REDEFINING REGIONAL HIGHWAY CORRIDORS

STRATEGIC DESIGN GUIDE

October 2021

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REDEFINING REGIONAL HIGHWAY CORRIDORS

STRATEGIC DESIGN GUIDE

Opportunities for
Design, Transportation, Economic Development, and Governance

Case Study
Route 65 Ohio River Boulevard from Bellevue, PA to Rochester, PA

Michael Baker International
Civic Design and Planning LLC
Quaker Valley Council of Governments

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EXECUTIVE SUMMARY

The *Strategic Design Guide* incorporates focused case study work on the Route 65 Ohio River Boulevard corridor and a broader review and analysis to redefine regional highway corridors.

The planning and design of corridors, on Route 65 and statewide, calls for increased attention. Older regional highway arterials are a distinct roadway type, now often typified by high-speed traffic directly intersecting with neighborhood streets, highway-oriented commercial development with curb cuts on the roadway, and the lack of a sense of connection to the communities they pass through. To improve their functionality and positive impact on the communities they serve, highway corridors need to better respond to their location, using a holistic approach that includes their identities as places, combining both design standardization for safety and strategies such as gateways, greening, and pedestrian crossings to underscore their visual and physical connection to place. The *Guide*, responding to these conditions, and recognizing emerging mobility preferences including semi and fully autonomous vehicles, provides analysis, tools, and recommendations to support multimodal and mixed-use functionality integrated into urban and suburban transportation planning.

The *Guide* provides preliminary recommendations to improve the Route 65 corridor for several key objectives, developed through analysis of existing conditions, community-engaged workshops, and technical and best practices review. The study's key objectives include creating synergistic and locally based relationships between the communities and boroughs that the route serves; recognizing and responding to commonly held corridor-wide citizen concerns; creating a unifying, place-based aesthetic, and providing a strategic guide for reimagining the highway corridor as a shared community asset. The case studies and research indicated similarities across other regional highway corridors and need for both standardization and stronger identity of place.

The Route 65 Ohio River Boulevard corridor, focusing on the historic "Boulevard" portion of the roadway and its surroundings from Bellevue to Rochester, provides an ideal case study location. The commitment of the Quaker Valley Council of Governments (QVCOG) to investigate mechanisms for inter-municipal decision-making connects the study to future action. The QVCOG as well and the Beaver County Council of Governments agreed to contribute their time to workshops and design-focused sessions, ensuring that local knowledge informed the study's objectives and conclusions. With these resources, the study has generated conclusions—towards a cleaner, greener, safer corridor—relevant to the local Ohio River Boulevard communities and more broadly.

The study identified two municipalities for design workshops, based on typologies of economic activity and roadway design, including active frontages on one or both sides of the corridor. In Emsworth, the workshops clarified that uses on both sides of Route 65 strongly support the transformation of the corridor into a green boulevard which physically slows traffic, visually connects all blocks through the Borough, and provides ample protection at crossings for pedestrians. In Ambridge, on the other hand, as a largely one-sided corridor, the boulevard character could be achieved by potential medians on cross streets that mark major gateways to the community. The workshops also revealed shared community priorities which included moving truck traffic off local and mixed-use main streets, highlighting and protecting historic areas, improving signage and wayfinding, and slowing traffic alongside the neighborhood.

The Corridor Design Toolbox identifies potential improvements, informed by the case studies and by corridor design research, from narrowing travel lanes to creating pocketed turns, enhanced gateways, and designation of pedestrian space, coordinated to support economic growth. Adding to these roadway design guidelines, the study developed strategies for inter-municipal governance, civic engagement, master plan initiatives, and recommendations for local TIP projects. The importance of and approach to corridor design standardization is articulated, as is a critical decision-making guide to better inform communities working together towards master planning and project funding resources. The report's conclusions build on the workshops, research, and analysis, concluding that in addition to the toolbox concepts, there are overarching goals. These include moderating speed limits, reducing visual occlusions, and accommodating enforcement, and in terms of governance, the importance of identifying structures for communities to work together on the master planning and project requests for what is a shared, inter-municipal asset. The *Guide* also underscores the need for an improved design and planning process with citizen engagement, including the technique used in the case study workshops with real-time visualization of design alternatives as a highly effective way to illustrate, discuss, and propose solutions to the design challenges familiar to the people who live, work, and visit these communities. This commitment to civic engagement will be critical a potential process of master planning for this and similar corridors, enabling communities to better shape the future design of the roadway and corridor.

Next Steps identified in this report are incremental, and together will be able to lead to a powerful cumulative impact: from inter-municipal cooperation agreements to the master planning process, to TIP project recommendations, including restriping travel lanes, improving signalized intersections, and installing wayfinding signage. These will all contribute towards the clearly expressed community objective of a safer, greener, cleaner Ohio River Boulevard corridor, one with implications for the regional and statewide approach to highway corridors.

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DESIGN PRINCIPLES AND VISION

INTRODUCTION & BACKGROUND

INTRODUCTION

VALUE OF REGIONAL HIGHWAY CORRIDORS

Regional highway corridors throughout Pennsylvania serve cities, suburbs, and small towns as generally efficient roadways that connect municipalities to one another, municipalities to Interstates, commuters to workplaces, and residents to shopping and other destinations. While some may be limited-access highways, most corridors are arterials and connector roadways that evolved from former trails and local streets to become routes to move traffic quickly and more efficiently between destinations.

These corridors have a significant impact on the life and livelihood of small towns that lie beyond the boundaries of larger metropolitan centers. In many towns these highway corridors are the main streets and locations for goods and services. In others they parallel or cross Main Street providing goods and services that cater to commuters, while others bypass a town's center providing little local support other than a linkage to the larger regional network. Regional corridor relationships to local communities can range from economically impactful to almost none, yet they are major contributors, good and bad, to the local quality of life. Like what is found in university towns, corridor communities live with a tension between residents and the outside public.

