Hills invest in active transportation (walking, biking, etc.)?

- Bike lanes
- Creating safer facilities (lighting, 911 trail location signs, etc)
- Sidewalks along major roads such as Davis, Rufe Snow & Precinct Line
- More crosswalks at major intersections would be great. Midcuties and Davis are not bike or pedestrian friendly. More trees in the parkways around the city would make walking more bearable in summer.
- Better crosswalk design and some pedestrain bridges over some key roads- such as Davis,basically I want a 13 year old to be safe walking/biking to the library from any point in townh
- More crossing signals that work, increase number of off street trails connecting to adjacent cities/towns and other trails and evenly distributed, bridges and crossings to have wide sidewalk access on either side and ADA compliant. More ADA ramps at intersections.
- Circulator bus as referenced above. Walking trails are great, and we use them. Bike trails are nice too for those who ride.
- Walking and biking trails for recreation are fine and could be expanded. No bike trails should be added to city streets. All they do is impede traffic and anger people..
- I would like to see increased regional bike connections
- More bike lanes on busy streets and more signs to remind drivers to share the road. Also join other cities to teach correct bike laws on sidewalks and streets.
- Pursue grants, additional funding without taxes
- We need more off-street trails and sidewalks separated from the edge of traffic for walking and biking. Mixing bicycles and cars is not a good option.
- More trials and parks
- Please do not cut off vehicle lanes for bike paths. It slows traffic for everyone. If you must add bike paths, make them away from the roadway and cross a minimal number of major intersections.
- I wouldn't. Why spend money on something people aren't going to use. I don't want NRH to become other cities. Look to the city of Keller for ideas. People use their parks and trails daily. People rarely use the Electric trails in NRH.
- I would like to see more sidewalks, especially along 26, to encourage active transportation.
- Bike lanes are a great way to separate bike and car traffic. Increases safety for bicyclists and reduces stress/frustration for drivers.
- I am fan but would not want such efforts to impede vehicular traffic
- Sidewalks and clearly marked and enforced bike lanes. My son was not able to walk to SMS because of the danger. I would definitely walk or bike to run short errands, but not in our current city situation.
- That would be great. It would motivate me and my family.
- I would like to see more designated areas for walking and biking, but not at the expense of motorized vehicular traffic ways.
- jogging/biking trails connected to commerce
- Add dedicated bike lanes to roadways. Do not take away from existing motor vehicle lanes.
- Ha! I think NRH should invest in getting their roads for cars fixed and safe before taking on another project.
- Add sidewalks to provide safe pedestrian transit in older neighborhoods.
- I don't bike or use the trails so I have no preference. I will say that for those who do

bike, it would be nice if they had more trails so they could stay off the roads. Would be safer for them.

- walk & bike trails
- Starnes road is a good example where the shoulder could be turned into a dedicated bike lane. There must be some low profile physical barrier before bikers will feel safe.
- More bike trails, extending the trails to shopping, dining and gyms. For example; extending the current John Barfield Trail north to LA Fitness/Kroger would be awesome.
- Safe paths outside of traffic lanes
- Wider sidewalks when possible and also designated bike lanes would be good, especially around HomeTown where retail is actually close enough to bike to. Obviously this area is going to become more congested as development continues, so maybe an additional way into or out of the Hometown area would be helpful too.
- More paths and sidewalks
- Public trasnfportation
- Have lighted pathways in appropriate areas. Need a park such as Capp Smith Park in Watauga for walkers and cyclists.
- walking & biking
- Additional walking trails
- Complete sidewalks. Eliminate need to cross street to continue on sidewalk (eg, one block sidewalk is on north side, next block sidewalk in on south side).
- Create a trail that links both side of 183 where bicyclists and pedestrians can safely cross the expressway and explore all of NRH.
- Shuttle Bus to transportation hubs.
- Sidewalks for walking and biking. However, It is too hot in Texas to walk/ride bikes all the time. It would be more seasonal.
- make trails to fun areas avaliable
- ?
- Get rid of it. We need all the room we can get for cars
- Creating biking lanes and continuing to expand current hike and bike trails
- Sidewalks in neighborhoods, especially the older ones. Bike lanes where appropriate but not at the expense of traffic lanes (it's getting tough enough!)
- yes
- buses to get to the walking, biking facilities.
- NRH will never be a bike commuting town. It's too hot and too spread out to be realistic for the majority of people. With that said however, I would like to see safe access for hikers and bikers to entertainment and shopping areas. Currently the bike paths don't go anywhere in particular, so it'd be nice if we could ride up to do some shopping or see a movie (when the Alamo opens up). Instead, if we bike to a destination we usually ride up to Grapevine or we load up the bikes and ride around Ft. Worth. One other important comment—it's terrible unsafe to cross major streets at the bike and walking trail crossings. The worst I've seen is crossing Mid-Cities going south into hometown. There is no stoplight or warning at the crosswalk and no one stops. Same is true at Rumfield, but the speeds are much slower there. I'd like to see crosswalk signals like they have in other towns up the Cotton Belt trail.
- I think more bike paths would be good for the city
- I'd like to see a few cross fit style stations, such as pull up bars and reverse pushup bars, along the cotton belt trail.
- Biking  Continue the cotton belt trail to ft worth
- Davis Blvd, Rufe Snow, Mid Cities, Hwy 26, and Precinct Line Rd are all used as work around streets for people avoiding the freeways. Traffic is very heavy, especially during school start and end times. We have asked for a traffic light on Davis and Northeast Pkwy or Davis and Odell for years. There are frequent car accidents

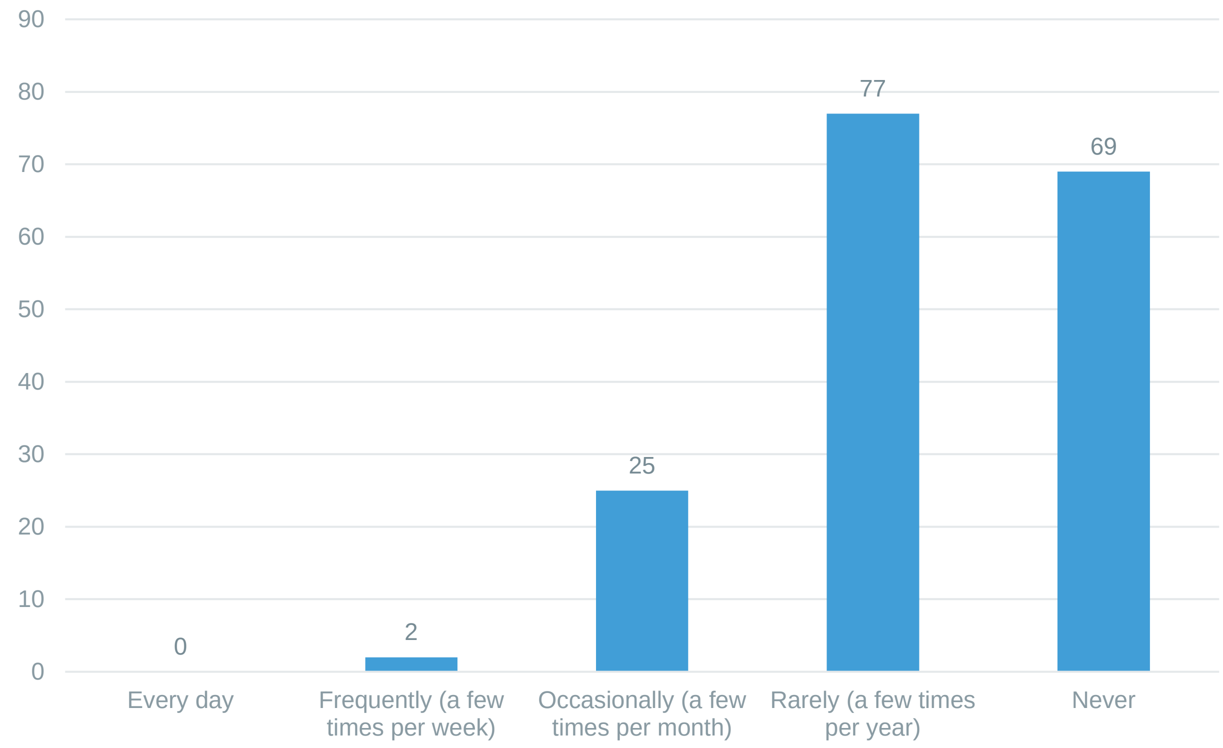
and money would be well spent to put up traffic lights. If there could be a shared cost, we would like to know the price and we will raise money.

- Don't know
- More bike and walking paths that are lighted. I will not walk the bike paths after dark due to feeling unsafe.
- Better trail system for walkers and horses and more bike lanes everywhere
- more the better
- Think is should be looked at for families and folks who want to use it.
- sidewalks along Davis and Precinct
- no
- We need sidewalks. The majority of our streets do not have a sidewalk.
- Invest in trails and keep bikes off the main streets.
- More sidewalks for walking.
- We need sidewalks in many of our neighborhoods to facilitate walking. Bicycle lanes are focused on recreational use and cross busy streets uncontrolled.
- no opinion
- Creating safe bike and walking trails...well lit..
- More sidewalks on Chapman Dr, Smithfield Rd, and surrounding neighborhood. I like to walk my baby in the stroller, but I'm limited to the area because of lack of sidewalks. I feel unsafe walking the baby in the street.
- Signs pointing to trail heads. They are hard to find.
- More public transportation
- put the money towards vehicle traffic and not spend on biking
- Walking or good bus service
- I have fibromyalgia & am unable to ride bikes or walk very much. I'd love to have you add buses & other transport that connect with other nearby cities, such as FTW.
- I would like to see walking/jogging/biking trails with over/under ways at busy highway junctions
- see above
- As recreational sport, yes. As transportation to work, etc, not sure. Most residents don't work close. I'm excited about the train station connecting NRH to the airport. It will be used!
- walking, biking,trails
- More walking trails. More sidewalks.
- Okay as long as it doesn't reduce lanes and increase car traffic.
- Better pedestrian controls at the intersections.
- I think we have a lot of options now.
- Great use of trails. In future when under construction please provide a temporary way to use trails.
- A bus system. Greatly reduce auto emission by students bussing to school and work. I would never get in a car with someone I don't know, like Left.
- Don't know. Haven't considered it. It appears quite unsafe cars do not respect bicycles
- more available sidewalks
- Fix sidewalks especially in older neighborhoods. A lot are in rough shape. And dangerous especially for older folks to walk on.
- Not a concern of mine
- Running, biking, walking
- More walking/bycicle lanes would enhance the appeal and safety of residents of NRH.
- Would very much like to see it.
- Safe crossings for walking are non-existant in most places. Yes, I would like to see safer walk and bike paths for those who are able to use them.
- Biking trails and traffic lanes.

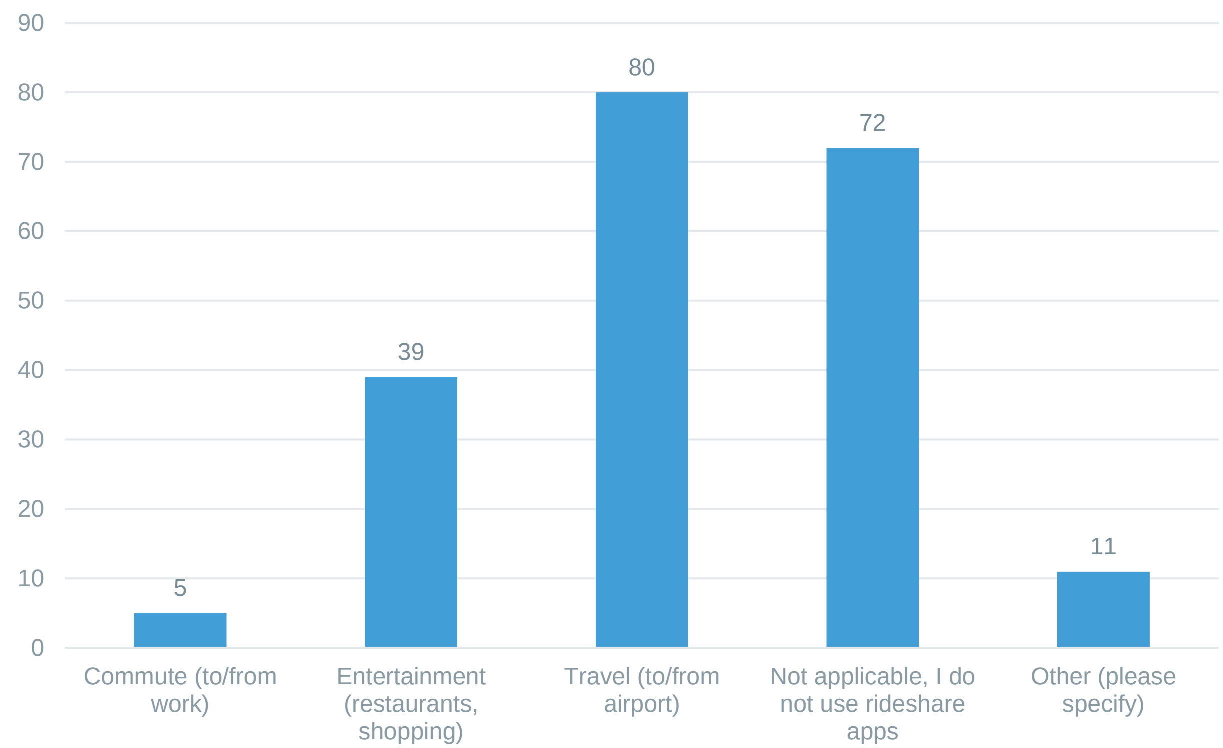
- Would a small bus service be feasible? 12 person vans maybe?
- Good trail system, look for opportunities to expand it.
- Build more dedicated trails to get around the city to popular destinations. Add dedicated bike lanes and safe bike corridors to move around the city. Revise the current bike routes and add better signage. Add "share the road" signage throughout the city. Create a safe connection into Richland Hills and Fort Worth.
- Access to riding lanes is good, but I know what I don't want, those shared bike companies are not good for the city, people just leave their bikes all over the city.
- Increase the ability to reach from inner neighborhoods, such as the Villas at Smithfield, to the walking and biking trails on Amundson. Currently there is no safe way to do so.
- I think people would to see a split trail system between bikers and walkers, while bikers complain about cars the bikers can become a hazard for walkers
- This is Texas. Things are far away. I applaud those who ride but they should be separate from traffic and largely second fiddle at best to vehicular travelers. Riding a bike is great, but would be absurd to build into the infrastructure as an alternative to driving. This ain't Portland, OR.
- less car traffic and use of other odes of transportation
- We need BUSES!!
- Better sidewalk and bike system
- Expand off road biking trails
- More sidewalks/ trails connecting area businesses such as one crossing Loop 820 and one all along Davis up to North Tarrant
- More bike trails and train stops
- Seems like plenty of trails exist to accommodate walking & biking
- I woulld not like to see car lanes taken for bicyles at this time. I have seen bike lanes used extensively in NYC and Europe BUT not in FW. Over a year ago, car lanes were taken to make bike lanes on W Rosedale in FW. I travel there several times each month and I have never seen a bicycle. Good intensions, but poor results for the money that was spent.
- A small to moderate investment over time. Allow people to adjust, otherwise it will never attained desired acceptance or usage.
- No ideas or input.
- A waist of money there are biking trails already we need to get our road construction done
- NRH has plenty of quality biking/walking trails and I don't feel taxpayer dollars should be wasted on additional trails. I am especially disappointed in the new light rail system! This will only import additional crime to NRH!
- I think the City effort should be directed toward more mobility challenged/handicapped access!
- Unsure
- Would be good to continue what has been started. We have some great trail systems, but need small bridges over the sections of the trail that cross the busy streets.
- More off the street trails.
- Not.
- I'd like to see increased sidewalk size on main streets.
- What little I know, it seems we are good in areas to bike without getting on streets. So I think NRH is okay. Keep up what we have now.
- Secured lanes
- yes
- NRH is too spread out and too hot to even think about trying to incorporate bike lanes. I think it would be a waste of money.

- It would be great if the trails in Fossil Creek park could be asphalted and an actual bridge put in place. Right now there is a door being used as a bridge to go over a small culvert. This doesn't seem safe and it is ugly.
- First (in my opinion) is that we need to have actual sidewalks on ALL city streets. Bike lanes are fine for teens / adults, but little ones need the safety of sidewalks as they are honing their skills.
- more walking / bike trails
- Not a concern of mine
- sidewalks - especially on streets like holiday south of 820 where kids are walking to all 3 nearby schools. also love the walking trail in my area - but there are no sidewalks to get there, so it is difficult to get my grandkids on their bikes and scooters to the trail safely.
- provide bike lanes on major streets
- I think the walking and bike paths are great. I am still active in riding but take bike to Legacy Park Trails. Local trails with not many trees to block sun in hot weather. Also road crossings are dangerous in many locations in town.
- It is SO hard to be active in Texas for 5 or 6 months out of the year. Being outside is usually miserable from mid May to mid October. That being said, I just don't see biking taking off in a major way. HOWEVER, if the infrastructure were in place some are definitely going to take advantage of it.
- -bus service for seniors
- Need additional information on this subject. I can see future problems with the combined traffic being too congested.
- Active transportation is more than adequate.
- More sidewalks
- NRH has miles of bike trails. Mixing automobiles and bikes on public roads is dangerous especially on state highways.
- I would love for NRH to make available safe, easy walking & biking trails to and from major locations like the Rec Centre, Library, City Hall, train stations, major shopping/eating areas, etc.
- Development of trail system
- Improve Valley Drive for walking. It's part of the walking trail system but Valley Drive has no lighting/sidewalk on the street. People walk in the middle of the street at night. Someone is going to get hit by an oncoming car.
- I wouldn't be interested in that at all. I would like a Bus System, that would be FANTASTIC but tearing up our roads that are lacking in enough lanes to support the current traffic to make HIKING or BICYCLE lanes, there are not enough Policing of the maniacal drivers on the road, the destruction/construction alone would place hikers and bicyclists in grave and mortal danger. Not to mention the COST of such a wasteful idea. No, no no and no.
- Bike lanes on major streets, lighted pathways, water fountains along the trails.
- Need sidewalks and benches for seniors
- Much of the year it is simply too hot to take advantage of the trails system
- For me, I like waking. I like the trails, but honestly we have typically driven to walk the Cotton Belt from LD Lockett park when we lived in Ember Oaks as renters. Now we hope to use the trials near Forest Glenn West as we recently made a purchase there.
- While I do not cycle, i would use trolleys/buses or shared forms of public transportation
- Fix sidewalks, put more sidewalks in and put ramps on all sidewalks.
- More trails, easier access accross busy streets. Maybe pedestrian bridges....
- Leading the way. More bike infrastructure. More options than just some MUP trails on park lands. Safe routes to schools.
- We have enough don't waste our taxes on more

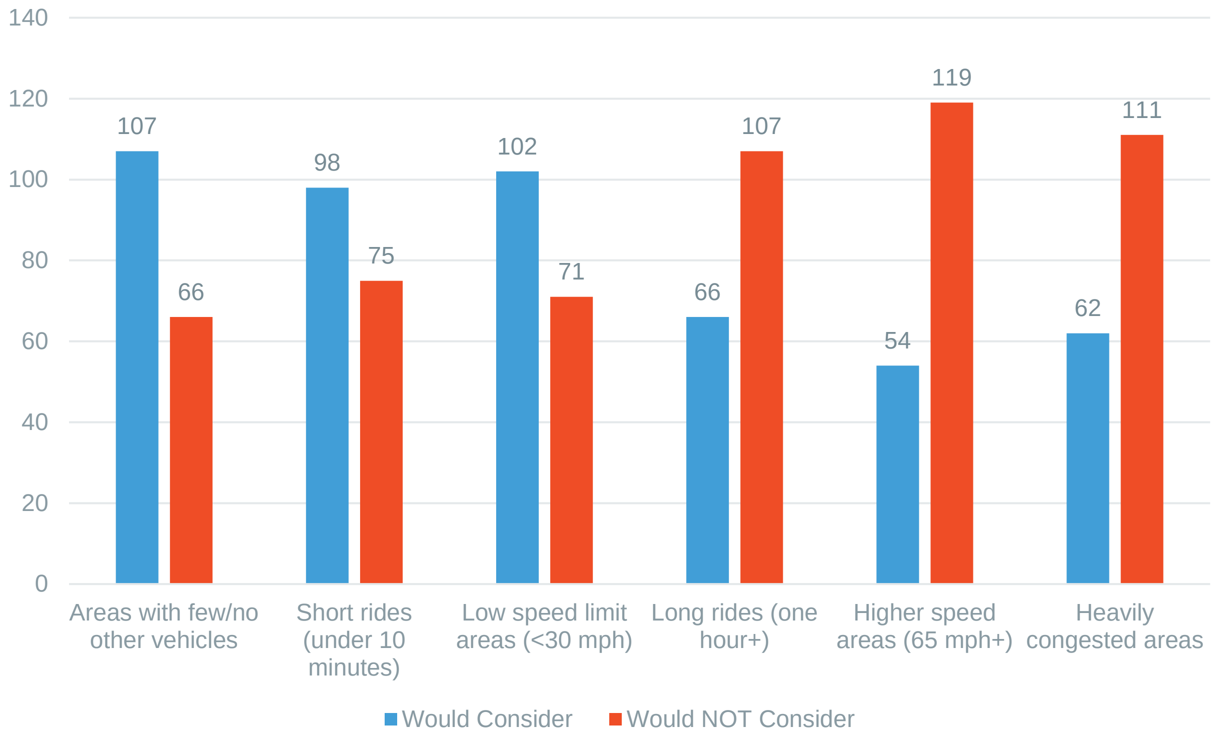
### 8. How often do you use rideshare apps (i.e. Lyft, Uber)?




### 9. With what type of trip(s) do you utilize rideshare? (check all that apply)



## 10. Under what conditions would you consider riding in an autonomous/self-driving vehicle?




## 11. Any additional thoughts you want to share to help inform the NRH Transportation Plan?

- I'm so excited about the train!!!!
- Something as simple as a two bus loops- one up 26 from city hall across mid-cities and then down Rufe Snow to Glendale and then back to city hall, and one going up and down Davis would decrease congestion and allow access to all city services
- Utilize traffic calming more, increase number of landscaped medians and setbacks, add more rest stop type facilities - trash cans, benches, water fountains with pet stations on existing and new trails.
- Have an older daughter who does not drive (choice) and has to walk or be driven everywhere. She is used to living in an area with well-developed public transportation. This is why I have referred to a circulator bus route to key points. Not a huge need, but would be a great enhancement.
- Reducing vehicular lanes to gain bicycle facilities is a bad idea. We need more off-street trails and sidewalks separated from the edge of traffic for walking and biking.
- Please do not take away lanes of traffic for bicycles. We are a growing community and will need every lane we can get. I don't know if you have the authority or if it is TXDOT but, that highway intersection at 820 and 183 heading towards Holiday Ln. is awful. Please find a way to at least add a lane to Rufe Snow just to alleviate the

immediate merging of 6 lanes down to 2 lanes within 1 mile..

- We need more mass public transit. I'd like to see the communities in NE Tarrant County get together and have a bus system that had pickup and drop offs next to hot spots within the cities that participated. Hot spots could include NE Mall, Grapevine Mills, Main Street Grapevine, Southlake Town Square, Roanoke Restaurant Row (technically Denton County), stops along Rufe Snow, Birdville FAAC for game day shuttles, etc.
- NRH should partner with other cities so improvements are not just limited to city limits.
- Continue to encourage most traffic onto larger roads, keeping smaller roads free of heavy traffic. This is one of the best aspects of this city.
- In the area that we live (vintage neighborhood), I would love to see it evolve into an urban village that is safe for walking/bicycling for the purpose of errands and recreation.
- I have lived in the Seattle area and in San Diego and I really miss biking and walking to get places.
- You guys are doing a good job. Very satisfied with current state. Always eager to see the latest and greatest developments.
- Make these roads safe again. Most of the road projects that have been done have made things worse.
- Buses, improving signal programming, force contractors to a firm deadline on construction.
- Yes. I know it's not NRH but could you encourage Watauga to consider finally widening Watauga Rd so that everyone can continue on Mid-cities to Western Center.
- NRH has done a far better job than most Texas communities. We are a leader.
- I do not have any other points or suggestions.
- No
- Bus transportation is very bad in my neighborhood. Would like to see more, so that people can get to shopping centers freely and be less reliable on cars.
- Keep on top of stop light synchronization!
- The existing trails are a great city feature. We just need to expand to connect all areas and make them a useful part of our day.
- no
- Police present during rush hour at the off ramp on 183 at Blvd 26 across from the Chevrolet dealer. Every day drivers get in the left turn only lane then Go straight instead of turning because the lane to go straight is backed up and it is along wait. Very dangerous situation.
- I would love train access to downtown fort worth and dallas
- More rail options
- Please finish the construction as soon as possible on Rufe Snow and Davis
- Make easy access to the TexRail stations a priority! The easier it is to get in/out of them, the more people will use them.
- I do not believe in the "ride share" cons. There are no standards for the drivers or the vehicles. Also, your fare can change as you are being driven. You can get a taxi out here, but it's hell on the pocketbook. What facilities are there for people who can't drive, walk or ride a bike?
- NRH is great. With all the growth of the past few decades I feel the city has kept up with growth very well. Still work to be done for sure, but doing well overall.
- cut out ambiguous driving conditions, i.e. two lanes merge into one before enter another roadway (e.g. Grapvine Hwy north bound entry to north bound Davis)
- Just need safer road crossings.
- Money on traffic lights for citizen safety would be more beneficial.

