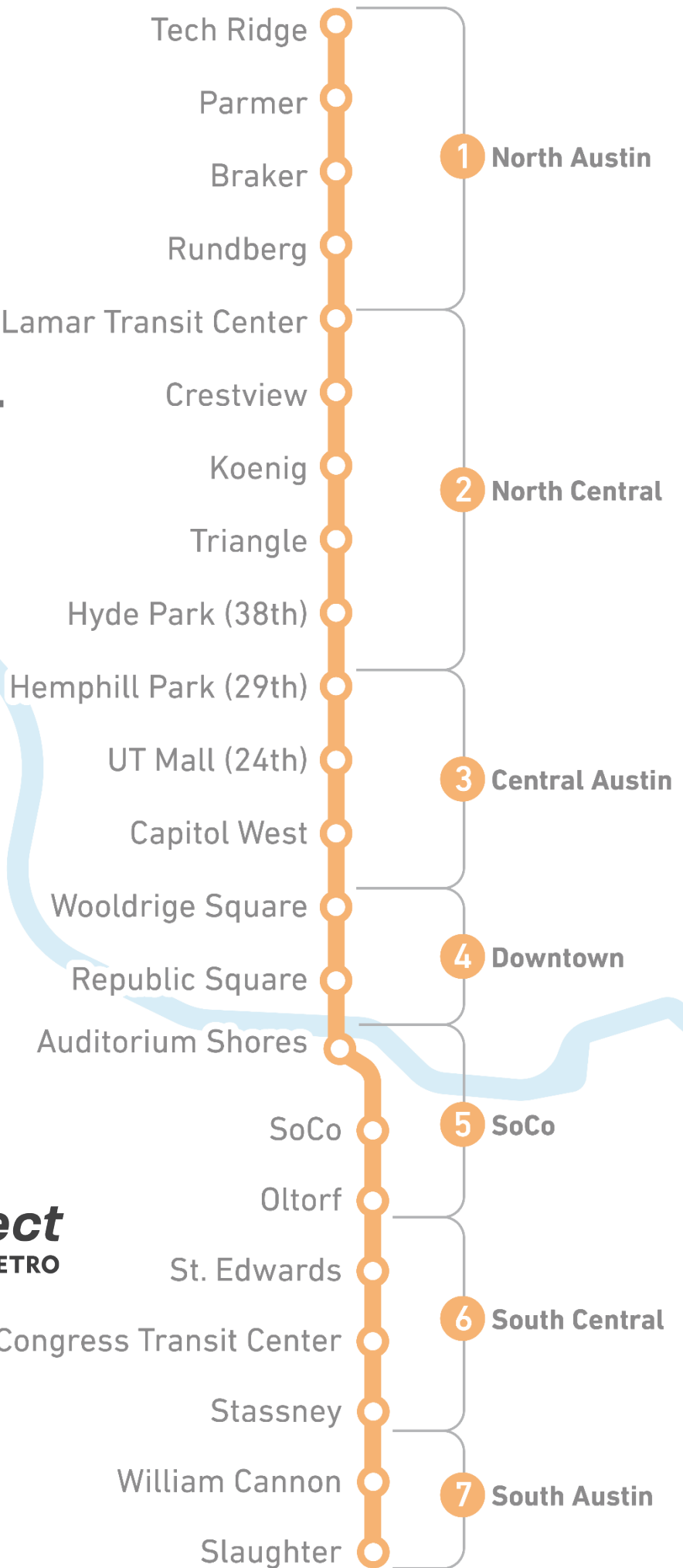


# Orange Line Alternatives Analysis Report

Final Report  
June 12, 2020



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## Executive Summary

The Orange Line Corridor Alternatives Analysis Report (Orange Line AA Report) provides an overview of the process used to evaluate high-capacity transit (HCT) in Austin, Texas and the path to develop a proposed Locally Preferred Alternative (LPA), including how public and agency input was used to craft the LPA. The analysis and future actions on the path toward implementation are outlined within this document. This document considers the Orange Line Corridor both as a single investment (to attract federal funds) and as a part of the Capital Metropolitan Transportation Authority's (Capital Metro) proposed Long-Term Vision Plan. The Purpose of the Orange Line Corridor HCT investment is to meet growing travel demand with a reliable, safe, cost-effective, time-competitive, state-of-the-art high-capacity transit option that serves multiple Central Texas destinations located in the City of Austin including existing and proposed regional activity centers and residential areas. The Orange Line Corridor is made up of seven segments (**Figure 1**).

Capital Metro began developing the Project Connect System Plan in 2016 to create a system of HCT options along with enhancing and expanding existing services that will connect people, places, and opportunities in an efficient, affordable, and sustainable way. The Project Connect area includes the five-county metropolitan statistical area of Bastrop, Caldwell, Hays, Travis, and Williamson counties (Central Texas). In 2018, the Capital Metro Board of Directors approved the Long-Term Vision Plan (2018), which identified the Orange Line Corridor for potential investment in HCT as a tool to address growth pressures, improve mobility, and connect Central Texans to their travel destinations. It has since been refined to reflect Capital Metro's response to growth challenges and the alternatives analysis process (**Figure 2**). It is projected Central Texas population of 2 million will double by 2040. In that same time, road capacity is expected to increase by only 15 percent. This growth will cause additional strain on the roadway network, result in increased travel times and travel costs, decrease mobility, hinder the region's economic health, and threaten air quality.

On April 19, 2019, Capital Metro and the Federal Transit Administration (FTA) published a Notice of Early Scoping in the Federal Register to initiate early scoping for the Orange Line Corridor. Early scoping allows the scoping process to begin as soon as there is enough information to describe the proposal so that the public and relevant agencies can participate effectively. Through this notice, Capital Metro invited public and agency involvement with ongoing planning activities and studies for the Orange Line Corridor, including review of the (a) purpose and need, (b) the proposed alternatives, and (c) the potential environmental, transportation, and community impacts and benefits to consider during the National Environmental Policy Act (NEPA) phase.

This Orange Line AA Report documents the project's purpose and need, analyzes a range of reasonable, feasible, and prudent HCT alternatives, and identifies an LPA in accordance with the Council on Environmental Quality's (CEQ's) and the FTA's regulations and guidance for implementing NEPA (40 Code of Federal Regulations [CFR] 1501.2 through 1501.8 and 23 CFR 771.111, respectively).

This Orange Line AA Report represents the step before Preliminary Engineering (PE) and NEPA phases. The adoption of an LPA would allow Capital Metro to proceed to PE and NEPA phases, and construction of the LPA. The sections of the Orange Line AA Report are summarized on the following page.

**Section 1 | Public Engagement:** This section examines the framework and process to receive and incorporate feedback from community leaders, partner agencies, stakeholders, and the public across Central Texas throughout the AA process of the Orange Line Corridor. Results of public engagement are incorporated within this Orange Line AA Report.

**Section 2 | Purpose & Need:** This section describes the development of defining the need for the project and how the project would address the transportation-related problems or challenges. It also describes how leaders, partner agencies, stakeholders, and the public across Central Texas were involved in the process of developing the Purpose and Need.

**Section 3 | Alternatives Analysis Process Development:** This section describes the development of the two-step process developed to evaluate the No Build and Build Alternatives for the Orange Line Corridor. A Build Alternative is made up of an alignment, transitway, vehicle, service plan, and any required support infrastructure (tracks, stations, and maintenance facilities).

**Section 4 | Detailed Alternatives Definition:** This section provides an overview of the alternatives presented during engagement with community leaders, partner agencies, stakeholders, and the public across Central Texas. The Build Alternatives are compared to the No Build and Transportation Systems Management Alternatives in order to understand the benefit of transportation investments and to fulfill FTA's requirements for Capital Investment Grant (CIG) funding.

**Section 5 | Evaluation Results:** This section provides an overview of the results from the alternative analysis process and the presentation of these results to community leaders, partner agencies, stakeholders, and the public across Central Texas.

**Section 6 | Engineering Considerations:** Describes the distinguishing factors that eliminate options within the alternatives and summarizes other known baseline conditions known to-date that could be refined in later project development phases as the LPA advances.

**Section 7 | The LPA – Your Plan, Your Orange Line:** This section describes the community-selected transit investment that is advancing as the LPA.

**Section 8 | Implementation and Next Steps:** This section describes how Capital Metro will advance the Orange Line project towards a competitive FTA Capital Investment Grant.

## Orange Line Corridor Overview

The proposed Orange Line Corridor (the “Project”) would extend from the Tech Ridge Park and Ride, along the western side of the University of Texas at Austin campus, through Downtown Austin to Slaughter Lane at the southern end of the corridor. The Orange Line Corridor is approximately 20 miles long and comprised of 22 stations organized into the seven defined segments listed below.

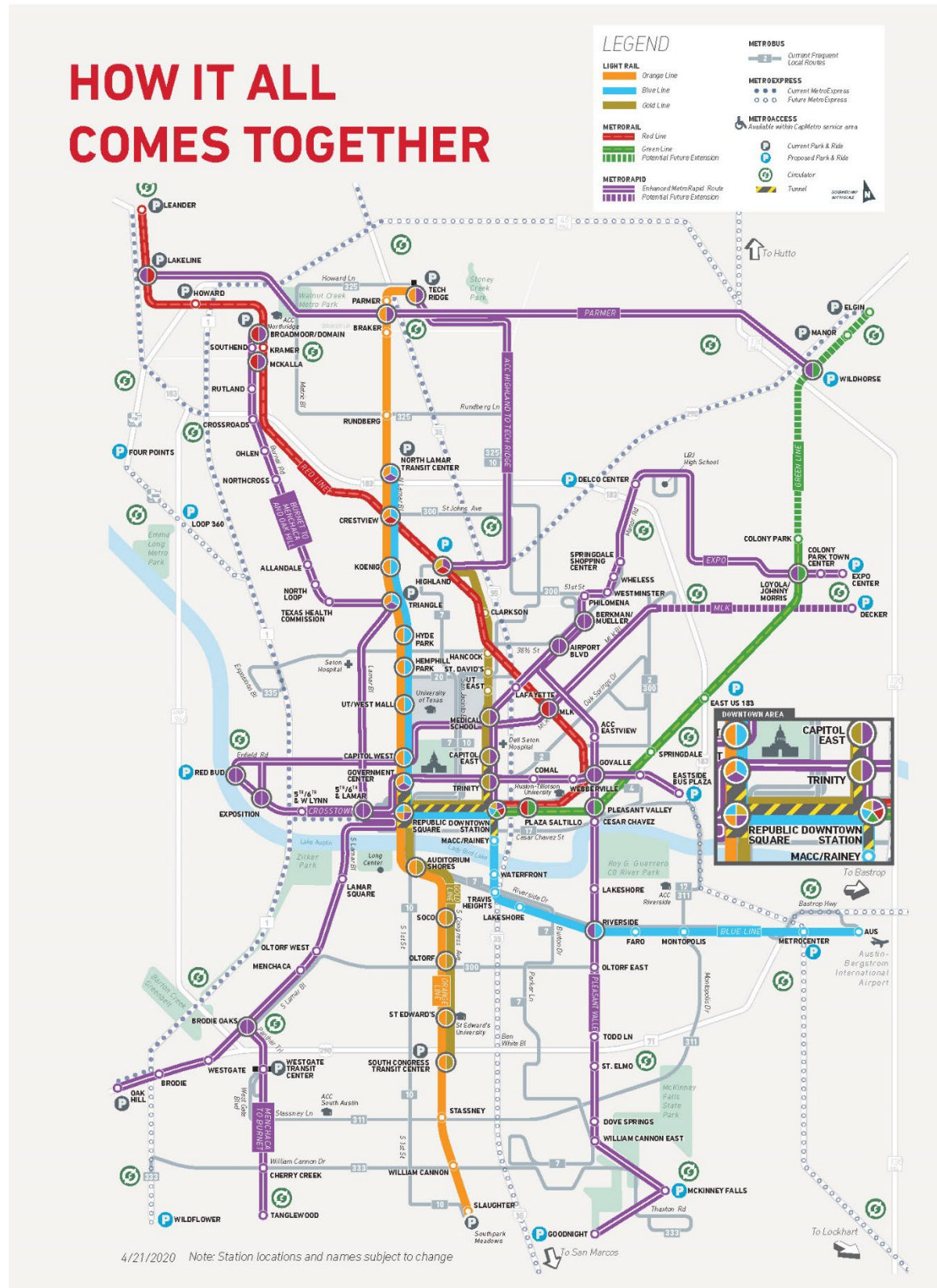
- **Segment 1:** North Austin (Tech Ridge to North Lamar Transit Center)
- **Segment 2:** North Central (North Lamar Transit Center to Hemphill Park)
- **Segment 3:** Central Austin (Hemphill Park to Wooldridge Square)
- **Segment 4:** Downtown (Wooldridge Square to Auditorium Shores)
- **Segment 5:** SoCo (Auditorium Shores to Oltorf)
- **Segment 6:** South Central (Oltorf to Stassney)
- **Segment 7:** South Austin (Stassney to Slaughter)

The corridor is divided into segments (**Figure 1**) to simplify the alternative definition and evaluation process. This segmentation facilitated the identification and comparison of various design configurations. Consistent data collection and analyses was applied along the full length of the corridor, but the results are reported in segments, where possible. These segments represent natural breakpoints in either corridor development character or right-of-way geometry.

**Figure 1. The Orange Line Corridor**



Figure 2: Project Connect Vision Map (May 2020)





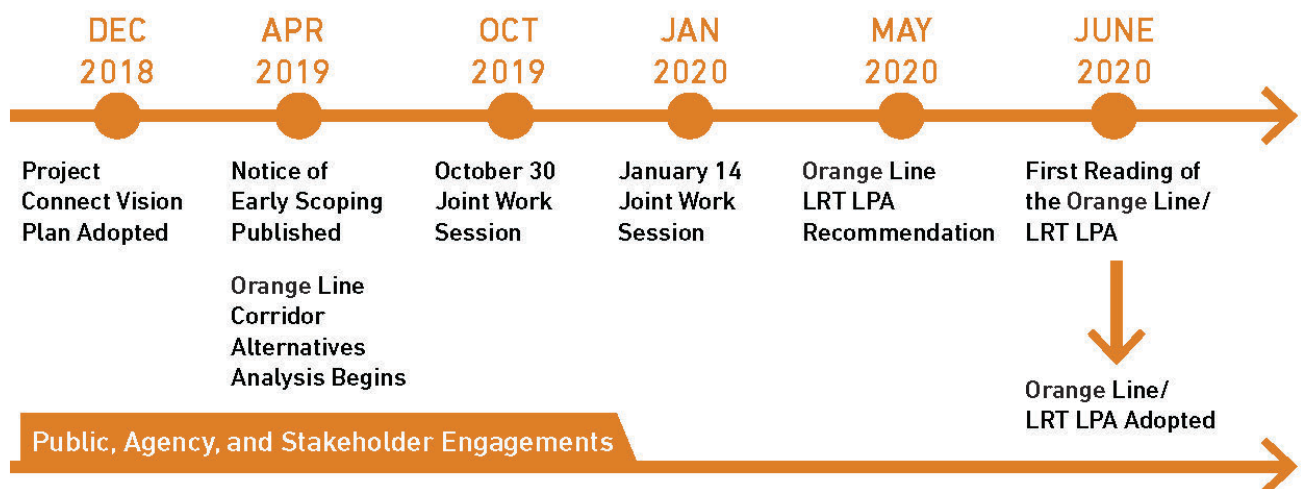
## 1.0 Public Engagement

Capital Metro adheres to the FTA and the 1969 NEPA process in order to be eligible for capital funding. Adhering to the FTA process increases competitiveness for federal funding. As such, over the last 30 months, Capital Metro has been developing the Long-Term Vision Plan (2018) per general guidelines of the Federal Planning and Environmental Linkages (PEL) process. Under this PEL process, Capital Metro conducted the alternatives analysis for the Orange Line.

