VOL 2

RETHINKING 322

Strategies for the proposed State College Area Connector in Penns-Brush Valley

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Developed by the Advanced Design Studio (LARCH 414) of the Stuckeman School Department of Landscape Architecture at Penn State, in collaboration with faculty members, the Centre County Historical Society, and the Hamer Center for Community Design, this initiative has been further enriched through contributions from Penn State Dickinson Law and Penn State Sustainability, as well as the Thomas D. Larson Pennsylvania Transportation Institute.

Distribution for electronic and printed formats was made possible through a generous grant provided by the Hamer Center for Community Design and the Centre County Historical Society.

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With an Introduction by Paul Daniel Marriott, associate professor of landscape architecture, and LARCH 414 studio instructor.

The information, concepts and illustrations in this document were developed by students in the Department of Landscape Architecture at Penn State during the fall 2023 semester to offer strategies to consider for the State College Area Connector project under study by the Pennsylvania Department of Transportation (PennDOT) and are not intended as engineering or safety advice.

Publication Date: Spring 2025

Image: Penns-Brush Valley - Hailey Sulkols

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LARCH 414 | Class of Fall 2023

Penn State, Department of Landscape Architecture, Stuckeman School

PennState
College of Arts
and Architecture

Stuckeman School
Hamer Center for Community Design

Centre County Historical Society, Jacqueline J. Melander Fund

Acknowledgements

We express our sincere appreciation and gratitude to the individuals and organizations across the Penn State University Park campus, the Centre Region, and throughout the nation. Your invaluable advice and insight has contributed to the success of our projects and enriched our work greatly.

Dean D. Ball, PE, Assistant District Engineer, District 2, PennDOT
Dorothy Blair, President, of Nittany Valley Environmental Coalition
Peter A. Butler, Pennsylvania Game Commission (North Central Region)
Charles Andrew 'Andy' Cole, Professor, Landscape Architecture and Ecology; Director, E+D: Ecology plus Design, Penn State
Matthew Cox, President, Centre Bike
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Kevin James, PE, Associate Vice President, Michael Baker International
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Terry Melton, Clearwater Conservancy
Jason Roth, Ecologist/Environmental Project Manager, Colorado DOT
James Saylor, Principal Transportation Planner, Centre County Metropolitan Planning Organization for Centre Regional Planning Agency
Charles Scott, Senior Associate and Project Manager, Jones & Jones Architects and Landscape Architects, Seattle, WA
Mary Sorensen, Executive Director, Centre County Historical Society
Alec Spangler, Assistant Professor, Landscape Architecture, Penn State
Roxi Thoren, Department Head and Professor, Landscape Architecture, Penn State
Thomas Yahner, Emeritus Professor, Landscape Architecture, Penn State
Scott Kasprowicz, Commonwealth Transportation Board, At-Large Urban
David Yeager, Assistant District Forester, Resource Department of Conservation & Natural Resources Rothrock State Forest, District 5

With special thanks to Mary Sorensen for editing and administrative oversight, and Keith Faminiano, Clareigh Ellis, and Morgan Smith for graphic design and print production of this publication.

Contents

Roundabout design, Brunswick, MD
Image: Aaron Solderich

Introduction

Welcome to *Rethinking 322: Strategies* for the proposed State College Area Connector in Penns-Brush Valley, **Volume 2**.

This publication was prepared as the final project for the eight students in the LARCH 414: Advanced Design Studio in the Stuckeman School's Department of Landscape Architecture at Penn State, who spent the 2023 fall semester exploring strategies to rethink the proposed State College Area Connector (SCAC) project under study by the Pennsylvania Department of Transportation (PennDOT).

As with the first Rethinking 322 studio in fall 2022, each student was charged with identifying an interest area related to the proposed highway or the contextual setting of Penns-Brush Valley. Their focus areas were refined during the early weeks of the semester as they researched the SCAC project and met with local advocacy organizations, government agencies, elected officials, and individual stakeholders to gather different perspectives about the proposed highway. The responses from area residents, advocacy organizations, and agencies were extraordinarily generous, and the sincere concerns they shared with the students, from improved highway safety to preserving rural heritage, are reflected in each student's strategy section in this document.

It is fair to say the community response to the SCAC has been controversial and contradictory. While the students heard near uniform opposition to the preliminary design concepts for the SCAC, they also heard near uniform agreement that the current U.S. 322 corridor between Potters Mills and Boalsburg requires significant safety improvements—an extraordinarily complex conundrum as they embarked on their 15-week course assignment. Therefore, the students were tasked not to endorse any of the proposed corridors under consideration by PennDOT for the SCAC, but rather to focus on the opportunities such a project might provide if the local communities could articulate a unified vision of what was desired, not only for the proposed highway project, but also for the future of Penns-Brush Valley.

From the start, the students identified the passion and affection for the rural character, historic sites, and agricultural heritage of the valley as a common theme in public meetings and the one-on-one conversations they had with area stakeholders. They learned about the SCAC within the 168-square-mile Penns-Brush Valley Rural Historic District that was determined eligible for the National Register of Historic Places in 2002. Within this context, specific concerns about climate change, growth in the Centre Region, ecosystem integrity, and sustainable farming were also voiced.

As a result, the students determined that while PennDOT's actions could impact the legacy of the valley, so too could local land use policies and conservation programs.

As the students explored their interests, they met twice weekly to share their research and community contacts with one another. In addition, in-person and virtual visits to the studio augmented their explorations with insights from the Penn State Dichinson Law and Penn State Sustainability, the Thomas D. Larson Pennsylvania Transportation Institute at Penn State, the Centre County Historical Society, and PennDOT Region 2. For fall 2023, the students traveled to Baltimore to meet with Floura Teeter Landscape Architects to learn about the design process for the award-winning Maryland Route 200/Intercounty Connector (ICC) project and visited the Context Sensitive Solutions (CSS) freeway to study the road's alignment, sound barrier design, integrated regional bike trail, wildlife crossings, and pollinator plantings. Next, they visited the Montgomery County Agriculture Reserve (MD) to learn about an innovative program to preserve farmland and sustainable farming. On the second day they explored the Mt. Vernon Memorial Parkway in Virginia then met with local officials in Middlesburg, Virginia on Hillsboro to look at two traffic calming projects on major arterials. They then traveled to Brunswick, Maryland (population 8,000) to tour the state's most successful roundabout - program a joint effort by the city, a local developer, and the Maryland State Highway Administration that has improved traffic efficiency and safety in the growing rural community.

Many of these new projects shaped the presentations and engagements during the student-led community meeting with the Centre County Historical Society. At this public event, students presented their strategies, receiving feedback from residents and advocates during a presentation.

The result of each student's studio work is presented in the following strategy sections. Their strategies are offered as an introduction to the many possibilities for safe, flexible, and context sensitive solutions for the SCAC and smart, sustainable, and relevant land management for the region. It is hoped that they will spark not only lively conversations, but also a new vision to rethink 322 and the future of Penns-Brush Valley.

—Paul Daniel Marriott, Studio Professor

Image: Dan Marriott

Image: Students explore pedestrian accommodations along Business 322, North Atherton Street

Paul Daniel Marriott, Ph.D.
Principal and Founder of Paul Daniel Marriott + Associates and Associate Professor of Landscape Architecture, Penn State

Dan is a licensed landscape architect and has consulted on transportation projects for the Federal Highway Administration and National Park Service. He is a past member of the Transportation Research Board's Standing Committee on Landscape and Environmental Design. He co-founded and chairs the Preserving the Historic Road International biennial conference, sponsored by the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO). Dan is the author of "Saving Historic Roads, Design and Policy Guidelines" (Wiley) and "From Milestones to Mile-Markers, Understanding Historic Roads" (FHWA-National Scenic Byways Program). Dan also served on the External Review Committee for FHWA's Flexibility in Highway Design guide. He has been an expert reviewer for UNESCO World Heritage roads and developed context sensitive solutions, scenic byway and historic roads trainings, and corridor management plans for state transportation departments including, Arizona, Alaska, California, Colorado, Hawaii, Illinois, Indiana, New Jersey,New Mexico, New York, the Osage Nation, and the Massachusetts Department of Conservation and Recreation. In addition, he has consulted on transportation projects in Australia, Canada, Mexico, and the United Kingdom. Dan was honored with the Centre County Historical Society, 2023 Education and Advocacy Award for his work with Rethinking 322.

Glossary

AASHTO–American Association of State Highway and Transportation Officials, a national state-led organization that conducts research and presents guidance on highway design. AASHTO guidance offers a range of acceptable solutions for different aspects of highway design and has been adopted by Federal Highway Administration (FHWA) for federal highway projects. A state may adopt the full range or a more limited range as a state standard for highway design.
ADT–average daily traffic, a calculation of the average number of vehicles on a particular segment of roadway measured in whole days.
Alignment–the movement of a roadway through the landscape, its curves, straight sections, and hills.
Arterial–a roadway providing the principal high-volume and high-speed linkages within a community and between communities.
Avenue–a broad urban thoroughfare, usually tree-lined.
Berm–an artificial hill or mound created for screening or to enhance a design landscape.
Boulevard–a broad urban thoroughfare, usually tree-lined and with a broad median.
Clear zone–the recommended area alongside a roadway clear of all potential hazards (something an automobile might strike), such as trees, rocks, utility poles, and the like. The recommended width of a clear zone varies based on the functional classification of the road.
Collector–a roadway providing service between arterials and local roads.
CSS–Context Sensitive Solutions, also known as Context Sensitive Design, is an approach to highway design that considers community structure, local landscapes, and environmental settings as an integral part of highway planning and design.
Cut and Fill–the removal (cut) or placement (fill) of soil in construction. Ideally highway construction projects are designed so that cut and fill are "balanced", i.e., the amount of soil removed in a hillside "cut" equals the amount required to "fill" the ravine at the base of the hill.
Designed landscape–a landscape, or the alteration or modification of the natural landscape, that has been created specifically to provide a desired experience (usually aesthetic) to the user or a community. Designed landscapes are generally created by a landscape architect, planner, architect, or other design professional.
Design speed–the maximum safe speed at which a vehicle can be expected to operate on a roadway. The speed for which a roadway is designed–this may not be the posted speed.
DOT– Department of Transportation
Errant vehicle–a vehicle leaving the roadway in a reckless or uncontrolled manner.
Expectancy–a theory, based on a motorist's "knowledge stores" of driving experiences, that suggests predictable driver responses to familiar situations and settings. Routine experiences, such as sufficient merging space at the end of a freeway ramp, become unconsciously established in the driver's mind, thus creating conflict should the "expectancy" not be met.
FHWA–Federal Highway Administration
Galvanized steel–a zinc coating applied to steel to prevent rusting. Galvanized steel has a flat chalky-gray appearance.
Guardrail–a barrier, usually of a post-and-beam construction located alongside a roadway, in medians, and in front of hazards to prevent an errant vehicle from striking an obstacle or encountering a dangerous slope or drop-off.
Horizontal alignment–the movement of a roadway to the left or right; its curves.
Integrity–the current quality of a feature or element when compared to its original quality.
Jersey barrier–an angled concrete barrier designed to guide an errant vehicle back to the roadway and guard against hazards.
Limited access–a concept whereby the entrances and exits of a roadway are restricted to certain locations–generally to allow for higher speed traffic movement due to the absence of cross streets and intersections.
Local road–a roadway serving adjacent residences and businesses–generally of low-volume traffic.
Median–a central space, often planted, dividing opposite moving travel lanes.
MPO–Metropolitan Planning Organization, a federally-mandated and federally-funded transportation policy-making organization to ensure regional cooperation in transportation planning.
MUTCD–Manual of Uniform Traffic Control Devices, the FHWA guidance for regulatory signs.
National Register of Historic Places–a national listing of sites meeting the U.S. Secretary of the Interior's standards, maintained by the National Park Service.
NEPA–National Environmental Policy Act of 1969, a federal review program to ensure federally-funded projects assess potential impacts to the environment. NEPA is dependent on federal funding. When there is no federal funding, Pennsylvania Department of Transportation (PennDOT) follows Section 2002 of the Administrative Code of 1929, which defines the powers and duties held by PennDOT. Act 120 of P.L. 356 amended Section 2002 in 1970 to add requirements to address environmental impacts from transportation projects.
Parkway–a roadway contiguous with or linking park spaces. In its truest definition, a parkway provides access to recreational, scenic, or leisure spaces.
PennDOT–Pennsylvania Department of Transportation
Post and cable guardrail–a guardrail constructed of regularly spaced posts connected by a flexible (usually steel) cable.
Posted speed–the speed at which a roadway is signed. This is usually, though not always, lower than the design speed.
Realignment–the repositioning of a segment of a roadway.
Reinforced concrete–concrete with a steel reinforcing framework. Reinforcing enables the concrete to perform in structural situations. Concrete by its nature resists high compressive loads (the heavy weight of a truck, for example). Steel reinforcing resists high-tensile loads (the pull to the left or right one would encounter on a bridge, for example).
Right-of-way–the land area dedicated to or associated with a roadway that is owned or managed by the road management entity, including the roadway, shoulder and affiliated landscape.
Road diet–the removal or narrowing of lanes to make a road safer or more efficient.
Shoulder–a stabilized level area adjacent and parallel to the roadway that provides a recovery space for an errant vehicle or a safe space for a disabled vehicle.
Sight distance–the length of roadway ahead that is visible to the motorist.
Standards–the legally adopted policies and practices directing the design and construction of a road in a state or municipality.
Street–an urban thoroughfare, usually defined by buildings.
Superelevation–the banking or sloping of a road curve to enable vehicles to maintain a speed consistent with the overall speed of the roadway. The banked ends of racing tracks represent an exaggerated superelevation.
Taking–in legal terms, the direct acquisition of property, or the implementation of policies or actions that significantly impact a property.
Tort liability–a situation in which an injury or harm has occurred due to a breach of a preexisting duty or obligation, resulting in potential exposure to an individual or organization for damages.
Traffic calming–a strategy to slow vehicle speed through the use of physical changes in the road's alignment, including speed humps, speed tables, roundabouts, and chicanes (a shift in the horizontal alignment). An example of traffic calming is the speed table that was installed in front of the HUB-Robeson Center on the Penn State University Park Campus to improve pedestrian safety.
Vertical alignment–the movement of a roadway up and down; its hills.
Volume–the number of vehicles a roadway carries.
Watershed–an area of land drained by a particular body or bodies of water. An individual body of water often belongs to a hierarchy of watersheds. A tributary of the Susquehanna River would have its own watershed with multiple creeks or streams, and is also part of the larger Susquehanna River Watershed and the even larger Chesapeake Bay Watershed.
W-Beam–a common type of guardrail/barrier recognized by its curved, "W," face.

Image: Dan Marriott

LARCH 414 studio class along the National Park Service Mt. Vernon Memorial Parkway. Virginia. From left to right: Layla Khalifa, Joseph Spatola, Christian Dominguez, Robert Beihl, Hailey Sukols, Aaron Solderich.
(Not shown: Adam Tak and Ryan Stackiewicz)

Marshland swamp, Overijssel, Netherlands
Image: Weerribben Wieden

Wetland Mitigation & Watershed Stewardship

Aaron Solderich | LARCH 414 | Fall 2023

Strategy

Healthy watersheds are a cornerstone for healthy and prosperous communities. Clean water from the Spring Creek Watershed has shaped settlement and agriculture in Penns-Brush Valley for millenia. The proposed SCAC and development pressure arising from a new highway could cause serious damage to a delicate balance of a healthy watershed.

This section will showcase strategies, policies, and investments to ensure that a new highway corridor protects and enhances the watershed as a source of pure water, trout habitat, and regional recreation.

Memorial Floodplain Crossing, Maryland Route 200 Image: Raja Veeramachaneni

Wetland Corridor Analysis

"The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased and not impaired in value. Conservation means development as much as it does protection."

-Theodore Roosevelt

History of Spring Creek Watershed

The Spring Creek Watershed (SCW) has a complex history relating to water quality issues dating back to the early 1900s. Limestone and dolomite bedrock facilitates swift infiltration of surface water, nurturing local groundwater aquifers that are a vital source for the region's drinking water and pristine aquatic habitats. Local waterways and associated landscapes have faced challenges, including toxic spills from the Nease Chemical Company located in State College during the 1960s-70s that caused mass fish death and groundwater contamination. Ongoing discharge from wastewater treatment facilities continued until 1992, further compounding the watershed's water quality concerns. Despite these circumstances, clean groundwater continues to emerge through numerous springs, feeding streams, wetlands, and floodplains in the Penns-Brush Valley.

Study Area

Figure 1.0 - Locator map of State College, PA, and project study area. Image: Google Earth

These maps identify the study area for the project and classify restorable and functioning wetlands described by the National Wetland Inventory (NWI).

PennDOT Corridors and Wetland Adjacency

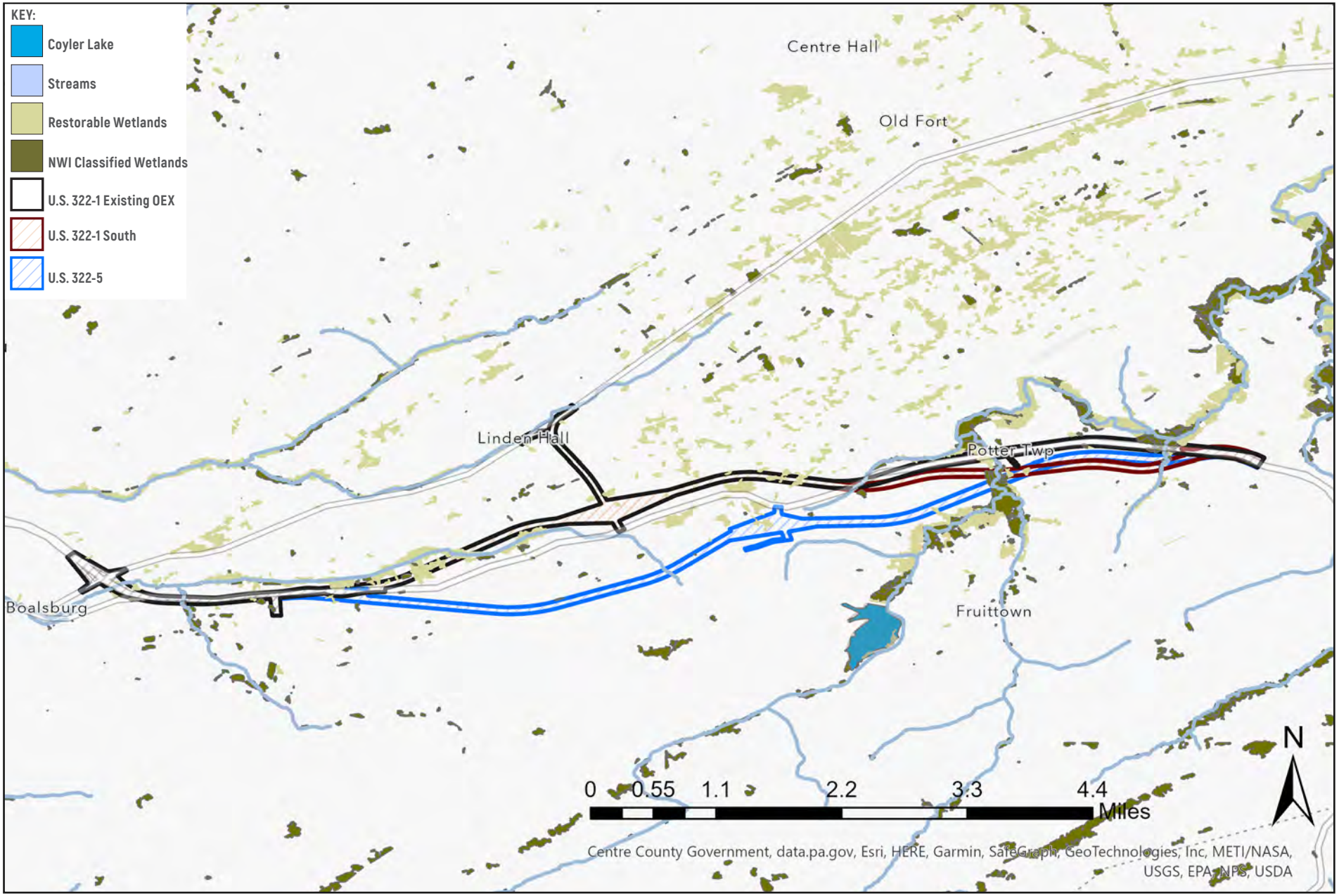

Figure 2.0 - Penns-Brush Valley PennDOT corridors and wetlands.

Image: Aaron Solderich

Transportation Impacts

Image: Resource Utilization of Acid Mine Drainage (AMD)

I-99 Construction

Urban sprawl, development, and transportation expansion projects have posed significant threats to the Spring Creek Watershed and associated wetlands in the Centre Region.

Image: (2002) Bald Eagle Mountain, Interstate 99

During the construction of Interstate Highway 99 (I-99) in 2003, along the ridge of Bald Eagle Mountain at Skytop, PennDOT unearthed veins of pyrite and zinc-lead deposits that, when exposed to oxygen and water, produced notable amounts of acid runoff. The exposed rock posed reclamation challenges due to volume, distribution, and lack of neutralizing minerals that were more extreme than many coal mines and other highway expansion sites. Over $50 million was spent in reclamation efforts to cap the exposed earth with a High Density Polyethylene (HDPE) liner, Geoweb, and limestone gravel.

Sites along Spring Creek used during the construction of I-99 for mobilization and storage posed potential threats to Spring Creek water quality and trout spawning habitat. A study conducted by PennDOT unit personnel found that construction activities resulted in an approximate 14% increase in sediment loading at each location, rising to nearly 180 metric tons.

Future projects in Centre County, such as the SCAC, must consider and identify potential impacts that consider the unique geological complexities within the region to prevent similar environmental impacts.