- Driving down davis is a nightmare with how poorly the lights are timed
- We need more mass transit, ie subways, trains, ect
- Please use resources wisely. The new train is nice but I don't thing you have fully impacted the traffic it will cause. Lastly please replace the streets. They are in terrible condition.
- Public transit invites criminal elements into areas they could not easily access before - been there and seen it. We already have a crime problem I hope this "plan" is taking your existing tax base into consideration.
- We do need some mode of public transportation that is just not senior or handicap specific. Would be nice if it would connect to the larger Fort Worth system.
- I am really disappointed with the poor planning for road construction this summer. I tried to vote against incumbents in the recent election, but there was only one non-incumbent running. There is no accountability for these problems.
- FINISH DAVIS AND MID CITIES INTERSECTION
- No horn zone when the new Texrail passes over Smithfield
- Better quality road maintenance. I noticed that the bad roads are bad (Davis)
- Need to spend money in our neighborhood to fix curbs and bumpy roads not for bike lanes. Spent too much money on our homes to have busted/cracked curbs in front of our houses.
- Bus service
- everything noted in survey
- No
- Repave Starnes from Davis to Smithfield to prevent so many near misses from cars swerving to avoid holes and drop offs.
- Stop the constant dang construction!!!!
- I want our city to be inviting and cater to the residents, but I do not want to see a large influx of visitors. It is a reason we chose NRH to begin with - the mix seems good.
- Everything is good!
- The traffic light at Holiday and 820 needs to be reactive to vehicles not on a permanent timer
- Mini-buses seem appropriate for our community.
- We need on ramp to 820W from Iron Horse Blvd completed.
- None.
- I get very concerned for the bicyclists I currently see on city streets. Especially Precinct Line and Boulevard 26.
- I do not tlike the quiet zone areas for the trains. I want to hear train horns and think quiet zones are unsafe. Perhaps once a few people are injured or killed, they will do away with quiet zones.
- Bicycles in towns are going to be more important in the future.
- Fix the Rufe Snow embarrassment, access why project failed and put plans in place to not repeat this type of miss step.
- I commute and run short errands by bicycle as much as possible. We need to revise the designated bike routes, add more bike lanes and bike paths, better trail connections and "share the road" signage. We also need a safe bike connection into Fort Worth.
- Take best practices from other cities.
- I live in North Richland Hills because it is a good place to live. I work in Richardson. I can't wait to potentially ride the train to work. But we need more safe ways to get from Northern Davis neighborhoods to the future train station. THANKS for asking!
- Looking forward to having the new train to DFW airport near our home!!
- North Richland Hills roads are arteries that feed other cities more than just NRH. The flow of traffic has increased because the

highways 820/183/121 have become a mess at most times of the day forcing people off of them to find more reasonable driving conditions.

- Thanks for putting the work in and asking your residents. Let's not live with a bunch of orange barrels and cones though.
- roads like Rufe Snow and now Davis Blvd. are too congested. Construction is taking too long and is dangerous.
- We need public transportation.
- Lower speed limits on roadways, i.e. Davis Blvd.
- Please install crossing lights where the bike trail crosses Kirk just north of Rumsfield. It's a very dangerous crossing.
- the ONLY self-driving veh I would consider is a commuter train on a track.
- More traffic enforcement for Davis Blvd (between Midcities & North Tarrant)), especially on Friday & Saturday nights. Numerous motorcycle racers (high speed) endangering residents attempting to access Davis.
- Eliminate toll roads.
- Get the road construction done.
- Again the worst thing to happen to NRH is the addition of the light rail between Downtown Cowtown and DFW international! I'm sure the city loves it for the federal revenue stream it will generate however it will do nothing more than import additional crime to the city.
- Traffic flow and handicap access are civic duties. Forget autonomous vehicles!!! Fix Rufe Snow Drive!!! Fix the congestion on Denton Highway, particularly at North Tarrant and Kroger Drive. We have unrestricted population increases and infrastructure is not keeping up. Look at slowing the building and population influx.
- Such a great city with great leadership. Very proud and happy to live in NRH. I like the idea of this survey.
- Fix Davis, Bedford road, hwy 26 intersection.
- Difficult to navigate roadway Construction. Thanks to public safety officer for continuing updates
- I appreciate the efforts to try to construct additional functionality on Davis/Rufe Snow/ Mid-Cities Blvd, but all of the construction should have been planned out better. Especially Rufe Snow...that is a horrible example of now to NOT choose a vendor.
- I would like to know more about transportation available in NRH.
- Sorry for being a wet blanket on promotion of the "autonomous/self-driving vehicle", but currently I love driving.
- Thanks for the opportunity
- The main issue is the lack of public transportation, train, busses, etc
- Sitting at traffic lights wastes time, gas, money and contributes to bad air quality. It is very frustrating to sit at a light for 3-4 minutes when yours is the only car. I would like to see low traffic intersections use sensors to detect the situation and flashing lights most of the time to improve wait times. Also, more traffic circles instead of 4 way stop signs.
- Fix Rufe Snow
- My apologies if this is in the wrong survey...But I believe we did our community a great disservice by not looking at the widening of Rufe Snow as an opportunity to create a really nice thoroughfare in our city. The fact that we did not get rid of the overhead power lines, incude green areas next to the street(s), get rid of intrusive signage, etc., seems to be a missed opportunity for us. Rufe Snow (when completed one of these decades) will just look like a wider concrete mixbag of trashy and uninviting storefronts. Again, in my judgment, a missed opportunity.
- excited about the train stops. already planning to use them. currently use Hadly Ederville

- I rated transportation fair primarily due to Rufe Snow Road and continued growth in area. Also some neighborhood roads, sidewalks, and curbs need more attention.
- I would love to see the area near Main Street (Back Forty BBQ) developed into a cute, walkable, bike able shopping and eating area similar to Grapevine Main Street (a smaller version perhaps). We live close to that area and my family and I would definitely bike to dinner or to a Saturday Farmers Market there. That would be a dream!
- no
- The City Planning Department should continue to study the forecasted future transportation needs and growth projections.
- Please address traffic noise which is too great. Additionally, there are too many vehicles with excessively loud exhausts; what is NRH and the Police doing to control traffic noise levels? Control the excessive number of e-commerce deliveries overrunning residential areas. Promote the use of smaller, more economic vehicles; the use of large SUV's and pickup trucks for one person to commute to work is questionable. What is it costing NRH residents for each rider on TEXRail; this expense needs to be reevaluated and why were we not given the opportunity to vote on this? Give police adequate resources to monitor and control traffic violations.
- If we made better/easier access to west bound 820 from multiple points on Davis Blvd, people wouldn’t drive all the way south on Davis to 26, only to turn right on 26 & turn right again onto 820 access road. This unnecessarily adds to the mess at that intersection.
- Consider traffic circles at some intersections. Other cities are using them and it seems to keep traffic flowing better than stop lights.
- If your "transportation plan" involves robot cars and ripping up overly crowded roads to make space for bicycles, I am against this with whole heart. It's wasteful and just MAD, completely insane. Who THOUGHT of this? No. Don't do this. BEGGING YOU. NO.
- Overall doing a nice job. I do avoid the double light at Lola/Davis and Harwood/Davis because traffic gets backed up. Just feel like it is a dangerous intersection. I have also been it by a car on my bike at Lola/Davis.
- After living here for over 40 years, we may have to relocate to an are with senior friendly transportation.
- I look forward to having a train stop in NRH. More media coverage/info. about the progress would be nice.
- I am looking forward to the train starting. We will defintly use the train to travel for recreation spots in Dallas, etc.
- Return the city buses.
- Would like to see ride share iniatives with larger area employees. Will there be long term parking at Smithfield station when it connects with dfw airport
- Please do something about all the delivery vans and box trucks that are overrunning neighborhoods delivering e-commerce. Fedex and UPS are making countless runs through the neighborhood in their noisy, rattling trucks and then there are the endless unmarked, white vans delivering internet orders. The drivers speed and fail to follow traffic signs and laws. Have you considered traffic noise reduction and noise pollution; the noise from traffic and especially motorcycles and vehicles with improperly functioning or modified exhausts needs to be controlled. We need more traffic policing; driving on Precinct Line, Davis, Rufe Snow, etc., with speeding, reckless and rude drivers is like a NASCAR race and just as dangerous.

# NRH 2017 Resident Satisfaction Survey

### 1. [Q7] How would you rate the QUALITY of these North Richland Hills city services?

**Maintenance of residential streets in your neighborhood**

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 979 | 90 | 48 | 69 | 29 | 170 | 279 | 200 | 71 | 20 | 351 | 610 |
| Excellent | 180 | 11 | 6 | 11 | 6 | 21 | 67 | 47 | 7 | 4 | 75 | 99 |
| Good | 398 | 34 | 24 | 19 | 15 | 65 | 129 | 79 | 26 | 6 | 136 | 255 |
| Fair | 272 | 24 | 14 | 25 | 5 | 51 | 60 | 57 | 27 | 8 | 93 | 176 |
| Poor | 129 | 21 | 4 | 14 | 3 | 33 | 23 | 17 | 11 | 2 | 47 | 80 |

### 2. [Q7] How would you rate the QUALITY of these North Richland Hills city services?

**Maintenance of the City's major streets**

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 983 | 89 | 49 | 70 | 29 | 172 | 280 | 201 | 70 | 20 | 354 | 612 |
| Excellent | 204 | 12 | 9 | 13 | 7 | 26 | 73 | 47 | 13 | 4 | 77 | 121 |
| Good | 470 | 46 | 26 | 24 | 17 | 65 | 141 | 104 | 33 | 12 | 169 | 292 |
| Fair | 237 | 22 | 13 | 25 | 5 | 55 | 50 | 40 | 22 | 4 | 74 | 161 |
| Poor | 72 | 9 | 1 | 8 | 0 | 26 | 16 | 10 | 2 | 0 | 34 | 38 |

### 3. [Q7] How would you rate the QUALITY of these North Richland Hills city services?

**Traffic signal timing**

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 986 | 86 | 50 | 71 | 29 | 172 | 281 | 204 | 70 | 20 | 357 | 611 |
| Excellent | 110 | 7 | 8 | 7 | 8 | 11 | 30 | 26 | 11 | 2 | 43 | 66 |
| Good | 458 | 48 | 26 | 38 | 15 | 66 | 143 | 80 | 28 | 14 | 168 | 283 |
| Fair | 285 | 23 | 13 | 13 | 6 | 62 | 70 | 65 | 28 | 3 | 91 | 187 |
| Poor | 133 | 8 | 3 | 13 | 0 | 33 | 38 | 33 | 3 | 1 | 55 | 75 |

### 4. [Q7] How would you rate the QUALITY of these North Richland Hills city services? Management of traffic flow

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 980 | 88 | 50 | 70 | 27 | 172 | 280 | 204 | 67 | 19 | 358 | 604 |
| Excellent | 112 | 9 | 5 | 6 | 7 | 11 | 41 | 21 | 11 | 1 | 51 | 60 |
| Good | 454 | 41 | 27 | 36 | 13 | 70 | 129 | 96 | 30 | 12 | 160 | 286 |
| Fair | 311 | 30 | 17 | 16 | 7 | 65 | 84 | 63 | 22 | 5 | 102 | 203 |
| Poor | 103 | 8 | 1 | 12 | 0 | 26 | 26 | 24 | 4 | 1 | 45 | 55 |

### 5. [Q7] How would you rate the QUALITY of these North Richland Hills city services? Maintenance of landscaped medians and right-of-ways

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 981 | 85 | 50 | 70 | 29 | 173 | 279 | 202 | 70 | 20 | 357 | 606 |
| Excellent | 244 | 24 | 12 | 13 | 11 | 40 | 81 | 43 | 16 | 4 | 89 | 151 |
| Good | 557 | 48 | 29 | 42 | 15 | 95 | 149 | 118 | 44 | 14 | 199 | 348 |
| Fair | 145 | 12 | 5 | 14 | 3 | 29 | 40 | 31 | 9 | 2 | 50 | 91 |
| Poor | 35 | 1 | 4 | 1 | 0 | 9 | 9 | 10 | 1 | 0 | 19 | 16 |

### 6. [Q7] How would you rate the QUALITY of these North Richland Hills city services? Parks, trails, and open spaces

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 933 | 85 | 47 | 63 | 25 | 166 | 272 | 192 | 64 | 16 | 351 | 565 |
| Excellent | 472 | 36 | 19 | 25 | 12 | 84 | 153 | 97 | 35 | 9 | 188 | 275 |
| Good | 402 | 41 | 24 | 29 | 13 | 69 | 112 | 79 | 27 | 7 | 140 | 254 |
| Fair | 51 | 7 | 3 | 9 | 0 | 12 | 7 | 11 | 2 | 0 | 19 | 32 |
| Poor | 8 | 1 | 1 | 0 | 0 | 1 | 0 | 5 | 0 | 0 | 4 | 4 |

### 7. [Q8a] How IMPORTANT are these city services to you?

### Maintenance of residential streets in your neighborhood

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 988 | 92 | 50 | 70 | 29 | 173 | 281 | 201 | 70 | 19 | 357 | 613 |
| Very Important | 785 | 74 | 43 | 57 | 23 | 138 | 209 | 163 | 58 | 17 | 273 | 496 |
| Somewhat Important | 192 | 15 | 6 | 11 | 6 | 34 | 69 | 37 | 12 | 2 | 79 | 111 |
| Somewhat Unimportant | 11 | 3 | 1 | 2 | 0 | 1 | 3 | 1 | 0 | 0 | 5 | 6 |
| Not at all Important | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### 8. [Q8a] How IMPORTANT are these city services to you?

### Maintenance of the City's major streets

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 987 | 91 | 50 | 69 | 28 | 173 | 281 | 202 | 71 | 19 | 356 | 613 |
| Very Important | 842 | 74 | 42 | 61 | 22 | 149 | 232 | 176 | 65 | 18 | 300 | 526 |
| Somewhat Important | 140 | 16 | 7 | 7 | 6 | 23 | 49 | 25 | 6 | 1 | 52 | 86 |
| Somewhat Unimportant | 5 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 4 | 1 |
| Not at all Important | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### 9. [Q8a] How IMPORTANT are these city services to you?

### Traffic signal timing

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 984 | 88 | 50 | 70 | 29 | 173 | 280 | 201 | 71 | 19 | 356 | 610 |
| Very Important | 628 | 55 | 33 | 43 | 17 | 109 | 177 | 138 | 40 | 13 | 225 | 389 |
| Somewhat Important | 324 | 30 | 13 | 25 | 10 | 62 | 94 | 57 | 30 | 3 | 116 | 205 |
| Somewhat Unimportant | 32 | 3 | 4 | 2 | 2 | 2 | 9 | 6 | 1 | 3 | 15 | 16 |
| Not at all Important | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### 10. [Q8a] How IMPORTANT are these city services to you?

### Management of traffic flow

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 982 | 87 | 50 | 69 | 28 | 173 | 279 | 203 | 71 | 19 | 357 | 607 |
| Very Important | 674 | 61 | 34 | 46 | 16 | 117 | 198 | 137 | 47 | 15 | 255 | 404 |
| Somewhat Important | 290 | 25 | 13 | 22 | 10 | 55 | 76 | 63 | 22 | 4 | 92 | 195 |
| Somewhat Unimportant | 18 | 1 | 3 | 1 | 2 | 1 | 5 | 3 | 2 | 0 | 10 | 8 |
| Not at all Important | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## 11. [Q8a] How IMPORTANT are these city services to you?

### Maintenance of landscaped medians and right-of-ways

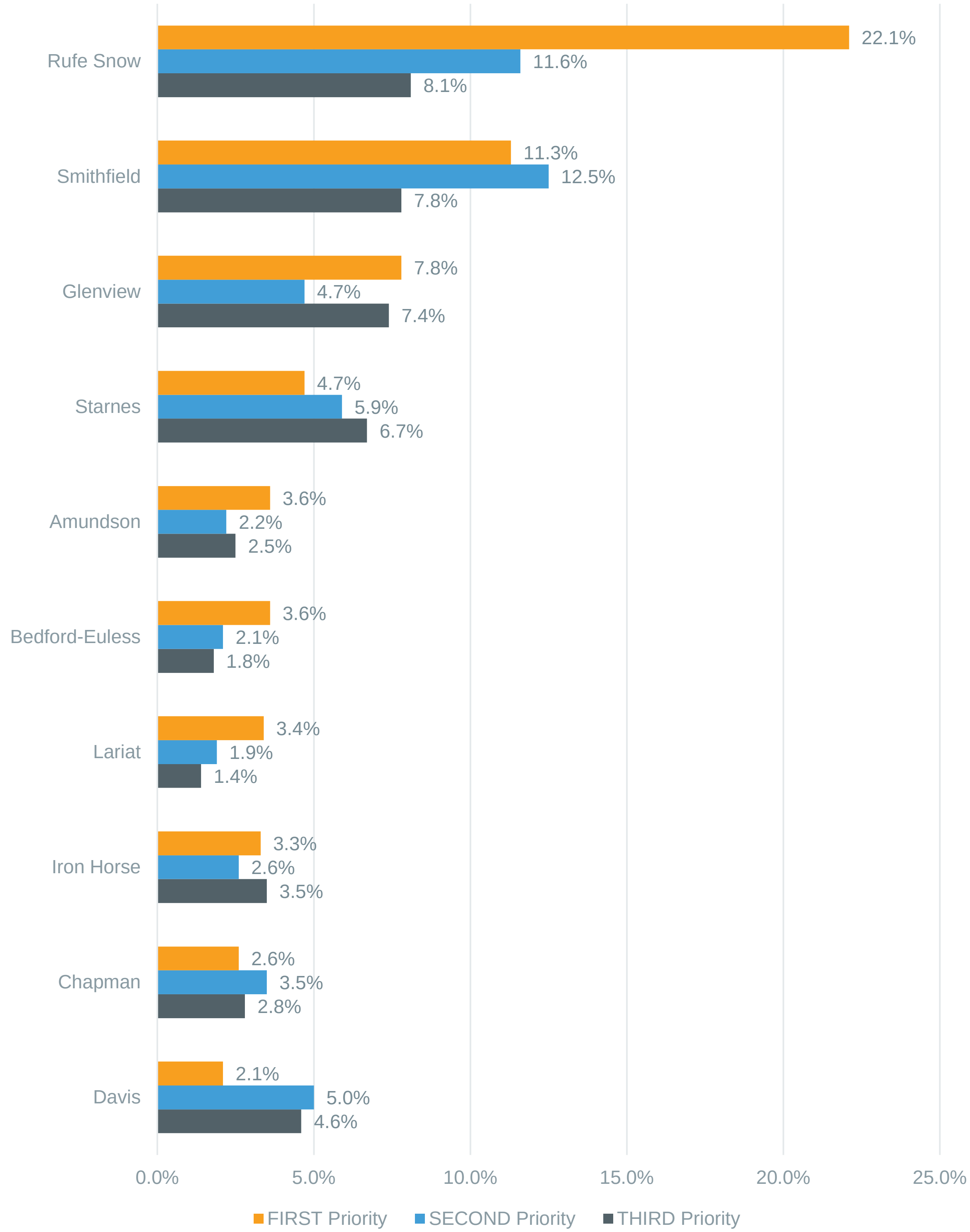
| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 982 | 89 | 50 | 68 | 29 | 173 | 279 | 202 | 70 | 19 | 354 | 610 |
| Very Important | 378 | 28 | 22 | 21 | 11 | 57 | 119 | 83 | 25 | 11 | 135 | 236 |
| Somewhat Important | 494 | 47 | 24 | 35 | 12 | 95 | 133 | 104 | 38 | 5 | 176 | 308 |
| Somewhat Unimportant | 96 | 12 | 4 | 8 | 4 | 18 | 25 | 14 | 7 | 3 | 37 | 58 |
| Not at all Important | 14 | 2 | 0 | 4 | 2 | 3 | 2 | 1 | 0 | 0 | 6 | 8 |

## 12. [Q8a] How IMPORTANT are these city services to you?

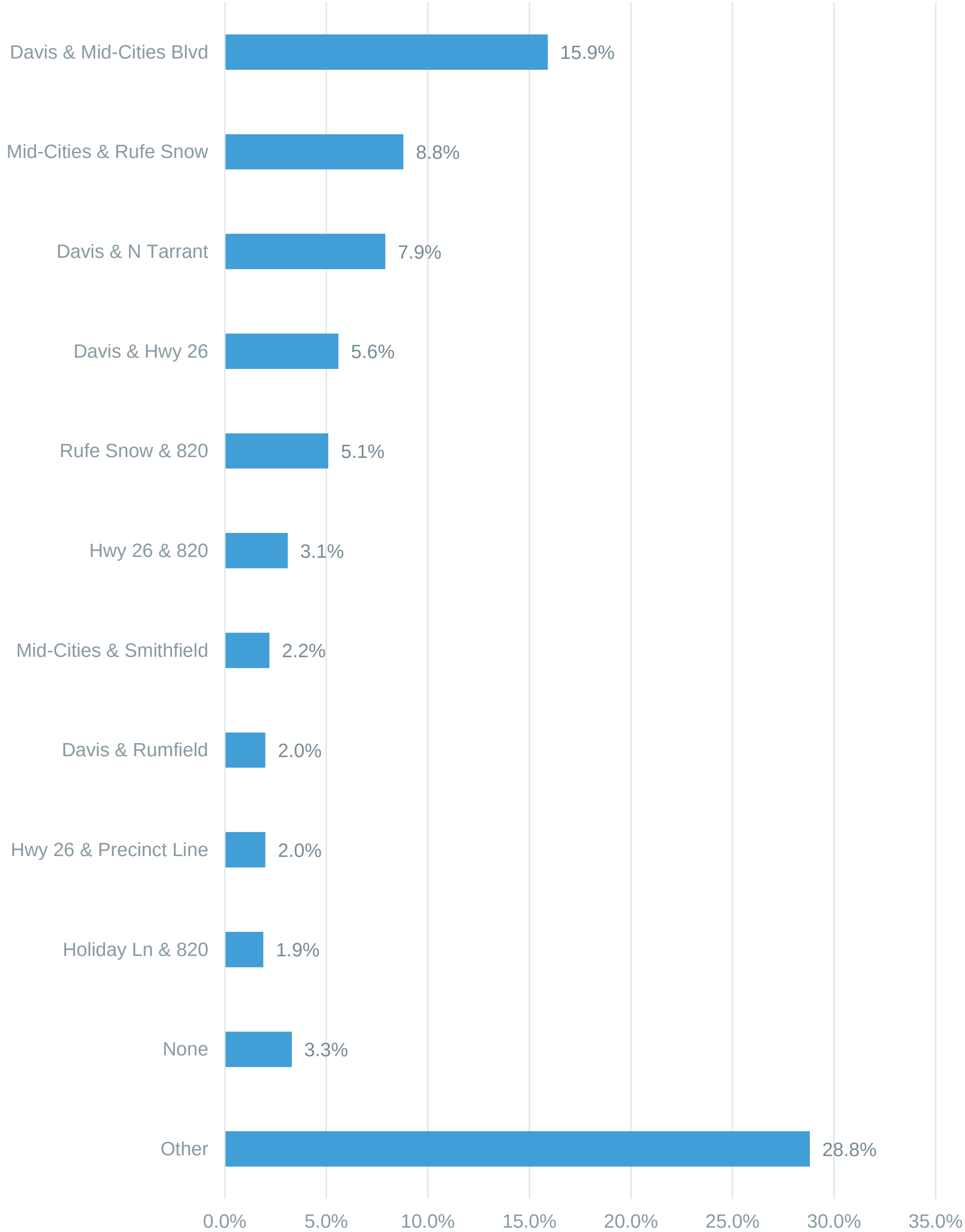
### Parks, trails, and open spaces

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 976 | 91 | 50 | 68 | 27 | 171 | 278 | 202 | 67 | 19 | 356 | 602 |
| Very Important | 534 | 46 | 25 | 24 | 17 | 91 | 165 | 117 | 35 | 13 | 229 | 295 |
| Somewhat Important | 383 | 41 | 19 | 40 | 7 | 73 | 97 | 72 | 27 | 5 | 116 | 259 |
| Somewhat Unimportant | 51 | 2 | 5 | 3 | 3 | 6 | 14 | 12 | 5 | 1 | 10 | 41 |
| Not at all Important | 8 | 2 | 1 | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 1 | 7 |

