FINAL ENVIRONMENTAL IMPACT STATEMENT

STOPS RIDERSHIP FORECASTING

TECHNICAL MEMORANDUM

SEPTA Task GEC17H - 06

Prepared for:

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1. Introduction

This document provides the ridership forecasting methodology and results for the King of Prussia (KOP) Rail Project's Final Environmental Impact Statement (FEIS). This ridership forecasting process used the Federal Transit Administration's (FTA) travel demand forecasting platform: STOPS (Simplified Trips-on-Project Software). This technical memorandum discusses the model implementation process in order to setup and run the STOPS model, the service planning assumptions made for the No Action Alternative and the Preferred Alternative, and the average weekday ridership forecasts produced for horizon years 2025 and 2040 for the No Action and Preferred Alternatives.

2. Model Implementation

This section includes discussion on the data sources and data used in order to setup the STOPS model. Using available data sources such as SEPTA/ Delaware Valley Regional Planning Commission's (DVRPC) origin-destination passenger intercept survey as well as current year Automated Passenger Count (APC) data can yield calibrations at the station or stop level for both Synthetic (American Community Survey (ACS) flow based) and Incremental (using SEPTA/DVRPC's On Board survey) implementations.

2.1.1 Data Sources

The following sections list the data used to setup the STOPS model from the FTA, DVRPC and SEPTA.

2.1.1.1   From FTA

The following data was provided by the FTA:

- STOPS model version 2.50
- American Community Survey (ACS) 2006-2010 Census Transportation Planning Package (CTPP) data for New Jersey, Delaware, and Pennsylvania including zone shapefiles, census block shapefiles, and Journey to Work data

2.1.1.2   From DVRPC

The following data was provided by the DVRPC:

- Zonal shapefile
- Approved population and employment forecasts for the base and horizon forecast years
- 2010 Transit On-Board Survey
- Zone to zone highway travel time and distances for base and forecast horizon years from their regional model (highway skims)

2.1.1.3 From SEPTA

The following data was provided by SEPTA:

- October 2019 General Transit Feed Specification (GTFS) data

- 2019 Route level counts

- 2019 Stop level APC data for all routes except Routes 10, 101, and 102 which use "traffic checks" for stop level ridership, and Market Frankford Line and Broad Street Line which used 2017 station counts scaled to match 2019 route level counts

2.1.2 Incremental Implementation

For the Incremental implementation of the STOPS model the 2010 On-Board Survey was used to generate a linked trip table to use as the basis for the base year model trip table. The survey was segmented by trip purpose into the purposes used by STOPS (Home Based Work, Home Based Other, and Non-Home Based), by number of vehicles owned by the household (0, 1, 2+ vehicles), and the origin and destination trip ends were tagged with the ACS zone that they were located within. A Type 12 Calibration was used which uses stop level counts as well as route level counts to calibrate the model.

Figure 2-1 shows the parameter settings used for the Incremental STOPS model.

Figure 2-1: Incremental STOPS Parameters

2.1.3 Synthetic Implementation

For the Synthetic model implementation, the ACS journey to work flows provided by the FTA was used as the basis for the trips within the STOPS model. A Type 12 Calibration was used which uses stop level counts as well as route level counts to calibrate the model. The 2019 Route and Stop level counts were used to calibrate the model with an overall unlinked target equal to their totals was used. No linked trip targets from the survey were used in the Synthetic implementation. *Figure 2-2* shows the Synthetic parameter settings.

Figure 2-2: Synthetic STOPS Parameters

2.1.4 Calibration Comparison

The following table shows the calibration results for corridor routes as well as systemwide for each model implementation (both incremental and synthetic). Calibration is the process undertaken to examine how well base year ridership on existing transit services under current socioeconomic conditions are replicated by the STOPS model. It is an application of STOPS to see how well the model can replicate observed base year transit ridership. This step provides information for determining how well the STOPS model understands the particular transit market being modeled and thus serves as an indication that STOPS would be a useful forecasting tool in this market to estimate transit ridership in the horizon years for the No Action and Preferred Alternatives. Both versions of the STOPS model calibrate well compared to the observed ridership on the routes and systemwide, meaning model-derived average weekday boardings (incremental and synthetic) are close in number to the actual observed boardings.