Image: Aaron Solderich (Interstate 99 Reclamation)

Image: (2002) Interstate 99 & U.S. 322 Interchange (PennDOT)

Acid Mine Drainage (AMD)

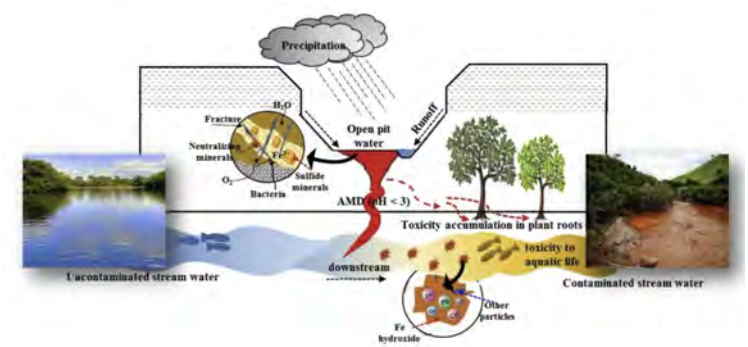

Image: Resource Utilization of Acid Mine Drainage (AMD)

Acid mine drainage (AMD) has severely impacted Mid-Atlantic watersheds with toxic waste. In Pennsylvania alone over 1,300 miles of streams have been impaired by AMD and more are at risk throughout the Commonwealth. There is no permanent method to remediate the effects of AMD; however, a common strategy utilized by conservation agencies like the Pennsylvania Department of Environmental Protection (DEP) is to add limestone structures into streams. The image below is an example of the potential effects AMD could have on local wetlands, thus the need for regional cooperation. The mine in the image is in West Virginia, but the discharge site is in Maryland.

Wetlands, Kempton, MD

Image: J.K. Litten, Laurel Run

I-99 Wetland Remediation

Soaring Eagle Wetlands, located in Julian, Pennsylvania, is a 135-acre property 11 miles northwest of State College. In the wake of the 2002 construction of I-99, this site was identified for implementing mitigation strategies to address the impacts of lost wetlands on the landscape. This property, which was former farmland prone to flooding, is now a wetland, upland meadow, and woodland along Bald Eagle Creek.

Soaring Eagle Wetland, Julian, PA

Image: Aaron Solderich,

Mitigating Change with Wetland Restoration

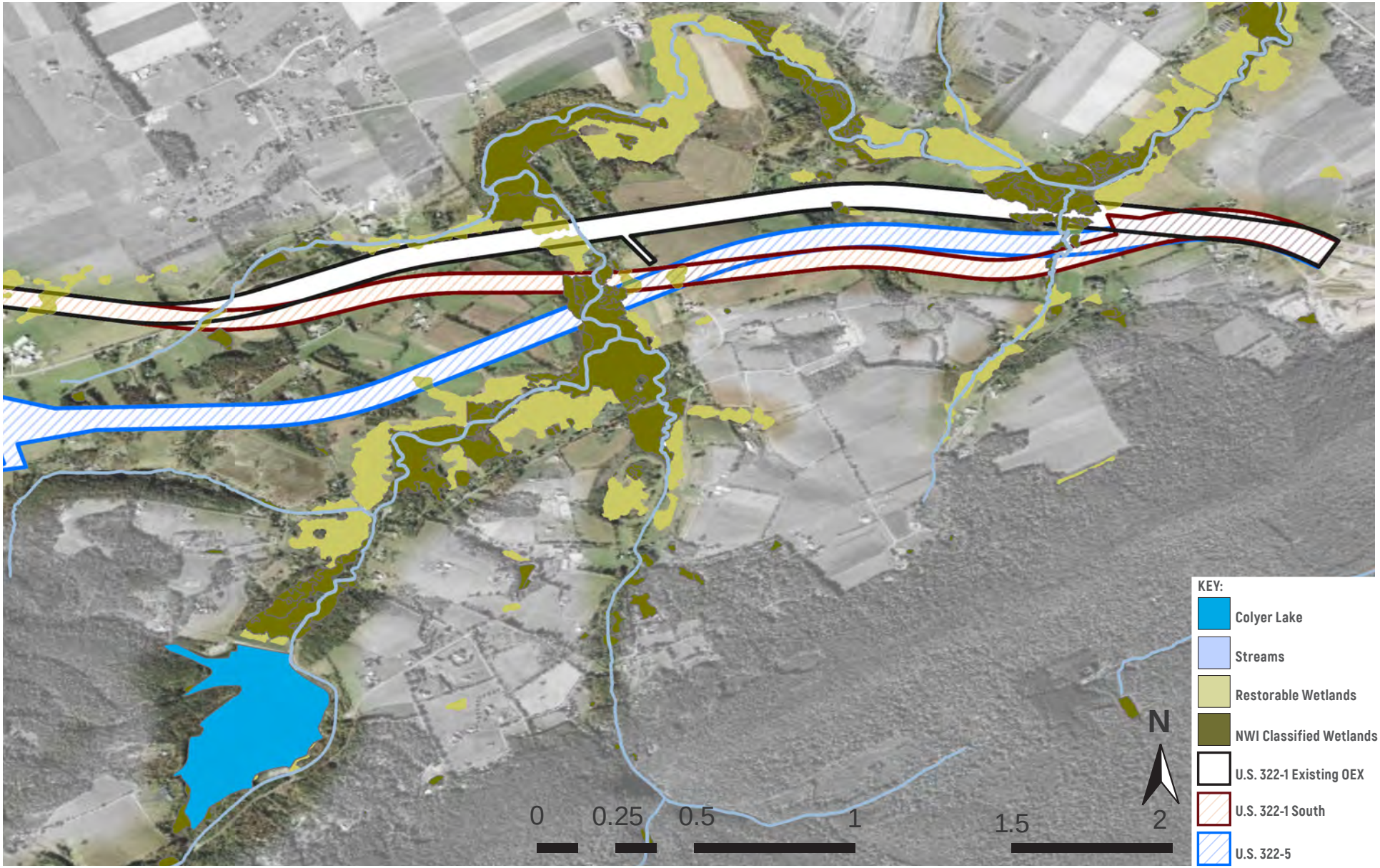

Figure 3.0 - Penns-Brush Valley PennDOT corridors and wetlands - zoomed In.

Image: Aaron Solderich

Loss of Wetland Functions

Under the Clean Water Act, Section 404, waterways and wetlands are regulated and protected from the impact of dredging and filling. When construction projects will impact wetlands, developers are legally required through most permits to provide mitigation measures that offset the loss or disturbance. The goal of mitigation efforts is to maintain or enhance the wetland ecosystem's function.

Soaring Eagle Wetland, Julian, PA Image: Aaron Solderich

Strategies

Restored

Wetland restoration returns former or degraded wetland landscapes to their natural functions. This method is typically less expensive to develop and best benefits an ecosystem's biodiversity and ecological value.

Enhanced

Wetland enhancement accentuates specific functions to improve the overall ecosystem (e.g., ponding duration, wildlife supporting, native vegetation, depth, or improving water quality).

Created

Created wetlands are the most difficult and costly to construct, requiring strict engineering. They are typically placed in soil conditions and landscapes that are not original to wetland ecosystems.

Successfully Restored Wetlands

The Helen B. Katz Natural Area in Crawford County, Pennsylvania, is a 552-acre preserve with restored floodplains, wetlands, and upland forest landscapes. In 2013, the Western Pennsylvania Conservancy acquired an additional 86-acre farmland parcel, returning it to a functional wetland. In addition, the organization planted over 3,400 trees on another 17 acres to protect 4,425 feet of streambank along tributaries of Cussewago Creek.

Helen B. Katz Natural Area Image: Western Pennsylvania Conservancy

Drawbacks of Created Wetlands

The comparison between plant species richness and vegetation cover in created wetlands versus natural ones revealed lower overall values. Notably, the biodiversity in younger "created wetland" sites doubled when compared to older, more established created wetlands, indicating a decline in biodiversity over time. All created sites exhibited lower species richness compared to the referenced natural wetlands. Additionally, created wetlands located away from nearby wetland seed sources are more likely to introduce upland species. The dominance of cattail, with its aggressive reproductive strategies, could outcompete other native species, raising concerns about achieving a "no net loss" of wetlands if they don't match their natural counterparts.

A study conducted by Hoeltje, S. M., & Cole, C. A. "intended to evaluate the effects of creating out-of-kind wetlands as mitigation for impacts from highway construction activities" and assess the loss of wetland functions from mitigation efforts. Developers gauged wetland success only by evaluating vegetation coverage per acre over time rather than comparing them to lost wetland ecosystems. Constructed wetlands along the I-99 corridor differed significantly in slope wetlands despite being anticipated to mimic floodplain wetlands due to their location. This suggests that created wetlands in Central Pennsylvania constitute a distinct category in their physical makeup and ecological role, emphasizing that creating effective mitigated wetland sites demands more than simply mirroring natural wetland landscapes.

Soaring Eagle Wetland Julian, PA Image: Aaron Solderich

Impacting Policy

Future of Penns-Brush Valley

Federal, state, and local policies for water quality should be carefully reviewed by local governments, communities, farmers, and residents to ensure the Spring Creek Watershed is properly recognized and protected by all available laws pertaining to use, contamination, erosion, land-use, construction, and ecology prior to any construction by PennDOT. While the Commonwealth of Pennsylvania is obligated to adhere to all environmental policies, the boundaries and expectations can be complicated.

Despite the best efforts of state regulations and PennDOT, oversights are possible. A local population that actively engages, monitors, and reports possible violations done to the Spring Creek Watershed during planning and construction is an important quality check to minimize potential damage to the watershed.

1. **Wild and Scenic Rivers Act**
2. **PA Scenic Rivers Act (1972)**
3. **U.S. EPA Clean Water Act (Section 404)**
4. **Wetland Banking Credits**
5. **Environmental Impact Studies**

Kuhns Family Property Image: Aaron Solderich

Kuhns Family Property Image: Aaron Solderich

Wetland Crossings

"The most effective form of regulatory compliance is to identify and avoid wetland impacts from the earliest stages of a project."

-PennDOT

Intercounty Connector Maryland Route 200

The $2.5 billion Maryland Route 200 Intercounty Connector (ICC) project crosses nine streams north of Washington D.C. and is an extraordinary precedent project for wetland mitigation and watershed stewardship. This project considered many environmental impacts throughout the design and construction along the corridor. Its minimum height of 30 feet on all underpasses allows vegetation to flourish due to the increased sunlight. The ICC minimized environmental impacts throughout the design and construction by spanning the entire floodplain and wetland ecosystem for all nine bridge crossings, maintaining ecological habitat connectivity and biodiversity.

Maryland ICC/Route 200. Image: Aaron Solderich

The Raja Veeramachaneni Memorial recognizes pioneering efforts to protect watershed and habitat ecologies during a highway construction project.

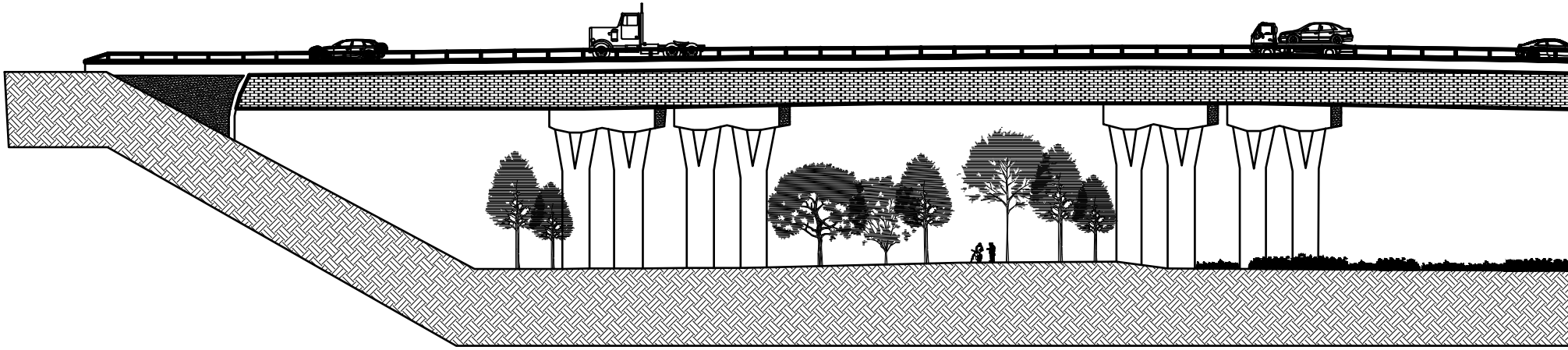

Figure 4.0 - Replication from ICC Maryland 200

Loss of Wetland Functions

Color, height, material, and texture provide aesthetic interest while decreasing the visual impact of the structure within the landscape. Spanning full floodplains ensures minimal disruption and fragmentation to wetland habitats. This method also minimizes required wetland mitigation under the Clean Water Act (CWA), Section 404.

In addition to function, spanning can incorporate multimodal infrastructure for wildlife and pedestrians into the landscape. Bicycle infrastructure and wildlife crossings facilitate safe passage for all users.

Wetland crossings also provide space for educational features within the landscape. Educational boards play a pivotal role by advocating for the importance of allocating resources supportive of outdoor learning initiatives, fostering deeper connections to nature.

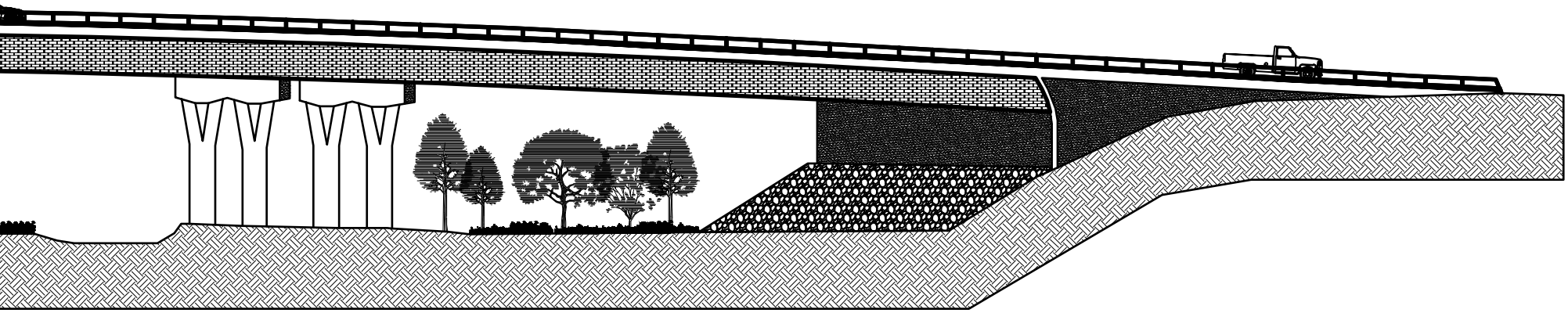

Image: Aaron Solderich

Wetland Crossings Reimagined for the U.S. 322 Corridor

The value of protecting existing wetlands is critical to maintain healthy ecosystems, vibrant open space systems, and thriving economies. While mitigation efforts from highway projects will never replicate the natural process, they are important to minimize impact. Wetland ecosystems play crucial roles within communities through flood control, carbon storage, recreation, aesthetics, habitat biodiversity, filtration, and recharging groundwater aquifers.

Re-imagined wetland crossings similar to the Maryland Route 200 (ICC) have the potential to establish groundbreaking ecological standards for future highway expansion projects in Penns-Brush Valley and nationwide. Incorporating strategic features into crossings shows how environmental concerns can cohabit with crucial infrastructure, setting a precedent for designing similar sustainable transportation projects.

1. **Wetland Restoration**
2. **Wildlife Underpass**
3. **Multimodal Infrastructure**
4. **Aesthetic Qualities**

Figure 4.0 - Replication from ICC Maryland 200

Image: Aaron Solderich

Biography

Aaron J. Solderich
Fourth-Year Landscape Architecture Student

Aaron was born and raised in Greenville, Pennsylvania. He sees a future career in environmental restoration and land conservation, educating and connecting people to local landscapes. A key lesson he learned from ***Rethinking 322*** is the significant roles and opportunities landscape architects have in designing groundbreaking context-sensitive transportation projects.

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Hamden Slough National Wildlife Refuge. Becker County, Minnesota

Image: Hamden Slough National Wildlife Refuge. Becker County, MN

Rescue efforts after a crash on U.S. Route 322 March, 2022
Image: StateCollege,com

Rethinking Safety

Strategies for the Boalsburg transition on U.S. Route 322

Ryan Stackiewicz | LARCH 414 | Fall 2023

Strategy

Safety is of paramount importance on every roadway and it is important as we rethink U.S. Route 322. Many states are now rethinking traditional safety solutions with a greater emphasis on multiple users and the specific needs of different road types, particularly where different road types intersect. While DOTs have traditionally focused on "wider, straighter, and faster" as the default response to safe motor vehicle movement, new models and alignments are offering safer alternatives better suited to the communities most impacted by the roadway. This section will focus on the high accident rates and fatalities on U.S. Route 322 between the PA 45 interchange at Boalsburg and the merge of Business 322/S. Atherton Street with U.S. Route 322. This roughly one-mile segment of U.S. Route 322 will be referred to as the "Boalsburg Transition."

U.S. 322 - Boalsburg

Image: PennDOT Videolog

Current Conditions

Rethinking safety and shifting away from a single approach to highway safety is being driven by a dramatic increase in highway fatalities in the United States. In the article, "The Exceptionally American Problem of Rising Highway Deaths," The New York Times reported that since 1994 highway-related pedestrian deaths have increased by 19%, bicycle deaths by 17%, and motorcycle deaths by 140% (Nov. 27, 2022). The American Association of State Highway and Transportation Officials (AASHTO) notes that accident rates are higher in areas where the roadway changes significantly or unexpectedly. The Boalsburg Transition marks the location where the four-lane, limited-access U.S. Route 322 Nittany Expressway merges with the two-lane rural arterial highway at S. Atherton Street (Business U.S. Route 322).

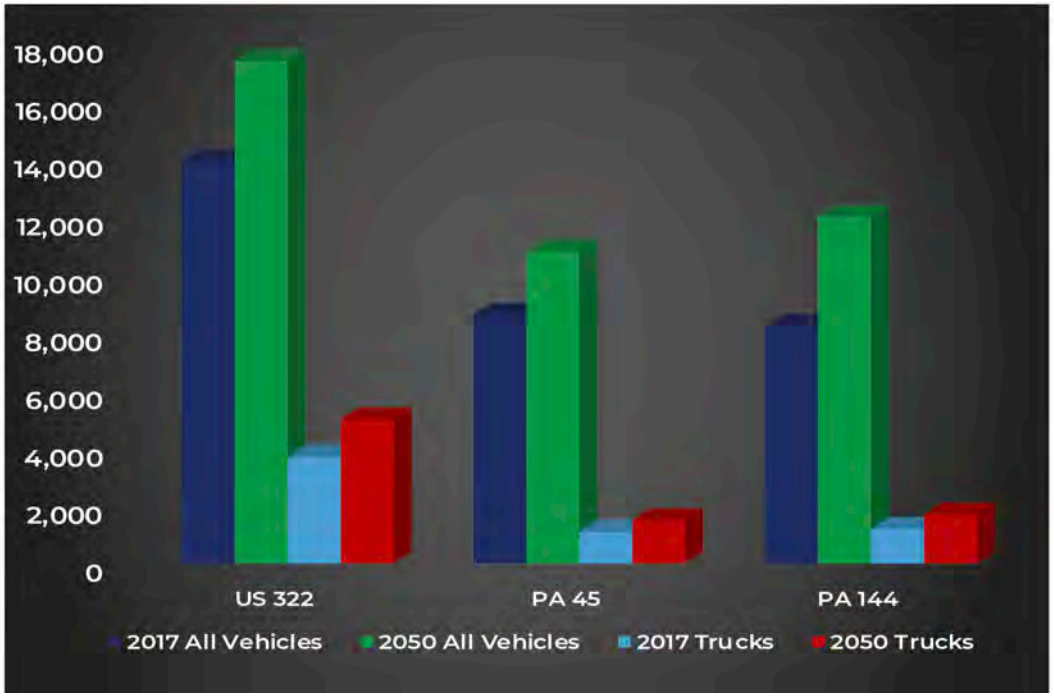

Figure 1.0- Traffic Increases. Image: PennDOT PEL

Traffic Conditions

To understand the current safety conditions of U.S. Route 322, this strategy uses data from the Planning and Environmental Linkages (PEL) study and the most current data from PennDOT's "Pennsylvania Crash Information Tool" (2020 to 2022 data). PennDOT notes that, "Traffic data shows that average annual daily traffic (AADT) on the study area roadway network varies between 8,220 and 13,900 vehicles per day, of which 13 to 27% were trucks" (PennDOT, 2023). On average, the percent of trucks traveling along U.S. Route 322 was three times higher than other roadways in the SCAC PEL study area. Most of these trucks have a starting point and end point that are outside of the study area.

Of particular note, PennDOT did not conduct an "origin/destination" study to determine where trucks traveling on U.S. Route 322 are coming from or going, thus missing and important information to understand how best to plan for truck traffic (local, regional, or national). Regardless of origin or destination, we do know that, "Ninety percent of the trucks have a start and end point outside of the study area, while passenger vehicles were traveling inside of the study area 74% of the time" (PennDOT 2023). The PEL notes that by 2050, all traffic will increase by 31% and truck traffic will increase by 35% (Figure 1.0). It has been noted, during conversations with community representatives, that some trucks may be using U.S. Route 322 as a route to avoid tolls on the Pennsylvania Turnpike or reduce travel time.

