DRAFT

REIMAGINED 5-YEAR TRANSIT SERVICE PLAN

SYSTEM REIMAGINING
Development of the Reimagined Network Plan

The Transit System Reimagining Project represents a transformative opportunity for the Metropolitan Transit Authority of Harris County (METRO). The project takes a fresh look at the bus network to develop a 5-Year Transit Service Plan that reimagines the transit network to better meet the needs of the Houston region. The plan was developed based on an in-depth analysis of the changing development and mobility patterns in the region and builds on a deep understanding of the performance of current transit services, including what works and what can be improved.

The 5-Year Transit Service Plan incorporates METRO’s existing infrastructure but takes a “clean sheet” approach to develop the transit network outlined in the recommendations of this report. The spirit of Reimagining requires rethinking the network from scratch. While some aspects look like existing services, features of the existing system were maintained only if they were believed the best approach, not just because of history or because they are existing. It is important to note that the 5-Year Transit Plan was developed as a resource constrained plan, utilizing METRO’s existing financial resources and redeploying those resources to meet the goals for the plan. The plan also defines a framework to manage future growth in the network as revenues grow, based on items such as the 2012 voter-approved referendum on the sales tax revenues that are the primary source of funding for METRO.

The following chapter provides a brief background on METRO transit services and the Case for Action for the System Reimagining project. In addition to presenting the Reimagined Transit Service Plan in detail, this chapter also outlines the approach used in developing the plan and spells out the outcomes of the draft plan for the region and for current and future riders of the system. This chapter was developed with the understanding that some readers may only wish to view the recommendations of the plan. For those who seek more background information including the complete Case for Action, a detailed analysis of the current transit network, and an assessment of the development patterns of the Houston region, the information can be found in the Existing Conditions Report created for this project.

About METRO

METRO operates a set of multimodal transportation services providing mobility options across the Houston region. This includes an extensive local fixed route bus network which is the primary focus of this plan. It also includes Park & Ride commuter services on a network of shared high occupancy vehicle (HOV) lanes, an expanding light rail network, local circulator services, METROLift paratransit services, and a variety of other services to support improved mobility in the Service Area for a broad range of customers.

METRO carries over 80 million passengers annually across its various transit offerings, ranking in the top 25 largest US transit agencies by passenger boardings. The largest of METRO’s services, the local bus network, accounts for 76% of annual riders. Over the past decade, the local fixed route bus network has seen a steady decline in ridership, from a peak of 84 million riders in 1999 to 58 million boardings in 2012. One factor in this decline was the opening of the first light rail corridor in Houston, the Red (Main Street) Line, a 7.5-mile segment that has been one of the strongest performing light rail lines in the country. Many trips that used to be completed on the bus network have transferred to light rail, which carried over 11 million riders in 2012.

The remainder of the ridership decline has been attributed to changes in the structure and enforcement of bus fares, changes and discontinuations of routes and services, and changes in development patterns and demographics in traditionally higher transit ridership neighborhoods. While 2013 data show a 3% year over year ridership increase, System Reimagining provides a more thorough review of system planning to realign the bus system to the goals and needs for transit in the Houston region. This review should also lead to overall optimization for the system, ensuring that METRO resources are best deployed to deliver improved performance against community goals.
The Case for Action - Five Key Factors

METRO has not previously undertaken such a holistic review of its bus network. The comprehensive assessment and recommendations from Transit System Reimagining come at a critical time for METRO for several reasons.

1. The public asked for improvements to the core bus system in the Long Range Plan.

2. Ridership has declined and there is a need to define the goals for transit in the METRO region.

3. The Houston region is changing faster than the transit system has adapted.

4. New light rail openings require rethinking large sections of the system.

5. History and peer performance show METRO Can Do Better.

The following discusses each of these issues as well as how they are addressed by the System Reimagining service plan.

1. The public asked for improvements to the core bus system in the Long Range Plan.

   Broad public outreach conducted through METRO’s Long Range Planning process indicated a strong public desire for improvements to the core bus system. While new service and large capital projects such as new rail were frequently mentioned, significant feedback related to more frequent bus service, longer spans of service, and a simpler, more legible network that better connects people to more destinations. The recommendations in this plan develop an approach to address this community feedback within METRO’s resources by providing simpler, more frequent, 7-day a week service connecting more people to more places with faster trips.

2. Ridership has declined and there is a need to define the goals for transit in the METRO region.

   METRO’s overall ridership has declined from peak levels with the majority of the decline experienced by local bus service. Clarifying goals about the level of resources in the proposed transit system plan focused on maximizing overall ridership was critical to the plan’s development. At the same time, it was generally agreed that access to service should be maintained for as many current riders as possible.

   A key step in the development of the proposed transit network was working with the METRO Board of Directors to define guidelines about the allocation of resources between the competing goals of ridership and coverage. Based on the reallocation of resources toward increased ridership, boardings are projected to increase 20% after full plan implementation.

3. The Houston region is changing faster than the transit system has adapted.

   The Houston region remains one of the fastest growing metropolitan areas in the United States for both population and new jobs. Development patterns have changed, with overall development moving westward, and new employment centers have developed, altering people’s location decisions and travel patterns. In many ways, the bus network has not adapted quickly enough to these changing patterns. Many routes still reflect the historical patterns in place at the time of their original development decades ago.

   The recommendations in this plan realign service to better match development patterns and activity levels in the region.

4. New light rail openings require rethinking large sections of the system.

   METRO has made a major investment in expanding the original 7.5 mile Red (Main Street) light rail line with the recent extension of the Red Line in December 2013 and the planned opening of the Green (East End) Line and Purple (Southeast) Lines in late 2014. The opening of these rail lines allows reinvestment of the existing bus resources into improving the bus network. It also requires rethinking how the rail and bus networks can work seamlessly together to provide the best overall service to riders of the system.

   The proposed network plan integrates the bus and rail networks to create stronger connections to the new rail lines. Service duplications have been removed to allow those resources to be reinvested back into stronger, more frequent bus routes.

5. History and peer performance show METRO Can Do Better.

   METRO’s own historical performance, along with an assessment of comparable peer systems, shows that the system can perform better. While METRO efficiently operates its bus network with one of the lowest costs among peers, the productivity of the system, as measured by the number of riders who use the system relative to the amount of service provided, remains comparatively low.

   By better matching the development and travel patterns of the city, and providing services that METRO can more effectively market and communicate, the transit system will become more relevant to more people. In doing so, the recommendations in this plan should increase the overall productivity of the system.
Overview of Current Service

A key to understanding the current transit system is analyzing the service area in which it operates, and a project with the scope of Transit System Reimagining requires a deep understanding of the METRO Service Area. A thorough assessment of current and historical demographic, socioeconomic and transit performance data was developed on multiple levels as outlined in the Existing Conditions Report of this project. The analyses focused on the overall region and specific performance of the transit system looking at the following areas.

• Region: Socioeconomics, Demographics, and Development Patterns
• Centers: Employment and Activity Levels, Commute Patterns, and Development Potential
• System: Current System-wide Service, Operations, and Performance
• Routes: Route Level Context and Performance; Strengths and Challenges
• Stops: Connections, Coverage, and Context

The assessment yielded insights into what is working and where improvements can be made in the current transit offerings. It also helped inform goal setting for the transit service plan. Many of these insights come from looking at the performance of the transit network relative to the development in the region and understanding how transit is responding to that development.

Figure 4.1 represents the types of analyses that were conducted to develop insights into the performance of the current system. The figure shows the current population density of the METRO service area, with areas of higher density represented as darker colors. The figure also shows (in red) the network of frequent routes at the project’s outset that had a frequency of 15 minutes better all day on weekdays. These routes represent locations where a rider can expect service to be frequent enough to build overlapping markets and drive themselves. And such a network supports the type of dense walkable neighborhoods that many Houstonians have expressed a preference for in regional surveys like the Kinder Institute’s annual Houston Area Survey. The map shows this in the significant areas of high density that don’t have direct frequent service. Gulfst, an area south of US 59 and west of IH 610, is surrounded by frequent routes but none travel through the heart of the area. High-density areas like Alief, Brays Oaks, Briar Forest, and Spring Branch are not well served by the network of frequent routes. Improving this fit of service to population and activity, especially where providing the levels of service that are required for a high degree of frequency, is a critical outcome of the System Reimagining plan. A stronger network with more routes sharing the characteristics of highly productive routes is likely to support many of the other goals for transit in the region expressed by the community. These include providing transportation options for low income, young, and elderly people who may not have ready access to a personal vehicle. They also include congestion and environmental benefits of having more people use the bus system and not drive themselves. This is seen clearly in Tables 4.1 & 4.2 which show METRO’s highest and lowest productivity routes when measured by boardings per revenue hour. Routes that have the characteristics of a productive route (denoted by three check marks) perform well. Routes that do not are not as productive. This understanding is critical for any future transit system.

Productive services:
• ... connect dense and walkable places ... 
• ... over distances that are
  o too far to walk ...
  o and long enough to build overlapping markets ...
• ... along a simple, straight path ...
• ... that does not duplicate other services ...
• ... with frequent service ...
• ... over a long span of service including the evening and weekend ...
• ... and many opportunities for connections.

While the Houston community provided feedback on a range of desired outcomes for transit through the public survey, to the extent that productivity (ridership per unit of cost) is the goal, future designs will need to look to build services that contain the known ingredients of productivity. A closer look at the overall performance of the system down to the route and stop level provided insight into what drives productivity in the current METRO system. This set of characteristics is consistent across most major transit systems and provides guidelines on what will drive success in a future network.

Figure 4.1 2010 Population Density and the Frequent Network

Population per Square Mile (000s)
- 6-10
- 10-20
- 20+
- Frequent Network (weekday, all-day headways of 15 minutes or less)

Key points:
- The map shows this in the significant areas of high density that don’t have direct frequent service.
- Gulfst, an area south of US 59 and west of IH 610, is surrounded by frequent routes but none travel through the heart of the area.
- High-density areas like Alief, Brays Oaks, Briar Forest, and Spring Branch are not well served by the network of frequent routes.
- Improving this fit of service to population and activity, especially where providing the levels of service that are required for a high degree of frequency, is a critical outcome of the System Reimagining plan.
### Table 4.1 Characteristics of METRO’s Ten Highest Productivity All-Day Routes

<table>
<thead>
<tr>
<th>Ten Highest Performing Routes</th>
<th>Quadrant of Service Area</th>
<th>Links major centers of activity</th>
<th>High Density along route</th>
<th>20 Minute or better Frequency all day</th>
<th>Route is Long (over 13 miles)</th>
<th>Route is Mostly Straight, Simple</th>
<th>Requires Walking, parallel Routes mostly 1/2 mile apart or more</th>
<th>Connects with at least 10 other routes outside Downtown</th>
</tr>
</thead>
<tbody>
<tr>
<td>52 Scott</td>
<td>SE</td>
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<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>46 Gessner</td>
<td>NW-SW</td>
<td>✓</td>
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<td>✔</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
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<td>✓</td>
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<td>2 Bellaire</td>
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<td>✓</td>
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<td>45 Tidwell</td>
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<tr>
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<tr>
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<tr>
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<td>✓</td>
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</tbody>
</table>

### Table 4.2 Characteristics of METRO’s Ten Lowest Productivity All-Day Routes

<table>
<thead>
<tr>
<th>Ten Lowest Performing Routes</th>
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<tr>
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<tr>
<td>30 Clinton</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>75 Eldridge</td>
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<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
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<tr>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>37 El Sol</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>38 Manchester Docks</td>
<td>SE</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</table>

High ridership is not the only goal of public transit service as many services exist to provide coverage. Coverage refers to the desire to provide access to some level of transit service within a walkable distance of everyone whether or not it is highly utilized. Therefore, this includes service in areas of lower population and employment density where ridership is predictably lower. Coverage services exist to meet goals such as:

- providing lifeline access to certain locations based on needs.
- distributing service in a way that is perceived as equitable.

If the motto of a ridership goal is “maximize ridership,” the mantra of a coverage goal is “provide access to transit to everyone.” When deploying finite resources, the ridership goal tends to yield higher frequency service in places where high ridership is possible but no or limited service elsewhere, while coverage goals lead to lower-frequency service spread over a larger area, ensuring access to some type of transit service for more people. An overview of these two goals for transit service is shown in Table 4.3 on the following page. Figures 4.2 provides an illustrative example showing how similar levels of bus resources would be deployed for ridership and coverage goals for an illustrative community.

### The Ridership vs. Coverage Choice

Before a recommended network was developed as part of the System Reimagining project, a critical input on goals was provided by the METRO Board of Directors. While it is common for agencies to adopt various goals, what this project needed was the answer to a specific question that arises from the nature of the transit service in a finite resource environment. The question is:

**What percentage of METRO’s service resources should be devoted to a goal of maximum ridership?**

As resources are not unlimited, resources not devoted to maximum ridership would be devoted to coverage, as described above. An assessment of the current METRO system estimates that about 50% of METRO’s non-Park & Ride service is effectively serving a goal of maximum ridership – that is, it is running where and how it would be running if ridership were METRO’s only objective. The rest is serving a coverage goal, or duplicating other service and serving neither goal.

