

Connecting to Trails in Delaware County

RECOMMENDATIONS FOR ON-ROAD BICYCLE FACILITIES PROVIDING ACCESS TO PRIORITY TRAILHEADS THROUGHOUT DELAWARE COUNTY







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Introduction

Delaware County's 2035 Transportation Plan recommends a comprehensive network of new bicycle corridors and multiuse trails to provide connectivity to a wide variety of origins and destinations across the county and beyond.

The purpose of this study was to plan for on-road bicycle connections to existing and planned multi-purpose trails throughout Delaware County. Trailheads were selected for analysis and design in collaboration with the Delaware County Planning Department (DCPD) and a group of local stakeholders, including trail professionals, advocates, volunteers, and municipal staff. Trailheads were selected based on proximity to key destinations, among other criteria. Existing datasets, such as bicycle facility locations, traffic volumes, and speed limits, were used to identify roads that could be used by cyclists to connect to the selected trailheads, either in their current condition or with bicycle facility and/or wayfinding improvements. Recommendations were guided by the following principles:

- · connecting residents and local destinations to trailheads using comfortable and direct on-road routes; and
- · proposing roadway improvements that improve the visibility of cyclists and the safety of all road users.

This report, Connecting to Trails in Delaware County, summarizes the approach used to plan the on-road bicycle network, which can serve as a basis for future network planning efforts. Bicycle network recommendations developed using this methodology are presented in an interactive story map, available here.

The recommended on-road bicycle network and the concept designs for specific locations can serve as a starting point for conversations with local stakeholders, including municipalities, community organizations, and the public. Through the engagement process, feedback can be incorporated to ensure the proposed on-road facilities serve the needs of the local communities.

CHAPTER 1:

Trailhead Priortization

In collaboration with the DCPD, the project team developed a prioritization process, consisting of quantitative analysis and stakeholder outreach, to select the trailheads on which to focus for initial on-street network and concept planning. For the purpose of this study, *trailheads* are defined as publicly accessible locations where a trail dead-ends or intersects with a road, parking lot, or park. Selected trailheads include locations from existing and future trails designated in the Delaware County Primary Trail Network. The goal of the selection process was to ensure that the trailheads analyzed for on-road network planning would allow for useful connections between people, desirable destinations, and trails, and expand the bicycle network throughout Delaware County.

Delaware County Primary Trail Network Connectivity Ranking 2035

In 2016, the county employed a connectivity ranking system to prioritize implementation of trail segments, based on their proximity to key destinations and existing trails. The Primary Trail Network was identified through this process. The ranking methodology consisted of a series of questions, where points were assigned based on potential demand for trail usage or how much it would contribute to the overall trail network. Trail segments with the most points were given the greatest priority for implementation and documented in the Delaware County Primary Trail Network Connectivity Ranking 2035.

Trailhead Selection Process

Similar to Delaware County's connectivity ranking, the project team created a prioritized trailheads list in this study, based on criteria outlined in Table 1 and stakeholder input. Higher-priority criteria were assigned heavier weights to reflect their importance in meeting the DCPD and stakeholder values (additional detail found in the Appendix). The prioritization criteria also considers a trailhead's proximity to census tracts identified in the Delaware Valley Regional Planning Commission (DVRPC's) Indicators of Potential Disadvantage (IPD), an analysis that identifies concentrations of populations of interest under Title VI and Environmental Justice. Additionally, using an interactive web map, stakeholders were asked to vote for three trailheads for initial focus.

Table 1: Weighted Trailhead Scoring Criteria

	Criteria	Weighted Proportion of Total Score*
	Stakeholder votes	33%
	Population	4%
	Distance from park	4%
	Indicators of Potential Disadvantage score	11%
Number of Nearby Amenities within two miles	Employers	4%
	Jobs	4%
	Destination types	4%
	Transit routes	7%
	Activity center	4%
Number of Nearby Destinations within two miles	Food store	4%
	Health facility	4%
	College or university	5%
	School	13%

 $^{{}^*\!}T\!hese\ percentages\ are\ rounded\ from\ the\ percentages\ used\ in\ the\ calculation,\ and\ therefore,\ have\ a\ sum\ of\ 101.$

¹ "Delaware County Primary Trail Network: Connectivity Ranking." Delaware County. October, 2016. Pg 8

Each trailhead received a manual, high-level screening. This included an assessment of the roadway cross-section width and roadway speeds, to determine if it would be safe to consider on-road improvements. Any trailheads determined to be infeasible were removed from the list. After evaluating the quantitative analysis and stakeholder input, the county assisted in the final selection of four trailhead areas of focus:

- Chester Creek Trail (four trailheads);
- John Heinz Wildlife Refuge (one trailhead);
- · Cobbs Creek Trail (six trailheads); and
- Darby Creek Trail (three trailheads).