Small towns and communities are also affected in other ways by their corridor connections, two of which involve their relationship with their MPO and statewide agencies and the other with local context. Municipalities struggle to effectively represent their interests when competing for state-wide funding. Acting alone, they have a very small voice at the planning and funding table. When they band together, they can become a significant advocate for improvements that extend beyond local boundaries while also benefiting themselves. The second involves their inability to locally and unilaterally create safe driving conditions, whether it be by lowering speed limits or installing traffic calming improvements on these state-owned roadways. Increasing truck and delivery activity and new transportation technologies, including autonomous vehicles as well as the rise of partially automated and connected vehicles, are raising new safety and design challenges. With little money for infrastructure, state agencies cannot keep up with maintenance and upgrades, let alone incorporate new technologies, to achieve maximum safety for both drivers and pedestrians.

As with most mid-Atlantic and New England states, Pennsylvania's corridors were never designed for today's transportation demands. Most rights-of-ways were established over a century ago when motorized vehicles were in their infancy and, while able to accommodate streetcars and light rail transportation alternatives, they are not conducive for today's volume of personal vehicles or wide trucks and vans. Patchwork solutions, such as converting parking lanes to travel lanes, widening the right-of-way where possible, and decreasing signalized intersections have contributed to higher speeds and increasing driver anxiety.

Multimodal integration is becoming common practice in urban and suburban centers providing alternative choices to personal vehicles that are choking local streets. Yet when it comes to regional arterial corridors and the municipalities that line them, little has changed. Corridors prioritize motorized vehicles and remain dangerous to other users, and municipalities rarely embrace corridors as an

integral component of their communities. Expectations of improvement are often treated as someone else's problem, with no clear process in place for local initiation. It is not a one-sided challenge. Intergovernmental cooperation, although encouraged by Pennsylvania law, is not commonplace.

MODEL FOR STATEWIDE REGIONAL HIGHWAY CORRIDORS

Ohio River Boulevard, the portion of Route 65 between the City of Pittsburgh and Rochester, PA, is the case study corridor for this research and typical of regional highway corridors in Allegheny County outside of the City of Pittsburgh. It is not atypical of most corridors in how they are understood by the public or documented within PennDOT's roadway classification system.

Corridors have not received the attention they need and deserve. Expectations of improvement are often treated as someone else's problem. Speed limits are not observed. Cars move fast and so do trucks, often intimidating drivers obeying posted speed limits. Residents and users fear the corridor and are afraid of making left turns into oncoming traffic to reach their home or businesses. Users would prefer equivalent alternative routes, but the topography and lack of a network grid precludes them.[1]

As a case study model, Route 65 was ideal from several perspectives. Its location in the Pittsburgh area allowed the study to build from a body of work previously generated.[2] Second, a commitment from the Quaker Valley Council of Governments (QVCOG) supported investigating mechanisms for multimunicipal decision-making. Third, the QVCOG and Beaver County Council of Government (BCCOG) were willing and able to contribute their time and participation with this report's case study workshops and design-focused sessions. Lastly, the study corridor provided a variety of physical and land use conditions expected to be found on most Pennsylvania corridors. Its universal character as a combination of physical settings and variety of economic types provided a range of contexts for the study's design approach and model-based recommendations.

Route 65 is not unlike other corridors in this region, such as Route 19 north of Pittsburgh, Route 8 from Etna to I-76, Route 837 along the Monongahela River, Route 51 to East Elizabeth, Route 22 from Penn Hills to Murrysville, and Route 30 to Greensburg. Similar regional highway corridors can be found outside other metropolitan areas of Pennsylvania. The study area is also typical of older regional highway arterials designed for mid-20th century lifestyles and lower traffic volumes that do not meet today's mobility demands or quality of life desirabilities.

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1. The shortest alternate for Route 65 is 15 miles longer and adds 7 minutes to the trip.
2. See Chapter 7 for a condensed review of previous work.

A DESIGN-CENTRIC APPROACH

Recognizing there are statewide multimodel policies, limited funding, difficult physical and political contexts, and often competing and challenging design issues, this project took a distinct approach to corridor planning that sought to resolve many of the issues raised above.

Michael Baker International, Civic Design and Planning LLC, and the Quaker Valley Council of Governments (QVCOG) sought to answer how the integration of multimodal, multimunicipal, and new technologies could be integrated and conceived from a perspective that fosters collaboration with collective benefits. The project took a design approach that built on both detailed case studies and a corridor-wide holistic perspective. Prioritizing safety, flow, and aesthetic concerns, a design strategy emerged, that is broad enough for application across the corridor and flexible enough for local adaptation and identity. While the focus was on regional highway corridors, the design-centric approach, tools, and lessons learned will be useful for other Pennsylvania corridors and the communities they serve.

1. Create synergetic and locally-based relationships with each of the small towns and boroughs they serve.
2. Recognize and respond to commonly held corridor-wide citizen concerns.
3. Create a place-based aesthetic that holistically unifies its corridor communities.
4. Provide a strategic guide for corridor communities to actively contribute to rethinking regional highway corridor planning and design for the shared benefit of themselves and their regulating (and funding) governmental partners.

In addition to the issues raised by corridors themselves, this project asked and investigated questions of transportation, community design, economic development, and governance. In brief, it focuses on a holistic rethinking of corridors not only as a design problem but also as community assets that can be cleaner, greener, and safer.

STRATEGIC DESIGN GUIDE FOR CORRIDORS

This project is a practical guide for corridor re-envisioning intended to be useful and educational for citizens and utilized by professionals during the planning process.

This design guide is also strategic in the broader perspective by considering corridors as holistic places with familiar features recognizable along their full lengths and made safer through consistent design and technological improvements.

