Direct Bus Feasibility Study

August 2021

DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

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Source: iStock (2013)

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Table 1 Evaluated Corridors with Existing SEPTA Service - Rank by Weighting Scheme

Corridor	Corridor # on map	Rank by Weighting Scheme (1 is high rank, 15 is low)		
		Ridership/Transit Reliability	Reverse Commute	Roadway Characteristics
Rising Sun and Ogontz Avenues	5	1	1	1
Erie and Torresdale Avenues	6	2	2	2
Frankford Avenue	8	3	6	4
Bustleton Avenue	1	4	5	3
City Avenue to Wissahickon Transportation Center and 69th Street	4	5	3	7
City, Montgomery, and Lancaster Avenues	7	6	4	6
Old York Road	15	7	8	5
MacDade Boulevard	3	8	7	9
69th Street to Chester	11	9	9	8
Germantown Pike & Stenton Avenue to Plymouth Meeting	13	10	10	11
Ridge Pike	12	11	11	10
Lancaster Pike	9	12	12	12
US-202 (Dekalb Pike)	2	13	13	14
West Chester Pike	14	14	14	13
Conshohocken to Plymouth Meeting	10	15	15	15

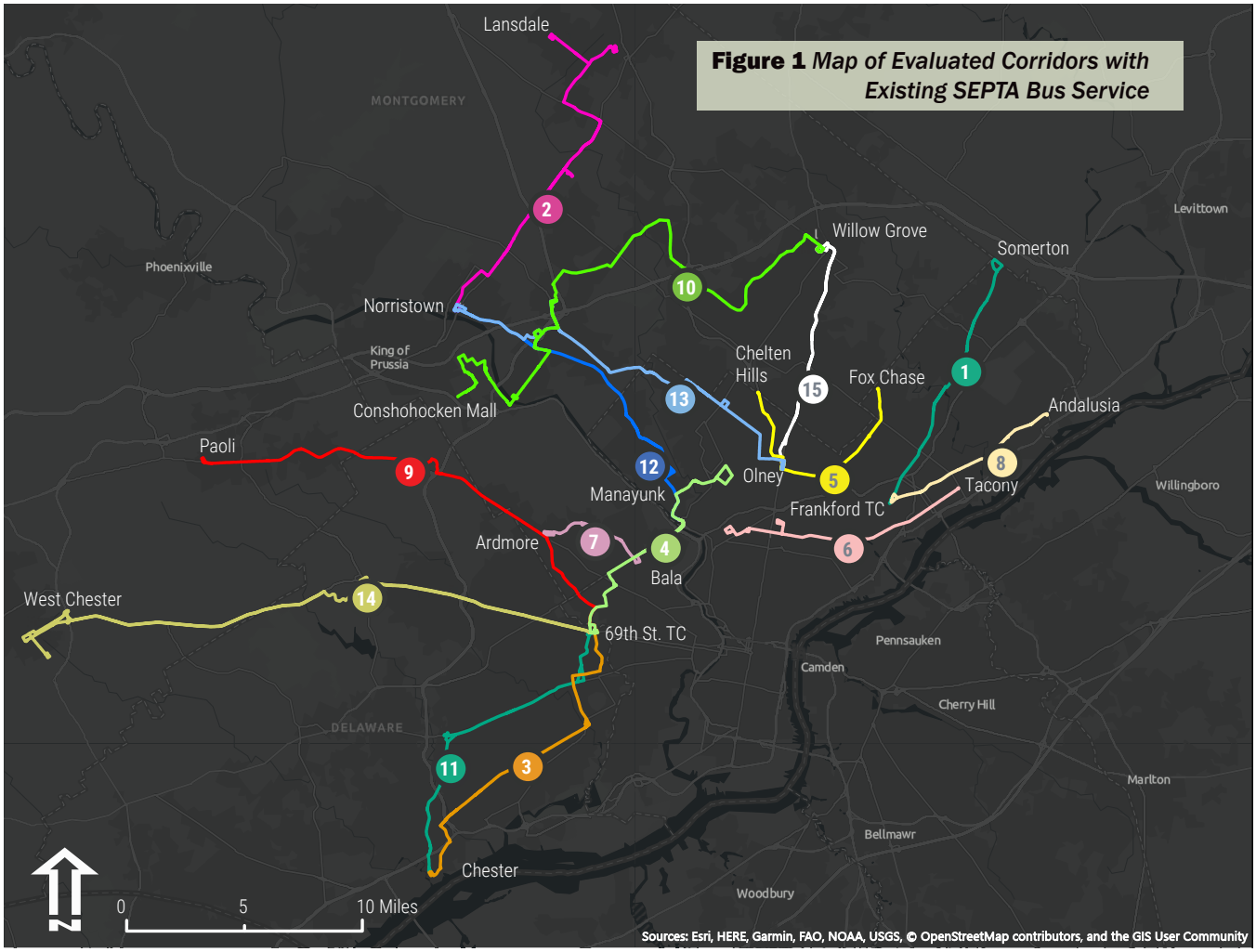


Figure 1 *Map of Evaluated Corridors with Existing SEPTA Bus Service*

Sources: DVRPC Esri, HERE, Garmin, FAP, USGS, OpenStreetMap contributors, and the GIS User Community

Executive Summary

The Southeastern Pennsylvania Transportation Authority (SEPTA) launched a new bus service in fall 2017, Direct Bus. The first route, Boulevard Direct, serves the arterial corridor Roosevelt Boulevard in Philadelphia. The Boulevard Direct service was developed in partnership by SEPTA and the City of Philadelphia. The service operates with a dedicated fleet of specially-branded buses, and features enhanced passenger amenities such as shelters, benches, and transit signage.

SEPTA is considering expanding Direct Bus service as part of its planned comprehensive bus network redesign, Bus Revolution. Direct Bus offers an efficient and reliable travel option, with frequent service and limited stops compared to local service. While Roosevelt Boulevard is unique within the region—with many lanes, both local and express, high speed traffic, etc.—SEPTA determined that other regional corridors also have characteristics which would make a Direct Bus service successful. SEPTA provided the project team and the project Steering Committee with the Direct Bus core and secondary attributes (see page 5 for more details) as well as with insight about the lessons learned for this first successful implementation.

As a complement to this work, SEPTA requested DVRPC identify corridors within its service area where future limited stop service would be valuable and successful. Initial Direct Bus candidate corridors were proposed by the Steering Committee. The project team then evaluated each corridor's potential for success as a Direct Bus route through two different analyses, depending on available datasets.

Corridors being served by SEPTA as of Spring 2019

Using SEPTA's Direct Bus core and secondary attributes as guidance, our team collected 11 relevant datasets to assess the best corridor per these datasets for the next Direct Bus service. Each corridor was created by combining these datasets and scoring them by half-mile segments using three weighting schemes. A final score was calculated by averaging the score of all half-mile segments within each corridor, see Table 1. Each of the 15 corridors' scores and rankings under each weighting scheme can be found in this online map. Figure 1 is a static version of this map.

Corridors where existing SEPTA bus routes operated through high population and job density scored well in all three weighting schemes—even those where population and employment metrics were deprioritized.

Generally, these high-scoring corridors (such as Rising Sun and Ogontz Avenues; and Erie and Torresdale Avenues) serve Philadelphia and its innermost suburbs. The corridors that scored well across all weighting schemes also had connections to either the Market-Frankford Line or the Broad Street Line, indicating that the ridership strength of Direct Bus candidate corridors is closely tied to the strong ridership base that transportation centers with multiple transfer opportunities provide.