Crashes and Crash Severity

The crash information chart (Figure 1.1) shows the analysis of crashes within the study area from January 2014 to December 2018. Over the five-year period, there were 396 total crashes within the SCAC PEL study area. U.S. Route 322 was the location for 108 of those crashes, which is just over 27% of the total crashes. Out of these crashes on U.S. Route 322 during this time period, 69 had no injuries, 39 had injuries, and none were fatal. Since 2018, fatal crashes in the SCAC PEL study area occurred on Feb. 20, 2020, on U.S. 322 in Potter Township; Aug. 4, 2021, on U.S. 322 in Potter Township; and, most recently, Nov. 18, 2023, on U.S. 322 in Harris Township at the Boalsburg Transition (during which this volume of ***Rethinking 322*** was being researched). By 2050, crashes are expected to increase by 17% on U.S. 322; theoretically, this means that there would be 126 crashes on U.S. 322 in the PEL study area by the year 2050.

Roadway	PDO[2]	Injury	Fatal	TOTAL
PA 45	72 (50%)	70 (49%)	1 (1%)	143 (36%)
PA 144	68 (61%)	39 (35%)	4 (4%)	111 (28%)
PA 192	0	1 (100%)	0	1 (0%)
US 322	69 (64%)	39 (36%)	0	108 (27%)
Linden Hall Road/Cedar Hill Road (SR 2004)	1 (100%)	0	0	1 (0%)
Brush Valley Road/Rock Hill Road (SR 2006)	3 (50%)	3 (50%)	0	6 (2%)
Boalsburg Road/Warner Boulevard (SR 3010)	3 (23%)	10 (77%)	0	13 (3%)
Boal Avenue (SR 3014)	5 (45%)	6 (55%)	0	11 (3%)
Brush Valley Road	2 (100%)	0	0	2 (1%)
TOTAL	**223 (57%)**	**168 (42%)**	**5 (1%)**	**396 (100%)**

1 Crash frequencies represent number of crashes (2014-2018) involving injuries or fatalities and not the number of injuries or fatalities

2 PDO: Property Damage Only (no injuries)

Note: Crash data collection occurred prior to the opening of the Potters Mills Gap Transportation Project

Figure 1.1- 2014-2018 Crash Statistics. Image: PennDOT PEL

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STATE COLLEGE

Bellefonte woman killed in head-on crash along U.S. Route 322, State College police say

BY BRET PALLOTTO

UPDATED NOVEMBER 08, 2023 5:04 PM

Figure 1.2- Fatal Crash on US 322. Image: *Centre Daily Times*

Rethinking Transitions on U.S. 322

Potters Mills and Boalsburg

The safety concern that I chose to focus my study on are transitions on U.S. Route 322. There are two transitions on U.S. 322 in our study area, where the road goes from four-lanes, limited-access to two lane rural arterial highways. One of these transitions is in Potters Mills (Figure 2.1) and the other is in Boalsburg (Figure 2.2).

Since this is a semester-long project, I chose to focus on one of these transitions so I could look into crash statistics in depth. After researching both transitions, I decided to focus on the Boalsburg transition. I hope that this study shows the community and PennDOT the significance of existing problems that these transitions cause as currently designed.

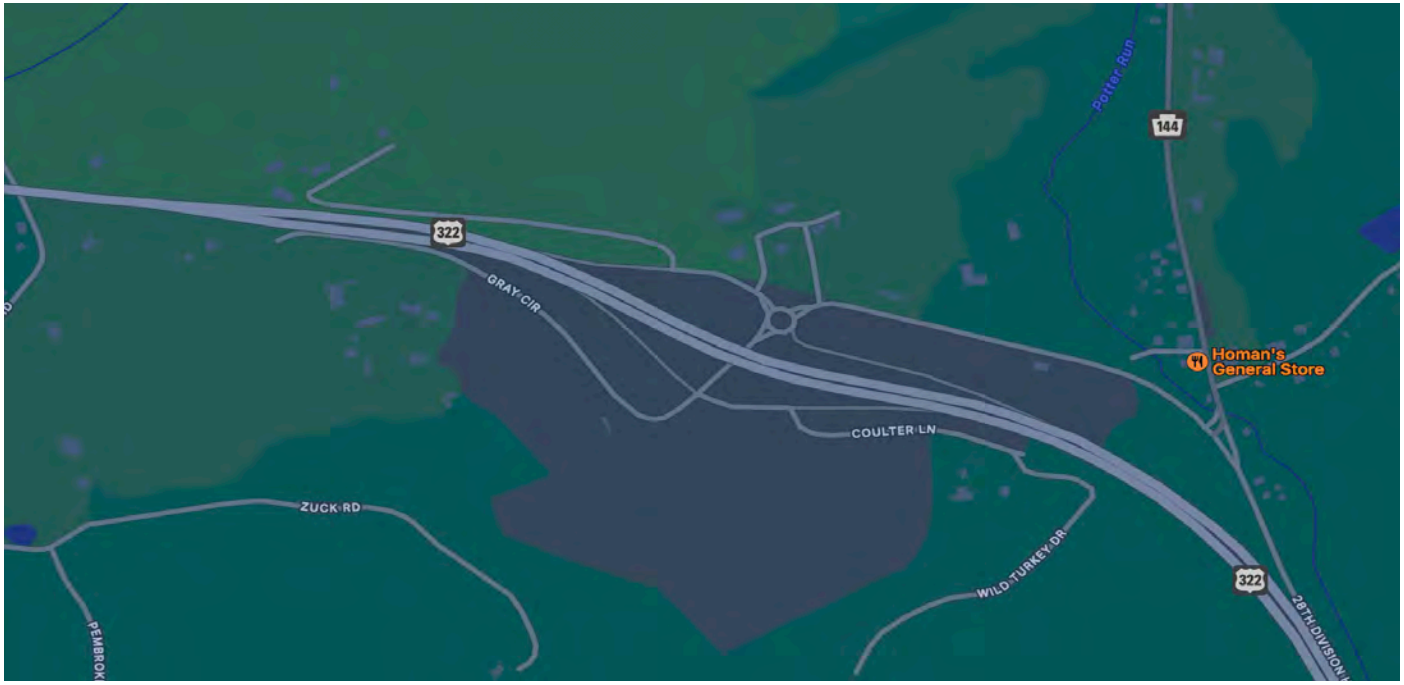

Figure 2.1 - Potters Mills Transition. Image: Google Maps

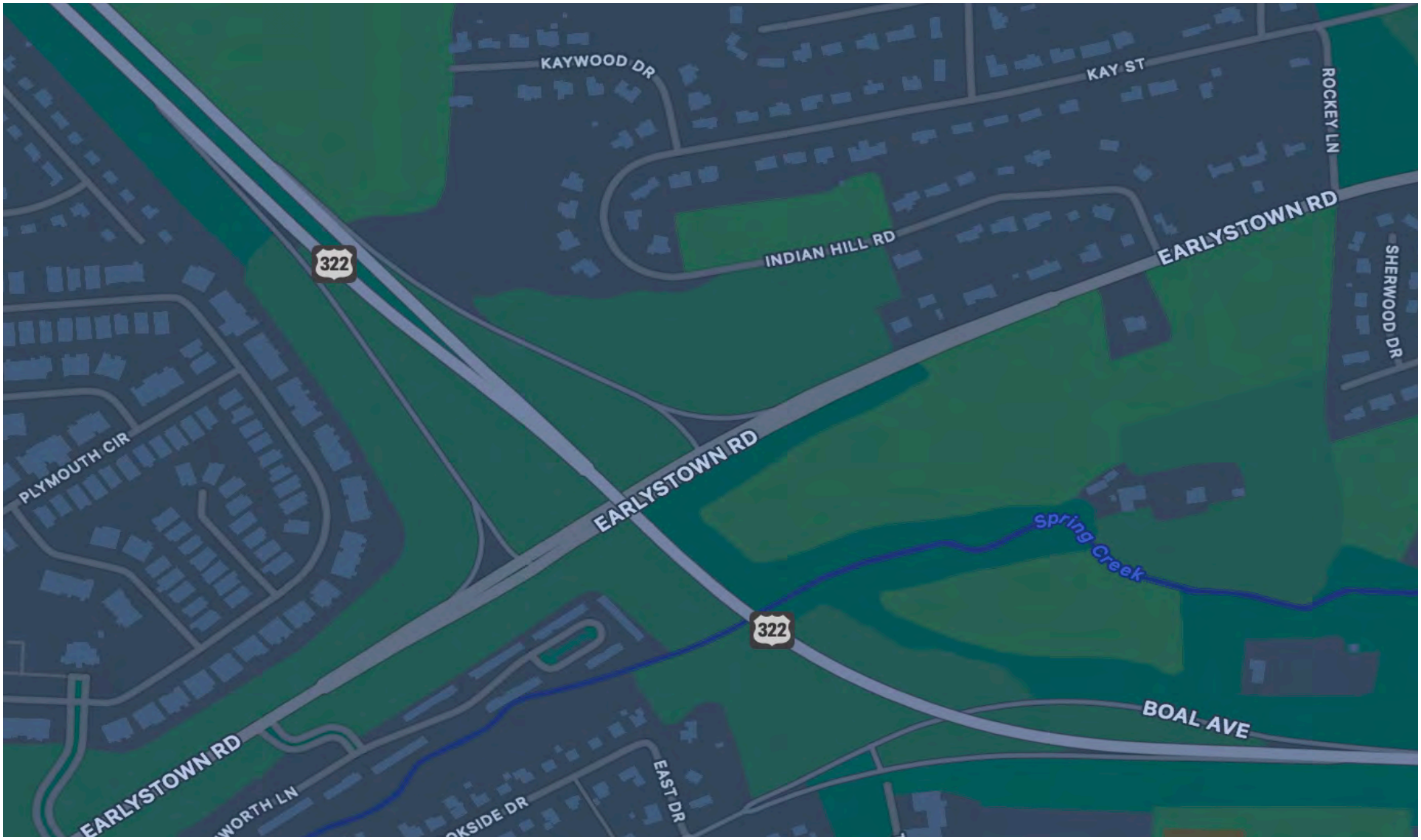

Figure 2.2 - Boalsburg Transition.

Image: Google Maps

Boalsburg Transition Crash Statistics 2020-22

Crashes at the Boalsburg Transition

As noted, ***Rethinking 322***, Volume 2 focuses on the crashes from 2020 to 2022 at the segment of the Boalsburg Transition using PennDOT's video log and crash information tool, which are available online (the fatal crash noted earlier in this section occurred in 2023, and was not included in this data reporting period). From 2020 to 2022, there were a total of 10 crashes on the Boalsburg Transition segment of the road. In 2020, there was one crash (Figure 3.1), in 2021 there were five crashes (Figure 3.2), and in 2022 there were four crashes (Figure 3.3). The information for 2023 was not available to the public at the time this document was prepared.

Each crash is identified by a "crash number" that can be found on the different spreadsheets available on PennDOT's Pennsylvania Crash Information Tool. Due to the overwhelming amount of information complied by PennDOT for each crash, key elements are included in this report to provide an overall understanding of the crash and the results (damage, injury, or fatality). For additional information, please visit the Pennsylvania Crash Information Tool at: https://crashinfo.penndot.pa.gov.

Important details of each crash are listed below to determine the factors behind the accidents (Figure 3.4). Out of the 10 crashes reported, two were alcohol-related (DUI), leaving eight crashes attributed to other reasons, such as aggressive driving (the case in half of the other accidents), and other factors such as wet roads, lack of street lighting, and speeding.

Crash Letter	Automobiles Involved	Commerical Vehichles Involved	Type Of Crash	Hour of Day	Illumination	Severity Level
A	1	0	Hit Fixed Object	9	Daylight	Injury not known
B	1	0	Unknown	18	Daylight	Minor Injuries
C	1	0	Hit Fixed Object	20	Dark(No StreetLights)	Property Damage Only
D	1	1	Head On	10	Daylight	Fatal
E	0	2	Sideswipe(Opposite Direction)	20	Dark(No StreetLights)	Unknown
F	0	1	Hit Fixed Object	3	Dark(No StreetLights)	Minor Injuries
G	1 Small Truck	0	Angle	11	Daylight	Property Damage Only
H	1 Small Truck	0	Sideswipe(Same Direction)	14	Daylight	Property Damage Only
I	0	1	Hit Fixed Object	10	Daylight	Minor Injuries
J	1	0	Sideswipe(Same Direction)	13	Daylight	Unknown

Figure 3.4 - 2020-2022 Crash Statistics.

Figure 3.1 - 2020 Crashes.

Figure 3.2 - 2021 Crashes.

Figure 3.3 - 2022 Crashes.

Image: PennDOT PA Crash Information Tool

People Involved	Relation to Road	Road Condition	Unbelted	Weather	Belted Death Count	Agreesive Driving	Alcohol Related	Speeding	Travel Speed(Estimated)
1	Roadside	Wet	1	Raining	0	Yes	Yes	Yes	70
4	On Roadway	Dry	0	Clear	0	No	No	No	55
1	Shoulder	Dry	1	Clear	0	Yes	Yes	Yes	70
2	Shoulder	Dry	0	Cloudy	1	No	No	No	65
2	On Roadway	Dyr	0	Clear	0	No	No	No	55
1	Shoulder	Dry	0	Clear	0	Yes	No	No	60
2	On Roadway	Wet	0	Snow	0	Yes	No	No	45
2	On Roadway	Dry	0	Clear	0	Yes	No	No	55
1	shoulder	Dry	0	Clear	0	No	No	No	55
3	On Roadway	Dry	0	Clear	0	Yes	No	No	55

Image: Data from PennDOT Information Tool

How to understand crashes at the Boalsburg transition

When studying crash history on any road, it is important to distinguish among design factors such as the alignment of the road and the provision of safety features, including barriers, traffic signals, and posted warnings; environmental factors, including weather conditions such as blinding sunlight or freezing temperatures; off-road distractions such as billboards; and driver behavior factors such as speeding, driving under the influence, and aggressive driving. Sadly, driver behavior is irregular and the most difficult to predict or design for.

Therefore, the first course of action to improve safety on any road is to address design and environmental factors. For example, if we factor out driver behavior and find that a road segment has a high crash rate, that may suggest that there could be a design flaw in the geometry of the road, something such as an abrupt change from two lanes to one lane that, if corrected, could improve safety. Similarly, for environmental factors, if there is a pattern of crashes during icy weather in one segment, textured pavement could be installed to improve safety. For driver behavior, it is still important to consider if any design or environmental factors contribute to poor behavior. For example, is aggressive driving the result of a random angry driver or chronic frustration with the design of the roadway (crossing the double yellow line when trying to pass slow moving trucks when no truck climbing lane is provided)? These were factors that were considered in assessing the information in the PEL for the Boalsburg Transition

When looking at Figure 4.1, which shows the crashes from 2020 to 2022, there are three main crash locations at the Boalsburg Transition. The first, starting on the top-left (A), is an outlier location; this crash included alcohol, speeding, and aggressive driving involved as factors.

The location where the most crashes have occurred is in the middle of the map (B, C, E, F, H, I, and J). This crash location occurs just after the road changes from a four-lane divided highway into a two-lane highway. These crashes have a variety of different factors: all seven of the crashes happened when the road was dry; four involved aggressive driving; one involved excessive speed; and one involved alcohol. For the aggressive driving and excessive speed crashes, the change from four lanes to two lanes should be considered as a possible influence on driver behavior.

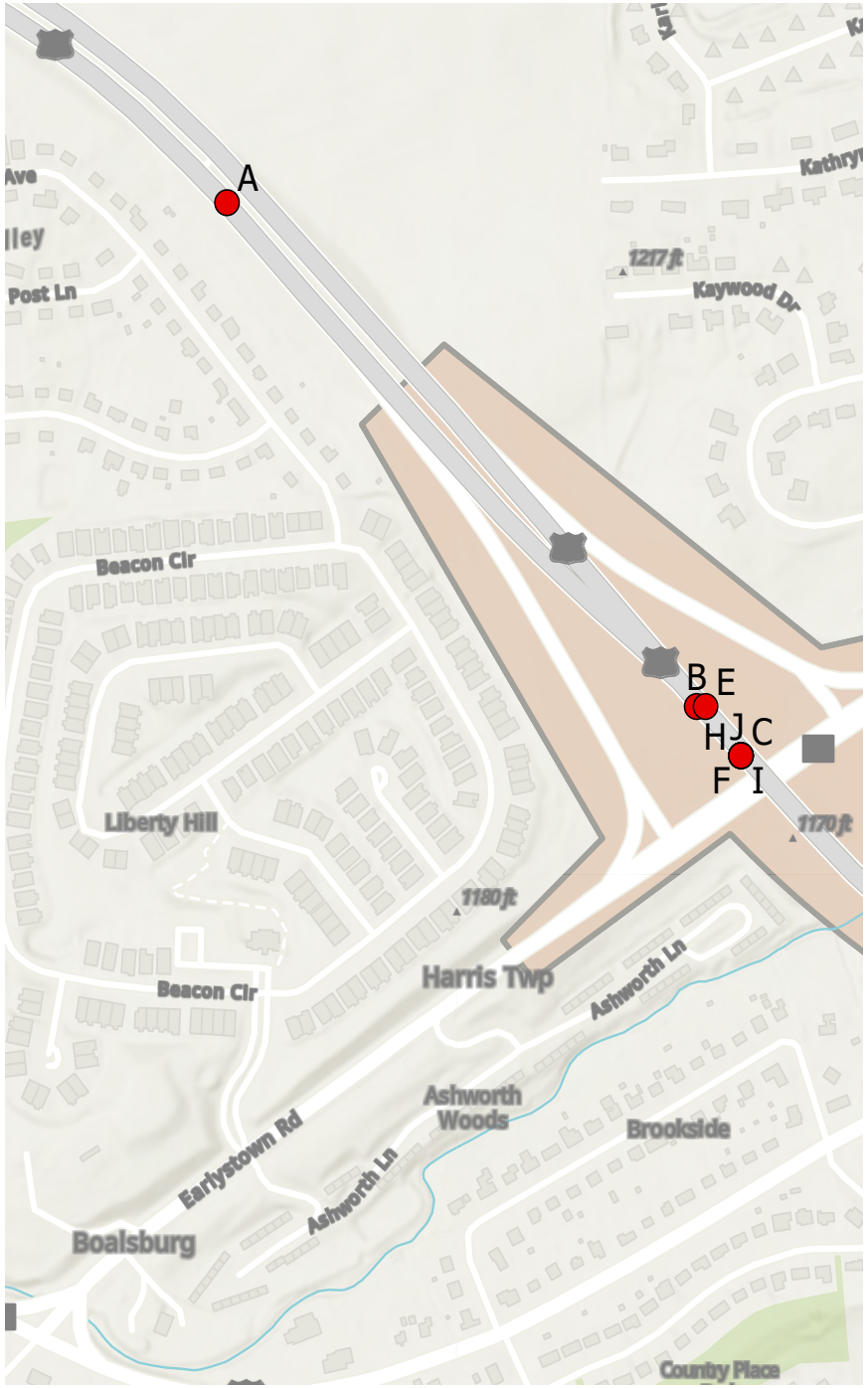

Figure 4.1 - 2020-2022 Crashes.

Image: PennDOT PA Crash Information Tool

Boalsburg Transition Proposal

Right Lane Exit Only

Based on the afore mentioned crash data, the following strategy was developed to address safety for the Boalsburg Transition. By rethinking the current alignment and geometry of the intersection, the proposed design ideas outlined below could improve the safety and function of the area with minimal cost and effort.

When traveling east on the Nittany Expressway (U.S. Route 322) from State College, U.S. 322 transitions from a four-lane divided highway to a two-lane highway with a double yellow line. Immediately before this transition is the exit toward Old Fort, PA 45. At the exit, U.S. Route 322 is a four-lane divided highway with a median. Immediately after the exit, eastbound U.S. Route 322 compresses from two lanes into one lane. Then, in less than 1,000 feet, the road changes from a divided highway to a two-lane arterial road. This area of transition has a high crash rate that may be attributed to design factors (the high-speed merge from two lanes to one lane) and driver behavior factors (drivers speeding to get ahead of other drivers before the merge ends).

To improve the segment, it is proposed to make the existing right lane approaching the PA 45 exit into an "Exit Only" lane. This would separate the through traffic to Potters Mills (and points east) from the local traffic going to Boalsburg and Old Fort in advance of the exit at Boalsburg. The "Exit Only" lane will eliminate the two-lane to one-lane high-speed merge just beyond the exit. With this simple change, all through traffic would be single file by the time it passed the PA 45 exit, thus eliminating the existing high-speed merge. This will help give drivers continuing east to Potters Mills advance warning, before the exit at PA 45, that the road is transitioning to a single lane, and encourage slower speeds before the divided highway transitions to the two-lane highway. It is hoped that this change will reduce the aggressive driving around the pinch-point of the road.

Figure 5.1 - Boalsburg Transition Zoomed Out. Image: Google Earth

Figure 5.2 - Boalsburg Transition Zoomed In. Image: Google Earth

Figure 5.3 - Image of split off towards PA Route 45 . Image: Google Earth

Figure 5.4 - Perspective. Image: Ryan Stackiewicz

Biography

Ryan Stackiewicz
Fourth-Year Landscape Architecture Student

Ryan is from Murrysville, Pennsylvania. He enjoys playing lacrosse and hockey, and loves being outdoors to fish and hunt. He is interested in urban design. In the future, Ryan is excited to create designs that all people can enjoy and use in different ways.

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Penns-Brush Valley Aeriel View
Image: King of Hearts

Traffic Calming

Joey Spatola | LARCH 414 | Fall 2023

Strategy

Flexible highway design is a strategy promoted by FHWA and the AASHTO to reconsider how we design highways. Flexible highway designs work to accommodate the safety and access needs of all user groups in a highway corridor. Rather than focus on a single or limited user group (commuter traffic, for example), flexible highway design balances the safety and efficiency of all user groups (commuter traffic and bicycle, school, pedestrian, recreation, and commercial traffic). Flexible highway design includes multi-modal corridor planning for different user groups, traffic calming to lower speeds, and enhanced pedestrian safety or local access in congested areas. Flexible highway design ensures the maximum safety for all user groups rather than the maximum efficiency for a single user group.

