Office of PLANNING and DEVELOPMENT

ADAMS COUNTY
ACTIVE TRANSPORTATION and SAFETY TOOL
Concept, Data, and Methodology

BACKGROUND

In 2017-2018, the County began working on what was intended to be an Adams County Bicycle and Pedestrian Plan. During this time, a proof of concept for several analyses were developed. Due to changes in staffing, a shift of focus, and the pandemic, this Plan did not move forward. In early 2021, the update to the Long Range Transportation Plan began and the decision was made to incorporate additional bicycle and pedestrian considerations and recommendations so that all aspects of transportation planning, projects, and programming would be consolidated into a single policy document. The previous analysis proof of concept was revisited and documented for inclusion in ONWARD2050 as a recommendation to complete an Adams County Active Transportation Safety Tool. The following will provide information about the concept of the analysis, including methodology, data, and maintenance of an Active Transportation and Safety Analysis and Tool.

Getting started

Staff members initially met to discuss the potential of certain data sets to be used in an analysis and the methodologies employed in other areas were reviewed as background material. After discussion and consideration of data available at the County level, the data sources and characteristics were confirmed. Specific attributes of those data sets were identified, and the data was further grouped into three analysis categories: On-Road Biking, Safety Needs, and Benefit.

The following documentation is related to the On-Road Biking Analysis and Safety Needs Analysis, which has been refined and referenced as a recommendation in the Long Range Transportation Plan for Adams County, ONWARD2050 (2022), as the “Adams County Active Transportation Safety Analysis Tool”. This analysis aims to determine level of traffic stress, similar to a “traffic stress test” performed in other areas, as well as locations where additional safety measures may be needed. The analysis is the foundation of the Active Transportation Safety Analysis Tool, which will provide analysis results, data, and information in a visual format to assist organizations, municipalities, residents, and visitors asses specific locations and support potential future project funding applications, prioritization, and upgrades.

The Benefit Analysis may be re-evaluated at a later date. With the abundance of data available through increased transparency efforts by state and federal agencies, multiple programs require project evaluation that considers equity, accessibility, and benefit to the residents. These agencies are developing similar tools and the possibility for duplication is high. The objective is to review the requirements of multiple programs and available tools to efficiently evaluate projects that provide the greatest benefit to the residents of Adams County.

Goal

To help identify roads where bicycle and other active transportation facility and safety improvements could have the greatest benefit to local and regional connectivity and safety. A set of criteria and measures of low-stress connectivity may be used as a basis to evaluate, guide, and expand active

transportation network planning in the future. Creating a safer and less stressful active transportation network may help make bicycling and other activities more appealing to a larger segment of residents and visitors.

Definition

Active transportation can be defined as the transportation of people or goods through non-motorized, often self-propelled activities. The best-known examples are walking and bicycling, but also can include running, skating, scooters, etc. (ONWARD2050)

ON-ROAD ACTIVE TRANSPORTATION ANALYSIS

The On-Road Active Transportation Analysis was based on the "Bicycle Level of Traffic Stress (LTS)" developed by Mineta Transportation Institute in the "Low Stress Bicycling and Network Connectivity" report (2012), which evaluates the comfort of people when they ride a bicycle close to traffic, as well as the connectivity of roadways and bicycle networks. The bicycle LTS classifies corridors and intersections into scores representing the level of stress and comfort riding a bicycle on each roadway or path segment. These scores also correspond to the type and skill level of the rider. Lower stress bicycle networks should be comfortable for bicyclists of all ages and abilities. Low-stress bicycle networks are also associated with a connected systems of lower-speed local roads, off-road trails, and on-road bicycle facilities.

A level of traffic stress analysis is typically done in urban areas, or cities, with a more established bicycle infrastructure and higher percentages of riders. Smaller communities and rural settings were typically excluded from bicycle and pedestrian design until more recently with the release of the U.S. Department of Transportation, Federal Highway Administration's "Small Town and Rural Multimodal Networks" document. This publication recognized the challenges and constraints of providing active transportation options in small towns and rural areas. It identified issues common to rural settings, like **longer non-local trip distance**, **higher crash rates**, as well as **income and health disparities**, which are concerns in Adams County. This publication also provides guidance on creating accessible, interconnected networks and retrofitting in small communities.