Corridors not being served by SEPTA as of Spring 2019

Origin-destination pairs and corridors without bus service connecting them, but whose potential transit demand was of interest to the Steering Committee, were also evaluated for potential Direct Bus implementation. **Using DVRPC's Regional Transit Screening Platform (RTSP) tool we found there is demand for travel between some of these pairs, in particular, to Trenton from Lower and Central Bucks County (see page 15 for more details).**

Figure 2 *Direct Bus Station*

Source: DVRPC (2018)

Chapter 1:
Introduction

After years of planning, SEPTA implemented a new service called Direct Bus. The first corridor is on Roosevelt Boulevard in Philadelphia and into Bucks County. The service was launched in the fall of 2017 and offers an efficient and reliable travel option with frequent service and fewer stops compared to the existing local service. The Boulevard Direct was developed as part of a partnership between SEPTA and the City of Philadelphia Office of Transportation, Infrastructure, and Sustainability (OTIS) to enhance public transit access in Philadelphia. Boulevard Direct service operates with a dedicated fleet of buses easily recognized by their branding (specific color, font, and D symbol). The service features enhanced stations at each stop with shelters, benches, transit signage, and other customer amenities, illustrated in Figure 2. These elements distinguish the service from the typical local SEPTA service and resemble a Bus Rapid Transit (BRT)—like service.

The Boulevard Direct service offers a competitive longer distance option to traveling in a personal vehicle. After this success, SEPTA, as well as the five counties in its service area, (Bucks, Chester, Delaware, Montgomery, and Philadelphia) as well as the Transportation Management Associations (TMAs) and municipalities it serves, are considering implementing more Direct Bus routes throughout the region.

Project Purpose

SEPTA is considering expanding Direct Bus service as part of its planned comprehensive bus network redesign, Bus Revolution, and requested DVRPC to identify corridors within the SEPTA service area where future limited stop service would be valuable and successful.

Project Goal

The goal of this study was to identify future potential Direct Bus corridors using both data analysis and stakeholders' local knowledge. The deliverable is a set of ranked lists by priority of corridors where future Direct Bus service may be most appropriate. A quantitative analysis using existing datasets was designed to generate the results.

Steering Committee and Stakeholder Input

The project team has looked to a group of stakeholders representing SEPTA's service area for local knowledge as well as advice and guidance during the project. These stakeholders were invited to participate in meetings throughout the study and provide the project team with feedback about the analysis. The Steering Committee included the following agencies.

- OTIS
- SEPTA
- Philadelphia Streets Department
- PennDOT District 6-0
- Philadelphia City Planning Commission
- Bucks County Planning Commission
- Chester County Planning Commission
- Delaware County Planning Department
- Montgomery County Planning Commission
- TMA Bucks
- University City District
- Delaware County Transportation Management Association
- Greater Valley Forge Transportation Management Association
- Partnership Transportation Management Association of Montgomery County
- Center City District
- Transportation Management Association of Chester County

Defining Direct Bus Service

To implement another Direct Bus route similar to Boulevard Direct, we needed to understand what made it successful. SEPTA assembled lessons learned from planning and implementing the Boulevard Direct into tables displaying Direct Bus core and secondary attributes (Tables 2 and 3). These characteristics were then translated into metrics that we could analyze across the region to identify where it may make sense to implement the next Direct Bus service.

Boulevard Direct Takeaways

Boulevard Direct serves Roosevelt Boulevard in Philadelphia and Bucks counties. The route is an overlay of existing local service. The route is modeled after SEPTA's Route 14, a high ridership and frequent bus route, with limited stops. While Roosevelt Boulevard is unique within the region—with many lanes, both local and express, high speed traffic, etc.—SEPTA determined that other regional corridors also have characteristics which would make a Direct Bus service successful. SEPTA provided the project team and the Steering Committee with insight about the lessons learned for this first successful implementation. These were used to guide this project's process and develop the metrics chosen for the quantitative analysis.

› Direct Bus implementation is a team effort. For Boulevard Direct the implementing team was able to collaborate under the umbrella of the Roosevelt Boulevard "Route for Change" planning grant from US DOT, which helped SEPTA, OTIS, and PennDOT communicate effectively. As Direct Bus service expands without a comparable grant, it will be important to have a platform and define the program's goals and communicate them effectively, so that all relevant stakeholders understand exactly what benefits the service can offer to their constituents.

› Direct and local service complement each other along a corridor. On Roosevelt Boulevard, SEPTA was able to reallocate many of the service hours it uses for the Boulevard Direct bus from existing local service, mostly from Route 14. But, local service on the Boulevard is still very much a part of the mix for riders. In evaluating corridors for Direct Bus expansion, balancing both local and Direct service will be key.

› Total ridership is not the only way to measure success. Direct Bus is certainly a popular service on Roosevelt Boulevard, with growing ridership, but, like most bus routes in SEPTA's system and bus routes nationwide, total ridership on the corridor has decreased slightly since 2017 (since Boulevard Direct implementation).

In addition, due to the onset of the COVID-19 pandemic March 2020, SEPTA bus ridership decreased suddenly and severely. At the time this report was published, daily transit passenger counts were about 50 percent of pre-pandemic normal. As ridership begins to return as some commercial and office spaces re-open, we may see new travel trends and find new ways to measure them. Due to the timing of this study, the project team used pre-pandemic Spring 2019 ridership for all analyses.

Figure 3 *SEPTA Route 104 Bus*

Source: DVRPC (2018)

We need to be pragmatic about what can be accomplished when SEPTA introduces Direct Bus service on a corridor, especially if there is not a strong existing ridership base. SEPTA's core and secondary attributes for Direct Bus service expand on some of the brand's non-ridership attributes. Some of these attributes speak to a corridor's physical characteristics (i.e.,will the right-of-way accommodate faster bus service?), while others relate to service characteristics (i.e., would riders be taking longer trips than we would see on a local bus route?).

› New service should complement SEPTA's existing and future network. SEPTA's Bus Revolution project has started, and should inform and be informed by further corridor study and selection.

How is Direct Bus Defined?

Defining exactly what "Direct Bus" means was a key task for this project. The conditions for the Boulevard Direct bus are not likely to be replicated across the region, so establishing which criteria will apply to future Direct Bus routes is important. Direct Bus expansion should complement any changes anticipated with Bus Revolution.

Using this background knowledge about Boulevard Direct, SEPTA provided DVRPC with the core and secondary attributes that describe the Direct Bus branding and mode shown in Tables 2 and 3. These attributes guided the datasets selected and the development of the weighting schemes that created the ranked list of viable corridors.

Some of the principles vital to Bus Revolution are also relevant for potential Direct Bus routes. For example, a renewed focus on making transfers at transportation centers reinforces the core Direct Bus attribute of feeding rail stations or transportation centers. Average trip length is a key indicator. Routes with longer average trip lengths for individual passengers are likely to benefit more from Direct Bus service than routes where riders use a short portion of the route. The roadway should be transit friendly (complementary uses with sidewalks) but also wide enough to accommodate two lanes in each direction, so the Direct Bus vehicles have the ability to bypass other buses or turning vehicles.

Table 2 Direct Bus Core Attributes

Direct Bus Core Attributes	Required Corridor Attributes
Frequent Service	Frequent service and relatively high ridership that both justify improved service and enable Direct Bus to be added without requiring excessive additional cost.
Limited Stop	Clear "nodes" of activity along the route which allow local stops to be bypassed without major impacts on ridership.
Overlay Local Service	Local bus service must exist on the corridor.
Ability to Pass Local Service	The roadway must be at least two lanes in each direction for at least a significant portion of the route. Vehicle traffic must also move at speeds which enable passing.
Train Station/Transportation Center Feeder	The corridor must be able to provide strong "end of lines," preferably at a transportation center or high capacity rail station.