U.S. Route 322
Image: AAroads

Rethinking the Current Route

Why improvements to the current road could be an option

This section will focus on alternatives to maximize the reuse of the current two-lane U.S. Route 322 corridor to minimize impacts to local communities, businesses, and agriculture. It will suggest alternatives to accommodate both through traffic and local traffic along as much of the current alignment as possible.

While the PennDOT SCAC, Planning and Environmental Linkages (PEL) eliminated the current alignment of U.S. Route 322 from consideration for the proposed SCAC due to existing safety and efficiency concerns, this student studio project will to rethink the existing road as a viable corridor. Under such a scenario, the redesign of the existing freeway transitions at Potters Mills and Boalsburg (see Strategy 2, Rethinking Safety) could more efficiently and safely transition traffic to a new two (plus) lane roadway to improve the corridor along the existing alignment. In addition, improvements, such as left turning lanes, truck climbing lanes and safety medians in areas could enhance safety. This alternative would minimize land takings and eminent domain proceedings.

Figure 1.0 - **Route 322 Boalsburg, two-lane rural highway with shoulders.** Image: Google Earth

Figure 1.1 - Route 322, Potter Township, two lane rural highway with center turning lane.

Image: Google Earth

Repairing and improving existing roads can often be more advantageous than constructing entirely new roadways. It is generally more cost effective to refurbish an existing road than to embark on the extensive and resource-intensive process of building a new one. This is particularly true when the existing road layout is functioning effectively but requires upgraded modifications to correct safety deficiencies and functional weaknesses. Additionally, renovating existing roads helps to preserve valuable environmental resources by avoiding the need for extensive land clearing and reducing the ecological impact associated with new construction. Moreover, upgrading existing roads minimizes disruptions to local communities as it typically involves less land acquisition and a shorter construction timeline compared to building entirely new corridors. Finally, by optimizing the functionality of existing road networks, governments and municipalities can make more sustainable use of limited infrastructure budgets, directing funds towards maintaining and improving the overall quality and safety of transportation systems.

In summary, revitalizing existing roads stands as a pragmatic and environmentally conscious strategy that addresses infrastructure needs while considering safety, economic, social, and ecological factors.

Revitalizing 322

"Farming alone is stressful, but when you know you're going to lose something that you worked so hard for and your parents before you worked so hard for, I can't put it in words."

-Jesse Darlington

A vision for improving 322 without dividing farms and families

Farms and families in Penns-Brush Valley will be directly impacted by the proposed SCAC. The farms, where families work hard to grow crops and take care of animals, are already being disrupted due to the uncertainty of the SCAC corridor studies and environmental evaluations. The families who have lived in this area for generations are feeling a sense of loss. A new road alignment is likely to forever change a landscape they know and love. It's not just about the physical changes, it's about the memories and traditions that are being affected.

After years of efforts to save Colyer Lake amid concerns over the dam's security, local residents now face a new challenge. In 2022, they voiced concerns about the proposed SCAC project and its potential impact on the lake they fought to protect. This ongoing advocacy reflects a long-standing tradition of community dedication to preserving Penns-Brush Valley.

Image: Save Colyer sign on Route 322

Image: *Centre Daily Times*

Image: *Centre Daily Times*

Problems on 322

Speed

The dangers associated with the speed of cars are serious concerns that affect communities everywhere. When cars travel at high speeds, the risk of accidents and injuries increase significantly. High-speed driving reduces the time drivers have to react to unexpected situations, such as sudden stops or obstacles in the road. It also increases the distance required for a vehicle to come to a complete stop, which can be especially dangerous in emergency situations.

When we focus on the specific issue of speeding on Route 322 through Penns-Brush Valley, the concern becomes more localized. The problem of cars and trucks speeding through Penns-Brush Valley exacerbates these general dangers. The alignment of the road, combined with limited sight distance, makes high-speed driving particularly hazardous. The proximity of homes, farms, and businesses to the road increases the potential for severe consequences in the event of an accident.

Efforts to address the dangers of speeding on Route 322 in Penns Valley may involve a combination of enhanced law enforcement, traffic calming measures, and community awareness initiatives. It's crucial to recognize that the consequences of speeding extend beyond the risk of accidents to touch the fabric of the community itself, affecting the well-being and sense of security of the people who call Penns-Brush Valley home.

Image: Vehicle Collision Image: John Foy

Image: Vehicle Collision Image: *Centre Daily Times*

Image: Errant Vehicle Image: wjactv.com

Traffic Calming

What is traffic calming?

Traffic calming is a set of strategies and measures implemented to manage and reduce vehicular speed on roads, creating safer and more livable environments for communities. The goal is to slow down traffic and enhance safety for pedestrians, cyclists, and motorists alike. In the context of Penns-Brush Valley and U.S. Route 322, traffic-calming measures could play a crucial role in addressing the specific problems associated with speeding.

Implementing traffic-calming measures in Penns-Brush Valley on U.S. Route 322 would not only address the immediate safety concerns associated with speeding, but also contribute to a more pleasant and safer corridor. By creating an environment that encourages responsible driving, these measures can enhance the overall quality of life for residents, making the road safer for everyone and preserving the character of Penns-Brush Valley. This report will introduce two traffic calming techniques-roundabouts and green medians-that could help rethink the current U.S. Route 322 alignment.

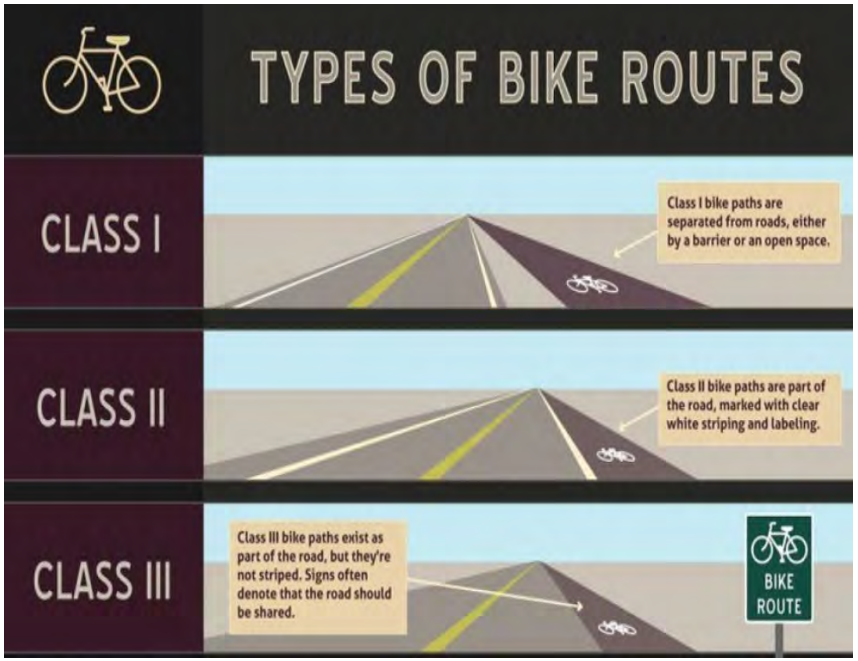

Image: Traffic calming bump out, Toronto, Canada

Image: City of Toronto

Image: Green median and crosswalk, Edmonds, WA

Image: Carmanah

Roundabouts

Image: Three-way roundabout in Alaska

Image: National Center for Rural Safety

Reduced Speeds: Roundabouts naturally direct vehicles to slow down as they approach and navigate the circular intersection, promoting safer driving speeds.

Continuous Traffic Flow: Unlike traditional stop signs or signal-controlled intersections, roundabouts keep traffic moving in a continuous flow, minimizing stops and starts. This leads to improved fuel efficiency and reduced emissions.

Fewer Conflict Points: Roundabouts have fewer conflict points compared to traditional intersections as they eliminate the risk of high-speed, right-angle, and head-on collisions. This can result in a lower overall number of accidents and decreased severity.

Pedestrian Safety: Roundabouts typically include crosswalks, and pedestrian refuge areas, enhancing safety for pedestrians. Additionally, the slower speed of vehicles makes it safer for pedestrians to cross the road.

Aesthetic Appeal: Well designed roundabouts can enhance the visual appeal of an area. Plantings and public art installations are often incorporated into roundabout designs, contributing to a more aesthetically pleasing environment.

Lower Operational Costs: Roundabouts typically have lower long-term operational costs compared to signalized intersections. They require less maintenance, and the absence of traffic signals reduces the need for ongoing electricity consumption.

Adaptability to Various Traffic Volumes: Roundabouts can be designed to accommodate a wide range of traffic volumes. They are suitable for both low- and high-traffic areas, and their design can be easily adjusted to match changing traffic patterns.

Encourages Smoother Traffic-Flow: The continuous movement of vehicles in a roundabout minimizes the need for aggressive acceleration and deceleration, contributing to smoother traffic flow and reducing the likelihood of traffic jams.

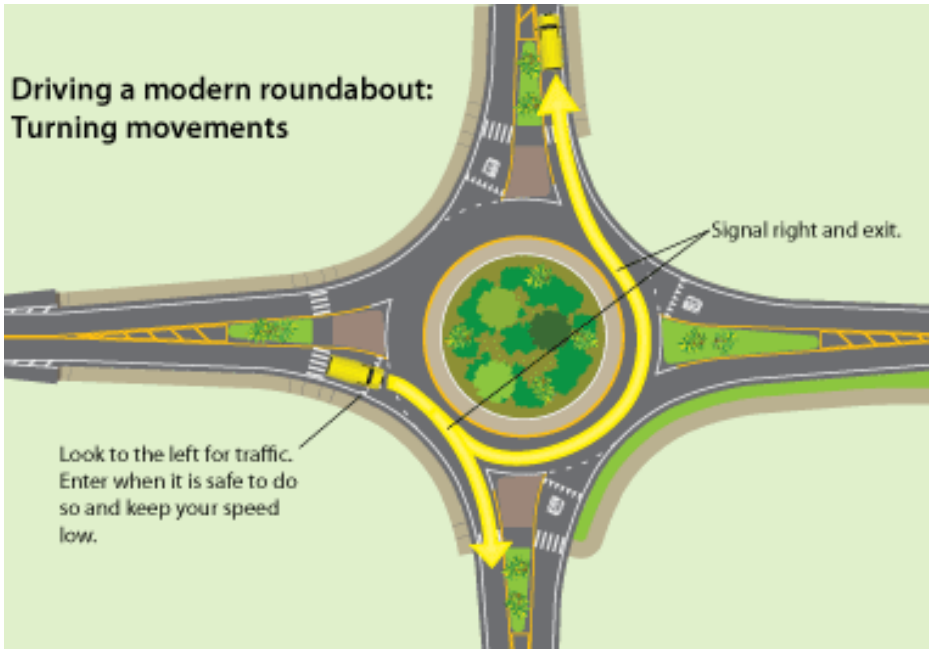

Image: Roundabout example

Green Medians

Image: Paris Pike, KY

Image: Jennifer Karim

Traffic Calming: Green medians serve as effective traffic-calming measures by narrowing roadways. This encourages drivers to slow down, improving overall safety for pedestrians and other road users.

Enhanced Aesthetics: Green medians contribute to the visual appeal of roadways, adding a touch of greenery and landscaping. This can enhance the overall aesthetics of the area and create a more pleasant environment.

Stormwater Management: Vegetated medians can absorb and filter rainwater, helping with stormwater management. This can mitigate flooding and reduce the impact of heavy rainfall on road conditions.

Improved Air Quality: The presence of vegetation in medians can contribute to improved air quality by absorbing pollutants and releasing oxygen. This is especially beneficial in urban areas with high traffic volumes and associated air pollution.

Biodiversity: Green medians provide an opportunity to incorporate a variety of plant species, contributing to local biodiversity. This can create a more ecologically-balanced urban environment.

Noise Reduction: Vegetation in medians can act as a natural barrier, helping to absorb and reduce noise from traffic. This can contribute to a quieter and more peaceful urban atmosphere.

Increased Property Values: Well-maintained green medians can enhance the attractiveness of neighborhoods, potentially leading to increased property values. This can have positive economic effects on local communities.

Pedestrian Safety: Medians can create safer crossing points for pedestrians by breaking up the flow of traffic. This is especially important in areas with heavy foot traffic or near schools and residential areas.

Image; Little Falls Parkway, Bethesda, MD.

Image: Dan Marriott

Intermittent Four-Lane Sections

Introducing occasional four-lane sections on a two-lane highway, particularly in congested areas, can significantly alleviate traffic congestion and enhance overall traffic flow. These expanded sections provide temporary relief by accommodating more vehicles, reducing bottlenecks, and allowing for smoother transitions in densely populated stretches. The additional lanes offer drivers increased flexibility, enabling them to overtake slower-moving vehicles and merge more seamlessly. This strategic use of intermittent four-lane configurations acts as a practical solution to mitigate congestion hotspots, ultimately promoting a more efficient and stress-free driving experience for commuters in busy areas of the highway.

The examples on this page show the Clara Barton Parkway in Maryland. The National Park Service parkway serves as an important commuter arterial into Washington, D.C.. To minimize impacts on the historic C&O Canal National Park, the parkway maintains a two-lane road for much of its route. However, intersections with the parkway are designed as four-lane limited–access highway segments. Importantly, the transitions from two-lane to four-lane are long and gradual, allowing a safe transition between roadway cross sections. This innovative design makes intersections safe and efficient (four lanes) while maintaining a narrow footprint for much of its length (two lanes).

Image: Clara Barton Parkway. Image: Google Earth

Figure 2.0 - Shows two-lane segment, Clara Barton Parkway. Image: Google Earth

Figure 2.1 - Beginning of median (a gradual transition), Clara Barton Parkway. Image: Google Earth

Figure 2.2 - Divided four-lane segment, Clara Barton Parkway. Image: Google Earth

Figure 2.4 - Divided segment transitioning to two-lanes, Clara Barton Parkway. Image: Google Earth

The Adaptation of 322

When considering the future development of the Harley Davidson complex, a commercial area located diring the 3-lane section of U.S. Route 322, a critical analysis of factors influencing traffic along U.S. Route 322 becomes imperative. Examining a precedent such as the Rockville Pike project in Maryland provides valuable insights. This initiative successfully alleviated congestion by re-routing vehicles away from the commercial area's main thoroughfare. By creating two separate roadways in close proximity to the buildings, the project not only redirected traffic away from the highway, but also seamlessly connected the various commercial establishments.

This deliberate design facilitated easier access for customers arriving from nearby buildings, fostering a more efficient and customer-friendly environment. Therefore, understanding and implementing similar traffic management strategies in the Harley Davidson commercial area could prove instrumental in optimizing both traffic flow and customer accessibility.

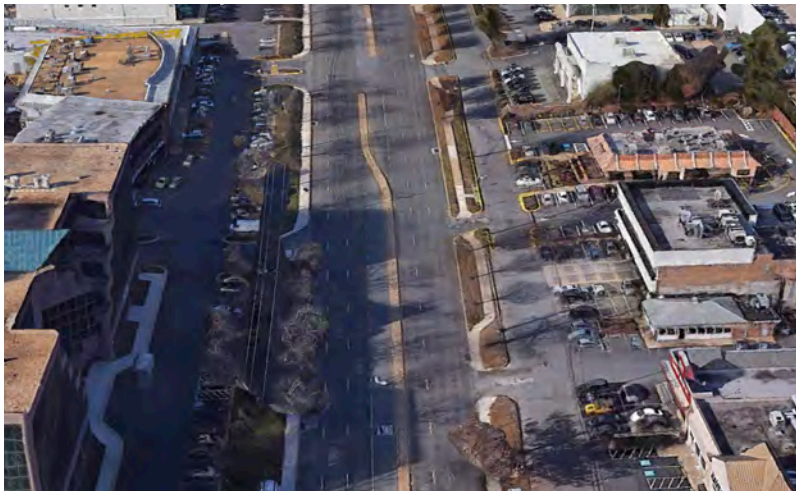

Image: Rockville Pike, MD Image: Google Earth

Image: Rockville Pike, MD Image: Google Earth

Exploring alternative designs, Figure 2.3 emerges as a promising solution. This design features the existing two-lane, intelligently separated by a 36-foot green median, effectively enhancing safety and traffic management. Adjacent to the buildings, two, four-lane commercial use roadways are strategically incorporated, deliberately designed to be narrow to encourage reduced driving speeds. Additionally, designated parking areas near the buildings contribute to a well-organized layout. The overarching goal of this design is clear: to divert commercial use traffic away from the highway while also marking distinct segments of roadways. By prioritizing safety and promoting controlled traffic flow, Figure 3.0 stands as a thoughtful and effective solution for optimizing the functionality of the area.

Biography

Joey Spatola
Fourth-Year Landscape
Architecture Student

Joey is from Wayne, New Jersey. He enjoys spending quality time with friends and family. Joey has a keen interest in urban design, and defines it as, "The art of efficiently organizing everything one might require within a manageable space." One of Joey's favorite quote is from Socrates which states, "Be as you wish to seem."

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Image: Seven Mountains, PA

Image: Banff National Park, Wildlife crossing.

Image: Parks Canada

Wildlife Crossings

Robert Beihl | LARCH 414 | Fall 2023

Strategy

Wildlife crossings are strategies to maintain functioning habitats before, during, and after the construction of a highway project. Successful wildlife crossings not only benefit migrating wildlife, but also reduce highway fatalities by minimizing the wildlife/driver interface. Different animals move in different ways and require different types of crossings, either over or under the highway. The types and locations of wildlife crossings required for reptiles and small and large mammals is based on observed patterns and habits.

Image: Banff National Park, Wildlife crossing. Image: Parks Canada

Habitat Connections

Background

Wildlife are an essential part in maintaining ecosystems. Centre County is home to a variety of species ranging from wild turkey to black bear. The development of a new alignment for U.S. 322 poses a new barrier to wildlife movement and habitat connectivity.

Problem Statement

Out of over 1,000 wildlife crossings in the United States today, Pennsylvania accounts for just 35 of those. Pennsylvania leads the nation in animal-vehicle collisions (State Farm). In 2022, Pennsylvania reported 156,176 animal collision accident claims, the highest number of any state. Wildlife crossings have been shown to be an effective means of creating connections for wildlife while protecting both human and animal lives.

Images: PennDOT

Image: Beihl, Robert. *Overlooking the Valley.* 28 Sept. 2023. Potter Township.

Habitats within the valley are heavily fragmented by agricultural and suburban development. Despite this, wildife continues to navigate through the valley, potentially leading to fatal vehicle collisions.

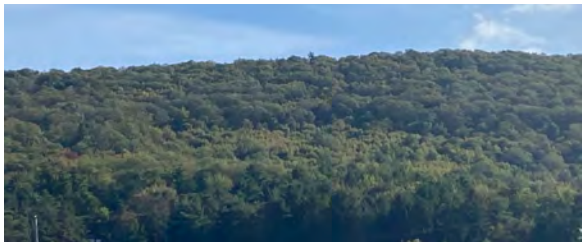


Image: Beihl, Robert. *Woodland Habitat.* 28 Sept. 2023. Potter Township.

Woodland habitat located on the ridge sees use by black bears, deer, and turkeys. Alignment U.S. 322-5 could potentially create a barrier here for movement, interrupting current wildlife movement patterns and isolating populations.

Wildlife of Central Pennsylvania

Central Pennsylvania is home to a variety of wildlife, ranging from large mammals like the black bear to small herptiles like salamanders. All of these animals play an important role in the ecosystem of Central Pennsylvania. Each individual species needs a certain range of space to live; however, human development threatens this space. Knowing the home ranges of these species while creating new roadways can help to mitigate the impacts development may have on wildlife habitats.

Birds

Wild Turkey (Range: 1-3 mi^2)

Great Horned Owl (Range: 1.5 mi^2)

Herptiles

Jefferson Salamander (F Range: 100 –1,227 ft^2) (M Range: 11–1,950 ft^2)

Spotted Salamander (Range: 46 ft^2)

American Bullfrog (Range: 226 ft^2)

Small Mammals

Squirrel (F Range: 1 mi^2) (M Range: 3 mi^2)

Fox (Range: 2-3 mi^2)

Skunk (Range: 4 mi^2)

Rabbit (Range: 7.7 mi^2)

Med/Large Mammals

Coyote (Range: 30-60 mi^2)

White-tailed Deer (Range: 3-5 mi^2)

Black Bear (F Range: 6-8 mi^2) (M Range: 20 mi^2)

Types of Wildlife Crossings

Wildlife crossings are specially designed structures that allow wildlife to cross over or under human-made barriers safely. Various types of crossings exist depending on the animals that are intended to use them and the environment in which they are built. Below are examples of some wildlife crossings in use today.

Image: PennDOT

Viaduct

As the largest of underpass structures, they allow passage for a wide range of wildlife. These are effective because of the large open natural areas. This design should only be considered based on the needs of the topography of the area.

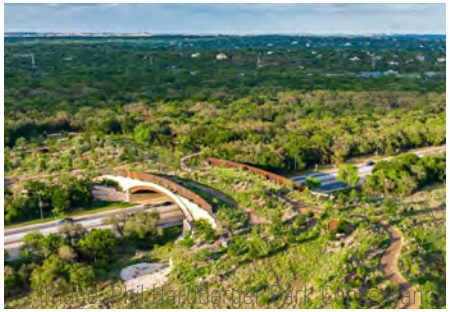


Image: Philadelphia Park & Recreation

Multi-use Overpass

As the smallest wildlife overpass, they are designed for both human and animal use. They are best adapted for human-disturbed environments and are meant for small to medium mammals accustomed to human activity.

Image: Parks Canada

Landscape Bridge Overpass

As the largest overpass, they can accommodate a wide range of animal diversity and habitat connections. They adapt to road infrastructures for specific wildlife movements and species like amphibian and reptile passages.

Image: F. Ottbox

Amphibian and Reptile Tunnel

These crossings are for use by amphibians and reptiles. Use by certain species depends on size, placement, moisture, temperature, and noise. These are best constructed as multiple tunnels along sections of road.