As part of the AA process, Capital Metro and its partners are proposing an LPA (Appendix A). Once the LPA is adopted, Capital Metro can make a formal request to the FTA to initiate the NEPA phase and evaluate the LPA’s environmental benefits and impacts. Capital Metro would seek federal funding for the proposed project. Additionally, federal permits would be required; therefore, FTA has determined that an Environmental Impact Statement (EIS) is the appropriate level NEPA documentation. Additional information relating to the environmental analysis is available in Capital Metro’s Planning and Environmental Linkages (PEL) report (June 2020).

The following sections provide a high-level summary of public engagement activities. **Figure 3** illustrates the key policy and project milestones.

**Figure 3. Orange Line Corridor Milestones**



### 1.1 Engagement Background, Goals, and Framework

Public input has been essential to the Orange Line Corridor planning process. Capital Metro has and will continue to seek feedback from community leaders, partner agencies, stakeholders, and the public across Central Texas throughout the development process of the Orange Line Corridor. Early on, Capital Metro worked to identify a public engagement framework to keep the public informed and solicit participation in the development of the Orange Line Corridor. In tandem with the project specific outreach techniques and strategies identified within the Capital Metro Orange Line Corridor Public Involvement Plan (PIP) (2019), Capital Metro also continues to implement systemwide planning outreach techniques and strategies identified within the Project Connect Community Engagement Plan (PCCEP) (2019). This plan reflects the recommended outcomes for Project Connect outreach efforts as established by the Capital Metro Board of

Directors and Austin City Council Engagement during a Joint Work Session held on November 28, 2018. These outcomes include:

- 1) Clear communication of the process and the community’s role by identifying the aspects of the project for which feedback is needed and how that feedback will be applied.
- 2) Provide multiple and meaningful feedback opportunities with ample notice at locations where stakeholders already gather.
- 3) Share information through traditional and non-traditional approaches.

Based on feedback from the Joint Work Session (November 2018), Capital Metro developed public engagement goals that have been adopted by the Orange Line Corridor. Overarching Orange Line Corridor goals include:

- Engaging and informing the community
- Connecting with individuals from all communities
- Tracking and reporting regularly on community engagement activities
- Receiving clearance on environmental studies

As a stand-alone project, the Orange Line Corridor has additional public engagement objectives. Objectives tailored to the specific needs of the Orange Line Corridor are:

- Understand overarching community values to inform decision-making for the project
- Coordinate with other public projects that have a similar timeframe and/or are located in proximity to the Orange Line Corridor
- Understand existing small area plans identified through City of Austin Planning and Zoning efforts

Based on feedback received at the November 2018 Joint Work Session, implementation strategies that would provide continuous public participation opportunities were clustered around major technical milestones, as illustrated in **Table 1**, with the goal to find consensus on tough decisions. Capital Metro heard from the public and agencies that there is a need to achieve progress on advancing solutions that improve mobility in Central Texas quickly; as such, the public engagement framework was developed to reflect this approach. Based on the framework set above, community leaders, partner agencies, stakeholders, and the public across Central Texas were provided a multitude of typical and innovative ways to engage in the project.

**Table 1. Technical Milestones and Public Engagement**

	Technical Milestone	Public Engagement Objectives
A	Development of the Purpose and Need and Early Scoping	Ensure the project’s Purpose and Need is clearly defined and provides the opportunity for the public to review and comment on the draft Purpose and Need.
B	Development of Conceptual Alternatives	Evaluate and compare the Build Alternatives against each other and the No Build Alternative, and gather input on the public’s needs and desires in order to refine the approach.
C	Detailed Evaluation of the Alternative	Develop and present quantitative and qualitative data and determine if the Build Alternatives or the No Build Alternative consider the public’s needs and concerns.
D	Identification of the LPA	Receive public feedback, share the proposed LPA, make refinements, and complete the remaining steps of the project development process.

## 1.2 Coordination & Maximizing Networks

Early on, the Project Connect and Orange Line Corridor public engagement framework helped Capital Metro identify the stakeholder groups that could serve as partners to help distribute information, engage Environmental Justice (EJ) communities, provide feedback, and offer insight into ongoing and future development projects within the Orange Line Corridor. Capital Metro coordinates with groups in order to maximize outreach and engagement, align messaging around the concurrent processes, and prevent information overload and confusion for the public. The groups are categorized below with a brief summary of to-date associated activities:

- **Community Leaders:** Capital Metro has worked with the Project Connect Ambassador Network (PCAN). PCAN members represent various interest areas including EJ communities, transit dependent populations, schools and youth, workers, walking and biking, healthcare, and business groups and is made up of more than 150 community organizations and stakeholders to provide input through a community lens. Regular updates at key Orange Line Corridor milestones identified in Table 1 as well as updates on ongoing activities were provided to the PCAN.
- **Partner Agencies:** Capital Metro coordinated closely with agency partners including City of Austin Transportation Department (ATD), TxDOT, Capital Area Metropolitan Planning Organization (CAMPO), Travis County, FTA, and many others to discuss facilities, policies, approvals, funding, regulations, public feedback, and other technical content. Capital Metro convened a Technical Advisory Committee (TAC) that included agency professionals from engineering and design disciplines and those with expertise on mitigating potential environmental impacts. Regular monthly updates at key Orange Line Corridor milestones identified in Table 1 were provided as well as updates on ongoing activities. These discussions occurred on a regular basis.
- **Stakeholder Groups:** These groups included local residential groups, business interests, and developers to name a few. One-on-one and small-group meetings were held with over 30 stakeholders near the Orange Line Corridor regarding project development and to solicit feedback.
- **Working Groups:** Three different working groups were established to focus on sharing information and providing feedback on the needs of specific areas of the corridor. These groups included the Downtown Working Group, the South Congress Working Group, and the Guadalupe Working Group.
- **Public:** Capital Metro conducted four rounds of formal public engagement to gather input at key points in the process that included partner agency participation. Capital Metro made a special effort to meet people in their communities, including attending community events, conducting outreach at transit stops, and implementing innovative strategies including online open houses and virtual outreach when community members were unable to attend in person public meetings.

### 1.3 Environmental Justice, Persons with Disabilities and Limited English Proficiency

Capital Metro sought to engage all individuals that could be impacted or benefit from the Orange Line Corridor. The public involvement process complies with legislation and guidance for persons with disabilities, persons with limited English proficiency, and environmental justice. Specific to low-income and minorities, persons with disabilities, and Limited English Proficiency individuals, the following strategies were implemented:

- Hosting Virtual Open Houses
- Hosting the Project Connect Hotline, and Capital Metro's general customer service hotline
- Community meetings with groups representing disabled populations at upcoming major Orange Line Corridor millstones
- Distributing fliers
- Community tabling with groups that represent disabled populations at upcoming major Orange Line Corridor millstones
- Translating materials

### 1.4 Events and Notification

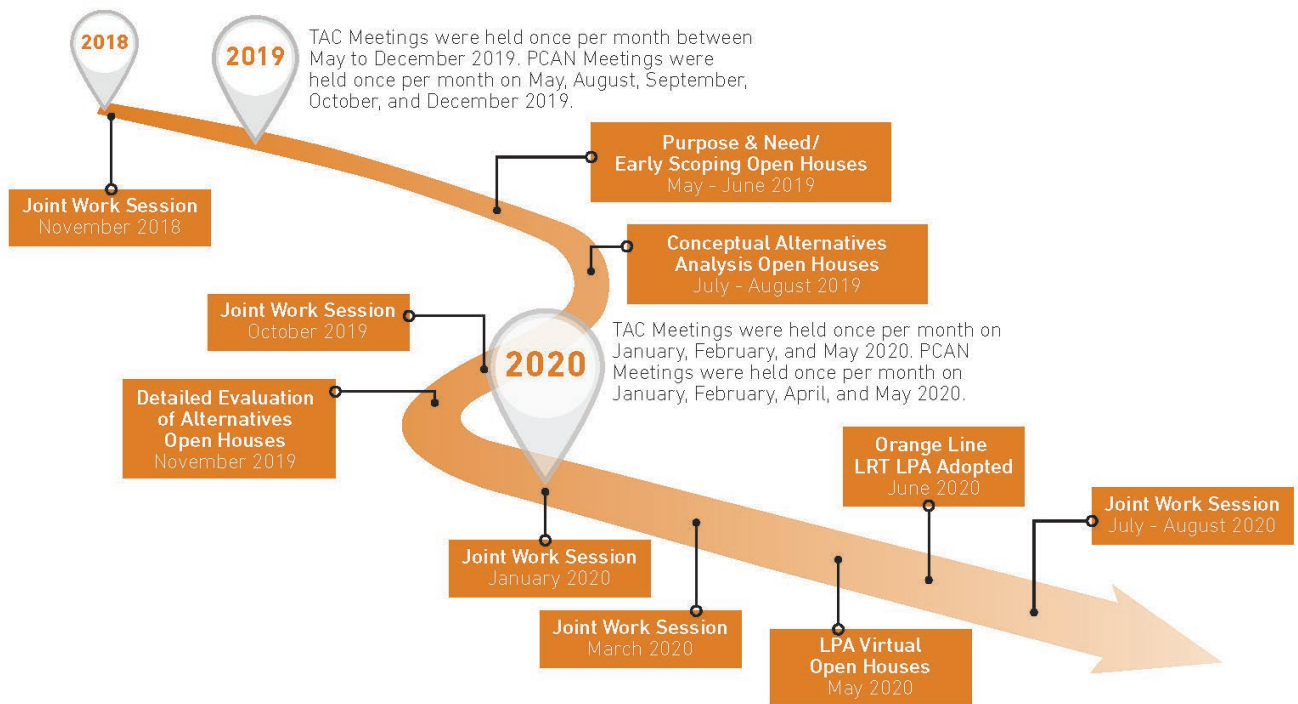
Consistent with the Capital Metro Orange Line Corridor PIP (2019) and PCCEP (2019), Capital Metro implemented various strategies to notify, solicit feedback, and engage in dialogue with community leaders, partner agencies, stakeholders, and the public. These strategies include, and are not limited to:

- Project Connect Website and Orange Line Webpage
- Capital Metro Website Promotional Banners
- E-newsletters and E-blasts
- Email Inquiries
- Social Media
- Traditional Media including news channels and newspaper ads
- Elected official and community leader briefings
- Pop-Up Outreach, Community Fairs, and tabling to target existing and potential new riders
- Project Connect Office
- Open Houses and Virtual Open Houses

### 1.5 Summary

Specific public engagement results for each milestone of Orange Line Corridor are found within each section of the Orange Line AA Report. **Figure 4** provides a high-level overview of public engagement activities targeting community leaders, partner agencies, stakeholders, and the public, including EJ communities.

**Figure 4. Public Engagement Summary**



Through its Project Connect engagement efforts, Capital Metro has engaged with over 40,000 people at nearly 600 events to discuss Project Connect. These events include tabling at transit stops and community events, presentations to neighborhood associations and community groups, office hours and special events for the public at the Project Connect office, and numerous public open house events at key milestones in the project. Communication strategies included phone calls, emails, flier distribution, advertisements, radio announcements and social media efforts.

Specifically, 35 neighborhood associations along the Orange Line Corridor were contacted at each of the project milestones to encourage their involvement. Working groups with stakeholder representation from the Guadalupe, Downtown, and South Congress areas were formed to share key project milestone information and updates. During the process, the three working groups convened for 14 meetings. Orange Line specific activities involved over 4,850 people at over 55 events, presentations, and meetings and over 1,230 people provided comments in response to Orange Line surveys.

## 2.0 Purpose and Need for the Orange Line Corridor

The purpose of the Orange Line HCT investment is to meet growing corridor travel demand with a reliable, safe, cost effective, time competitive, state-of-the-art HCT option that is congestion proof. The Orange Line HCT Corridor Study is being undertaken by Capital Metro to assess the need for a HCT system with

transitways<sup>1</sup> in Central Austin, and to evaluate a range of alternative alignments, station locations and vehicle modes.

The study will follow the NEPA process, so that the recommended alternative may be eligible for potential federal funds, as well as state and local funds. The NEPA process begins with the identification and detailed assessment of the need for a transit project. The process will continue with an evaluation of a range of alternatives and vehicle modes that would satisfy the identified needs, complemented by a significant level of community participation in the evaluation process; resulting in a recommendation for an LPA. The NEPA process will also evaluate future conditions in the year 2040 if nothing is implemented beyond planned improvements (the No-Build Alternative). It will also evaluate lower-cost transportation system improvements as well as physical improvements and transit service enhancements on the existing corridor.

The need for Orange Line HCT is demonstrated by increasing congestion within the Orange Line corridor and parallel roadways, which is exacerbated by the inability to sufficiently expand roadway capacity to accommodate the projected demand while maintaining reliable travel speeds or levels of service. Orange Line HCT will efficiently expand mobility capacity by leveraging the existing transportation network infrastructure. Sustaining Austin's strong economy relies upon ongoing population and employment growth, which will increase travel demand and corresponding congestion without an efficient means to move more people. Failure to accommodate this increased demand for efficient mobility is a threat to continued community and economic growth.

Four needs have been identified and outlined for the Orange Line corridor HCT investment and are as followed:

Need #1: Sustainably Support Austin's Population and Economic Growth

Significant population and employment growth is affecting all travel modes and travel times. CAMPO estimates the Orange Line corridor's population and employment are expected to grow 65 percent and 93 percent, respectively, from 2010 to 2040. Within Travis County, where the Orange Line corridor is located, population and employment growth from 2010 to 2040 is forecast at 71 percent and 112 percent, respectively. Counties at both ends of the Orange Line corridor, Williamson and Hays, are experiencing some of the most significant growth in the region, with their populations doubling or tripling between 2010 and 2040. The region's growth will reduce people's ability to access jobs, education, medical care, and other needs while reducing the quality of life, particularly as development of residential, employment, and entertainment centers continue in Central Austin.