### 13. [Q9a] Please list in order of your opinion the 3 NRH streets most in need of repairs/repaving?

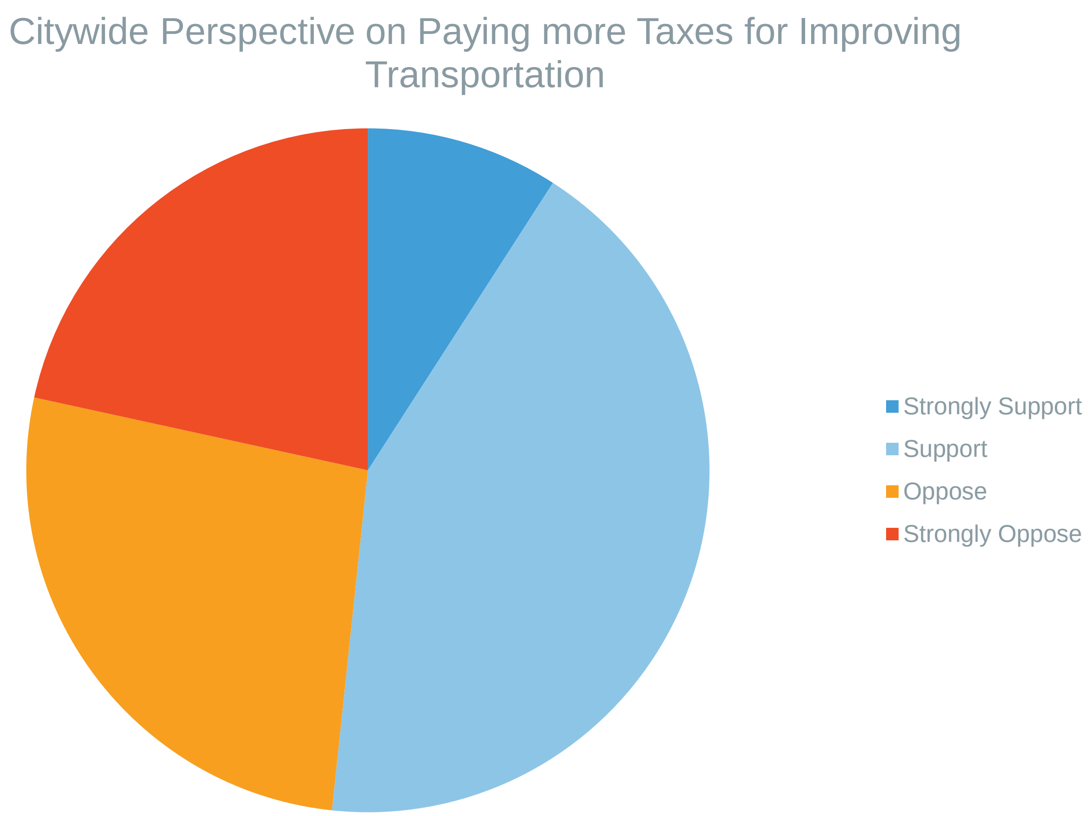


**14. [Q9b] On a typical day, which one NRH intersection do you feel you spend too much time at due to traffic congestion or traffic signal timing?**



### 15. [Q9c] How strongly would you support or oppose paying more taxes for improving city streets and intersections?

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 834 | 77 | 35 | 55 | 18 | 152 | 245 | 171 | 65 | 14 | 307 | 517 |
| Strongly support | 76 | 11 | 3 | 4 | 3 | 16 | 17 | 11 | 10 | 1 | 29 | 47 |
| Support | 355 | 39 | 17 | 26 | 9 | 57 | 93 | 77 | 30 | 5 | 104 | 244 |
| Oppose | 223 | 21 | 7 | 13 | 3 | 36 | 76 | 46 | 16 | 5 | 100 | 122 |
| Strongly oppose | 180 | 6 | 8 | 12 | 3 | 43 | 59 | 37 | 9 | 3 | 74 | 104 |



### 16. [Q10] In the last 12 months, about how many times have you or other household members used these North Richland Hills facilities?

**Trails**

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 1,044 | 99 | 56 | 75 | 29 | 179 | 292 | 214 | 75 | 22 | 375 | 651 |
| Never | 380 | 42 | 24 | 40 | 15 | 62 | 84 | 69 | 34 | 10 | 74 | 301 |
| 1-2 Times | 179 | 23 | 13 | 14 | 4 | 27 | 40 | 38 | 15 | 4 | 72 | 99 |
| 3-12 Times | 204 | 18 | 12 | 11 | 4 | 39 | 67 | 33 | 14 | 4 | 92 | 111 |
| 13-26 Times | 100 | 7 | 2 | 3 | 3 | 19 | 37 | 22 | 6 | 1 | 58 | 41 |
| 26+ Times | 181 | 9 | 5 | 7 | 3 | 32 | 64 | 52 | 6 | 3 | 79 | 99 |

### 17. [Q11] How would you rate these North Richland Hills facilities?

**Trails**

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 773 | 66 | 37 | 50 | 20 | 133 | 230 | 166 | 51 | 17 | 326 | 434 |
| Excellent | 372 | 25 | 12 | 12 | 12 | 60 | 126 | 85 | 28 | 11 | 150 | 216 |
| Good | 366 | 36 | 22 | 36 | 8 | 66 | 95 | 73 | 22 | 6 | 163 | 196 |
| Fair | 30 | 4 | 2 | 2 | 0 | 7 | 7 | 7 | 1 | 0 | 10 | 20 |
| Poor | 5 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 3 | 2 |

## 18. [Q12] How would you rate the following?

### Level of traffic safety enforcement

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 893 | 84 | 43 | 64 | 28 | 151 | 258 | 187 | 62 | 15 | 342 | 538 |
| Excellent | 248 | 27 | 10 | 21 | 11 | 43 | 67 | 46 | 21 | 2 | 103 | 143 |
| Good | 474 | 50 | 25 | 27 | 15 | 79 | 132 | 105 | 30 | 11 | 173 | 291 |
| Fair | 140 | 5 | 7 | 12 | 2 | 22 | 52 | 30 | 8 | 1 | 52 | 87 |
| Poor | 31 | 2 | 1 | 4 | 0 | 7 | 7 | 6 | 3 | 1 | 14 | 17 |

## 19. [Q14] How often have you seen the following problems in your neighborhood?

### A lack of sidewalks or sidewalks in disrepair

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 998 | 93 | 54 | 72 | 28 | 172 | 281 | 204 | 74 | 17 | 369 | 614 |
| Frequently | 271 | 30 | 17 | 21 | 8 | 52 | 59 | 53 | 23 | 7 | 130 | 140 |
| Sometimes | 231 | 13 | 12 | 13 | 6 | 45 | 65 | 52 | 19 | 4 | 84 | 142 |
| Rarely | 237 | 26 | 18 | 17 | 8 | 36 | 60 | 51 | 17 | 4 | 66 | 169 |
| Never | 259 | 24 | 7 | 21 | 6 | 39 | 97 | 48 | 15 | 2 | 89 | 163 |

### 20. [Q14] How often have you seen the following problems in your neighborhood? Potholes

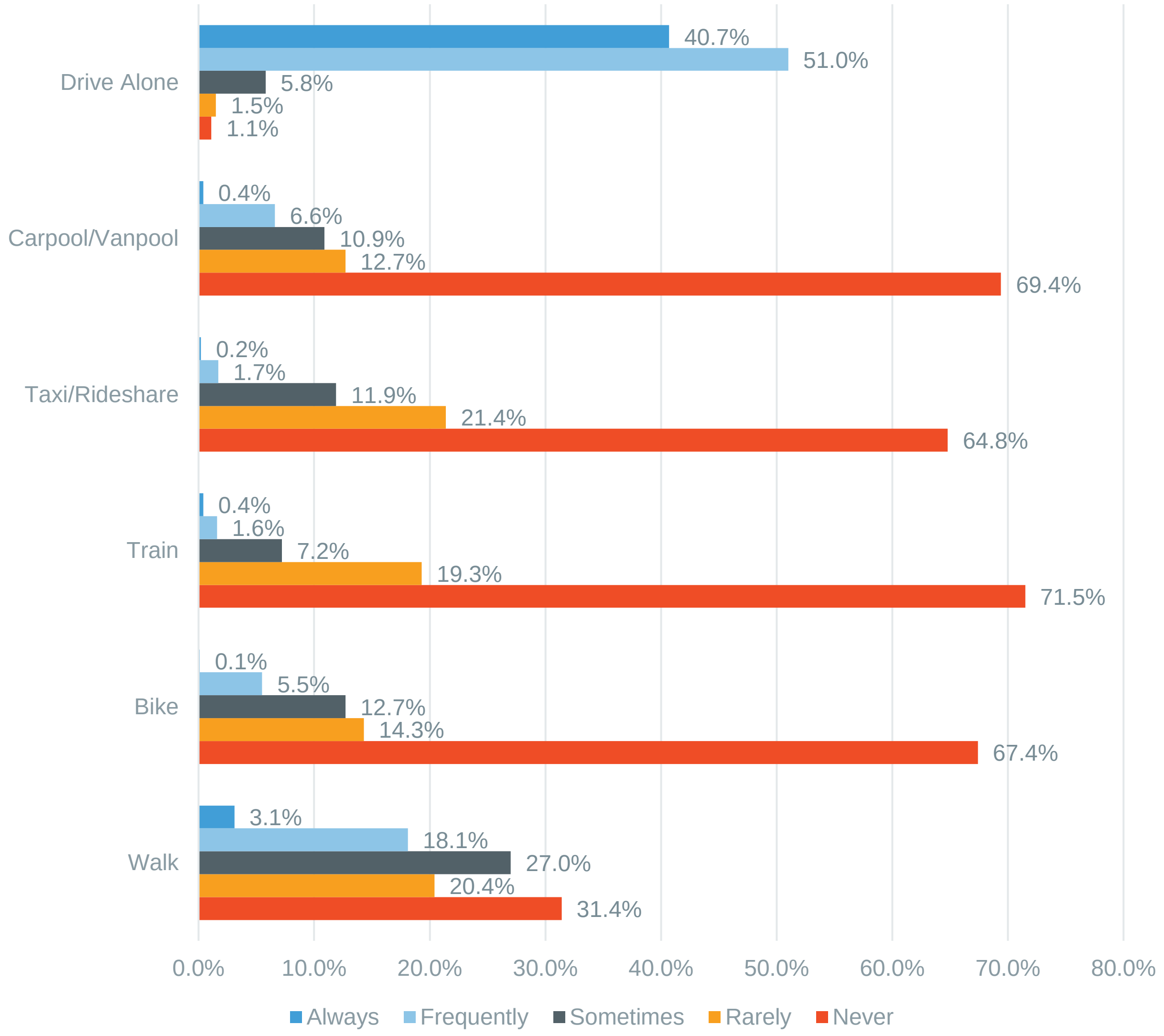
| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 1,016 | 94 | 55 | 73 | 29 | 176 | 286 | 206 | 75 | 19 | 369 | 632 |
| Frequently | 176 | 32 | 9 | 18 | 6 | 38 | 24 | 29 | 16 | 4 | 61 | 114 |
| Sometimes | 361 | 31 | 22 | 24 | 7 | 69 | 102 | 58 | 38 | 7 | 131 | 227 |
| Rarely | 309 | 15 | 18 | 23 | 13 | 52 | 97 | 71 | 14 | 6 | 110 | 196 |
| Never | 170 | 16 | 6 | 8 | 3 | 17 | 63 | 48 | 7 | 2 | 67 | 95 |

### 21. [Q14] How often have you seen the following problems in your neighborhood? Speeding/traffic safety concerns

| | Total | District of Residence | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Unsure | Under 55 | 55+ |
| Total | 1,022 | 94 | 56 | 73 | 28 | 176 | 290 | 210 | 74 | 18 | 372 | 635 |
| Frequently | 317 | 20 | 20 | 27 | 5 | 57 | 94 | 62 | 27 | 5 | 125 | 191 |
| Sometimes | 338 | 39 | 14 | 17 | 10 | 63 | 94 | 66 | 25 | 8 | 101 | 233 |
| Rarely | 262 | 22 | 16 | 22 | 11 | 44 | 71 | 56 | 15 | 5 | 94 | 164 |
| Never | 105 | 13 | 6 | 7 | 2 | 12 | 31 | 26 | 7 | 0 | 52 | 47 |

### 22. [Q14] How often do you use the following modes of transportation?

| | Drive Alone | Carpool or vanpool | Taxi service or rideshare app | Train | Bike | Walk |
|---|---|---|---|---|---|---|
| Total | 1,032 | 938 | 941 | 939 | 945 | 967 |
| Always | 420 | 4 | 2 | 4 | 1 | 30 |
| Frequently | 526 | 62 | 16 | 15 | 52 | 175 |
| Sometimes | 60 | 102 | 112 | 68 | 120 | 261 |
| Rarely | 15 | 119 | 201 | 181 | 135 | 197 |
| Never | 11 | 651 | 610 | 671 | 637 | 304 |



# Stakeholder Input Meeting

## Meeting Sign-in Sheet

### North Richland Hills Transportation Plan

#### Planning Input Workshop

DATE & TIME:
January 22, 2018, 4:00 to 6:00 PM

LOCATION:
City Hall Community Room

**Welcome!** Please sign in.

| | |
|---|---|
| 1. Sam Tvronge | 16. Burt Barr |
| 2. Justin Welborn | 17. Daryl Beltran |
| 3. Mike Benton | 18. Behrooz Aghapour |
| 4. Karen Russell | 19. Amy Mai |
| 5. Jerry Lyon | 20. Ito Rodriguez |
| 6. Skip Baskerville | 21. |
| 7. Rob Wright | 22. |
| 8. Tracye Tipps | 23. |
| 9. Mark S. Wood | 24. |
| 10. Brian Crowson | 25. |
| 11. [illegible] | 26. |
| 12. Tom Lombard | 27. |
| 13. Tim Welch | 28. |
| 14. Lee Knight | 29. |
| 15. Suzy Compton | 30. |

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Toole Design Group

## Pre-Meeting Materials

# North Richland Hills Transportation Plan

## Planning Input Workshop Pre-Meeting Materials

MEETING DATE, TIME, & LOCATION:
January 22, 2018, 4:00 - 6:00 PM
City Hall Community Room

### PURPOSE

The Input Workshop's purpose is to define the existing state of the transportation system in NRH through issues, needs, strengths, and opportunities identification, and to define what you feel success looks like for transportation in the local context of NRH.

### YOUR ROLE

Your role is to use your experience and insights into the intricate day-to-day details of transportation in NRH to help guide the Transportation Plan. Your role is also to be a voice for your community and speak to the goals and desires of an effective transportation system for the future. By familiarizing yourself with the materials within prior to the meeting, you will be able to come prepared to provide feedback to the planning team on the range of topics to be discussed.

### MATERIALS INCLUDED

1. Meeting Agenda
2. Biographies of Planning Team
3. Overview of Planning Process
4. Draft Transportation Goals
5. Active Transportation Primer
6. Transit-Oriented Development (TOD) Primer
7. Target Corridor Maps

Additional Resources

- Existing Thoroughfare Plan
- 2016 Trail and Route System Plan
- Your Knowledge!

### QUESTIONS TO THINK ABOUT

- Do the Draft Goals encompass a transportation vision for NRH to strive toward?
- What are the transportation-related strengths and opportunities in NRH?
- What are the transportation-related issues and needs in NRH?
- What walking- and cycling-specific issues are there in NRH?
- What types of walk/bike facilities best fit NRH?
- What connections are needed to enhance access to the TOD stations?
- What issues, concerns, and context are you aware of for each target corridor?

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# North Richland Hills Transportation Plan

## Planning Input Workshop

DATE & TIME:
January 22, 2018, 4:00 to 6:00 PM

LOCATION:
City Hall Community Room

### AGENDA

**General Overview (All Group)**
Team Introductions
Integration with Ongoing Strategic Plan Efforts
Review of Transportation Plan Process & Major Tasks
- Goals, Travel Demand Modeling, Rightsizing, Target Corridor Planning, Trail System Integration, Transit-Oriented Development, Design Standards

**General Input (Small Group Discussion)**
Discussion of Transportation Goals
Discussion on Strengths & Opportunities
Discussion on Issues & Needs

ISSUES & NEEDS

**Specialty Topics Introduction (All Group)**
Active Transportation Overview & Strategies
Transit-Oriented Development (TOD) Strategies
Safe Routes to Schools (UTA Institute of Urban Studies)
Target Corridor Planning Introduction

**Specialty Topics Input (Small Group Discussion)**
Discuss Transportation Connections
- Active Transportation
- TOD Integration

Discuss Target Corridors

**Wrap Up Summary (All Group)**
Summary of Input Heard
Schedule and Next Steps
Question & Answer Session

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# North Richland Hills Transportation Plan

## Planning Team Biographies

### EDDIE HAAS
Project Manager

Edmund (Eddie) Haas specializes in the development of comprehensive urban and transportation plans, and assisting in the municipal development of long-term traffic and land use solutions. He also is experienced in the development of policy-oriented land use plans, demographic analyses, multimodal transportation systems, corridor plans, and parking and impact fee systems.

**Relevant Experience:** Fort Worth Thoroughfare Plan Update (as subconsultant); Transportation Plans: Garland, Irving, Cedar Hill, Schertz, Weatherford, Waxahachie, Greenville, Rockwall. County Transportation Plans: Kaufman, Denton, Cooke, Parker.

### KEVIN ST. JACQUES
Assistant Project Manager

Kevin St. Jacques is an experienced engineer with diverse resume including transportation and mobility regional planning, bicycle and pedestrian system planning and design, traffic engineering, roadway design and construction management. He is a member of the Speaker's Bureau for the National Complete Streets Coalition.

**Relevant Experience:** Weatherford Transportation Plan; Texas High-Speed Rail; Cresson Thoroughfare and Future Land Use Plan; Denton Bicycle Plan; Midlothian Comprehensive Plan – Transportation Component (as subconsultant).

### DANIEL HERRIG
Transportation Lead

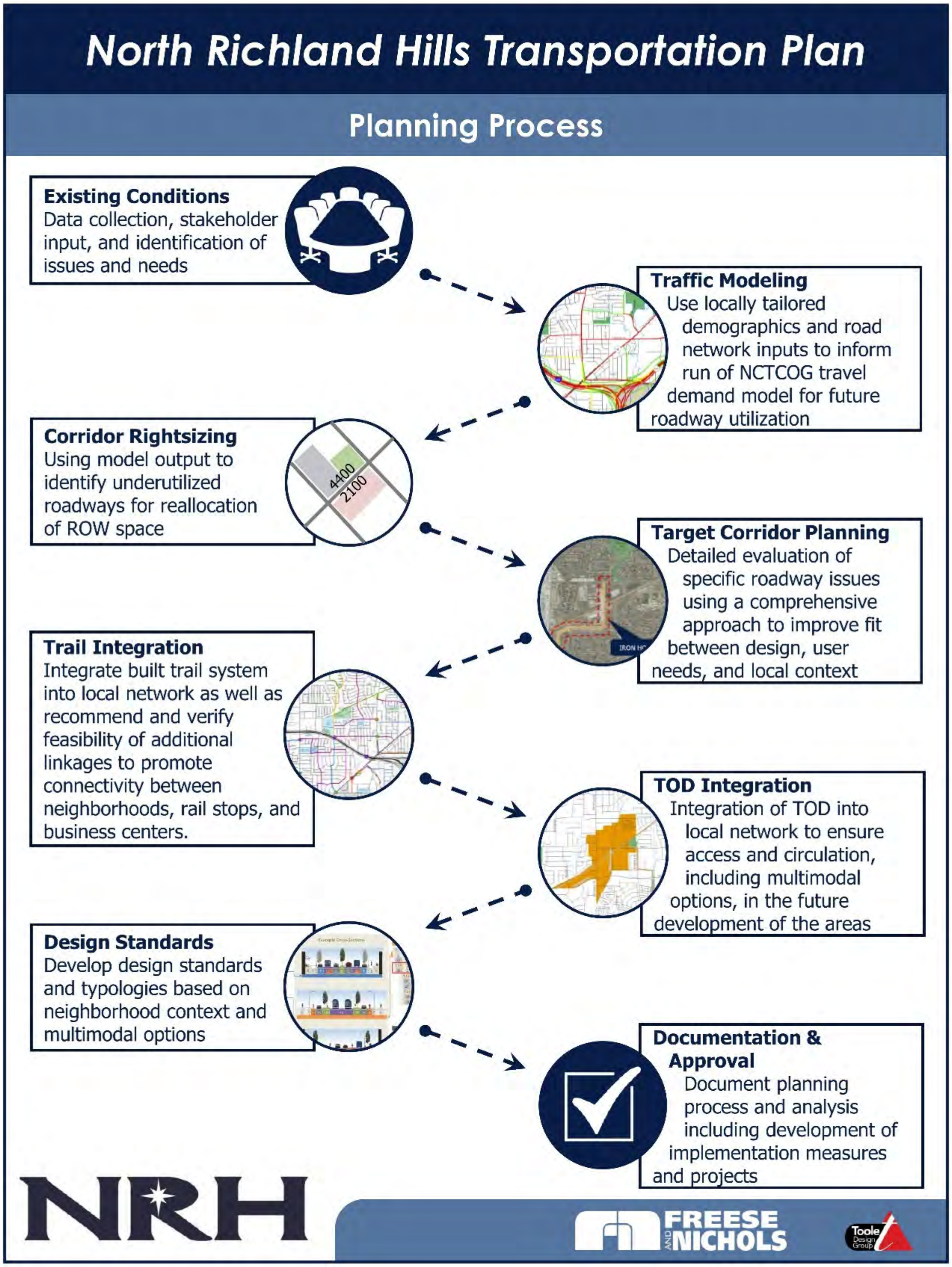
Daniel Herrig is a transportation engineer and planner focusing on long-range transportation planning service for public sector clients. He has experience in roadway design projects, bond programs, impact fees, corridor management, thoroughfare planning, and planning and environmental linkage (PEL) studies. He also has experience in cost estimating, economic benefit analysis, and data collection and analysis.

**Relevant Experience:** Schertz Thoroughfare Plan; Weatherford Transportation Plan; Norman Comprehensive Transportation Plan.

### ADDIE WEBER
Active Transportation/Transit-Oriented Development

Addie Weber is an urban designer and planner with extensive experience collaborating with multidisciplinary teams on numerous livable transportation projects. She has worked with a wide range of clients to develop community-supported, context-sensitive design solutions for suburban and urban environments. She has worked on over 70 station area plans.

**Relevant Experience:** Atlanta BeltLine, Charlotte's Light Rail Transit Extension, Denver's Commuter Rail Line, ULI National Advisory Services Panel Largo Town Center TOD.


North Richland Hills Transportation Plan
Planning Process
Existing Conditions
Data collection, stakeholder input, and identification of issues and needs
Traffic Modeling
Use locally tailored demographics and road network inputs to inform run of NCTCOG travel demand model for future roadway utilization
Corridor Rightsizing
Using model output to identify underutilized roadways for reallocation of ROW space
4400
2100
Target Corridor Planning
Detailed evaluation of specific roadway issues using a comprehensive approach to improve fit between design, user needs, and local context
Trail Integration
Integrate built trail system into local network as well as recommend and verify feasibility of additional linkages to promote connectivity between neighborhoods, rail stops, and business centers.
TOD Integration
Integration of TOD into local network to ensure access and circulation, including multimodal options, in the future development of the areas
Design Standards
Develop design standards and typologies based on neighborhood context and multimodal options
Documentation & Approval
Document planning process and analysis including development of implementation measures and projects
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# North Richland Hills Transportation Plan

## DRAFT Transportation Goals

**Transportation Goals** founded on the City Council's 2017 Goals & Objectives (to the right). Statements listed below each goal expound on the core of that idea.

| | | |
|---|---|---|
| Quality Community Development & Revitalization | Safety & Security | Positive City Image |
| Efficient & Effective Delivery of City Services | Financial Stability | Targeted Economic Development |
| Efficient & Effective Transportation System | Sense of Community | Local & Regional Leadership |

NOTE: Goals generated by City Staff and Planning Team for purposes of initiating discussion.

In evolving the Thoroughfare Plan into the Transportation Plan, we strive to:

### 1 Expand Mobility and Access by

- Promoting interconnected neighborhoods for ALL modes of travel.
- Integrating trails, transit, roadways, and sidewalks into a more comprehensive plan for all forms of transportation.
- Exploring using new technologies to enhance transportation options.
- Evaluating specific existing and planned roadway corridors for future transportation needs.
- Developing policies and standards for off-street connectivity, dead-end streets, and new cul-de-sacs.

### 2 Enhance Quality of Life by

- Focusing on moving people safely and efficiently.
- Encouraging transportation design standards appropriate to the neighborhood context.
- Complying with state and local air quality standards.

### 3 Improve Economic Vitality by

- Improving access to employment, commerce, education, and community resources.
- Providing for the efficient movement of goods and services.
- Strengthening the integration of transportation and land use.
- Providing and maintaining infrastructure capacity in line with growth or decline demands.
- Planning for Transit Oriented Development (TOD).