Image: PennDOT

Mammal Underpass

While not as large as viaducts, they are the largest of underpass structures specifically designed for wildlife use. For best performance, this underpass must be in an area with minimal human disturbance.

Image: Parks Canada

Multi-use Underpass

These are similar in design to a mammal underpass; however, the objective is to allow co-use between wildlife and humans. These will be used particularly by most species common in human-dominated environments.

Do animals know where to cross?

One way to ensure animals use wildlife crossings is to use right-of-way fencing. Fencing helps to guide animals away from the road and towards wildlife passage sites. Wildlife tend to be wary of unnatural situations and confinement. When given the choice between going through an unfamiliar wildlife crossing and crossing the highway pavement, they may choose the latter, leading to potential collision. Fencing safely directs wildlife to the crossing.

In addition, fencing along the edge of the highway should provide an "escape" route to allow larger mammals that get trapped within the highway right-of-way to return safely to the other side. In agricultural areas, crossings to allow for the movement of livestock between fields bisected by a highway project should be considered, helping to minimize the roadway's impact on agricultural operations.

Variables concerning the surrounding environment should be considered to ensure wildlife successfully use the constructed crossings. These variables include:

1. width, height, length
2. openness
3. structure floor material
4. distance to forest cover
5. distance to drainage
6. human use
7. traffic density
8. vegetation and soil
9. water drainage
10. home range

Current Accomodations and Human Interactions

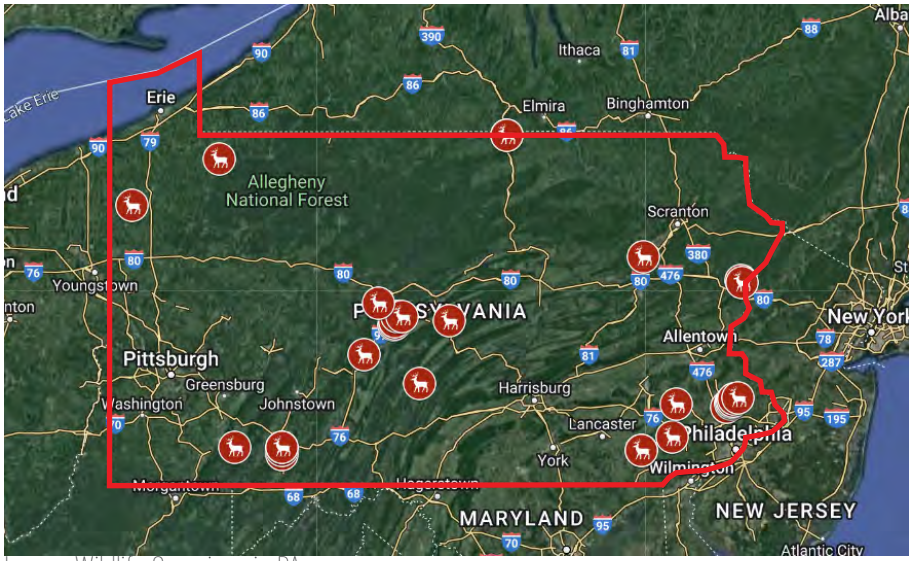


Image: Wildlife Crossings in PA

Pennsylvania Crossings

Pennsylvania has constructed 35 wildlife crossings, all of them being undercrossings. While most are located in remote northern and western counties, some are located in more developed areas of the southeast. Compared with western states, like Colorado with over 60 crossings, Pennsylvania is relatively behind the national trend. Even when looking to the East Coast, Florida has 60 wildlife crossings for panthers alone. Maryland, despite being a much smaller state, has 44 wildlife crossings.

A majority of crossings in Pennsylvania date to the early 2000s, and were constructed at the request of the Pennsylvania Fish and Boat Commission and Pennsylvania Game Commission. PennDOT has been collecting animal and crash data to identify potential crossing locations. Biologists from the U.S. Fish and Wildlife Service and game commissions identify migration and breeding patterns.

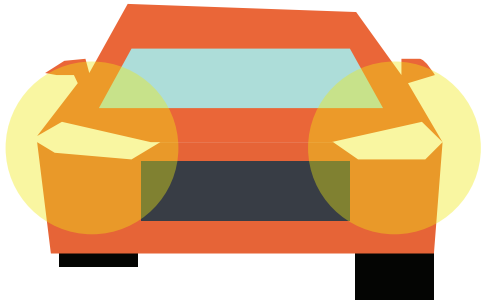


Image: LaMar, Scott

In 2021, wildlife collisions in PA resulted in 1,255 human injuries and 13 fatalities.

Image: State Farm

Programs and Policies

Bipartisan Infrastructure Law

As of Nov. 15, 2021, the Infrastructure Investment and Jobs Act was signed into law. This authorized $350 million in federal aid contract authority funding for fiscal years 2022 through 2026 for the purpose of reducing wildlife vehicle collisions (WVCs) while improving habitat connectivity. This money is awarded by the U.S. Department of Transportation through the Federal Highway Administration for the Wildlife Crossing Pilot Program.

PA House Resolution 87- Wildlife Corridors

On May 23, 2023, the Pennsylvania General Assembly adopted the Pennsylvania House Resolution 87. This law directs the House Legislative Budget and Finance Committee to study and issue a report on the status, management, and overall benefits of wildlife corridors. The report is set to be completed over the course of late 2024/early 2025. Since it did not need Senate passage or the governor's signature, the measure was implemented immediately. This resolution is a step forward to guide PennDOT in developing a plan to reduce future wildlife collisions.

WCPP Competitive Grant Program

The WCPP is a competitive grant program put forward by the FHWA with the goal of reducing WVCs while improving habitat connectivity for terrestrial and aquatic species. PennDOT plans to make grant selection announcements in early 2024.

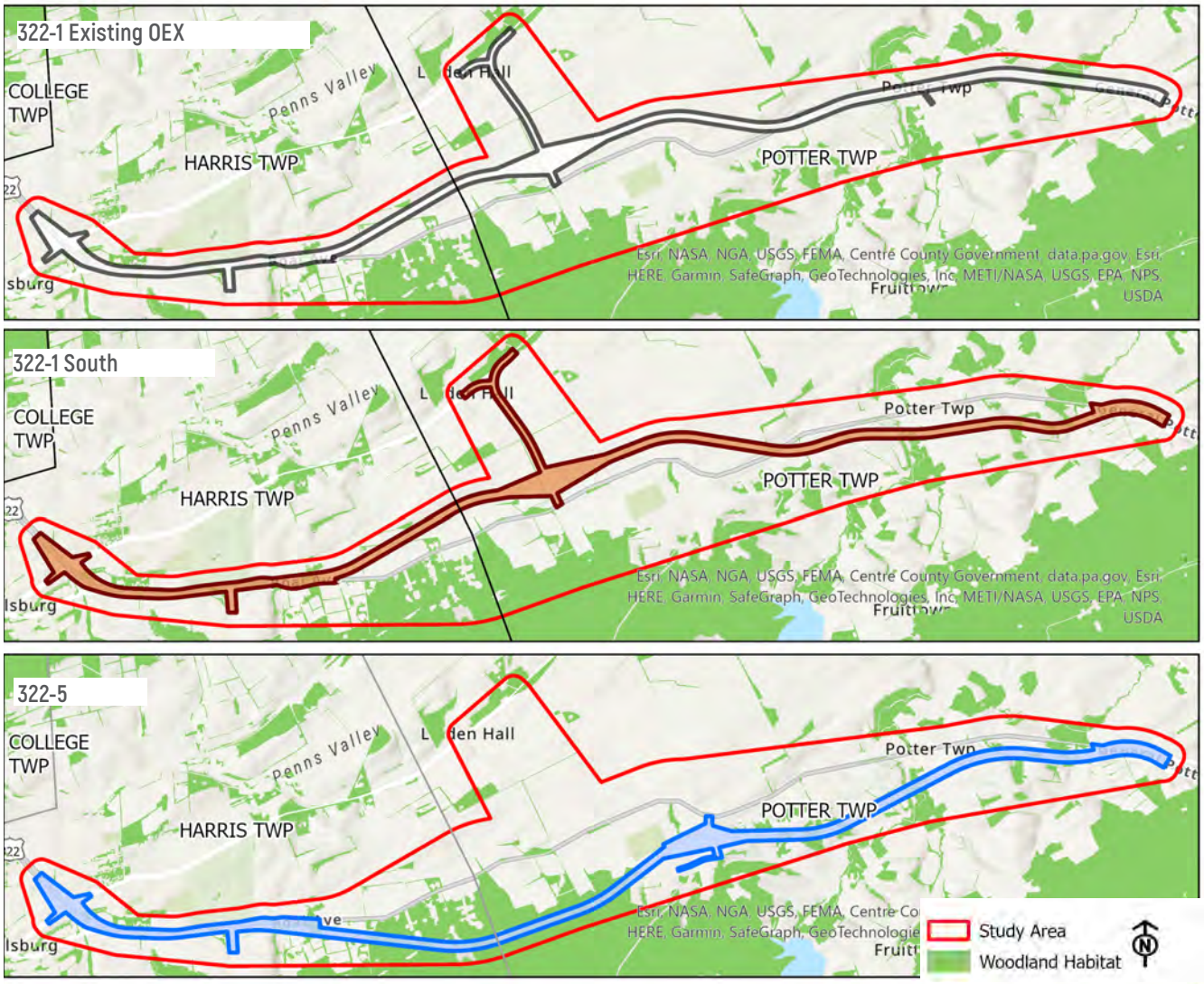
Applicants include:
State Departments of Transportation
Metropolitan Planning Organizations (MPOs)
Units of local government
Regional transportation authorities
Special purpose districts or public authorities with a transportation function
Indian tribes
Federal Land Management Agencies (FLMA)

Eligible Projects Include:

Construction Projects
Engineering, design, permitting, right-of-way acquisition, and other activities related to infrastructure improvements, such as the building or designing of a wildlife crossing overpass or underpass.

Non-Construction Projects
Planning, research, and educational activities that are not directly related to the construction of infrastructure improvements, such as a hot-spot analysis of WVCs.

Habitat Impacts of 322 Alignments



Out of the three alignments currently put forward, alignment U.S. 322-5 has the most visible impact on woodland habitats, cutting directly through a large area. All three alignments will have impacts on the movements of wildlife in the valley. PennDOT has yet to conduct wildlife impact studies.

Pennsylvania Crossing Precedents

Images: PennDOT

I-99 State College and Bald Eagle - Centre County, Pennsylvania

In 2007, 18.2 miles of new four-lane limited-access highways were set to go through what was primarily forested habitat in the Bald Eagle Mountain area. In order to preserve environmental connectivity, five wildlife undercrossings were constructed. In the years that these passages were monitered, 2008-10, there was an 85% decrease in animal fatalities. Today, these crossings regularly see use by black bears, bobcats, deer, and Canada geese.

Images: PennDOT

SR 209 at Marshalls Creek - Monroe County, Pennsylvania

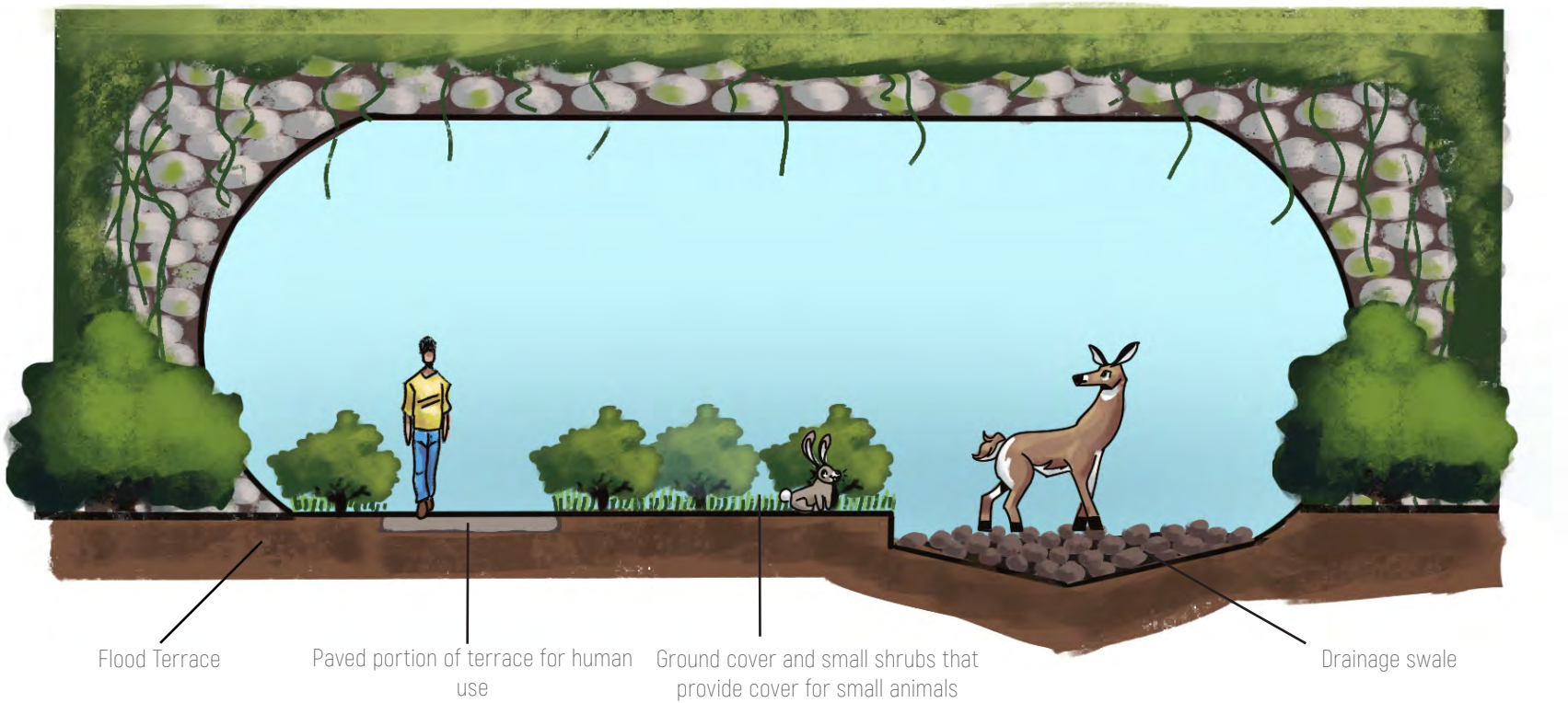
As part of the SR 209 project, located in Monroe County, three large and medium mammal crossings were built. These were included along the section of road between Seven Bridges Road and Milford Road. All three crossings are underpasses designed for use by black bears and white tail deer, but they also facilitate medium and small animals such as bobcats, fox, and geese. They were put into use in 2012.

Images: PennDOT

SR 219 at Meyersdale - Somerset County, Pennsylvania

In 2017, as part of a wetlands mitigation project in response to a new roadway, the USFWS requested the construction of wildlife crossings. The crossings constructed included a large mammal box underpass and a small animal “critter crossing.” Monitoring was added to the comprehensive mitigation plan. This project is now part of PA Gamelands 50.

Multi-use Wildlife Crossings: Mitigate & Integrate



The concept behind this design is to mitigate the impacts of human development and integrate into the surrounding environment. The first decision was to make a multi-use wildlife crossing. A majority of the area that the U.S. Route 322 project will span is an area that has human disturbance and human presence. Multi-use wildlife crossings will benefit both human use (such as recreation or multimodal trails) and wildlife use. This allows species that are accustomed to humans in the valley to continue to be able to move, mitigating the negative impacts that the new highway alignment might have. Looking at how to integrate into the environment, most wildlife undercrossings in Pennsylvania use the box culvert style with the concrete wings. These structures call attention to themselves by being clearly man-made. In order to better blend into the environment, stone, tinted concrete, or textured concrete could be used on its walls as well as naturalized plantings in and around the crossing. This would help to make the crossing look less human-made and more natural.

Biography

Robert Beihl
Fourth-Year Landscape Architecture Student

Robert plans to receive his Bachelor's in Landscape Architecture in the Fall of 2024. He is interested in creating sustainable designs that work for both human and wildlife needs. In his spare time he paints landscapes, draws, and plays the piano.

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Image: Hailey Sukols

Penns-Valley Drive
Image: Nicholas_T via Flickr

Agricultural Landscape

Layla Khalifa | LARCH 414 | Fall 2023

Strategy

Penns-Brush Valley is a largely intact agricultural landscape. A large section of the district has been "determined eligible" for the National Register of Historic Places as a Rural Historic District by the Pennsylvania State Historic Preservation Office (PA SHPO) and the National Park Service. As a National Register of Historic Eligible District, PennDOT is required to undertake a Section 106 Review (National Historic Preservation Act of 1966) as part of the agency's state and federal environmental review process.

Image: 19th Century Penns Valley
Image: Penns Valley and Brush Valley Rural Historic District,

Brush Valley in 19th Century Image: BHP File #119404

Historical Context

The natural context of the Ridge and Valley landscape played a significant role in the agricultural and physical development of Penns-Brush Valley. The agricultural landscape of the valley is defined by the vertical edges provided by the forested mountains. Most of the district's historical landscape stay intact within their natural context and the agricultural patterns persist and are visible on the landscape (2002, March 15).

The farms of Brush Valley are aligned with the main road and the fields have been planted to reflect the linear characteristics of the valley; whereas, in Penns Valley, with its more rolling topography, farms often have been tucked in among the hills with steep, wooded hillsides as their backdrop. They result in a more irregular landscape patchwork (2002, March 15). The proposed SCAC Corridor could significantly disrupt these characteristics.

The historic agricultural landscape of Penns Valley and Brush Valley have a clear correlation to the economic and social patterns of the area's past. For example, existing barns in the area were built to accommodate dairy herds, the wire fencing along roads was made to confine the farm animals, and field patterns became more regularly shaped to accommodate farmers' machinery. The landscape's significance is acquired from features like open fields, property boundaries, and the orientation of buildings concerning roadways and natural features (2002, March 15).

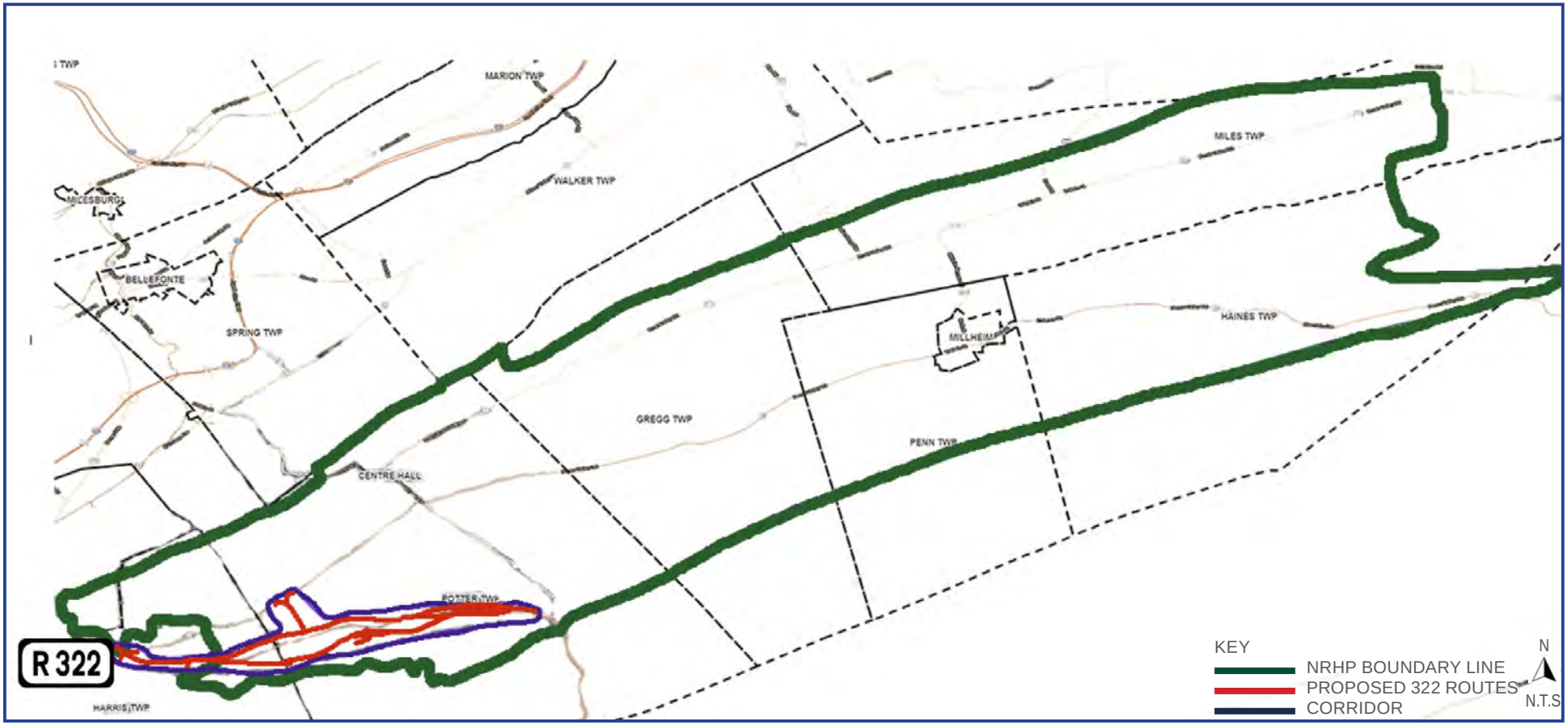
Historical Agricultural Landscape Still Remaining

Preserving the unique character and rich agricultural heritage of Penns-Brush Valley stands as a responsibility for the community. Among picturesque landscapes and abundant fields, Penns-Brush Valley exudes a charm that is deeply intertwined with its agrarian history. As we navigate the challenges of constructing a new corridor for U.S. Route 322, it is imperative to create a balance between progress and tradition, fostering sustainable practices that not only protect the area's distinctive character, but also nurture its agricultural legacy. The community can work together to build a future where the essence of Penns-Brush Valley's rural identity and farming heritage flourishes for generations to come.