Source: DVRPC (2020)

Table 3 Direct Bus Secondary Attributes

Direct Bus Secondary Attributes	Preferred Corridor Attributes
Complementary Land Uses	Medium to high density of residences/commercial uses along significant parts of the corridor.
TOD Potential	Locations where higher densities could be supported around stations.
Municipal/County Will & Cooperation	The existence of local support for the service, and will to cooperate during the planning process.
Economic Development Momentum	Residential and/or commercial growth is occurring in the area, there is development proposed or under construction.
BRT Potential	The size and character of the corridor would allow a BRT system with dedicated bus rights of way, and larger future stations. There is local support for BRT, and BRT could be justified in the future.

Source: DVRPC (2020)

Figure 4 *SEPTA Route G at Overbrook Station*

Source: DVRPC (2008)

Chapter 2:
Methodology for Quantitative Analysis

To understand what would help identify successful Direct Bus corridors the project team brainstormed and collected existing datasets that would inform the core and secondary attributes described in Chapter 1. These are listed in Table 4. These datasets were discussed with the Steering Committee in the second committee meeting.

During this brainstorming period the project team discovered some core and secondary attributes that could not be quantified at a regional scale. These attributes will need to be addressed either through qualitative problem solving or at a more detailed level once the stops and routing for a potential route is proposed.

Table 4 Datasets and Metrics Used in Analysis

	Category	Core/Secondary Attribute	Data Set Description
Demographics	Population	Secondary	Population by Tract (American Community Survey [ACS])
	Proxies for Transit Riders*	Secondary	• Means of Travel When Living or Working Along a Bus Corridor by Tract • 0-1 Car Households by Tract (Census Transportation Planning Products [CTPP])
	Employment	Core	Number of Employees by Tract (National Establishment Time Series [NETS])
	Major Destinations	Core	Employers with 200+ Employees (NETS)
Transit	Total Ridership*	Core	Boards + Alights by Stop (SEPTA Automated Passenger Counter [APC] Spring 2019)
	Reliability	Core	DVRPC Surface Transit Reliability Score: Composite of On-Time Performance, Scheduled Transit Speeds, and the Ratio of Peak-Period vs. Free-Flow Travel Time
Physical Characteristics	Walkability	Secondary	Intersection Density within ½ Mile of a Bus Stop Sidewalk Density within ¼ Mile of a Bus Stop
	Roadway	Core	Traffic Signals Per-Mile Along a Bus Route Lane count by Road Segment

** At the time the study began, demographic data based on riders from SEPTA and SEPTAKey data was unavailable.*

Source: DVRPC (2020)

Initial Corridor Selection

The Steering Committee suggested 15 corridors with existing service they predicted would be successful for Direct Bus. This included 31 SEPTA routes in total. In some cases, committee members had selected corridors with multiple overlapping SEPTA routes, or routes with multiple patterns. In other cases, they suggested corridors with two existing bus routes that roughly paralleled each other. The project team merged and simplified these suggestions to create proposed Direct Bus corridors in Figure 5 and Table 5.

These refined corridors were then broken into half-mile segments, and the datasets were applied to these segments. The team flattened the top 5 percent of each category to account for outliers. These two steps made it possible to create a consistent format for the datasets to be averaged together and scored. The outcome was all the segments of each of the routes and all their patterns with all the datasets attached.

The project team used SEPTA's core and secondary Direct Bus attributes as guidance for refining the analysis corridors. In general, each route is anchored on at least one end by a transportation center, often with a connection to a high-capacity fixed rail route. When presented with multiple routes, the project team selected routes that were the most geographically direct option, connected major ridership generators, and/or followed multilane roads. In addition, the average trip distance by bus route (provided by SEPTA) was used to determine which existing route travel pattern would be the most suitable for future Direct Bus service.

Figure 5 *Map of Evaluated Corridors with Existing SEPTA Bus Service*

Sources: Esri, HERE, Garmin, FAP, USGS, OpenStreetMap contributors, and the GIS User Community

Table 5 Proposed Corridors with Existing Bus Service

	Corridor(s)	Description	Existing Route(s)	Associated County(s)
1	Bustleton Avenue	This corridor originates at Frankford Transportation Center and follows Bustleton Avenue. The corridor follows all of Route 58's 15-minute frequency portion, and continues roughly a mile more to reach Somerton Regional Rail station in Northeast Philadelphia.	58	Philadelphia
2	US-202 (Dekalb Pike)	This corridor follows DeKalb Pike between Norristown Transportation Center and the Lansdale Regional Rail station.	96	Montgomery
3	MacDade Boulevard	This corridor connects 69th Street Transportation Center to Darby Transportation Center and Chester Transportation Center. It follows Route 113 along MacDade Boulevard, but omits the low-frequency Route 113 pattern to Naamans Road in Delaware.	113, 114	Delaware
4	City Avenue to WTC and 69th Street	This corridor connects 69th Street Transportation Center to Wissahickon Transportation Center and Germantown via City Avenue and Walnut Lane.	65 (primary route)	Montgomery, Philadelphia
5	Rising Sun and Ogontz Avenues	This corridor connects Cheltenham Transportation Center to Olney Transportation Center, and Fox Chase. West of Broad Street, it generally follows Route 6, while east of Broad Street, it follows Route 18.	6, 18	Philadelphia
6	Erie and Torresdale Avenues	This corridor connects the Bakers Centre shopping center in Tioga to Cottman & Bustleton Avenues in Tacony, following the existing Route 56.	56	Philadelphia
7	City, Montgomery, and Lancaster Avenues	This corridor connects Wissahickon Transportation Center to Ardmore via City Avenue and Montgomery Avenue.	44	Montgomery, Philadelphia
8	Frankford Avenue	This corridor follows Frankford Avenue from Frankford Transportation Center to the Frankford & Knights Loop at the Philadelphia/Bucks County border.	66	Philadelphia
9	Lancaster Pike	This corridor connects 69th Street Transportation Center and Paoli via Lancaster Pike and Haverford Avenue.	105, 106	Delaware, Montgomery, Philadelphia
10	Conshohocken to Willow Grove	This corridor connects several malls in Montgomery County and downtown Conshohocken, following existing Route 95.	95	Montgomery
11	69th Street to Chester	This corridor connects 69th Street Transportation Center to Chester Transportation Center via Baltimore Pike and PA-320.	109	Delaware
12	Ridge Pike	This corridor connects Wissahickon Transportation Center and Norristown Transportation Center via Ridge Avenue/Ridge Pike and Henry Avenue.	9, 27, 35, 60, 61, 93	Montgomery, Philadelphia
13	Germantown Pike & Stenton Ave. to Plymouth Meeting	This corridor connects Olney Transportation Center to Plymouth Meeting via Stenton Avenue and Germantown Avenue/Pike.	L, 97	Montgomery, Philadelphia
14	West Chester Pike	This corridor connects 69th Street Transportation Center to West Chester via West Chester Pike.	104, 112, 115, 120, 123, 126	Chester, Delaware
15	Old York Road	This corridor connects Olney Transportation Center to the Willow Grove Park Mall via Old York Road (PA-611).	22, 55	Montgomery, Philadelphia

Source: DVRPC (2020)

Data Weighting Schemes

The project team created three weighting schemes, each of which prioritized different datasets while deprioritizing others. These weighting schemes helped identify which datasets might be more influential across diverse demographic and physical geographies. For example, dense corridors score highly on demographic metrics due to their high population and job density, but some less dense corridors score highly if they include wider, less congested roads.