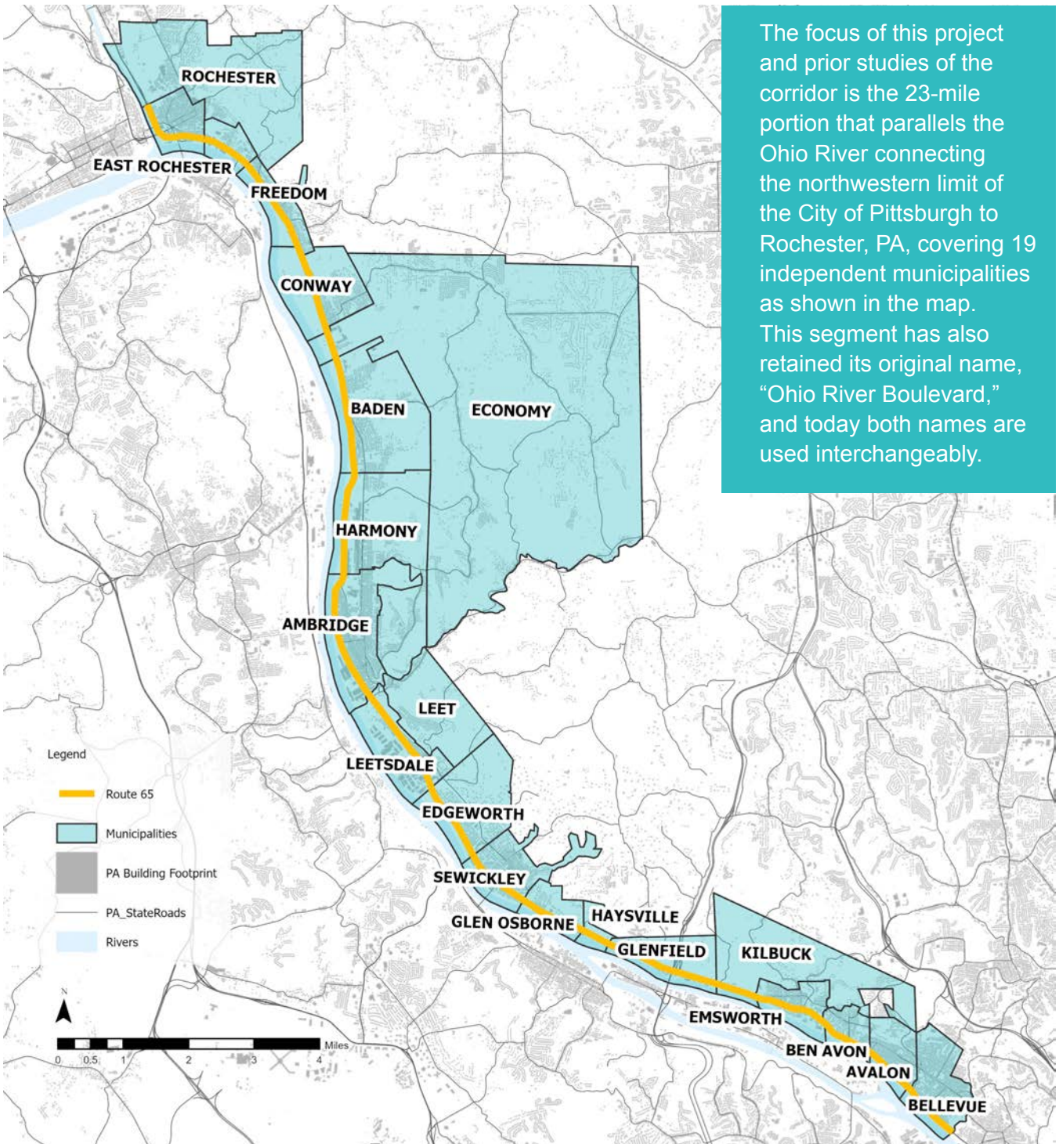
The design-centric approach was accomplished through dual and simultaneous design processes: grassroots design through participatory case study design workshops that sought to identify local and specific right-of-way design recommendations intended for broader application, and secondly, project team development of corridor-wide thematic design with flexibility for local responses and respectful of individual municipality identity and desired corridor-to-main street relationships.

These tasks guided the project:

1. Identify two corridor municipalities and conduct separate community-engaged case study design workshops based on different corridor physical and land use typologies.
2. Create a tool kit for achieving optimal multimodal roadway design and safety that is informed by urban design, zoning, land use.
3. Identify strategies and design items for governance, potential master plan initiatives, TIP projects, and statewide corridor implications.
4. Document concepts derived from the workshops.
5. Analyze safety and roadway design to identify potential countermeasures, including strategic multi-municipal transportation planning recommendations, lessons from the workshops, multimunicipal governance, local recommendations for 3 TIP projects, and statewide highway corridor implications.
6. Identify ongoing engagement with local key stakeholders and recommend civic engagement strategies related to typology recommendations.

ROUTE 65 CORRIDOR STUDY AREA

Route 65 begins in Pittsburgh and continues for 51 miles to New Castle, PA in the northwestern portion of the southwestern Pennsylvania region. This 4-lane highway is the primary connection between the metropolitan centers of Allegheny and Beaver Counties.



The focus of this project and prior studies of the corridor is the 23-mile portion that parallels the Ohio River connecting the northwestern limit of the City of Pittsburgh to Rochester, PA, covering 19 independent municipalities as shown in the map. This segment has also retained its original name, “Ohio River Boulevard,” and today both names are used interchangeably.

RECENT PLANNING AND ADVOCACY

Planning, research, and local advocacy over the last few years laid the groundwork for this project.

Allegheny County's First Transportation Comprehensive Plan
"*ActiveAllegheny,*" competed in 2010, was added to Allegheny County's first comprehensive plan, "AlleghenyPlaces" as a blueprint for improved access and choices to connect people to communities, work sites, transit, schools, attractions, and residents. The plan, prepared by Michael Baker International, focused on a walkable and bikeable transportation system for the county in addition to strategies that promoted active transportation for major commuter corridors, including Route 65.

Corridor Guidelines Research
The Remaking Cities Institute (RCI) at Carnegie Mellon University completed a highway corridor study in 2016 titled, "*Corridor Guidelines*," for PennDOT Research. Route 51 in Pittsburgh served as the case study. The research proposed highway corridors as a separate Corridor Typology system and companion to PennDOT's Roadway Typology system. Corridor recommendations sought to address the importance of holistic multimodal and mixed-use functionality integrated into urban and suburban transportation planning.