Image: View from 322 within proposed corridor. Image: Layla Khalifa

The image above was taken while driving through Penns-Brush Valley on Route 322. The rolling hills and fertile farms still stand as of now.

Historical Area of Penns-Brush Valley



Map of NRHP Boundary Line within Penns-Brush Valley

Image: Layla Khalifa

The National Register of Historic Places

For National Register eligibility, resources are generally considered historic if 50-years-old or older–a rolling benchmark that serves as a general litmus test of credibility. The National Register recognizes sites, districts, multiple-properties and thematic resources. For Penns-Brush Valley we have examples of sites and districts.

Site

National Register sites are individual properties such as a house or a farm. Historic roads may also be listed as sites, such as a historic turnpike, for example.

District

National Register districts are contiguous areas that present a number of contributing resources that are historically interdependent and sufficient in number to showcase a particular period(s) of significance, such as a neighborhood or industrial site. For Penns-Brush Valley, the historic district recognizes buildings and structures such as farm houses, barns, churches and bridges. It also recognizes landscape resources such as field patterns, woodlands, watercourses viewsheds (such as views of Mt. Nittany), and the connective networks or roads and paths that historically united the district. A district includes all aspects that distinguish an area that is representative of a specific period of history and human activity (such as farming).

Section 106

Section 106 of the National Historic Preservation Act of 1966, 16 U.S.C. §470f, requires all federal agencies to "take into account" the effects of their actions on historic sites and districts. These actions involve federally-sponsored or funded projects, as well as state, local, or private activities and projects that are subject to federal licensing, permitting, or other approvals. Whether on the National Highway System (NHS) or not, all roads in the United States that utilize, in whole or in part, federal transportation funds, must comply with Section 106 of the National Historic Preservation Act or Section 4(f) of the Department of Transportation Act of 1966. Most every road project in the United States has federal funding, licensing, permitting, or approval at some point during the scoping, design, and construction process.

Under Section 106, if the proposed action will have an "effect" or impact on a historic property, the owner or managing agency (local, state, or federal) is required to undertake a review of the proposed action and consult with the SHPO to determine its effects on the integrity of the historic property prior to approving and funding the project. For example, if a historic district (such as Penns-Brush Valley) is listed in or determined eligible for listing in the National Register, and the local transportation office/department received federal dollars either directly from FHWA or indirectly through the DOT to reconstruct the road (even if the federal funds were only a partial source of the total cost), the agency (PennDOT, in this case) is required by federal statute to consult with the SHPO prior to beginning the project for approval. Often this consultation leads to a modification of the proposed action to protect the historic resource.

In some instances, the historic property or district can be altered, or even destroyed if there is a compelling reason for the action. Under such circumstances, mitigation for the loss of historic resources must be arranged in an agreement with the managing agency or owner and the SHPO. Mitigation agreements may take many forms, including documentation of the resource (photos and measured drawings), funding for another historic preservation project in the community, or the development of education and interpretation programs. If an agreement cannot be reached at the state level, the Advisory Council on Historic Preservation may be called on to intervene and render a judgment.

As with all historic sites and districts, listing or eligibility for listing in the National Register for a place does not exempt it from change. In instances, a compelling safety concern or overarching regional transportation goal may necessitate changes to a historic place. It is not the purpose of Section 106 to prevent any change, but rather to ensure that whatever action is finally determined will have recognized any historic resources and "taken into account" the full range of options to preserve those historic resources.

Analysis

Prime farmland soils will be disrupted or lost with the SCAC. Nearly three-fourths of the U.S. 322-1 (OEX) route disrupts productive agricultural land. Over three-fourths of the U.S. 322-1 (S) route disrupts productive agricultural land, and nearly half of the U.S. 322-5 route disrupts productive agricultural land.

Agricultural security areas (ASA) are a tool for protecting farms and farmland from non-agricultural uses. An ASA may include non-adjacent farmland parcels of at least 10 acres, or be able to produce $2,000 annually from the sale of agricultural products. This system benefits farmers and residents. All three proposed 322 connector routes disrupt ASAs. While these areas are protected, they are exemptions to board jurisdiction including work on existing highways and projects that have Federal Energy Regulatory Commission (FERC) or Pennsylvania Public Utility Commission (PUC) approval.

Kuhns Tree Farm

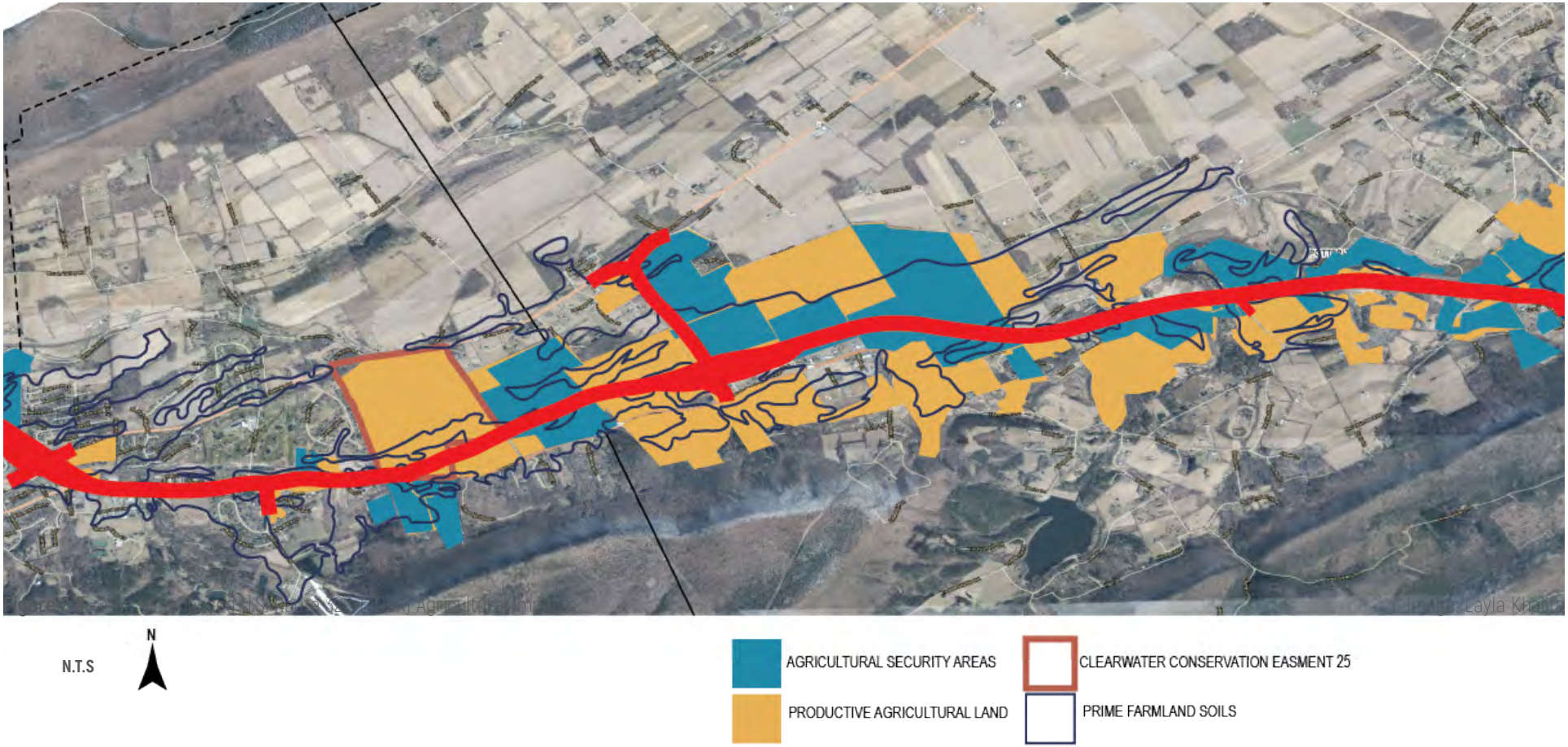
There are farms in Centre County where families have been working their land for more than 200 years. They honor the legacy of their ancestors and build their reputation as stewards of their land. Marianne Kuhns and her family, owners of Kuhns Tree Farm, are facing the potential impacts of the reconstruction of 322. Options US322-1 (OEX) and U.S. 322-1 (S) run directly through the farm's prime growing area, which could force them to close a family operation that has been serving Centre County since the 1980s. It takes seven years to grow seven-foot trees, so not only would the reconstruction of 322 close them down, it would make much of the work done to maintain the currently-growing trees redundant. When private farm property is being taken for public use, Pennsylvania offers all farms a set price regardless of the land's specific qualities. Longer term crops, such as trees, are not compensated as equitably as annual crops. Kuhns Tree Farm is just one of many fourth- and fifth-generation farms that may be divided by the connector road.

ClearWater Conservancy is a non-profit land conservation program in central Pennsylvania that is passionate about protecting land with important ecological functions and habitats. Its primary methods for land conservation are conservation easement and land purchase (ClearWater Conservancy). A conservation easement is a legal agreement between a landowner and a land trust that permanently limits the uses of the land to protect its conservation value (Western Pennsylvania Conservancy, 2023). So far, ClearWater has eased nine farms. These easements offer great flexibility and are beneficial to farms as well. ClearWater is protecting the rare wildlife habitats living on the farm, which benefits the ecosystem and fluidity of the farm. If need be, the trust might allow continued farming and building of additional agricultural structures.

Figure 1.0 - Map of Proposed U.S. 322 Routes Interfering Kuhns Farm. Image: Layla Khalifa

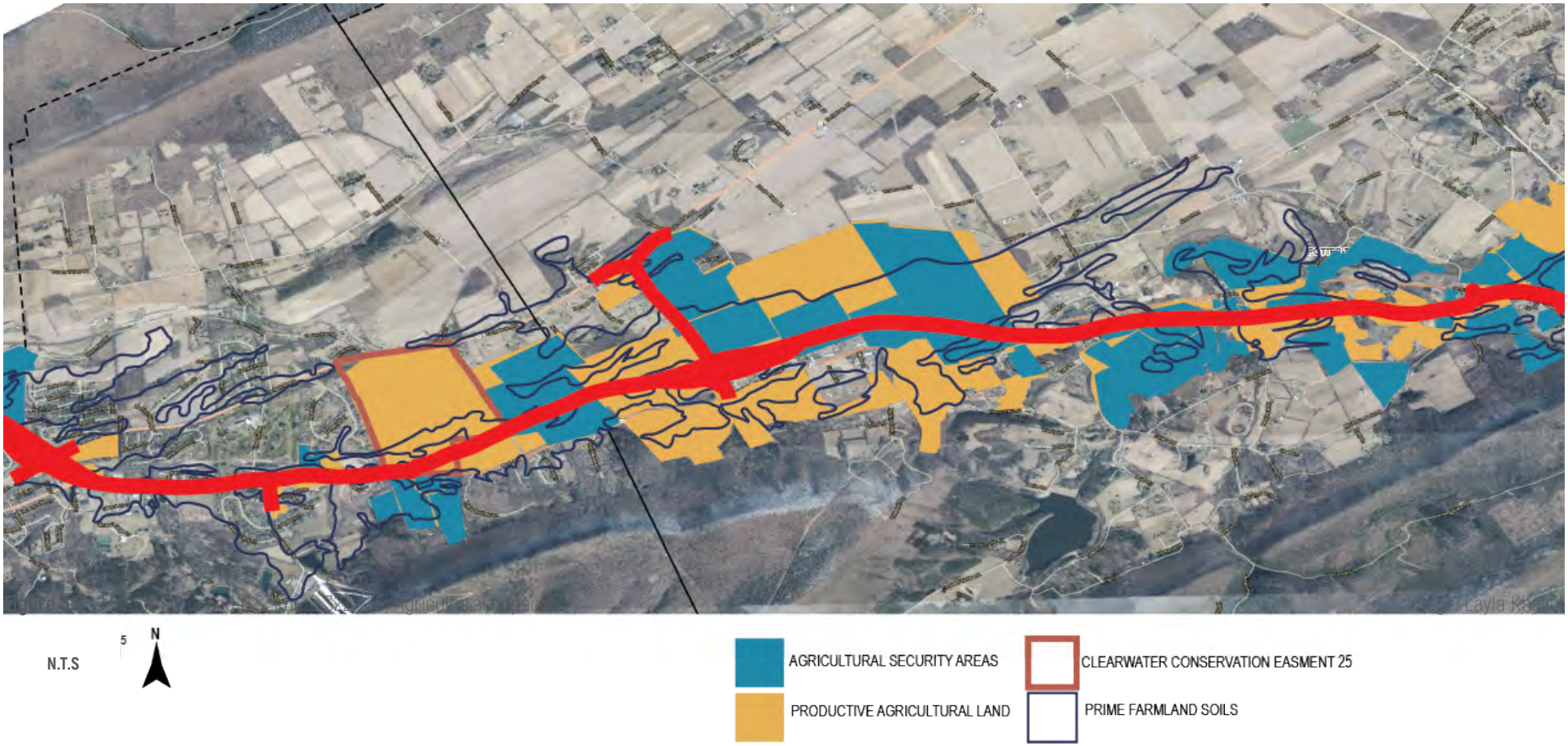
Image: Kuhns Farm Christmas Trees Image: Layla Khalifa

U.S. 322-1 (OEX)



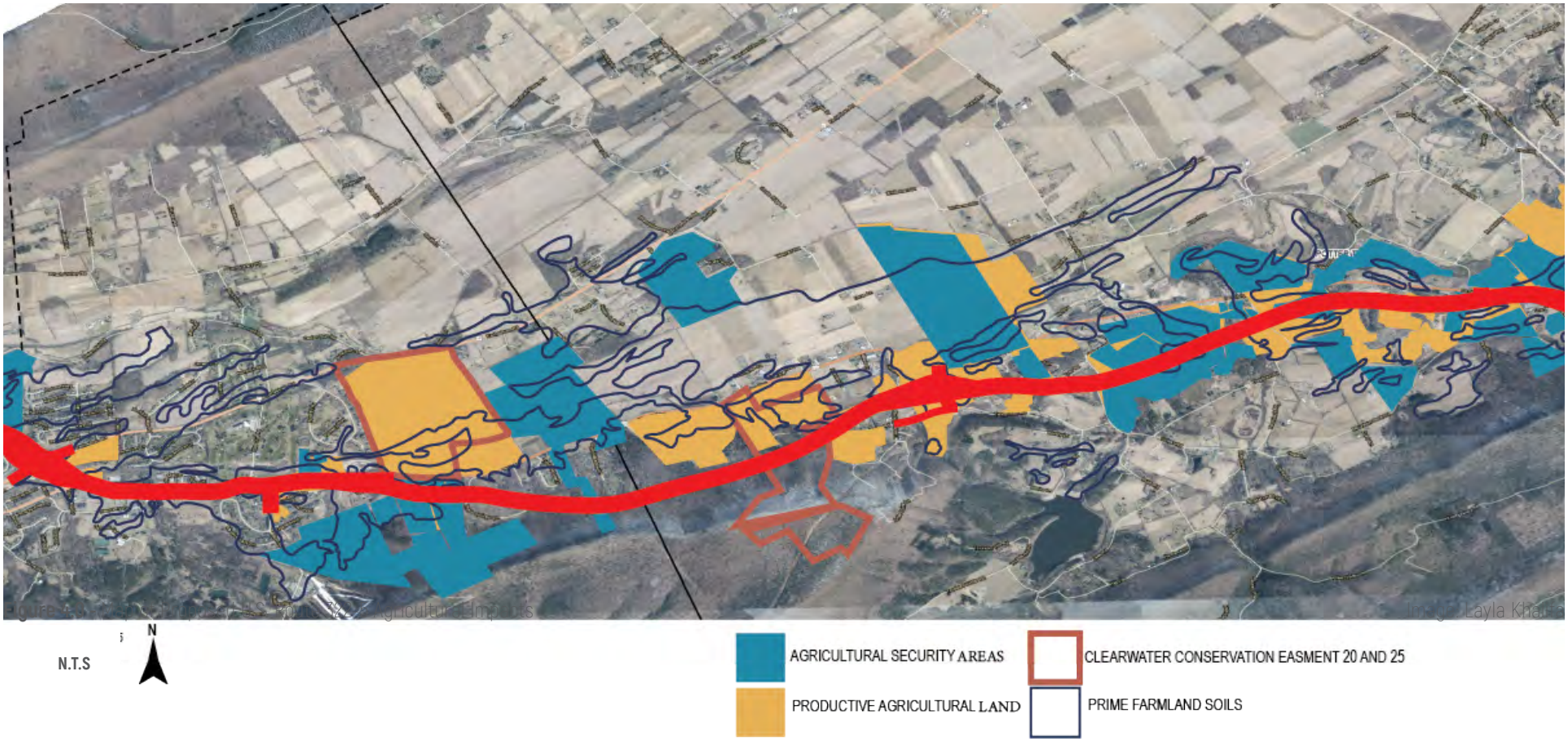
The map above outlines PennDOT's proposed Route U.S. 322-1 (OEX) and the agricultural implementations that it directly impacts. These implementations include agricultural security areas, conservation easements, productive agricultural land, and prime farmland soils.

U.S. 322-1 (S)



The map above outlines PennDOT's proposed route U.S. 322-1 (S) and the agricultural implementations that it directly impacts. These implementations include agricultural security areas, conservation easements, productive agricultural land, and prime farmland soils.

U.S. 322-5



The map above outlines PennDOT's proposed route U.S. 322-5 and the agricultural implementations that it directly impacts. These implementations include agricultural security areas, conservation easements, productive agricultural land, and prime farmland soils.

Biography

Layla Khalifa
Fourth-Year Landscape Architecture Student

Layla was born and raised in Downingtown, Pennsylvania. Before entering the ***Rethinking 322*** studio, she had minimal interest in highway and transportation design. She took several weeks to dissect this sector and find her place. It was not until Layla spoke to Marianne Kuhns, owner of Kuhns Christmas Tree Farm, that she found her interest in preserving Penns-Brush Valley's agricultural landscape. It resonated with her when she heard about family farm businesses being negatively affected by the proposed routes of 322 since Layla comes from a family-owned business. For the remainder of the semester, she deeply dove into the history and present day Penns-Brush Valley agricultural lands. This studio provided Layla with something to be passionate about, which fueled her desire to gain more knowledge regarding ***Rethinking 322***. It also showed her that landscape architects have a place in transportation and can make a meaningful difference within the sector.

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Image: Rotterdam, Netherlands, Earthen Sound barrier

Image: Summum Engineering

Sound Walls

Adam Tak | LARCH 414 | Fall 2023

Strategy

Sound walls parallel many of our highways to mitigate disruptive vehicle noise on adjacent communities, schools, and parks. Disruptive sound is detrimental to the well-being of local residents and wildlife. Sound walls are a solution to this problem, mitigating highway noise that commonly bothers communities near highways. While they can reduce noise pollution, they can also be designed as environmental and artistic additions to the local landscape. This section will examine alternative wall designs, as well as effective plantings as a green solution to noise.

Image: Danish vegetative sound wall Image:Pilebyg

Past and Present

"It took until the late '60s for people to realize the effects noise (cars) can have on everyday life."

-Kate Wagner

Background

After the Federal-Aid Highway Act was passed in 1956, car infrastructure spread across the United States at a rapid pace. The sound of cars was becoming inescapable, yet engineers and planners made no effort to develop or standardize any form of noise control before embarking on mass construction. Because of this, the first sound wall would not be constructed until 1968 in California. The earliest concepts were low-bearing concrete walls that would be absorbed by the surrounding vegetation and provide just enough privacy and protection for suburban residents.

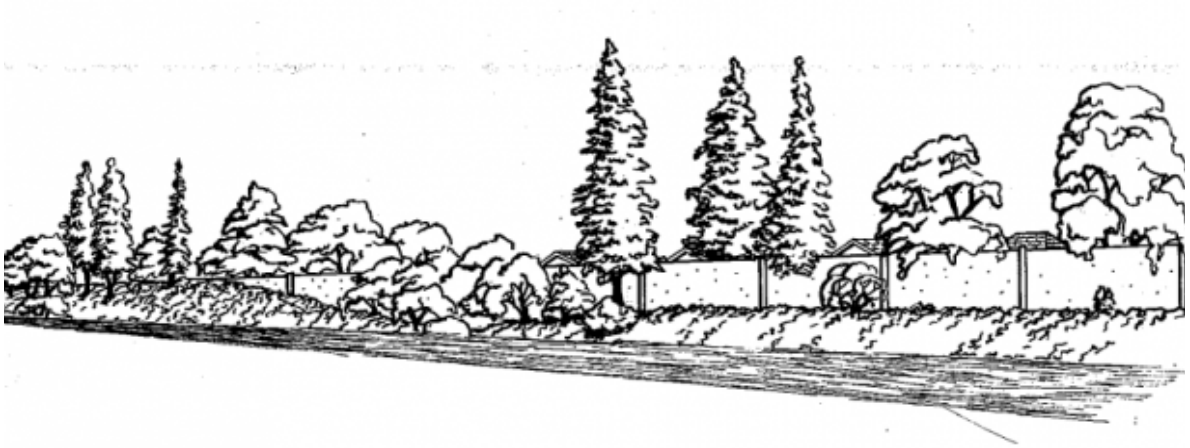


Image: California DOT early sound-wall prototype (1968)

Image: Virginia DOT I-81 (2018)

Present Day

Today, sound walls can be seen on many stretchs of highway. A study in 2010 found there to be over 2,700 miles of sound walls in the United States. While these walls are helpful in making surrounding residents feel more comfortable, they can be harsh on the visual appeal of the landscape. Whether it be blocking sight lines to major landmarks, poor material/color choice, or a lack of local in context or traditional materials, these walls can become scars on the landscape. With the average cost $2 million per mile, it's important that this funding is going towards a project that will enhance the road functionally and visually.