These themes of emphasis will help SEPTA and its regional partners better understand the reasons certain corridors may be more suitable than others for future Direct Bus service. The three weighting schemes emphasize different metrics, the details are shown in Tables 6-8. They are called: ridership/transit reliability, reverse commute, and roadway characteristics.

The first weighting scheme in Table 6, is focused on transit operations, these metrics are also bold in Table 6. This weighting scheme emphasizes transit demand using ridership data and transit reliability using DVRPC's Surface Transit Reliability tool.

Table 6 Ridership/Transit Reliability Weighting Scheme

Dataset	Weight
Population by Tract (ACS)	1
Work in a Tract Along a Bus Corridor and Travel From Home to Work on Transit; Work in a Tract Along a Bus Corridor and 0-1 Car Households by Tract (CTPP)	0.25/0.25
Live in a Tract Along a Bus Corridor and Travel from Home to Work on Transit; Live in a Tract Along a Bus Corridor and 0-1 car households by Tract (CTPP)	0.25/0.25
Number of employees by Tract (NETS)	0.5
Employers with 200+ Employees (NETS)	0.5
Boards + Alights by Stop (SEPTA APC 2019)	**2.0**
DVRPC Surface Transit Reliability Score	**2.0**
Intersection Density within ½ Mile of a Bus Stop	0.5
Sidewalk Density within ¼ Mile of a Bus Stop	1.0
Traffic Signals Per-Mile Along a Bus Route	0.5
Lane count by Road Segment	1.0

Source: DVRPC (2020)

The second weighting scheme emphasizes reverse commuting, shown in Table 7. The reverse commute weighting scheme emphasizes routes serving major employment destinations and transit dependence using Census data on 0-1 car households, bold in Table 7.

Table 7 Reverse Commute Weighting Scheme

Data Set	Weight
Population by Tract (ACS)	0.5
Work in a Tract Along a Bus Corridor and Travel From Home to Work on Transit; Work in a Tract Along a Bus Corridor and 0-1 Car Households by Tract (CTPP)	**1.25/1.25**
Live in a Tract Along a Bus Corridor and Travel from Home to Work on Transit; Live in a Tract Along a Bus Corridor and 0-1 car households by Tract (CTPP)	**1.25/1.25**
Number of employees by Tract (NETS)	**1.25**
Employers with 200+ Employees (NETS)	**1.25**
Boards + Alights by Stop (SEPTA APC 2019)	0.5
DVRPC Surface Transit Reliability Score	0.5
Intersection Density within ½ Mile of a Bus Stop	0.25
Sidewalk Density within ¼ Mile of a Bus Stop	0.25
Traffic Signals Per-Mile Along a Bus Route	0.25
Lane count by Road Segment	0.25

Source: DVRPC (2020)

The third weighting scheme emphasizes the physical components of a roadway that makes it ripe for Direct Bus, titled roadway characteristics, see Table 8. The roadway characteristics weighting scheme emphasizes routes that are more likely to be able to pass local buses or other traffic because they travel on multilane roads with signalized intersections, bold in Table 8.

Table 8 Roadway Characteristics Weighting Scheme

Data Set	Weight
Population by Tract (ACS)	1.0
Work in a Tract Along a Bus Corridor and Travel From Home to Work on Transit; Work in a Tract Along a Bus Corridor and 0-1 Car Households by Tract (CTPP)	0.25/0.25
Live in a Tract Along a Bus Corridor and Travel from Home to Work on Transit; Live in a Tract Along a Bus Corridor and 0-1 car households by Tract (CTPP)	0.25/0.25
Number of employees by Tract (NETS)	0.25
Employers with 200+ Employees (NETS)	0.25
Boards + Alights by Stop (SEPTA APC 2019)	0.5
DVRPC Surface Transit Reliability Score	1.0
Intersection Density within ½ Mile of a Bus Stop	**2.0**
Sidewalk Density within ¼ Mile of a Bus Stop	0.5
Traffic Signals Per-Mile Along a Bus Route	1.0
Lane count by Road Segment	**2.5**

Source: DVRPC (2020)

Chapter 3:
Results of Quantitative Analysis

Each corridor was scored by half–mile segments using each of the three weighting schemes. A final score was calculated by averaging the score of all half-mile segments within each corridor. Tables 9–11 show the rank of each corridor by weighting scheme. Each of the 15 corridors' scores and rankings under each weighting scheme can also be found in this online map.

Findings

Common themes emerged across all three weighting schemes. **Corridors where existing SEPTA bus routes operated through areas of high population and job density scored well in all three weighting schemes—even those where population and employment metrics were deprioritized.** Generally, these high-scoring corridors (such as Rising Sun and Ogontz Avenues; and Erie and Torresdale Avenues) serve Philadelphia and its innermost suburbs.

The corridors that scored well across all weighting schemes also had connections to either the Market-Frankford Line or the Broad Street Line, indicating that the ridership strength of Direct Bus candidate corridors is closely tied to the strong ridership base that transportation centers with multiple transfer opportunities provide.

Some corridors consistently scored low across all three weighting schemes, specifically Conshohocken to Plymouth Meeting, US-202 (Dekalb Pike), West Chester Pike, and Lancaster Pike. Echoing the scores of the best-performing corridors, these corridors scored the lowest even in weighting schemes where population and employment metrics were deprioritized. In general, these are long-distance, suburban routes that pass through areas of very low population and job density. These results suggest it may make sense to evaluate urban and suburban routes differently for purposes of Direct Bus, and implement varying improvements and enhancements. For example, urban corridors may benefit most from Direct Bus improvements that reduce congestion, such as dedicated bus lanes. Suburban corridors may benefit more from appropriately locating limited Direct Bus stops and creating appropriate passenger amenities.

The results also provide insights that may be useful for Bus Revolution or other initiatives outside of the Direct Bus program. **For example, two corridors using City Avenue consistently scored in the top half or top third of corridors, despite only one of those corridors having a direct connection to the Market-Frankford Line. This suggests that a single, frequent route serving the City Avenue corridor may be a useful element of SEPTA's redesign.**

Table 9 Ridership/Transit Reliability Scores and Rankings

Rank	Corridor	Score
1	Rising Sun and Ogontz Avenues (Olney)	43.4
2	Erie and Torresdale Avenues	40.2
3	Frankford Avenue	38.1
4	Bustleton Avenue	37.3
5	City Avenue to Wissahickon Transportation Center and 69th Street	35.6
6	City, Montgomery, and Lancaster Avenues	34.2
7	Old York Road	32.2
8	MacDade Boulevard	30.8
9	69th Street to Chester	30.8
10	Germantown Pike & Stenton Avenue to Plymouth Meeting	27.9
11	Ridge Pike	27.7
12	Lancaster Pike	27.2
13	US-202 (Dekalb Pike)	25.7
14	West Chester Pike	24.9
15	Conshohocken to Plymouth Meeting (following various roadways)	23.1

Source: DVRPC (2020)

Table 10 Reverse Commute Scores and Rankings

Rank	Corridor	Score
1	Rising Sun and Ogontz Avenues (Olney)	45.1
2	Erie and Torresdale Avenues	43.1
3	City Avenue to Wissahickon Transportation Center and 69th Street	40.0
4	City, Montgomery, and Lancaster Avenues	35.7
5	Bustleton Avenue	35.2
6	Frankford Avenue	33.4
7	MacDade Boulevard	32.5
8	Old York Road	32.0
9	69th Street to Chester	31.9
10	Germantown Pike & Stenton Avenue to Plymouth Meeting	29.7
11	Ridge Pike	28.6
12	Lancaster Pike	27.0
13	US-202 (Dekalb Pike)	24.5
14	West Chester Pike	23.2
15	Conshohocken to Plymouth Meeting (following various roadways)	23.0