The rural nature of Adams County, topography, distance between population centers, lack of bicycle infrastructure, and absence of trail connectivity were known impediments in developing an analysis that could be applied consistently to the entire County. County Planning Office staff decided to proceed with a selected set of data layers to analyze the County's roadways in hopes of developing a generalized "traffic stress test" through an objective, data-driven, GIS-based approach.

The On-Road Active Transportation Analysis was developed by incorporating several GIS data layers and attributes. Characteristics of the data were grouped into values, which were reclassified with an assigned score. The final score to determine the level of traffic stress is the sum of the input characteristics of each road segment. The assignment of scores and levels of stress are identified in the Classification Table following the description of the input data below.

Preparation of the Base Roadway Layer

The foundation of this analysis is based on a countywide roadway layer. While Adams County maintains a GIS road centerline, segments like alleys and US Route 15 are included, but were not intended to be part of this analysis. A new base layer of the County's road network was constructed by combining

PennDOT's RMS Segment (Roadway Management System) inventory of State Roads and PennDOT's Pennsylvania Local Roads GIS line data. Since several of the data points were initially sourced from attributes in PennDOT's State Roads. The thought was that a PennDOT segmented roadway layer could be associated with other attributes, if needed, and be more easily updated in the future. However, PennDOT maintains several road layers, which are not segmented the same and do not have a consistent, unique identifier for the segments. The resulting Road Network is a hybrid of multiple sources and maintained manually.

The combined "Road_Network" layer was compared against the Adams County-maintained centerline to make sure all roadways were included. Other manipulations of the initial road network include:

- The removal of Route 15, because bicycling is prohibited.
- An attempt was made to remove alleys. This can be difficult in places like East Berlin Borough, where alleys are named like roads. The Adams County centerline was used for comparison, but is not entirely accurate in the identification of all alleys. Private roads were also not included.
- PennDOT's Local Roads include farm lanes and driveways to farms, larger businesses, etc. These lines were manually deleted.
- Roads in developments that may be proposed, but not yet built were not included. The Road Network will be re-evaluated every other year and roads in developments will be incorporated as they are constructed.
- Scoring fields were added to reclassify the input values and record the score of the segments for each of the data inputs.

Input Data

The following data sets and sources were used in the initial development of the On-Road Biking Analysis. The characteristics of the data were classified and assigned a score between 0 – 4, which is presented in the Classification Table. The sum of each segment's scores were calculated to obtain the overall score, which were grouped considered the level of traffic stress of that segment.

FUNCTIONAL CLASSIFICATION

The Federal Highway Administration classifies roadways by how they function in the transportation system. Each class is based on the type of service it provides, considering access, mobility, and location.

- FC3 – Other Principal Arterial (ex. Route 30)
- FC4 – Minor Arterial (ex. Route 194)
- FC5 – Major Collector (ex. SR 233 Pine Grove Road)
- FC6 – Minor Collector (ex. Bon-Ox Road)
- FC7 or 0 – State Owned Local Roads (ex. Georgetown Road) and all other Local Roads

SPEED LIMIT

RMS Segments include speed limit for state roads, the Local Roads and County GIS Centerline do not. Those segments that did not contain a speed limit were assigned 25 mph within Boroughs or residential developments and 35 mph within Townships.

SHOULDER WIDTH

The shoulder width on state roads was initially based on values in PennDOT's data. Upon further evaluation, it was determined that a lot of these values were incorrect. The shoulders of many roadways were manually measured using aerial photography.

BICYCLE INFRASTRUCTURE

Road segments of the county that contain bicycle infrastructure were manually selected and given a score, depending on the presence of an off-road, separated path, like the North Gettysburg Trail along Old Harrisburg Road, on -road lane, or sharrow.

SIDEWALKS

To establish if a sidewalk was present along either one or both sides of a roadway, road segments that intersected within 25 feet of a sidewalk were selected. This value was determined to account for the width of the centerline to a sidewalk. These locations were spot checked and manually corrected to remove segments that may have been selected because they were within proximity of a sidewalk, but did not have a sidewalk. In a few locations, segments indicate they have a sidewalk, but only a portion of the segment contains a sidewalk. The sidewalk feature class is now a part of the County's gis data and is maintained through aerial photography.