Need #2: Increase Transportation Network Capacity to Meet Increasing Travel Demand

CAMPO estimates that while the region's population doubles by 2040, new roadway capacity will grow by 15 percent between 2010 and 2040. As population and employment have grown in Central Texas, the traditional approach to providing transportation capacity by expanding roadways has become increasingly complex and expensive. In order to provide mobility and accessibility for current and future residents, the region will need to make better use of existing transportation right-of-way (ROW) and find ways to move more people in a limited amount of space.

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<sup>1</sup> Transitways are pathways only transit vehicles can use in order to provide the highest level of reliability, speed and safety. They are separated from other vehicles to keep transit vehicles moving free of traffic.

Need #3: Improve Transit Access between Affordable Housing and Jobs

Employment opportunities continue to increase within and adjacent to the Orange Line Corridor. However, access to those jobs is challenged by the lack of affordable housing and reliable mobility options. While employment options in downtown Austin continue to grow, the cost of living in downtown has increased and government-backed affordable housing cannot bridge the gap alone. Employees are forced to live further from their jobs which results in the need for affordable and reliable transportation.

Need #4: Support Growth of and Connectivity to Regional Activity Centers

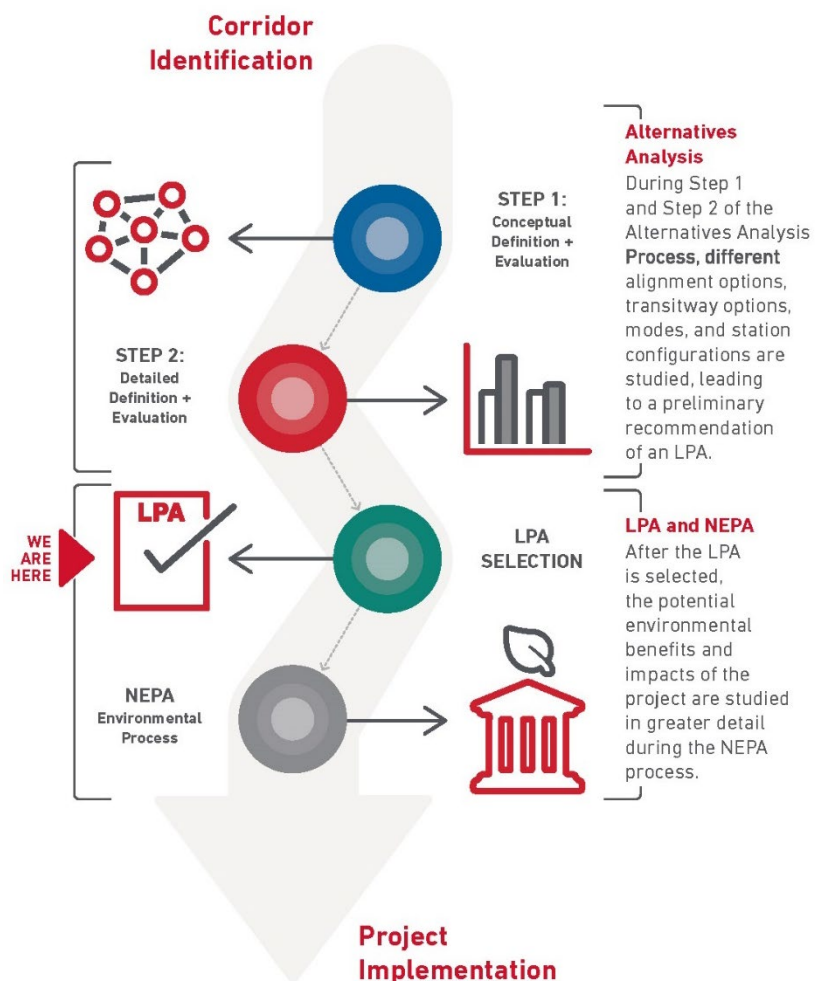
Capital Metro would provide better transit service along the Orange Line Corridor to connect existing activity centers and future growth along the corridor. Population in the Austin metropolitan statistical area (MSA) has increased by 34 percent in the past 10 years and is projected to double by 2040. By providing improved transit service between established activities centers, Capital Metro would encourage additional transit-supportive land use at strategic locations. These areas of transit-supportive land uses could be connected through a network of improved transit service.

### 3.0 Alternatives Analysis Process Development Summary

As mentioned in previous sections, Capital Metro adheres to the FTA and NEPA process in order to be eligible for FTA’s Capital CIG funding. These formal guidelines require the adoption of an LPA. To determine an LPA, an alternatives analysis process may be conducted prior to or within the formal environmental process. Since the EIS must be completed within two years, Capital Metro is conducting an alternatives analysis to determine an LPA prior to the EIS. The findings and due diligence documents for the alternatives analysis process will move forward into the EIS through the FTA PEL federal guidelines.

The Orange Line Corridor AA process uses a phased approach, as illustrated in **Figure 5**. The process is structured as a tiered screening, where alternatives are defined, evaluated, and refined or eliminated in each step of the process. The result is a proposed LPA whose environmental benefits and impacts will be

**Figure 5: Analysis and LPA Selection Process**



further evaluated under the formal NEPA process.

The evaluation criteria identified for each step of the alternatives analysis process relates to the goals and objectives identified for the Orange Line Corridor, as shown in **Figure 6**.

**Figure 6. Orange Line Corridor Goals and Objectives**



### Step 1: Conceptual Definition and Evaluation Results

The conceptual evaluation of Step 1 established a method for carrying forward transitway options for each segment to the Detailed Evaluation of Step 2. The evaluation used the available ROW width and transit supportive nature of preliminary station locations to determine the appropriateness of four<sup>2</sup> different transitway types within each segment. Throughout the Orange Line Corridor, the type of transitway may vary due to differing ROW constraints and land use. For the purposes of the Step 1 analysis, these constraints were assessed by segment. In segments where a large percentage of the ROW is narrow and/or the station areas are highly transit supportive, a more capital-intensive transitway (such as Elevated or Underground) may be considered, while segments with minimal amounts of narrow ROW and less transit supportive station areas may not warrant a more expensive transitway capital investment.

To expedite the analysis and ensure consistency with work completed to-date, the Step 1 evaluation used the percentage of the segment ROW width calculated as "Narrow" (less than 80') from the Purpose and Need Early Scoping public meetings (completed in May 2019) and "Low/Medium/High" transit supportive station area scores from the Station Area Evaluation conducted for the Project Connect Long Term Vision Plan (completed in 2018). The inputs to produce results of the Step 1 conceptual evaluation may be found in the Step 1 Definition and Evaluation of Conceptual Alternatives Report.

<sup>2</sup> Following the Step 1 evaluation, "Cut-and-Cover" and "Tunnel" transitway types were consolidated to a general "Underground" option for future phases of evaluation. Further explanation can be found in section 3.3.2.



**Figure 7: Step 1 Conceptual Evaluation Inputs**



The results of the Step 1 conceptual evaluation are shown in **Figure 8**. The conceptual evaluation determined that due to the less transit supportive nature of the station areas and the ample ROW available in Segments 1, 6, and 7, elevated and underground transitways are generally eliminated for further consideration within those segments of the Orange Line Corridor. In Segments 2, 3, 4, and 5, all transitway options move forward into the detailed evaluation phase.

**Figure 8. Step 1 Conceptual Evaluation Results**



	Street Level	Elevated	Underground
1. North Austin	✓	X <sup>1</sup>	X <sup>1</sup>
2. North Central	✓	✓	✓
3. Central Austin	✓	✓	✓
4. Downtown	✓	✓	✓
5. SoCo	✓	✓	✓
6. South Central	✓	X <sup>1</sup>	X <sup>1</sup>
7. South Austin	✓	X <sup>1</sup>	X <sup>1</sup>

<sup>1</sup>Elevated and Underground are not necessary due to limited street-level tradeoffs.

Note: Following the Step 1 evaluation, "Cut-and-Cover" and "Tunnel" options were consolidated to a general "Underground" option for future phases of evaluation.

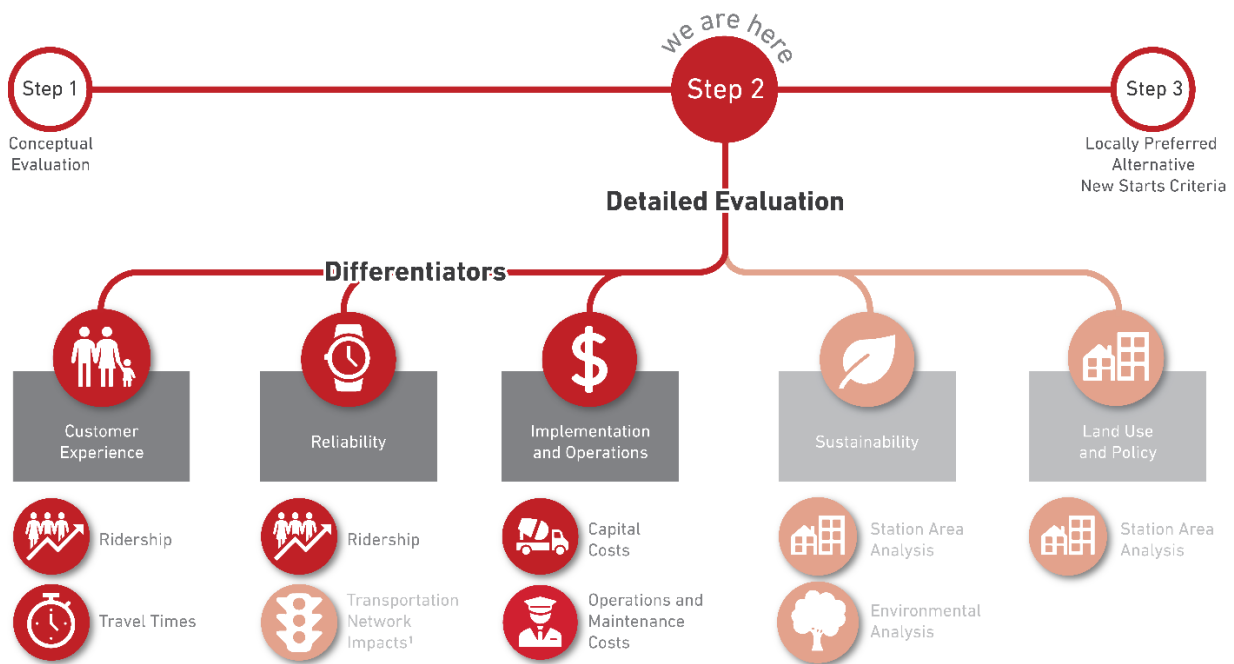
### Step 2: Detailed Definition and Evaluation Metrics

The Step 2 evaluation of the Orange Line Corridor alternatives includes the use of quantitative and qualitative assessments of benefits and impacts to understand the performance of the alternatives and identify a preliminary LPA to evaluate further through the NEPA process. The evaluation centers on six areas of technical analyses documented in technical memoranda that provide comparative metrics on how well the alternatives address the Orange Line Corridor's goals and objectives:

- Ridership
- Capital Costs
- Operating and Maintenance (O&M) Costs
- Station Area Analysis
- Environmental Analysis
- Transportation Network Impacts Analysis

The metrics were related to the project goals and objectives shown in **Figure 9**. The evaluation categories that provide the most distinction between alternatives are the potential ridership, travel times, capital costs, and O&M costs, shown in the figure with dark red icons to highlight the role these metrics play as differentiators in the overall alternatives analysis process. The other technical evaluations and metrics are also useful for a variety of other reasons discussed later in this report, but do not provide as much differentiation between the alternatives at this stage of analysis. These metrics are shown in lighter red on the figure below.

**Figure 9. Detailed Evaluation Analyses and Goals/Objectives**



## 4.0 Detailed Alternatives Definition

This section summarizes the alternatives presented during engagement with community leaders, partner agencies, stakeholders, and the public across Central Texas. The Build Alternatives are compared to the No Build and Transportation Systems Management Alternatives (TSM) in order to understand the benefit of transportation investments and to fulfill FTA requirements.

### No Build (Do Nothing)

As required by the FTA, Capital Metro will carry forward a “No Build” or “Do Nothing” alternative for comparison. For the Orange Line Corridor, the No Build Alternative keeps the existing transit network consistent with Capital Metro’s existing 2019 network which includes Capital Metro’s 2018 system overhaul changes referred to as Cap Remap.

The No Build Alternative provides the baseline against which the TSM and all build alternatives are compared in the alignment alternatives process. The FTA Simplified Trips-on-Project Software (STOPS)-based No Build ridership model uses the existing transit network described above. Forecasted ridership will be estimated based on existing ridership in the corridor and other factors, such as population and employment forecasts.

### Transportation Systems Management Alternative

The TSM alternative presents the plan for system service improvements informed by the CMTA board-approved Connections 2025 plan. This study used Connections 2025 as a starting point and coordinated with CMTA staff to inform which roadway improvements and transit service changes will be implemented before 2028. The TSM identifies improvements to two existing MetroRapid routes (801 and 803) as well as the introduction of two new MetroRapid routes (804 and 820).

The recommendation from Connections 2025 that the 801 and Route 1 should be consolidated with 1/3-mile stop spacing was excluded from the TSM. Consolidating the routes would make the route less desirable due to longer travel times with more frequent stops. It seems unlikely this change would be implemented before 2025 and therefore was excluded. This recommendation also included 7.5-minute frequencies for the 801; however, for this analysis, the current 10-minute frequency and route alignment was used.