Source: DVRPC (2020)

Table 11 Roadway Characteristics Scores and Rankings

Rank	Corridor	Score
1	Rising Sun and Ogontz Avenues (Olney)	48.0
2	Erie and Torresdale Avenues	46.4
3	Bustleton Avenue	44.9
4	Frankford Avenue	43.6
5	Old York Road	42.1
6	City, Montgomery, and Lancaster Avenues	41.4
7	City Avenue to Wissahickon Transportation Center and 69th Street	40.4
8	69th Street to Chester	40.0
9	MacDade Boulevard	39.4
10	Ridge Pike	38.1
11	Germantown Pike & Stenton Avenue to Plymouth Meeting	37.3
12	Lancaster Pike	35.8
13	West Chester Pike	35.5
14	US-202 (Dekalb Pike)	34.4
15	Conshohocken to Plymouth Meeting (following various roadways)	32.6

Source: DVRPC (2020)

Chapter 4:
Corridors Without Existing Service

In addition to the corridors that already have bus service, the Steering Committee members also suggested origin-destination pairs and corridors that currently do not have SEPTA bus service connecting them, but that were of interest to find out if there is potential for successful public transit service between them. Those pairs and corridors are listed in Table 12.

DVRPC's Regional Transit Screening Platform

DVRPC created an evaluation tool called the Regional Transit Screening Platform to inform analyses just like this one. This platform contains a set of screening tools that shed light on public transit needs and opportunities in the DVRPC region. For the purposes of this study the output and information can be used to generate and evaluate ideas for service, operations, enforcement, and capital improvements.

One of the four tools is called the Transit Network Gap Analyzer. This tool helps evaluate in-demand connections between transit supportive origins and destinations where transit is not available or not competitive with private vehicles using a composite measure. It helps us to answer the question, where are there service gaps in the transit network? The Network Gap Analysis examined three attributes of each origin-destination (OD) pair of Transportation Analysis Zones (TAZs) in the DVRPC region: directness, density, and demand.

Directness

The directness of transit service for an OD pair depends on the circuitousness of the route and transfers. Specifically, is the shortest available distance that can be traveled via transit longer than the driving distance? Is the transit travel time longer than the estimated driving time? How many transfers are required to get from origin to destination via transit? Finally, how long is the scheduled wait time for those transfers? These questions were answered using the daily average (for all time periods) collected from DVRPC's regional travel model. Points were assigned based on the answers and were summed to determine the directness score for the OD pair (for more information see this document). The higher the directness score, the more room for improvement.

Density

Density is a measure of transit supportiveness using DVRPC's 2015 Transit Score. Transit Score categorizes TAZs into five bins from low to high based on the density of population, employment, and zero-car households. A high Transit Score means the zone is dense enough to support transit service. The higher the density score, the more transit supportive the OD pair.

Demand

Demand is the total number of trips, using all modes, between each OD pair based on the regional travel model. Approximately 86 percent of the OD pairs in the region had no demand between them and were given a demand score of 0. The rest were split into 2 bins, less than 5 and greater than 5, and given a score of 1 (9 percent of the region's OD pairs) or 2 (5 percent of the region's OD pairs) respectively.

These 3 variables - directness, density, and demand - were combined to calculate the overall network gap score. The directness score was multiplied by the density score. The results are weighted by demand when displayed. Therefore, OD pairs identified as a transit gap that also have relatively high demand for travel between them show up as a higher priority. **The highest scoring places overall represent in-demand connections between transit supportive places where transit is not available or not competitive.**

Table 12 Potential Destination Pairs for Direct Bus Service Without Existing Service

Corridor	Transit Priority Gap Summary
From Schwenksville Borough (local analysis)	Trips being made from Schwenksville Borough to destinations, such as Phoenixville, King of Prussia, and Norristown Borough, have the highest network gap scores indicating that between Schwenksville Borough and these other destinations there are in-demand connections between transit supportive places where transit is not available or competitive with driving (page 17).
PA-29 Corridor (regional summary)	Along the PA-29 corridor Limerick Township, Collegeville, and Phoenixville are areas that can be defined as places that are transit supportive where there is service, but it is not direct, and therefore not competitive with driving (page18). Schwenksville Borough is also along PA-29 corridor and is summarized above in this table.
US-422 Corridor (regional summary)	There are transit gaps in Pottstown Borough and Phoenixville Borough and the surrounding area around Limerick Township and King of Prussia. There is demand for travel between these locations, where the land uses are relatively dense, but the public transit connections are not direct, and therefore transit is not competitive with driving (page18).
Warminster Township to New Hope Borough & Warminster Township to Morrisville Borough (local analyses)	Local analysis on travel from Warminter to New Hope shows New Hope in dark green. This indicates that there is no existing transit service between them, but there is demand for travel and density is relatively transit supportive. In Morrisville there is bus service, but it is not direct between here and Warminster. Morrisville is relatively dense and transit supportive where there is demand for additional service (page 19).
From Newtown Township to Trenton (local analyses)	Trips being made from Newtown Township and the surrounding area show that there is demand for travel to Trenton, which is dense and transit supportive, and the OD pair is not currently served by direct public transit service (page 20).
Quakertown Borough to Philadelphia (local analysis)	Quakertown Borough does have a high scoring transit priority gap score, however, there is very little demand for travel between Quakertown Borough and Philadelphia (page 21).

Source: DVRPC (2020)

Evaluating Corridors without Service in DVRPC's Regional Transit Screening Platform

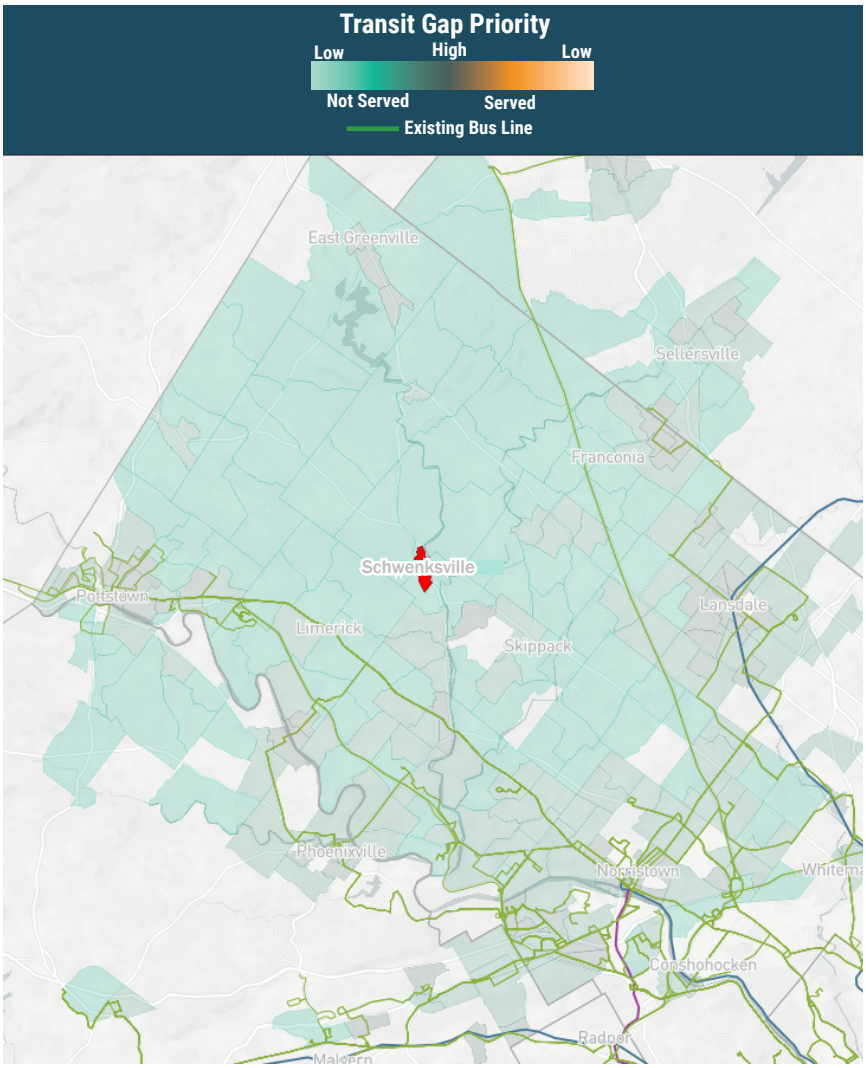
There are two ways to evaluate potential public transit connections and view this data: a regional summary map or a local analysis. First, a regional summary map shows TAZs symbolized by the demand weighted average network gap score. The summary for each zone is determined by the average network gap score from that zone to every other zone and to that zone from every other zone. The resulting average is then weighted by demand. **The darker the color, the higher priority the transit gap.**