It is acknowledged that sidewalks are not necessarily meant for bicycles, like in parts of Gettysburg Borough. For this analysis, additional points were given to those roadway segments with sidewalks to distinguish borough and residential development settings, where smaller children or families may feel more comfortable riding on a sidewalk.

Classification Table

The threshold of each input was determined, in order to group values and assign a score. Scores were assigned to each roadway segment based on the breakdown of each input in the table below. The sum of the inputs was calculated and added to a field to determine an overall score, which corresponds to the level of traffic stress of a road segment. Higher scores indicate a lower level of traffic stress. Several road segments cross US Route 15 without a signal or other safety measures, those segments were manually given a '0' overall score.

Classification Table

LEVEL OF TRAFFIC STRESS

Score	Shoulder Width (ft)	Speed	Functional Class	Bike Infra-structure	Sidewalks	Level of Traffic Stress	
						Total Score	Stress Level
0	0	50+	Principal Arterial	-	-	0 - 4	Extreme
1	1' - 2'	40 - 45	Minor Arterial	-	-	5 - 6	High
2	3' - 4'	-	Major Collector	Sharrow - Shared Lane	Yes	7 - 9	Moderate
3	5' - 7'	30 - 35	Minor Collector	On-Road Lane	-	10 - 13	Low
4	8' - 10'	0 - 25	Local Road	Off-Road Trail	-	14+	Comfortable

Levels of Traffic Stress

The classification levels of "stress" are somewhat unique to the Adams County analysis. Due to the rural nature and attempt to develop a Countywide analysis, our assessment may not be comparable to the rider types used by Mineta and others in more urban areas. Consideration was also given to selecting criteria that could be used on both state and local roads, which may not have consistent attributes. The assigned classifications are a result of the sum of input scores. The segments have not been evaluated individually. Each person may perceive level of traffic stress in a different way.

COMFORTABLE

Segments that are indicated as Comfortable are those locations with off-road paths or separated, protected bike lanes. These locations are the safest segments and can be traveled by riders of all ages and levels of experience.

LOW

Segments are primarily located on Borough side streets with sidewalks, outside of the main thoroughfare, and residential development settings are considered to have a low level of traffic stress. These roads could be ridden comfortably by the general adult population.

MODERATE

Roadway segments with a moderate level of traffic stress are typically those that may have low traffic volumes in rural settings or residential areas with lower speeds, but do not have sidewalks, like most of Carroll Valley, Lake Meade, or Lake Heritage.

HIGH

Roadways with a high level of traffic stress may include segments with higher speeds or volumes, like Borough main streets that are state roads, or more rural roads, which do not have shoulders. These locations may only be comfortable to the most experienced and confident cyclists.

EXTREME

These segments include roadways with the highest traffic volumes and speeds, which would be uncomfortable for most riders.

SAFETY NEEDS ANALYSIS

A second analysis was developed to help identify locations that may benefit from additional measures, such as flashing crosswalks, trails, signage, or connections to increase safety near schools. This analysis assigns scores to roadway segments based on their proximity to school buildings, the number of bicycle and pedestrian accidents within one mile of the schools, and if school buildings are clustered.

Input Data

The foundation of this analysis is a roadway segment's proximity to schools and the number of bicycle or pedestrian crashes on that segment. This method could help distinguish road segments that have higher numbers of bicycle and pedestrian crashes and are closer to schools, where more people could be walking or biking.

SCHOOLS

The building outlines of the County's public and private school buildings, including post-secondary and excluding District offices, were buffered to create a multi-ring polygon around each school building at quarter mile increments, up to one mile. Roadways segments that intersected these buffers were assigned a point value based on where the centroid of the segment was located.

School buildings were considered "clustered" when the quarter and half mile buffer rings overlapped. In these instances, additional points were given as a proximity bonus. A higher number of students may be walking, biking, or using another form of active transportation in these locations, if more than one school was in the vicinity.