Route 65 Background Research and District 11 Interest
Later in 2016, QVCOG teamed with RCI to investigate the prospects for master planning Route 65, an intention of the COG. In addition to corridor planning, QVCOG's interest also included creating a new type of inter-municipal cooperative agreement to work more effectively with PennDOT and other state agencies for transportation-related improvements. With the idea of strengthening municipal participation, the COG approached the Beaver County COG who agreed to participate and add Beaver's Ohio River corridor communities to the planning effort. RCI was interested in testing the *Corridor Guidelines* recommendations on a regional highway typology and successively received grant funding from Mobility21, the research arm of CMU's University Transportation Center, for background research. QVCOG also successfully received funding for community education and engagement from the PA Department of Community and Economic Development (DCED) as companion research, including educational workshops.

Using educational workshops and a joint website to gather feedback, QVCOG and BCCOG sought to understand the fundamental issues of why Route 65 was held in such poor esteem and identify the need to rethink the corridor; reasons why so many residents are critical and fearful of the corridor yet depend on its functionality; what accounts for the corridor's driving difficulties; and identifying locations where users believe the corridor is unsafe; reasons why it is so difficult to drive; and user opinions about its visual appearance.

During this same period, discussions with PennDOT's District 11 and state leadership confirmed the significance of QVCOG working with a single corridor-wide representative and encouraged future work to include multi-municipal agreement research. PennDOT's benefit from one-voice representation for

Transportation Improvement Program (TIP) initiatives has the potential to reduce agency time and produce a faster TIP process given Pennsylvania's 67 counties and 2,561 independent municipalities. QVCOG welcomed the opportunity to take the lead with the belief that a grassroots initiative had more potential for success than a state-mandated directive. District 11 also confirmed the desire to rethink Route 65 in terms of needed safety improvements, multimodal use, and to better understand how emerging technologies, including autonomous cars and trucks, would affect roadway design. District 11 also foresaw growth in Beaver County including development spurred by the natural gas cracker (refining) plant in Potter Township, with the potential for Beaver County to be the site for a new plastics industry and its eventual impact on Route 65.

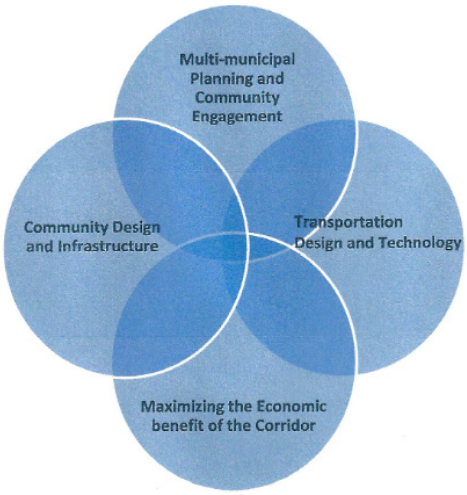
RCI issued their report in 2019, titled "*Regional Highway Corridor Benefit Research Study Proof of Concept—Phase 1: Research and Understanding*," that included corridor and municipal data, background research, safety issues and emerging technologies, and identification of physical and economic typology models to guide later master planning. QVCOG documented workshop and citizen concerns and feedback.

PHASE 1 FINDINGS

The following summarizes the pertinent findings of the Phase 1 work that informed and were carried forward in this report.

COORDINATED CORRIDOR PLANNING

QVCOG developed a VENN diagram of four integrated areas of inquiry important to the COGs to guide civic engagement and research investigations. These were later modified during the project's case study design workshops (see Case Study Design Testing).



Integrated Areas of Inquiry

Multi-Municipal Planning and Community Engagement: Sustainable models and mechanisms for intermunicipal cooperation; and a single point of contact for regional decision-making.

Transportation Design and Technology: Connectivity and access to and from the corridor; multimodal transportation; and the effect of emerging transportation technologies.

Economic Benefit of the Corridor: Potential mechanisms to capture and distribute corridor-generated income both within individual communities in the corridor; economic impact on development; and market generated improvements of quality of life and aesthetics of each corridor community.

Community Design and Infrastructure: Strategic uses of land, activities, and improvements to support community objectives; measurements and indicators; corridor design features from the automotive industries' perspective as they relate to safer autonomous vehicle operation.

MULTIMUNICIPAL PARTNERING

A consistent theme throughout the community workshops was that municipality members of the COGs would have more impact when acting together as a unified entity. Most COG activities have involved the benefits of shared purchasing power for services and a communications vehicle for promoting activities throughout the COGs. They learned during Phase 1 that PennDOT's interest in simplifying the TIP engagement process and the Department's policy of partnering with communities for transportation projects could also align with their community objectives.

These lessons had not previously influenced earlier long-range planning where corridor communities had not fully considered their relationship to a larger transportation system. Of the Allegheny County corridor communities, few voiced comments about the corridor. Bellevue, Avalon, and Ben Avon addressed signalization and pedestrian intersection problems and Sewickley and Glen Osborne additionally mentioned the corridor as an obstacle to reaching the riverfront trail and recreation. Beaver County has traditionally produced a single comprehensive plan for all county municipalities; however, Route 65 is not specifically mentioned as having strategic value for its corridor communities.

DCED recognized these community and economic benefits of municipal teamwork by funding the QVCOG work during the Phase 1 study and the benefits to Pennsylvania from interagency cooperation and from multi-agency integration on improvement projects.

CORRIDOR TYPOLOGIES

Phase 1 work identified sets of physical and economic typological models of the corridor's organization as a shorthand for describing typical corridor-to-community and corridor-to-main street relationships. Each set is descriptive of the different characteristics one would expect to encounter with other corridors across Pennsylvania. The Route 65 highway corridor, while mostly suburban and rural in context, exhibits three distinctive physical typologies and three land use typologies.