Table 2-1: Base Year Average Weekday Observed versus Modeled Boardings

Route	Observed	Incremental	Synthetic
NHSL-Norristown TC to 69th S	11,132	11,143	11,150
123-King of Prussia to 69th	1,017	1,020	1,019
124-Chesterbrook to 13th & M	1,892	1,775	2,229
125-Valley Forge to 13th-Mar	2,352	2,458	2,017
139-Limerick to King of Prus	441	251	221
92-Exton to King of Prussia	358	1,020	769
99-Phoenixville to Norristow	1,279	805	1,093
95-Gulph Mills to Willow Gro	578	358	392
96-Lansdale to Norristown TC	1,351	1,422	1,036
Manayunk/Norristown Line	9,151	9,152	9,178
Paoli/Thorndale Line	19,497	16,475	16,146
Systemwide Total	**1,032,917**	**1,037,340**	**1,035,995**

3. Service Planning Assumptions

The October 2019 GTFS files received from SEPTA were used to generate the No Action and Preferred Alternative networks. For the No Action Alternative network, the October 2019 files were used with the addition of the Wayne Shuttle and Upper Merion Rambler which are existing services in the corridor, but routes without observed data to include in the calibration of the model.

For the Preferred Alternative, the No Action Alternative transit network was used but with modifications to Route 99 to be replaced by Route 99A and 99B, Route 92 replaced by Route 92A, and 92B, removal of Route 123, and addition of the Inner Loop Shuttle as per the Bus and Shuttle Plan for the KOP Rail FEIS being developed by AECOM. In addition to the bus and shuttle service changes for the Preferred Alternative, the existing NHSL trips were replaced with the trips documented in the August 25, 2020, Draft Rail Operations Simulation Report – Norristown High Speed Line Extension for the KOP Rail project by Gannett Fleming for HNTB and SEPTA.

The Preferred Alternative includes 5 new project stations: 1st & Moore, 1st &American, Mall Blvd, Allendale Rd, and Henderson Rd. The 1st & Moore station and Henderson Rd station have park and rides with 500 vehicle capacities. *Table 3-1* shows the operating plan for average weekday trips on the NHSL by trip pattern for the Preferred Alternative.

Table 3-1: Preferred Alternative Operating Plan (NHSL)

Train Pattern	Number of Trains
Norristown to KOP	58
KOP to Norristown	61
69th to KOP Local Early AM	2
69th to KOP Local	48
69th to KOP Express	35
KOP to 69 Express	43
KOP to 69 Local	39
69th to Bryn Mawr	23
Bryn Mawr to 69th	23
Norristown to 69 Local	38
Norristown to 69 Express	29
69th to Norristown Limited	11
69th to Norristown Express	15
69th to Norristown Local	41
Total Daily	**466**

4. Ridership Forecasts

The following section contains a description of the forecasting results and tables for the year 2025 and 2040 horizon forecasts for project specific measures as well as system level results for the average weekday.

4.1.1 Project Level Results

The project specific measures summarized from the STOPS model are the "Trips on the Project" which summarizes total average weekday trips that use any of the five new project stations, regional new riders which are new transit riders that did not take transit in the No Action Alternative, but do in the Preferred Alternative, station boardings by Mode of Access for the Project Stations, and regional vehicle miles of travel (VMT) change between the No Action Alternative and Preferred Alternative.

4.1.1.1   Average Weekday Trips on the Project (Preferred Alternative)

The following tables show the forecasted trips on the project segmented by type of trip (Work and Non-Work) and household auto ownership (0 and 1+ cars). Both the Incremental and Synthetic STOPS forecasts show 6,000 to 6,200 average weekday

trips on the project for 2025 and 6,500 to 6,700 average weekday trips on the project in 2040 with the Incremental implementation forecasting the higher number of trips.

Table 4-1: Incremental Average Weekday Trips on the Project

Trips on the Project (Preferred Alternative)	2025	2040
Work Trips - 0-Car Households	1,090	1,237
Work Trips - 1+Car Households	3,071	3,271
Work Trips - Total	4,161	4,508
Non-Work Trips - 0-Car Households	1,296	1,385
Non-Work Trips - 1+Car Households	802	862
Non-Work Trips - Total	2,098	2,247
Total Trips - 0-Car Households	**2,386**	**2,622**
Total Trips - 1+Car Households	**3,873**	**4,133**
Total Trips	**6,259**	**6,755**

Table 4-2: Synthetic Average Weekday Trips on the Project

Trips on the Project (Preferred Alternative)	2025	2040
Work Trips - 0-Car Households	1,586	1,708
Work Trips - 1+Car Households	2,807	3,057
Work Trips - Total	4,393	4,765
Non-Work Trips - 0-Car Households	777	844
Non-Work Trips - 1+Car Households	836	909
Non-Work Trips - Total	1,613	1,753
Total Trips - 0-Car Households	**2,363**	**2,552**
Total Trips - 1+Car Households	**3,643**	**3,966**
Total Trips	**6,006**	**6,518**

4.1.1.2   New Riders

The following tables summarize the regional linked trips forecast in the No Action Alternative and the Preferred Alternative and the New Riders to transit being the change in linked trips between the two. The Incremental implementation forecasts higher new riders to transit with 4,200 new riders on an average weekday in 2025 and 4,600 in 2040.