The TSM Alternative route improvements include:

- **Route 4 Montopolis**
  - Increased headway and reduced service span
- **Route 20 Manor Road/Riverside**
  - Increased headway and reduced service span
- **801 North Lamar/South Congress**
  - New alignment and improved frequency
- **803 Burnet/South Lamar**
  - New alignment and improved frequency
- **804 7<sup>th</sup> Street**
  - New MetroRapid route
- **820 Riverside/Manor**
  - New MetroRapid route
- **550 MetroRail Red Line**
  - Improved frequency

The TSM Alternative would assume completely mixed-traffic operations with no dedicated transitways except for three areas of transit priority lane expansion/improvements:

- South 1<sup>st</sup> Street Bridge
- Guadalupe between MLK and 38<sup>th</sup> Street
- 7<sup>th</sup> Street between Guadalupe and I-35

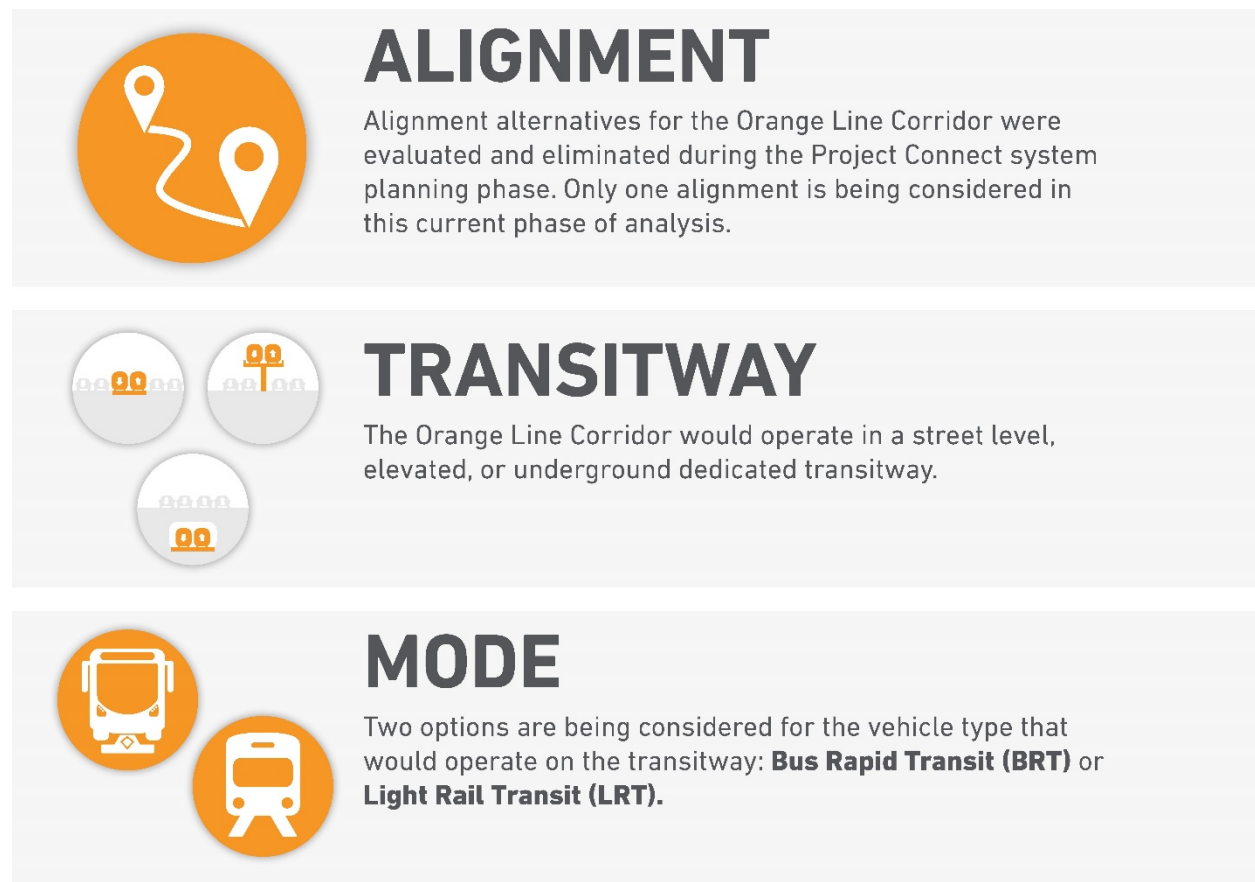
These projects would facilitate the movement of buses by providing a lane separated from congestion for bus operations.

### Build Alternatives Overview

The definition of Build Alternatives is based on the 2018 Project Connect Long-Term Vision Plan and has been advanced through the Orange Line Study. Each Build Alternative (**Figure 10**) is comprised of three elements:

- Alignment
- Transitway Type
- Mode

Figure 10: Build Alternative Elements



### 3.3.1 Alignment

The Orange Line Corridor follows the 20-plus-mile route and serves the stations that were identified in the Vision Plan. The corridor was broken into seven segments for purposes of alternative definition and evaluation; this segmentation facilitated the isolation of key differentiators between the alternatives. Changes in roadway geometry, variations in development patterns and land uses, and the presence of major activity generators were used to identify segment boundaries.

The seven segments are shown in **Figure 11** and listed in **Table 2** (including stations).

Figure 11. Orange Line Corridor Segments



**Table 2. Orange Line Corridor Segments**

	<b>Segment Name and Limits</b>	<b>Stations</b>
1	North Austin <i>Tech Ridge to North Lamar Transit Center</i>	Tech Ridge, Parmer, Braker, Rundberg
2	North Central Austin <i>North Lamar Transit Center to 38<sup>th</sup> Street</i>	North Lamar Transit Center, Crestview, Koenig, Triangle, Hyde Park (38 <sup>th</sup> )
3	Central Austin <i>38<sup>th</sup> Street to 15<sup>th</sup> Street</i>	Hemphill Park (29 <sup>th</sup> ), UT Mall (24 <sup>th</sup> ), Capitol West
4	Downtown <i>15<sup>th</sup> Street to Riverside</i>	Wooldridge Square, Republic Square,
5	South Congress (SoCo) <i>Riverside to Oltorf</i>	Auditorium Shores, SoCo, Oltorf
6	South Central <i>Oltorf to Stassney</i>	St. Edwards, South Congress Transit Center, Stassney
7	South Austin <i>Stassney to Slaughter</i>	William Cannon, Slaughter

### 3.3.2 Transitway

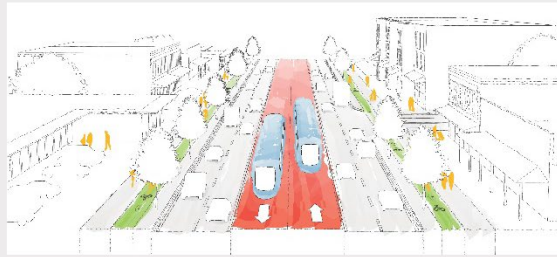
The detailed definition of Build Alternatives uses the results of the Step 1 evaluation to identify the transitway types considered for each segment in the Step 2 evaluation. **Figure 12** highlights the dedicated space for transit within the ROW called “transitways” that were evaluated for each segment of the Orange Line Corridor.<sup>3</sup>

<sup>3</sup> Capital Metro initially identified four types of transitways that could accommodate HCT service within the Orange Line Corridor. After the Step 1 analysis, Cut-and-Cover and Tunnel transitways were combined into one “Underground” transitway for various reasons. Cut-and-Cover and Tunnel transitways have similar archaeological and environmental considerations. Both Cut-and-Cover and Tunnel transitways have similar impacts to the built environment once operational. Additionally, there is no significant difference in transit operations between Cut-and-Cover and Tunnel.

**Figure 12: Transitway Options**

### STREET LEVEL

- » A dedicated transitway running along an existing street
- » Operations are affected by conflicts with traffic signals, pedestrians, bikes, intersections, and other street level uses



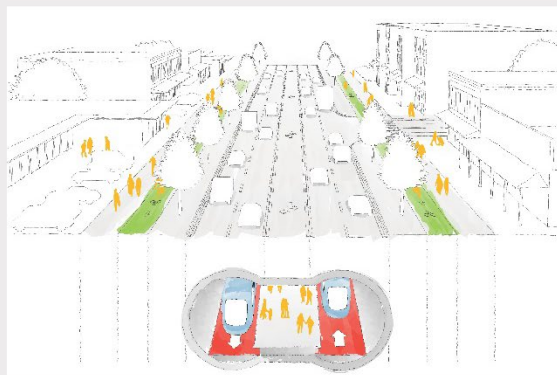
### ELEVATED

- » A dedicated transitway built up above street level along an existing street
- » Stations are above street level and are accessed by stairs, escalators, and/or ADA accessible elevators



### UNDERGROUND

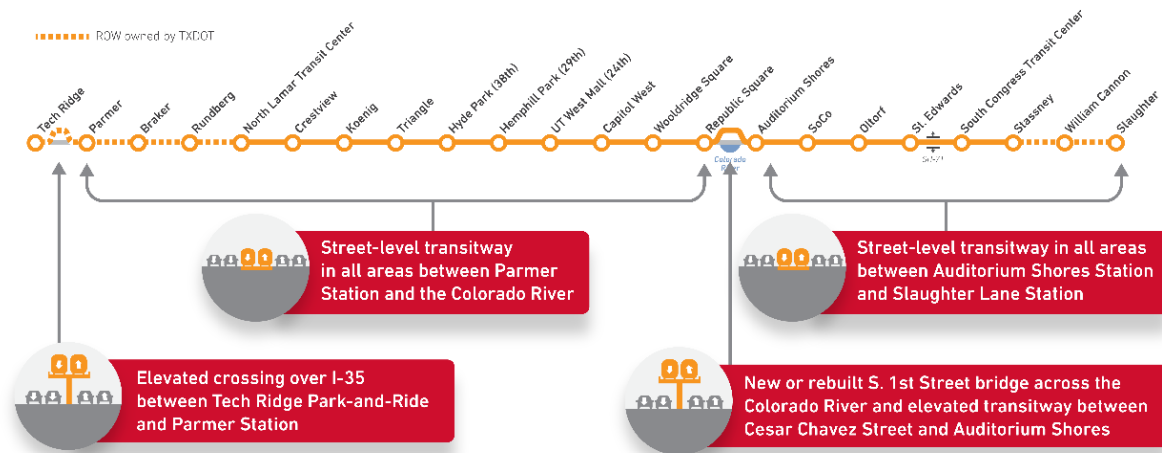
- » A dedicated transitway under the roadway
- » Stations are underground, and are accessed by stairs, escalators, and/or ADA accessible elevators



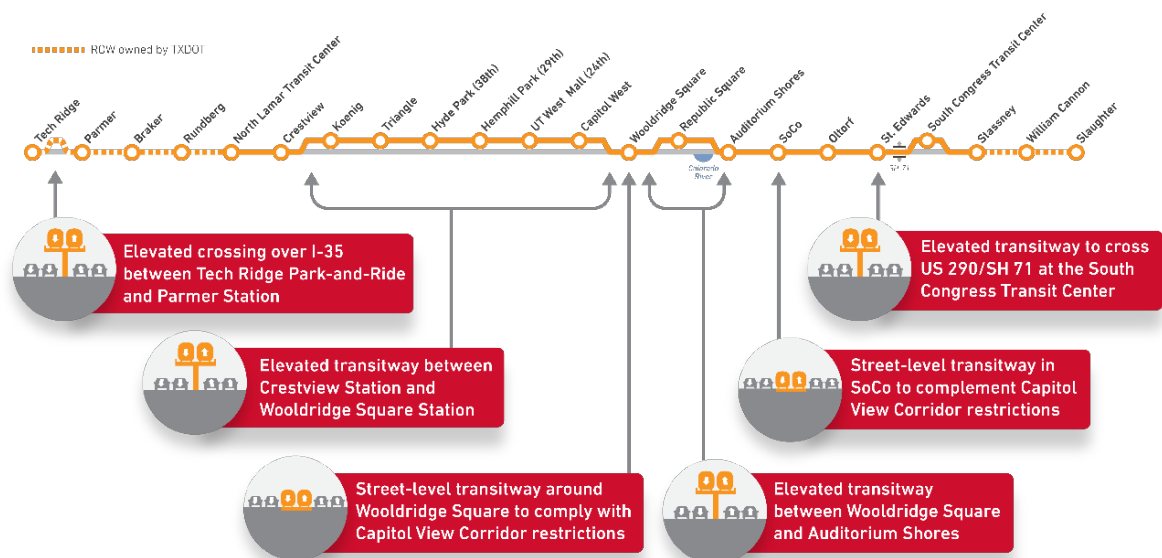
The transitway types identified for each segment were combined to generate two end-to-end transitway profiles for the Orange Line Corridor: Mostly Street Level and Mostly Elevated. A Partially Underground design option will continue to move forward, but the exact details on how much of the route could be underground will be determined through a separate process conducted in coordination with the Blue Line Corridor team. Due to this uncertainty, a Partially Underground transitway profile was not evaluated during Step 2 for any metric other than high-level capital costs. **Figures 13 and 14** show the potential transitway profiles assumed for each Build Alternative.



**Figure 13. Mostly Street Level**



**Figure 14. Mostly Elevated**



### 3.3.3 Mode

Capital Metro had identified two HCT modes for consideration in the Step 2 evaluation: **Bus Rapid Transit (BRT)** and **Light Rail Transit (LRT)**. Both BRT and LRT vehicle fleets would be fully electric, and both feature off-board fare collection, larger stations with level boarding, and intersection signal prioritization. The primary difference between the two modes is the capacity of the vehicles and the perceived attractiveness of the modes as assumed in ridership estimating (discussed later in this report). **Table 3** shows the general characteristics of each mode.

**Table 3. Mode Characteristics**

	BRT	LRT		
<b>Maximum Speed</b>	Posted arterial speeds were used for Street Level segments. Grade Separated maximum speeds are based on transitway character with a maximum speed of 55 mph. <sup>1</sup>	Posted arterial speeds were used for Street Level segments. Grade Separated maximum speeds are based on transitway character with a maximum speed of 55 mph. <sup>1</sup>		
<b>Acceleration/Deceleration</b>	2.7 mph/second	2.7 mph/second		
<b>Station Dwell Time</b>	<i>Boardings</i>	<i>Dwell Time (sec)</i>	<i>Boardings</i>	<i>Dwell Time (sec)</i>
	15 or less	20	170 or less	20
	16 – 34	30	171 – 290	30
	35 or more	40	291 or more	40
<b>Guideway Curvature (Street Level)</b>	30 seconds of additional time and acceleration/deceleration at identified turns that require vehicles to slow down	30 seconds of additional time and acceleration/deceleration at identified turns that require vehicles to slow down		
<b>Guideway Delay (Grade Separated)</b>	N/A	Minimum of 3 minutes to change direction at Republic Square in Build Alternative 1 (Trinity)		
<b>Vehicle Type</b>	60-foot domestic BRT vehicle 5 doors per vehicle	Low-Floor LRV 4 doors per train car		
<b>Vehicle Capacity</b>	115 total passengers (per vehicle)	172 total passengers (per vehicle)		

<sup>1</sup> Maximum speeds in the Downtown portion of Segment 3 were lowered to 25 mph due to the urban character of the corridor.

Autonomous Rapid Transit (ART) was identified as a mode that could be accommodated within the transitway as a future condition if the technology becomes more readily available to transit markets in the United States. At this time, ART technology cannot reasonably or feasibly be evaluated in direct comparison to BRT and LRT modes within the Orange Line Corridor, and is therefore not defined as a distinct mode in the definition of detailed alternatives. Capital Metro does recognize that any capital improvement should consider and, where possible, incorporate elements to future-proof the investment.