### 4 Focus on Implementation by

- Coordinating local and regional initiatives to leverage local transportation dollars.
- Upgrading streets and transportation infrastructure in older and substandard areas.
- Maintaining the cleanliness and good repair of existing transportation infrastructure.

# North Richland Hills Transportation Plan

## What is Active Transportation?


## What are some of the benefits?

### » HEALTH «

Moderate physical activity, like bicycling and walking, for at least **150 minutes per week** helps prevent chronic diseases and maintain a healthy weight.

### » COMMUNITY «

More people bicycling and walking means more eyes on the street, which improves safety, encourages more activity, and enhances community cohesion.

### » ECONOMY «

Bicyclists are often the **best shoppers,** spending more money and visiting more often.

Bicycling projects result in nearly **50% more jobs** per dollar than road-only projects

### » HAPPINESS «

Bicycling reduces depression, can improve the quality of sleep, and has been shown to improve cognitive functions for older adults.

Bicyclists report **greater satisfaction** with their commute than people who drive to work.

Half of all trips are **3 miles or less** & 28% of trips are **1 mile or less,** an easy biking or walking distance.

# North Richland Hills Transportation Plan

## What is Transit Oriented Development


Photo by Joe Hinson

The role of transit in shaping urban form is as important as its mobility role. The type and nature of development around a transit station will greatly influence that station's effectiveness. Transit Oriented Development (TOD) plans provide focus for regulatory and infrastructure improvements, and joint development that together catalyze the full realization of a transit investment. TOD's include a mix of land uses that foster a walkable, vibrant, and engaging environment for all users.

### What are some of the benefits?

- Reduced household driving and thus lowered regional congestion, air pollution and greenhouse gas emissions
- Enhanced ability to maintain economic competitiveness
- Improved access to jobs and economic opportunity for low-income people and working families
- Walkable communities that accommodate more healthy and active lifestyles
- Expanded mobility choices that reduce dependence on the automobile, reduce transportation costs and free up household income for other purposes
- $$$$ Potential for added value created through increased and/or sustained property values where transit investments have occurred

Source: www.reconnectingamerica.org

# North Richland Hills Transportation Plan

## Target Corridor Planning

### WHAT IS IT?

The **detailed evaluation** of localized roadway needs for specific target corridors using a **comprehensive approach** to consider all users and the local context.

- Access & Circulation/ Major Traffic Control Elements
- Land Use Context-Sensitivity
- Active Transportation/ Safety
- Traffic Operations Analysis

### WHY DO IT?

1. To provide solutions specific to unique corridor issues
2. To improve the fit between design, user needs, and physical context
3. To increase the opportunities for greater numbers of people to benefit from future investments in the corridor
4. To provide deeper information that can inform decision-making and allocation of future resources to allow more effective use of funds

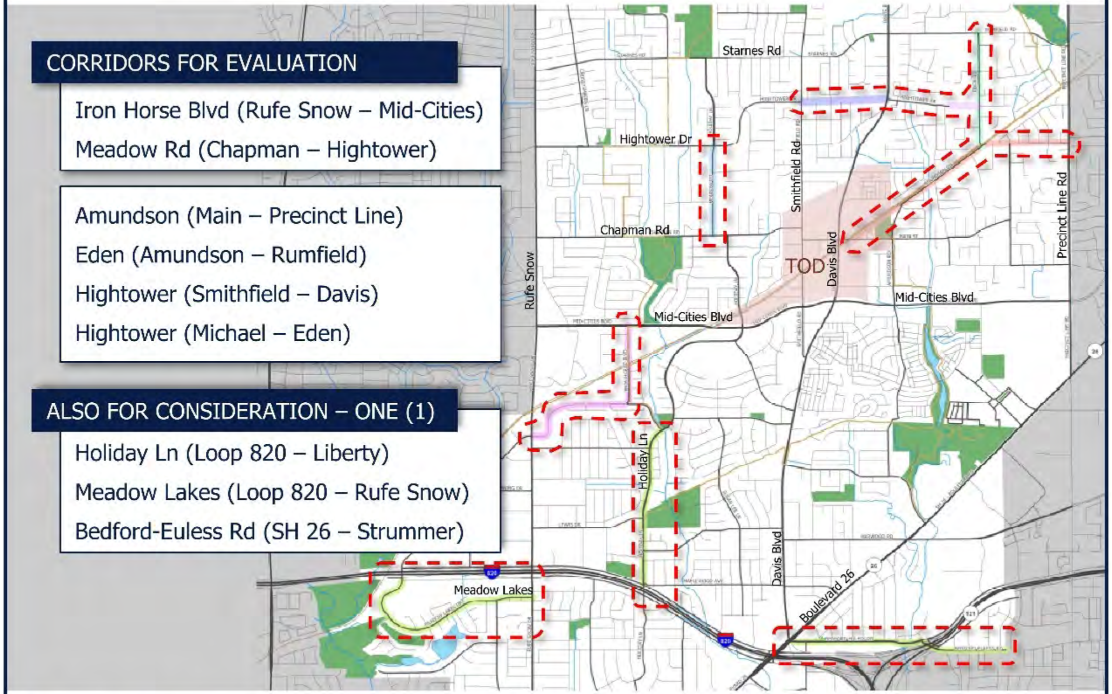
**CORRIDORS FOR EVALUATION**

- Iron Horse Blvd (Rufe Snow – Mid-Cities)
- Meadow Rd (Chapman – Hightower)

- Amundson (Main – Precinct Line)
- Eden (Amundson – Rumfield)
- Hightower (Smithfield – Davis)
- Hightower (Michael – Eden)

**ALSO FOR CONSIDERATION – ONE (1)**

- Holiday Ln (Loop 820 – Liberty)
- Meadow Lakes (Loop 820 – Rufe Snow)
- Bedford-Euless Rd (SH 26 – Strummer)

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# North Richland Hills Transportation Plan

## Target Corridor Planning

**MEADOW ROAD**

**CONTEXT**

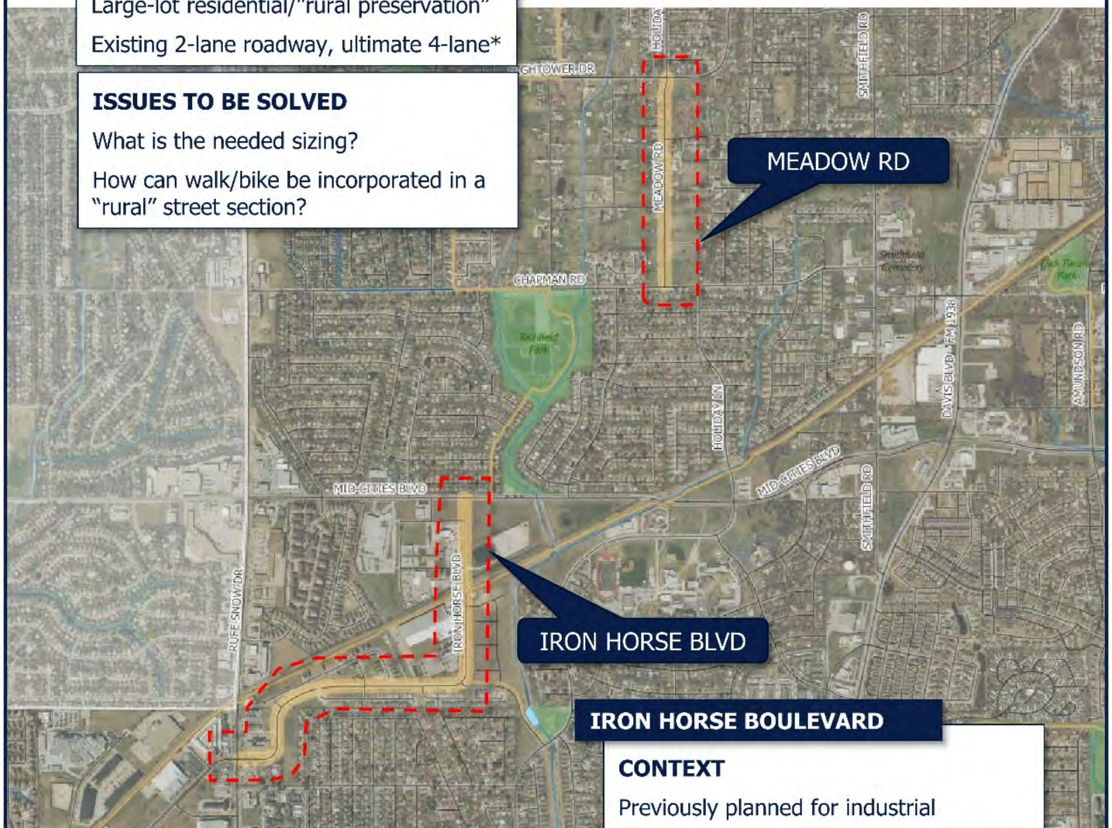
Large-lot residential/"rural preservation"

Existing 2-lane roadway, ultimate 4-lane*

**ISSUES TO BE SOLVED**

What is the needed sizing?

How can walk/bike be incorporated in a "rural" street section?




**IRON HORSE BOULEVARD**

**CONTEXT**

Previously planned for industrial

Changed to planned residential & office

**ISSUES TO BE SOLVED**

How can corridor adapt to new context?

*Ultimate section refers to current thoroughfare plan designation of roadway lanes at build-out.

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# North Richland Hills Transportation Plan

## Target Corridor Planning

*Ultimate section refers to current thoroughfare plan designation of roadway lanes at build-out.


### EDEN ROAD

**CONTEXT**

Large-lot residential

Existing 2-lane roadway, ultimate 4-lane*

**ISSUES TO BE SOLVED**

What is the needed sizing?

### HIGHTOWER DRIVE

**CONTEXT**

Residential context, no existing roadway

Planned to increase circulation & access

**ISSUES TO BE SOLVED**

What is the needed sizing and timing?

### AMUNDSON ROAD

**CONTEXT**

Adjacent to railroad

Existing 2-lane roadway, ultimate 4-lane*

**ISSUES TO BE SOLVED**

What is the needed sizing?

Would a modified section be appropriate in the context?

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# North Richland Hills Transportation Plan

## Target Corridor Planning

**For Your Consideration:**
Which *one* of these corridors should be focused on?

### HOLIDAY LANE

**CONTEXT**

Heavy school peak traffic

Minimal walk/bike infrastructure

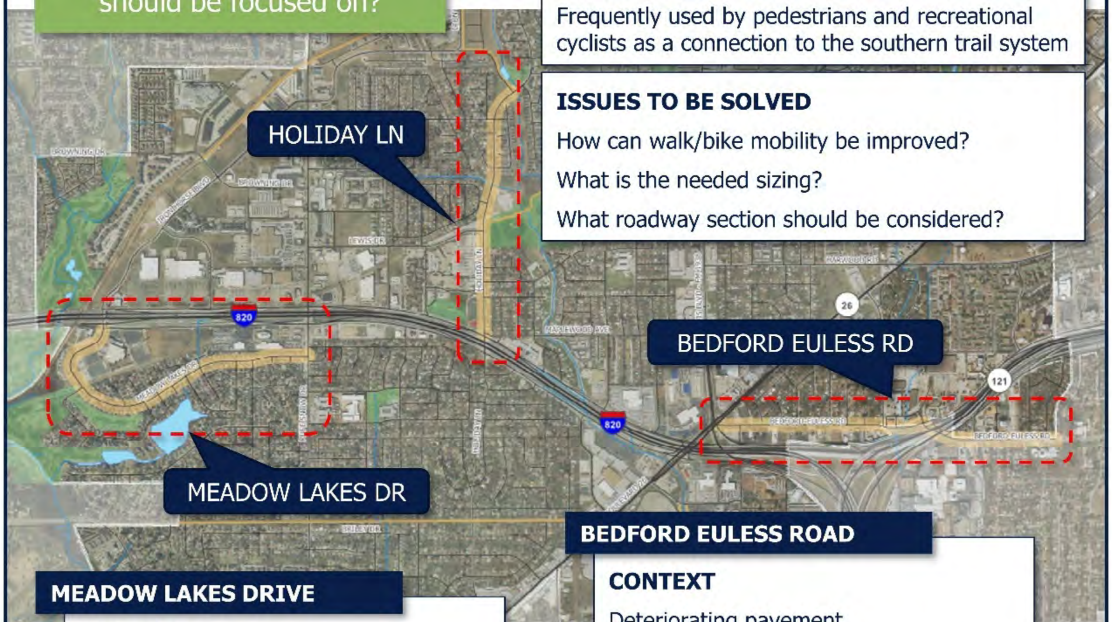
Frequently used by pedestrians and recreational cyclists as a connection to the southern trail system

**ISSUES TO BE SOLVED**

How can walk/bike mobility be improved?

What is the needed sizing?

What roadway section should be considered?




### MEADOW LAKES DRIVE

**CONTEXT**

Rehabilitation of pavement needed

Concerns of cut-through traffic with Rufe Snow/TexRail Station

**ISSUES TO BE SOLVED**

How can various objectives of corridor be accommodated? (i.e. parking, traffic calming, residential access, etc.)

### BEDFORD EULESS ROAD

**CONTEXT**

Deteriorating pavement

Some sight-line and alignment issues

**ISSUES TO BE SOLVED**

Can this commercial corridor be redesigned to support both residences and various business types (office, retail, restaurants) and promote walkability between these uses in the area?

Can driveway accesses be condensed to reduce curb cuts?

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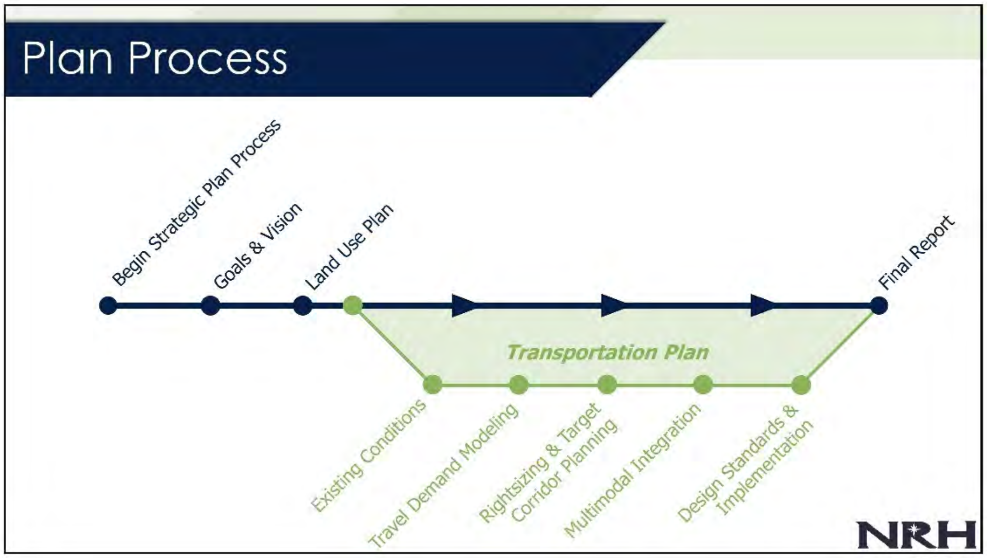
## Meeting Presentation



1


Plan Process
Strategic Plan
Goals & Vision
Land Use Plan
Transportation Plan
Economic Development
NRH


Plan Process
Begin Strategic Plan Process
Goals & Vision
Land Use Plan
Final Report
Transportation Plan
Existing Conditions
Travel Demand Modeling
Rightsizing & Target Corridor Planning
Multimodal Integration
Design Standards & Implementation
NRH

2


Strategic Plan Goals
Quality Community Development & Revitalization
Safety & Security
Positive City Image
Targeted Economic Development
Efficient & Effective Delivery of City Services
Efficient & Effective Transportation System
Financial Stability
Sense of Community
Local & Regional Leadership
NRH


Transportation Goals
1 Expand Mobility and Access
2 Enhance Quality of Life
3 Improve Economic Vitality
4 Focus on Implementation
NRH

3


Transportation Goals
1
EXPAND MOBILITY AND ACCESS BY
• Providing interconnected neighborhoods for all modes of travel.
• Integrating trails, transit, roadways, and sidewalks into a more comprehensive plan for all forms of transportation.
• Exploring use of new technologies to enhance transportation options.
• Evaluating specific existing and planned roadway corridors for future transportation needs.
• Developing policies and standards for off-street connectivity, dead-end streets, and new cul-de-sacs.
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Transportation Goals
2
ENHANCE QUALITY OF LIFE
• Focusing on moving people safely and efficiently.
• Encouraging transportation design standards appropriate to the neighborhood context.
• Complying with state and local air quality standards.
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4

## Transportation Goals

### 3 Improve Economic Vitality

- Improving access to employment, commerce, education, and community resources.
- Providing for the efficient movement of goods and services.
- Strengthening the integration of transportation and land use.
- Providing and maintaining infrastructure capacity in line with growth or decline demands.
- Planning for Transit Oriented Development (TOD).

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## Transportation Goals

### 4 Focus on Implementation

- Maintaining the cleanliness and good repair of existing transportation infrastructure.
- Coordinating local and regional initiatives to leverage local transportation dollars.
- Upgrading streets and transportation infrastructure in older and substandard areas.

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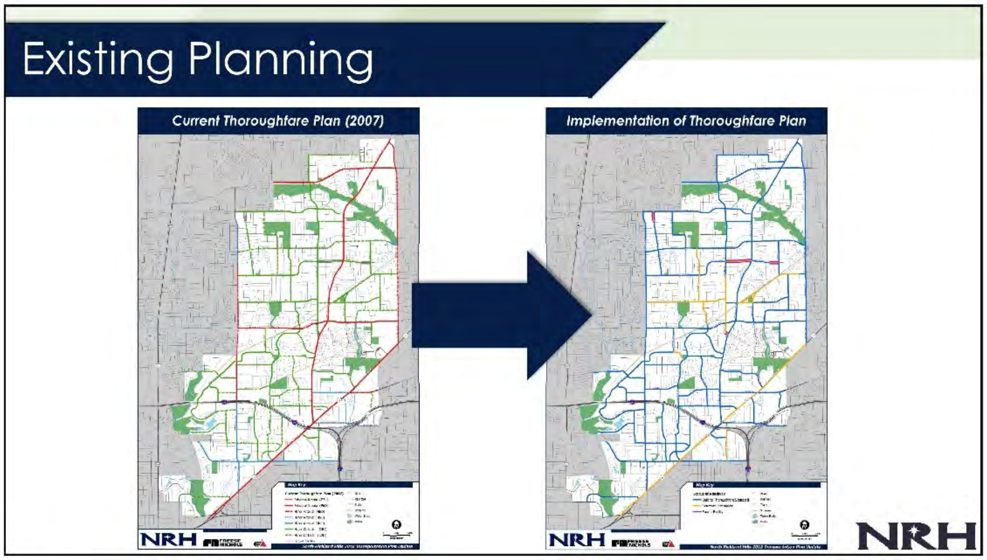
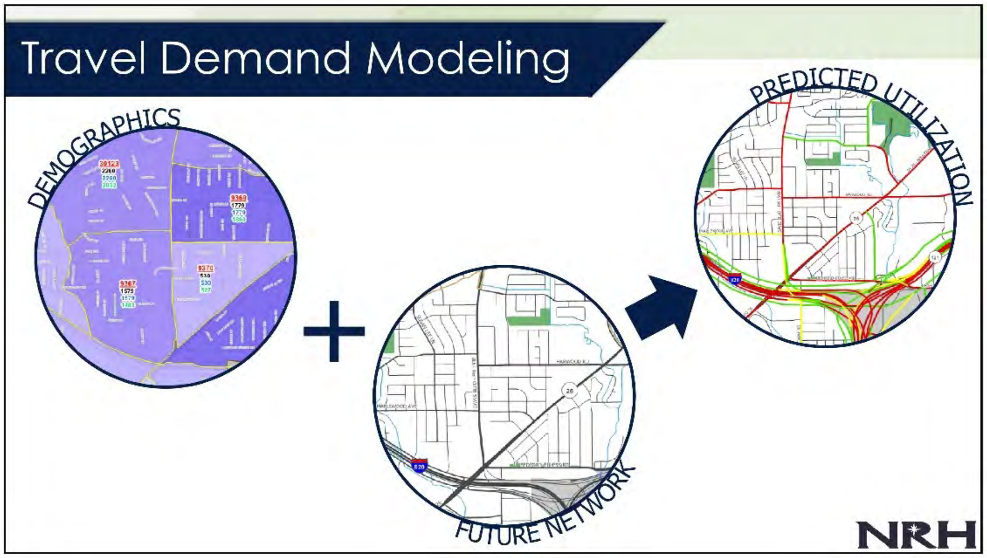
5


Existing Planning
Current Thoroughfare Plan (2007)
Implementation of Thoroughfare Plan
NRH


Travel Demand Modeling
DEMOGRAPHICS
+
FUTURE NETWORK
PREDICTED UTILIZATION
NRH

6

## Travel Demand Modeling

**Predicted Utilization**

- Not a crystal ball
- Must be held accountable to local context and character
- Informs sizing and future roadway network needs
- Informs active transportation typologies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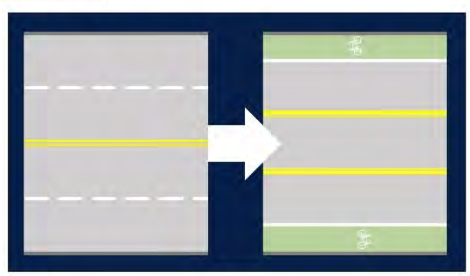
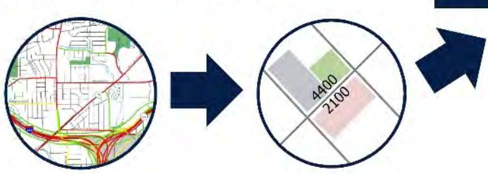
## Corridor Rightsizing

- Maintains vehicular travel needs
- Allows reallocation of space to people walking or cycling
- Aims to increase safety and access for all users
- Helps foster livability and support adjacent businesses






NRH

7

## Target Corridor Planning

*The **detailed evaluation** of localized roadway needs for specific target corridors using a **comprehensive approach** to consider all users and the local context.*

- Traffic Operations Analysis
- Active Transportation/Safety
- Land Use Context-Sensitivity
- Access & Circulation/Major Traffic Control Elements

NRH

## Target Corridor Planning

### Benefits:

1. Solutions specific to unique corridor issues
2. Improve fit between design, user needs, and physical context
3. Increase opportunities for greater numbers of people to benefit
4. Allow more effective use of financial resources in future