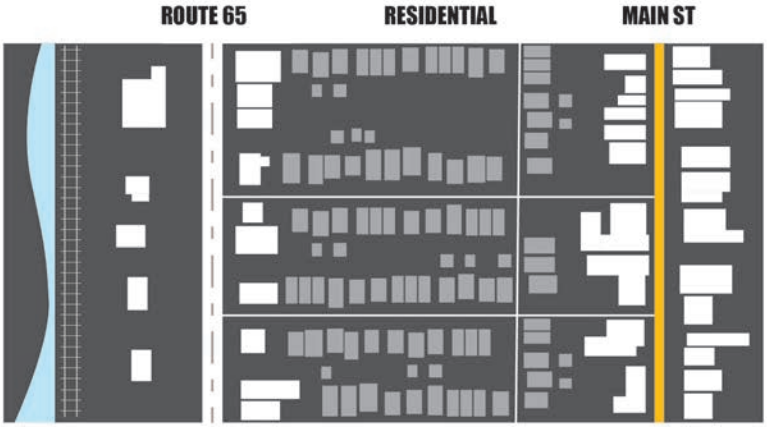
These became useful for this project when selecting municipalities that would best serve as case studies and help decide which design recommendations would be useful for corridor-wide application and those specific to each case study's respective typology.

Physical Typologies

Three types were identified: Parallel, Through, and Bypass. The distinguishing characteristic is the location of highway corridor with respect to the municipality's main commercial street (main street).

Parallel: Corridor Parallels Main Street
Most Parallel typologies occur in locations where the community had previously established a strong commercial Main Street long before the addition of the corridor. In some instances, the distance between the two is a single block and others several blocks, with the distinguishing factor being

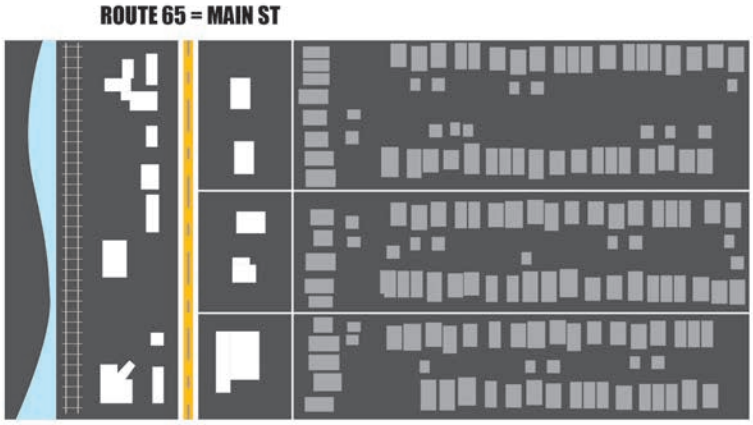
the availability of buildable land between the corridor and main street. There are two variants: the separation is a single block and commercial development occurs at both ends as illustrated in the diagram below. The width of space between them may be short and often just the depth of the commercial property while in others the block may be long and other uses will occupy the space between. With this variant there is either commercial competition between the two roadways or compatibility. When the distance is several blocks and not visually apparent, commercial development usually evolves and separates into two distinctive parts where they do not compete with one another. For example, Main Street may consist of neighborhood services including small retail businesses, banks, and municipal buildings, whereas the highway corridor developed as business- and auto-oriented where the buildings are larger and serve a commuter-oriented function.



PARALLEL

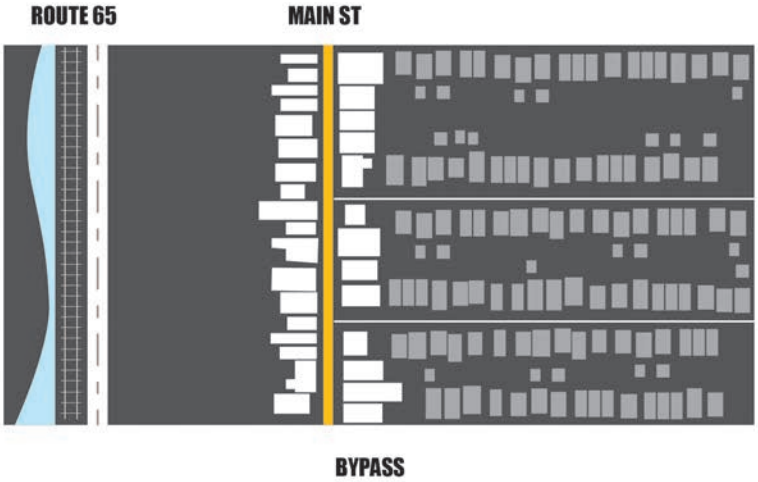
Through: Corridor is the Main Street

This typology occurs infrequently along Route 65. In municipalities where there is not enough population to support a separate main street this typology occurs. Development along the corridor is typically auto-oriented with big box and shopping center type development. In some cases, the Through typology occurs roughly in the middle between two larger municipalities where the driving distance between them is far enough where local big box or shopping center development makes economic sense. In others, development may be no more than a single stop-light intersection where a service station and/or a small restaurant or small strip mall provides service/retail uses for the residents.



THROUGH

Bypass: Corridor Bypasses Main Street
A Bypass corridor occurs when either the municipality favored a highway corridor bypass to preserve its tranquility, or the municipality is solely a bedroom community with little desire or need of additional commercial activity. Along Route 65 these communities are located in the hills away from the river's flat lands and often in quiet landscapes comprised of farms and larger properties or where hillsides are near the corridor's edge and commercial development is physically impossible.



Economic Typologies

Three economic types were identified primarily based on their respective land use characteristics.

Bedroom-Commuter: Residential Land Uses with Few Other Uses
This typology describes a suburban or rural residential community located adjacent to or within commuter distance of a larger city. In some cases, there may be several layers of suburban communities ringing a city with highway corridors providing primary access into the city, while others may be located to the sides of a limited access highway. These communities may or may not have a commercial Main Street, a shopping center, or other retail activities that support the municipality. Economic worth is achieved through property taxes and the value may or may not be substantial. Typically, the further the distance and/or smaller the population the lesser the tax base requiring essential services be provided by others. The Route 65 study area contains several bedroom-commuter municipalities, including those from Avalon to Kilbuck Township, Aleppo Township, and Economy Township.