Initially, a point was used as the basis to create the buffers around the schools used in the analysis and presented with the launch of the Tool. However, campus settings, like the multiple classroom buildings associated with Gettysburg College, may not be accurately reflected in the buffer of a single point. The 2025 update to the Safety Analysis rescored the school component utilizing a multi-ring buffer of the school buildings, including post-secondary classroom buildings.

BICYCLE AND PEDESTRIAN CRASHES

The locations of accidents that occurred in the past five years (initially 2018–2022) and involved a bicycle or pedestrian were buffered 25 feet. Buffering ensures that the crash point intersects a road segment. The number of crashes at each location were counted by spatially joining the crashes with the road segments. This produces a field which counts the number of crash points that intersect the associated road line.

Classification Table

Parameters of each input were determined to group values and assign a score. Scores are assigned to each roadway segment based on the breakdown of each input in the table below. Segments that have installed, off-road or separate on-road bicycle facilities are given a score of '0'.

Classification Table

SAFETY NEEDS ANALYSIS

Score	Proximity to Schools	Proximity Bonus	Bike-Ped Crashes	Benefit of Safety Measures	
				Total Score	Level of Benefit
0	Over one mile from a school	-	0	1	Lowest
1	Three quarters of a mile to 1 mile	Quarter mile to a half mile	1	2 - 3	Low
2	Half mile to three quarters of a mi	Up to a quarter of a mile	2	4 - 5	Moderate
3	Quarter mile to a half mile	-	3+	6	High
4	Up to a quarter of a mile	-	-	7+	Highest

Supporting Data Information

CRASHES

PennDOT offers crash data in a .csv format to the public, which can be downloaded through their Open Data Portal. Crash data for the last five years is provided as a layer in the web application to provide additional information. The data in the app does not contain many details and has a visible scale range.

TRAFFIC VOLUMES (AADT)

Average Annual Daily Traffic (AADT) is the typical daily traffic on a road segment, seven days a week, over a one-year period. PennDOT updates and maintains these statistics. Traffic volumes were initially included in On-Road Active Transportation Analysis in an attempt to differentiate higher and lower volume roads. However, due to the inconsistency of the available data between state and local roads, traffic volumes were removed from the analysis. A traffic volume layer is available in the app to provide additional context to the user.

UPDATES

While the framework of the County's roadways is fairly static, some inputs to the levels of the "stress test" may change as the County grows or as older road segments are repaired or upgraded to include bicycle and pedestrian infrastructure. In the last few years, there have been several positive improvements as the Gettysburg Inner Loop becomes a reality. The process outlined above seems to be valid for the County, based on available data. The Methodology may be revised as new data or advances in software become available.

Maintenance

ON-ROAD ACTIVE TRANSPORTATION ANALYSIS

With New Aerial Imagery (about every three years)

- Maintenance and updates should be done to the ATSA_Road_Network when new aerial photography becomes available. Adams County is typically flown every three years.
- Update the sidewalk feature class by comparing against aerial imagery. The majority of sidewalk additions will be associated with new development.
- Verify the ATSA_Road_Network feature class against County centerlines and incorporate roadway segments from new development.
    - Assign sidewalk, speed, and functional class scores when attributes of new roads are added.

New Active Transportation Infrastructure

- If bicycle/ active transportation infrastructure has been incorporated, update the overall scores of those road segments, so they are visible on the web maps.

SAFETY ANALYSIS

Annual Review

- **Schools and Buffers**: Confirm school building locations (ACsde.GISADMIN.Location/Schools). If any schools have relocated or closed, new buffers will need to be created.
- **Bike-Ped Crashes**: Crash data is released annually by PennDOT and new crashes are appended to the existing crash data. Crashes involving a bicycle (BICYCLE_COUNT > 0) or pedestrian (PED_COUNT > 0) are manually indicated as 'Y' in a 'BIKE_PED_CRASH' field when new crash data is added.

ACTIVE TRANSPORTATION AND SAFETY TOOL

The "Tool" itself consists of a StoryMap which explains the concept, data, analysis, and limitations to the user in a visual and interactive format, before launching the web application. The ArcGIS Online app portion of the Tool presents the Level of Traffic Stress and Safety Needs Analysis, along with other data layers, so the user may customize their experience.

This Tool is intended for planning purposes. Levels of traffic stress do not guarantee the safety or fitness of the segment.