Second, the results are presented in an interactive web map. The web map allows users to identify and prioritize transit gaps to and from specific areas of interest. Once users select an area of interest, either by TAZ(s) or municipality, the tool calculates and displays the demand weighted average network gap score between that area and every other TAZ in the region. **The darker the color, the higher priority the transit gap is in relation to the selected area**.

Using this tool, the project team assessed the potential transit demand from the stakeholder suggestions in Table 12. Figures 6 through 12 show this information in map form. In the map there are two color schemes distinguishing areas that are currently served by transit and those that are not. The areas shown in orange and brown are served by transit (bus or rail) and the green is unserved, while the gray areas are locations where there is no demand for transit from, or to that area.

Figure 6 shows a local analysis and the network gap score for connections from Schwenksville Borough, the origin municipality in this analysis. The analysis in the reverse (to Schwenksville Borough) shows very similar results. The green scale indicates that there is no or very little transit service serving Schwenksville Borough.

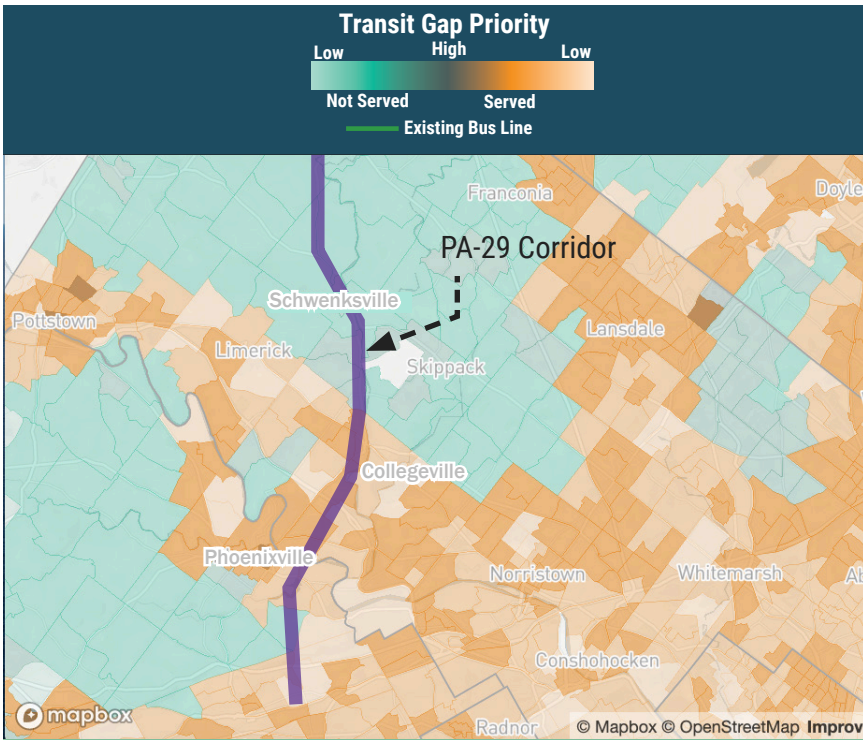
Figure 6 *From Schwenksville Borough*



Source: DVRPC Regional Transit Screening Platform (2019)

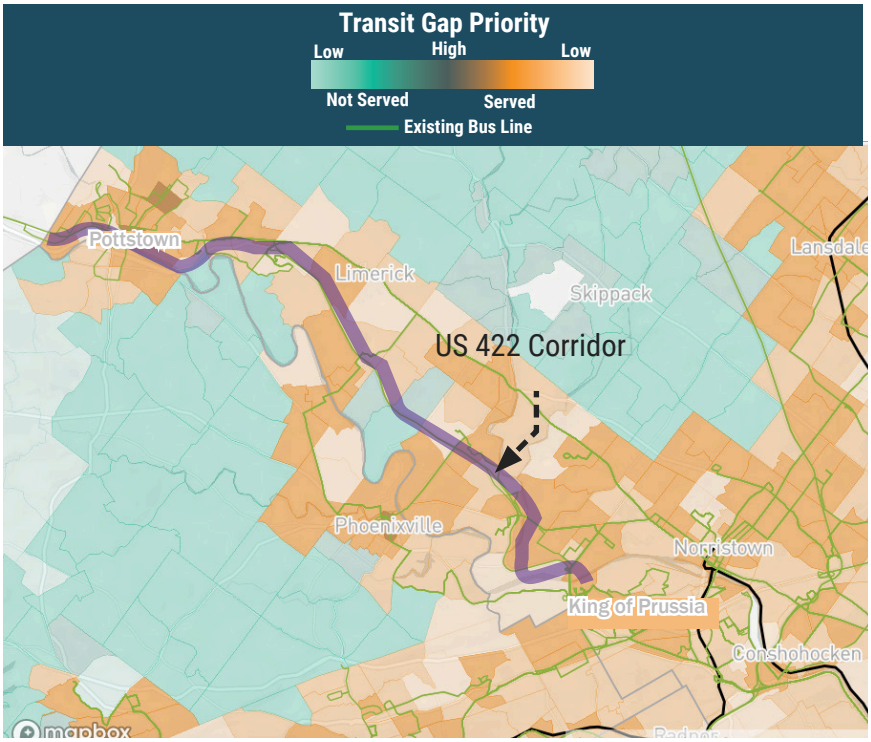
Trips being made from Schwenksville Borough to destinations that are also dark green in Figure 6, such as Phoenixville, King of Prussia, and Norristown Borough, have the highest network gap scores This analysis indicates that there is potential for successful public transit between Schwenksville Borough and other destinations in parts of Bucks County, Chester County, and Montgomery County.

Figure 7 *Regional Summary PA-29 Corridor*



Source: DVRPC Regional Transit Screening Platform (2019)

Figure 8 *Regional Summary US-422 Corridor*



Source: DVRPC Regional Transit Screening Platform (2019)

Figure 7, the regional summary map, shows TAZs symbolized using the average network gap score. The darker the color, the higher the score, indicating a higher priority transit gap.

Along the PA-29 corridor Limerick Township, Collegeville, and Phoenixville are areas that can be defined as places that are transit supportive where there is service, but it is not direct, and therefore not competitive with driving. Figure 6 on the previous page discusses the transit gap for Schwenksville Borough, which is also along this corridor, but not currently served by transit, and is therefore dark green.