CHAPTER 2:

Bicycle Network Planning Methodology

Level of Traffic Stress (LTS)

On-road access to the selected trailheads was first examined using DVRPC's regional Level of Traffic Stress (LTS) data. LTS is a road classification scheme based on the estimated comfort of bicyclists in the traffic stream. DVRPC's LTS assignment is based on the number of lanes, effective vehicle speed, and the presence and type of bicycle facility on the road segment. Divided highways and major arterials are often higher stress (and designated LTS 3 and 4), while local, residential streets often present the lowest stress (and are designated LTS 1 and 2). Trails and off-road paths are considered non-stressful in this analysis.

Groups of connected LTS 1 and LTS 2, or *low-stress* (represented by green lines), roads can be considered together as low-stress areas or "islands" (see Figure 1). If a typical cyclist begins a trip on one of these islands, they may be limited to destinations within that connected low-stress area. Creating connections between these low-stress areas unlocks additional destinations to which cyclists can travel safely and comfortably.



Figure 1: Low-Stress Islands

Source: DVRPC 'Connecting the Trails in Delaware County' StoryMap, 2022 (see webmap)

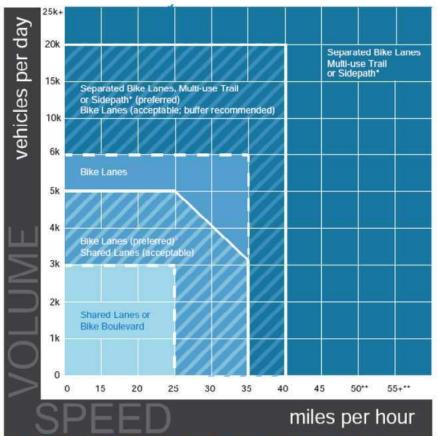
Leaning into the idea of low-stress areas, recommendations for improving on-road access to trails were considered as serving two primary functions:

- 1. connections: improvements focused on connecting disconnected low-stress areas OR creating more direct, safer routes within low-stress areas; and
- 2. wayfinding: improvements, typically signage or pavement markings, that help cyclists to navigate between trailheads, nearby destinations, and residential areas.

Beginning at each trailhead, local roads were assessed based on a variety of different attributes to determine if they would be good candidates for on-road facility or wayfinding improvements, including:

- vehicle speed and volume, as it relates to the Pennsylvania Department of Transportation's (PennDOT) bicycle facility design guidelines (Figure 2);
- · nearby land use and driveway access density;
- · available road width; for example, wide shoulders or wide vehicle lanes that could be narrowed safely; and
- proximity to trailhead and/or nearby destinations (outlined in Table 1).

Figure 2: PennDOT On-Road Bicycle Facility Guidance



- To determine whether to provide a multi-use trail/sidepath or separated bike lane, consider pedestrian and bicycle volumes or, in the absence of volume, consider land use.
- ♦♦ Speeds 50 mph or greater in urban areas are typically found in urban/rural transition areas.

Sources: PennDOT, 2021; Iowa Bicycle and Pedestrian Long-Range Plan, 2018

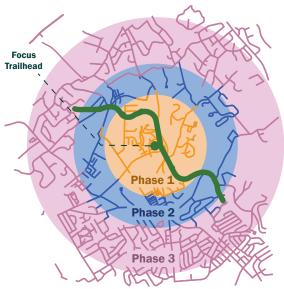
If a segment was selected as part of the connecting on-road bicycle network, measurements were taken and imagery was analyzed to determine if signage, sharrows, bike lanes, or a combination would be the most appropriate given the context using Figure 2 as a guide. On-road bicycle networks developed using these attributes are presented in the project story map.

Phasing

Since it is not feasible to implement each concept simultaneously, segments of the network are suggested to be developed in phases. Recommended on-road facilities were selected based on two factors:

- · importance of the connection to the selected trailhead; and
- · ease of implementation.

Figure 3: Trailhead Phases Illustration



Source: DVRPC, 2022

One way to think of the phases is as concentric circles surrounding trailheads (see Figure 3), with adjacent improvements recommended first, followed by improvements that build on and connect to earlier recommendations. The phasing is as follows:

- Phase 1: recommends on-road facilities adjacent to trailheads that provide critical access for creating safe trail access for neighbors;
- Phase 2: recommends segments that are a bit farther into the local road network; these improved segments connect additional low-stress areas and destinations or enable more direct low-stress routes between trailheads and nearby residential areas and destinations; and
- Phase 3: recommends extending on-road facilities even farther into the network; making low-stress paths more direct and sometimes connecting to planned trailheads that do not exist yet.