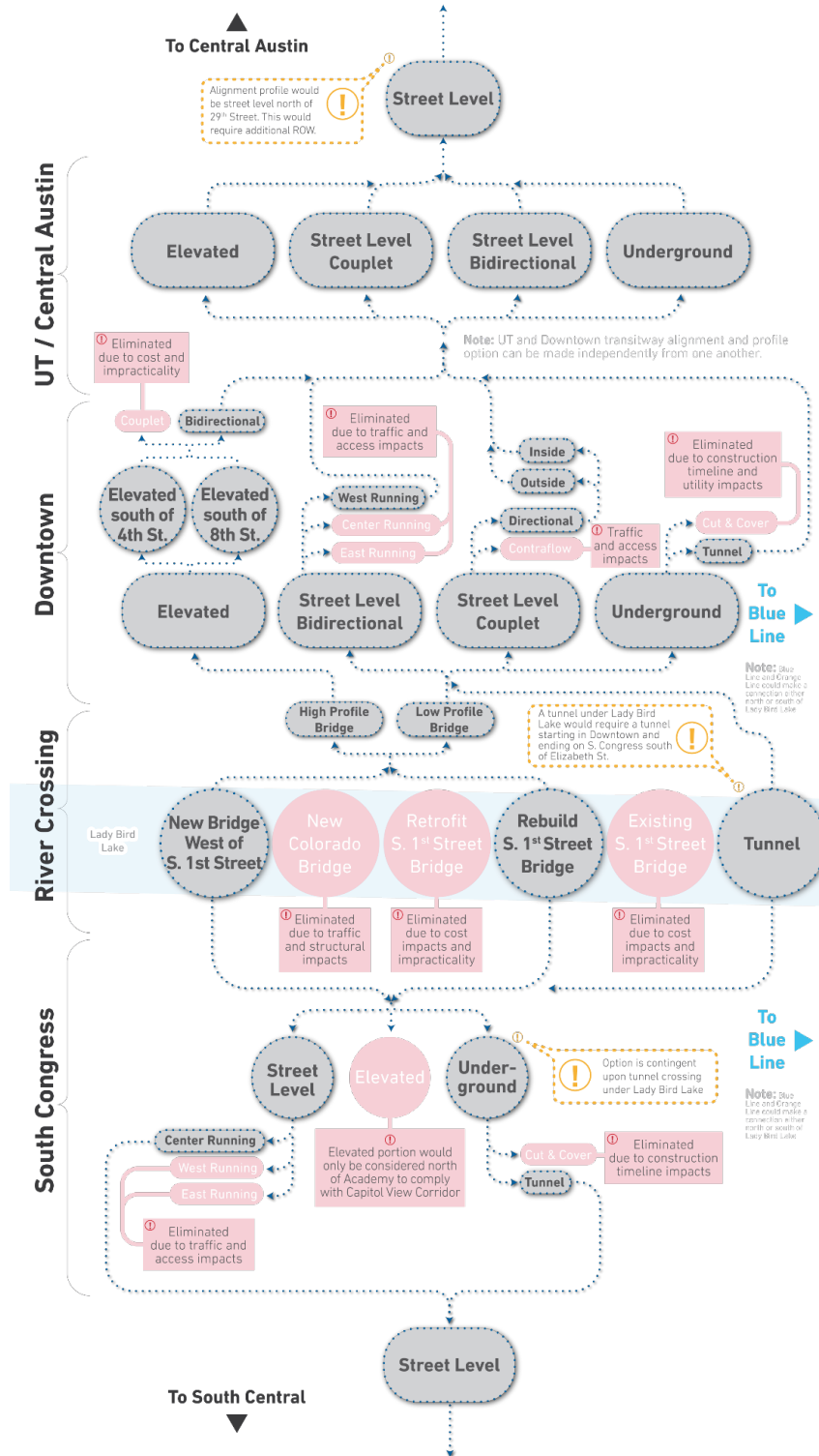
### Detailed Alternatives Summary

The following table (**Table 4**) summarizes the Build Alternatives identified as part of the Step 2 alternatives definition process. These alternatives are compared to the No Build and TSM Alternatives using a variety of evaluation metrics in the following section.

**Table 4. Orange Line Alternatives**

Alternative	Mode	Transitway Type	Corridor Segments							
			1 North Austin	2 North Central	3 Central	4 Downtown	5 SoCo	6 South Central	7 South Austin	
No Build	NB	-	None	NA	NA	NA	NA	NA	NA	NA
Transportation System Mgmt	TSM	Bus	None (Mixed Traffic) with Select Portion of Transit Priority Lane Impts	Mixed Traffic	Select Transit Priority Lane Impts	Select Transit Priority Lane Impts	Select Transit Priority Lane Impts	Mixed Traffic	Mixed Traffic	Mixed Traffic
Build	BRT	Street Level	✓	✓	✓	✓	✓	✓	✓	✓
		Elevated	✗	✓	✓	✓	✓	✗	✗	
		Cut-and-Cover	✗	✓	✓	✓	✓	✗	✗	
		Bored Tunnel	✗	✓	✓	✓	✓	✗	✗	
	LRT	Street Level	✓	✓	✓	✓	✓	✓	✓	
		Elevated	✗	✓	✓	✓	✓	✗	✗	
		Cut-and-Cover	✗	✓	✓	✓	✓	✗	✗	
		Bored Tunnel	✗	✓	✓	✓	✓	✗	✗	

Figure 15: Refining the Alternatives for Detailed Evaluation



Note: While some of these options that are recommended for elimination may be further studied during future project phases, it is recommended that they are removed from consideration during this phase of the study.

## Refining the Alternatives for Detailed Evaluation

While **Table 4** lists the universe of alternatives for detailed evaluation in Step 2, some of these alternatives would not be feasible for implementation and/or operations. The Lady Bird Lake (Colorado River) crossing is the constraining factor in the design of segments 4 and 5 – that decision dictates how (street-level, elevated, or underground) and where (new bridge, rebuilt 1st Street Bridge, or tunnel) the transitway could be located north and south of the crossing. **Figure 15** “maps” the designs that could be feasible based on the viable Lady Bird Lake (Colorado River) crossing options. This conceptual assessment of detailed alignment options was analyzed and presented to stakeholders at ATD for further vetting and coordination. While some of the options recommended for elimination could be further studied during future project phases, they were recommended to be removed from consideration during this phase of the study. The remaining alternatives were carried forward for detailed evaluation. Additional information regarding the alternatives carried forward for detailed evaluation can be found in the Definition of Detailed Alternatives Report

## 5.0 Detailed Evaluation Results

### Evaluation Summary of Results

The Step 2 evaluation of the Orange Line Corridor used the evaluation criteria established in the technical evaluation methodologies and the detailed alternatives defined as a result of the Step 1 evaluation to generate high-level comparison between different combinations of options for alignments, transitway, and modes within the Orange Line Corridor. **Table 5** provides a summary of some of the key metrics from the technical evaluations, while the sections that follow discuss some of the key assumptions and results from each of the six technical memorandums.

The metrics displayed in **Table 5** report the results of the analysis for capital and O&M costs, ridership, and travel time, which are often the factors that are used by communities to select an LPA. These factors, are not, however, the only that were generated through this study – potential impacts to the transportation network (traffic, parking, and active transportation), station areas socio-economics, demographics, and land use, and potential environmental impacts, are all considerations that should be integrated into the process of identifying the LPA. Selection of the LPA will be made through the balance of high-level tradeoffs between key decision points – such as the cost of minimizing street-level impacts through grade separated transitways – but do not necessarily reveal any one tested combination to be the “right” choice for the LPA. This information is intended to provide decision-makers and the public with information that will help them balance costs and benefits, and the ultimate selection of the LPA may represent a different combination of mode, transitway, and alignment that meets the Purpose and Need of the project, is financially feasible, and has strong local support.

**Table 5. Selected Evaluation Metrics for All Alternatives**

		No Build	TSM <sup>4</sup>	Build Alternatives			
				Mostly Elevated (Configuration A)		Mostly Street Level (Configuration B)	
				BRT	LRT	BRT	LRT
Running Time	One-Way <sup>5</sup>	91-96 mins	91- 96 mins	42-43 min		52-53 min	
		Tech Ridge to Republic Square	54 – 56 min	26-27 min		32-33 min	
		Republic Square to Slaughter	37 – 40 min	15-16 min		19-20 min	
Average Weekday Boardings	2028 (Low)	--		38,600		33,700	
	2028 (High)	--		55,000		47,600	
	2040 (Low)	12,300	11,100	53,600		45,200	
	2040 (High)			73,700		61,600	
Capital Cost <sup>6</sup>		--	\$214.3 M	\$3,479.1 M	\$5,062.7 M	\$1,972.6 M	\$3,761.0 M
Annual Operating & Maintenance Cost <sup>7</sup>		--	\$80.7 M	\$30.3 M	\$55.6 M	\$24.4 M	\$50.2 M

<sup>4</sup> TSM running times reflect PM peak running times.

<sup>5</sup> Reflects a rounded average of the northbound and southbound one-way running time.

<sup>6</sup> Represented in mid-construction year dollars (2023 for TSM; 2025 for Build Alternatives)

<sup>7</sup> Represented in opening-year dollars (2028 for all alternatives)

## Ridership

Ridership forecasts are an indication of potential demand for service. Ridership forecasts were utilized as an input to a capacity analysis which drove the service plan utilized for operating and maintenance costs. **Figure 16** provides an overview of the ridership results.

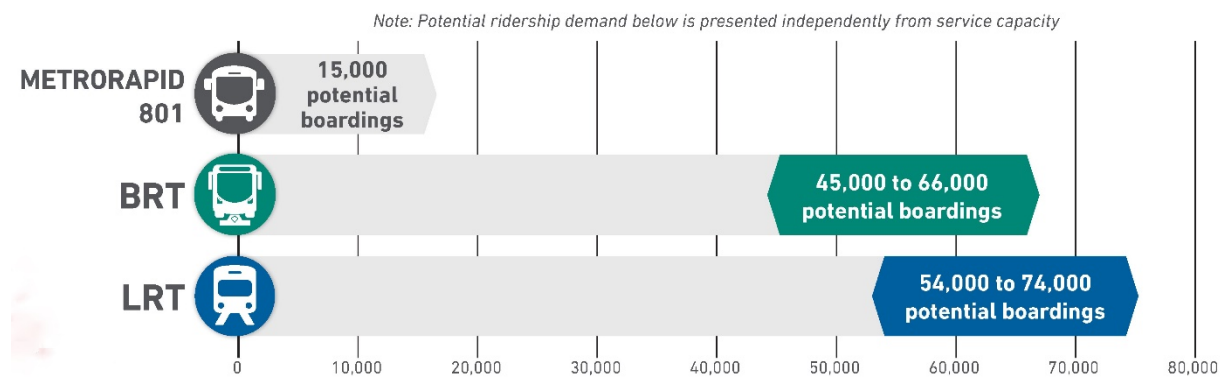
The Orange Line Corridor as a part of Project Connect represents one of the two proposed dedicated transitways. The transitway would provide reliable and frequent transit operating in a congestion-proof environment from which the entire Capital Metro System would benefit. The range in results depend on the configuration and the mode for the Orange Line.

The mostly elevated alternative provides the highest ridership results due to faster running times achieved through grade separation. The highest ridership Orange Line stations for the mostly elevated alternative are UT Mall, Rundberg, and Republic Square. The highest ridership Orange Line stations for the mostly street level alternative are UT Mall, Rundberg, and Crestview.

Regardless of the operating configuration, both alternatives represent operating on a dedicated transitway and produce significant increases in ridership along the corridor ranging from a 175% to 351% increase for the 2028 opening year along the corridor compared to the expected 2028 ridership for the No Build MetroRapid 801 that operates in mixed traffic, based on potential diversions from other routes due to constants and visibility factors.

The operational enhancements of the Orange Line result in a premium service that is attractive at the system level and benefits the system level ridership resulting in 11% to 28% increase for the 2028 opening year compared to the No Build system level ridership.

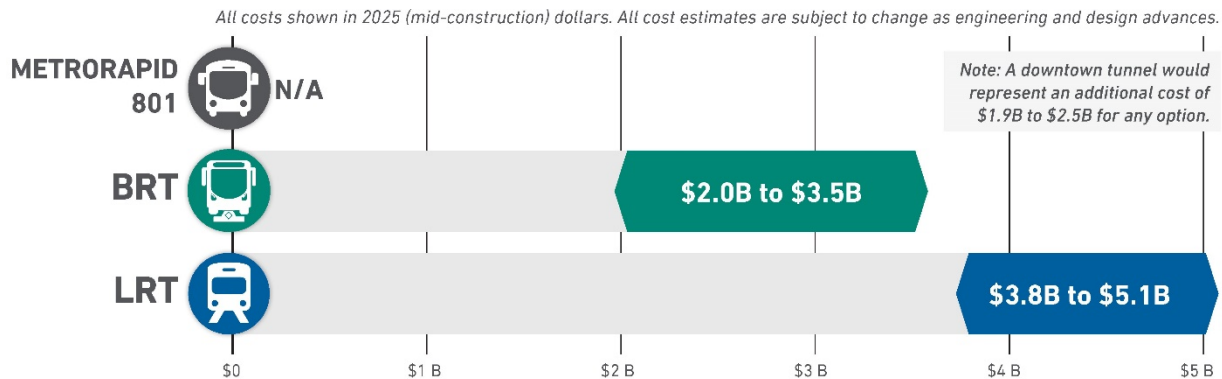
**Figure 16: Potential Ridership Demand on Typical Weekday**



## Capital Costs

Capital cost estimates were prepared for each of the Orange Line Corridor Build Alternatives and the TSM Alternative (**Figure 17**). Standard Cost Categories (SCC) represent FTA's format for the reporting, estimating, and managing of transit capital projects and were used in this estimate. Financing costs (SCC 100) were not included as the development of the financial plan and would not be completed until the selection of an LPA. Unit costs used to develop the capital cost estimates were developed in coordination with Capital Metro using similar recently completed FTA-funded projects and scaling the unit costs to the local market. All costs were escalated to a mid-construction year estimate (2025) using a 3.5 percent annual inflation rate.