Figure 8 also displays the regional summary map focused on the US-422 Corridor shown in purple. This map illustrates that there are transit gaps in Pottstown Borough and Phoenixville Borough (both dark orange) and the surrounding area around Limerick Township and King of Prussia (both light orange), all do have some existing public transit service. There is demand for travel in these locations, where the land uses are relatively dense but the connections are not direct, and therefore transit is not competitive with driving.

Figure 9 shows the average network gap score from Warminster Township, a local analysis. This dynamic map allows users to identify and prioritize transit gaps to and from specific areas of interest. The darker colors indicate higher transit priority gaps in relation to the selected area. The Steering Committee was interested in two potential destination pairs: from Warminster Township to New Hope Borough and from Warminster Township to Morrisville Borough.

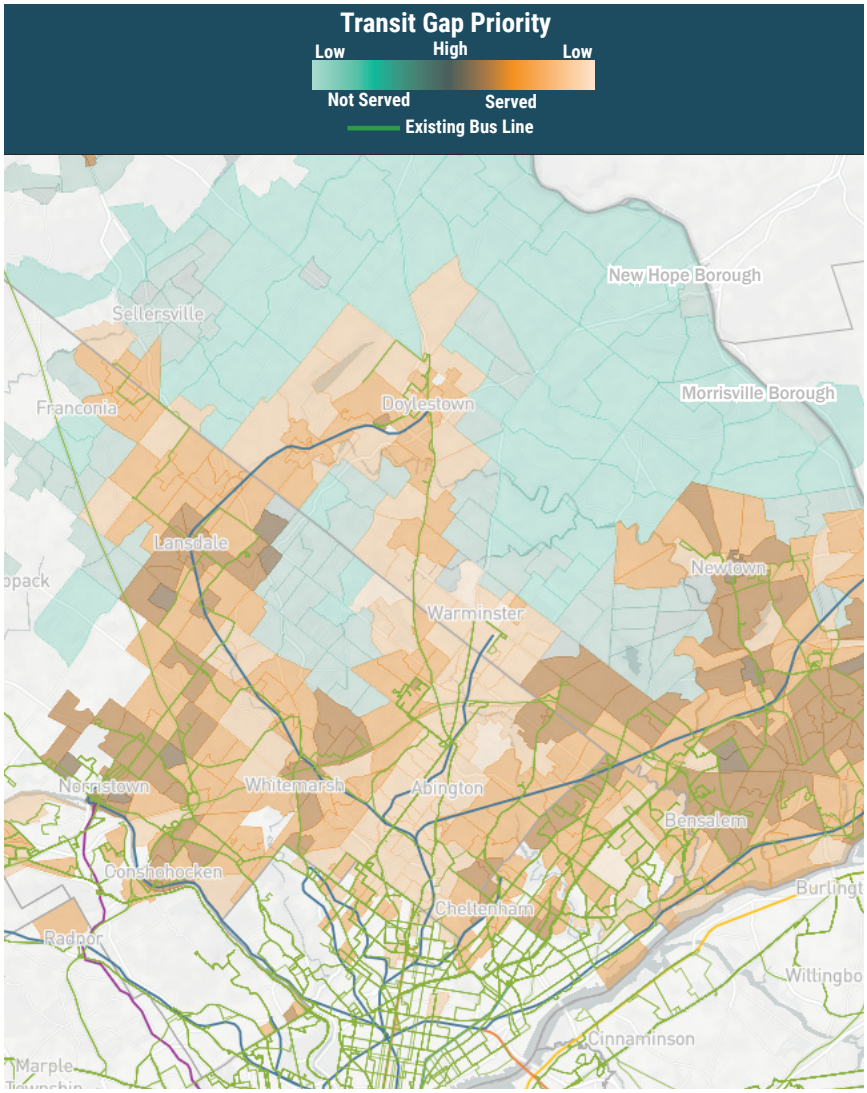
Warminster Township is served by SEPTA Bus Route 22 and the Warminster Regional Rail Line. There is no public transit service in New Hope Borough.

In Figure 9 Warminster Township is primarily a light orange and does not score very high because it does have public transit service and the land use is not as dense and transit supportive as some other areas in this analysis.

Local analysis on travel from Warminter Township to New Hope Borough shows New Hope in dark green. This indicates that there is no existing transit service between them, but there is demand for travel and density is relatively transit supportive in New Hope Borough.

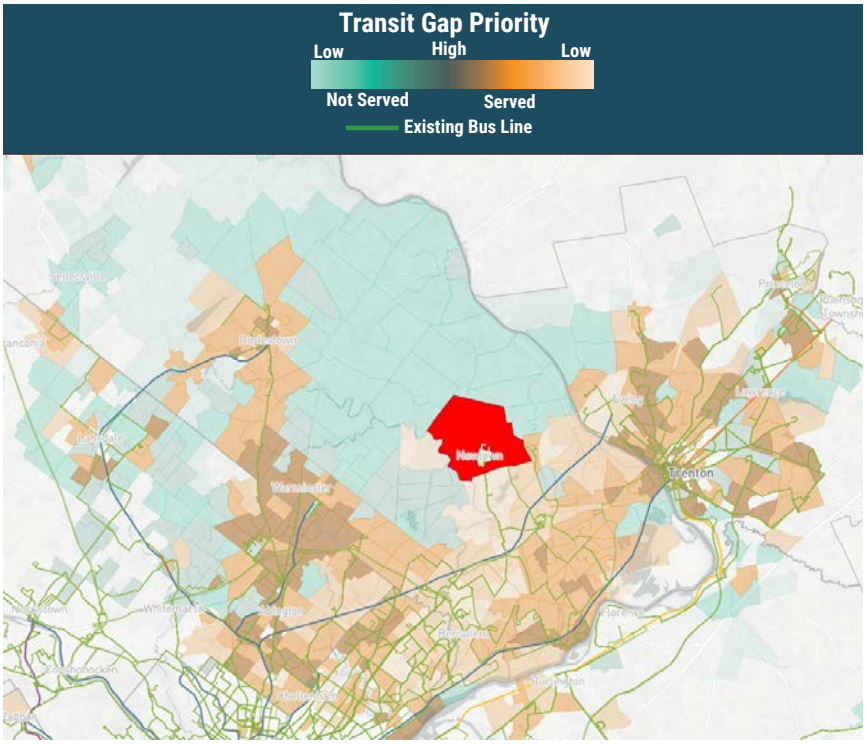
In the same Figure 9, Morrisville Borough is a dark orange. The single green line indicates there is bus service, but due to the dark orange color, it is not direct between this OD pair. Morrisville Borough is relatively dense and transit supportive where there is demand for additional service. To travel between Morrisville Borough and Warminster Township via public transit it would take a person an average of over two hours and would require multiple transfers.