To support the METRO Board in providing this critical input to the planning process, key findings from the analysis of the system...
Table 4.3 Summary of Ridership and Coverage Goals

<table>
<thead>
<tr>
<th>Ridership Goal</th>
<th>Coverage Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Maximum ridership.”</td>
<td>“Providing more people access to transit.”</td>
</tr>
</tbody>
</table>

**Performance Measure**

<table>
<thead>
<tr>
<th>Ridership Goal</th>
<th>Coverage Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity: Boardings or passenger-miles per unit of service cost.</td>
<td>Coverage: % of population and jobs that can walk to some all-day service.</td>
</tr>
</tbody>
</table>

**“Typical Objectives and Desires Served by the Goal”**

<table>
<thead>
<tr>
<th>Ridership Goal</th>
<th>Coverage Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum subsidy (“Run transit like a business”)</td>
<td>“Meeting needs.” Basic access for low density or difficult to serve areas</td>
</tr>
<tr>
<td>Vehicle trip reduction and emissions benefits.</td>
<td>“We pay taxes too.” Expectations of “equitable” distribution of service over the area.</td>
</tr>
<tr>
<td>Support for denser and more walkable urban development</td>
<td></td>
</tr>
</tbody>
</table>

**Typical Service Meeting the Goal**

<table>
<thead>
<tr>
<th>Ridership Goal</th>
<th>Coverage Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer but more frequent transit lines, focused on areas with high ridership potential.</td>
<td>Many transit routes spread all over the region, but less frequent than ridership service.</td>
</tr>
</tbody>
</table>

Service developed to meet a Ridership Goal will choose its markets, just as a business does. It will deploy high-frequency service (many buses on each line) but focusing only on the highest-density markets where the conditions are most favorable to high ridership. (Dots represent population density)

Service developed for a Coverage Goal will focus on providing access to more people, including at low densities where low ridership is the predictable outcome. The goal here is not ridership, but maximizing the number of people who have access to some service, regardless of how much they use it.

Based on these facts and an understanding of the principals by which the Reimagined Network would be developed, the METRO Board of Directors at their November, 2013 meeting set the allocation of resources for the development of the Draft System Reimagining Plan at 80% focused on maximum ridership and 20% to the goal of maximizing coverage of existing riders. This direction was aligned with feedback from the project’s Stakeholder Task Force along with feedback from the general public collected through an online survey.

The design principles to optimize both Ridership and Coverage services are outlined in the following section.
Key Network Design Principles

Ridership Service

This section details the approach to network planning that tends to lead to higher ridership outcomes. These strategies and approaches were used to deploy the 80% of total service resources assigned to the goal of maximum ridership.

It is sometimes said that transit should be “run like a business,” and the ridership goal – focused on maximizing the number of customers – does involve thinking the way a business does. Most importantly, businesses choose which markets they will enter and where they will compete. An airline is under no obligation to serve an airport that is too small to fill its planes, and likewise, an agency focused entirely on ridership would feel no obligation to serve neighborhoods where low ridership is a predictable outcome.

Transit agencies rarely devote 100% of their resources to a ridership goal precisely because they are not businesses and do recognize an obligation to serve low-ridership areas. But where METRO currently achieves high ridership in its bus network, it does so primarily by running two kinds of service:

1. Freeway express service in protected lanes, competing with congested freeways. This service wins over the competition through some mixture of speed, reliability, and the ability to do other things (e.g. email, read, rest) during your travel time. METRO’s Park & Ride services work this way. Where and when these services are busy, they are part of a ridership strategy.

2. All-day, all-evening, all-weekend service linking high-demand places, providing a reasonably attractive transportation option for a wide range of trip purposes and demographics. Most of METRO’s high ridership local service is of this kind.

In both cases, METRO is focusing where it can provide the most value to the most riders and where the competition is weak, just as a business does. In the first case, Park & Ride service focuses narrowly on a particular time of day when competition with the private car can be effective, because driving a single-occupant vehicle can be unpleasant and potentially slower due to congestion and time for things like parking.

The second case, however, is a much more powerful growth strategy. Here, the idea is to provide an all-day, attractive product that a wide diversity of people in different situations will find useful for all kinds of trips, including but not limited to “nine to five” peak period work commutes.

The recipe for all-day high-ridership service is simple:

- A service that is useful to a wide range of people…
- focused on areas where this service can succeed.

Some people think that all-day service, especially bus service, is mainly for transit-dependent persons, and this over-simplification can cause opportunities to be missed. The typical notions of a “transit dependent” rider as distinct from a “choice” rider make us think of two separate classes of people who are entirely different from each other, and who will be attracted to completely different services. This is a misleading idea of how transit ridership works, one that is contradicted by the way ridership actually responds to service changes.

In transit systems everywhere, incremental increases or decreases in service quality have incremental impacts on ridership. Each such change, however modest, pushes a few people over a line to where transit becomes useful to them, compared to their alternatives, in their particular situation, given their own values and preferences. The first key to succeeding with this market, then, is to recognize its breadth and diversity. Service addressing this breadth and diversity of potential riders needs to:

- Be useful enough to be a logical choice in a wide range of situations, to people with a range of preferences.
- Send signals through design and operations that customers are not viewed as “dependent” but have options in how they travel.

Network design, the primary concern of System Reimagining, is mostly about making the service useful. It is through being broadly useful, for many kinds of trips, to many kinds of people with different preferences and situations, that the highest-performing routes at METRO (and in other cities) achieve their ridership. These routes point the way to what a higher ridership METRO will look like. Most notably, they are frequent, straight, and simple.

Frequent Service is More Useful to More People

Frequency is the most misunderstood feature of public transit, and yet it sits at the foundation of many different things that make transit useful:

- Frequency determines waiting time. Real-time information is making waiting time less onerous by allowing you to spend less of it at the bus stop. Still, waiting time is the difference between when you want to go and when you can go. Waiting is transit’s crucial disadvantage in competition with private vehicles, and high frequency is about attacking that disadvantage. High-frequency service approximates the convenience of a personal vehicle that is available to go whenever you are.
- Frequency is a key part of reliability. While there are many causes of delay in transit, frequency reduces the chances that a single late vehicle will leave you stranded.
- Frequency creates networks by making it easy to connect

Frequent Service is the Most Useful to the Widest Range of People
from one service to another. In many ways, this is the most transformative impact of increasing frequencies in promising markets.

While the speed of service is a feature in enlarging the range of someone’s access, high speed is rarely as important as frequency. Park & Rides depend on speed because they are attempting to be faster than the private car in a narrow market shaped by peak-period congestion. This competition is possible because the premise of Park & Ride service is that large masses of people all want to travel at the same time to common destinations. All-day service involves a different calculation. People’s need to travel can arise at any time of day, so frequency becomes paramount. It is routinely faster to take a slow service that comes soon rather than a faster service for which you will wait half an hour. This System Reimagining devotes significant resources to improving people access to higher frequency service.

**Straight and Simple is More Useful to More People**

As detailed in the Existing Conditions report, most of METRO’s current top performing routes lie on long, straight, simple paths, traveling mostly either north-south or east-west. These routes are not successful solely because of their shapes, but because their shapes are well-fitted to dense corridors serving sources of all-day demand, places transit can succeed. All other things being equal, however, straight services are more attractive than circuitous ones, both because they are easier to understand and because they are more likely to be taking many people in a desired path of travel.

**Focusing on Places Where Transit Can Succeed is More Useful to More People**

The other part of achieving high ridership is deploying useful service in places where transit can succeed. What is a place where transit can succeed? For a very simple approximation of the answer, ask:

*In this area, how far does a bus have to drive to serve 1,000 residents or jobs?*

The lower the answer to this question is, the more transit-friendly the place is. If the number is very low, the area could be a good candidate for frequent service justified by high ridership.

This question intuitively captures the three strongest features of a place that determine transit-friendliness:

- **Density.** The relationship between activity density and ridership is a mathematical fact, not just an inference from data. Ridership begins with lots of people finding a particular transit stop useful. That means there need to be a lot of people around a stop – either as residents, workers, students – or people with other reasons to travel there. In other words, density.

- **Walkability.** A street network that enables people to walk directly to the bus stop, rather than going via crooked streets or around large superblocks, means that more people are being served at that stop. This factor determines how many of the people who are within a one quarter mile air distance from a stop are within a one quarter mile walk.

- **Straightness.** A straight-line path is the most efficient way to
serve lots of people per unit of distance driven. Where transit is required to thread its way through labyrinthine street patterns, it has to drive further to serve the same number of people. High-ridership transit tends to stay on the straight major streets.

**Duplicative Service Degrades Usefulness**

A duplication is any long segment where two routes run together along the same street(s), doing effectively the same thing, but without combining their resources to create a higher frequency. Duplication means that two routes are doing the work of one. In most cases, a duplication is a waste of resources.

When parallel routes run very close together it is also a form of duplication. Closely spaced parallel routes compete with each other for riders because most of the riders within an acceptable walk distance of one route are also a short walk from the other. This type of route spacing limits the ability of both to be highly productive routes, because each will drain riders from the other, and also does not serve the coverage goal because the second route does not greatly extend the geographic area from what is already covered by the first.

Within the limits of the street pattern, great effort was made to avoid duplicative spacing of routes (closer than one-half mile) in the Reimagined Network.

**Coverage Service**

This section explains the principles recommended for deploying the share of the budget that the board assigns to the coverage goal.

Services designed for coverage are designed to optimize the number of residents, jobs, and key destinations served, regardless of the ridership generated as a result. Coverage services maximize the performance on a coverage standard, which is the percentage of residents and jobs that are within a specified distance (one quarter mile or one half mile) of a bus stop. The coverage goal is not about ridership, but about sheer availability of service as a goal in itself.

If an area has the necessary features for a high-ridership service, as outlined above, then it has no need for a coverage service. Coverage service thus focuses on areas where the development form lacks the conditions needed for ridership. Again, the best question for evaluating an area in terms of ridership potential is:

“How far do we have to drive to touch 1,000 people or jobs?” For coverage areas, that answer is typically “a long way.”

Coverage service strategies are answers to the question: “how do we allocate service over a large area to provide access to the maximum number of residents and jobs?” Coverage, in other words, involves its own kind of efficiency. Rather than measuring riders per unit of service cost, we measure how many people have access to the service, regardless of whether they ride.

The core problem that arises with coverage service is that if the goal is to cover truly everyone, or even everyone now served, a large share of resources must often go to serving very small numbers of especially hard-to-reach people. For that reason, coverage standards are not set at 100%.

The method for developing the recommended coverage services was a combination of a number of approaches:

- Deploying coverage according to the same question, “How far do we have to drive to serve 1,000 people or jobs?”
- Lower resource levels required to operate service, typically by providing hourly frequencies and potentially by utilizing a smaller transit vehicle with lower operating cost. Where possible, these infrequent services should have timed schedules that enable access to connections without long waits.
- Timed connections, also called pulses, which occur when buses from many routes are scheduled to be at the same place at the same time so that people can quickly connect from one route to another. Timed connections allow infrequent routes to make reasonably fast connections with one another, thus expanding the range of places that can be reached from each route in a certain amount of time. Timed connections are relevant for both ridership-oriented planning and coverage-oriented planning, because while they increase the range of destinations and thus increase ridership potential, their utility is greater on the infrequent routes (every 30 or 60 minutes) that tend to be the result of coverage goals.
- Clockface frequencies, which simply means that all frequencies are set to divide evenly into one hour so that the schedule repeats the same pattern every hour, at least during the midday, evening, and weekend periods (clockface frequencies are much harder to offer during the peak because of variable running times). This means that whenever two lines cross, the connection time will not necessarily be ideal but at least will be consistent throughout the day. There is no way to schedule all hourly routes so that they will make consistent connections wherever they cross, but at least if both routes are hourly, the connection will work the same way all day. In cases where it is convenient to make a connection, it will at least be consistently so, and some people will find it memorable and useful.

- Willingness to tolerate longer walks, especially for customers in places that are expensive for transit to cover, such as subdivisions accessible only from one side that prevent a transit route from navigating a reasonably direct course through the area.
- Demand-responsive or flexible service strategies that cover more area with a given resource by serving certain stops only when someone requests a deviation there. However, these have a narrow range of applicability, and do not change the predictably low ridership of all coverage services. The types of demand-responsive service considered during System Reimagining are expanded upon in the following section.

Given the desire to maintain service to virtually all current riders, the intent in Reimagining is to protect existing riders from service loss rather than to optimize coverage overall.

**Demand-Responsive and Flexible Service Strategies**

In areas where fixed-route services are not cost-effective but demand for transit service still exists, various alternative services can be considered. For the METRO Transit System Reimagining process, these applications are likely to be replacement services in areas where low ridership fixed routes are eliminated rather than as new services in areas where transit service currently does not exist.