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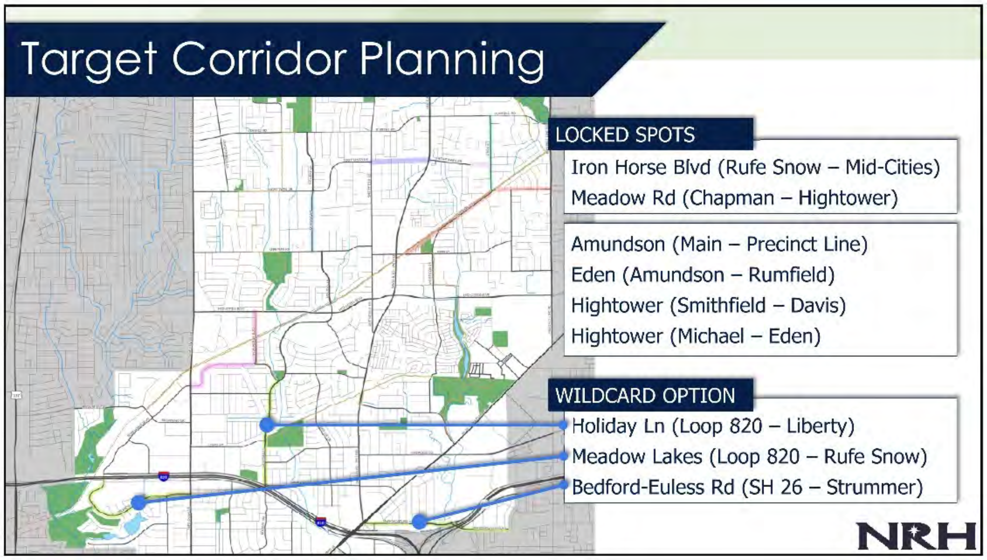
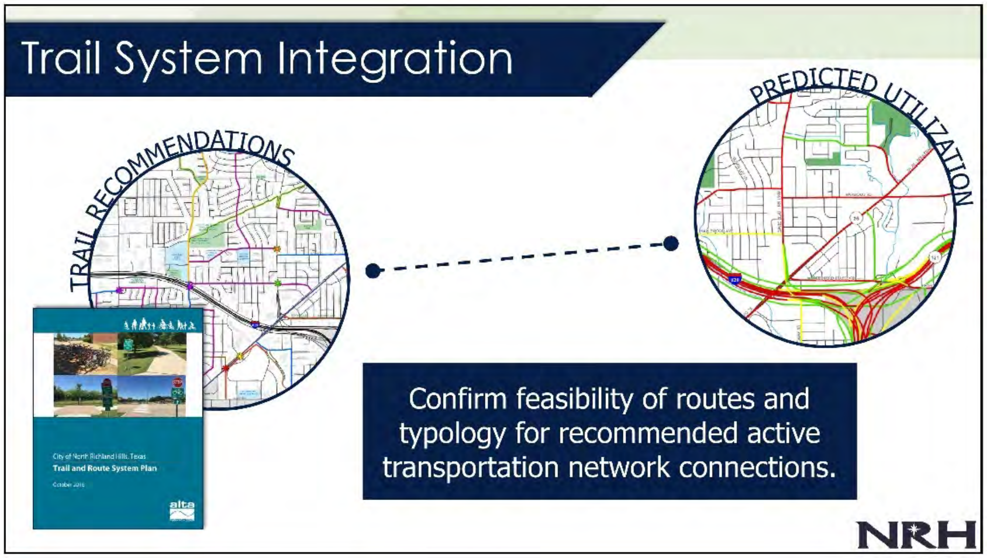
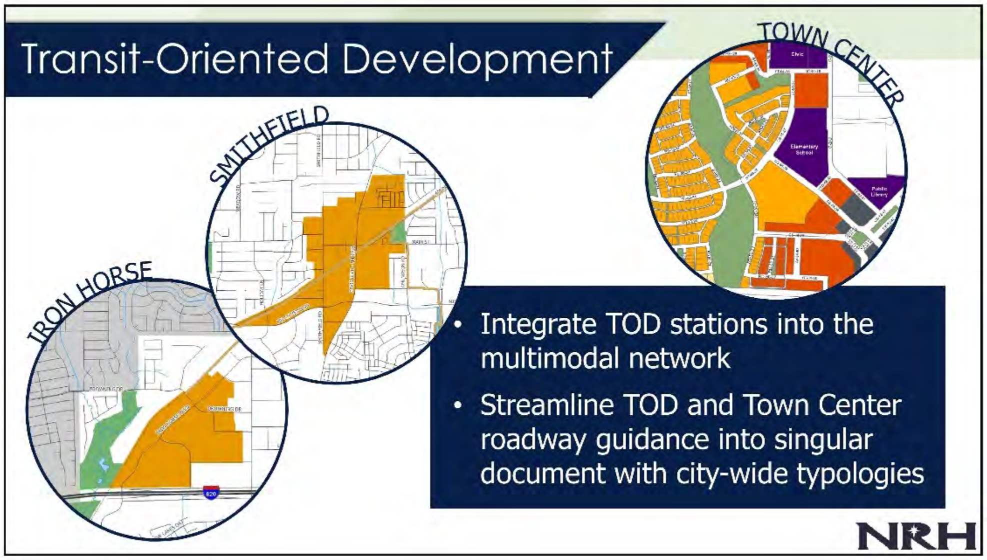
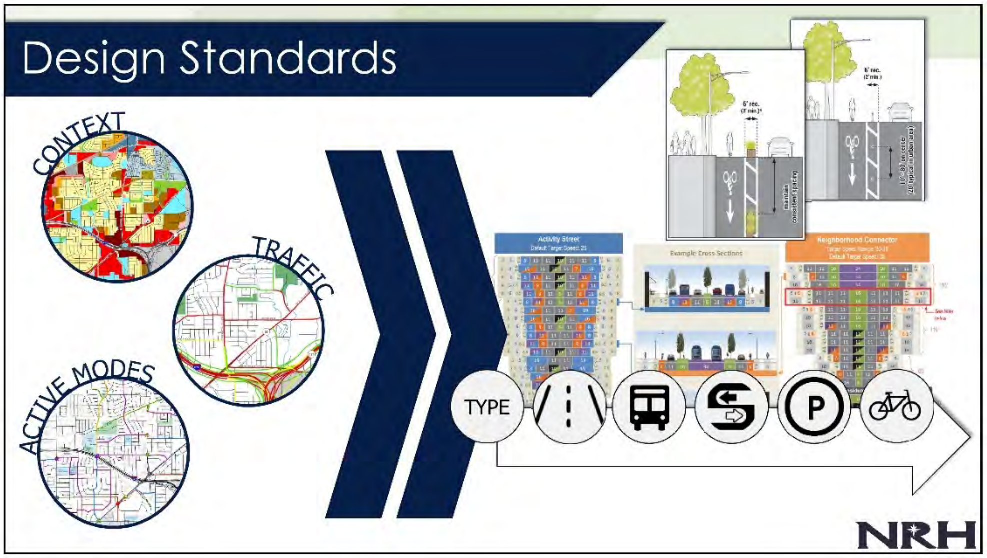
8


Target Corridor Planning
LOCKED SPOTS
Iron Horse Blvd (Rufe Snow – Mid-Cities)
Meadow Rd (Chapman – Hightower)
Amundson (Main – Precinct Line)
Eden (Amundson – Rumfield)
Hightower (Smithfield – Davis)
Hightower (Michael – Eden)
WILDCARD OPTION
Holiday Ln (Loop 820 – Liberty)
Meadow Lakes (Loop 820 – Rufe Snow)
Bedford-Euless Rd (SH 26 – Strummer)
NRH


Trail System Integration
TRAIL RECOMMENDATIONS
PREDICTED UTILIZATION
Trail and Route System Plan
Confirm feasibility of routes and typology for recommended active transportation network connections.
NRH

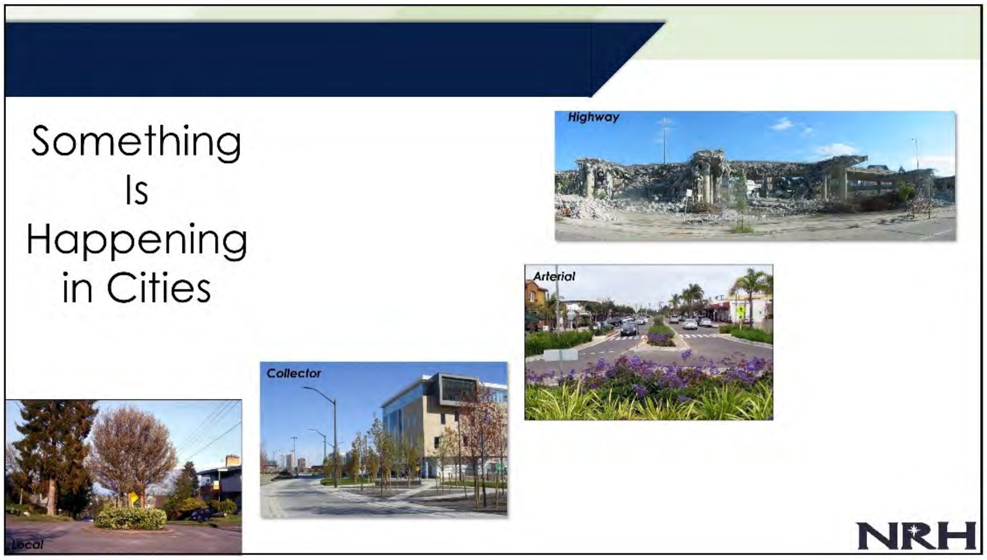
9


Transit-Oriented Development
SMITHFIELD
IRON HORSE
TOWN CENTER
Integrate TOD stations into the multimodal network
Streamline TOD and Town Center roadway guidance into singular document with city-wide typologies
NRH


Design Standards
CONTEXT
TRAFFIC
ACTIVE MODES
TYPE
NRH

10


Group Discussion (40 min)
Goals, Strengths & Opportunities, Issues & Needs


Something Is Happening in Cities
Highway
Arterial
Collector
Local
NRH

11

## What We Are Hearing

Authenticity
Pleasant for Making Short Trips
Transit-Friendly
Walkable
Proximity to Things We Want
Mixed Land Use
Connected Street & Trails
Bikeable
Universal Access
Attractive Public Realm
Comfortable & Safe
Choices
Places & Identity

NRH

12

## TOD?


## Rockville Pike, MD

Grosvenor-Strathmore Plan Changes Could Permit More Than 1,100 New Homes, 260-foot Buildings

A Maryland County Tries to Tame a Stretch of Suburban Sprawl

*Grand Makeover Is Set for Maryland Strip City*

By EUGENE L. MEYER APRIL 27, 2010

13

## Rockville Pike, MD

NRH

NRH

14


NRH


NRH

15

## Rockville Pike, MD

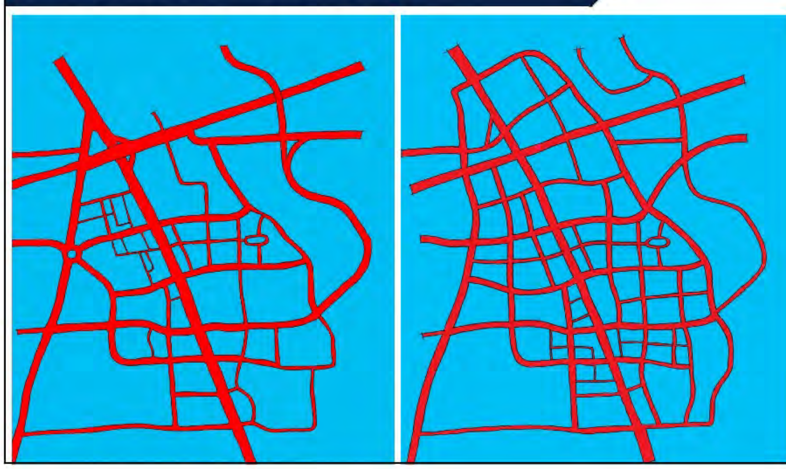
### Approach

**1. Collaborative Process**
Agencies, property owners, community…

**2. Adjust the "Bones"**
Street network / block structure
Trails, Open space

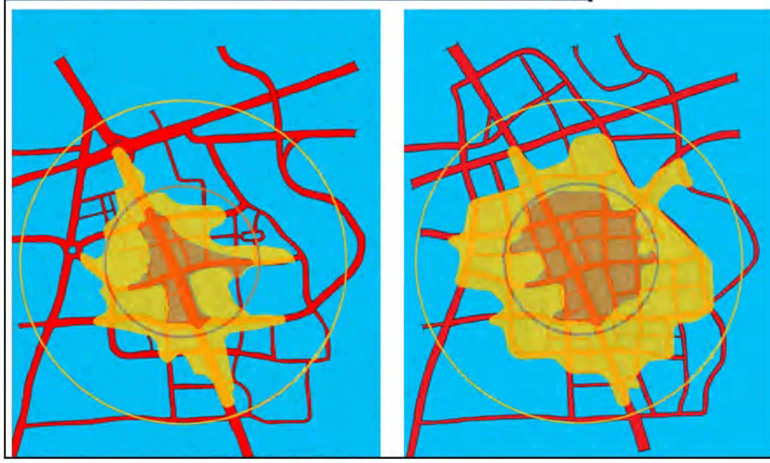
**3. Add the "Flesh"**
Building form, use, relationships
Street cross-sections, intersections, landscape, materials

## Rockville Pike, MD



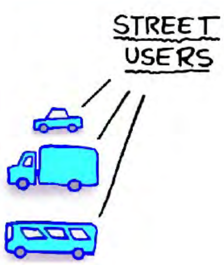
16

## Rockville Pike, MD



NRH

## Complete Street

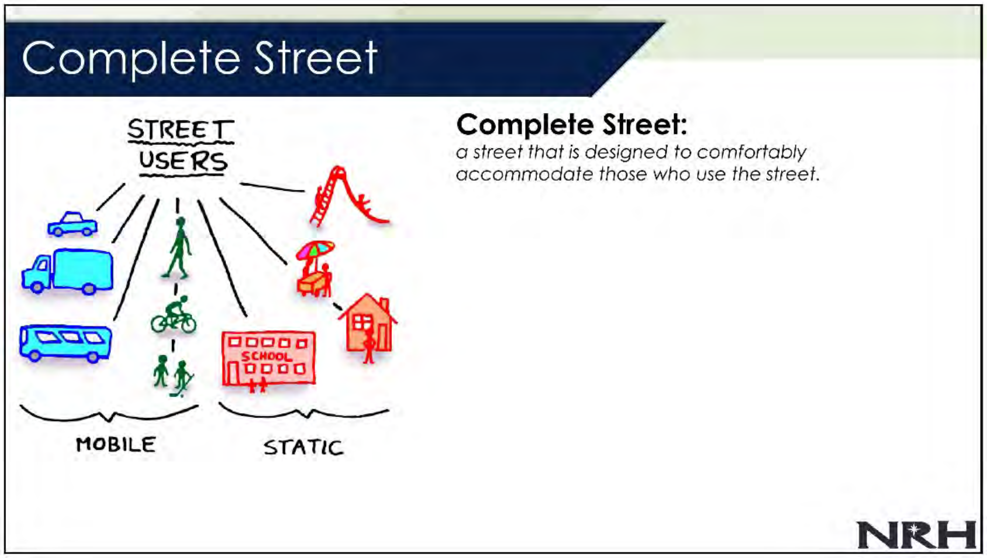



**Complete Street:**
*a street that is designed to comfortably accommodate those who use the street.*

NRH

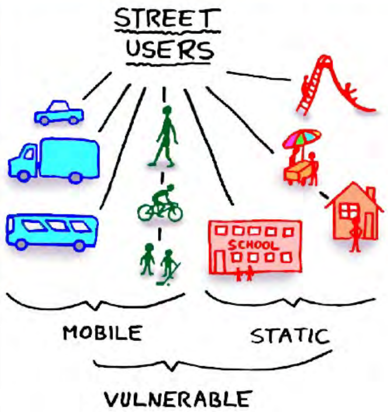
17


Complete Street
STREET USERS
MOBILE
Complete Street:
a street that is designed to comfortably accommodate those who use the street.
NRH


Complete Street
STREET USERS
SCHOOL
MOBILE
STATIC
Complete Street:
a street that is designed to comfortably accommodate those who use the street.
NRH

18

## Complete Street




**Complete Street:**
*a street that is designed to comfortably accommodate those who use the street.*

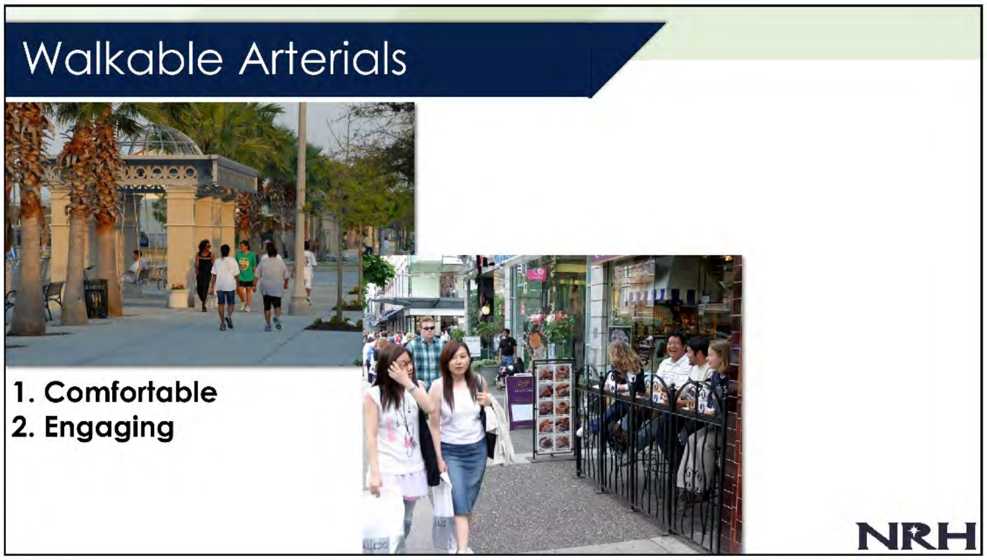
NRH

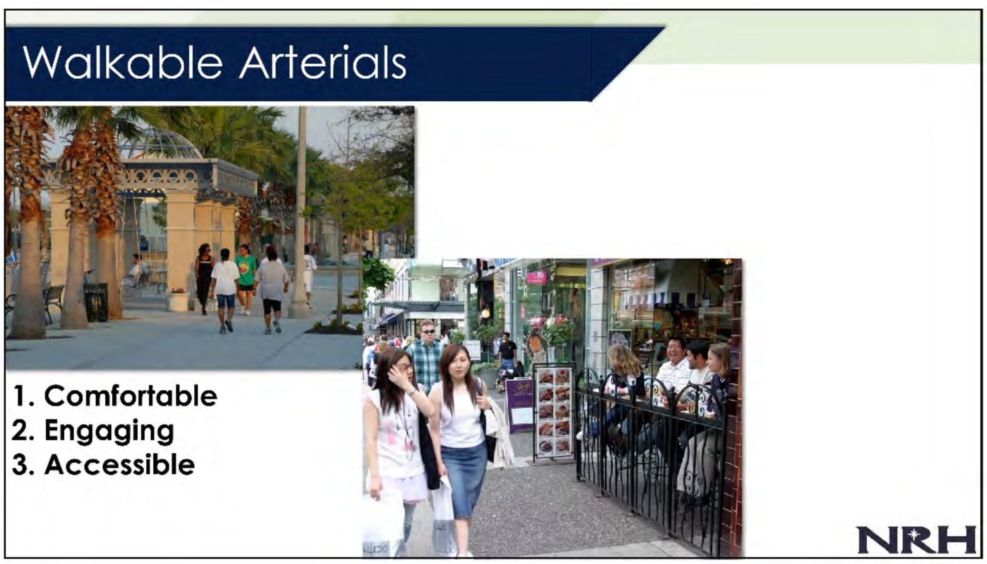
## Walkable Arterials

**1. Comfortable**

NRH

19


Walkable Arterials
1. Comfortable
2. Engaging


Walkable Arterials
1. Comfortable
2. Engaging
3. Accessible

20

## Walkable Arterials

1. Comfortable
2. Engaging
3. Accessible
4. Convenient

NRH

## Walkable Arterials

1. Comfortable
2. Engaging
3. Accessible
4. Convenient
5. Connected

NRH

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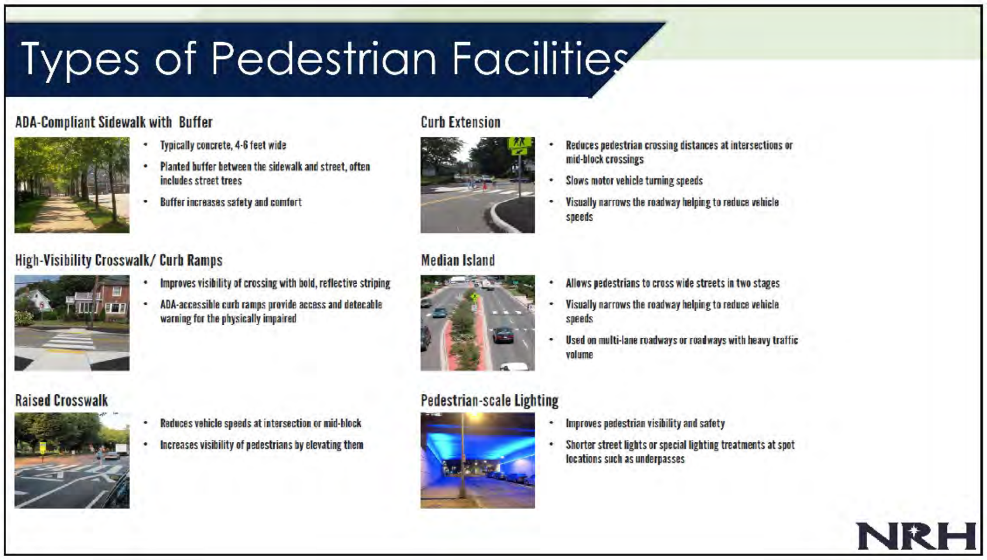
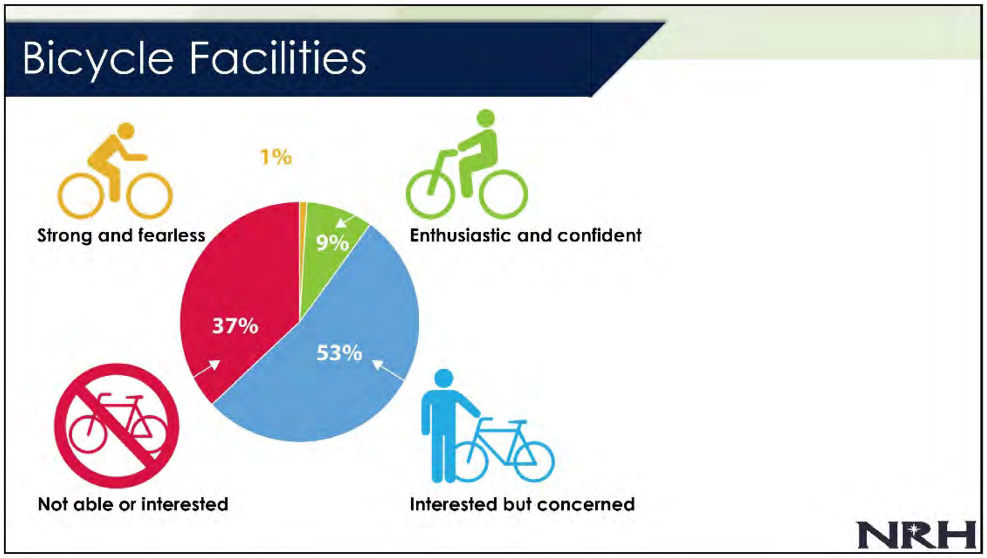

Types of Pedestrian Facilities
ADA-Compliant Sidewalk with Buffer
Typically concrete, 4-6 feet wide
Planted buffer between the sidewalk and street, often includes street trees
Buffer increases safety and comfort
Curb Extension
Reduces pedestrian crossing distances at intersections or mid-block crossings
Slows motor vehicle turning speeds
Visually narrows the roadway helping to reduce vehicle speeds
High-Visibility Crosswalk/ Curb Ramps
Improves visibility of crossing with bold, reflective striping
ADA-accessible curb ramps provide access and detectable warning for the physically impaired
Median Island
Allows pedestrians to cross wide streets in two stages
Visually narrows the roadway helping to reduce vehicle speeds
Used on multi-lane roadways or roadways with heavy traffic volume
Raised Crosswalk
Reduces vehicle speeds at intersection or mid-block
Increases visibility of pedestrians by elevating them
Pedestrian-scale Lighting
Improves pedestrian visibility and safety
Shorter street lights or special lighting treatments at spot locations such as underpasses
NRH


Bicycle Facilities
Strong and fearless
1%
Enthusiastic and confident
9%
37%
53%
Not able or interested
Interested but concerned
NRH

22


Bicycle Facilities
Strong and fearless
Enthusiastic and Confident
Interested but Concerned
NRH


Types of Bicycle Facilities
Shared-Use Path
• Path fully separated from a street, shared by bicylists, pedestrians and others
• Typically paved and marked with a center line
• May be along the roadway or on a separate alignment
• High-volume or high-speed streets
Bike Lane
• Marks dedicated space for bicyclists on the street with pavement markings
• Often on the right side of the street, and can be marked on one-way streets
• Medium- or low-volume streets
Cycle Track
• Provides bike-only facility physically separated from automobile travel lane and sidewalk
• Separated from traffic by curb, bollards, parked cars and/or other vertical elements
• Medium- and high-volume streets
Shared-Lane Marking ("Sharrow")
• Shows both bicyclists and drivers where bicyclists should ride on street for safe travel
• Reinforces that bicyclists belong in the lane and drivers must share the road
• Low- and medium-volume streets where bicycle lanes cannot be accommodated
Buffered Bike Lane
• Increases riding space and comfort by adding a painted buffer to standard bike lane
• Buffer located either between the bike lane automobile travel lane, or between bike lane and parking
• Medium- to high-volume streets
Signed Route
• Directs bicyclists to connecting routes
• Notifies drivers to expect bicyclists on the roadway
• "Share the Road" signs often used
• Low-volume streets in rural or local neighborhood contexts
NRH

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## Separated Bicycle Lanes

Comfortable Bike Infrastructure Results in Increased Comfort and Increased Safety

NRH

## Separated Bicycle Lanes


**Separated bicycle lanes are:**

1. Much Safer
2. More Comfortable & Appealing to More People
3. Good Investment Economically
4. Adaptable to Many Contexts
5. Growing in Popularity
6. Increased Mobility.

NRH

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# Safe Routes to School

INSTITUTE OF URBAN STUDIES

## What is Safe Routes to School?

The Federal Safe Routes to School (SRTS) Program was established in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users Act (SAFETEALU) in August, 2005. Safe Routes to School programs and initiatives seek to create safe, equitable, accessible, and convenient routes for children to walk and bike to schools. Additional goals include the increase in neighborhood awareness, walking and biking safety, the reversal of the upward nationwide trend in childhood obesity, and the promotion of physical activity and engagement. Programs are intended to utilize infrastructure enhancements to improve pedestrian mobility and safety (including bicyclists), as well as non-infrastructure strategies.