Job-Concentrated: Commercial and Industrial Employment Centers
Job-centered communities may be current or former company towns, where a single company overshadows the community; an ex-urban community where a commercial office or retail center draws commuters or patrons from surrounding municipalities; an industry-dominated community with a small residential enclave; or combinations of the three. The community or municipality is known better for its jobs and employment rather than its residential component. The tax base is often dominated by their

commercial and industrial uses and that use often occupies a sizeable portion of the municipality's land. Baden and Conway are two examples of Job-Concentrated municipalities in the Route 65 corridor. These can also be industrial communities that produce wealth through taxes and employment, or a community dominated by an industrial use that has little local benefit, such as the railroad's switching center in Conway. As these communities evolve, it is notable that commercial office-oriented communities can generate significant wealth. Route 65 is commuter-oriented corridor with a good mix of industry and has the potential to add a significant quantity of commercial office uses if desired.

Mixed-Economy: Combinations of Uses

Mixed-Economy communities combine residential and job-oriented uses, and a balance exists between them, such that neither dominates. These communities are usually more economically stable than Job-Concentrated types and able to provide a broader range of activities than Bedroom-Commuter typologies due to their economic mix and variety of land uses. When one use is under pressure, the other(s) are substantial enough to sustain the other. This economic typology is more apt to occur in ex-urban communities close to large urban centers and in mature municipalities located far enough from the urban center to have created their own economic equilibrium. The Borough of Sewickley is the best example of this typology in the Route 65 corridor. Others are Ambridge, Baden, and Rochester.

CITIZEN CONCERNS AND FEEDBACK

Concurrent with other Phase 1 research, QVCOG organized and led four topic workshops to gather citizen input relative to Route 65. Participants included both COGs, RCI, area experts in the respective topics, residents, business owners, and municipal officials.

Educational Workshops

Workshop topics included:

- Multi-Municipal, Multimodal, Riverfront, Greenways
- Placemaking and Attracting Investment
- Roadway Safety
- Land Use and Land Development

Each began with an educational component led by topic experts which was followed by participant discussion. Cognizant of a divergent opinions, the discussions ranged from the topic material to any Route 65 item or question a participant may have had.

Participant feedback provided more substance to earlier QVCOG concerns: safety, congestion, high-speed auto and truck traffic, need for better corridor integration with communities, and recognition of the corridor as an asset. The Safety workshop morphed into a question and answer session with the two Chiefs of Police due to public safety information not known to the participants. The Land Use workshop documented locations the participants felt were important landmarks and destinations; its feedback information was provided directly to the QVCOG. For the other two, Multi-Municipal and Placemaking, the same 6 questions were asked during each.

Multi-Municipal and Placemaking Workshop Feedback

What is on your mind?

We don't know what our assets are.

What sparks your imagination?

Challenge ourselves to identify our strengths and valued assets.

What concerns do you have?

High-speed traffic throughout the corridor and especially in Kilbuck, Glenfield, and Haysville once beyond heavily populated sections; heavier vehicle flow and congestion; safety, including intersections and railroad crossings; heavier truck traffic now and anticipated in the future in Beaver County; transit is too slow; not enough resources to attract visitors; too many curb cuts; few trails, trees, wayfinding; placelessness appearance; make efforts sustainable.

What do you need to know more about?

Leveraging placemaking with what needs to be fixed; connectivity for pedestrians between areas of activity and between municipalities; achieving corridor benefits for the economic good of local communities; transit appropriateness; coordination of stormwater initiatives with recreational development; education of public officials about corridor-to-community needs.

What action should occur?

Increase safety; increase pedestrian destinations along the corridor; build upon ethnic heritage and history; increase opportunities for art- and technology-related businesses.

What assets can we build upon?

Follow existing multi-municipality comprehensive plans; stormwater initiatives that leverage other improvements; streets parallel to the corridor that can offer alternative activities; parks and recreational areas within the communities; corridor width should allow for complete street initiatives wherever possible.

Public Safety Workshop Feedback

The police chiefs of Bellevue and Leetsdale spoke about speeding and enforcement on Route 65. The corridor occupies close to 75% of the patrol officers' time which significantly impacts their ability to meet their boroughs' patrol needs. Corridor speed is their number one issue and represents most of their traffic violations.

Even though it consumes a significant portion of their time, officers are highly reluctant to stop speeders for several reasons: there are very few places to pull vehicles over for ticketing and most vehicles stop in the right-hand movement lane causing traffic to weave into the center movement lane; numerous curves and the sloping roadway provides very little reaction time for drivers to change lanes; and nighttime visibility is poor for everyone due to few streetlights and intermittent commercial activity.

CORRIDOR WEBSITE AND OPINION SURVEY

QVCOG developed the www.65corridor.org website for COG communications during Phase 1. The website also contains an opinion survey developed by CMU students where citizens are encouraged to add information about the corridor, whether positive or negative, and pin the location relevant to the item onto a Google Map of the study area. Design information gathered from citizen commentary on the Comment on Ohio River Boulevard interface (CORBi) survey includes:

Location Pins

- High speed areas (several locations)
- Congested intersections due to rush hour traffic (numerous locations)
- Needed turn lanes at named intersections (numerous locations)
- Railroad crossing backup onto Route 65 (numerous locations)
- Auto and truck shortcuts through residential areas (several locations)
- Need for electric vehicle (EV) charging stations
- Blind curve locations (several locations)
- Too many curb cuts

General Information Pins

- High speeds, typically 20+ mph over limit (several locations)
- Scared resident drivers (several locations)
- Need for EV charging stations
- Restaurant, recreation, and historic destinations (numerous locations)

CITIZEN AGENDA

The workshop engagements, the CORBi survey, along with QVCOG informal discussions between COG members and interested citizens revealed that citizen concerns initially focused on personal experiences, usually unfavorable, and their fears of Route 65. These were shared through comments and stories during the workshops and through surveys opened to the public and summarized above.

QVCOG summarized the collective feedback as three basic concerns: Safer, Cleaner, and Greener.

Safer: Discussions uncovered that the common concern was to slow down traffic and community residents were very uncomfortable with “other” drivers ignoring speed limits.

