Introduction
What is a “Choices Report”? 

This report studies the existing performance of bus services within the City of Philadelphia, in the context of the environment in which they operate, and the needs and demands they try to serve. The goal of this report is to provide a background of facts and insights that can provide direction to any effort to redesign the bus network.

The report is called a Choices Report because it lays out choices rather than recommendations. If the goal of a system redesign were increased ridership, there are a series of network design approaches that could be taken, outlined in Chapter 6. However, ridership is not the only goal of transit networks, and many other expectations will need to be weighed to determine if these strategies should be pursued. Ridership-increasing network designs also usually trigger objections from people who are used to the service as it is.

In other words, transit planning requires difficult decisions about how to balance competing goals, and these decisions should be made locally based on local discussion. Nothing we say in this report should operate, and the needs and demands they try to serve. The goal of this report is to provide a background of facts and insights that can provide direction to any effort to redesign the bus network. Where the analysis suggests that existing service patterns make sense, those elements would be retained. Ultimately, the goal is a network designed for the Philadelphia of today and tomorrow, not one based on the past.

Why focus on buses?

The vast majority of public transit in Philadelphia is provided by buses. Figure 13 shows that 45% of annual ridership on the entire SEPTA system happens on buses in SEPTA’s City Division (which serves the City of Philadelphia and small portions of the surrounding counties). By contrast, the two rapid transit lines (Market-Frankford Line and Broad Street Line) only account for 29% of SEPTA ridership. Even in cities like New York, where a majority of the population is within a half-mile of a subway station, enormous numbers of people travel by bus.

As a result, a study of Philadelphia’s bus network is a study of most of the public transit in Philadelphia. It is also a study of what can be done soon, because buses are the only high-capacity public transit offering whose services can be revised without large infrastructure spending.

Redesigning Philadelphia’s bus network is an opportunity to review the evidence for transit demand, and to design a network that meets those demands most efficiently. Redesign does not necessarily mean massive change. The key point is that thinking is not constrained by the existing network. Where the analysis suggests that existing service patterns make sense, those elements would be retained. Ultimately, the goal is a network designed for the Philadelphia of today and tomorrow, not one based on the past.

Limitations in Space

Public transit is essential to a city of Philadelphia’s size and density, because there is simply not room for everyone’s car. Like most dense cities, Philadelphia presents features that make transit essential, and require that it be highly efficient:

- **Severe road space limitations.** Across most of Philadelphia, especially in the Center City, the roadway width is fixed and will never be wider. Efforts at widening roads in built-up areas are extremely costly, frequently-destructive and counterproductive. Curb space is also limited and cannot be readily expanded.

Figure 14: (right) The road space required to move the same number of people using public transit, bicycles, and cars

Photo copyright We Ride Australia

• **Intensification of land use.** In response to growing demands for housing and commercial space, both central and outlying areas are growing more dense. More and more people are living within the same limited area.

These two factors combined mean that more and more people are trying to use a fixed amount of road space. If they are all in cars, they simply do not fit in the space available. The result is congestion, which cuts people off from opportunity and strangles economic growth. Figure 14 shows that buses and bikes use exponentially less space than cars. Even autonomous cars will not change this basic geometric challenge, as they take up almost the same amount of space as today’s cars and even carrying three to four persons per car, they cannot be anywhere near as space efficient as buses or bicycles.

The only alternative to congestion is for a larger share of the public to rely on public transit and other alternative modes that carry many people in few vehicles. This requires services that most efficiently respond to the city’s changing needs, as well as corridor improvements to give buses a level of priority over cars that reflect the vastly larger numbers of people on each bus.
Introducing the Network

The maps on this and the following pages (Figures 15–22) introduce a style used throughout this report, in which colors mostly represent frequency of service. Red lines are frequent service, which means that they run every 15 minutes or better, in the midday and peak periods. Dark red lines are the most frequent routes, running every 10 minutes or better. Magenta lines run about every 20 minutes. Blue lines run about every 30 minutes and green lines are the least frequent, 31–60 minutes.

We use this style because frequency is a critical element of service, and a network can only be fully understood if the patterns of frequency are apparent. We have categorized each route based on its midday frequency, which is the typical frequency of service between 10 am and 3 pm. The frequency of service on most routes is higher in the peak periods (generally 6 am to 9 am and 3 pm to 6 pm).