- ENGINEERING
- EDUCATION
- ENFORCEMENT
- ENCOURAGEMENT
- EVALUATION

NRH

# Safe Routes to School

INSTITUTE OF URBAN STUDIES

## Why is Safe Routes to School Important?

- Enhanced personal safety
- Increased physical activity and community health
- Improved traffic safety
- Better air quality
- Long-term cost savings
- Greater student academic achievement

NRH

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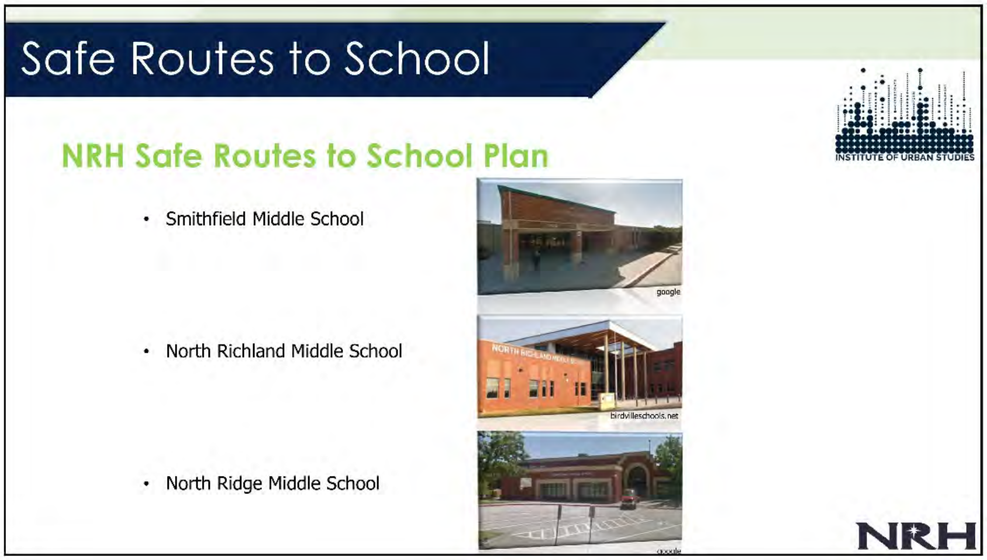
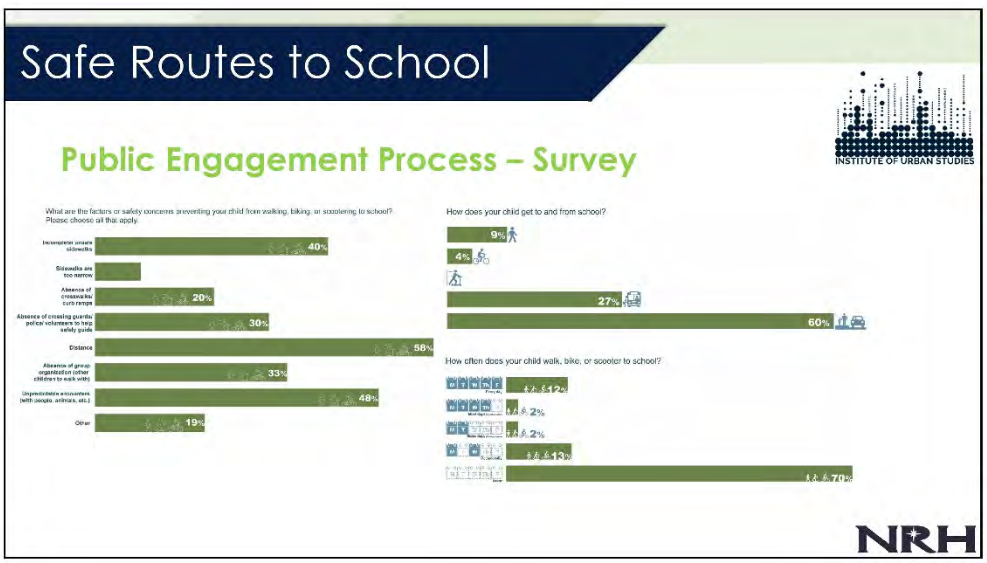

Safe Routes to School
INSTITUTE OF URBAN STUDIES
NRH Safe Routes to School Plan
• Smithfield Middle School
• North Richland Middle School
• North Ridge Middle School
google
birdvilleschools.net
google
NRH


Safe Routes to School
INSTITUTE OF URBAN STUDIES
Public Engagement Process – Survey
What are the factors or safety concerns preventing your child from walking, biking, or scootering to school? Please choose all that apply.
Incomplete/ unsafe sidewalks 40%
Sidewalks are too narrow
Absence of crosswalks/ curb ramps 20%
Absence of crossing guards/ police/ volunteers to help safely guide 30%
Distance 58%
Absence of group organization (other children to walk with) 33%
Unpredictable encounters (with people, animals, etc.) 48%
Other 19%
How does your child get to and from school?
9%
4%
27%
60%
How often does your child walk, bike, or scooter to school?
12%
2%
2%
13%
70%
NRH

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# Safe Routes to School

## Public Engagement Process – Survey

Q24 What is your definition of a safe walk to school for your child?

Rufe Snow Security Worry Lots of Kids Traffic Risk
Major Intersections Hightower Safe Supervised
Crossing Guards Mile Sidewalks
Clear Walk Minimal School Distance Adult Uneventful
Not having to
Cross Street

Q10 Please list major intersections that your child crosses/would need to cross on their way to school.

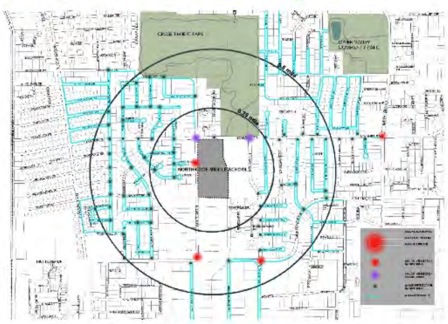
Loop 820 Riviera Briley Freeway Cross Highway 820
Holiday Blaney Rufe Snow Smithfield
Glenview Hwy Shauna School Service Road
Starnes

INSTITUTE OF URBAN STUDIES

NRH

# Safe Routes to School

## Infrastructure Analysis



North Ridge Middle School


North Richland Middle School

INSTITUTE OF URBAN STUDIES

NRH

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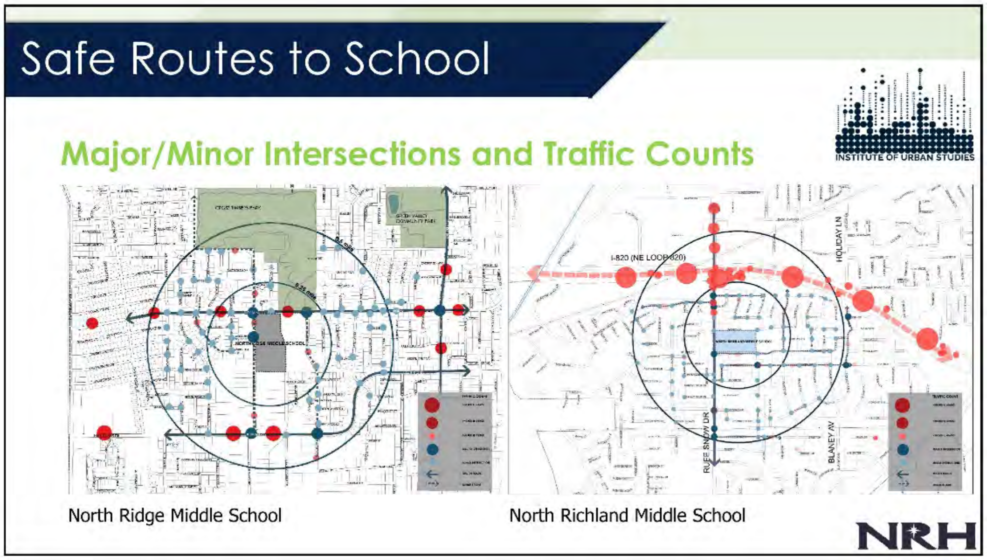
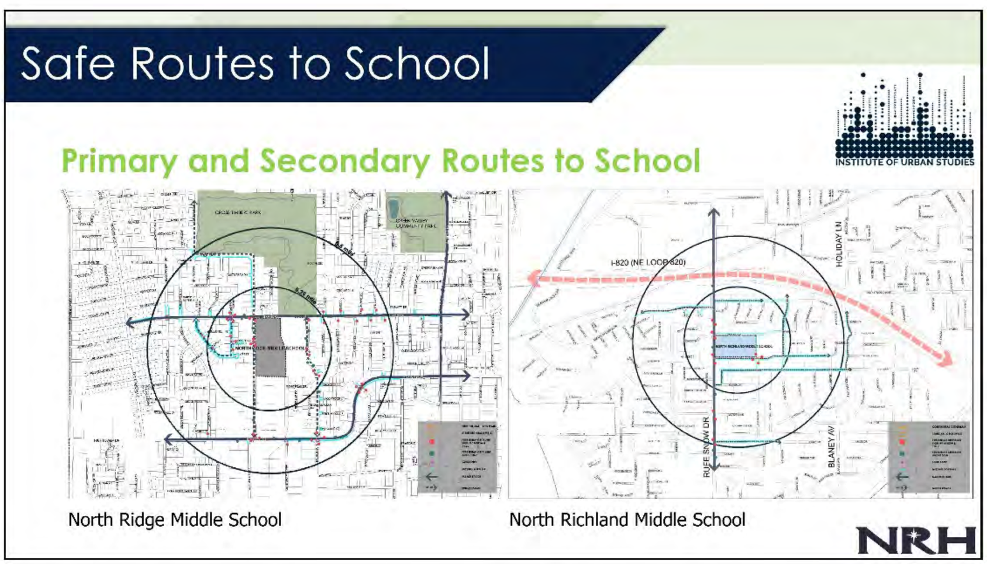

Safe Routes to School
INSTITUTE OF URBAN STUDIES
Major/Minor Intersections and Traffic Counts
I-820 (NE LOOP 820)
HOLIDAY LN
RUFE SNOW DR
BLANEY AV
North Ridge Middle School
North Richland Middle School
NRH


Safe Routes to School
INSTITUTE OF URBAN STUDIES
Primary and Secondary Routes to School
I-820 (NE LOOP 820)
HOLIDAY LN
RUFE SNOW DR
BLANEY AV
North Ridge Middle School
North Richland Middle School
NRH

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# Safe Routes to School

## Recommendations

- ENGINEERING
- EDUCATION
- ENFORCEMENT
- ENCOURAGEMENT
- EVALUATION

Before

After

NRH

# Safe Routes to School

## Continuation…

**ELEMENTARY SCHOOLS**

- Foster Village Elementary
- Green Valley Elementary
- Holiday Heights Elementary
- Alliene Mullendore Elementary
- North Ridge Elementary
- W.A. Porter Elementary
- Academy at C.F. Thomas
- Smithfield Elementary
- Snow Heights Elementary
- Walker Creek Elementary

**HIGH SCHOOL/OTHER**

- Richland High School
- Birdville Center of Technology and Advanced Learning
- Birdville High School

NRH

# Target Corridor Planning

**LOCKED SPOTS**

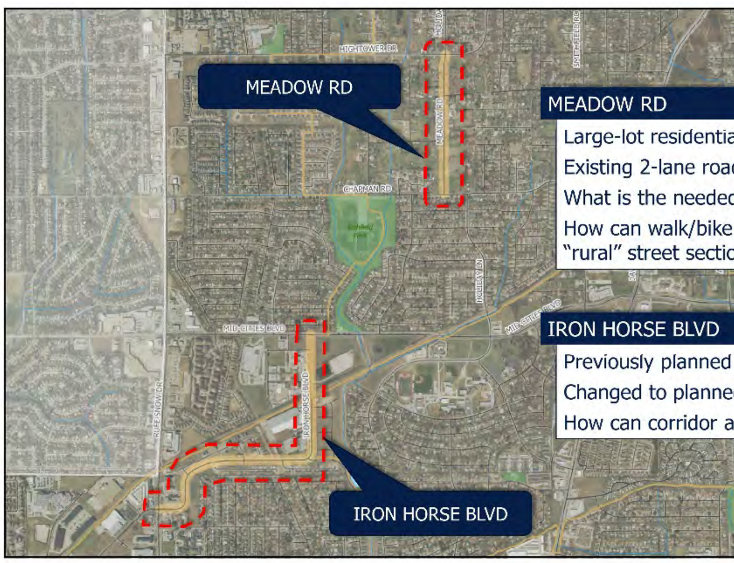
- Iron Horse Blvd (Rufe Snow – Mid-Cities)
- Meadow Rd (Chapman – Hightower)

- Amundson (Main – Precinct Line)
- Eden (Amundson – Rumfield)
- Hightower (Smithfield – Davis)
- Hightower (Michael – Eden)

**WILDCARD OPTION**

- Holiday Ln (Loop 820 – Liberty)
- Meadow Lakes (Loop 820 – Rufe Snow)
- Bedford-Euless Rd (SH 26 – Strummer)

NRH




**MEADOW RD**

- Large-lot residential/"rural preservation"
- Existing 2-lane roadway, ultimate 4-lane
- What is the needed sizing?
- How can walk/bike be incorporated in a "rural" street section?

**IRON HORSE BLVD**

- Previously planned for industrial
- Changed to planned residential & office
- How can corridor adapt to new context?

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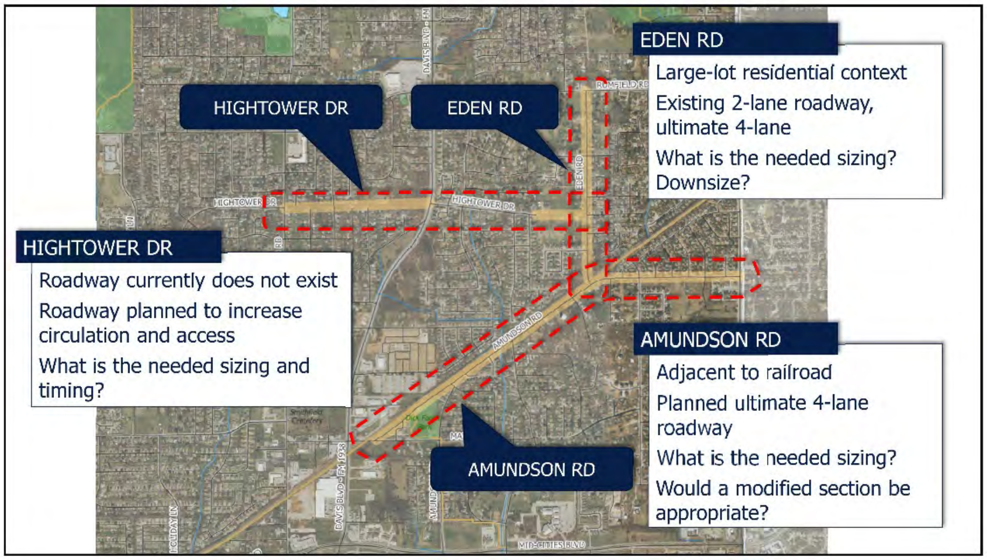
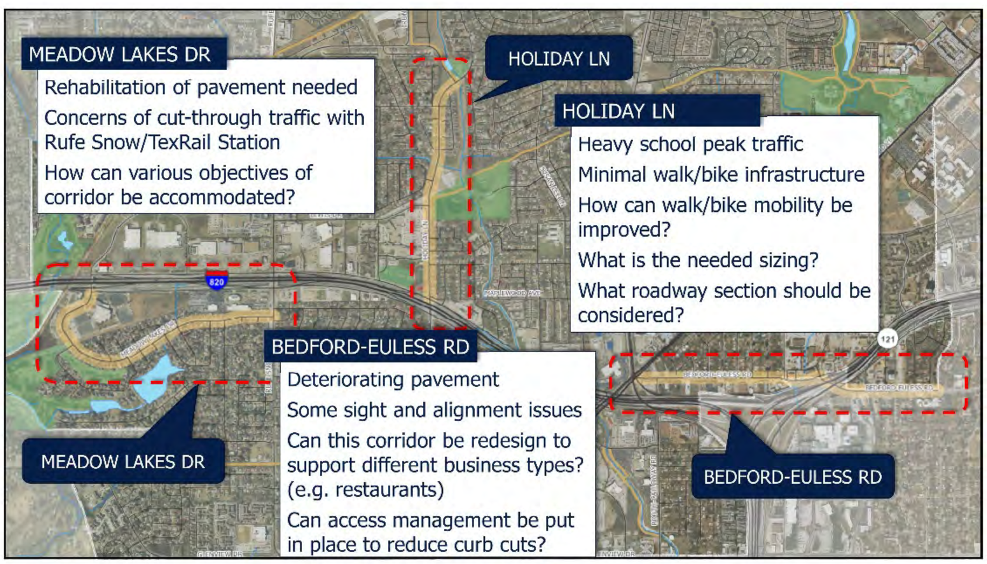

EDEN RD
Large-lot residential context
Existing 2-lane roadway, ultimate 4-lane
What is the needed sizing? Downsize?
HIGHTOWER DR
EDEN RD
HIGHTOWER DR
Roadway currently does not exist
Roadway planned to increase circulation and access
What is the needed sizing and timing?
AMUNDSON RD
Adjacent to railroad
Planned ultimate 4-lane roadway
What is the needed sizing?
Would a modified section be appropriate?
AMUNDSON RD


MEADOW LAKES DR
Rehabilitation of pavement needed
Concerns of cut-through traffic with Rufe Snow/TexRail Station
How can various objectives of corridor be accommodated?
HOLIDAY LN
HOLIDAY LN
Heavy school peak traffic
Minimal walk/bike infrastructure
How can walk/bike mobility be improved?
What is the needed sizing?
What roadway section should be considered?
BEDFORD-EULESS RD
Deteriorating pavement
Some sight and alignment issues
Can this corridor be redesign to support different business types? (e.g. restaurants)
Can access management be put in place to reduce curb cuts?
MEADOW LAKES DR
BEDFORD-EULESS RD

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Group Discussion (40 min)
Transportation Connections, Target Corridors


Summary of Input Heard

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## Small Group Meeting Notes

NRH Strategic Plan Committee and City Council Joint Work Session
January 22, 2018

Blue Square Group Notes

Small Group Attendees –
1. Mayor Oscar Trevino
2. Danny Beltran
3. Daniel Herrig (Freese & Nichols)
4. Paulette Hartman (staff)
5. Brent Barrow
6. Lee Knight
7. Skip Baskerville

Session 1 break outs

Goals
- Make sure to incorporate/maintain traffic calming especially in residential areas such as Meadowlakes. Lends to quality development and safety and security
- Don't want people to dread driving through NRH
- Maintain neighborhood/small town feel
- Be cognizant of where traffic gets "redirected" to alternative routes when there is heavy congestion
- Maintenance of existing street network is critical along with future
- View toward quality construction and cognizant of impact on future maintenance
- Connectivity between trails - northern to southern

Strengths and Opportunities
- What does NRH do well? New construction
- Strengths - TODs, existing trails, aren't trying to be something we're not, upkeep of streets, 20 minutes from anywhere, location of city hall, developments at Rufe Snow and 820, foresight in regulations related to development, school district, intentional timing of traffic signals
- Weaknesses / issues / needs -condition of Iron Horse Blvd and other major thoroughfares, Hightower future connection but consider the cut Grau it creates and impact on resident, speed on Bursey Rd, meadowlakes high speed cut thru to church highly used, Holiday & Meadow Rd not a straight connection, meadow Rd still rural with bar ditches (make like Douglas)

What does NRH need to avoid
- no need to have trail connections to all the businesses
- Need more trails in NW quadrant
- Need to create connections to trails south of the loop
- Plenty of trails behind Birdville HS

External factors impacting transportation plan
- Davis/Precinct/1938 - growth of traffic with Davis cut thru to 114 on increase in houses and businesses
- NTP and other connections to 2 lane rural streets in Colleyville
- Commuters accessing rail

Destinations hard to access

- Blvd 26/Davis/820 intersection
- Bedford Euless Road area
- Off ramp to NTE / airport freeway (need to follow up on this)
- Access to 121 from Blvd 26

Session 2 break out

Connections

- Iron Horse trail connection to Meadowlakes
- Signs to mark bike routes on streets already used for trail connections
- Mark trail connections that are on Rivas
- Chapman to Iron Horse at Mid-Cities Blvd
- Connect Robin's Way to North Electric Trail
- Directional signs on trails to say where they end up and distance to that point i.e. 0.5 miles to Davis Blvd
- Started bike lanes on Holiday
- Don't take away traffic lanes or parking to create bike lanes
- Smithfield - bike lane markings (shared not dedicated lanes)

TOD Connections

- good access to stations - trail and car
- Amundson/ Main connection - awkward but not heavily traveled
- Smithfield middle - bike lane markings

Target Corridors

- Amundson/ Eden / Hightower
    - No issue Amundson
    - Eden - neighbors like rural feel
    - Hightower (Smithfield to Davis) relieve traffic on Starnes, be cognizant of neighbors concerns, Eden will need to be widened when Hightower connects

Meadow/Chapman/Iron Horse (Mid-Cities to Rufe Snow)

- need sidewalks on Iron Horse
- More boulevard type to slow people down
- Changing character to residential
- Street lights and streetscaping on Iron Horse

Wild cards

- Bedford Euless - need exit from NTE, urban center type development
- Meadowlakes - cognizant of neighbor concerns, need cigarette with residents if studied, against improved access for vehicles from Iron Horse, need trail connections and lanes for bikes

**Small Group Attendees – Green Group**

1. Karen Russell, Strategic Plan Committee
2. Tim Welch, City Council/Strategic Plan Committee
3. Mike Benton, City Council
4. Mark Wood, Strategic Plan Committee
5. Eddie Haas, Freese & Nichols
6. Clayton Comstock, NRH Staff

**Goals/SWOT Discussion**

- Strengths & Opportunities:
    - New TEXRail Stations
    - Position in regional market; great access to everything
    - Bike-friendly signage and infrastructure
    - Traffic calming / speed reduction on certain corridors
    - Signal synchronization – "Smart Technology"
    - Off-street cross-access between properties
    - Bedford-Euless Road exit from SH 183
    - Land uses/walkability of TEXRail and TODs
    - Iron Horse trail connection to the south side
- Weaknesses, Issues & Needs
    - Speeds & curves on Davis Blvd
    - Bottleneck of the City – 26/Bedford-Euless/Davis/820
    - Bedford Euless corridor and Strummer Drive
    - Glenview between Loop 820 & Boulevard 26
    - Image of the City from the rail lines – need to clean it up
    - Gaps in the trail and sidewalk network
- Mark Wood: Certain corridors may focus on different goals than others.
- Tim Welch: The goals look appropriate. The goals need to be flexible and reflect an open and diverse demographic.
- Tim Welch: We need to be forward-thinking; golf carts on the trails like other communities would set us apart.
- Mike Benton: Would like to see more bicycle lanes.
- Mark Wood: Fort Worth is doing round-a-bouts everywhere. What do we all think of them?
    - Karen Russell: Likes them.
    - Mike Benton: They look good.
    - Tim Welch: It depends on the context. There are too many variables and unpredictability. They are better as part of a master plan like City Point.
    - Clayton Comstock provided examples where they may be appropriate for future further study in North Richland Hills, including Browning & Iron Horse, Starnes & Smithfield, Bursey & Smithfield
- Autonomous Vehicles / Technology

  - Precinct Line is a good corridor for synchronization of signals but requires coordination between cities.
  - Mike Benton: Other cities are getting into autonomous vehicles.
- Tim Welch: The exit off Loop 820 @ Bedford-Euless Road needs to be explored for economic development purposes for the Bedford-Euless corridor.
- Opportunities for the Transit and TODs
  - Karen Russell: Asked about overnight parking at the stations.
  - Karen Russell: Pointed out that the mix of land uses in a walkable environment will be a good thing.
  - Mark Wood expressed concern for the image of the city from the rail line. Code Enforcement should view the city from the trail/rail.
  - Mike Benton: Iron Horse should connect the trail system to the south.

**Discussion of Specific Corridors**

- Meadow
  - The Holiday/Meadow offset intersection has always been difficult. There was discussion as to why Meadow hasn't been and likely won't be aligned with Holiday.
  - Mark Wood: Meadow & Hightower would be a candidate for a round-a-bout.
  - The group agreed that, pending traffic data to support it, Meadow should remain a rural feel road but with designated bicycle and pedestrian facilities.
  - Clayton Comstock asked Eddie Haas to explain "Level of Service" to the group.
- Karen Russell stated that the Iron Horse & Liberty intersection needs more clarifying signage.
- Hightower Road
  - Mark Wood stated that Hightower west of Davis is not as important as Hightower connection east of Davis. Tim Welch agreed.