Table 4-3: Incremental New Riders (Average Weekday)

	2025		2040	
	No Action Alternative	Preferred Alternative	No Action Alternative	Preferred Alternative
Regional Linked Trips	661,850	666,086	712,954	717,509
New Riders	-	4,236	-	4,556

Table 4-4: Synthetic New Riders (Average Weekday)

	2025		2040	
	No Action Alternative	Preferred Alternative	No Action Alternative	Preferred Alternative
Regional Linked Trips	733,844	737,527	770,684	774,688
New Riders	-	3,683	-	4,005

4.1.1.3   Station Boardings by Mode of Access

The following tables show the average daily boardings by mode of access at the KOP Rail project stations. The Henderson Rd and 1st & Moore stations include park and ride lots. All the stations have transfer opportunities to other transit and have walk access and kiss and ride access from surrounding locations.

Table 4-5: Incremental Project Station Boardings by Mode of Access (Average Weekday)

Station	2025 Preferred Alternative					2040 Preferred Alternative				
	WLK	KNR	PNR	XFR	**ALL**	WLK	KNR	PNR	XFR	**ALL**
Henderson Rd	102	9	35	101	**246**	111	10	37	114	**273**
Allendale Rd & Cross	233	1	0	9	**242**	250	1	0	10	**260**
Mall Blvd	1,204	13	0	44	**1,260**	1,276	13	0	47	**1,337**
1st - American	552	15	0	44	**612**	589	16	0	47	**651**
1st & Moore	169	34	68	594	**866**	177	38	78	676	**967**
NHSL Extension Subtotal	**2,260**	**72**	**103**	**792**	**3,226**	**2,403**	**78**	**115**	**894**	**3,488**

Table 4-6 Synthetic Project Station Boardings by Mode of Access (Average Weekday)

Station	2025 Preferred Alternative					2040 Preferred Alternative				
	WLK	KNR	PNR	XFR	**ALL**	WLK	KNR	PNR	XFR	**ALL**
Henderson Rd	118	18	115	136	**387**	129	20	125	147	**421**
Allendale Rd & Cross	374	2	0	8	**385**	406	2	0	9	**419**
Mall Blvd	984	1	0	28	**1,012**	1,055	1	0	29	**1,084**
1st - American	629	1	0	62	**694**	686	1	0	68	**756**
1st & Moore	305	36	123	385	**849**	331	40	147	422	**940**
NHSL Extension Subtotal	**2,410**	**58**	**238**	**619**	**3,327**	**2,607**	**64**	**272**	**675**	**3,620**

4.1.1.4   VMT Impacts

The following tables show the forecasted Vehicle Miles Traveled (VMT) impacts between the No Action Alternative and the Preferred Alternative. The STOPS model forecasts the change in Personal Miles Traveled (PMT) with an asserted average vehicle occupancy factor of 1.21 applied to estimate the change in VMT. The Average Vehicle Occupancy factor was used from the ***Vehicle Occupancy for the Delaware Valley Region*** DVRPC Report for average Pennsylvania counties auto occupancy.

Table 4-7: Incremental Change in PMT and VMT

	2025	2040
Change in PMT	-67,865	-74,177
Average Vehicle Occupancy	1.21	1.21
Change in VMT	-56,087	-61,303

Table 4-8: Synthetic Change in PMT and VMT

	2025	2040
Change in PMT	-39,770	-43,291
Average Vehicle Occupancy	1.21	1.21
Change in VMT	-32,868	-35,778

4.1.2 System Level Results

The following tables show the average weekday ridership by route group for the existing (base) year calibration as well as the forecast years for the No Action Alternative and the Preferred Alternative.