The SEPTA bus network in Philadelphia covers nearly all parts of the city. During the midday there are many high frequency bus routes across most of the dense areas of Philadelphia. In addition, trolley (light rail) lines, shown with light grey and red dash, are frequent during peak and midday periods on weekdays.

Also shown on the map are the Market-Frankford Line (MFL, in blue) and Broad Street Line (BSL, in orange), which also provide high frequency service throughout the day and provide a central spine to the network of transit service in the city.

The map to the right is not meant to be readable in detail. Instead, it is meant to provide a high level view of the overall network within the city. It is meant to help the reader see the overall picture of frequent and infrequent service available across the city and the overall design of the network. The maps on the next few pages provide more detail on the exact location of routes on particular streets and in each part of the city.
Figure 16: Map of SEPTA network—Center City, University City, and South Philadelphia

Figure 17: Detailed map of SEPTA network in Center City

Existing Network
Midday Frequencies
- 10 minutes or better
- 11 – 15 minutes
- 16 – 20 minutes
- 21 – 30 minutes
- 31 – 60 minutes
- Some trips continue
Change in service frequency indicated by line color
- Many transit routes

Other Transit
- Norristown High Speed Line
- Broad Street Line
- Market-Frankford Line
- Trolley Line
- Regional Rail
Figure 18: Map of SEPTA network—Center City, West, and North Philadelphia

Existing Network
Midday Frequencies
- 10 minutes or better
- 11 – 15 minutes
- 16 – 20 minutes
- 21 – 30 minutes
- 31 – 60 minutes
- Some trips continue
  Change in service frequency indicated by line color
- Many transit routes

Other Transit
- Norristown High Speed Line
- Broad Street Line
- Market-Frankford Line
- Trolley Line
- Regional Rail

Corridors
- Market: 
- Chestnut: 
- Walnut: 

69th St TC
Wissahickon TC

Center City, West, and North Philadelphia
Southwest Philadelphia

Figure 19: Map of SEPTA network—Southwest Philadelphia

Existing Network

Midday Frequencies
- 10 minutes or better
- 11 – 15 minutes
- 16 – 20 minutes
- 21 – 30 minutes
- 31 – 60 minutes

Some trips continue
Change in service frequency indicated by line color

Many transit routes

Other Transit
- Norristown High Speed Line
- Broad Street Line
- Market-Frankford Line
- Trolley Line
- Regional Rail
Northwest and Upper North Philadelphia

Figure 20: Map of SEPTA network—Northwest and Upper North Philadelphia

Existing Network
Midday Frequencies
- 10 minutes or better
- 11 – 15 minutes
- 16 – 20 minutes
- 21 – 30 minutes
- 31 – 60 minutes
- 11 – 15 minutes
- Some trips continue
- Change in service frequency indicated by line color
- Many transit routes

Other Transit
- Norristown High Speed Line
- Broad Street Line
- Market-Frankford Line
- Trolley Line
- Regional Rail
What are the recent trends?

From 2013 to 2017, bus ridership within the SEPTA system trended downward. Figure 23 shows the trend in total bus (including trolley-bus) ridership, compared to five peer agencies. In this context, ridership is defined as the total number of times someone boards a transit vehicle, also known as “boardings”, in each year.

The decline in ridership for SEPTA from 2013 to 2017 is about the same as the increase in ridership from 2009 to 2013 and ridership never dropped below the trough seen in 2007. It is important to notice that the vertical axis in these graphs does not begin at zero. This is done to help show detail, but it exaggerates the scale of changes.

Peers such as Los Angeles have seen more significant declines in ridership. Denver and Washington have seen relatively flat ridership since 2010. Seattle, however, has seen significant increases since 2007.

A key driver of ridership is total service and total service-hours provided per person. A service hour is one bus operating for one hour. More service per person means more transit is available for people to ride. Figure 24 shows this measure for SEPTA and five peer agencies. Of note is that this chart overstates the growth in service per capita in fast growing cities like Seattle because the population used in the denominator of the calculation is held constant at the 2010 population.

SEPTA provides more service per capita than four other peers (Seattle has by far the highest). After rising from 2007 to 2010, service per capita in the SEPTA service area has been relatively flat since 2010.

Because so much of transit’s operating cost relates to human labor, and humans are generally compensated based on their time, the bulk of transit operating cost arises from hours of service (rather than distance, or the size of vehicles, or other factors).

Thus “service hours” describes the sheer quantity of transit service provided, without consideration for how much it costs the agency to deliver each hour of service. The service hours required to operate any given route will increase if:

- The length of the route increases.
- The frequency of the route increases.
- The span (hours of operation) of the route increases.