Related Studies

The Eastern DelCo Bikeway Prioritization Study, completed in 2022, proposes a low-stress bicycle network connecting a number of municipalities in eastern Delaware County. This study, funded by DVRPC's Transportation and Community Development Initiative (TCDI) grant, led by the Borough of Lansdowne and supported by Bergmann and Toole Design Group, identified bicycle connections throughout eastern Delaware County through extensive public outreach and a data-driven analytical effort. The bicycle network proposed by the Eastern DelCo study includes connections to most of the trailheads along the Cobbs Creek Trail and Darby Creek Trail selected by the steering committee for this DVRPC study.

In an effort to remain consistent with the recommendations of the Eastern DelCo study, the connections to trailheads suggested in this area look to expand upon the Eastern DelCo study network with connections to additional trailheads, and to provide ideas about how to address certain challenging intersections. Phasing is not included for all of these recommendations, as they should be coordinated with the implementation of the on-road network proposed in the Eastern DelCo study.

Wayfinding

Wayfinding is a critical piece of developing on-road connections to trails throughout Delaware County. Benefits of wayfinding signage include:²

- · creating a sense of place and community;
- · raising awareness of destinations and nearby trails; and
- increasing road user comfort with clear, easy-to-understand navigation.

Successful wayfinding systems, based on best practices across North America, have been designed with the following key principles in mind, as outlined by Alta Planning and Design in their wayfinding guidebook for a trail system in Wisconsin:

- · Connect places.
- Promote active transportation.

² Alta Planning and Design, East Central Wisconsin Trail Wayfinding Guidebook. (Fall 2017)

- · Maintain motion.
- Be predictable.
- · Keep information simple.

Key pieces of bicycle wayfinding include signs that help cyclists decide in which direction to go (decision), confirm that they are on the correct path (confirmation), and direct them when to make a turn towards their destination (turn). Examples of each of these types of signs are shown in Figures 5-7. Decision and turn signs, sometimes used together, should be placed in advance of intersections where cyclists are required to make a directional decision and need time to navigate the turn smoothly. Confirmation signs should be placed after turns, especially in complex areas.

Additionally, wayfinding can be incorporated into on-road markings. Sharrows or bike lane markings with turn arrows can reinforce suggested routes (see Figure 4).

After additional community engagement, any on-road facilities implemented to connect to trails in Delaware County should incorporate Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)- and American Association of State Highway and Transportation Officials (AASHTO) compliant elements of wayfinding.

Figure 4: Directional Sharrow



Source: DVRPC

Figure 5: Confirmation Signs







Source: NACTO, City of Oakland, 2022

Figure 6: Turn Signs







MUTCD

Source: NACTO, City of Oakland, 2022

Figure 7: Decision Signs







Portland Metro Cities, OR

Source: NACTO, City of Oakland, 2022

CHAPTER 3:

Concept Plans

Given the density of development and the existing roadway conditions, numerous segments and intersections presented design challenges. To help determine potential feasibility of the recommendations, the project team selected eight segments or intersections for which to develop detailed concept plans. The concept plans, linked in the story map and available on the following pages, allow viewers to visualize recommended on-road facility improvements. The Remix concept plans primarily propose improvements within the bounds of the right-of-way from curb to curb. The wide white border in the Remix concepts is typically only used to designate the edge of the roadway, not sidewalks. Instances where recommendations extend beyond the curb, such as changes to sidewalks or curb lines, are explicitly identified in the accompanying text. Due to limits in the scope of this study, some challenging locations were identified as candidates for future study to determine the feasibility of better or more direct connections.

Chester Creek Trail

Lenni Road & New Road

Lenni Road, from South Pennell Road to Hillcrest Lane, is a relatively low-volume road through a low-density residential area adjacent to the northernmost trailhead of the Chester Creek Trail (see Figure 8). Due to the relatively low traffic volumes and posted speeds along this road, the proposed network aims to connect trail users to nearby Neumann University using sharrows and signage for both wayfinding and to indicate where cyclists should position themselves within the roadway.

Figure 8: Chester Creek Trail-Lenni Road & New Road



Source: Concept created in Remix, 2022." Click here to review the full design in detail

Concord Road & Tryens Road

Concord Road is an arterial roadway in Delaware County spanning from Baltimore Pike in Glen Mills to the Delaware Expressway in Chester (see Figure 9). The proposed network includes conventional bike lanes along Concord Road from Convent Road to Tuscany Road, which already has seven-foot shoulders in each direction. This portion, which travels past a school, church, cemetery, and a handful of businesses, has a posted speed limit of 35 miles per hour.