Table 4-9: Incremental Route Group Ridership (Average Weekday)

Route Group	2019 Observed	2019 Existing	2025 No Action Alternative	2025 Preferred Alternative	2040 No Action Alternative	2040 Preferred Alternative
SEPTA City Light Rail	63,710	64,762	68,548	68,520	77,167	77,147
SEPTA 101, 102	8,639	8,680	9,087	9,394	9,426	9,747
SEPTA Victory Bus	40,334	40,314	40,737	41,225	42,136	42,632
Blue Route/ Media Bus	1,017	1,020	792	0	834	0
Schuylkill Expwy Buses	4,244	4,233	4,048	2,475	4,488	2,699
SEPTA Frontier Bus	22,082	17,437	17,560	18,189	18,550	19,254
SEPTA City Bus	475,308	478,928	488,166	487,679	516,754	516,158
KOP Area Buses	2,078	2,076	2,762	3,689	3,001	4,178
Contract Operations	1,327	1,422	1,546	1,567	1,710	1,739
Airport Line	5,155	5,236	5,667	5,618	6,011	5,961
Broad Street Line	112,251	113,559	119,243	119,609	138,167	138,490
Chestnut Hill East Line	4,598	5,268	5,627	5,662	5,894	5,930
Chestnut Hill West Line	4,621	4,641	5,030	5,158	5,353	5,496
Main Line	20,039	20,171	22,245	22,225	24,090	24,084
Fox Chase Line	4,609	4,650	5,212	5,238	5,642	5,670
Lansdale Doylestown Line	14,896	14,930	16,411	16,345	19,576	19,506
Norristown Line	9,151	9,152	9,938	9,137	10,991	10,264
Media/Elwyn Line	10,322	10,377	10,623	10,654	11,052	11,083
Market-Frankford Line	178,977	180,912	191,743	195,793	209,405	213,689
NHSL Line (100)	11,132	11,143	11,466	20,640	11,982	21,750
Trenton Line	10,312	10,314	10,708	10,552	11,604	11,448
Warminster Line	8,767	8,785	9,076	9,100	10,012	10,037
Wilmington/Newark Line	9,296	9,311	9,796	9,857	10,073	10,135
West Trenton Line	10,052	10,019	11,101	11,151	12,515	12,693
Total	**1,032,917**	**1,037,340**	**1,077,132**	**1,089,477**	**1,166,433**	**1,179,790**

Table 4-10: Synthetic Route Group Ridership (Average Weekday)

Route Group	2019 Observed	2019 Existing	2025 No Action Alternative	2025 Preferred Alternative	2040 No Action Alternative	2040 Preferred Alternative
SEPTA City Light Rail	63,710	64,385	69,909	69,988	74,272	74,354
SEPTA 101, 102	8,639	8,651	8,915	9,227	9,126	9,456
SEPTA Victory Bus	40,334	40,348	40,903	41,172	41,707	41,972
Blue Route/ Media Bus	1,017	1,019	1,015	0	1,049	0
Schuylkill Expwy Buses	4,244	4,246	4,382	2,263	4,712	2,465
SEPTA Frontier Bus	22,082	22,756	22,759	22,920	23,349	23,534
SEPTA City Bus	475,308	474,691	486,320	486,139	508,258	508,040
KOP Area Buses	2,078	2,083	2,669	3,820	2,935	4,188
Contract Operations	1,327	1,337	1,458	1,475	1,576	1,591
Airport Line	5,155	5,192	5,523	5,496	5,872	5,843
Broad Street Line	112,251	112,965	118,557	118,775	126,641	126,871
Chestnut Hill East Line	4,598	4,616	4,784	4,804	5,002	5,023
Chestnut Hill West Line	4,621	4,640	5,018	5,015	5,475	5,475
Main Line	20,039	20,149	21,767	21,806	23,505	23,538
Fox Chase Line	4,609	4,631	4,816	4,813	4,985	4,982
Lansdale Doylestown Line	14,896	14,926	15,889	15,862	16,764	16,735
Norristown Line	9,151	9,178	9,854	9,689	10,494	10,310
Media/Elwyn Line	10,322	10,366	10,997	10,965	11,411	11,375
Market-Frankford Line	178,977	180,146	191,249	192,817	204,257	205,938
NHSL Line (100)	11,132	11,150	11,640	18,350	12,150	19,334
Trenton Line	10,312	10,329	10,856	10,850	11,376	11,369
Warminster Line	8,767	8,798	9,234	9,239	9,714	9,718
Wilmington/Newark Line	9,296	9,315	9,670	9,610	9,915	9,850
West Trenton Line	10,052	10,078	10,619	10,634	11,157	11,173
Total	**1,032,917**	**1,035,995**	**1,078,803**	**1,085,729**	**1,135,702**	**1,143,134**