**Figure 17: Estimated Capital Costs**



\*This cost reflects a joint tunnel for Orange and Blue Lines

Key assumptions used for the Orange Line Corridor capital costs include:

- Unit prices for the various standard cost elements are based on unit prices for other completed U.S. transit projects and tempered for the Austin market.
- Quantity estimates are based on the conceptual designs developed for each alternative.
- Capital costs are escalated by 3.5% per year for inflation and reported in 2025 dollars.
- Guideway
  - LRT tracks
    - Embedded track – Street level
    - Direct fixation – Elevated
  - BRT guideway
    - Concrete guideway throughout the alignment
- Signals
  - At grade crossings of the guideway would be limited to signalized intersections.
  - Signals in aerial sections would be modified
  - Assume mid-block crossings only for center platform
- Roadway work
  - Reconstruction of sidewalk may be on both sides of the street along the alignment with Americans with Disabilities Act (ADA) compliant crosswalks at all signalized intersections
  - Assuming reconstruction of roadway along alignment including curb and gutter and drainage where needed.
  - Cross streets may need to be rebuilt or modified
  - Medians assume landscape 50% concrete 50%
- Professional services and contingency are calculated as percentages of different subtotal costs and therefore vary depending on both the transitway and mode



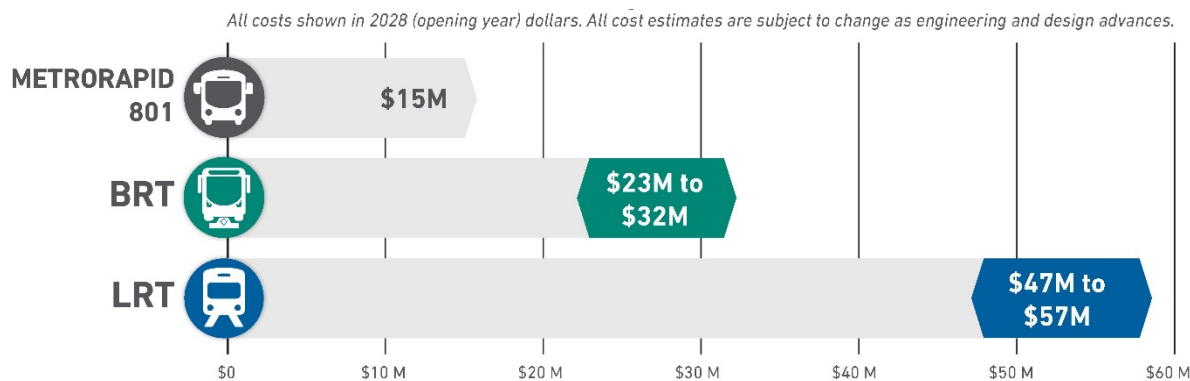
In general, the Street Level alternatives are less expensive than Elevated alternatives and significantly less expensive than Underground alternatives. LRT alternatives are also more expensive than BRT alternatives. This is primarily due to the greater cost of the transitway, stations, vehicles, and systems associated with LRT technology compared to BRT technology. There is also a significant difference between LRT maintenance facility capital costs and BRT facility costs. Sitework and ROW costs are more dependent on the transitway assumption rather than the mode.

### Operating & Maintenance (O&M) Costs

Cost estimates for each Build Alternative and the TSM Alternative are shown in **Figure 18**. Cost estimates are presented in 2028 dollars reflecting the anticipated opening year for the Orange Line Corridor. Note that the TSM Alternative cost estimates are for traditional bus, not BRT or LRT modes.

Overall, BRT Build Alternatives have a lower estimated annual O&M cost. However, not all O&M cost estimates are intuitive as the primary driver for O&M costs is revenue hours which is driven by the service plan (to meet capacity) and cycle time. For example, one may assume that the Mostly Elevated alternative has a lower O&M cost due to a shorter cycle time (driven by running time); however, this alternative forecasts higher ridership which requires additional service in order to meet demand. As such, the service plan for each alternative varies based on forecasted demand. Therefore, to meet forecasted demand, additional capacity was necessary either in the form of increased headways (BRT) or increased vehicles/cars (LRT).

**Figure 18: Estimated Annual Operating and Maintenance Costs**



### Station Area Analysis

The Orange Line Corridor analysis evaluated data on population and density characteristics and identified stations where there may be higher concentrations of transit-dependent populations as part of an EJ evaluation. Improved access to employment, improved connectivity, and/or improved air quality can offset impacts to EJ populations. An initial assessment indicates that EJ populations would have access to employment near station areas.

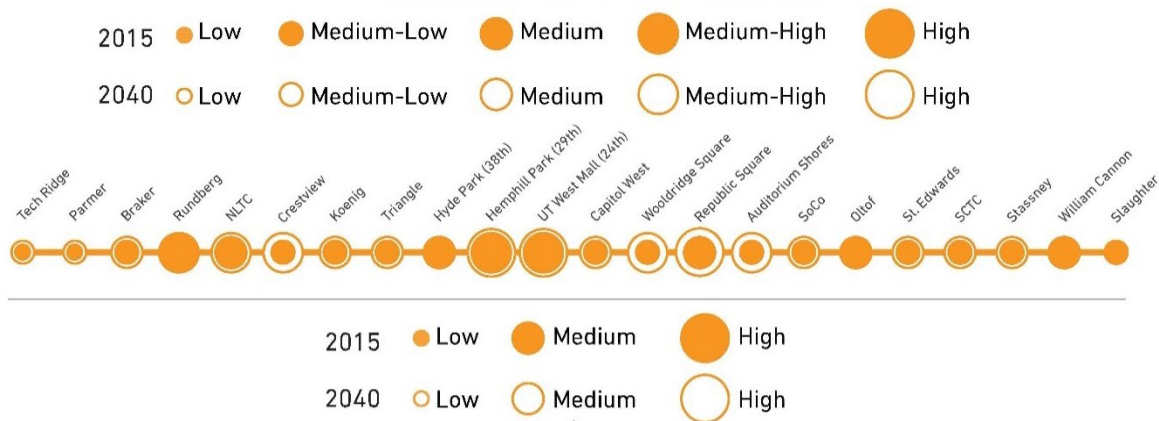
**Table 6** shows the overall population, employment, and EJ characteristics of the build alternative alignment studied for the Orange Line Corridor. The Orange Line Corridor would serve a high number of jobs (over 150,000) and population (almost 90,000), and a higher percentage of the corridor’s residents identify as minority, low-income, or belonging to a zero-car household than citywide and regional averages.

**Table 6. Corridor-Level Demographic Summary**

	Population (2015)	Employment (2015)	% Population Minority	% Households Below Poverty	% Zero Car Households
Orange Line	86,270	150,082	47.7%	19.5%	7.3%
City of Austin	851,846	603,036	51.3%	18.0%	6.6%
Five-County Area	1,978,341	944,538	46.4%	14.2%	4.8%

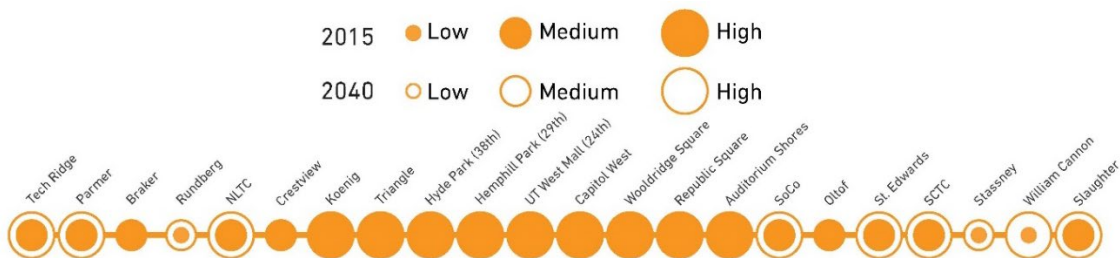
The assessment shows that about one third of the station areas along the Orange Line corridor (7 of 22 station areas studied) score Medium to High in population density. Unsurprisingly, downtown through UT and Hemphstead Park are the densest sections of the Orange Line corridor and also the places where population density is expected to increase the most through 2040. **Figure 19** shows population density by station for 2015 and 2040.

**Figure 19. Population Density by Station**



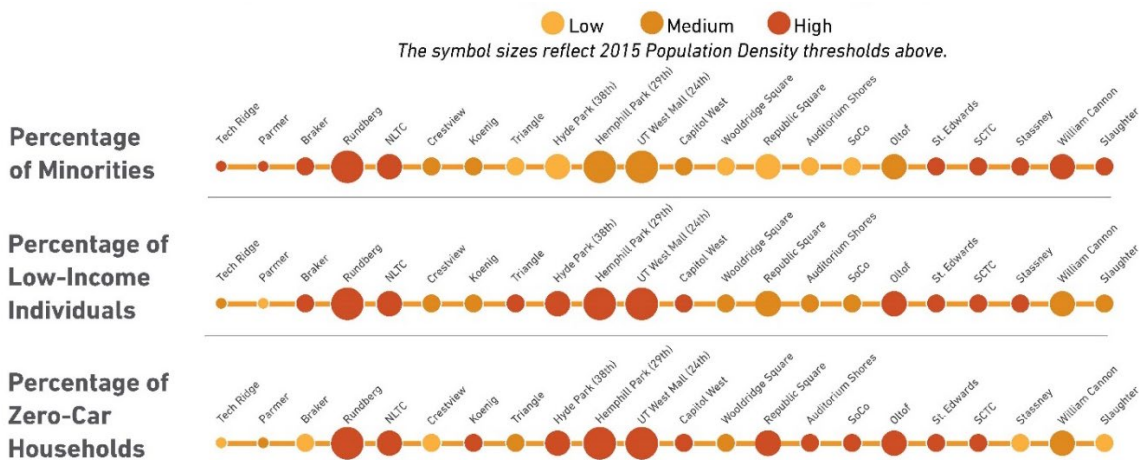
Almost 50% (9 of 22 station areas studied) scored High in the metric of employment density. By 2040, 17 station areas are projected to score High in employment density while all the remaining station areas score Medium. **Figure 20** shows employment density by station for 2015 and 2040.

**Figure 20. Employment Density by Station**



The station areas with the highest EJ population concentration are both in the northern and the southern portions of the proposed alignment. The Rundberg Station in particular has high concentrations of EJ populations and has the highest percentage of zero-car households, and has the largest number of affordable housing units. **Figure 21** shows the relative percentage of EJ population within each station area compared to citywide averages.

**Figure 21. Environmental Justice Populations and Transit-Dependent Households**











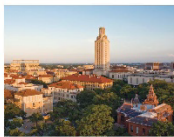



### Environmental Analysis

The environmental analysis is intended to provide a basis of comparison for a variety of environmental parameters and to identify potential adverse effects on environmental resources within the defined study areas for each.

Overall, there would be environmental constraints or environmental benefits for each segment and option along the Orange Line Corridor as summarized in **Figure 22**. Elevated transitway may have the potential for indirect adverse effects with regard to Section 4(f) resources and historic structures. While direct impacts and tradeoffs to EJ communities will continue to be evaluated, there are inherent benefits from any Build Alternative if adverse direct effects are avoided, minimized, or mitigated. The extent of adverse impacts to EJ communities will be fully investigated during the NEPA phase. At this time, no fatal flaws or significant impacts to socioeconomic resources are anticipated for any of the HCT alternatives. However, detailed design is required to assess any alternatives that would disproportionately limit or remove access to community facilities, displace minority or low-income communities, or segregate minority or low-income communities. These critical socioeconomic resources and potential effects will be considered and documented within the Orange Line EIS.

**Figure 22. Environmental Considerations**

	<p><b>Habitats &amp; Species</b> Based on U.S. Fish and Wildlife (USFWS) data (1) there are no designated critical habitat for any federally-listed species in the study area; and (2) there are potential habitats including Lady Bird Lake, and Karst Zones 1, 2, and 3.</p>	
	<p><b>Floodways &amp; Waters of the U.S.</b> The Orange Line Corridor contains crossings of Waters of the U.S., including Lady Bird Lake (Colorado River) and 100-year floodplains; the Orange Line Corridor intersects the Edwards Aquifer Transition Zone in Segment 1 along N. Lamar Blvd.</p>	
	<p><b>Capitol View Corridors</b> Capitol View Corridors exist along the Orange Line Corridor. The Capitol View Corridors will be examined further under NEPA and the Section 106 process of the National Historic Preservation Act.</p>	
	<p><b>Historic and Archaeological Resources</b> Numerous historic and archeological resources exist throughout the Orange Line Corridor. Direct impacts to National Register of Historic Places will be avoided to the extent possible. Section 106 compliance concerns for direct and indirect impacts may be highest for new right-of-way, above-ground, or below-ground construction.</p>	
	<p><b>Parks</b> There will be impacts along Lady Bird Lake (Colorado River) and associated parkland. The Orange Line Corridor will minimize impacts to park resources in compliance with environmental regulations found in Section 4(f) of the U.S. Department of Transportation Act of 1966 and Section 6(f) of the Land and Water Conservation Fund Act.</p>	
	<p><b>Air Quality</b> No significant negative impacts to air quality are anticipated to result from any of the alternatives.</p>	
	<p><b>Community Resources</b> All Orange Line Corridor alternatives serve community resources including health care and government services, schools, places of worship, and cultural institutions.</p>	
	<p><b>Environmental Justice</b> All Orange Line Corridor alternatives serve Minority and Low-Income persons as well as Zero-Car Households. Positive impacts (benefits) could include improved access to transit options and improved travel times. Adverse impacts would be avoided, minimized, or mitigated during the NEPA process.</p>	

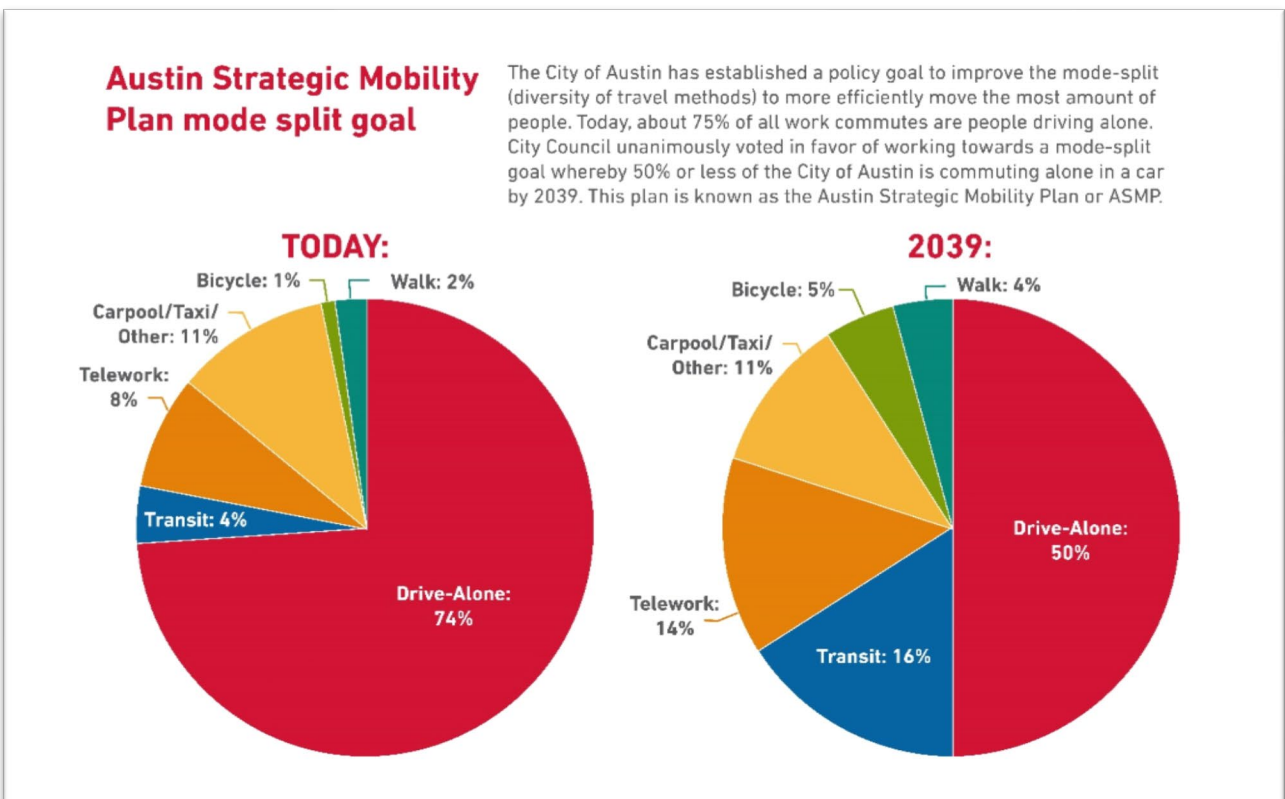
## Transportation Network Analysis

The Orange Line Corridor alignment alternative was evaluated for the potential impact on the transportation network in terms of transit travel times, intersection delay and LOS, parking impacts and effects on active transportation. Further analysis on roadway and vehicle movement and capacity will be evaluated in preliminary engineering and design.