Figure 9: Chester Creek Trail—Concord Road & Tryens Road



Source: Concept created in Remix, 2022." Click here to review the full design in detail

Pennell Road & Weir Road

Sharrows are proposed along Weir Road from Shubrook Lane through the intersection with Pennell Road, to Cherry Tree Road (see Figure 10). Although Weir Road is primarily a low-stress residential road, additional signage and markings are needed to raise awareness of cyclists traveling through the intersection with the high-volume Pennell Road.

Figure 10: Chester Creek Trail—Pennell Road & Weir Road



Source: "Concept created in Remix, 2022." Click here to review the full design in detail

John Heinz Wildlife Refuge

Swarthmore Avenue & Hinckley Avenue

Rail lines serve as a vital piece of the commuter and freight networks in eastern Delaware County, but also serve as a barrier, with limited crossings in many parts of the road network (see Figure 11). Drivers, pedestrians, and cyclists alike rely on bridges to cross train tracks in many parts of the county. The Swarthmore Avenue Bridge provides an example of how bridges can be redesigned to allow vehicles and cyclists to safely share these critical bottlenecks. Bike boxes are recommended at intersections to increase visibility of cyclists, and conventional bike lanes with a painted buffer are recommended across the bridge, from Ridley Avenue to Chester Pike, to separate bicyclists from vehicular traffic. Nearby, the proposed design reduces the radius of the corners of Ridley Avenue and Hinckley Avenue, shortening crossing distances for pedestrians and slowing turning vehicles. The painted southwest corner of Hinckley Avenue is enforced with delineaters while the northwest corner permanently alters the roadway geometry.

Figure 11: John Heinz Trail—Swarthmore Avenue & Hinckley Avenue



Source: Concept created in Remix, 2022." Click here to review the full design in detail

Cobbs Creek Trail

Main Street & Woodland Avenue

The Cobbs Creek trailhead near the northeast corner of Main Street & Woodland Avenue provides a direct connection to the larger low-stress network and connects to the John Heinz Trail (see Figure 12). Trolley tracks along Main Street in Delaware County leading into Philadelphia make on-street bicycle facilities less safe and less desirable. The proposed network instead focuses on guiding cyclists through the signalized intersection of Main Street & Woodland Avenue, using wayfinding and high-visibility pedestrian crossing signage. The design proposed pulling back the western crosswalk from the intersection and straightening it to shorten the crossing distance for users. Cyclists should then walk their bikes along the sidewalk on the southern side of Main Street for one block, until they reach Water Street, which should be upgraded to include sharrows for wayfinding.

20 A

Figure 12: Cobbs Creek Trail—Main Street & Woodland Avenue

Source: Concept created in Remix, 2022." Click here to review the full design in detail

Church Lane & Chester Avenue

To access the trailhead at 70th Street & Cobbs Creek Parkway from Delaware County, cyclists must pass through a complex and high-volume intersection at Church Lane & Chester Avenue (see Figure 13). Bicycle lanes are proposed on Church Lane through the intersections at Chester Avenue (four-way intersection) and Allen Drive (T-intersection). These two intersections are close together, and the channelized turns on the south side of Chester Avenue create numerous conflict points for cyclists with turning vehicles.

To enhance the safety of the proposed bicycle lanes along Church Lane, it is recommended that the intersection of Allen Drive be realigned with smaller radii so that cars enter perpendicular to traffic on Church Lane. This creates better sight lines for drivers, while also providing a shorter crossing distance for pedestrians and cyclists. The worn path along the west side of Church Lane should also be replaced with a sidewalk.

Figure 13: Cobbs Creek Trail—Church Lane & Chester Avenue



Source: "Concept created in Remix, 2022." Click here to review the full design in detail

Pembroke Avenue & Church Lane

Building on the Eastern DelCo Bikeway Prioritization Study, the proposed bicycle network includes connections to the existing bicycle lane on Church Lane (see Figure 14). This is facilitated through the extension of the Church Lane bike lane through the intersection with Long Lane. Current roadway geometry, specifically the lack of width and the one-way configuration, poses safety challenges for cyclists at this intersection. To continue toward the proposed facilities on Pembroke Avenue, wayfinding signage and on-road markings should direct cyclists traveling southbound on Church Lane to turn right on Emerson Avenue, then left on Crosley Avenue/Oak Avenue, before turning right onto Pembroke Avenue, to avoid pinch points. Cyclists traveling eastbound on Pembroke Avenue can continue all the way to Church Lane to head north.