Cleaner: Consensus revolved around better maintenance, removal of clutter, and clearer visibility. Citizens are uncomfortable with unanticipated situations and corridor anomalies.

Greener: While cautious of creating upkeep costs and maintenance issues, participants strongly voiced the need for street trees and maintenance-free landscaping to the greatest extent possible.

CORRIDOR DESIGN CHALLENGES

Pennsylvania Department of Transportation budgets have been tight and improvement projects often reduced to specific upgrades or have moderated broader initiatives through value engineering. The message is clear to local municipalities to not build unrealistic expectations and there is little incentive for major planning projects.

Corridor planning, however, does involve broader design and investment challenges and just as deferred maintenance is more costly in the long run, so is deferred planning. Many are important, and not readily apparent, policy and infrastructure challenges that require attention. Most are longer-term transportation stressors that develop slowly yet are highly impactful over time. Their slow evolution is deceptive as they behave similarly to a metastasis requiring broader systemic attention when considering longer-term planning and the consequences of discouraging life-cycle investment.

Transportation policy, environmental change, rapidly evolving vehicle-related technology, and rethinking how achieve equity in mobility are challenges for the planning and design of corridors as well as for broader, systemic mobility issues. They are not particularly compatible with one another yet offer design opportunities and potential. It is not often that this number of challenges vie for attention.

POLICY AND REGULATORY CHALLENGES

Since the 1990s PennDOT has been one of the leaders rethinking roadway design from traffic calming and the use of bicycles to wide-ranging principles and policies that encourage multimodal activity. The agency has sought closer integrated transportation planning relationships with local communities.

On the other hand, the need for efficient and safe movement of high volume traffic is a constant struggle. Corridors, whether arterials or collectors, are positioned between safer, more efficient limited-access highways and the inherently slower, calmer and often more appealing local streets. They desire to be just as efficient, just as safe, and just as pleasant. It is an unrealistic expectation and paradox at the core of corridor planning and design. Without greater clarity regarding goals, strategies, and implementation, corridors will continue to be an under-planned and under-designed element of the roadway system.

Multimodal Issues Without Speed and Calming Actions

PA policy advocating multimodal functionality, which require abundant safety measures to accommodate all modal activity including pedestrians, continues to place minimum speed limits of 40 mph and prohibits physical traffic calming measures within the roadway. Multimodal facilities and complete street design do not work well with narrow rights-of-way or in topographically-challenged contexts that cannot physically accommodate a network system alternative. The policy does provide some relief when alternative streets are not available, but the restrictive nature of corridor speed minimums and essentially no calming allow for little change unless corridors are holistically rethought.

Integrated Corridor and Community Planning

Multimodal policy requires that highway and PA-owned roadway improvements are integrated into local planning agendas and their comprehensive plans. When improvements involve the addition of safety-related facilities, such as bridge reconstruction or signalization upgrades, the process works generally well. The policy does not work well, though, in two aspects observed by the project team:

- Integrating corridor improvements with local planning agendas.
- There is no process or requirement that multiple municipalities work and plan together or work compatibly with PennDOT.

Other than state-mandated comprehensive plans there is no Pennsylvania mandate for local municipalities to address or contemplate corridor highway improvements or maintenance beyond their boundaries. Regional planning is left to state agencies and MPO/RPO councils to think beyond local jurisdictions. However, broader regional issues usually take precedence over local scaled projects, such as corridor planning and design, unless included as a complementary adjunct to larger priorities.

The message from Route 65 corridor municipalities and previous corridor research is clear. Local communities believe that corridor design, improvements, and maintenance are PennDOT's responsibility, whether accurate or not. Typically, PennDOT funds and installs improvements and expects the municipalities to provide maintenance. The right-of-way is state property and local property begins beyond its boundary. It is not clear whether the issue is one of ownership or available funds. PennDOT's funds are limited, and priorities are placed on correcting unsafe roadway infrastructure, not providing local maintenance. Local municipalities, likewise, have restrictive budgets.

Imbalance in the Planning Process

Working with a single community is not an equal engagement; PennDOT and the regional MPO/RPO control the budget and the agenda. When corridors cross multi-municipal boundaries there are few models or procedures, mandated or suggested, for municipalities to work together and speak in a unified voice. In addition, budgets for local communities range from small to generous that creates an inequality among themselves that can constrain cooperation and participation. Often, their self-interests take precedence and they are not inclined to share unless there is a direct benefit.

On the other hand, the PennDOT and MPO/RPO process is not geared to take the initiative for planning at the local level. Neither are equipped to directly provide project planning expertise within their agencies and funds are scarce for hiring professionals for more than typical Transportation Improvement Program (TIP) initiatives. However, local communities are expected to initiate the planning process by formally requesting agency assistance for broader scope planning, such as corridor master planning; both agencies report they will be involved, but only if the initiative originates locally. The process is unclear to local communities. While a multi-municipal cooperative agreement would be ideal for the agencies, the process would appear to be more political by strength in numbers, not merit.

It would behoove all parties if the planning and design process were formal, the selection process and criteria transparent, and master planning given equitable consideration.

Current Planning and Funding Mechanisms Not Appropriate for Corridors

Although corridors cross multimunicipal and county boundaries there are no policies or requirements for cooperative engagement among local, county, regional, or state entities. The Intergovernmental Cooperative Agreement encourages cooperation among local municipalities, and its template facilitates a wide latitude of “agreements.” However, other than for a direct mutual benefit it is not a requirement of state agencies or guarantee of equal benefit across multiple municipalities. Urban areas have implemented Transportation Management Agreements and other types of project-specific administrative programs to work across boundaries and a variety of mechanisms for project- or system-specific planning and funding. Smaller municipalities do not have appropriate examples to follow or use, the local expertise, or the funds to pay for larger cooperative efforts unless a higher authority takes on the leadership responsibility.

SMART TECHNOLOGY CHALLENGES

Smart technology is being adopted by the transportation industry as best practices and for good reason. It promises significant benefits particularly with those that increase efficiency of existing systems. Some, such as autonomous and robotic vehicles, should be considered as long-term system stressors requiring different planning and design practices. The transportation industry, including their developers and many in the transportation planning, design, and engineering fields, are just beginning to understand their costs and benefits. All will have unintended consequences. Some can be disruptors.