These areas of lower demand where alternative service may be appropriate likely display one or more of the following features:

- Low—and in many cases, declining—residential density
- Poorly performing fixed routes
- Discontinuous or circuitous street network, which makes both bus routing difficult as well as walk distances to the buses longer
- Poor walking environment with discontinuous or absent sidewalks
Many older residents who still need transit but not for work trips (therefore, each resident generates fewer trips per week than a working adult)

High risk of shifting of passengers from fixed-route service to (more expensive) ADA complementary paratransit service if all general public service is eliminated

Some agencies implement alternative service for reasons such as easier access to transit for the mobility impaired, but for the purposes of this project, alternative services were considered if they would provide access to transit for the same number of riders or the same geographic area as the existing fixed-route service but at a comparable or lower cost. To achieve lower costs, either one bus deployed on an alternative service must cover more area than it could when tied to a fixed route or the unit cost of service must be lower (and not be reproducible on a fixed route). Alternatively, a flexible service could be considered if it costs the same as a fixed-route option but achieves others goals of the community, such as easier access for seniors or safer access to service.

Based on peer examples, such as DART in Dallas, Denver RTD, and PACE in Chicago, passenger boardings for these services vary between 4 to 10 passengers per hour depending upon the geographic area and trip generators served. Therefore, productivity per unit of service is lower than many fixed routes, but total costs may be lower if fewer or less expensive resources are used.

One potential impact of the alternative strategies is that they do not require complementary paratransit service under the Americans with Disabilities Act (ADA). This difference alone can create significant cost differential between alternative services and fixed route service. However, METRO does not currently link its METROLift (ADA paratransit) service area to its fixed-route service as allowed by ADA but rather provides METROLift service in many areas that are outside of three-quarter mile of a fixed route. Therefore, METRO will not be able to realize at least some of the cost savings from alternative service concepts. Concurrently with System Reimagining, METRO is reviewing the METROLift program and coordination with alternative services may be a topic for review.

While a number of alternative service strategies were included in the Service Toolbox Report, two of these were identified in the System Reimagining planning process as having potential immediate applicability, Route Deviation and Timepoint Deviation services. The concepts are discussed below.

Route Deviation

In a route deviation service, a vehicle operates along a fixed route on a fixed schedule, making scheduled stops along the route. Vehicles will deviate from the route to pick up and drop off passengers upon request within the time points established for the route. The vehicle then returns to the fixed route at the point at which it departed to accommodate the request. If the route deviation service is intended to replace ADA service, it must be possible to deviate at least three-quarter mile on either side of the fixed route.

Passengers can request deviations in a number of ways: a reservation made a specified length of time in advance, a subscription or permanent reservation, or a request made upon boarding.

Some systems will deviate only for people with disabilities who are eligible for complementary paratransit while other systems deviate for the general public. Site-specific deviations are also an option to serve a community center, a senior center, or other trip generator. Requests may be denied if they cannot be accommodated within the fixed scheduled.

Route deviation is most appropriate where deviations are not disruptive to general service. Deviated routes are typically long routes with longer headways and work best where the service area is more linear and trip generators are not far off the fixed route. Deviations of one block up to a maximum of three-quarter mile are the norm.

Timepoint Deviation

A timepoint deviated route has a fixed timepoint or timepoints within a defined service area zone. The vehicles circulate within the zone to pick up and drop off passengers. Deviations are in response to requests the day or days before service, a subscription, a call on the day of service, or a request from a passenger boarding a bus. Calls may be handled by the bus operator or a central call center a specified time in advance of a pickup. Time points are established for each route at major generators – transit hubs, schools, shopping or community centers; passengers may access the route at these timepoints without prior scheduling. Most agencies use small buses or vans for the service, since the number of passengers on a vehicle at any one time is generally low.

Some systems that operate timepoint deviation focused on a transit station or other major transit hub only pick up in the inbound direction in morning to the station and drop off outbound in the afternoon after leaving the station. If someone wants to be dropped off in the zone in the off-peak direction, they must ride through the station before reaching the final destination. During the off-peak hours, passengers can be picked up and dropped off anywhere in the zone without riding through the anchor station.

The service could be provided by an agency’s paratransit operator, but care should be taken to distinguish time point deviation services from ADA service. ADA service carries certain requirements by law—such as zero trip denials and certain pick up and drop off windows—that would not apply to general public flexible service. These ADA requirements can increase the cost of the service and should not, therefore, be presumed for the general public services.
How the Reimagined Transit Network Was Drawn

The Draft Reimagined Network Plan emerged from a process of consultation with the public and stakeholders, as well as goal setting by the METRO Board of Directors. This process culminated in an intensive design workshop called Core Planning. In this workshop, a team of METRO planners and schedulers and consulting staff defined the structure of the network described in this report. This workshop was guided by the METRO Board’s instruction to allocate 80% of available resources to transit services focused on generating the maximum ridership, and to devote the remaining 20% to services providing access to the system to the greatest possible number of existing riders.

Because of the complexity of transit operations, network design at this scale requires a degree of abstraction, referred to as planning “altitude.” The Core Planning process was primarily focused on drawing a complete network for the Houston region; at this altitude, some very specific detail is lost in the interest of thinking at a broader scale. Details such as particular turning movements and potential layover locations were not considered until after the workshop in order to make the best use of the expertise of workshop participants to achieve the primary objective of designing a transit network.

As the group conferred, the proposed network was developed on a base map (Figure 4.3) showing the density of activity (jobs and population), as well as existing average daily boardings at stops in METRO’s existing network. The team also referred to locations of other major destination in defining route alignments.

This basic integration of land use into the planning process helped shape decisions on the alignment and service level of specific routes, enabling a focus on the areas of highest density where ridership-focused services are most likely to succeed, and showing the extent of the lower-density areas requiring coverage services. A variety of other datasets relating to characteristics of METRO’s existing system, demographics of the service area, and major destinations were also assembled to aid decision-making, allowing planners to compare proposed routes with the performance of the existing system.

Because the System Reimagining project is a no-growth restructuring of the existing network, a budget for the exercise was defined equal to METRO’s current resources plus the rate of expected inflation and sales tax revenue growth up to the study year, 2015. Per the Board direction, this budget was then divided into two portions to be spent on ridership (80%) and coverage (20%) services. As routes were added to the network, they were sorted into ridership or coverage categories based on which goal they were designed to achieve. The group also had the option to assign to routes the smaller ARBOC vehicles, which have a lower operating cost if used on routes with appropriate levels of demand, to the extent permitted by METRO’s existing fleet.

In order to achieve this budget split and to stay within financial limits, cost estimates in revenue hours and miles were continuously updated throughout the Core Planning process. These estimates were determined by calculating the required vehicle hours and miles for each route based on estimated running times, and then applying variable cost factors to approximate the labor and maintenance costs of each proposed route. Cost estimates were determined through analysis of the existing system to be accurate within 5%, suitable for an exercise of this scope, and were later refined as more detail on specific routing was developed following the workshop. During and after the Core Planning workshop, numerous iterations of revisions were required to ensure the plan was effectively balancing the goals defined for the project.

The key product of the Core Planning workshop was a draft network design which formed the foundation of this Network Plan. Following the workshop, METRO staff and the consultant team refined operational details that fell below the level of altitude of the Core Planning process and conducted a variety of analyses into the impacts of the network initially defined. The resulting Draft Reimagined Network Plan is described in this report.
Five different service types are defined in this Network Plan: the Frequent Network, the secondary 30-minute network, the less frequent coverage network, peak-only services, and flexible/alternative services. During the Core Planning process, the network was initially drawn in this order reflecting the proportional importance of each service type in terms of cost and the number of people, jobs and trips likely to be served. The Frequent Network is the most expensive piece, serving the greatest number of people and jobs, and so was drawn first. On the other hand, the flexible service zones, designed to serve a small number of dispersed people and jobs, are much less expensive and were drawn last.

Once the initial network was developed, there was a process of iteration and refinement to ensure the routes worked together as a network from a rider’s perspective. Additional refinement also ensured that the plan balanced the defined goals for ridership, overall coverage and coverage of existing riders, and allocation of budget resources.

The five defined service types can be broadly classified as pursuing either “Ridership” or “Coverage” goals, and by the frequency and span of each type (see Table 4.4). This section discusses the general characteristics, purposes, necessary conditions and consequences of each service type.

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent Network</td>
<td>Ridership</td>
</tr>
<tr>
<td>Basic 30-Minute Network</td>
<td>Ridership/Coverage</td>
</tr>
<tr>
<td>Infrequent Coverage</td>
<td>Coverage</td>
</tr>
<tr>
<td>Peak-Only</td>
<td>Ridership</td>
</tr>
<tr>
<td>Flexible Service</td>
<td>Coverage</td>
</tr>
</tbody>
</table>

Table 4.4  Summary of Ridership and Coverage Goals
Frequent Network (Ridership)

The purpose of the Frequent Network is to generate high ridership by providing a service that is useful to a wide range of people and is focused on places where transit can succeed. These are typically high density, walkable places where the street network allows transit routes to use efficient, relatively straight paths and where the pedestrian network does not present barriers to access for people near to transit.

Routes in the Frequent Network are characterized by:

- 15 minute or better midday and peak frequencies for at least 15 hours each day, with at least three additional hours of evening/late night service at 20 or 30 minute headways
- 18+ hour total span every day, including weekends

Where the routes are similar to existing services, effort was made to maintain frequency and span of service where existing ridership supports those levels of service.

As shown in Figure 4.4, Frequent Network routes share many of the characteristics of highly successful routes in METRO’s existing network: straight, frequent service through complementary land uses, anchored at the route ends by destinations that generate many trips, or by a connection point to other useful transit services such as a Transit Center or light rail station. These routes offer the same advantages of existing frequent routes: shorter wait times, better reliability, and easier connections between Frequent Network routes.
Base 30-Minute Network (Ridership/Coverage)

Shown with blue lines in Figure 4.5, these routes can serve either the ridership or the coverage goal. Individual blue lines were sorted into one of these categories. Those that were estimated to have the necessary conditions to potentially grow into Frequent Network lines in the future were classed as ridership, while the rest were presumed to be coverage focused.

Routes in the Secondary Network are characterized by:

- 30-minute frequency throughout the midday and evening/late-night, increasing to 15 or 20 minutes during the peak depending on demonstrated or anticipated demand.
- 18+ hour weekday and weekend span

Where the routes are similar to existing services, effort was made to maintain frequency and span of service where existing ridership supports those levels of service.

Some of these routes have the potential to generate high ridership such that they might one day be upgraded to the standard of the Frequent Network as additional resources became available. In two cases, Dallas-Polk and Harwin, a pair of blue routes overlap with coordinated schedules to provide frequent service and form part of the Frequent Network.

- Dallas Polk: 10 Kirby Dallas Polk and 11 Heights Dallas Telephone overlap to form a frequent segment
- Harwin Flyer: 151 Harwin Westwood and 152 Harwin Briar Forest overlap to form a frequent segment

Several 30-minute routes provide a less frequent, but fast nonstop "Flyer" between a Transit Center and Downtown Houston. In a few cases, 30-minute routes are long-line segments of Frequent Network routes, where every other trip on the frequent segment continues on to provide the lower frequency service.

Some coverage-oriented routes are included in the 30-minute network. While these routes are unlikely to generate strong all-day demand through the length of the route, they do pass through areas of moderate productivity, or may connect a particularly important destination such as an educational or social service institution to the Frequent Network.

Figure 4.5 Frequent and Base 30-Minute Network
Coverage Services

Infrequent Coverage routes, shown in Figure 4.6 with green lines, are designed to provide basic access to the transit system to the largest possible geographic area. The goal here is maximizing the number of people who have access to some transit service, regardless of how much it is likely to be used. This network is particularly important for ensuring that most existing riders in low productivity areas maintain access to service.

The Coverage network is characterized by:
- 60 minute frequency throughout all periods of the day, with most routes increasing to 30 minute frequency during peak periods
- 14-hour weekday and weekend span

Where the routes are similar to existing services, effort was made to maintain the existing span of service.

The purpose of the Coverage network is to efficiently and equitably deploy METRO resources in order to provide access to the transit system to people in places where ridership potential is low, as indicated by a low aggregate density of population and jobs, difficult-to-navigate street patterns, and an inhospitable pedestrian environment. Coverage routes are also used to extend lifeline access to important destinations located in hard-to-serve or low-density locations.

Peak-Only (Ridership)

METRO currently operates an extensive network of peak-only express routes, providing Park & Ride service to the core of Houston. This service type is characterized by very high frequencies in the peak direction, with some reverse-peak trips and off-peak service as demand warrants. These services, where and when they are busy, serve the ridership goal and remain mostly unchanged in the Reimagined Network.