### Transit Travel Times

Reduction in travel times is a key means of fostering achievement of the Austin Strategic Mobility Plan (ASMP) 16 percent transit mode split in the peak commute hours shown in **Figure 23**.<sup>8</sup>

**Figure 23: Austin Strategic Mobility Plan Framework Overview**



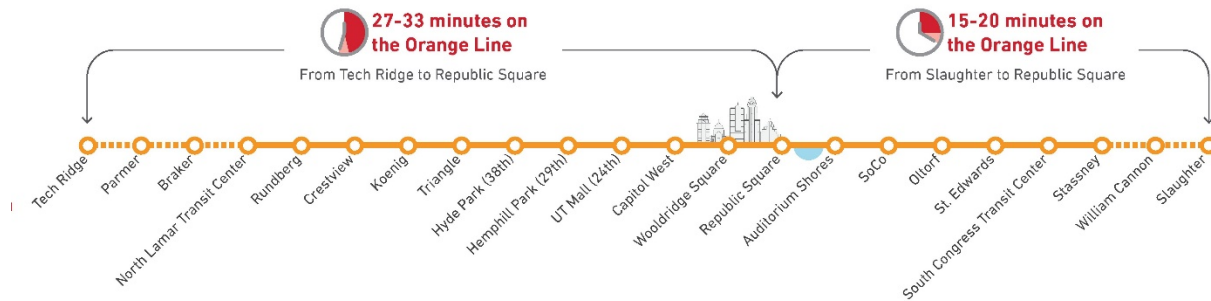
**Figure 24** provides an overview of travel times for LRT. **Table 8** shows travel times between stations for the Build and TSM alternatives. Adding dedicated transit way significantly increases travel time along the Orange Line. Mostly aerial provides the greatest benefit in travel time savings. As demonstrated in the table below, many trips are significantly shorter by transit, however intersection delay and LOS will be evaluated during the NEPA process.

To accomplish the project Goals and Objectives, travel times along the Orange Line Corridor between key activity centers should improve for targeted populations including new riders previously not using transit along the corridor as well as members of EJ communities. **Figure 25** shows four different types of trips

<sup>8</sup> City of Austin. <https://www.austintexas.gov/department/austin-strategic-mobility-plan>.

showing travel times between Central Texas activity centers that help determine whether travel times improve with the Build Alternatives based on the modeled operating plan.

**Figure 24: Orange Line Travel Times**

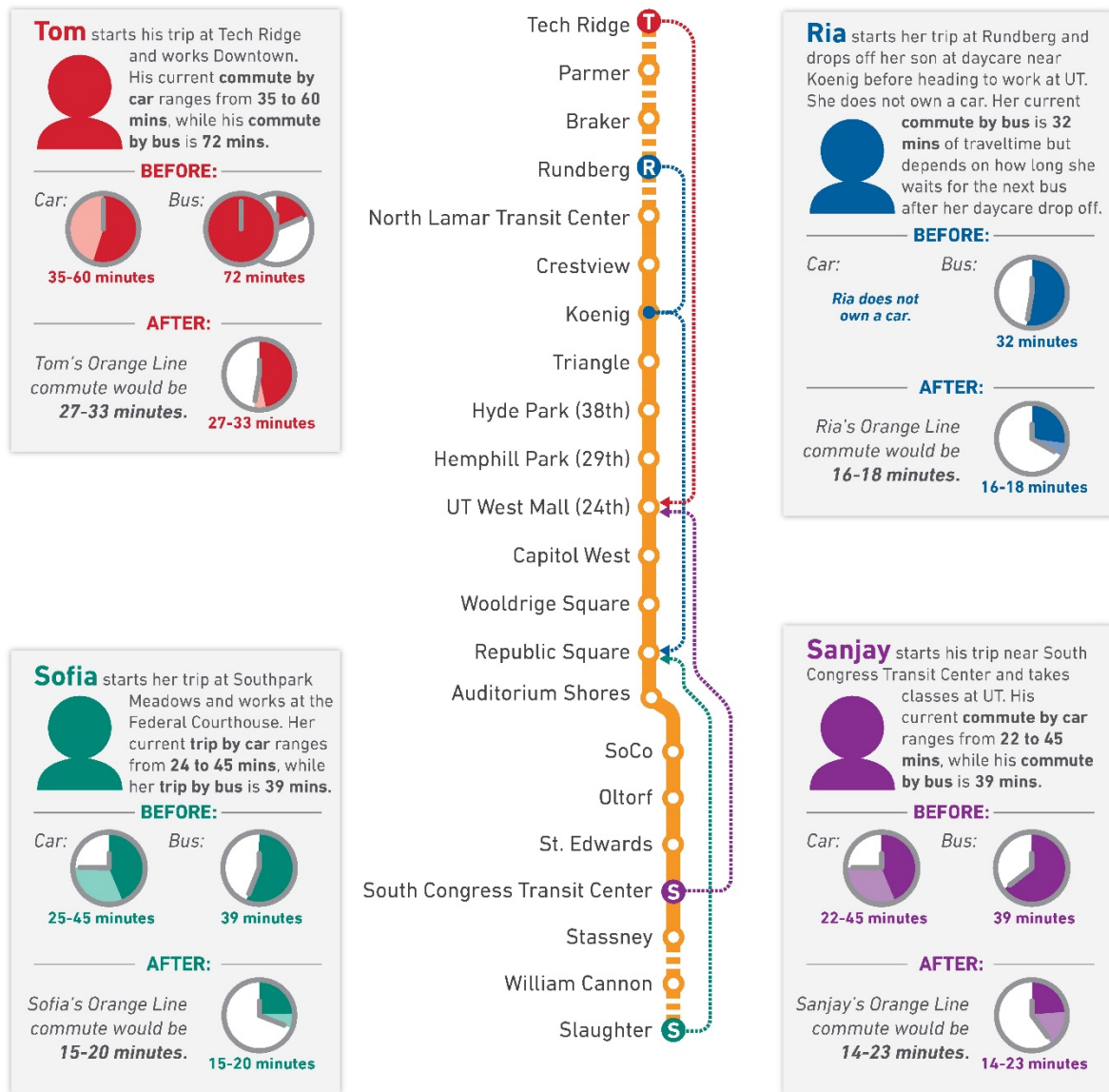


**Table 8. Travel Times Between Stations for TSM and Build Options**

	TSM	Option A (Mostly Aerial)	Option B (Mostly At-Grade)
	Off Peak (Midday)		
Average End to End	88	43	52
Slaughter to Auditorium Shores	32	13	16
Slaughter to Republic Square	34	15	19
Slaughter to Crestview	62	30	39
St. Edwards to Republic Square	17	7	11
St. Edwards to Tech Ridge	67	34	44
Auditorium Shores to Lamar & Rundberg	43	21	28
Republic Square to Lamar & Rundberg	41	19	25
Republic Square to Tech Ridge	54	27	33
Crestview to Tech Ridge	33	13	13

Source: Orange Line Corridor Running Time Model

Figure 25: Travel Time Estimates between Activity Centers



Note: Car travel time does not include time spent finding a parking space.

Intersection Delay and Level of Service

Existing delays are as reported in the Guadalupe Street Corridor Mobility Program Report (2019). Both transitway alignment options preliminarily evaluated increase intersection delays at most intersections. Delays are higher in the PM for the existing and alternative configurations. Reported delays in **Table 8** only represent delays calculated from SB traffic diverted from Guadalupe Street to Nueces/San Antonio. The delay at the intersection of the eastern leg of Nueces Street and 24th Street is indicative of the heavy delay possible on Nueces Street for this configuration. Guadalupe & 29th and Guadalupe & Dean Keeton are substantially delayed by the addition of the at-grade HCT guideway for all scenarios.

### Active Transportation

For the Active Transportation analysis, the approach taken was to compile facilities in and around the potential Orange Line alignment, and identify opportunities and constraints within each station area for pedestrian and bicycle access and identifies critical gaps in the active transportation network where future recommendations should be made to enhance station area connectivity. In the next phase, the analysis will go further to recommend strategies for implementation to the build alternative. Active transportation is critical in transit first/last-mile connections.

### Parking Impacts

The parking impacts analysis was a preliminary inventory of on-street parking spaces impacted by the potential Orange Line alignment. The total number of available parking spaces would be reduced by the addition of an HCT guideway; however, the exact impact is unknown until a locally preferred alternative has been selected. There is a possible under-utilization of parking in the Orange Line Corridor based on the data presented in this report and the previous Downtown Austin Alliance Parking Report. Downtown parking especially appears to be underutilized outside of normal business hours. Further analysis of the location and design of parking spaces that would not be impacted by the HCT guideway will be addressed in the subsequent phase of this project.

## **6.0 Engineering Considerations**

In order to fully evaluate options and set a path forward, distinguishing factors that eliminate alignment options and types of transitways were evaluated. This analysis is representative of baseline conditions known to-date that could be refined in later project development phases. This section describes analysis performed that is reflective of a continued planning effort to understand engineering constraints at a conceptual level.

For this effort, preliminary engineering drawings were developed to an extent that facilitated analysis of the ROW available and what would be required for the transitway of each alignment. The purpose of the effort documented below is to help inform local decision-making in the selection of an LPA. As the LPA is advanced, more detailed engineering and design activities will occur through the Preliminary Engineering and NEPA phases.

### **Horizontal Alignment**

Through the Vision Plan and subsequent study, the Orange Line corridor was identified as a HCT corridor with fully-dedicated transitway. To serve the capacity needs of the completed system, the corridor would consist of double track guideway. The horizontal alignment generally follows the existing southbound MetroRapid 801 service route, traveling along the major N Lamar Blvd, Guadalupe St, and S Congress Ave within both TxDOT and City of Austin right-of-way. From the northern terminus at the existing Tech Ridge Park and Ride Station, the alignment travels north-to-south along N Lamar Blvd and transitions to Guadalupe St north of the Triangle. It continues along Guadalupe St through UT campus and Downtown, crosses Lady Bird Lake, and transitions via E Riverside Ave to S Congress Ave. The alignment continues along S Congress Ave to the southern terminus near Slaughter Lane. Each of the baseline alternatives evaluated shares a similar horizontal alignment with slight variations due to guideway and station configuration. Horizontal alignment will be refined slightly as part of preliminary engineering.

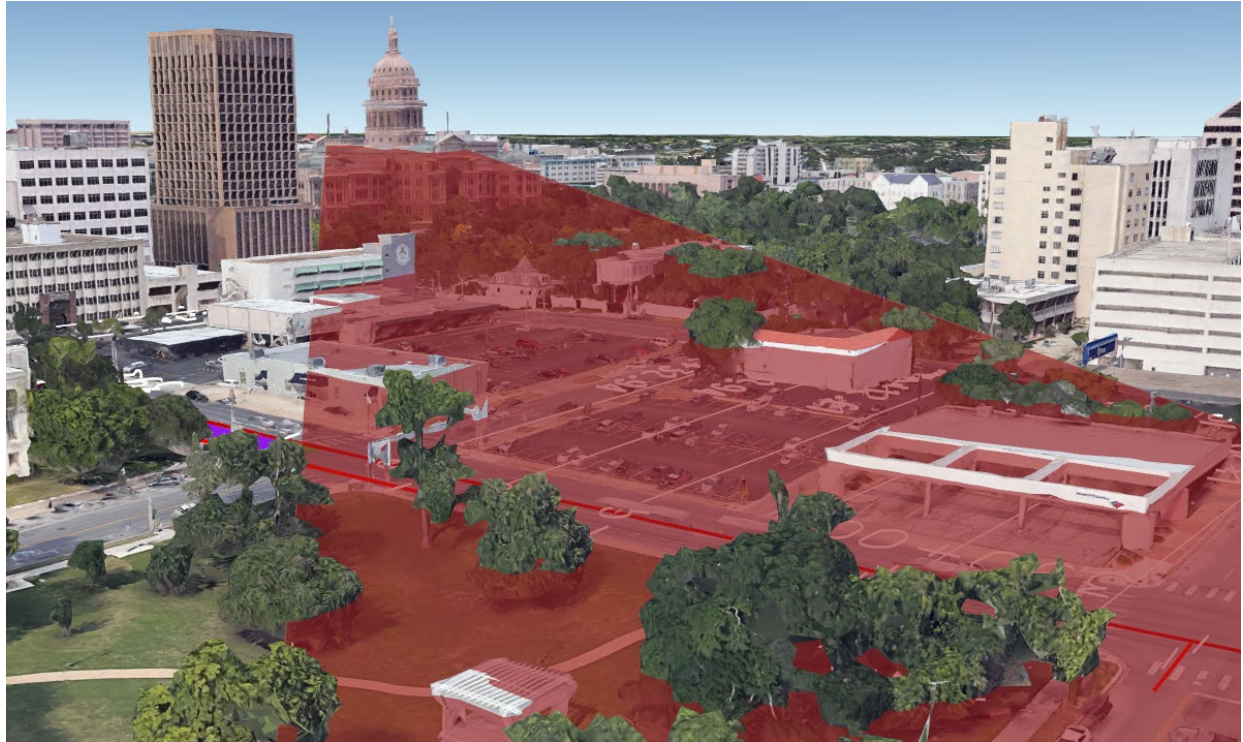
### **Capitol Viewshed Corridor**

Based on the Capitol View Corridor requirements as defined in Texas Government Code §3151.000, an aerial guideway or station would be precluded adjacent to Wooldridge Square. For this reason, an otherwise fully aerial guideway downtown would need to touch down to at-grade between approximately



12th St and 8th St. The station adjacent to Wooldridge Square would also need to be at-grade in this location.

