

Southwestern Pennsylvania Commission **Active Transportation Plan Update** Multimodal Network Analysis Methodology

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#### **Multimodal Network Analysis Methodology**

Toole Design performed a series of spatial analyses to understand the experience of getting around the Southwestern Pennsylvania Commission (SPC) region by walking and biking. These analyses and resulting maps were used to identify opportunities to improve multimodal connectivity throughout the region. The analysis measured network connectivity, ease, and comfort for pedestrians and bicyclists. The table below shows the questions this analysis will answer and a brief overview of the methodology. The following sections provide insight into what each analysis is and what is necessary for its completion.

	Analysis Question	Supporting Analysis / Data	Purpose and Relevance to the SPC Active Transportation Plan
	Which areas have low-stress access to jobs, transit, businesses, and schools?	Level of Traffic Stress (LTS) Analysis	This analysis assigns streets a score based on how comfortable they would be for a novice, younger, or older bicyclist based on a number of street attributes. Though designed for bicyclists, this analysis can be used to evaluate the level of stress on micromobility users as well. LTS is evaluated for the existing network.
		Intersection Crossing Level of Stress Analysis (Pedestrian LTS)	This analysis similarly assigns intersection crossings a score based on how comfortable they would be to cross for a pedestrian. Intersection Crossing LTS is evaluated for the existing network.
		Walkshed and Bikeshed Analysis	The analysis routes people along the sidewalk network within specific distances (0.5 miles for pedestrians and 3 miles for bicyclists) of jobs, transit, businesses, and schools to highlight the areas with low-stress access.
	Where is it safe and comfortable to access the trail network?	Trail Access Walkshed and Bikeshed Analysis	The analysis routes people to trail access points utilizing 0.5 miles for pedestrians and 3 miles for bicyclists, the trail network, the bike network, and sidewalks.
	Where do critical gaps exist in the bicycle and pedestrian network?	Critical Gap Analysis Trip Potential (Replica Data)	This analysis identifies segments lacking bike and pedestrian facilities (identifying segments that are not continuous), or have high level of stress scores near the important destinations used for the walkshed/bikeshed analyses. Trip potential will be analyzed using Replica data through mapping the count of origins for trips, by all modes, that are under 1-3 miles in length, while assuming that is an indication of where walking and biking would occur, if accommodated adequately. Overlaying the trip potential with the gaps in the comfortable network points to streets/areas of high mode-shift potential, if
			improvements are made.
	Where is it safe and comfortable to walk, bike, and access public transportation?	Walkshed and Bike shed Analysis	The analysis routes people to transit stops utilizing 0.5 miles for pedestrians and 3 miles for bicyclists to show the safe and comfortable network in the region.

### Which areas have low-stress access to jobs, transit, businesses, and schools?

The SPC Level of Bicycle Comfort data does not include all roads throughout the region and has ratings from 1-5 with a total of seven different comfort levels, which is different from our level of traffic stress analysis. This method for completing a level of traffic stress analysis uses roadway and traffic conditions to assign a score from 1-4. The data used to conduct this analysis includes traffic speed, traffic volume, number of lanes, and more, which is shown below.

After combining the results from the level of traffic stress analysis with destinations, transit, and employment data, walkshed and bikeshed analyses were performed to illustrate accessibility to those destinations. Results highlighted where key low-stress network segments are and areas with high concentrations of jobs, businesses, and schools, as well as showing access to transit.

Level of Traffic Stress Analysis				
Inputs	Data	Source		
Roadway direction designation	Streets Layer: DIR_IND	PennDOT		
Number of lanes	Streets Layer: LANE_CNT	PennDOT		
Speed limits	Streets Layer	PennDOT		
Average daily traffic	Streets Layer: CUR_AADT	PennDOT		
Bike infrastructure type	Bikeways Layers	SPC & PennDOT		
Bike infrastructure width	Will create assumption based on bike infrastructure widths seen in the SPC region.	N/A		
Parking lane width (if next to a bike lane)	Will create assumption based on parking lane widths seen in the SPC region.	N/A		
Marked centerline and dual carriageway info	Streets Layer: FAC_TYPE and PAR_SEG_IND	PennDOT		

Intersection Crossing Level of Stress Analysis (Pedestrian LTS)			
Inputs	Data	Source	
Traffic signals	Traffic signals layer (includes electronic signs, flashing warning devices, intersection control beacons, rectangular rapid flashing beacons, school zone flasher, traffic signal)	SPC	
Stop signs		Open Street Maps	
Median crossing islands	Pedestrian Islands Layer	SPC	
Average daily traffic	Streets Layer: CUR_AADT	PennDOT	
Number of lanes	Streets Layer: LANE_CNT	PennDOT	

Where are jobs, transit, businesses, and schools?			
Inputs	Data	Source	
lobo	Job Concentrations layer (LEHD data)	LEHD	
JODS	Retail Centers layer	SPC	
Transit Routes	Transit routes layer	SPC	
Transit Stops	Transit stops layer	SPC	
Businesses	Retail Centers and Grocery Stores layers	SPC	
Schools	Public schools layer, private non-public schools' layer, higher education layer	SPC	

## Where is it safe and comfortable to access the trail network without an automobile?

A walkshed and bikeshed analysis were performed by routing people from trail access points (within the Trail Facilities layer from SPC) utilizing the same distances for pedestrians and bicyclists as the previous analysis, segments with low level of stress scores, and sidewalks. Once completed, the analysis showed the network, or areas, where it is safe and comfortable to access trails through active transportation.

Trail Access Walkshed and Bikeshed Analysis			
Inputs	Data	Source	
Trail Access Points	Trail Facilities layer	SPC	
Level of Stress Network	Level of Stress Analysis	New Analysis	
Sidewalks	Sidewalks layer	SPC	

#### Where do critical gaps exist in the bicycle and pedestrian network?

A critical link/propensity analysis identified segments lacking bike and pedestrian facilities (identifying segments that are not continuous) and have high level of stress scores near the important destinations used for the walkshed/bikeshed analyses.

Trip potential was analyzed using Replica data through mapping the count of origins for trips by all modes that are under 1-3 miles in length while assuming that is an indication of where walking and biking would occur if accommodated adequately.

Overlaying the trip potential with the critical link/propensity analysis pointed to streets/areas of high mode-shift potential if improvements are made.

# Where is it safe and comfortable to walk, bike, and access public transportation?

A walkshed and bikeshed analysis were performed by routing people from transit stops utilizing the same distances for pedestrians and bicyclists as the previous analyses, segments with low level of

stress scores, and sidewalks. Once completed, the analysis showed the network, or areas, of where it is safe and comfortable to access public transportation through active transportation.

Trail Access Walkshed and Bikeshed Analysis			
Inputs	Data	Source	
Transit Stops	Transit Stops layer	SPC	
Level of Stress Network	Level of Stress Analysis	New Analysis	
Sidewalks	Sidewalks layer	SPC	