In addition, some local routes provide express-type service during peak periods. These are shown in orange in Figure 4.6.
Flexible Service

As a part of the Core Planning process, three general areas were identified as having potential for alternative, demand-responsive services. The first is some portion of the area in the northeast bounded loosely by US 90A East, the METRO Service Area boundary, US 59 North, and the 610 Loop. The second is some portion of the area bounded by IH-45 North, West Mount Houston Road, West Montgomery, and West Tidwell. The third is bounded by US 59, Aldine Mail Route, Aldine Westfield Road, and Little York Road. These areas were identified for the following reasons:

- Areas are currently served by the fixed-route bus system
- Current fixed-route bus routes in the areas consistently perform poorly in terms of ridership productivity
- Demographic trends in the area indicate that ridership is not likely to grow in the near future
- Areas have high concentrations of older and low income residents who need at least some access to transit
- Circuitous and disconnected street patterns make efficient routing of fixed routes difficult
- Poor or missing sidewalks and disconnected streets makes walking difficult and at times longer than the “as the crow flies” distances used to gauge quarter mile walk distances to fixed route transit

After further refining the proposed fixed-route network in the area, five areas were identified for implementation of timepoint deviation services referred to as Flex Zones. These Flex Zones are identified on the Draft Reimagined Network Map (Figure 4.6) and summarized in Table 4.5. Service in each zone would operate hourly from a hub transit center using one ARBOC bus each. The five Flex Zones were assumed to operate 14 hours per day, seven days per week.

The hub transit centers for routes 376, 377, and possibly 377 and 398 are located outside their respective Timepoint Deviation Zones. The services are linked to the transit centers to ensure good access to multiple, quality fixed routes for users of the services. Buses would pick up or drop off passengers at the transit centers and then travel hourly to the edge of the zones to begin demand-responsive pick ups and drop offs (Figure 4.7). Because of the extra travel time involved, the zones need to remain comparatively small.

Alternatively, hub timepoints could be established within the zones, linked to at least one fixed route, rather than have the buses leave the zone to travel to a transit center. The Mesa Transit Center is in Zone 377, but this facility is not on the Frequent Network and lies on the outer edge of the zone. It could serve as the hub for the zone, if needed, but alternative locations such as the intersection of Tidwell Road and Homestead Road could be used. The final hub locations for the Flex Zones are expected to be determined with input from the public in these service areas.

Zone 398 (Jensen Flex) does not include a transit center nor is there one nearby. Zone 398 could be linked to a potential location near the intersection at Tidwell and Jensen to allow connections in multiple directions. Alternately, a hub in or near the zone could be created at a major shopping center or community building.

Ridership on the Flex Routes is likely to be low, ranging from 4 to 10 passengers per hour. Table 4.5 includes the number of boardings on METRO’s current fixed-route system within each zone that would not be within one-quarter mile of a fixed route in the Draft Reimagined Network. All of these fixed-route boardings would not likely shift to the timepoint deviation services. Some would simply walk further to the nearest fixed route; others would either not travel or find other transportation. Nevertheless, the boardings give some idea of the demand for flexible service that may exist in these areas.

A second source of potential ridership is current METROLift customers in the zones who do not ride the existing fixed route service.

Table 4.5  Flex Route Summary

<table>
<thead>
<tr>
<th>Route</th>
<th>FW/DH Flex</th>
<th>Mesa Flex</th>
<th>Kashmere Flex</th>
<th>N Shepherd Flex</th>
<th>Jensen Flex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Transit Center/Hub</td>
<td>Fifth Ward/Denver Harbor TC</td>
<td>Mesa TC or other</td>
<td>Kashmere TC</td>
<td>North Shepherd Park &amp; Ride</td>
<td>TBD (near Jensen at Tidwell)</td>
</tr>
<tr>
<td>Running Time from Zone to Hub</td>
<td>11 minutes</td>
<td>N/A or TBD</td>
<td>4 minutes</td>
<td>N/A</td>
<td>N/A or TBD</td>
</tr>
<tr>
<td>Zone Area</td>
<td>5.0 square miles</td>
<td>4.3 square miles</td>
<td>4.8 square miles</td>
<td>7.4 square miles</td>
<td>5.1 square miles</td>
</tr>
<tr>
<td>Daily Fixed Route Boardings1</td>
<td>275</td>
<td>444</td>
<td>329</td>
<td>152</td>
<td>116</td>
</tr>
<tr>
<td>Daily Fixed Route Wheelchair Boardings2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Est. Daily Boardings from Current METROLift Customers3</td>
<td>2 to 4</td>
<td>2 to 4</td>
<td>2 to 4</td>
<td>2 to 4</td>
<td>2 to 4</td>
</tr>
</tbody>
</table>

1 Weekday boardings on METRO’s existing fixed route system that would be outside one quarter mile of a fixed route in the Draft Reimagined Network.
2 Average weekday ramp events at stops that would be covered by the zone.
3 Conservative estimate based on number of METROLift customers in the zones, typical frequency of use, and ability and willingness to use fixed route service.
system because they cannot access the bus due to distance, walkability, or other conditions in the neighborhoods. At least some of these people may now be able to use the point deviation service. METROLift staff looked at the number of METROLift customers living in each zone and provided an order-of-magnitude estimate of daily boardings that could shift. All of the zones are in which METROLift considers average to heavy density paratransit use areas; while these zones are fairly low in overall density and low in the density of fixed route usage, the demand for paratransit is fairly high.

The estimated ridership from METROLift patrons is low because (1) METROLift would not require passengers to shift, (2) the zone service would not remove all barriers (real or perceived) to using regular METRO services, and (3) many METROLift customers do not ride every day, i.e. 2 to 4 boardings a day translate to more than 2 to 4 customers. But since METROLift service is expensive, with variable cost per boarding of over $24.00 per boarding in FY 2012, passengers who shift would save METRO resources that could potentially be allocated to other services.

The wheelchair boardings identified in Table 4.5 are those on current fixed routes within the zones. If no replacement service were offered in the zones, these boardings would likely shift to METROLift.

The point deviation services as proposed are intended to provide transit coverage to current riders who would otherwise not be served by the proposed fixed route network within reasonable walk distances. They also are intended to address needs in these communities that would not be served well with fixed-route bus service. The poor walking environment and the mobility challenges of aging populations mean that accessing fixed routes on major arterials is and will continue to be difficult. While circuitous fixed routes could be drawn to cover the boarding locations of most current riders, this solution would not be responsive to either the needs of the communities or responsive to METRO’s goal of finding better alternatives to poorly performing, winding routes. The cost of service in these five zones—whether it be with fixed routes or zone service—is very small compared to the rest of the system; therefore, any cost savings realized from the zone service will be small as well. The decision of whether to implement the alternative services is, therefore, not as much financial as it is community needs-driven.

Figure 4.7 Flex Zone Travel Options

Riders in Flex Zone Have a Choice:
1. Walk to traditional fixed route service nearby
2. Use the new Flex Route service

How Flex Zones work:
3. Riders can call ahead for pickup, or
4. Meet the bus at a specific time and connection point, such as a transit center

Where does it go?
5. The bus will take you to another destination within the flex zone, or
6. The bus will take you to the transit center where you can connect to the rest of the bus system

How does it get there?
7. The route will depend on where other riders need to be picked up and dropped off but it will always return to the connection points at the scheduled time.
A detailed map of the local routes in the Draft Reimagined Network Plan and their proposed base headways, or time between buses, is at right in Figure 4.8. Base headway is driven by the frequency of a bus arriving in the midday and on weekends. Peak headways may be shorter. Benefits and impacts of this network are described in detail in the following section. Detailed profiles of each route in the Reimagined Network can be found in the appendix. For comparison, a similar frequency map of the existing network is shown in Figure 4.9.

The following section, Plan Outcomes, describes the customer-facing benefits and impacts of the proposed network. It focuses on the attributes of network design that affect the usefulness of the transit service as these are the factors that ultimately determine ridership and the ability of the system to meet METRO’s goals.

There are a number of reasons to be confident that implementation of the Reimagined Network Plan would result in considerably higher ridership on the local bus network. First, experience in other cities indicates that frequent grids are powerful drivers of transit ridership. Second, productivity estimates tabulated for the proposed routes show high ridership potential for the network. Third, travel demand modeling conducted on the proposed network forecasts ridership increase of 20% or greater on the weekday bus network. The combination of these factors gives a level of confidence that ridership growth will be significant once the full Reimagined Network is in place and supported by appropriate marketing and communications to existing and potential customers.

Budget Considerations
The plan was developed based upon METRO’s estimated 2014 bus operation budget. While a detailed method of service cost estimation was used, the exact annual cost of operating the new network will not be known until detailed schedules and operator runs are developed during the implementation phase. Therefore, it is possible the network as shown in the plan could come in a few percent over or under budget. The implementation plan

Figure 4.8 Reimagined Local Network Map
will revise the network plan to meet the budget by phasing in certain services and adjusting service levels on others. As such, the network may not exactly reflect the plan on the first day it’s implemented, and will certainly not exactly reflect this draft plan as revisions will be made based on the feedback received in the public outreach process.

Budget considerations will also dictate that any revisions made to the draft plan that add cost will have to be balanced by cost reductions elsewhere or designated for future implementation as resources become available.

To support future implementation, the 2012 General Mobility Referendum provides for additional funds to potentially become available for bus system improvements in coming years. This will be based on continued growth in the regional sales tax funding that provides the majority of funding for METRO’s operations. The final plan will also include recommendations on how the Reimagined Network can be expanded and enhanced if additional funding becomes available, whether that be through stronger than expected sales tax receipts, grant funding, or increased farebox revenue due to higher ridership.

**Downtown Routing Considerations**

Recommendations regarding the Downtown routing of the routes in the Draft Reimagined Network Plan are included in the Route Detail Appendix. Routings have been carefully designed to allow for efficient operation and convenient connections. However, a detailed study is recommended to determine how best to optimize Downtown streets to balance the demands placed on them by local buses, commuter buses, cars, trucks, light rail trains, bicycles, and pedestrians. This should be done in support of the significant level of development that continues to occur Downtown. Such a study might look into consolidating routes into designated transit priority corridors that utilize strategies to expedite buses and improve the passenger experience. Many cities that have developed this type of approach have consolidated bus routes onto transit malls in order to allow other corridors to be prioritized for other modes of travel and adjacent development patterns.

**Figure 4.9 Existing Local Network Map**
New Exclusive Right-of-Way Services

The Draft Reimagined Network Plan was developed assuming that several new exclusive right-of-way transit services will be opened in the next several years. First the Green (East End) and Purple (Southeast) LRT lines are projected to open in late 2014. This would be prior to any of the implementation of the system Reimagining Plan and the plan was developed to ensure the bus service integrates with them. Also, the dedicated bus lane project on Post Oak Boulevard connecting Northwest Transit Center to Uptown is assumed to move forward, preliminarily expected to open in 2017. As the Reimagined Network will likely be implemented prior to that opening date, a frequent route, the 47 Post Oak, has been recommended. This route would operate in mixed traffic along the same alignment recommended for the future dedicated bus lane service.

Route Numbering

The Draft Reimagined Network Plan introduces a new route numbering pattern that was developed to make the network structure clearer and more legible for existing and prospective riders alike. Details of the proposed numbering pattern are described in point 6 of the Plan Outcomes section. A brief overview is presented here to support understanding of the plan description.

• East-west routes in the grid are numbered in the 1 to 29 range from south to north.
• North-south routes in the grid are numbered in the 30 to 69 range from west to east.
• Routes in the east, west and north regions of the network that don’t conform to the grid are numbered in the 70, 80, and 90 series, respectively.
• Freeway express and Park & Ride services are numbered in the 100 and 200 series based on the fare and in decades based on the freeway corridor they serve. Corridors are numbered clockwise from North Freeway to Tomball Parkway. See Section 3 for additional detail on freeway express numbering.
• Flex routes are numbered in the 300s.
• 400s are used for circulators, e.g. Greenlink.
• Q is added to the route number to denote Quickline service, e.g. 5Q Bellaire Quickline.
The Benefits of the Draft Reimagined Network Plan

The previous sections outline the process for the development of the proposed Reimagined Network and the components of the service plan. Ultimately, the plan will succeed based on the benefits it provides to existing and potential riders in the service area. A major service change such as that recommended in the Reimagining Plan is something METRO should pursue infrequently and when the benefits are clear.

Beyond the ridership increase of 20% or more projected for the plan, the Draft Reimagined Network Plan creates a stronger transit system that is more relevant to the Houston region. The plan provides significant benefits by delivering:

A transit network that...

1. Provides frequent service to more people and places
2. Is much easier to understand and use
3. Connects more people to more jobs
4. Provides significantly improved weekend service
5. Better serves METRO’s current riders
6. Provides faster, more reliable trips
7. Is built to support future growth

The following sections discuss each of these benefits in detail.
A Transit Network with Frequent Service to more People and Places

Frequent Routes

At the core of the Reimagined Network is a series of high-frequency bus routes with buses running every 15 minutes or better for at least fifteen hours a day, seven days a week, with lower frequency service (30 minutes or better) for an additional three or more hours in the evening. These 25 bus routes, along with the three rail lines, form the Reimagined Frequent Network shown in Figure 4.10.

To the extent the street pattern allows, the network forms a grid across the areas of highest activity in the Service Area. Numerous crosstown routes allow trips to be made along their most direct routings rather than forcing connections to be made Downtown even when Downtown is out of direction.

On the following page, Figure 4.11 shows the eleven existing routes that run every 15 minutes or better during the weekday midday period. The existing Frequent Network is entirely radial, feeding into the Downtown-TMC axis without any crosstown links. This negates one of the key benefits of frequency, the ease of connections, for passengers making trips that don’t logically pass through the Downtown-TMC core.