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1 The peers in these charts were chosen because each is a regional transit agency in a large metropolitan area with some, but not comprehensive, heavy or light rail service and therefore where bus service is essential to regional mobility.
Increased markedly in Seattle since 2010, likely in response to the increase in service per capita. Concern about the ridership declines in Figure 23 is understandable, but any change in ridership must be considered in the context of the quantity of service shown in Figure 24. From 2013 to 2017, ridership declined while service quantity remained mostly flat. That change leads to a decline in the “productivity” of the system.

Productivity is a transit industry term for what lay-people might call “efficiency.” If ridership is an outcome people care about, then ridership relative to cost describes how “productive” an agency is towards that outcome. The productivity ratio is:

\[ \text{Productivity} = \frac{\text{Ridership}}{\text{Cost}} = \frac{\text{Boardings}}{\text{Service Hours}} \]

In 2017, an average of 38 people boarded a SEPTA bus for every hour of service provided. Figure 26 shows that the productivity of SEPTA has ranged from a high of 47 boardings per service hour in 2013 to a low of 38 in 2017. Productivity for SEPTA is higher than in Seattle, Denver, or Washington but lower than Los Angeles and Boston. SEPTA’s productivity declined from 2007 to 2009, generally rose through 2013, and then declined from 2013 to 2017.

In contrast, boardings per capita have declined significantly in Los Angeles, and dropped in Washington. In 2017, SEPTA had more boardings per capita than all its peers except Seattle. Boardings per capita declined from 2013 to 2017 as boardings declined. Compared to peers, SEPTA has had more boardings per capita for most of the period from 2007 to 2017. During that period, boardings per capita have declined significantly in Los Angeles, and dropped in Washington. In contrast, boardings per capita have increased markedly in Seattle since 2010, likely in response to the increase in service per capita.

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Can SEPTA stop the ridership decline?

Declining ridership is always a concern for a transit agency, but ridership declines are not always attributable to things that a transit agency can control. Redesigning service to be more useful would certainly help, but would not be enough to reverse this trend alone.

Multiple research papers have shown that the changes in the cost of car ownership and use can have a significant effect on transit ridership. Over the course of the second half of 2014, gas prices in the US fell about 50%, remaining relatively low ever since (See Figure 27). A Mineta Transportation Institute paper looking at 2012 ridership for many cities found that gas prices were the most powerful external variable (i.e. outside the control of the transit agency) affecting ridership. That analysis also showed that changes in gas prices affected transit ridership in all urban areas similarly.2

The significant decline in gas prices is probably the factor that explains the fall in ridership in Philadelphia, which began at the same time. It often takes time for behavior patterns to change, so even though gas prices fell suddenly, they may still explain some of the drop in later years.

The impact of ride-hailing (Uber, Lyft, etc.) is hotly debated, but it probably caused some ridership loss among more financially comfortable riders. Estimates of the impact of ride-hailing vary, but the recent UC Davis study indicates that 21% of adults in major American cities use ride-hailing. This study also indicates that when people start using ride-hailing their use of transit declines by 6%.3

These companies, it should be noted, are not profitable, which means their prices are unsustainable. Consolidation of the industry or shifts in its business model, which are likely to happen at some point, may reverse this negative impact on transit ridership.

Economic conditions—especially levels of employment—also affect ridership. In Houston, the introduction of a restructured network in August 2015 corresponded with a decline in employment. Because Houston’s economy depends heavily on petroleum, the drop in fuel prices had already sent ridership declining before the changes, and as the petroleum industry downsized in response to the price drops, the result was falling employment which further drove down ridership. While Houston ridership has been broadly level since the changes, this is against a background of continued decline among its Texas peers, suggesting that without these external factors, ridership due to the network restructuring would be up.

In addition to these fully external factors, many aspects of SEPTA’s customer experience are governed by decisions made at other levels of government, notably the City of Philadelphia and PennDOT. Speed and reliability are the foremost issues in this category. Chapter 3 explores some of these issues where a partnership with these agencies will yield useful results.

So while there are some things SEPTA can do to improve its offering and its attractiveness, it would be wrong to conclude that SEPTA is fully or mostly responsible for the recent ridership decline. Powerful external forces constantly move transit ridership up and down, and will continue to do so regardless of what service changes are made.


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Figure 27: A 50% gas price cut in the second half of 2014 is likely the most significant reason for Philadelphia’s decline in ridership.