Why Are They Necessary?

"Tire noise is usually louder than engine and exhaust noise at vehicular speeds over 30 miles per hour."

-PennDOT

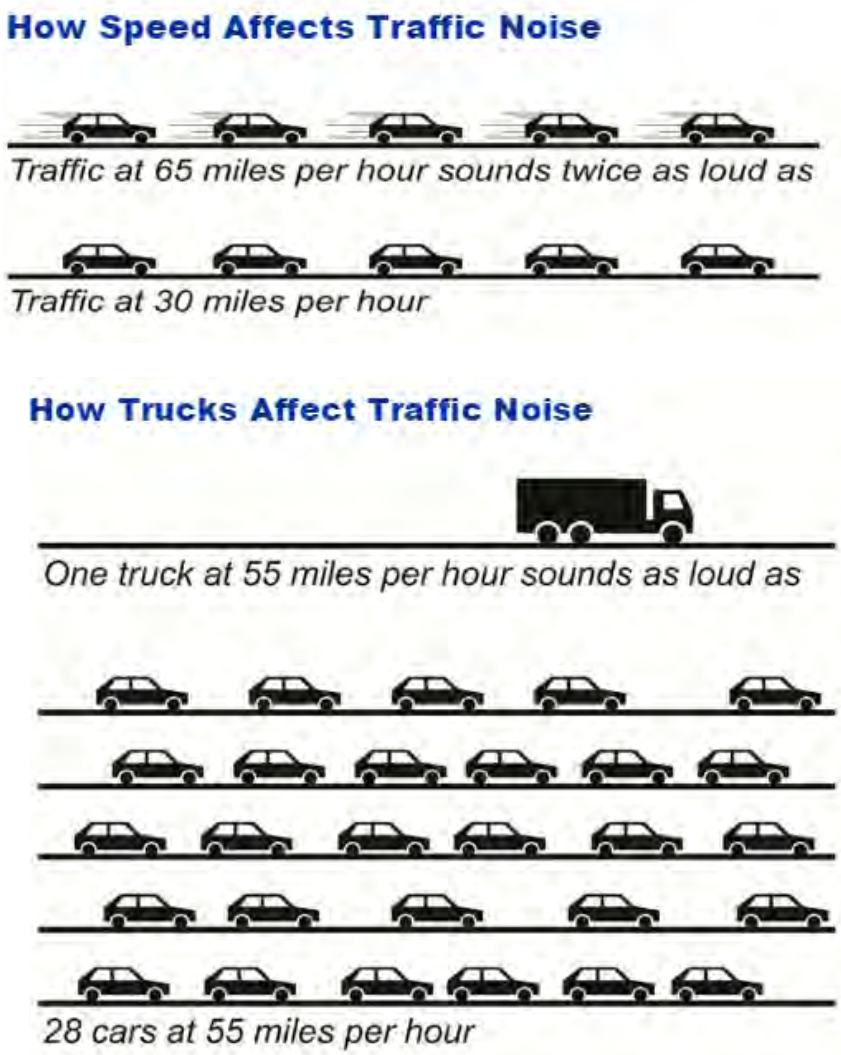
The World Health Organization notes that exposure to loud noises can cause a number of short- and long-term health problems, such as sleep disturbance, cardiovascular effects, and poorer work and school performance. Sound walls attempt to block as much of this noise as possible while balancing the ratio of cost to benefit. The need for sound walls is a product of the noise generated by the cars and trucks passing at high speeds. The majority of this sound is not coming from the engine noise but rather the friction between the asphalt and tires. This means that as speed and weight of a vehicle increase, so does the level of sound. For high-speed roads with high levels of traffic, the noise can be agitating to residents in close proximity.

Considerations

In Pennsylvania, PennDOT decides where sound walls are needed and feasible through a noise level simulation. Any properties in proximity to noise levels at or above 66 decibels are considered for a sound wall construction eligible. For reference, 66 decibels (dB) is comparable to the sound of a hair dryer blowing into your face.

Image: Adobe Stock

- Sound walls don't just keep the neighborhood quiet, they are a visual barrier between the road and private lands.
- PennDOT defines a soundwall project as a success as long as it can reduce sound levels by 5dB.
- For scale, the average person cannot perceive the difference of loudness levels at or below 3dB.

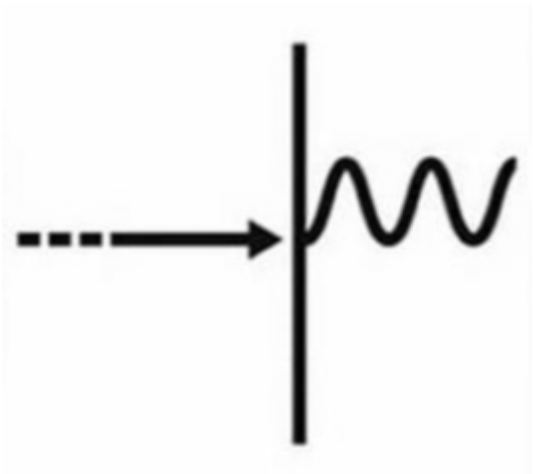


Images: PennDOT Sound Abatement Brochure

How Sound Interacts with Walls

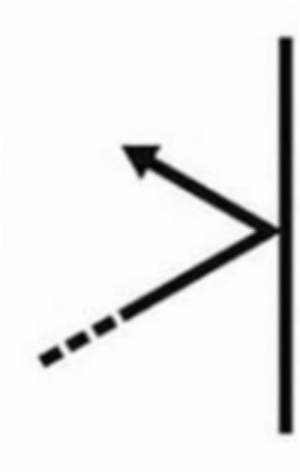
Absorbtion

Some sound is absorbed by the walls at different rates depending on density and thickness of material. High-frequency noise is absorbed, but lower frequencies are able to permeate most walls.



Reflection

Some sound is reflected off the walls and back toward the road. If walls are built too close on either side of the road, it can create a tunneling effect and even amplify the sound.



Diffraction

Because sound behaves like a wave, it is able to bend around walls and spill into the other side. Walls must be sealed to the ground to be effective and tall enough to block these waves.

Images: Adam Tak

Sight lines

As long as a wall cuts off the sight line between the source and receiver, there is an average reduction of 5dB. As the wall increases in height, every meter decreases the sound levels by about 1.5dB.

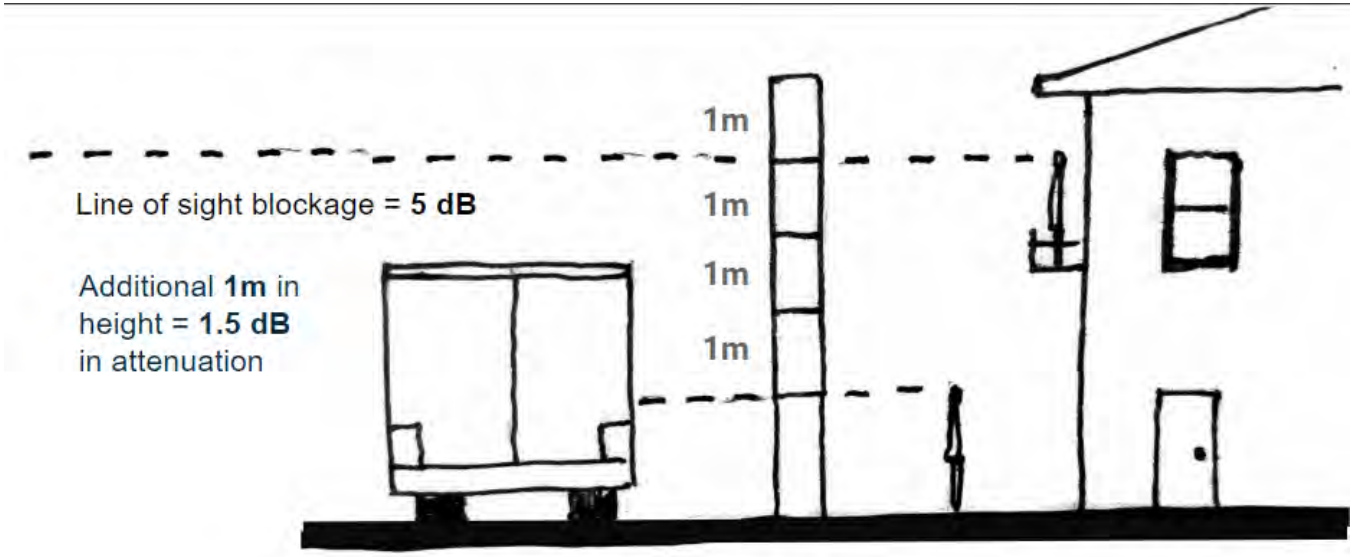


Image: Adam Tak

Materials

Multi-modal trail, Intercounty Connector, MD 200. Heavy plantings soften the sound barrier along the trail. Image: Paul Daniel Marriott

Concrete

- Nearly half the noise walls in North America are made of concrete.
- Rates among the most durable materials.
- Withstands severe temperatures, intense sunlight, moisture, ice, and salt.
- Offers surface textures including smooth, exposed aggregate, form liners, veneers, and stucco.
- Offers versatility since concrete can be shaped, molded, textured, colored, or tinted.

Stone

- Conforms easily to varying ground contours.
- Comes in different widths, styles, and colors that can create interesting patterns or designs representative of area landmarks and resources.
- Offers surface textures, including exposed aggregate, veneers, and stucco.

Metal

- Offers weight advantage and is particularly useful for vertical extensions of existing noise barriers or mounting on bridge structures.
- Imparts an industrial appearance sometimes considered undesirable by residents in adjacent neighborhoods.
- May cause staining in adjacent concrete during weathering.
- May not accommodate adjacent vegetation near sun-heated metal panels.
- Is susceptible to glare from opposing light sources.

Wood

- Blends well with natural or residential backgrounds.
- Provides versatility in plank orientation, grain and roughness, and shapes and sizes of posts to create different textures and shading patterns.
- Offers varying colors and durability depending on species.
- Can be treated with stains or paints.

Concrete Molding

Concrete molding is an affordable option way to bring some life and identity to the standard concrete sound wall construction. By creating a rubber mold, pre-cast concrete walls can be made with limited funding. For a project with a base cost of $1.6 million, a master mold can be made for $7,000, which is a minimal cost when considering the drastic enhancement to the typical concrete wall aesthetics.

This process of designing the mold patterns is a great opportunity to bring in local artists and community members. Doing this can bring a local flare to the walls design and reinforce the identity of the community and residents.

Under the chief landscape architect for the Arizona DOT, Leroy Brady, a statewide program was initiated to design beautiful sound walls that reflected local communities, the natural landscape, and indigenous iconography.

Images: WSDOT

Images: WSDOT

Images: Arizona DOT

Images: HDR Architects

Route 28 Pittsburgh

In 2023, PennDOT commissioned local artist Brian Peters to design an artful addition to Pittsburgh's latest two-mile sound wall installation along Route 28. This is great example of using a mold to manufacture concrete blocks that can be fit together in various orientations to create unique organic patterns. Brian took inspiration from the Allegheny River's watter ripples, contributing to the local identity. This project exemplifies PennDOT's willingness to collaborate with artists to create a visually appealing addition to their roadways.

Images: Union Progress

Other Applications

Concrete molding is not limited to sound walls and can be used for overpass abutments in a tasteful manner. The examples below clearly define the unique character of Arizona by highlighting local topography and a traditional Southwestern art style.

Scan this QR code to watch a video on the Route 28 soundwall.

Scale

The scale and degree of complexity to which a pattern is designed should be dependent on the mode of transportation of the people who will view the wall. A person walking along a sidewalk, for example, is able to take in a much more complex pattern design without it being distracting. A car traveling at high speed, however, will have a harder time to absorb the pattern as it begins to blur together. If the car was going slower the pattern may distract the driver.

Images: Arizona DOT

Image: Adam Tak

Vegetation

There are many ways in which vegetation can be integrated into sound wall design to give a more natural aesthetic. Vines can be easily grown on walls to protect the materials from deterioration and graffiti. Additional landscaping can be layered into the design such as trees, bushes, grasses, and native wildflowers. This added effort can make it seem like the wall is fading into the landscape, thus drawing attention away from the actual wall and toward the planted vegetation. Often, a department of transportation will stray away from planting a substantial amount of vegetation due to the cost of maintenance required; however, with a well-thought-out plant palette, the vegetation can be largely self-sustaining after a few years and would require minimal maintenance.

Image: Durisol Ltd.

Image: Ramo

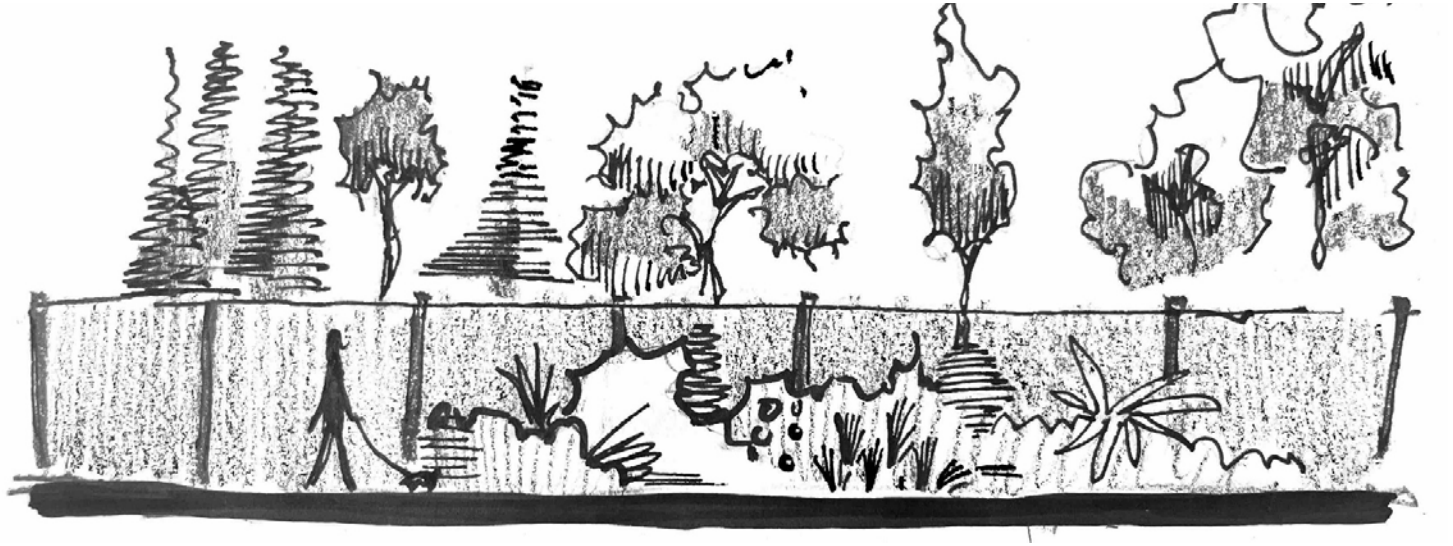


Image: Adam Tak

Variety in Design

Every project comes with a different set of constraints and expectations. Some may desire a wall that strictly cancels out as much sound as possible; others may benefit from an aesthetic barrier that remains fluid with a natural landscape while providing ample privacy. There are many ways to approach wall construction as shown below with a combination of landforms, vegetation, and construction. It is important to consider what the site needs and what will provide the most benefit to the residents and roadway.

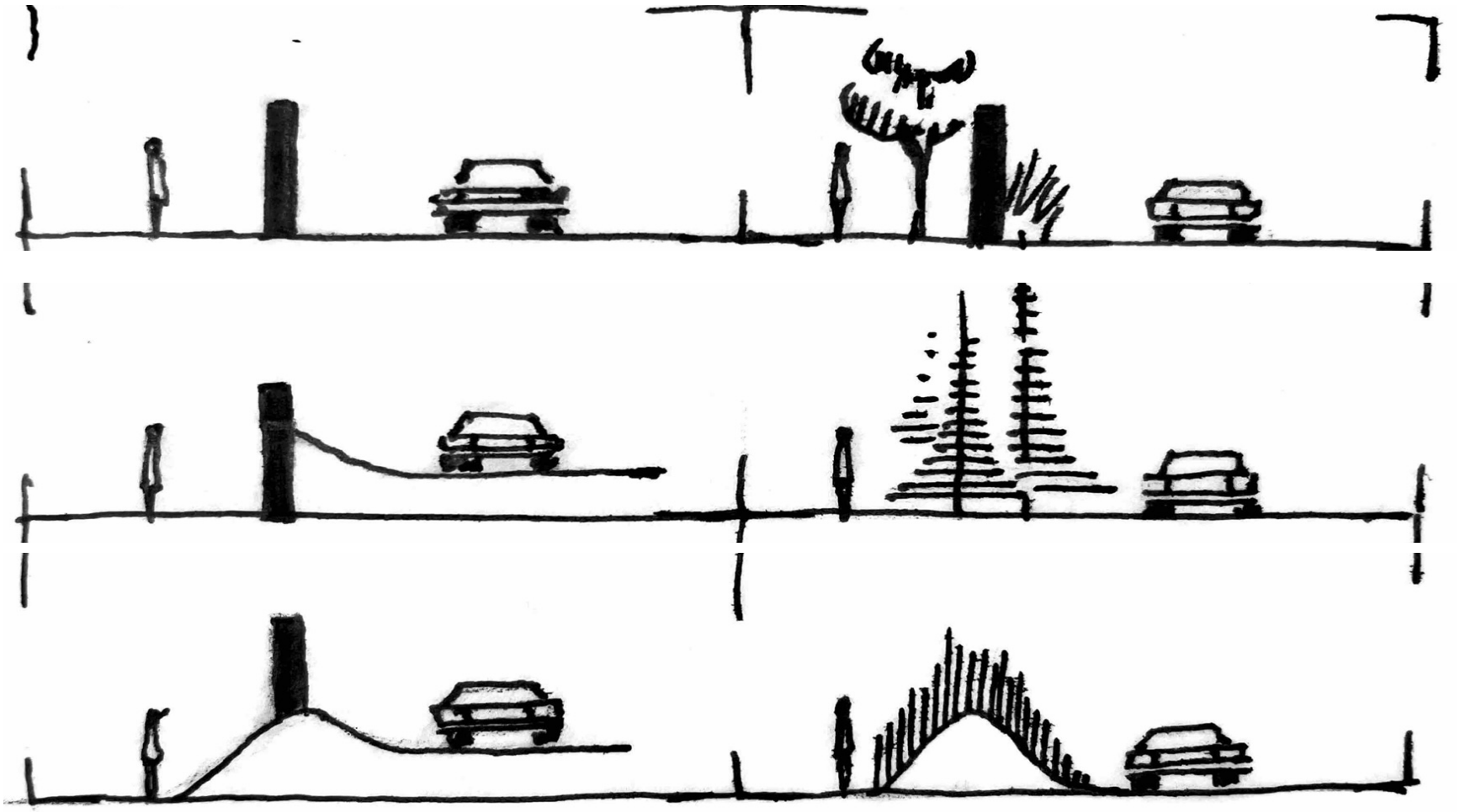


Image: Adam Tak

Biography

Adam Tak
Fourth-Year Landscape Architecture Student

Adam is from Charlotte, North Carolina. He is interested in the implementation of sound design in urban and natural landscapes. He believes the understated aspects of a landscape make all the difference to the way we perceive space. As a future practicing landscape architect, he hopes to make a difference by putting extra care into the details.

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Image: Massachusetts DOT

Designing for the Community & Landscape

Hailey Sukols | LARCH 414 | Fall 2023

Strategy

Penns-Brush Valley is a historic landscape with distinctive cultural features with the selling of the Ridget Valley province of the Appalachia Mountains. How can designers represent the community within their proposals? It is vital for the people who reside in the area to have a say in the design of any structure that will affect their lives. This project considers the many features of a project that makes it successful for community use.

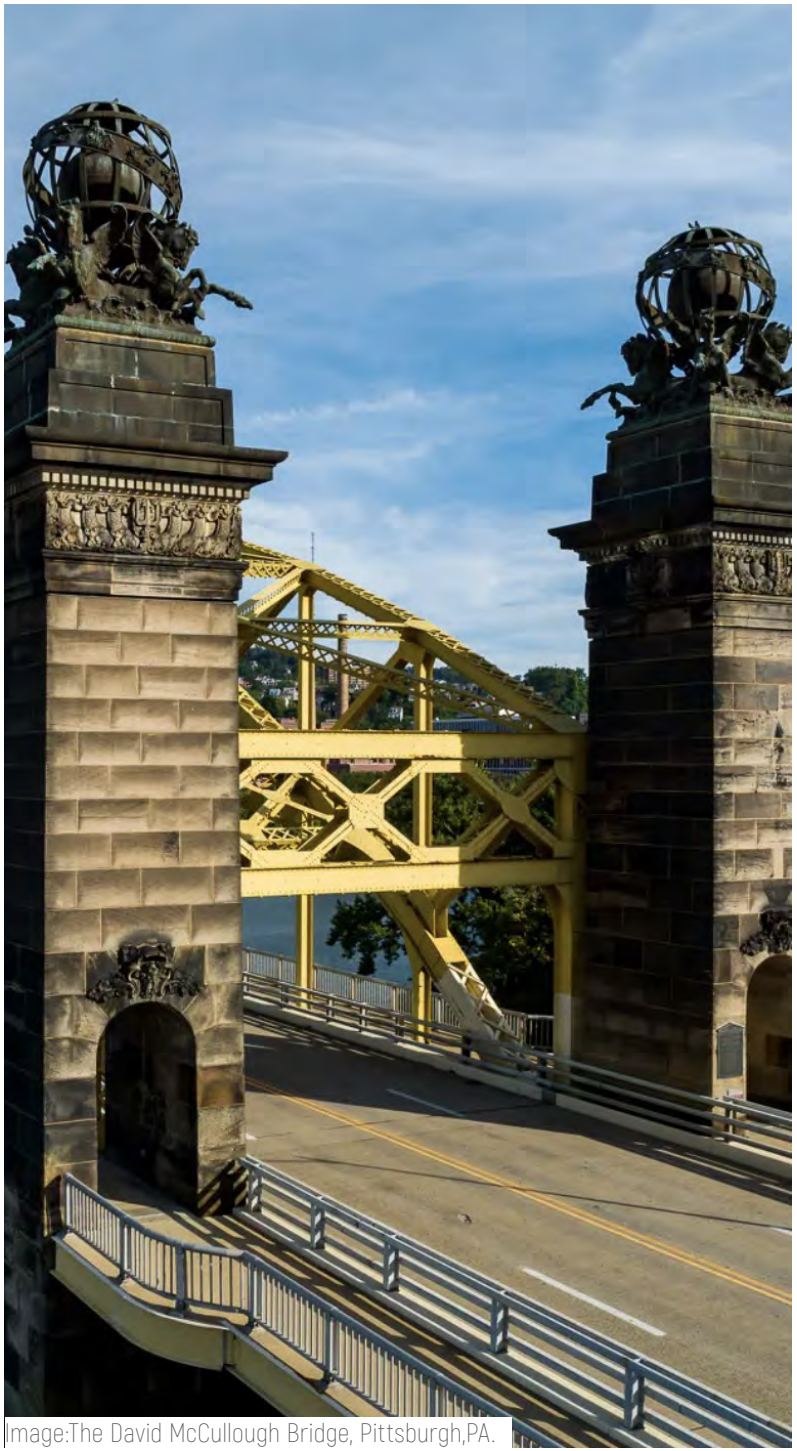

Image:The David McCullough Bridge, Pittsburgh,PA.