The grid shape of the Reimagined Frequent Network is a major reason to be optimistic about ridership outcomes. Grids support better transit service and usage in multi-centered regions such as Houston, because they are designed not around any favored destination, but rather to help people get from anywhere to anywhere on the network, quickly, usually with a single transfer (Figure 4.13 on page 25).

The dramatic usefulness of grid service can already be seen in the existing network from the strong performance of many straight, long crosstown routes that rely heavily on connections – even though these routes are not frequent enough to be really efficient for connection purposes. The 46 Gessner and 45 Tidwell stand out as two remarkably successful routes whose success is explainable primarily through their position in the grid and the connection possibilities. Based on strong historical performance and position in the network, these Gessner and Tidwell West routes will play an important role in the frequent grid. All the signals exist that a frequent grid pattern would be a winner for METRO.
It bears highlighting that the Reimagined Frequent Network offers greater span of frequency than any of the existing frequent routes except Westheimer. Routes in the Reimagined Frequent Network are programmed to run frequently (every 15 minutes or better) in both directions for at least 15 hours a day and less frequently (every 20 to 30 minutes) for an additional three to five hours in the evening. The period of the day that existing routes run frequently is typically much shorter, especially on weekends.

**Simple, Straight Routes**

A significant barrier for new riders trying to use the existing system is the complicated nature of routes in many parts of the city. For example, the existing 5 Southmore Gulf Gate Branch stair-steps across the street grid, making 13 turns on its 10 mile run from Downtown to Gulf Gate Transit Center, spending just one mile on Southmore Boulevard and splitting from another branch that adds to the complexity for the rider. Routes in the Reimagined Network, to the extent possible, stick to their one or two namesake streets. Similarly, many streets in the Metro Service Area currently have different bus routes serving different segments along their length. For instance, a ten mile trip up Shepherd Drive from Richmond to North Shepherd Park & Ride at noon today would require three transfers including a 3,500 foot walk because service is not continuous. Including expected wait times, travel times, and walk time, this trip would take almost two hours. A rider would be better off going Downtown to transfer, far out of the logical path for this trip, as that routing would only take one and a quarter hours.

The Draft Reimagined Network Plan introduces a 50 Shepherd route (Figure 4.12) that runs the length of the Shepherd/Durham/Greenbriar corridor. The Richmond to North Shepherd trip would be a one-seat ride with an expected wait-plus-ride time of 46 minutes.

Numerous other streets would see simplified service, as well, including Fondren, Lockwood, and 18th/20th/Cavalcade. With routes that run in a straight line along major street corridors, the network is easily understood by anyone who already has a feel for the street map.

The other aspect of the existing network that adds significant complexity and causes considerable confusion for new and seasoned riders alike is branching. A branch is where buses numbered for the same route turn in different directions and end up at different destinations. For example, westbound buses on the

![Figure 4.11 Existing Weekday Frequent Network](image-url)
existing 2 Bellaire can follow the Westchase branch to Westchase or the Mission Bend branch to Mission Bend and Alief. Riders must pay attention to the text on the destination sign to be sure they are boarding the bus they want and not one that will end up in a different location entirely from their destination.

Branches can also cause headway reliability problems on higher frequency routes. When buses follow different paths before joining the trunk segment they are likely to be impacted differently by traffic delays, leading to uneven headways and bus bunching on the trunk. This phenomenon can be observed frequently along Westheimer, where 81 Westheimer-Sharpstown and 82 Westheimer-West Oaks buses are scheduled to be offset from one another by six to twelve minutes but regularly end up bunched together, causing long gaps in service.

A recent analysis by METRO staff indicates that about 40 branches exist in the network today. The Draft Reimagined Network does not include any branches. In two cases (Dallas/Polk and Harwin), a pair of routes with coordinated schedules combine for higher frequency along the common segment but are numbered differently to avoid confusion.

It should be noted that a branch is not the same as a short line/long line or turnback pattern. In a number of cases, some proposed trips on a route continue along a lower frequency extension called a long line. A rider intending to take a long line bus who accidentally boards a short line bus can simply get off where that bus terminates and wait for the next long line bus to come along. In contrast, a rider who boards the incorrect bus on a route with a branch could end up far out of his way and have a difficult time returning to his intended path of travel.

Figure 4.12 Proposed 50 Shepherd

Figure 4.13 Typical Frequent Grid Trip
A Transit Network That is Much Easier to Understand and Use

Easier to Understand

Some of the ways the Reimagined Network will make the system easier to understand were described under Benefit 1, especially simpler, straighter routes that stick to their namesake streets and a minimum of branched routes. In addition, a logical, consistent numbering pattern will help riders orient themselves in the network and differentiate the services that might be most useful to them. The existing numbering system, within the range 1-99 that covers local services, is largely random. There is no sign of any pattern in it, and any patterns that one might discern are so small as to be of little use in understanding the network. The problem with random numbering over such a large service area is that it tends to emphasize complexity. It implies that there is a pile of up to 100 routes that are all more or less equally important, and that are scattered all over the region. The underlying message is that the system is very complicated and that there’s a lot you have to learn to make an unfamiliar trip.

Reimagining is a unique opportunity to introduce a logical numbering scheme because almost every route will change. The proposed geographic numbering of local routes will make the whole system clearer and improves legibility of the entire grid. The proposed system is organized as follows:

- East-west routes in the grid are numbered in the 1 to 29 range from south to north (Figure 4.14).
- North-south routes in the grid are numbered in the 30 to 69 range from west to east (Figure 4.15).
- Routes in the east, west and north regions of the network that don’t conform to the grid are numbered in the 70, 80, and 90 series, respectively (Figure 4.16).
- Freeway express and Park & Ride services are numbered in the 100 and 200 series based on the fare and in decades based on the freeway corridor they serve. Corridors are numbered clockwise from North Freeway to Tomball Parkway (Figure 4.17).
- Flex routes are numbered in the 300s (Figure 4.18).
- 400s are used for circulators, e.g. Greenlink.
- Q is added to the route number to denote Quickline service, e.g. 5Q Bellaire Quickline.

Some push back is to be expected from riders and communities that have become accustomed to their route numbers. A more organized pattern will benefit all users of the system. Furthermore, since practically all routes are changing significantly, maintaining the same number on a route that behaves differently in the Reimagined Network could easily cause more confusion than it prevents.
Easier to Communicate

METRO’s local bus network has historically been a very difficult product for the agency to market. Routes vary widely in frequency and usefulness, and the lack of a unifying identity for those simple, frequent services likely to appeal to a diversity of people has made communicating their benefits difficult.

Transit service can be branded using many different criteria: for example, every transit agency has a brand that is extended through its public information system, vehicle fleet and infrastructure. METRO’s logo and characteristic red and blue stripes are elements of such a brand. Branding is often nested, including both the provider name and a name distinguishing this product from others; this is the distinction between “Microsoft” and “Excel,” for example. Like Microsoft, a transit agency must convey not just its corporate identity but also help customers understand the product. It does this by naming different products differently, but also conveying that they are designed to work together.

Transit service branding is built on the same principle, but it is critical that the brands reflect the same distinctions of usefulness that the network design is meant to optimize. In the reimagined Network this is primarily differences of frequency. METRO currently brands the Park & Ride and Quickline services, but unlike some other agencies, it does not distinguish frequent services from others, even though high-frequency service has a fundamentally different kind of utility: it’s useful to people in a hurry, and it fits together as a network with easy connections to a degree that less frequent services do not.

It makes sense to advertise these features clearly. Service can be branded to help users understand how different types are different and how they fit together into a network. The Draft Reimagined Network was designed using distinct service types with consistent characteristics, with the intent that these characteristics would be marketed through service branding.
Recommended Messaging
While there are many gradations of frequency and span, best practice planning seems to recognize two distinctions as fundamental:

- High vs. low frequency, where high frequency means that you can assume it’s coming close to the time that you need it.
- Peak-only vs. all-day span, where the latter usually also implies some evening and weekend service.

High frequency and all-day span refers to service that (a) runs so frequently that you do not need to refer to a timetable, and (b) runs for a long service day, usually at least 18 hours a day, 7 days a week.

In the Draft Reimagined Network, a Frequent Network brand would consist of all local routes and Quicklines that meet the 15-minute standard over a 15-hour daily span with an additional 3 hours or more of less frequent evening service. In this report, these routes are shown on maps as red lines. Because the Frequent Network offers the highest level of service to the most destinations, it can be useful to the greatest number of people, but the nature of this service must be effectively message in a way that conveys its essential qualities. Important messages to convey to customers include:

- “There When You Need It”
- “No Schedule Required”
- “The Network for People in a Hurry”

Signage and Information Recommendations
Despite their importance, frequency and span are often invisible on transit maps and on the ground. METRO currently has several routes that would be part of a Frequent Network if the existing system were branded, but these qualities are not evident on the system map or other materials. For customers to understand how useful transit can be to them, and to make informed location decisions, the most important characteristics of service must be clearly communicated.

Service branding is generally implemented in two places:

- Electronic and printed customer information (maps, schedules, websites)
- On-street infrastructure (signs, stops, etc.)

Network Maps
Not everyone is comfortable with maps. Some people have a narrative sense of where they are and how to go places, and tend to be more comfortable with directions than with maps. Both kinds of information are critical, which is why major online map providers, such as Google and Bing, always provide both side by side.

For those who are comfortable with maps, clear and information-rich mapping is a crucial tool. Maps allow the customer to form a mental image of the network, which they can then use in getting around the city. The Draft Reimagined Network is much simpler, so it will be easier for people to keep a map of it in their heads, as easy as keeping a rough street map in your head for the areas in which you travel frequently. In fact, in many cases, routes follow the entire length of a street so that the street and the transit line can be remembered as a single entity.

Maps are a fundamental space for communicating brand services. The conceptual maps used to illustrate the Draft Reimagined Network Plan use a simple visual hierarchy of red, blue, and green to denote varying frequencies of all-day fixed routes. This type of map is referred to as a Frequent Network map, and is designed to help the customer understand the type of service to expect from each route. As shown Figure 4.19, the reimagined map should be easy for users to determine their best route. In the maps in this report, a red line communicates the basic aspect of the Frequent Network – a short wait to catch the bus so a rider can “show up and go” without consulting a schedule.

Many peer agencies now publish maps using varying colors or qualities of line to convey frequency. Some even produce a separate map entirely focused on the Frequent Network. Examples from other cities are shown in Figure 4.20 and are similar to the map in Figure 4.10 on page 23. The most widely used techniques use heavy lines and the warm color spectrum to highlight frequent routes, communicating their importance. METRO should adopt similar conventions for its own maps in order to showcase one of the most important benefits of the Reimagined Network, the expansion of reliable, simple, frequent service.

Other aspects of the information system should also be integrated into the service brand hierarchy. Elements of the Frequent Network brand should accompany any mention of the brand or its component routes on schedules, brochures, and materials posted at stops, on METRO’s website, and in online and mobile applications.
Because the network is increasingly focused on connections, a rider will need to understand clearly how to use multiple routes to complete his or her trip. To market the utility of connecting routes, individual route maps, should note the connecting services visually. For example, a map of Westheimer service should not just note Fondren as a cross street but also the route number on it, and also use a different color or symbol if that route is Frequent. Frequent connections are easy connections, so people should know where they are available.

On-Street Infrastructure

Another important element of the information system is signage. Currently, METRO’s signage shows little information besides route names and numbers, with the notable exception of the station-style stops of the Bellaire Quickline. Quickline has been established as a unique brand among METRO’s services by the combination of a unique bus wrap and stop design. The Frequent Network brand will apply to many more routes, so it does not require nearly the same level of investment at each stop, but the same principle applies: it is important that riders can understand they are at a Frequent Network stop. If one of the meanings conveyed by the brand is “coming soon” then indicating that at each stop lets the passenger know that they won’t be waiting long.

This concept is widely implemented among peer agencies, varying by the particular characteristics of the brand. Where there is a logo, that logo is generally present on all Frequent Network stops; otherwise, “Frequent Service” is clearly signed. Examples are shown in Figure 4.21.

Easier to Use

All the features of the Draft Reimagined Network Plan that make it easier to understand and communicate will also make it easier for new and existing customers to use, but there are other design features that will benefit ease of use, as well. In particular, routes in the Draft Reimagined Network have been planned for clockface frequencies and consistent spans.

Clockface frequency refers to headways set to divide evenly into one hour so that the schedule repeats the same pattern every hour, at least during the midday and weekends periods when consistent travel times allow for uniform scheduling. This is of particular benefit on lower frequency routes when it comes to planning connections.

For example, on the map one can see that the existing 45 Tidwell and 77 Liberty Homestead branch cross at Tidwell and Homestead. This is a location where one might wish to connect, say, from the 45 to the 77. Both are infrequent, so a look at the schedule to see if the timing will work out is definitely worthwhile. During peak hours both routes run every 20 minutes or so, giving us confidence that this connection wouldn’t be too time consuming. Unfortunately, middays and weekends are a different story. This branch of the 77 Liberty generally runs every 60 minutes, with gaps of 50, 55, and 62 minutes thrown in intermittently. The 45 Tidwell runs every 40 minutes during the weekday midday and 50 minutes on the weekend. The result of this hodgepodge of long headways is that the connection will work differently each hour. Some times of day it might be an easy five or ten minutes, but it could just as easily be a day-consuming 59 minutes.