Figure 9 *From Warminster Township*



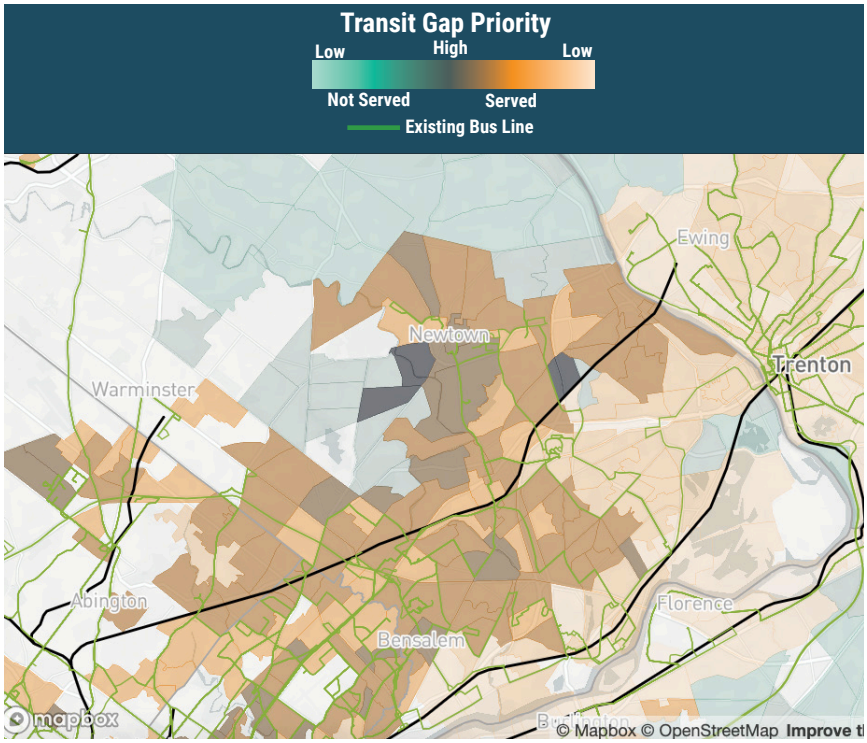
Source: DVRPC Regional Transit Screening Platform (2019)

Figure 10 *From Newtown Township*



Source: DVRPC Regional Transit Screening Platform (2019)

Figure 11 *To Trenton*



Source: DVRPC Regional Transit Screening Platform (2019)

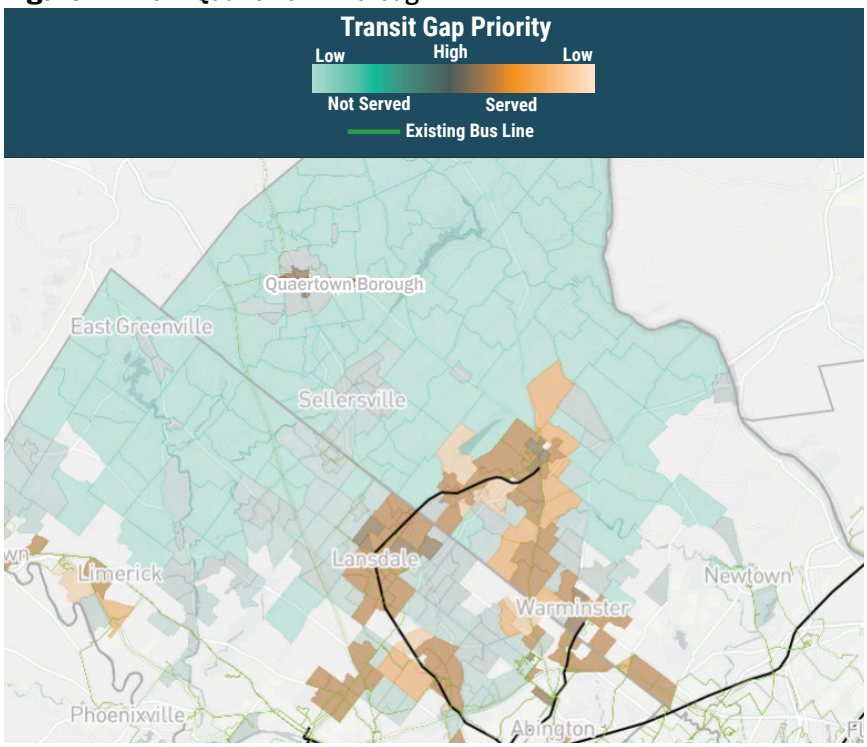
Figures 10 and 11 show the average network gap score for connections from Newtown Township, Bucks County and to Trenton, respectively. The Steering Committee was interested in learning if there is transit demand between Newtown Township and Trenton. The green lines illustrate existing bus service (both SEPTA and NJT) while the black lines are passenger rail lines. There is public transit serving both municipalities, however, there is no service that connects them directly.

Figure 10 is a map that shows the average network gap score for connections from Newtown Township. The darker orange TAZs indicate higher priority transit gaps visible in Trenton. Trips being made from Newtown Township to these darker color areas, such as Trenton, are relatively dense, without direct public transit service, and demand for travel exists.

Figure 11 is a map that shows the average network gap score for connections to Trenton. Trips being made from the dark brown TAZs, such as Newtown Township and the surrounding area, indicates that there is an in-demand connection between those two, the area is dense and transit supportive, and is not currently served by direct service. This analysis reveals that creating better public transit connections between Trenton and Newtown Township may warrant further study.

Figure 12 is a map that shows the average network gap score for connections from Quakertown Borough. The Steering Committee was interested in understanding if there were transit gaps or in-demand connections between Quakertown Borough and Philadelphia. Only TAZs with substantial demand from the selected area are being displayed. The darker colors indicate higher priority transit gaps, primarily suburban areas around Ambler Borough, Doylestown Township, East Norriton Township, Lansdale Borough, and Warminster Township. While Quakertown Borough does have a high transit priority gap score, this analysis demonstrates there is no or very few in-demand connections between Quakertown Borough and Philadelphia.

Figure 12 *From Quakertown Borough*



Source: DVRPC Regional Transit Screening Platform (2019)

Chapter 5:

Next Steps: How will this analysis be used in the future?

This project identified two types of corridors through two different analyses that could be successful for limited stop bus service.

› **Corridors being served by SEPTA in Spring 2019.** Using SEPTA's core and secondary attributes for Direct Bus our team collected 11 datasets and combined and scored them by half-mile segments using three weighting schemes. A final score was calculated by averaging the score of all half-mile segments within each corridor. Each of the 15 corridors' scores and rankings under each weighting scheme can be found in this online map.

› **Corridors not being served by SEPTA in Spring 2019.** Origin-destination pairs and corridors that currently do not have bus service connecting them, but that were of interest to the Steering Committee to find out if there was potential transit demand between them were evaluated for potential Direct Bus implementation using DVRPC's RTSP tool. A number of these (see Chapter 4) did show potential; however; we found the demand to Trenton from Newtown Township to be particularly strong.

While these analyses help SEPTA to understand the elements of success for future Direct Bus corridors, there are other relevant data points as well. Qualitative information is also important in understanding where Direct Bus should be implemented.

In an effort to preserve and continue this work a new committee will be formed to focus on Direct Bus future implementation in SEPTA's service area. This will serve as a partnership between SEPTA, PennDOT District 6-0, Bucks County, Delaware County, Chester County, Montgomery County, and Philadelphia. This committee has the potential to work on a number of tasks including, but not limited to the following:

› Refine existing analysis and gain consensus on the next steps for expansion.

› Develop and elaborate the qualitative criteria that should be used to evaluate corridors.

› Create a set of goals and minimum standards for frequency, activity nodes, stops, and segmentation for future Direct Bus service.

› A one page checklist resource for those looking at SEPTA Direct Bus or BRT service.

› Work on methods (physical and policy) to help create collaboration between and prepare counties, municipalities, and corridors (specifically those that may score lower quantitatively) for future Direct Bus service.

› Share best practices from within the region and from peer agencies nationwide.

Figure 13 *SEPTA's Boulevard Direct Bus*

Source: DVRPC (2018)

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ABSTRACT
DVRPC worked with SEPTA to identify corridors within its service area where future limited stop service would be valuable and successful. Each corridor was created by combining various datasets and scoring them by half-mile segments using three weighting schemes. A final score was calculated by averaging the score of all half-mile segments within each corridor. Corridors where existing SEPTA bus routes operated through high population and job density scored well in all three weighting schemes, but the purpose of this analysis is to understand where direct bus could be successful, not to determine which corridors are chosen.

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