**Figure 26: Capitol Viewshed Corridor (Wooldridge Square looking Northeast)**



### Vehicle and Systems Requirements

While vehicles and systems elements were not the focus of the initial planning and conceptual engineering design, efforts to identify the potential vehicle technology and systems elements that would be most suitable for the Orange Line based on the characteristics of the project corridor were initiated. A white paper is being developed which will contain a series of sections that describe various systems elements of the Light Rail alternative--namely, the vehicles, traction electrification system, OCS, signaling, communications, fare collection, and operations and maintenance facility.

An important decision to be made early in the preliminary engineering phase is the selection of the vehicle configuration. While there are a number of examples of light rail vehicles (LRV) with level boarding using high passenger station platforms (e.g., Buffalo, Calgary, Edmonton, Los Angeles, Pittsburgh, St. Louis), all of the most recent new start light rail systems have opted for low passenger station platforms and level boarding using partial (approximately 70%) or 100% low floor LRVs (e.g., Charlotte, Houston, Hudson-Bergen, Kitchener-Waterloo, Minneapolis, Norfolk, Phoenix, Portland, San Jose, San Jose, Seattle, and soon Ottawa). Calgary and Edmonton, the two earliest LRT systems in North America, began and have expanded with high platform stations, and are now building new, stand-alone lines with low platforms, as well.

### Future-Proofing

The Orange Line is a substantial capital investment and would drastically reshape travel patterns throughout the region. In turn, this investment must endure and be scalable to support advancements in technology, emerging system capabilities and service needs. Planning for system resiliency and scalability

helps eliminate design obstacles that limit a project’s long-term usability and helps determine design considerations that provide the best investment value over the project’s entire life cycle.

Future-proofing Capital Metro’s Orange Line so it will be positioned to incorporate emerging technologies and adapt to changing patron demands will require investment in and commitment to making provisions and accommodations that may not be used during the early stages of revenue service of the system.

A separate document related to future-proofing all elements of the Orange Line has been prepared, and each element should be evaluated for implementation during future design phases of the project.

## 7.0 The LPA — Your Plan, Your Orange Line

Selection of the LPA is a balance between tradeoffs made at key decision points – such as the cost of minimizing street-level impacts through grade separated transitways even though it may be more costly. The AA process provided information to the decision-makers and the public that helped them balance costs and benefits, but it does not necessarily reveal any one alternative to be the “right” choice for the LPA. The LPA selection is represented by a combination of mode, transitway, and alignment choices that when combined meet the Purpose and Need of the project, is financially feasible, and has strong local support. This section summarizes the proposed LPA that evolved from the Orange Line Corridor AA process.

The Orange Line LPA is defined as light rail operating in an approximately 20-mile dedicated transitway from Tech Ridge on the northern end of the corridor to South Park Meadows on the southern end of the corridor (**Figure 27**).

The transitway is proposed to operate at street level (center running) throughout most of the corridor. The Orange Line transitway profile near Crestview Station and the Red Line crossing will be determined pending the outcome of a separate study. Through Downtown and UT, there are four potential transitway options: street level, partially elevated, and tunnel. Selection of the preferred transitway option (or combination of transitway options) between Auditorium Shores and Hemphill Park Station (29th St) will be made during the next project phase (Preliminary Engineering).

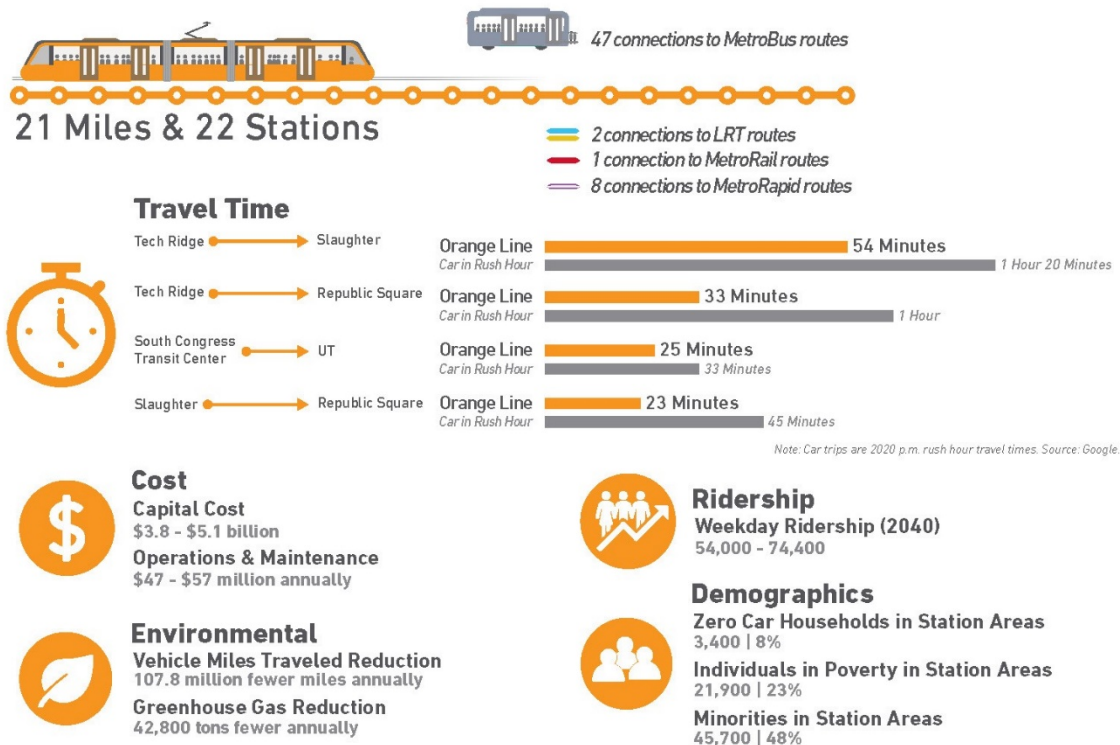
Twenty-two stations are planned along the route. The placement of these facilities will be coordinated with the local community during the design phase. Service has been modeled to operate every 10 to 15 minutes, seven days a week, from 5:00 a.m. to 3:50 a.m. (12:50 a.m. on Sundays), the next day. The Orange Line would feature off-board fare collection, larger stations with level boarding, ADA accessibility, and intersection signal prioritization.

The Orange Line would connect with the Blue and Gold Line in downtown Austin at Republic Square; the exact location of that connection (including potential joint use of a tunnel) will be determined in Preliminary Engineering.

Figure 27: The Orange Line LPA at a Glance

# ORANGE LINE *at a glance*

## Mode *Light Rail*



## 8.0 Implementation and Next Steps

The LPA was unanimously adopted by the Capital Metro Board of Directors and endorsed by Austin City Council on June 10, 2020, affirming it ready to advance into the next steps in the implementation process. These next steps include incorporation of the LPA into the CAMPO 2045 plan and developing an implementation plan that addresses funding, completion of the federal environmental review process, preliminary and final design, and construction. Capital Metro will continue to engage with the community throughout this process as the Orange Line project advances.

### Project Implementation

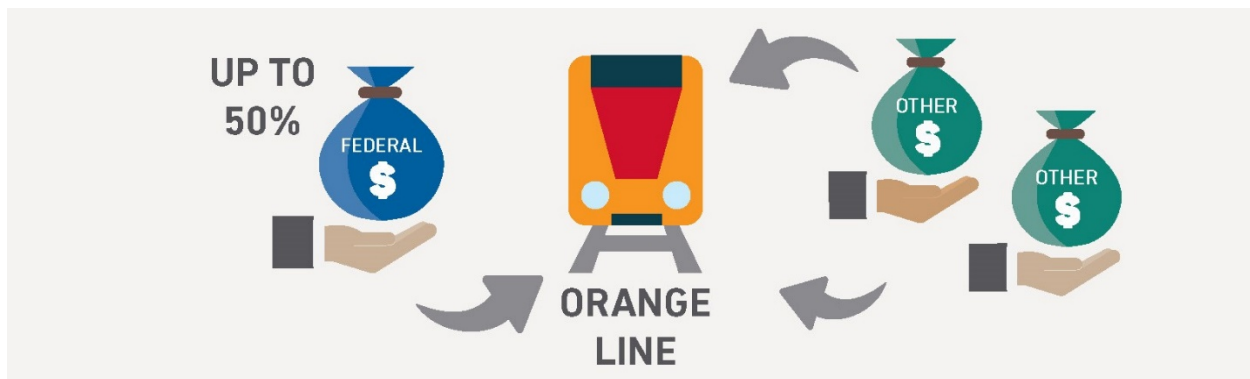
Following the LPA's June 2020 adoption, Capital Metro will develop an implementation plan that identifies the sequencing and extent of projects to be implemented over the coming years. This may include consideration of a Minimum Operable Segment (MOS) and/or implementation of a Starter System of whole or part of the Orange Line LPA. An MOS provides the most cost-effective solution with the greatest

benefits for the project. The MOS must be able to function as a stand-alone project and not be dependent on any future segments being constructed.<sup>9</sup>

### Project Funding

The implementation plan will include a funding strategy to implement the proposed projects. With the adoption of the LPAs, the project would be eligible for Federal funding in line with recent trends in CIG authorizations. The CIG program may award up to 50 percent of a project’s capital cost. Other funding will primarily come from local sources, and authorization of new local funding to be directed towards some or all of the Orange Line cost could be on a potential November 2020 referendum. **Figure 28** illustrates the funding approach discussed above.

**Figure 28: Orange Line Funding Approach**

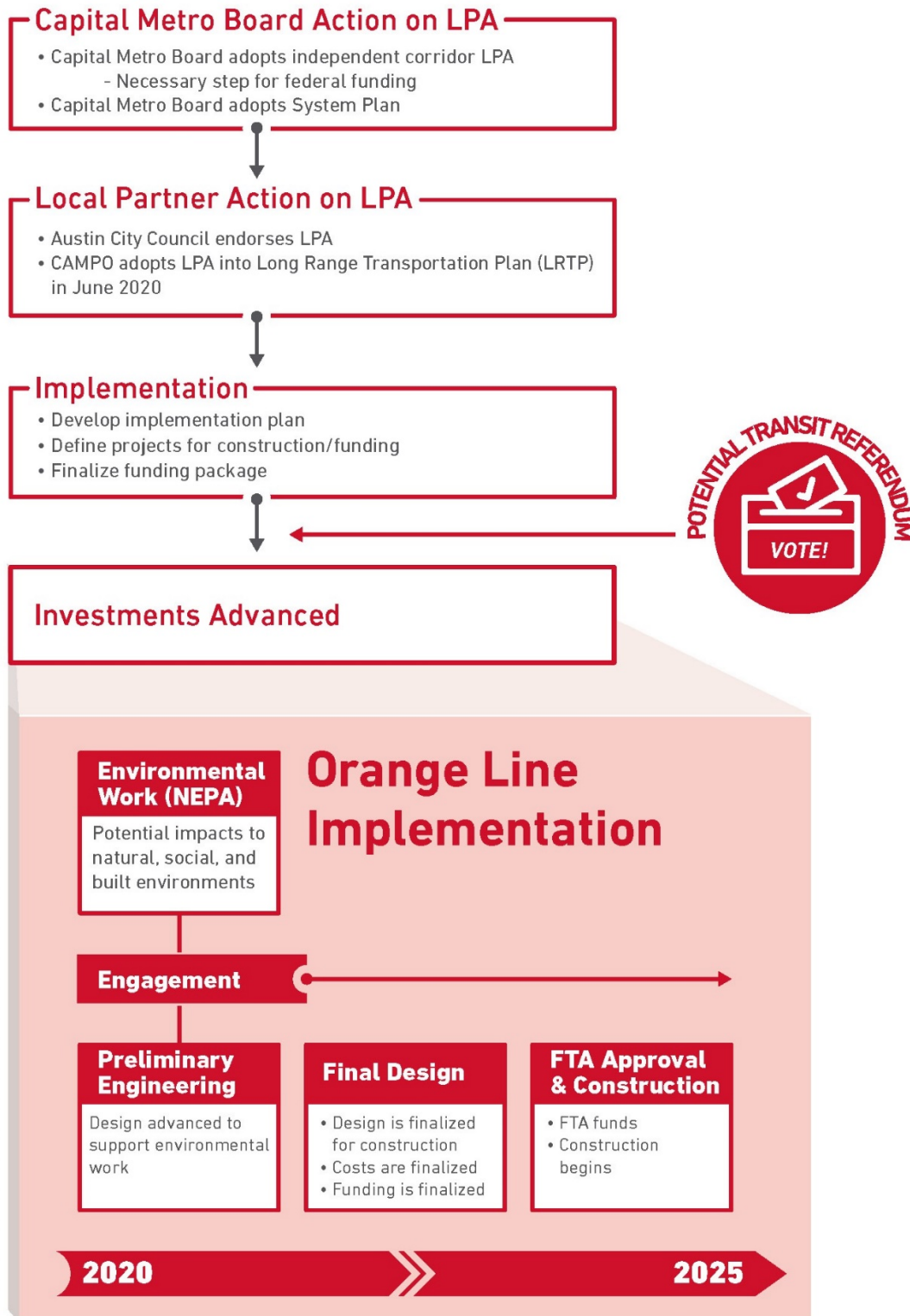


### Preliminary Engineering and NEPA Phase

The project implementation plan will determine how the Orange Line project advance into the Preliminary Engineering and NEPA phases (**Figure 29**). During these phases, the potential impacts and benefits to the natural, social, economic and built environments will be evaluated in detail and compared to the alternative of taking no action to implement HCT in Austin. The project design will be advanced to support this evaluation and it will include the development of preliminary design concepts for a tunnel in downtown Austin.

<sup>9</sup> FTA Circular 9300.1B, November 2008.

Figure 29: Implementation Steps for the LPA



## Proposed Next Steps

The proposed Orange Line LPA is documented in the LPA Summary Report (Your Plan, Your Orange Line Summary Report, April 2020). Public comment on the LPA was sought through a virtual open house.<sup>10</sup> Feedback from those virtual public engagement efforts helped to inform the Capital Metro Board of Directors adoption of the Orange Line LPA and the Austin City Council's endorsement. Following June 2020 adoption of the System Plan, Capital Metro will develop a sequencing plan and funding strategy for implementing the projects, including consideration of how the Orange Line service will be coordinated with the Blue and Gold Lines.

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<sup>10</sup> Source: <https://www.capmetroengage.org/en/engagement-initiatives/project-connect-virtual-open-house>