In the Draft Reimagined Network Plan, the 65 Homestead consistently runs every 60 minutes during the midday and on weekends and the 26 Tidwell West runs every 30. While scheduling this particular connection to be convenient may or may not work within the overall network, at least it will line up the same way each hour. Riders will be able to know if it takes 10 minutes and is easy, takes 20 minutes so they can grab a bite at a local coffee shop, or takes 55 minutes and another route might be a better option.

Clockface schedules also make it easy to remember when the bus is coming. The existing 29 TSU/UH Hirsch runs every 35 minutes on Saturdays, making it nearly impossible to remember the pattern of times it passes a particular stop throughout the day. With a clockface schedule on the proposed 62 Cullen Hirsch, one could much more easily remember that it passes that stop at, say, 8 and 38 minutes past each hour.

Consistent spans seven days a week also allow the system to be scheduled in a much more user-friendly way. Currently, spans on many routes vary among the weekday, Saturday, and Sunday schedules. For instance, the first trip of the day on the 40 Telephone arrives Downtown at 5:30 AM on weekdays and 6 AM on weekends. The last trip leaves Downtown at 11:01 PM on weekdays, 10:02 PM on Saturdays, and 10:31 PM on Sundays. With consistent spans, those times could be the same every day, making it easier for customers to remember as well as for METRO to communicate on signage.
The key to gaining ridership on the local bus system is providing more useful service to more people. Most potential riders do not have the time to spend all day waiting for buses or the inclination to design their lives around a bus schedule. Therefore, usefulness for most people comes down to faster trips and frequent service from where they live to where they want to go.

**More People**

Frequent service is currently available within one half mile to about 534,000 residents of the METRO Service Area on weekdays, 260,000 on Saturdays, and 111,000 on Sundays. As seen in Figure 4.22, the existing weekday frequent routes miss major areas of high population density including Alief, Brays Oaks, Gulfton, Sharpstown, and Spring Branch.

The Draft Reimagined Network Plan provides frequent service within one half mile of over 1.1 million people, seven days a week. At the shorter walking distance of one quarter mile from a stop, frequent service connects with 700,000 people. These gains were achieved by fitting the Frequent Network to the areas of highest population density, as shown in Figure 4.23. Figure 4.24 charts the increase in weekday frequent access for the general population of the METRO Service Area. More than twice as many people will have high-quality, frequent transit service near their homes.

In addition, the Frequent Network better connects these people to more destinations and employment opportunities. As shown in Figure 4.22, the existing network of weekday frequent routes is entirely radial, allowing easy movement toward and away from the Downtown-TMC activity centers but not in other directions. A frequent grid allows trips to far more major job centers and other destinations, typically with at most one connection. Because the routes are frequent, that wait for that connecting bus will be short.

It should be noted that similar increases in access to useful service are seen across all socioeconomic and demographic groups as well as levels of vehicle ownership. More than twice as many people in poverty, a group of particular concern to stakeholders and the METRO Board, will have access to frequent service in the Reimagined Network.

Frequent Access: People

<table>
<thead>
<tr>
<th>Distance</th>
<th>Existing</th>
<th>Reimagined</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 Mile</td>
<td>290,000</td>
<td>703,000</td>
<td>+142%</td>
</tr>
<tr>
<td>1/2 Mile</td>
<td>534,000</td>
<td>1,126,000</td>
<td>+111%</td>
</tr>
</tbody>
</table>

Source: 2010 US Census Data; American Community Survey

These shorter waits and faster trips give people extra time in their busy days. The ability to own fewer cars afforded by an improved bus network could allow them to greatly improve their economic situation.
More Job Opportunities

Since home-to-work trips are an important component of transit ridership, connecting more jobs with better service is important to a strong transit network. Frequent service in the existing network is primarily focused on Downtown and the TMC, as shown in Figure 4.25. The Reimagined Network expands seven-day frequent service to more job centers, as shown in Figure 4.26. By doing so, it provides weekday quarter mile frequent access to an additional 60% of jobs as indicated in Figure 4.27.

Since employment drives the high travel demands seen during the weekday morning and evening peak periods, frequent service to job centers during these times is particularly important. Frequency increases on most routes in the Reimagined Network during peak hours, and Figure 4.28, on the following page, shows the access provided by routes that are proposed to run every 15 minutes or better during the weekday peaks. These routes touch 1.6 million people and 1.3 million jobs within one half mile during the peak periods.

Table 4.6 tabulates the number of frequent routes serving the region’s major activity centers. Westchase and Memorial City gain midday frequent service for the first time. All major employment centers see increases in frequent access, some to a great degree, including Downtown and the TMC which are already relatively well served.

### Frequent Access: Jobs

<table>
<thead>
<tr>
<th>Total METRO Service Area Employment: 1.8 Million</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Existing Routes</th>
<th>Reimagined Routes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle 1/2 Mile</td>
<td>475,000</td>
<td>788,000</td>
</tr>
<tr>
<td>+66%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle 1 Mile</td>
<td>643,000</td>
<td>998,000</td>
</tr>
<tr>
<td>+55%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: 2010 US Census Data; American Community Survey

**Figure 4.27 Frequent Access for Jobs**

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**Table 4.6 Frequent Service to Job Centers**

<table>
<thead>
<tr>
<th>Job Center</th>
<th>Existing Peak Frequent Routes</th>
<th>Reimagined Peak Frequent Routes</th>
<th>Existing Midday Frequent Routes</th>
<th>Reimagined Midday Frequent Routes</th>
<th>Existing Saturday Frequent Routes</th>
<th>Reimagined Saturday Frequent Routes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downtown</td>
<td>12</td>
<td>16</td>
<td>6</td>
<td>10</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>TMC</td>
<td>6</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Uptown/Galleria</td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Greenway Plaza</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Westchase</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Energy Corridor</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Memorial City</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Greenspoint</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>UH/TSU</td>
<td>4</td>
<td>7</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

Includes local fare bus routes and rail lines with headways of 15 minutes or better.
Figure 4.28 Reimagined Peak Network over Employment Density
Greatly Improved Weekend Service

Nearly all routes in the existing network operate at lower frequency on the weekends and some don’t operate at all. In the Reimagined Network, every local route is proposed to operate seven days a week with a consistent level of service to the weekday midday and equal span to a weekday.

Nearly all existing riders will see a dramatic improvement in weekend service, and thousands will have Saturday and/or Sunday service for the first time. Today, over 5,400 weekday riders board at stops with no Saturday service and over 15,600 board at locations with no Sunday service. Of these, over 1,400 don’t have service with one-half mile on Saturdays and over 7,000 don’t have service within one-half mile on Sundays. All local routes in the Draft Reimagined Network Plan are proposed to provide service seven days a week. Peak only and Park & Ride service would remain weekday only to meet periods of peak demand. Figures 4.29 and 4.30 show existing Saturday and Sunday service, respectively. Of the 11 frequent weekday bus routes, only three run every 15 minutes or better on Saturdays (81/82 Westheimer, 2 Bellaire, 50 Harrisburg) and only one qualifies as frequent on Sundays (81/82 Westheimer). In contrast, all 25 bus routes in the Reimagined Frequent Network are also frequent on weekends, as shown in Figure 4.31. Furthermore, routes in the Reimagined Frequent Network are proposed to be frequent for at least 15 hours a day on weekends just like weekdays. Existing routes are typically only frequent for 10 to 11 hours a day on weekends.

Seven-day frequent service on the Frequent Network and seven-day service on all other routes will also help make the system more useful to more people. Many jobs, especially in the retail, restaurant, and service industries, require weekend hours. If someone has to own a car because infrequent or nonexistent bus service makes it hard to get to their job on Saturdays, they will likely use that car to get to work Tuesday though Friday, as well. The existing system limits the potential for five or seven-day a week riders by offering lower levels of service on weekends. The Reimagined system makes these trips possible and in many cases more frequent and much faster than today.
In addition to providing better service to more people and jobs, the Draft Reimagined Network also puts more people and jobs within reach of some level of service. That is, overall coverage of the region is increased by 2 to 4 percent, as shown in Figure 4.32. An estimated 63,000 people and 49,000 jobs will be within walking distance of local bus service for the first time.

While the primary coverage objective in developing the proposed network was coverage of existing riders, these overall coverage gains come about primarily through the addition of services that allow connections where the network was previously disconnected, especially in the northwest. Therefore, they are designed to have benefit to all riders who travel in those areas and do not represent coverage expansions solely for their own sake.

All of the benefits of the Reimagined Network are achieved with minimal impact on access to service for existing riders. In fact, 99.5% of existing boardings, all but about 1,066, will remain within one quarter mile of service. Some 99.95% of existing boardings, all but less than 100, will still be within one half mile of service. That is, overall coverage within reach of some level of service. That is, overall coverage within reach of some level of service.
the vast majority (93%) of existing riders will be able to board the bus at the very same bus stop they do today.

Figure 4.33, on the previous page, shows the locations of coverage changes in the Reimagined Network. This include coverage expansion in green and the weekday boardings that will fall outside one quarter (orange) and one half mile (red) of service in the new network.

Figure 4.34 compares how access to various levels of service are impacted between the existing network and the Reimagined Network. As shown, the Reimagined Network provides access to seven-day a week frequent service for nearly 100,000 riders versus existing, a 50% increase over current weekday service, to seven-day a week frequent service for nearly 100,000 riders.

Percent of Typical Weekday Local Boardings of 207,000

<table>
<thead>
<tr>
<th></th>
<th>Weekend</th>
<th>Workday</th>
<th>Reimagined Network (7 days)</th>
</tr>
</thead>
<tbody>
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<tr>
<td>service</td>
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99,000 more current boardings would have close access to all-week frequent service.

While 93% of boardings can happen at the same stop as today and most or the remainder will be within 1/4 of service, there are some riders that will be asked to walk further, typically to better service. Figure 4.34 also breaks down those boardings, showing that most are either at locations that are still close to service or in location that are difficult to serve. Over 40% (436 out of 1,066) of those bus stops outside 1/4 mile are just barely farther. Another 40% are located on loops, deviations, or frontage roads, features that make efficient transit service harder to provide. The remaining boardings that will be farther from service are located in extremely low-ridership and/or hard to serve areas.

Eighty-four existing boardings are located at stops that will be more than one half mile from service in the Draft Reimagined Network Plan. Some 31 of the 84 boardings are located at stops without Saturday service and 40 are at stops without Sunday service, so riders in these areas are already accustomed to making other travel arrangements on weekends. None of the bus stops at which the 84 riders currently board is further than 1.2 miles from proposed service, so walking or bicycling to access service will remain viable options for many of these customers.

Only 33 existing boardings are at stops located more than 0.6 miles from service in the Draft Reimagined Network Plan. It would take an estimated three to four buses at an operating cost of about $1 million a year to provide seven-day service to the areas in which these boardings are located. The estimated 11,000 annual boardings these services would add to the system would come at an opportunity cost of 200,000 boardings if the same service were deployed on routes that deliver the system average productivity. That number could be even higher if the service were deployed on highly productive routes.

Due to the low ridership at the 70 stops proposed to fall outside one-half mile of service, the incremental cost to provide fixed-route service would likely be over $30 per boarding. As such, fixed-route service would not be the most cost-effective option. Taxi vouchers or even METROLift would potentially cost less.

It should be noted that we only know the locations where people board the bus; they may already be walking or biking some distance from their origin or destination to access service. In some cases, the routes in the Reimagined Network may actually take them closer to their desired destination than today.

Breakdown of 1,066 (0.5%) existing boardings between 1/4 and 1.2 miles from proposed service.

More than 0.25 miles from proposed service 1,066
Between 0.25 and 0.30 miles from proposed service 270
On a loop or frontage road no longer served 161
On a deviation that was straightened 115
Other location between 0.30 and 0.50 miles from proposed service 84
Between 0.50 and 1.2 miles from proposed service 84
Better connections outside of Downtown will allow many trips to follow more direct routings, reducing indirect travel into Downtown for transfers. An example is shown in Figure 4.35, illustrating a trip from the Heights to Memorial City that today would require a transfer Downtown. The trip via Northwest TC not only saves over half an hour, but would feel much faster to the customer since the first 15 minutes of the trip isn’t spent traveling in the opposite direction from the destination.

The bulk of the travel time savings afforded by the Reimagined Network, however, are the result of shorter waits and faster connections made possible by higher frequency. The average or expected wait time for a bus or train for a customer who shows up to the stop at random is typically assumed to be half the headway. This means the expected wait time for a service that runs every 30 minutes is 15 minutes. For a service that runs every six minutes, the expected wait time is three minutes.

One of the key benefits of the Reimagined Network is faster total travel time. This is critical to expanding the number of destinations that one can access via transit in a given amount of time, or the freedom that transit affords.