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Figure 14: Cobbs Creek Trail—Pembroke Avenue and Church Lane

Source: "Concept created in Remix, 2022." Click here to review the full design in detail

Darby Creek Trail

Bishop Avenue & Hawarden Road

Although not a direct connection to the Darby Creek Trail, improvements at the intersection of Bishop Avenue & Hawarden Road could provide integral connections between the residential neighborhoods on either side of Bishop Avenue (see Figure 15). The proposed network includes a route with reduced vehicle conflicts for bicycles traveling southeast from Darby Creek Trail or northwest toward the trail. In spaces where the shoulder is wide enough bike lanes are suggested, while low-speed roads with minimal shoulder widths are designated as shared lanes. The suggested bike lane guides cyclists in a counterclockwise direction starting at Hawarden Road across Bishop Avenue, riding counterflow to Pine Ridge Road. The opposite movement takes the cyclist from shared lanes on Westpark Lane across Bishop Avenue, and back onto Hawarden Road. Wayfinding signage and on-road markings will be critical to guiding cyclists through this intersection safely.

Figure 15: Darby Creek Trail—Bishop Avenue & Hawarden Road



Source: "Concept created in Remix, 2022." Click here to review the full design in detail

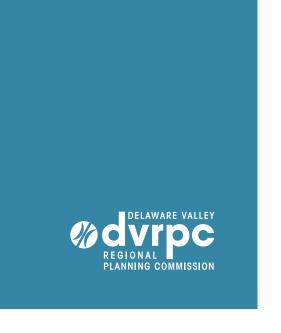
Next Steps

The methodology presented in this document served to identify locations for on-road connections to multi-purpose trails throughout Delaware County. The same method can be applied to other connections across the county. The next step for the recommendations developed through this work should be for the county to engage the public. Conversations with local stakeholders, including municipalities, community organizations, and the public, can build on the proposed on-road bicycle network and the concept designs, as presented in the story map. Through the engagement process, feedback can be combined with the recommendations, ensuring the proposed on-road facilities serve the needs of the local communities.



Appendices

A: Weighted Trailhead Scores



APPENDIX A:

Weighted Trailhead Scores

Table A-1: Weights of Trailhead Scoring Criteria within Two Miles

	Measurement	Score
Votes	5	25
	4-5	15
	2-3	10
	1	5
	0	0
Population	80,000+	3
	30,001-80,000	2
	15,001-30,000	1
	0-15,000	0
Distance from Park (ft)	0	3
	1-656	2
	657-2624	1
	2624+	0
Indicators of Potential	Well Above Average	7
Disadvantage Score	Above Average	5
	Average	3
	Below to Well Below	1
	Average	
Number of Employers	3000+	3
	2001-3000	2
	501-2000	1
	0-500	0
Number of Jobs	15,001+	3
	10,001-15,000	2
	5001-10,000	1
	0-5000	0
Number of Destination	5-6	3
Types	3-4	2
	1-2	1
	0	0
Number of Transit Stops	13+	5
	10-12	4
	8-9	3
	4-7	2
	1-3	1
	0	0

	Measurement	Score
Number of Elderly	8-10	3
and Disabled Activity	4-7	2
Centers	1-3	1
	0	
Number of Food	35+	3
Stores	11-34	2
	1-10	1
	0	0
Number of Health	10+	3
Facilities	5-9	2
	1-4	1
	0	0
College or University	Yes	5
	No	0
Number of Schools	10+	5
	8-9	4
	5-7	3
	3-4	2
	1-2	1
* Coorea are relative to co	0	0

^{*} Scores are relative to each other and do not sum to 100 percent.

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RECOMMENDATIONS FOR ON-ROAD BICYCLE FACILITIES PROVIDING ACCESS TO PRIORITY TRAILHEADS THROUGHOUT DELAWARE COUNTY

Publication Number:

TM22027

Date Published:

December 2022

Geographic Area Covered:

Delaware County, Ridley Park, Lansdowne, Darby, Springfield, Aston, Media

Key Words:

Bicycles, Bike Lane, Low-Traffic Stress, Low-Stress Island, Neighborhood Greenway, Network, On-Road Facilities, Sharrows

Abstract:

Delaware County asked the Delaware Valley Regional Planning Commission to propose recommendations to increase access to the county's trails network through on-road bicycle facilities. This memo explores the project team's on-road bicycle network methodology in connecting adjacent low-stress, typically residential islands to selected trailheads. A complementary web map further depicts the proposed designs and phasing.

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