MINUTES OF THE TRANSPORTATION PLAN SMALL GROUP
(RED TRIANGLE ▲ TABLE)

JANUARY 22, 2018

| | | |
|---|---|---|
| Present: | Suzy Compton | Committee Member |
| | Tom Lombard | City Council Member |
| | Scott Turnage | City Council Member |
| | Tracye Tipps | Committee Member |
| | Justin Welborn | Planning and Zoning Commissioner |
| Staff Member: | Caroline Waggoner | City Engineer |
| Consultant: | Kevin St. Jacque | Freese & Nichols, Inc. |

Session 1

I. Goals

A. Expand Mobility & Access

i. Challenges: not just how to do it, but do we want to do it? Example: St. Joseph Estates where residents did not want to connect Meadowview Estates to Davis Blvd.

ii. Older neighborhoods: some have pedestrian connections from cul-de-sacs to adjacent tracts or ROWs. They support pedestrian connections to dead-ends.

iii. Low-hanging fruit: beaten down footpaths along roadways indicate the need for sidewalks.

B. Quality of Life

i. Discussion about sidewalks on older streets like Mackey Drive. The members feel that most residents come to appreciate sidewalks even if they didn't want them initially.

ii. The Hightower extension east of Davis to Smithfield may have an impact on the quality of life as a number of homes that back up to the future ROW and roadway alignment have a buffer today.

C. Economic Vitality
   i. Lack of sidewalks can prevent pedestrians from access to businesses. It was noted that sometimes it is too far to walk even if sidewalks are present.

D. Implementation
   i. Use grants whenever possible

II. Strengths, Opportunities, Issues and Needs

A. Strengths: vehicular access is really good, especially north to south through the City.

B. Weaknesses:
   i. Pedestrian routes north to south. Meadow is a good opportunity to allow for north-south pedestrian/bike connections.
   ii. Appearance of major arterials
      1. Mid-Cities needs additional landscaping
      2. Cost of retrofitting can be high
      3. Consider removing extra curb cuts
      4. Commercial redevelopment needs new design standards
      5. Access management: encourage shared driveways
      6. Projects need to be prioritized with right-of-way in mind.

III. Are other communities affecting us?

A. Traffic from the north (Keller, Southlake, etc.) heading to the freeway travels through NRH

B. Colleyville roadways are too small (example North Tarrant is a 6-lane that becomes a 2-lane road in Colleyville)

C. Richland Hills and Watauga are not keeping up with roadway projects. Not equal partnerships.

Session 2

IV. Connections

A. North-South pedestrian / bike connections needed

B. Finish Cottonbelt Trail from current dead-end at Browning across Loop 820 to Meadow Lakes Drive. They want to connect the trail to the Iron Horse Station sooner rather than later, and not wait for adjacent properties to develop in order to make that happen. Would be open to trail going along Browning and Iron Horse roadways to get the trail to the station. There was concern about the bridge over Loop 820 being dangerous for bikes / pedestrians due to recent accidents, but the group felt it was still a safer alternative than using the Rufe Snow bridge to cross the highway (for peds/bikes)

C. Is the parking lot across from Richland High School (owned by BISD) an opportunity for anything? School district rarely uses it. Consensus was it wouldn't provide anything substantial if it were converted to a trail area.

D. Bike Lanes on street:

   i. Buffered bike lanes are preferred

   ii. Shared pavement is an option

   iii. Holiday / Meadow is the best opportunity for north-south bike connection alignment

E. Smithfield Road: Should we make it narrower to push traffic to Davis?

F. Northeast Parkway may be a better connection between Smithfield and Davis than Hightower, and more feasible from a construction standpoint as it doesn't have the challenging topography to deal with.

G. The group would like an exhibit of missing sidewalks in arterial corridors so a plan can be developed to fill in the gaps. The feeling was that even a sidewalk not designed to full trail standards provides a good alternative route for non-motorists. The wider the sidewalk, the better.

V. Target Corridors

A. Bedford Euless: Not worth doing anything until ramp from the highway is reconfigured

B. Holiday: Discussed heavily throughout the workshop. Group is in support of Holiday becoming a better north-south bike route

C. Meadow Lakes: Traffic calming is needed. Speed tables?

**North Richland Hills Transportation Plan**

**Work Shop (Jan 23rd)**

**"Yellow Circle" Table**

Addie Weber (FNI)

Wendy (FNI)

Jerry Tyner (City Board)

Brian Crowson (City Board)

Mike Curtis (Staff)

Rita Wright Oujesky (Councilwoman)

**Goals**

The four (4) draft goals presented by Staff and the Planning Team (FNI) were acceptable and valid for the evaluation of the Transportation Plan ….. except, the group wanted more emphasis placed on "Maintaining the existing transportation infrastructure in good condition." The group believed this to be such a priority that instead of it being the last goal listed it should be one of the first things listed.

Possible Goals….

1. Expand; Mobility and Access by ….
2. **Focus on Implementation by maintaining the existing transportation infrastructure…..**
3. Improve Economic Vitality by ……….
4. Enhance Quality of life by ……

**General Concerns:**

a) Creating a plan that the city can afford to fund

b) Creating a plan that works for NRH

c) There seemed to be some concern that some of the actions listed under the goal was too general and perhaps didn't reflect the general population of the city. There wasn't much discussion about it just some looks when they were reviewing the draft goals.

**Strengths/Opportunities:**

1. Strong Economy
2. Great Location
3. Good Traffic Volume
4. Good Leadership

General Comments:

a) The group would like to see round-abouts where they are reasonable. Don't just show one if not practical.

b) Would like to see better access to the properties that are currently not developed or those that the city would like redeveloped. For example, the property along Bedford-Euless.

c) Better signal light timing, especially along Davis Blvd.

**Issues/Needs**

a) Group sees an issue with limited control on TxDOT roadways. Our Major corridors are mostly controlled by TxDOT.

b) Make sure TOD's are well connected to Trails. Iron Horse seems to be connected well but not Smithfield.

**General Concerns:**

a) Keep existing transportation infrastructure in good condition. This point was emphasized.

b) City and infrastructure is aging

When asked …. Who is your major competition, the group responded, the Alliance Corridor in Fort Worth and the Southlake Business District.

**Connections (Trails/TOD):**

1. Depends on the area of the city. Many collector streets will not be suitable for on-street walking/biking. (For example; North Tarrant Parkway, Davis Blvd., Precinct Line, Boulevard 26, Rufe Snow, Mid-Cities and Glenview). In NRH off-street trails seem to work better, just need better connection between the trails.

2. Better Connection needed from the North area of the Smithfield TOD (on city) to the South side of Rail Road tracks to connect to Cotton Belt Trail.

**General Questions/Concerns:**

a) Not sure if there will be a large demand for bikes as a mode of transportation. Seems to be more recreational.

b) Bike Share might work from the Iron-Horse Station to the Smithfield Station, but that would probably be it.

c) Drainage channels may be an opportunity to provide trail connectivity.

d) Smithfield Road may be a good option for better North/South traffic to and from Smithfield TODS.

**Target Corridors:**

a) Concerns about condition of existing streets and sidewalks

b) There was some support about all streets being concrete

c) Better signal timing

d) Better use of technology to improve traffic

e) Concerns were expressed about cut-through traffic along Meadowlakes when the Iron Horse Station opens. Especially with WAZE and other social media options become available to tell motorist the "fastest" path to take.

f) The pavement condition is poor along Bedford-Euless Road

**Wild Card Project:**

Holiday Lane – this project seems to offer more positive transportation benefits to the residents.

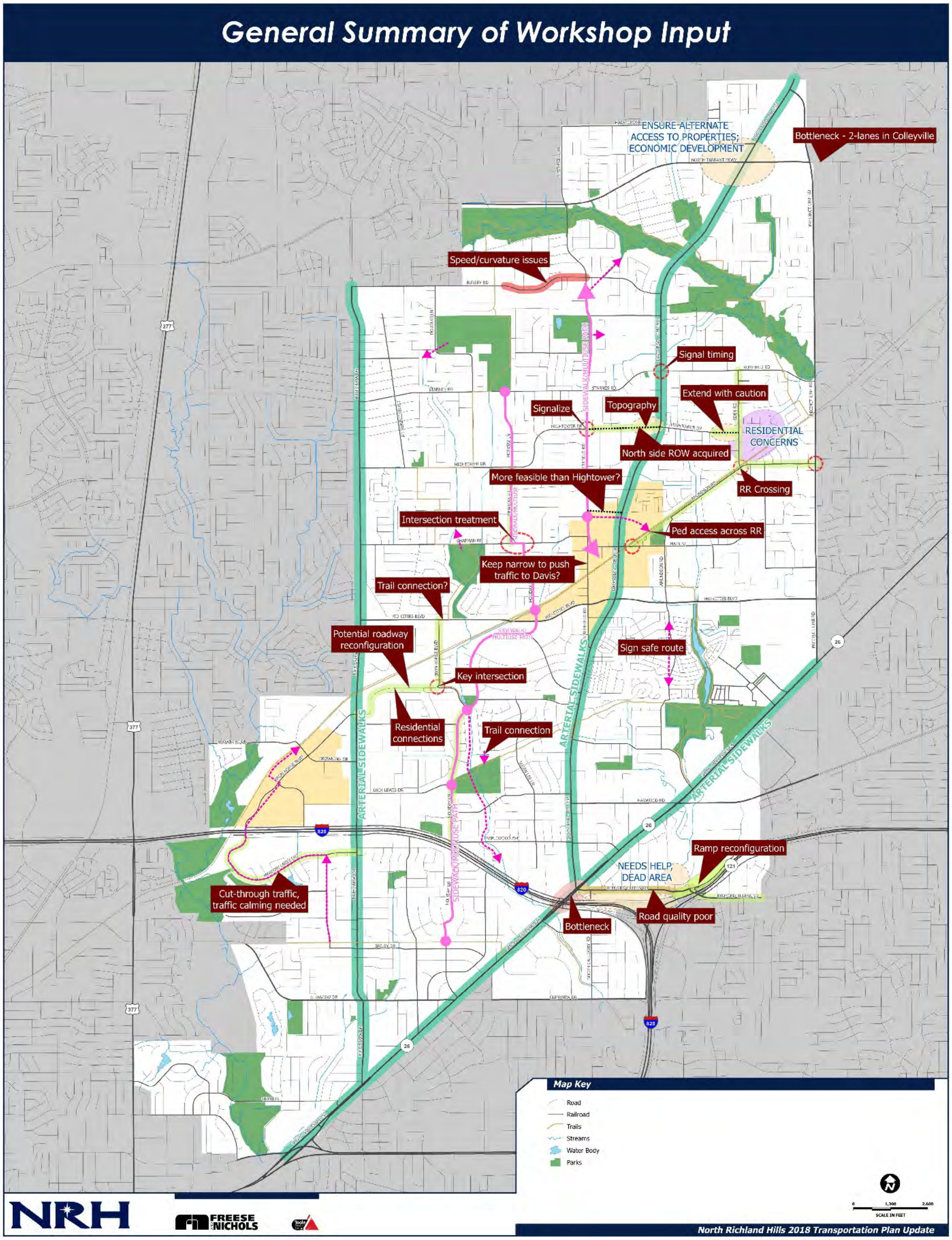
**General Concerns:**

a) Want a plan that can be utilized and will work for North Richland Hills

b) Don't think "National Standards" with regards to walk/bike needs apply to NRH

c) Traffic congestion along major corridors is a concern.

## Summary of Input Map



# APPENDIX F:

# ACTION PLAN DETAILS

The implementation matrix is a tool to identify, track and monitor the progress of the recommended strategies and actions. These strategies can only be achieved through a collection of stakeholders and partnerships, working together to promote the transportation goals of the community. For each action listed, the associated transportation goal and projected timeframe for the strategy to be implemented is shown.

This appendix lists the detailed actions identified in **Chapter E**. They have been curated to achieve specific transportation goals for the City. Some actions are policy-based and some are physical projects to be constructed. They are organized around five (5) focus areas:

- Operations & Maintenance
- Transportation & Land Use Interface
- Encouraging Multimodal Transportation
- Technology & Innovation
- Funding & Prioritization

## Timeframe

To assist with planning and implementation, the strategies are assigned a projected timeframe for implementation to commence. The assignment of short- and mid-range attributes to these items indicate the relative importance of their implementation. As opportunities for funding and partnerships arise, the relative importance of any one project may move within these relative priorities. The implementation plan should be flexible to allow such instances. The approximate established timeframes are as follows:

### *On-going or Annual*

Implementation of these strategies are done on an on-going or annual basis. These are typically activities involving monitoring or reporting transportation conditions.

### *Short-Range (2019-2020)*

Implementation of these strategies can begin soon after plan adoption. These strategies are considered “low hanging fruit” because they are more attainable and do not require large amounts of funding or special consulting.

### *Medium-Range (2020-2025)*

Implementation of these strategies will likely be just as important as Short-Range Strategies but are not as attainable within the first five years. They require planning to prepare but should be implemented in a five- to ten-year timeframe.

### *Long-Range (2025-2030)*

These strategies have no specific timeframe but should be continually addressed by City leadership. Long-Range projects may be further defined to identify interim Short-and Mid-Range projects to facilitate ultimate implementation. As conditions change, the status of these long-term projects should be adjusted.

# A. Operations & Maintenance

## A1. Monitor Roadway and Bridge Conditions

Continue the ongoing practice of evaluating roadway, bridge and major culvert conditions and recommending improvements based on specified thresholds. Identify funding for needed improvements to roadways and bridges/culverts, and design and schedule the improvements as funding allows. Bridge and major culvert conditions are evaluated by TxDOT every two years. This report from TxDOT should be evaluate by NRH to determine deficiencies and major needs.

## A2. Monitor Sidewalk and Trail Conditions

Conduct a similar though less rigorous pavement and bridge/culvert conditions assessment for the network of sidewalks and trails in NRH, and establish a threshold for improvement recommendations. Identify funding for needed improvements to sidewalks and trails and their bridges/culverts, and design and schedule the improvements.

## A3. Maintain Preventative Street Maintenance Program and Evaluate Program Effectiveness

The Preventive Street Maintenance Program provides the city with an effective street maintenance program to protect the public investment on all public streets, thoroughfares and public ways. This program consists of minor reconstruction, resurfacing, overlaying, slurry sealing and patching of public streets to preserve and extend the life of the pavement. This program keeps the city from having to pay higher costs for street repairs in the future and helps to extend the life expectancy of the pavement.

The City selects streets for the Preventive Street Maintenance Program using a pavement management system. The condition rating is based upon the deterioration of the pavement with additional input in street selection in the program from the latest citizen survey results and City Staff.

The NRH City Council approved $1 million in preventive street maintenance projects on May 14, 2018. The City should continue funding and implementing this program. The funding allocation should be evaluated over time to ensure it adequately addresses the long-term maintenance and rehabilitation needs of City streets.

## A4. Assess Annually the Traffic Congestion on Major Roads and Intersections

Select key arterial streets and intersections to monitor traffic data performance measures so as to compare roadway system performance over time. The performance measures should be readily measurable and meaningful such as peak hour traffic, queue lengths at intersections, and "in-stream" measurements of travel time and delay. Establish the performance measures and monitoring locations, establish a budget for monitoring of performance measures, conduct the counts and analysis and prepare annual reports of roadway system performance.

## A5. Assess Annually the Safety of Transportation

Continue to monitor the location, type and severity of motor vehicle crashes, including the location and severity of motor vehicle, bicycle and pedestrian crashes in NRH. Analyze the causal factors of the crashes and prepare mitigation measures to potentially reduce the occurrence of life-threatening crashes in NRH. Use a safe systems approach to proactively mitigate safety issues at similar locations. Establish the specific performance measures and annual comparison methodologies, compile the data and conduct the analysis, and prepare annual reports of the transportation system safety performance.

## A6. Assess Annually Active Transportation (Walking and Bicycling) Conditions

Maintain the sidewalk inventory for arterial, collector and local streets to annually assess the availability of safe routes to school for the target population of students within a one-mile radius of public schools in NRH. Develop and update the Safe Routes to School Plan for each elementary and middle school in NRH, adjusting for changes in student locations, and identify the needed improvements to the pedestrian and bicycle network for access to each school. Coordinate with other planned improvements to identify needed projects to provide sidewalks, ramps, crosswalks, pedestrian signal elements and other needed improvements for a safe route to school.

Include observations of bicyclists as part of the monitoring of traffic performance measures so as to gather data on the on-street bicycling activity over time. The performance measures should be readily measurable and meaningful such as miles of designated bicycle facility by type, number of bicyclists passing various control points, and other logical performance measures. Conduct regular surveys of bicycle rider origins, destinations, trip purpose and needs. Establish the performance measures and monitoring locations, establish a budget for monitoring of performance measures, conduct the counts and analysis and prepare annual reports of bicycling activity and bicycling network performance.

Some example performance measures below help measure progress towards achieving an active transportation vision. Progress on these measures should be documented and published annually for public review.

**Physical Activity Indicators**

- Conduct an annual active transportation survey to gauge the level of physical activity among residents
- Survey could also include questions about barriers to active transportation

**Semi-Annual Pedestrian and Bicycle Counts**

- After developing a baseline of pedestrian and bicycle activity, aim for year over year increases.

**Education Programming**

- Track the number of children and adults who participate in pedestrian and bicycle education programming every year.

**Active Transportation Funding**

- Track spending on Active Transportation programs and infrastructure projects.
- Maintain a database of grant applications and awards.

**Length of New Facilities Built**

- Document the construction of new bicycle and pedestrian facilities and monitor the expansion of the network over time.

## A7. Monitor Walking and Bicycling Utilization Barriers and Develop Mitigation Measures

Information generated in **Action A6**, along with ongoing Bicycle and Pedestrian Advisory Committee (BPAC) (**Action C6**), advocacy group feedback, staff observations, and bicyclist feedback, will provide information needed for the monitoring of sidewalk and street crossing safety, bicycling accommodations, and network performance. On an ongoing basis, address issues of immediate concern to the walking and bicycling community and implement strategic elements of the Bicycle Plan.

Local law enforcement agencies should also be engaged for mitigation measures as they can support active transportation through regular enforcement of traffic laws. They can also share their knowledge with students at bike rodeos that teach basic bike handling skills in a controlled environment.

## A8. Monitor Intersection Traffic Operations and Develop Mitigation Measures

Information generated in **Action A4**, along with ongoing staff monitoring of signal operations and citizen feedback, will provide information needed for the monitoring of intersection performance and identification of issues. On an ongoing basis, prepare congestion mitigation plans and designs, submit projects for local and regional congestion mitigation funding, and schedule construction.

## A9. Monitor Transit Usage Barriers and Develop Mitigation Measures

Trinity Metro ridership data and surveys and NRH citizen feedback will provide information needed for the monitoring of the TEX Rail transit system performance. This feedback along with input from the BPAC (**Action C6**) should identify barriers to the use of the transit system. On an ongoing basis, promote transit access plans and marketing of the service.

## A10. Traffic Signal Coordination and Corridor Optimization

With traffic signals in-place throughout the NRH transportation network, the City should continue to manage traffic signal timing and coordination. This includes optimizing traffic flow on major mobility corridors to reduce delay through signal operations. The annual citizen survey will serve to input key intersection issues along with data gathered by City Staff. Emergency services should also be considered in the upgrade and management of traffic signal systems to minimize response times. Identify budget for the necessary equipment and communications network connections for continued enhancement of traffic management strategies and implementation as funding allows.

# A11. Manage High-Demand Parking

As communities work to gain walkability and bikeability, and build-in sustainability to their infrastructure, parking for motor vehicles often becomes a sticking point. Cities everywhere are grappling with questions about where parking is located, how much it costs, and how these and other factors such as ride hailing services and changing demographics will affect parking demand. While no one can predict the future, many cities are already taking a proactive approach to reducing the demand for parking. Doing so not only frees up space within the public right-of-way for wider sidewalks and bicycle facilities, but can also help shift travel to other modes, reducing greenhouse gas emissions and improving public health.

Urbanizing areas, like Iron Horse TOD, Smithfield TOD, and HomeTown, can create high demands for parking leading to a perception of insufficient parking supply though ample parking is located in the nearby vicinity. NRH should identify and develop parking management strategies within areas of higher density or trip generation. Strategies should include smart parking management policies to reduce excessive traffic circulation and to set standards for supply ratios that might encourage alternative modes of transportation such as: transit, shared parking, on-street parking provisions, bicycle parking, parking management technologies, parking districts. NRH should continue to monitor high-demand on-street parking locations and implement parking management strategies, including identifying management districts to operate and maintain the application of these parking strategies.

## Best Practices for Managing Existing Parking

### *Smart Meters*

Smart meters provide more convenience for users, more flexibility for pricing, and the ability to collect parking data. Compared to single space meters, multi-space meters reduce clutter on the street.

### *Variable Pricing*

Variable pricing requires rates to be raised when spaces are difficult to find, for example along commercial corridors or during peak hours, and lowered when demand is low, such as in neighborhood business districts at off-peak hours or downtown during weekends. Variable pricing can also be used during special events to encourage people to take transit, walk, or bicycle. Variable pricing should be considered when on-street parking rates are substantially lower than garage or off-street parking rates in the area to reduce the incentive for drivers to circulate and find the best deal. Pricing parking according to location and time of day can create unintended spillover into adjacent neighborhoods or districts if not implemented and managed properly. Parking policies may require coordination amongst adjacent districts to ensure community concerns of overflow parking are addressed.

### Repurposing Existing Parking

One motor vehicle parking space can provide about 10 to 14 bicycle parking spaces and four to five motorcycle or scooter spaces, resulting in a more inclusive use of the space. When combined with online access, these alternative modes of travel can have the personalization, flexibility, and convenience of car-ownership; and the cost-efficiency, environmental awareness, and health benefits of public transportation.

### Strategies to Reduce Demand for Parking

- Zoning changes that allow for more shared parking
- Parking cash out programs
- Providing free or discounted transit passes
- Priority parking for carpools or vanpools
- Provision of bike parking and amenities such as lockers and showers
- Car sharing programs (e.g. Zipcar)
- Shuttle services from nearby transit stations or satellite parking lots
- Ride-matching services that help people identify potential carpool or vanpool partners
- Guaranteed ride home services that allow employees who do not bring a car to work to get a free ride home (usually via taxi) if they need to stay late, or if they need to leave unexpectedly in the middle of the day
- Charge for on-street parking in busy areas, or increase the cost of parking to reflect the demand for parking (see charging for parking).
- Charge for student parking at high schools, especially if there is a fee for riding the bus.

## A12. Develop Sidewalk and Trail Maintenance Program

Similar to **Action A3**, continued maintenance and rehabilitation of the City's sidewalks and trails is important for their continued use. As the City completes the sidewalk network, it should also reinvest in the existing pedestrian network to keep these facilities functional.

NRH should develop a Sidewalk and Trail Maintenance Program which includes an avenue for citizen input of issues as well as an ongoing funding source to respond to needs. The annual pavement condition evaluation could serve as a starting point to assess sidewalk conditions concurrent with roadway pavement condition.

## A13. Create Parking Management Districts for TODs and Urban Villages

To facilitate the orderly and logical collaboration of off-street parking lots in the Iron Horse and Smithfield station transit-oriented developments and urban villages, such as HomeTown, parking management districts should be created as a managing authority to coordinate parking supply and usage constraints and to add new parking supply in these special management districts. Allocate start-up budget and staffing to get the authority organized and operational. The parking management district and/or authority would manage the revenues from parking meters and support development of needed parking improvements. The authority would collaborate with area merchants to establish a validation program. A master plan for future parking provisions for the district would be developed, in collaboration with area merchants and property owners, and financial plans prepared for their implementation.

## A14. Promote Public-Private Partnerships (PPP) for the Upkeep and Embellishment of Non-Roadway Elements within ROW

Transportation system users and adjacent developments they serve are in a position to be both impacted by and benefit from the conditions of the transportation system. NRH already has an active adopt-a-street program, empowering neighborhoods and citizen groups to provide enhanced litter removal, landscaping and even extension of neighborhood surveillance to specific streets of the city. Expand and enhance the public-private partnerships (PPP) to allow private citizens, groups and businesses to physically and financially support their interests in the upkeep of specific aspects of the transportation system serving NRH, including streetscape on arterial roadways, trail network enhancements, and TEX Rail passenger rail stations.

# B. Transportation & Land Use Interface

## B1. Educate Residents on Complete Streets, Rightsizing, and Their Benefits to the Community

Upon adoption of the Transportation Plan, develop educational and public awareness campaigns to the safety, health, and functional benefits of complete streets, rightsizing, and multimodal transportation infrastructure. The League of American Bicyclists looks for the following educational activities when reviewing Bicycle Friendly Community Applications:

- Public awareness campaigns using Public Service Announcements and other media to make both motorists and cyclists aware of their rights and responsibilities.
- Motorist education program for professional drivers.
- Regular opportunities for adults to develop their bicycling skills, including riding in traffic.
- Bicycle education opportunities for children and youth outside of school through bike rodeos, youth recreation programs, helmet fit seminars or a Safety Town program.