To calculate the expected time a transit trip will take requires consideration of walk time to reach the stop, wait time for the service, travel time on board the vehicle, any walking or waiting time involved in connecting between services, and walk time from the stop to the final destination. System Reimagining will have effects on each of these factors but will primarily improve trips through shorter wait times and more direct travel paths.

Walk time will remain unchanged for the vast majority of riders since 93% will be able to board at the same stop they do today and stop spacing is not being addressed during initial implementation of the Reimagined Network. Survey feedback indicates, however, that stop spacing is an issue that should be revisited in the future.

Travel time will be improved slightly in some situations due to a reduction in time-consuming turning movements along the simpler, straighter routes in the Reimagined Network. In some corridors, freeway express service is being strengthened to provide travel time savings. Additional rapid services like Quicklines could also improve travel times but are proposed for future increases in available operations funds.

A Transit Network That Provides Faster, More Reliable Trips

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Figure 4.35 Heights to Memorial City, Weekday Midday

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<tr>
<td>Ride Time:</td>
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<tr>
<td>Total:</td>
<td>89 Minutes (1 Transfer)</td>
<td>Total:</td>
<td>50 Minutes (1 Transfer)</td>
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39 minutes (44%) Time Savings

Better connections outside of Downtown will allow many trips to follow more direct routings, reducing indirect travel into Downtown for transfers. An example is shown in Figure 4.35, illustrating a trip from the Heights to Memorial City that today would require a transfer Downtown. The trip via Northwest TC not only saves over half an hour, but would feel much faster to the customer since the first 15 minutes of the trip isn’t spent traveling in the opposite direction from the destination.

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Figure 4.36 Thirty Analysis Points

The right to identify the impacts of the implementation of the Reimagined Network there will be opportunities to improve on these travel times by increasing the diversity, covering a variety of activity levels and nearby destinations in order to provide a sample of possible trips people might make. Total travel time, including walk, wait, and ride, was calculated from each point to the 29 others. The difference between travel time in the Reimagined Network compared to the existing network is shown in Figure 4.37. The abundance of faster trips, which are shaded in green, indicates that trip times are improved for a wide variety of trips. This is shown in the distribution of trip time changes shown in Figure 4.38. A small number of points see longer trips, driven by the decision made during the Core Planning process to devote resources to improving access to a variety of destinations rather than just the express freeway service trip. These locations could be prioritized for future investment to improve trip times as resources become available.

The power of the Frequent Grid to improve travel times to many destinations is shown in Figure 4.39. Straight, frequent routes on Fondren and Westheimer cut the trip from Fondren to the Galleria by over 20 minutes compared to today. Similar improvements in travel time are seen in Memorial City and the University of Houston, as seen in Figure 4.37. Riders understandably might be concerned that no longer sending the existing 163 Fondren Limited on the freeway to Downtown would make trips to Downtown take much longer. In fact, the expected trip time to Downtown remains virtually unchanged, as indicated in Figure 4.40.

The assumptions built into the travel time matrix in Figure 4.37 are estimates intended to conservatively capture the total travel time for a particular trip. As specific routes are scheduled as part of the implementation of the Reimagined Network there will be opportunities to improve on these travel times by increasing the coordination among route schedules. This can be accomplished in several ways, including:

- Through routing - Have one route continue on as a different route at connection points. For example, trips on the 46 Antoine and/or the 35 Wilcrest Flyer could be shown to "continue as" the 160 NWTC Downtown Flyer at Northwest TC. This can be shown on schedules for those routes so customers who are seeking a ride where they do not need to

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**Midday Travel Time Change (Minutes of Travel Time*)**

* Minutes of Walk + Wait + Travel Time

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*Figure 4.37 Weekday Travel Time Changes (Midday)*

To assess travel time impacts of the Reimagined Network, thirty points around the service area (numbered from lowest activity to highest activity in Figure 4.36) were chosen for geographic diversity, covering a variety of activity levels and nearby destinations in order to provide a sample of possible trips people might make. Total travel time, including walk, wait, and ride, was calculated from each point to the 29 others. The difference between travel time in the Reimagined Network compared to the existing network is shown in Figure 4.37. The abundance of faster trips, which are shaded in green, indicates that trip times are improved for a wide variety of trips. This is shown in the distribution of trip time changes shown in Figure 4.38. A small number of points see longer trips, driven by the decision made during the Core Planning process to devote resources to improving access to a variety of destinations rather than just the express freeway service trip. These locations could be prioritized for future investment to improve trip times as resources become available.

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make a connection can be sure to catch those particular trips.

- Pulse Connections - Pulse or timed connections bring multiple routes together at the same time to allow fast transfers. This can be effective where several lower frequency routes meet in the network and the schedules can be coordinated. For example, to the degree possible, the Flex Routes should be scheduled such that they return to their transit hub at a specific time that allows a fast connection to the other routes at that location.

![Figure 4.39 Fondren to The Galleria, AM Peak](image1)

![Figure 4.40 Fondren to Downtown, AM Peak](image2)

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![Figure 4.38 Distribution of Travel Time Savings for trips shown in Figure 4.37 (Minutes; Weekday Midday; 870 Total Trips Analyzed)](image3)

![Figure 4.38 Distribution of Travel Time Savings for trips shown in Figure 4.37 (Minutes; Weekday Midday; 870 Total Trips Analyzed)](image4)
More Reliable Service

In addition to providing faster trips, the Reimagined Network has been developed to deliver more reliable trips as experienced by customers of the system. A significant number of comments received through the System Reimagining online survey mentioned the need for greater reliability and on-time performance in the local bus network. The Draft Reimagined Network Plan addresses reliability in three major ways: frequency, route design, and avoidance of railroad grade crossings.

Frequency and Reliability

Frequency is a powerful way to address reliability as the customer experiences it. Despite the best efforts of schedulers and mechanics, buses will always be susceptible to various types of delays and mechanical breakdowns. When and where these issues occur it’s not always possible to get a new bus and driver into service to prevent disruption. On a route that runs every 30 minutes or a branch that runs every hour, the wait for the next bus is lengthy. On a frequent route where the next bus will be along in 10 or 15 minutes, the wait for the next bus might still be an inconvenience but not nearly to the same degree.

Route Design and Reliability

The first way the design of routes in the Draft Reimagined Network Plan aims to improve reliability is by reducing the number of extremely long routes. Extremely long routes are harder to schedule reliably and harder on drivers since breaks are fewer and farther between. One way to measure this is to look at the number of very long routes that drivers are currently driving. Zero proposed routes in the Reimagined Network have one-way running times of over 110 minutes compared to five routes in the existing system.

The elimination of branches will also help improve reliability. While branched routes are typically scheduled to provide evenly spaced buses along the trunk segment, differential traffic conditions on the branches will often delay buses on one branch more than the other. This leads to bus bunching, a frequent customer complaint, on the trunk, where a long gap in service is followed by a pair of buses running on top of one another.

Railroad Crossings and Reliability

Railroad grade crossings are a significant cause of delay in the existing network, particularly in the east and northeast portions of the service area where a large number of at-grade crossings exist. The design of the Draft Reimagined Network was informed by data on the locations of grade crossings, freight train volumes, and the severity of delays caused by trains at those crossings. In the existing network, a METRO bus crosses a railroad grade crossing about 11,000 times a day. The Reimagined Network reduced this number to about 8,000, roughly a 30% decrease, reducing the potential that a bus will be delayed by a train.
Support Future Growth

A Transit Network That is Built to

Undertaking a significant service change at the level proposed in the System Reimagining project is a challenge that a transit agency will likely not want to undertake on a regular basis. At the same time a level of permanence in the system is beneficial to support people making more informed location decisions about where they live and work if they want to utilize transit for more of their trips. Therefore, the Reimagined Network Plan was developed with an eye towards the future to provide the foundation for growth and improvement of the system as additional resources become available and needs arise.

The goal-based methodology with which the plan was developed can be employed to prioritize and refinements improvements to service, as well. For example the METRO Board may wish to set in place the 80-20 split of resources focused on ridership services and coverage services to best allocate future resources to the system. The following is a list of key areas METRO may want to invest to improve the system as resources come available, either through future sales tax revenue, grant dollars or other available funding sources.

**Expand the Frequent Grid**

Expansions aimed at continuing to build ridership would focus on building out the frequent grid. Ridership trends will indicate which of the secondary ridership routes hold promise as additions to the Frequent Network and many of these routes have been designed with the awareness that their frequencies may warrant improvements in the future. In addition to attracting ridership to a particular route by adding frequency, building out the grid strengthens the network as a whole, compounding the ridership benefits. Likewise, as land use and demographics change, some lower frequency routes may merit additional frequency and evolve into secondary ridership routes.

**Improve travel times**

Opportunities to improve travel times for customers include services like additional rapid or Quickline routes and express hub-to-hub service. The desire for faster service options was frequently expressed by respondents in the online survey. The first step in this is establishing a foundation of improving trip times through frequent service to as many people as possible. At the same time, rapid bus options on high-volume corridors are certainly part of a ridership building strategy and should be pursued in the future.

The most promising corridors that were discussed in Core Planning for additional rapid or Quickline service are Richmond Avenue from Westchase to UH and Westheimer from Wilcrest to Downtown. Due to roadway geometry constraints on Westheimer inside Loop 610 that prevent buses from passing one another, a Westheimer Rapid might use the future dedicated bus lanes on Post Oak and connect to Memorial Drive to reach Downtown. In both cases, as well as potentially for the existing Bellaire Quickline, it is worth considering attaching the outer section of the local route to the rapid service so as to extend travel time benefits to those traveling from the furthest out. The underlying local service would operate a shorter pattern overlapping just the segment where the rapid makes limited stops.

**Adjust spans to meet demand**

An especially important aspect to look at as budget allows is total span of service. A frequent comment on the System Reimagining online survey was that buses stop running before many people get off work. Just like inadequate weekend service, inadequate span is losing the system riders. Transit agencies in four of the five largest US cities operate principal bus routes 24 hours a day, Houston being the exception. Of the twelve highest ridership bus systems in the US, only Houston METRO and Boston MBTA do not offer around the clock service on any routes. According to METRO staff, all-night service was once offered on Westheimer and performed adequately but was cut for budget reasons. As budget allows, high-ridership routes in the frequent network should be considered for span improvements particularly in places where the first and last trips of the day are highly utilized. A 24-hour city like Houston can benefit from 24-hour bus service.

**Expand the reach of the network**

As the Houston region continues to grow, additional system coverage should be considered in areas that have the potential for increased local bus ridership. Coverage expansions could include route additions in parts of the service area that currently don’t have service. By expanding the reach of the network, new markets may be developed in areas that previously had no transit options. This is one area in which METRO can seek feedback as part of the outreach for the System Reimagining project.

Currently a significant focus of METRO planning is on routes that current serve the coverage goal as these tend to perform poorly on the route ranking model. Allocation of some percentage of resources, potentially with the same 20% that was part of the Reimagining plan, will provide an appropriate level of focus on these services to determine how to best provide access to the METRO system for customers.
The aforementioned benefits represent the customer-facing impacts of the service changes to the local bus system proposed in the Draft Reimagined Network Plan. Such a fundamental change in the network structure will also require modifications to METRO facilities, adjustments in operating practices, and a review of how the complementary services like Park & Ride fit with the Reimagined Network to truly capture the full impact of the Reimagining Plan.

**Facilities: Transit Centers and Park & Rides**

METRO maintains approximately 20 Transit Centers and 30 Park & Ride lots which provide off-street locations for riders to wait for and connect among transit services. All Park & Rides and some Transit Centers also include customer parking. Some of these facilities will require capacity and customer amenity improvements as a result of the greater role they play in the Reimagined Network while others may no longer be needed for transit connection purposes. Furthermore, new facilities at high connectivity locations in the new network will need to be considered.

**Park & Ride and Transit Center Nomenclature**

Changes in the functions of some facilities over the years have resulted in inconsistency when it comes to naming them Transit Centers versus Park & Rides. A consistent approach based on the type of service provided and the availability of parking is recommended in order to help customers know what to expect:

- A Park & Ride is a facility with freeway express service to a major activity center AND over 400 parking spaces.
- A Transit Center is any other off-street facility where multiple bus routes connect. Transit Centers may have parking available, and this should be indicated on the system map. In situations where parking demand outstrips supply, pricing the parking may be considered.

Based on the service proposed in the Draft Reimagined Network Plan and the definition above, the following facilities are recommended to be renamed:

- Hillcroft Transit Center becomes Hillcroft Park & Ride
- Fannin South Park & Ride becomes Fannin South Transit Center
- West Loop Park & Ride becomes West Loop Transit Center
- Fifth Ward/Denver Harbor TC is adequately sized for the service proposed in the Reimagined Network assuming the proposed Lockwood route stops on-street and two lower frequency routes use the pull-outs on Farmer Street. Long term, more off-street bays may be desirable.
- Northline TC currently has four bus bays and two layover spaces. In the Reimagined Network, seven routes terminate at Northline, though two are low-frequency and could share bays. Two additional routes pass by the location and could stop along Fulton Street. Regardless, the facility is space-constrained and located on leased land. For implementation in the short term, solutions for stop and layover space will have to be worked out. Longer term, a new facility may be desirable. See Fulton & Tidwell in the Potential Future Facilities section.
- Northwest Transit Center serves as the most powerful hub in the Reimagined Network. METRO staff has estimated the number of bus bays required to be as high as 27 in order to accommodate all local, express, and Park & Ride routes, and any enhanced service on Post Oak, while providing room for future growth. The facility currently has twelve bus bays meaning short term solutions will be required and long term rethinking of the Northwest TC area will be critical. Demand for parking at this location, which is currently free and over capacity, is also expected to increase and Northwest TC also is likely to serve a location for HOV access to managed lanes on the Katy Freeway (IH-10) and US 290 corridors. METRO Capital Planning is already looking at ways these needs could be addressed.
- Addicks Park & Ride sees an addition of one peak express and two local routes. Further evaluation of its bus capacity at peak hours may be required.