Inspiring Design Features

I believe that this highway should represent the lives of the people who drive this road every day and whose homes, businesses, and livelihoods are rooted here. Their lives depend on this land, and its design should depend on them, too. Listed below are features that I believe are crucial to successful highway design. In this section I will address identity, consistency, materials, roadside details, protecting viewsheds, vegetation, area of engagement, coinciding land use, community representation, and artistic inspiration.

The following pages offer inspiring images from Penns-Brush Valley, Pennsylvania, and surrounding states to inform and inspire your conversations about ***Rethinking 322*.**

Features

1. Identity
2. Consistency
3. Materials
4. Roadside Details
5. Protecting Viewsheds
6. Vegetation
7. Areas of Engagement
8. Coinciding Land Use
9. Community Representation
10. Artistic Inspiration

Image: Penns-Brush Valley

Image: Robert Beihl

Identity

Image: Living New Deal

This sign is one of several guiding drivers to Skyline Drive, which makes it a familiar wayfinding tool.

Image: Aaron Solderich

This roundabout in Brunswick, Maryland, creates a break in the monotonous road and creates a threshold indicating a change in the road's identity.

Image: Hailey Sukols

The stonework from the Brunswick roundabout is continued in the surrounding roads, ushering visitors into the crossing and emphasizing its identity.

Consistency

Image: Hailey Sukols

This bridge along the Mount Vernon Memorial Parkway in Virginia allows Little Hunting Creek to enter the Potomac River. Viewed from the water, its design is stunning and flows well with the natural landscape.

Image: Hailey Sukols

The furnishings of the adjacent Riverside Park also follow this material repetition, connecting the two spaces.

Image: Hailey Sukols

This is a view of the same bridge viewed from the road. The materials are consistent and create unity between different views and experiences.

Materials

Image: Gregory Corp

Substituting wooden guard rails for classic metal guard rails can make a highway landscape feel more intentional. This example is reinforced with a steel back.

Image: Main Line Fence

These wooden guard rails can act as a view-framing tool as well as a safety tool since they are reinforced with steel.

Image: Hailey Sukols

This roundabout in the town of Hillsboro, Virginia, uses materials that give the road a distinct character. The durable granite curbs line the roadway in a lighter color; the sidewalk details are reddish in tone, which is consistent for a palette for this area.

Image: Hailey Sukols

Also in Hillsboro, this simple change in paving material indicates that the two surfaces are used for different things without painting more parking spots.

Protecting Viewsheds

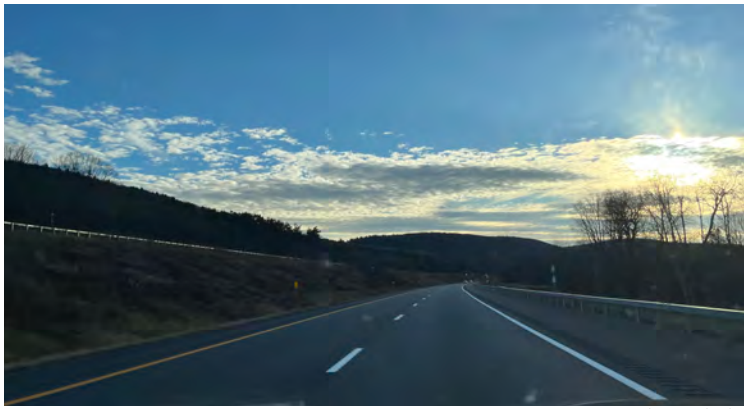

Image: Hailey Sukols

This image is from Interstate 88 in New York. The vertical alignment of the road allows the upper lanes to disappear from view, opening up to the mountains.

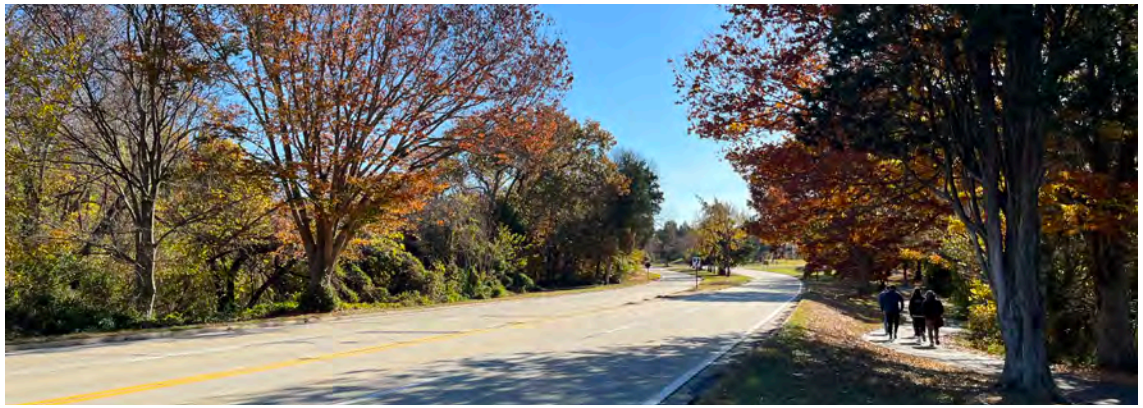

Image: Hailey Sukols

Vegetation can be used to soften curves and control sightlines, like in this example from the George Washington Memorial Parkway. As the road bends around the curve it is obscured by trees and shrubs.

Image: Hailey Sukols

This is a view overlooking the existing U.S. 322 Highway. The view of the farmland and mountains from this area is impeccable; the new design of the road should honor these views.

Roadside Details

Image: Hailey Sukols

This image from the George Washington Memorial Parkway displays how the simple act of painting the backs of signs can transform the way these fixtures are observed by passers-by. This is a cost efficient way to lessen the visual impact of highways.

Image: Hailey Sukols

Also from the George Washington Memorial Parkway, this large sign nearly disappears into the woody vegetation on the side. Users of the adjacent trail won't have to look at shiny, distracting metal as they walk along the roadway.

Image: Hailey Sukols

The George Washington Memorial Parkway uses short 3-inch curbs, which seem to invite the user into the surrounding land instead of framing the road.

Vegetation

Image: Hailey Sukols

Native meadow plants are perfect for highway plantings because they can create amazing color interactions and textures while serving ecosystems. Goldenrod and aster flowers are two common meadow plants in the Penns-Brush Valley region; together they create a beautiful color contrast that is visible from great distances.

Image: Hailey Sukols

Vegetation can be used in front of sound walls to minimize their visual impact. In this example from the roadside of MD 45, the sound wall is a subtle architectural feature that is softened by purposefully wild-looking vegetation.

Image: Hailey Sukols

Meticulously-placed shrubs and trees allow this sound wall and bike path to feel intentional rather than an afterthought of MD 200 on the other side of the wall.

Areas of Engagement

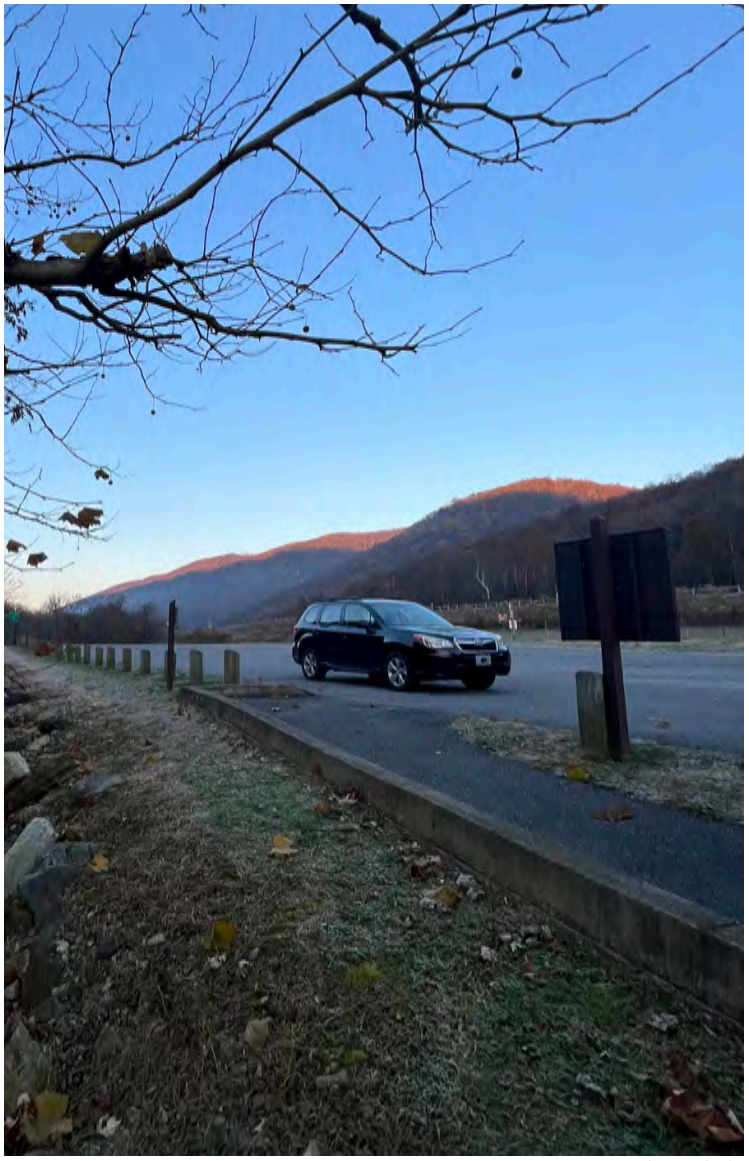

Image: Hailey Sukols

This image was taken from an existing point of engagement on U.S. 322, between Lewistown and Mifflintown, which grants access to a trail and a park.

Image: Robert Beihl

Resting underneath MD 200, the Raja Veeramachaneni Memorial creates space for humans and wildlife to appreciate the underpass without feeling the threats of rushing vehicles just above.

Image: Hailey Sukols

This sign is adjacent to the pull-off parking lot and trail head.

Image: Robert Beihl

The Raja Veeramachaneni Memorial includes a sign that helps readers engage with the history and development of the MD Route 200 freeway project.

Coinciding Land Use

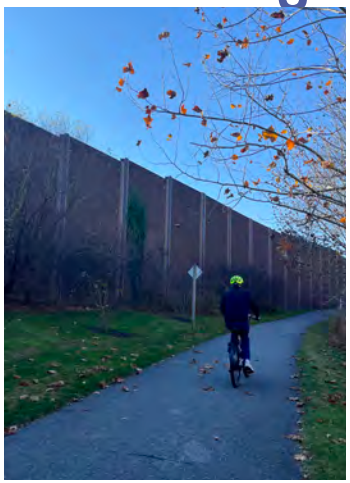

Image: Hailey Sukols

This sound wall separates cars from communities and creates safe passage.

Image: Hailey Sukols

This wildlife crossing under MD 200 addresses pedestrian, wildlife, and vehicular needs without making aesthetic sacrifices.

Image: Kentlands, Maryland.

Image: Robert Beihl

This elegantly bending trail adheres to the edge of the adjacent pond, gently framing it. The trail allows pedestrians to enjoy their strolls separate from the quick movements of cars.

Image: Hailey Sukols

The bridge supports under the MD 200 wildlife crossing are mostly to be seen by wildlife, but still embrace the artistic form of the rest of the bridge.

Community Representation in Penns-Brush Valley

Image: Rhoneymeade

The topography of our valley creates a wonderful backdrop for sculptures such as these. The lack of a peak means these mountains create distinct horizontal structural lines that are embelished by the green rust of this sculpture.

Image: Rhoneymeade

Using vegetation as an artistic medium would be a easy way to respect views.

Image: Rhoneymeade

The matte finish of this metal artwork is nonabrasive to the eyes and does not offend the landscape. The use of wooden supports roots it into the earth. This artist played with light and perspective, which are crucial to highway art design.

Image: Hailey Sukols

There is also an opportunity to involve local businesses along the highway. For example, Kuhns Tree Farm would be a great partner.

Artistic Inspiration

Image: Dream Idea Machine

The Te Tuhirangi Contour in New Zealand, designed by Richard Serra, is a corten steel strip that follows a single contour around a vast landscape. As it bends and curves around the manicured lawn, it creates forms that are natural and inviting. When viewed from afar, this piece cleary fits into its landscape, including the mountains that lie just behind this sculpture. Could you imagine something like this as a sound barrier in the Penns-Brush Valley area?

Image: Storm King Art Center

Storm King Wall, designed by Andy Goldsworthy, is located at the Storm King Art Center in Hudson Valley, New York. This wall uses stone from a previous wall to wrap around trees and then plunge into the still pond water.

Image: Dumbarton Oaks

This is another of Richard Serra's contours, this one located in Dumbarton Oaks in Washington D.C. The use of pink and white flowers gives this sculpture a mystical feel.

Canal Parkway, Cumberland, Maryland

I had the incredible opportunity of speaking with David Patterson, who worked as a project manager at Mahan Rykiel Landscape Architects to design the Canal Parkway in Cumberland, Maryland. I believe that this parkway is a stellar example of how the previously discussed design features can work in unison to create a final product that is deeply rooted in its community and landscape. As you look at these images, I urge you to imagine how these same ideas could be applied here in our valley. For example, what materials would best represent this valley's history?

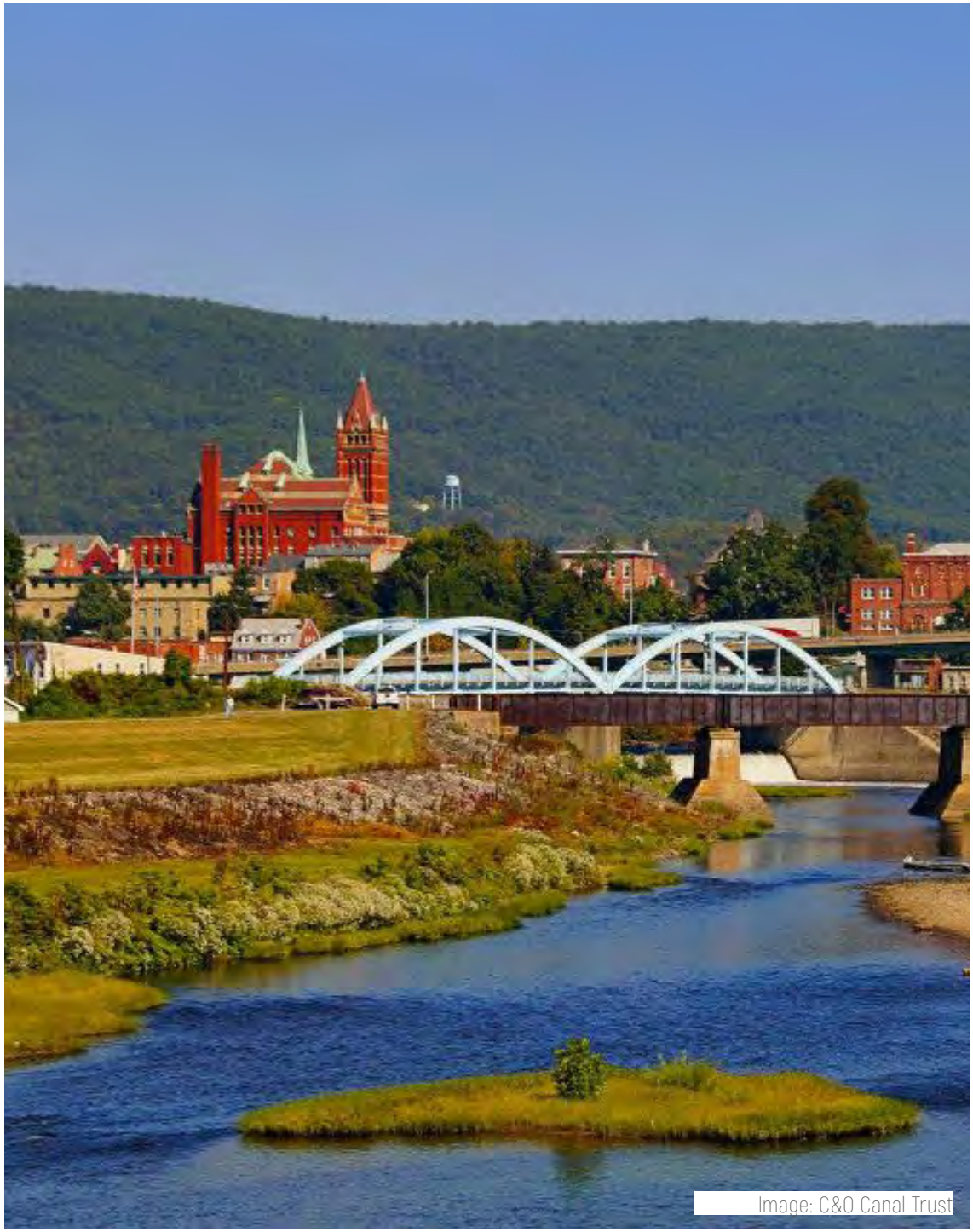

Image: C&O Canal Trust

Canal Parkway, Cumberland, Maryland

Image: David Patterson

The natural materials used here feel perfectly suited for the landscape, and the contrasting flowers in the foreground make this shine.

Image: David Patterson

This sign acts as a title page for the story that the rest of the Canal Parkway will tell as riders move through. It also connects this road to the city of Cumberland, whose history the road intends to emulate.

Image: David Patterson

The same manufactured stone material used for the signage was also used for retaining walls and other features, and the repitition creates a strong sense of identity.

Image: David Patterson

Each design feature was carefully considered; details like this can make or break a project.

Image: David Patterson

This road takes advantage of clear sightlines and uses design features responsibly to focus sightlines. A lack of billboards and other side-of-the-road distractions means that drivers can focus on the beauty of the road design itself.

Image: David Patterson

The same stone pattern is replicated on the trail-side of the road as well, giving bikers a visual cue to the road's identity.

Image: David Patterson

The road site above is Chesapeake & Ohio Canal National Historic Park, but the road's design features are brought down to pedestrian level, too.

Image: David Patterson

The current bridge was modeled after a previous historic bridge that was on site. The shape, color, and materials of this bridge are nearly identical to that of the signage used on the rest of the road.

Image: David Patterson

Guard rails and bridges are connected seamlessly here, despite being different materials. These details are often overlooked.

Image: David Patterson

Wooden guard rails (with steel-backing) in conjunction with the repeated stone walls frame and guide the roadway while also adding interesting structure. Having elements in the foreground also helps to fade out the sound wall in the background.

Image: David Patterson

The Canal Parkway was inspired by historic modes of transportation including trains and boats. These elements are easily visible from key points in the road, but they never interfere with one another.

Image: David Patterson

Planting grass on the shoulder of roadways is a great way to invite the vegetation inwards and immerse folks in the land they are seeing.

Biography

Hailey Sukols
Fourth-year Landscape Architecture Student

Hailey Sukols is from Upstate New York, just north of Albany. She has a passion for exploring the outdoors, and often does so through creating art, foraging, and playing music. Hailey found her niche in this project by exploring the way that highway designs reflect their communities and landscapes. She hopes to further her career by designing artistic landscapes that work in harmony with nature. In the future, Hailey aspires to work on bioremediation projects that capitalize on the crossovers between sustainable design and art, especially those which utilize mycology.

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Image: Rhoneymeade

Appendix

Appendix

Pennsylvania Department of Transportation

1. State College Area Connector Website:

https://www.PennDOT.pa.gov/RegionalOffices/district-2/ConstructionsProjectsAndRoadwork/SCAC/Pages/default.aspx

2. Public Meetings - PennDOT

10/19/2022 at Nittany Middle School in State College, PA
10/20/2022 at Nittany Middle School in State College, PA

3. Field Trip

Floura- Teater Landscape Architects
MD Route 200
Montgomery County
Mt. Vernon Memorial Parkway
Middleburg, VA
Brunswick, MD

4. Final Presentation

Centre County Historical Society

Penns-Brush Valley Rural Historic District, National Register of Historic Places

1. Centre County Historical Society

https://centrehistory.org/wp-content/uploads/2022/03/Penns-Brush-Valley-NR-Nomination_email.pdf

VOL 2

RETHINKING 322