### Bike Month

One concept would be for the City of NRH to run a week-long Green Commute Challenge, involving 10-15 of the local employers. Every employee has a chance to score points for their team, based on how green their commute is to and from work. To build on this, there are many other nationwide bike events that can involve smaller businesses as well.

Bike to Work Day and Bike Month are annual campaigns, usually held in May, to encourage people to bicycle to work and for other trips. These campaigns often include highly publicized rides, stations with information about bicycle commuting, and giveaways. Bike Month often involves the participation of local elected officials and other community leaders to generate publicity and show support for traveling by bicycling. Given the access to a high number of visitors from the region, the city should consider hosting a bicycle race during Bike Month to build momentum and enthusiasm for bicycling.


### Mayor's Monthly Bike Rides & Walks

The NRH Mayor hosts monthly bicycle rides and walks to encourage social interaction in the community and promote these active transportation options. As family friendly events, these are great opportunities to engage the residents and businesses in NRH and highlight the extensive networks.

## B2. Monitor Neighborhood Traffic Calming Program

The City should continue to monitor the Neighborhood Traffic Calming Program in place to address citizen concerns for neighborhood speeding or unsafe driving behaviors. Assess the past successes and challenges the City has had with traffic calming and update the program and process, as needed

## B3. Develop and Adopt a Complete Streets Policy, Program, and Guidelines

After adoption of the updated Transportation Plan, a Complete Streets policy should be drafted and adopted supported by a set of guidelines for its application and creation of a complete streets program of related departmental processes and procedures for implementation. Los Angeles County, California had developed a robust Policy on Livable Community and associated Guidelines, which can be incorporated in whole or in part into any community program with proper notification and acknowledgement of the authors.

## B4. Update Engineering Design Standards for 2030 Transportation Plan Design Decision Process

Update the design standards and process contained in the existing *Public Works Design Manual* to reflect the recommendations of the 2030 North Richland Hills Transportation Plan. Of particular note are the configurations of the Target Corridors discussed in the Plan, street and lane widths, and the integration of multimodal components into the public ROW.

## B5. Incorporate Neighborhood Placemaking in Transportation Corridor Urban Design Program

Cities are constantly changing and embracing placemaking or “tactical urbanism” approaches to street safety and neighborhood improvement projects. Large scale urban transformations, such as museums, parks, and stadiums are high profile projects that typically generate attractive returns. However, such projects require a substantial investment of time and a considerable reserve of social and financial capital. Additionally, the long-term economic or social benefit of these projects is not always guaranteed. Through the incremental approach of placemaking and “tactical urbanism,” NRH can add identity and low-cost responsiveness to transportation implementation in the community. This initiative, particularly focused on transportation corridors, should be incorporated into a larger urban design program in the city.



Tactical urbanism is a term used to describe a collection of low-cost, temporary changes to the built environment intended to improve local neighborhoods and public places. From plazas and parklets to open streets events and piloting complete streets designs, these initiatives are a deliberate, phased approach to instigating change in the public realm. Placemaking or tactical urbanism efforts can occur through formalized strategies, such as New York’s Pavement to Plazas program or through small-scale projects that are rapidly implemented such as with San Francisco MTA’s commitment to complete at least 24 traffic safety improvements within 24 months of adopting the Vision Zero framework.

# C. Encouraging Multimodal Transportation

## C1: Accommodate Pedestrian and Bicycle Access during Construction in Public ROW when Feasible

Roadway and land development construction can affect normal traffic patterns by removing or reducing the width of sidewalks, bikeways, and motor vehicle travel lanes. In some cases, a priority placed on maintaining motor vehicle travel lanes comes at the expenses of sidewalks and bikeways. This can result in bicyclists traveling in motor vehicle lanes and pedestrians forced to make extra crossing to travel around a closed sidewalk. Texas law requires bicycle and pedestrian pathways be maintained in construction zones.

The City should develop streamlined procedures and standard applications to facilitate ability of private developers and utilities to collaborate with the City regarding the need to close lanes and sidewalks for construction and attain concurrence on the needed vehicular and non-motorized accommodations during construction. Provide for enhanced monitoring and enforcement of these concurred provisions during construction.

Local enforcement is needed to ensure that the accommodations occur from the beginning of the project and each day of the project. A clearer policy regarding maintaining bicycle and pedestrian pathways through work zones may be helpful. For example, Nashville, TN requires contractors to submit a traffic management plan that includes bicyclists and pedestrians for projects of less than 20 days and 20+ days. Key elements of the policy are: project length; adopted guidelines; compliance with ADA; approval process.

### Other Government Examples

Seattle, WA provides regulations and guidance on work in the public right-of-way and its impact on pedestrians and bicyclists. Their Traffic Control Manual includes a chapter on pedestrian access during construction. Further, the City offers an online base map and GIS layers for developing a traffic control plan for construction projects.

## C2. Actively Engage in Planning of Regional Transit by Trinity Metro

Trinity Metro completed a Transit Master Plan in 2015, including envisioning key services in NRH like TEX Rail, a new transit center, Rapid Bus, and frequent bus routes. Keep in contact with Trinity Metro staff regarding the advancement of the Master Plan and report back to city leaders. City leadership should participate in higher level regional discussions of transit service between Tarrant County cities as needed.

## C3. Complete Missing Sidewalks and ADA-Compliant Ramps

There are gaps in the sidewalk network on the arterial and collector roadways that are anticipated to need to be completed by the City and other gaps that will be completed as development in that area occurs. These gaps and missing sidewalk ramps are particularly troublesome to the mobility impaired. Prepare designs, idenitfy funding, and schedule construction of the sidewalks and ramps identified for City implementation. Consider the significance of those sidewalk segments that are identified for construction as part of future development and determine whether any of those should be facilitated or accelerated by city participation. The higher priority area for focused implementation is in the commercial and activity centers and within one-half mile of schools. Budget for, design, and implement the construction of sidewalks and ramps to complete the sidewalk network on arterial and collector roadways.

Set annual goals for the completion of sidewalks and ramps in NRH and establish a budget for design and construction of the needed improvements. Monitor and report on the completion of identified gaps and deficiencies in the sidewalk system.

### Provide Pedestrian Accommodations on Local Streets

Many local streets do not have sidewalks in residential neighborhoods. Establish a policy that all neighborhood streets should be walkable for the safety, health and vitality of the city. Complete the inventory of sidewalks (**Action C5**) to include local streets. Identify any local streets that are acceptable to not have sidewalks. Work with residential neighborhood groups to identify needed pedestrian accommodations along streets in their neighborhoods and prioritize their implementation. Establish and/or fund a Neighborhood Sidewalk completion program to match citizen funds, Safe Routes to School funds, Alternative Transportation funds, Block Grants and other potential funding to build the missing and needed sidewalk improvements.

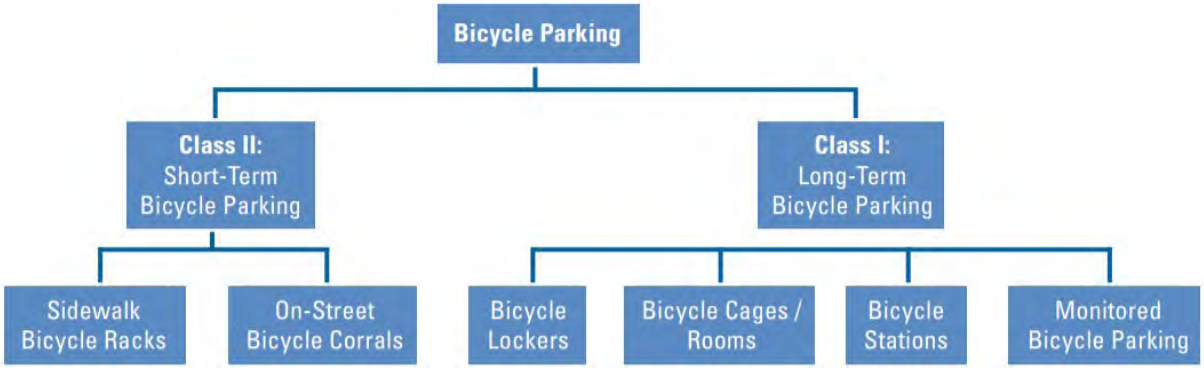
# C4. Develop Parking Standards for Bicycles and Update Ordinance

Bicycle parking and other end-of-trip facilities are essential elements in a bicycle transportation network. For example, people need to know that there will be a safe place to lock their bicycle at the end of their trip. The type of short-term and long-term bike parking also affects the placement. The NRH parking requirements should be updated to include provisions for bicycle parking in new development.

## Bike Parking Locations

Bike parking should be located anywhere it will be used without affecting other uses or ADA compliance. As the demand for bicycle parking increases, the need to identify bicycle parking space also increases.

Variations in each type of parking are shown in the diagram below from the San Francisco MTA Bicycle Parking Guidelines. (A third category is temporary event parking.) Short-term parking should be provided near building entrances and close to bikeways. Bike corrals (groups of racks) may be provided in on-street parking spaces instead of car parking, or on curb extensions. Long-term parking should be in well-lit and visible locations close to the ground floor of a building (e.g., within one story of ground level).




## Bike Parking Quantities

There should be enough bike racks or lockers to satisfy demand, so bicycles are not parking where they should not. Guidelines for determining the number of parking spaces by development type generally are:

- For schools – based on enrollment and staffing
- For residential developments – based on number of units
- For retail or mixed use – based on square feet
- For transit stations – based on ridership and mode share targets.

## C5. Develop a Pedestrian Master Plan

The City of NRH should develop a Pedestrian Master Plan which includes an inventory of sidewalks along arterial, collector, and local roadways, identifies critical gaps in the network, and establishes policy and implementation measures to further walking in NRH.

### Develop a Pedestrian Network Policy

Current design guidance provides information on how to build the pedestrian network, but a set of pedestrian network policies will help the city know what, when, and where to make those investments. The policies should be grounded in the four principles below:

1. Build safe, direct pathways,
2. Make sure the network is coherent, continuous and connected,
3. Allocate space to meet ADA requirements,
4. Build it to be used, maintain it so it is used.

Resulting policies may cover:

- Sidewalk standards for areas with high pedestrian volumes, especially to allocate more space for pedestrians from the right-of-way.
- Curb extensions on streets with on-street parking to better define on-street parking, reduce crossing distances, and make pedestrian more visible to motorists.
- Maximum distance between pedestrian crossings to encourage pedestrians to cross at designated locations.
- Mid-block crossing decision process and criteria.

## C6. Establish a Local Bicycle and Pedestrian Advisory Committee (BPAC)

A local Bicycle and Pedestrian Advisory Committee (BPAC) should be established in NRH to provide public outreach support, review of bicycle and pedestrian planning, and input in the prioritization of bicycle and pedestrian projects. The BPAC can help filter input from advocacy organizations in NRH and provide a citizen voice for prioritizing projects. This group can also help advise the development of the Pedestrian Master Plan (**Action C5**) and continued monitoring of walking and bicycling conditions within NRH (**Actions A6, A7**)

## C7. Develop Bicycle Facility Implementation Process, Including Community Outreach


The implementation of on-street or off-street bicycle facilities balances benefits and challenges. NRH should develop an implementation process which weighs these benefits and challenges, considering both the facility's importance in the overall active transportation network and the impact to adjacent properties. For example, the removal of on-street parking to provide space for bicyclists can reduce conflicts between bicyclists and motorists but also reduces parking capacity for adjacent properties. It is important to educate stakeholders in these projects of the benefits and challenges, as well as what additional alternatives can be considered, or mitigation measures needed to minimize impacts. In the example, policies may be enacted to help reduce parking demand, provide more parking on side streets, or provide more shared off-street parking areas to offset the loss of the on-street parking.

## C8. Develop and Implement a Comprehensive Multimodal Wayfinding Program

Wayfinding encompasses all the ways in which people orient themselves in physical space and navigate from place to place. It connects people to the places they want to go, while making them aware of places along the way. Wayfinding exists in many forms, including directional signage, mile markers, trail heads, informational signs, map kiosks, and pavement markings to reinforce signage. Initial elements of wayfinding signage were discussed in the Active Transportation Pattern Book (**Appendix D**).

The City should build on this to develop a comprehensive master plan for a multimodal wayfinding system of information, locations, graphic design and display medium to raise awareness and give guidance for locating special areas and attractions in NRH for visitors and residents of NRH. Identify collective elements of the wayfinding system plan that can be implemented together in a logical manner. First, by corridor, to take advantage of ongoing projects; then, to complete wayfinding for sets of congruous destinations. Budget for the additional enhancement in ongoing and planned roadway projects and develop a budget and timeframe for completion of the remaining wayfinding system plan.

## C9. Develop a Local Transit Plan

To supplement Trinity Metro's 2015 Transit Master Plan, NRH should develop a local transit plan to enhance access to the new TEX Rail stations and circulation around major activity centers in the city. This plan should consider the development pattern of NRH to determine if traditional fixed-route transit can be effective or if an alternative transit model should be pursued. The transit plan should be incorporated into the Transportation Plan's overall Design Decision Process to ensure travelway and pedestrian zone features are included to accommodate transit.

## C10. Continue Pedestrian and Bicycle Count Program

A growing number of cities, counties, and states, including NRH, conduct bicycle and pedestrian counts to track ridership, usage of facilities, and other purposes such as determining which facilities are most appropriate based on existing volumes. Florida DOT has recently begun a Statewide Non-Motorized Traffic Monitoring Program and is installing counters throughout the state. NRH could establish and maintain a count program to supplement the ones collected by NCTCOG, and then work with NCTCOG and TxDOT to increase installation of counters and investment from the regional and state level.

Typically, counting programs include permanent counters and short-term, manual counting. Permanent counting refers to a count technology that is used to collect data 24 hours per day, such as a loop counter, video, or thermal imaging. Additionally, many cities conduct periodic short-term, manual counts, typically using volunteers or staff to collect data. We recommend that NRH begin a manual short-term counting program, and work with NCTCOG/TxDOT to expand its permanent counters in visible, high-use locations, such as along trails.

## C11. Develop Funding and Implementation Strategy to Increase Sidewalk and Trail Lighting

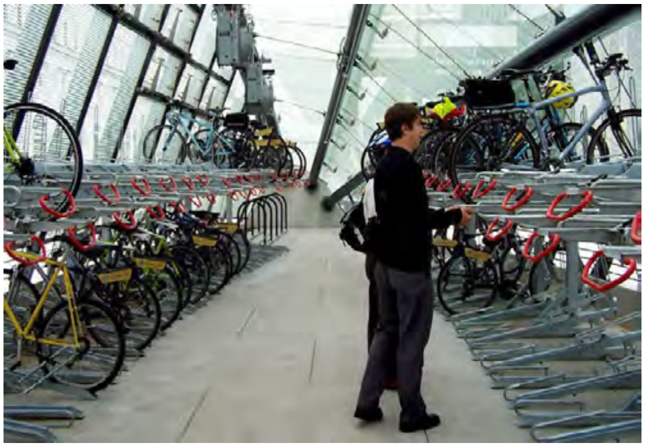
Lighting is a key safety feature of walking and bicycling infrastructure. Treating trails and sidewalks as transportation infrastructure for those navigating to and from transit stations or the City's activity centers, a lighting plan should be developed. This plan would help advance the implementation of sidewalk and trail lighting with the identification of funding and implementation strategies.

## C12. Evaluate Establishing a Multimodal Mobility Hub at the Transit Stations

As the transportation options change and are expanded to include people arriving by rail, visitors will need options for “last-mile” travel to or from their destination. This includes an array of mode choices, such as bikes to be used for local trips or a place to store a bike during their visit, ridehailing options and pick-up/drop-off locations, car-sharing programs, shuttle or local transit, and other potential shared-use micromobility options. A multimodal mobility hub or transfer center would allow visitors to use their preferred mobility option upon arrival. It also provides a focal point of connectivity where transportation integrates seamlessly in an environment that supports mixed-use activity of work, live, shop, and play.

Considerations for establishing such a center include:

- Determining if it is an allowable use of transit property.
- Developing a process to determine who runs the multimodal facilities and rental venues, especially given the number of potential micromobility rental companies and options. One option is to model micro-mobility rentals on the rental car model, with counters for the various bicycle, scooter, or other micromobility rental providers.
- Supporting land use considerations, such as bicycle repair facilities, restrooms, and venues for waiting, such as coffee shops or parks.
- Multimodal wayfinding and placemaking to create a pedestrian-friendly environment. This can include public wi-fi and/or real-time arrival information to assist in travel guidance.
- Transporting luggage back and forth.
- Enhancing the transit station circulation plan to expand pedestrian and bicycling networks.
- Establishing bicycle connections from the transit station to the bicycle network, including safe roadway crossings and wayfinding.



# D. Technology & Innovation

## D1. Develop an Open Data Platform to Increase Transparency

Open Data helps increase access and encourage the use of public data in the City. Transportation data should be one set of data available, but the fully array can include information on land use, public facilities, cultural institutions, finance, statistics, weather, the environment, and more. Typically, this information includes geographic information system (GIS) mapping for download and reuse.

The City should develop an Open Data platform tin increase transparency and engage citizens. In our representative government, it is important for citizens to know what their government is doing. This includes having access to information on government functions and the ability to use and share this data. This transparency also builds accountability, trust, and credibility in the citizenry as they stay connected and informed.

This data also promotes progress and innovation as it provides access to information for commercial applications, including economic business markets, where it may not otherwise be available. It also allows academic and industry-based research communities to utilize and process the data. Finally, it also preserves information over time to track trends and progress which can be valuable to citizens and businesses within the community.

## D2. Develop a New Mobility and Technology Plan

As mobility technology advances, including in-vehicle technology and connectivity, automation, and connected infrastructure, the City of NRH should prepare a plan focused on leveraging these new mobility options. The City should pursue funding and partner with NCTCOG to develop this plan of action. Some key items for consideration in the plan include:

- Understand legal and regulatory framework.
- Collaborate with NCTCOG as well as private sector technology companies.
- Identify opportunities for connected, multimodal mobility to prepare for Mobility-as-a-Service (MaaS), integrating transit, personal vehicles, ridehailing, car sharing, bicycling, walking, and potential for-profit micromobility operators.
- Identify public-private pilot projects to test new technologies, like automated vehicles, and educate the public.

- Identify technologies to increase roadway reliability and safety and reduce emergency response times.
- Identify new data sources and develop framework to maintain security and privacy of this data.
- Identify initial steps for integrating connected infrastructure into municipal infrastructure and operations

## D3. Develop Travel Demand Management (TDM) Program

Transportation Demand Management (TDM) is the balanced objective to infrastructure capacity. TDM focuses on shifting the travel decisions people make to reduce the demands at peak times, like morning and evening rush hours. It also helps guide people to use infrastructure in place that may be underutilized and better serve their needs, such as transit, walking, or biking.

A TDM program in NRH can include information, encouragement, and incentives to organizations or institutions to help people know about and use all their transportation options to optimize all modes in the system. Working with NCTCOG, the City should meet with major employers in NRH to discuss and encourage the implementation of voluntary employer trip reduction programs.

One example of TDM is carpooling. Waze is a nationwide carpooling service started by Google in 2015. Waze is a navigation app similar to google maps that relies on a constant flow of user information to determine the most optimal route to take in order to reduce traffic. Waze was created as a possible solution to the growing traffic problems nationwide caused by overpopulation and traffic delays such as accidents or construction. Users of Waze can provide real time updates while using the app which can include information on things such as accidents, traffic jams, and police locations. Drivers can set up their profile through the Waze app and post their commutes for others to see and request rides along a similar route. Waze carpool helps those who need rides find eligible drivers going their way. Users can define specific parameters within the app such as the preferred price, driver rating, and even gender that allow them to search for rides that safely and accurately meet their needs.

## D4. Pursue PPPs with Data Analytics, Data Sharing, Ridehailing, and Other Related Companies

Private companies collecting data through smartphone data or ridehailing services can provide the City with useful information in optimizing the transportation system. The City should evaluate data providers and partnerships to enhance data in transportation decision-making in NRH. These partnerships can also help to better understand issues in the transportation system and provide alternative sources to information like traffic crashes, potholes, and peak congestion areas.

Waze Connected Citizens program is a joint effort between Waze and various government agencies to improve community traffic flow by sharing data and information over traffic incidents and delays. Citizens provide real-time traffic data using the Waze app, which Waze then provides to the government in exchange for information on future public projects that could have an impact on traffic flow. This has been used in North Texas by other cities to push crash reporting to emergency services for faster and more accurate response.

# E. Funding & Prioritization

## E1. Conduct Regular Surveys of Citizen Opinions on Transportation (NRH Resident Satisfaction Survey)

In conjunction with the annual NRH Resident Satisfaction Survey, query a basic set of questions regarding their citizens' satisfaction with the transportation system in NRH. Establish the specific questions related to system performance measures, compile the transportation related data, and prepare a summary report of the public scorecard on transportation in NRH.

## E2. Allocate a Portion of the Available Local Funds to All Modes

To create a predictable atmosphere for gradual implementation of the multimodal plan, establish a program for allocation of local funds among the modal elements of the Transportation Plan. Establish minimum levels of annual investment/savings for bicycle improvements, pedestrian improvements, and for maintenance of roadways and bridges. The potential leveraging of local monies with non-local and private monies, and the resulting timing of design and construction activities, could result in project development with a different balance of project types when implemented each year.

## E3. Collaborate with TxDOT to Advance Locally Preferred Projects and Enhancements on State ROW

Planned improvements to TxDOT roadways, including Boulevard 26, should consider local issues and preferences for localized function and appearance. NRH should collaborate with TxDOT at the early stages of project development to implement elements of the NRH Transportation Plan, including goals for multimodal accommodations in the roadway corridor and aesthetic appearance of the corridor. Identify locally preferred treatments and requirements that are above and beyond TxDOT financial obligations for the corridor and identify city and non-city funding sources and a timeline for their implementation. Solicit TxDOT participation in signal system improvements on state-maintained roadways.

## E4. Collaborate with Neighboring Communities to Minimize Regional Obstacles to Travel

While city borders serve as jurisdictional boundaries, transportation is often regional and crosses multiple borders. It is important to maintain consistency across these borders in the regional transportation network to ensure efficient and reliable travel. The City of NRH should meet regularly with neighboring cities to coordinate transportation efforts related to regional corridors, trail connections, and bicycle facility continuity.

## E5. Seek NCTCOG Funding for Regional Initiatives

Participate in high-level discussions with management of NCTCOG and TxDOT regarding the availability of funds for the region, the regionally significant slate of projects to be implemented in the short-range planning horizon, and develop a consensus on support of the major project funding for the region. Garner support for regionally significant projects that benefit the City and adjacent communities. Assess the availability of funding for the various multimodal project needs of NRH.

## E6. Submit NRH Transportation Plan to NCTCOG for Inclusion of Plan in Regional Travel Demand Model and TIP

Transportation projects and services that will utilize federal funding are required to be listed in the metropolitan Transportation Improvement Program (TIP) and the Statewide Transportation Improvement Program (STIP). Additionally, TIP projects must be consistent with the region's long-range transportation plan, Mobility 2045, and must reflect federal, state and local transportation funds expected to be available during the four-year TIP period. The STIP is a financially constrained program which details the utilization of Texas' federal and state transportation funds appropriated for regionally significant projects requiring federal action. It includes a list of priority transportation projects to be carried out in a four (4) year period. NRH should submit the NRH Transportation Plan, with functional class and sizing updates, to NCTCOG for incorporation into the Regional Travel Demand Model and specific projects into the regional and statewide TIP.

## E7. Leverage Local Funds to Secure Bonds for Needed Transportation Infrastructure Improvements

Utilize the bonding capacity of NRH to design and construct the significant transportation infrastructure projects to improve current mobility conditions and prepare for the pending transportation needs of NRH. Every two to five years, or as bonding capacity allows, prepare a list of candidate projects, publicly assess their benefits to the community, and select a slate of projects for a bond program of funding to be voted on by the citizens of NRH.

## E8. Implement Project Prioritization Criteria and Methodology for Transportation Projects in Future Bonds

Many demands for investing in the City's transportation infrastructure stretch the funding available. A quantitative process and criteria for project evaluation should be developed by NRH to prioritize project needs with the criteria founded in the City's transportation goals. This prioritization process is critical for future bond programs to balance the varying needs in the community, while advancing the City's transportation goals.

## E9. Institute a Program of PPPs for the Development and Management of Non-Roadway Elements within ROW

Transportation system users and the destinations and adjacent developments they serve are in a position to benefit from early implementation and localized enhancement to the transportation system. Formalize a process to actively seek PPPs for incorporating enhancements into the design of transportation facilities in NRH. Develop a policy and framework for agreements to allow private citizens, groups and businesses to financially support their interests in the advancement and management of specific aspects of the transportation system serving NRH. As necessary, special districts may be established to facilitate the raising of funds and the implementation of larger and longer duration projects. These districts can include, but are not limited to, Public Improvement Districts (PIDs), Tax Increment Reinvestment Zones (TIRZs), Tax Increment Finance Districts (TIFs), or Business Improvement Districts (BIDs).