**Customer Amenity Improvements**

- Wheeler Transit Center already serves as an important point of connectivity and will be served by three frequent routes in the Reimagined Network. Provision of larger canopies in the bus waiting areas should be considered.

**Transit Centers with No Proposed Service**

Three existing transit centers do not have service using the facility in the Reimagined Network plan due to their locations and challenges with access that would require lengthy deviations to continue to serve them. These represent locations where METRO may find alternate uses, beyond local service, that are more optimal for the sites and are recommended for further study.

- Gulfgate TC - No routes are proposed to terminate in the area of Gulfgate TC making it not useful as a layover location. Time-consuming detours would be required for other routes to access its frontage road location, adding operating cost and travel time. Transfers in the Gulfgate area can be made more efficiently where routes meet on street.
- Heights TC - No routes terminate in the area of Heights TC, and accessing the facility would require time-consuming detours for two of the three nearby routes. Transfers can be made more efficiently where these routes meet on street.
- Tidwell TC - Ridership data show that most riders transferring between the existing Tidwell and Jensen routes do so at the intersection of those two streets rather than riding the deviation to the Transit Center. No routes are proposed to terminate in the area of Tidwell TC so it is not useful as a layover location.
Bus Operation Impacts

Bus Requirements

The dramatic increase in midday and weekend service proposed in the Draft Reimagined Network Plan is offset by more efficient deployment of peak service and a reduction in local buses required to operate the weekday peak periods. Preliminary estimates indicate that peak pullout is reduced by about 25 full-size buses and three ARBOC vehicles. Since the number of buses METRO must maintain to meet peak pullout is a significant driver of fleet cost, any reduction in peak pullout can create significant savings.

Higher weekend service levels will increase the weekend bus pullout by about 30 buses on Saturday and 130 buses on Sunday. Whether these increases necessitate the opening of an additional Bus Operating Facility (BOF) on weekends will require further consideration and analysis.

Based on the estimated impacts from the Reimagined Network, the overall mix of vehicles in the bus fleet should be assessed. While METRO’s fleet currently includes 70 articulated buses, the development of more higher ridership routes will mean that additional higher capacity buses will be required to avoid overload conditions (which should be specified in service standards). Based on an initial assessment of routes that are most likely to meet these requirements, as many as 105 additional articulated buses (approximately 175 total) may be required. The Route Detail Pages for the Reimagined Network indicate routes that are candidates for articulated buses.

Driver Shifts

The increase in off-peak service also means fewer split shifts, or work schedules where divers work during the morning and evening peak periods with unpaid time in between. It is expected that most drivers would rather work a straight shift and the Draft Reimagined Network Plan makes that possible.

Future Bus Operating Facility

Since many of the highest frequency bus routes are in the southwest quadrant of the city, efficient route scheduling and operation may support a new bus operating facility in that area. Based on input from staff and current BOF assignments, existing facilities on the west side of town are over capacity, so buses that operate routes in the southwest may have to be deadheaded from...
facilities in other parts of town until a new BOF is constructed or alternate plan is developed.

Standby buses
The marketability of the Frequent Network relies heavily on the promise that a customer can show up knowing he or she won’t have to wait more than 15 minutes for a bus. When traffic congestion, railroad crossings, equipment failures, and other factors disrupt scheduled operations, it will be important that METRO is ready to respond and keep that 15 minute promise to the greatest degree possible.

An important tool for maintaining service reliability is the standby bus. These buses and drivers are stationed at key locations in the system, ready to be dispatched on any route that is experiencing a schedule disruption. METRO has utilized standby buses in the past but discontinued the practice due to budget considerations.

In the Reimagined Network, Downtown, TMC, and Northwest Transit Centers are key terminals and hubs where standby buses could protect numerous routes. As experience is gained operating the new network, other standby locations may emerge based on frequent reliability trouble spots. The level of standby protection in the network may need to be adjusted seasonally as the Galleria area, in particular, is known for holiday traffic congestion that impacts the cycle times of a number of bus routes.

It is strongly recommended that where ever possible, provisions for higher levels of service reliability such as standby buses and signal timing improvements be considered during implementation of the Frequent Network. Headway reliability is a key component to the success of the Frequent Network and customers ability to make connections. Standby buses at locations near rail can also help respond to rail service disruptions as the Reimagined Network reduces bus duplication of the rail lines.

Headway Maintenance
Another way to ensure reliability on high-frequency bus services is to operate using dynamic headway management strategies rather than a static schedule. On a route that is scheduled to operate every ten minutes, customers don’t arrive at the stop expecting to catch the 8:34 bus but rather expecting that a bus will be along in ten minutes or less. If, on a particular day, every bus on that route were operating ten minutes late, the agency would consider it failing with zero percent on-time performance while customers would be completely satisfied since buses would be showing up just as often as advertised.

Other agencies that operate high-frequency bus service in challenging traffic situations have developed methods for targeting and maintaining consistent headways and may be an area for consideration in METRO’s Service Standards document.

Scheduling
Incremental changes to the existing network over time have led to an array of different routing patterns on some routes. Some follow a different route based on the time of day or day of week, or just certain trips with an extension or deviation. The most clearest example of this, the 40 Telephone/Pecore, has approximately 30 different route patterns. This causes confusion for customers when the 40 doesn’t necessarily take them to the same place by the same route each time they board. It also adds considerable complexity to the tasks of METRO schedulers.

The Draft Reimagined Network Plan takes the number of patterns on local-fare routes from about 440 today to somewhere between 100 and 150 depending on morning startup patterns, school trippers, and other complicating factors. Some of the proposed Park & Ride route changes are aimed at simplifying patterns, as well. As noted in the discussion on trip times, through routing should also play a important role in the scheduling of the system.

Fewer patterns mean a more legible network for customers and a simpler system for METRO to manage. Bus drivers will also have an easier time learning their work assignments and answering customer questions about routes.
Proposed Park & Ride Modifications

By and large, the existing Park & Ride network is already optimized to maximum ridership and does not require revision to meet that goal. Where changes are recommended, they are primarily aimed toward:

1. Reducing duplication with other services in the Reimagined Network;
2. Enabling connections with local services;
3. Supporting reverse commute opportunities;
4. Simplifying service patterns so riders always know what to expect; or
5. Integrating with the proposed service in the dedicated bus lanes on Post Oak Boulevard through the Uptown.

The proposed Park & Ride/freeway express network is shown in Figure 4.41 and the specific recommendations are detailed in Table 4.7. For comparison, a similar schematic diagram of the existing Express and Park & Ride network is shown in Figure 4.42 on page 47.

This plan assumes that Park & Ride customers would be able to connect to an exclusive right-of-way service along Post Oak Boulevard for access to Uptown. Until this link is in place, the existing Kuykendahl-Greenway-Uptown route would likely continue to operate on Post Oak.

Included in this proposal is a renumbering of most Park & Ride routes to create a more descriptive and user-friendly numbering system. The pattern retains some similarity to the existing scheme, designating the 200 century as premium fare commuter express services and a different decade for each freeway corridor. The pattern retains some similarity to the existing scheme, however, is more logical and consistent, starting with 20X North Freeway corridor and numbering clockwise to 28X Tomball Parkway corridor. 29X numbers can be used for other commuter routes to create a more descriptive and user-friendly numbering system. Furthermore, the numbering of individual services is more consistent, with the final digit in the route number increasing based on the distance from Downtown of the primary facility served. For example, the Eastex Park & Ride service is numbered 211, Townsen is 212, and Kingwood is 213. This leaves ample room for any potential future Park & Ride facilities which would likely be further from Downtown. Midday and evening services that make multiple stops retain the 2X9 numbering and TMC services are numbered 2X8 with the decade based on the corridor.

**Figure 4.41 Proposed Freeway Express and Park & Ride Network**
The proposed changes described in Table 4.7 represent a suite of potential changes to the existing of Park & Ride service. Several of the recommendations are based on eliminating duplicative services that have been addressed differently in the Reimagined Network. Some may be implemented over time as resources allow and others are dependent on the development of the dedicated bus lanes through Uptown and the construction of the Bellaire Uptown Transit Center for connections.

If budgetary constraints require these changes to be offset in the initial budget, opportunities may exist in a couple of areas. First, Houston Center trips on most corridors operate with considerable spare capacity. They also create customer confusion in determining the proper bus to board, similar to a branch on the local network. Moving these trips to the regular Downtown routing may allow the revision of schedules to save one daily round trip each on the Kingwood, Kuykendahl, Addicks, and Westwood routes. Coordination with the Greenline Downtown Circulator and new light rail lines can provide connectivity to destinations east of Main Street including Houston Center.

Second, service levels to the lower performing Park & Ride lots could be reevaluated. Nearly all trips on the existing 262 Westwood and 244 Monroe routes operate at less than 40% capacity. This represents a significant opportunity cost in terms of peak riders METRO could be moving were these buses on a route where their seats would be filled. Opportunities to improve efficiency by adjusting frequency or combining trips with other routes should be considered.

<table>
<thead>
<tr>
<th>Freeway Corridor</th>
<th>Proposed Changes to Existing Park &amp; Ride Service Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>North (I 45)</td>
<td>• All 209 Kuykendahl Spring midday/evening trips (4 additional trips) stop at Kuykendahl P&amp;R for pattern consistency and to replace local service at Kuykendahl P&amp;R.</td>
</tr>
<tr>
<td>Eastex (US 59)</td>
<td>• No changes proposed.</td>
</tr>
<tr>
<td>East (I 10)</td>
<td>• No changes proposed.</td>
</tr>
<tr>
<td>Gulf (I 45)</td>
<td>• All 239 (existing 249 Monroe Fuqua Bay Area midday/evening) trips (1 additional trip) stop at Eastwood TC for pattern consistency.</td>
</tr>
<tr>
<td>West Loop</td>
<td>• 261 West Loop service to Downtown discontinued. Route operates with significant spare capacity; highest-ridership trip fills only 44% of seats on an average weekday. New 2 Brays Bayou provides frequent and direct peak and half-hourly off-peak service to TMC Transit Center where connection to the Red Line is available. Scheduled travel time impact for West Loop to Downtown peak direction commuters is anticipated to be additional five minutes, though existing travel time on SH 288 is variable and unpredictable due to the absence of HOV lanes and increasing traffic, particularly along the US 288 segment of this route.</td>
</tr>
<tr>
<td>Missouri City</td>
<td>• Hourly midday service and additional evening trip proposed on 248 (existing 170 Missouri City).</td>
</tr>
<tr>
<td>Southwest (US 59)</td>
<td>• All trips in both directions on 258 (existing 292 West Bellfort Westwood TMC) add stop at Bellaire Uptown TC when constructed.</td>
</tr>
<tr>
<td>Westpark</td>
<td>• Peak-only 274 Westchase Gessner replaced by peak-only 150 Westpark Express making local stops from Mission Bend P&amp;R to Westchase P&amp;R, limited stops at key transfer points from Westchase P&amp;R to Gessner P&amp;R and Hillcroft P&amp;R, and running express to Bellaire Uptown TC (future) and Downtown.</td>
</tr>
<tr>
<td>Katy (I 10)</td>
<td>• 285 Kingsland Uptown discontinued. Similar service provided by 268 (existing 298) and frequent 47 Post Oak.</td>
</tr>
<tr>
<td>Northwest (US 290)</td>
<td>• All trips in both directions on 268 (existing 298 Kingsland Addicks TMC) at Northwest TC.</td>
</tr>
<tr>
<td>Northwest (US 290)</td>
<td>• All trips in both directions on 269 (existing 229 Kingsland Addicks midday/evening) stop at Northwest TC and Addicks P&amp;R.</td>
</tr>
<tr>
<td>Tomball Parkway (SH 249)</td>
<td>• Additional trips added to 281 (existing 212 Seton Lake) to replace existing 108 Veterans Memorial Limited Seton Lake trips.</td>
</tr>
<tr>
<td>North/Southwest</td>
<td>• Upon completion of Post Oak dedicated bus lanes and Bellaire Uptown TC, 207 Kuykendahl Greenway Uptown (existing 283) replaced by 291, with stops at Kuykendahl P&amp;R, Downtown, Greenway Plaza, Bellaire Uptown TC (future), and West Bellfort P&amp;R. Operates bidirectionally during peak hours.</td>
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</tbody>
</table>
Figure 4.42 Existing Freeway Express and Park & Ride Network