Autonomous Vehicles

Even at this early stage of integration, the autonomous vehicle (AV) industry is observing more rear-end crashes caused by driver-operated vehicles, an increasing number of AV crashes and deaths caused by AV operators’ trust of the technology and turn their attention to other activities while driving, and the need to overcome human unpredictability before AVs will be fully accepted at Level 4 (high automation, driver not required) and 5 (complete automation).

The AV industry is simultaneously exploring two types of AV operation: driver-assisted vehicles and fully autonomous, or driverless, vehicles. Driver-assisted technology now on our roadways, include cruise control, lane-change warning, and automatic braking in addition to manufactured products such glare reducing windshields and roadway paints. The automotive industry is evolving quickly with new assists introduced on a yearly basis.

AV and Driver-Assisted Physical Safety

Lane Location

Lane location challenges include unmarked travel lanes; lane markings covered by snow or water; changes to roadway geometry caused by snow or water accumulation, such as drifts, plow-created snow mounding, and flooded locations that the roadway's elevation; and unfamiliar construction zone reconfigurations among others.

Occlusions

Occlusions include a variety of dangerous conditions where objects and physical settings are hidden from or misunderstood by AVs. Basically, the AVs are blind when they cannot "see" a potential danger. AV software developers have identified over 30 different occlusion types. Earlier research on Route 65 identified 16 types that are particularly relevant to corridor design. Most involve a fixed object (e.g., overhanging foliage) or a moving physical impairment (e.g., vehicle) blocking the AV's view of a potential hazard, a construction zone with a flagman (e.g., an unmapped condition with no automatic AV response), or a fixed object (e.g., overhanging foliage) that can be mistaken for a tunnel.

AV Reaction Time and Shorter Stopping Distances

AVs are capable of significantly shorter stopping distances due to faster reaction and response times. On average AV reaction time is consistent at 0.83 sec, while human driver reaction time ranges from around 1.5 sec for younger drivers to 2.0 sec for seniors. The faster reaction time translates into an AV's braking distance about half that of driver operators. The differences in breaking lengths can mean the difference between mild fender benders and serious accidents. Most autonomous vehicle accidents are caused by drivers rear-ending AVs.

Predictability and Anticipation

Current autonomous vehicle technology works best in predictable conditions and where physical change occurs slowly. Limited access highways (freeways) are now the most predictable driving environment. However, it is humans as drivers and pedestrians who create unpredictable conditions. Predictability accounting for human behavior and edge computing, involving deep learning and meta activity, are the latest areas of AV research but far from resolution.

While drivers and pedestrians are unpredictable, humans do have another capability that AVs need but do not possess: anticipation. Drivers can anticipate driving conditions and usually behave in a pro-active manner to avoid risk. Humans are capable of split-second assessment to take appropriate action, while AVs are confused by the multiplicity of possibilities and may, or may not, act. In addition, drivers are cognizant of "contributing" conditions like changing weather conditions or an erratic driver either ahead or behind and drive respectively. Drivers can anticipate – AVs can only react.

> AV software systems developers are confident that today's AVs can perform accident-free in an all-AV driving environment (no human drivers), because environmental mapping is continuously updated in real-time and environmental mapping has reached a high level of database sophistication.

MICROMOBILITY

The proliferation of smaller personal and robotic vehicles, both self-powered as with bicycles and motor-powered, used for shorter travel distances will become an increasing challenge for corridor design. Recent approval of robotic devices for use on sidewalks compounds an already complex corridor multimodal and complete street agenda. In addition to curbside management, sidewalk management and its maintenance will require more design and funding attention for their safe operation in corridor locations where additional sidewalk space is required. This challenge requires clarity of jurisdiction for all PennDOT highways and other owned roadway right-of-ways.

INTERNET OF THINGS

As technology has advanced from the development of sensors and data aggregation, cyber-physical systems (CPS: control of a mechanism by computer-based algorithms) are now in place, such as adaptive signalization and vehicle collision avoidance, and highly effective. Recent cloud and edge computing (external computing systems to store and analyze data) have greatly expanded CPS capabilities and their use in vehicles and roadway systems will become commonplace. The Internet of Things (IoT): sharing between computer systems without human interface) will eventually allow for fully autonomous “smart” roadway systems where communications between roadway components will be fully automatic. 5G (and later versions) and advanced wireless allow instantaneous communication of large data sets and later versions will expand the capabilities of today’s smart technologies.

With their ability to increase flow efficiency and safety, corridors are logical locations for these vehicle and communication devices. At the same time, without thoughtful design and placement guidelines, sensors, cameras, and communications devices could add to the visual clutter along most corridors.

Adaptive Signalization

When compared to conventional (fixed) signal timing plans, adaptive signalization has shown an average 25%-50% reduction in rush hour delay and an average 15%-25% reduction of travel time. This CPS is now being installed by PennDOT in the Pittsburgh area for high-volume regional highway and urban corridors. One of the values of adaptive signalization for Route 65 would be its ability to also assist with reducing travel speeds by prioritizing the algorithms for consistent flow speed, which could result in shorter total trip time while traveling slower. This action would be equivalent to phased timing of signals on high volume urban streets.

Vehicle-to-Vehicle and Vehicle-to-Other Communications

Communication between vehicles (V2V) currently uses radar-based devices for communicating between large proprietary servers and vehicles within the same fleet. Experimentation is underway

for V2X communication between AVs and between AVs and other IoT devices located outside the vehicle on poles, streetlights, buildings, or other infrastructure on roadway systems. Bus2bus and bus2X communication is now available for vehicle synchronization and real-time schedule messaging. Signal prioritization for transit vehicles (and HOVs when appropriate) should be considered. At multimodal intersections, pedestrian and micromobility vehicles are candidates for dedicated signalization sequencing and, perhaps, prioritization; this is an equitable solution for disabled persons.

ENVIRONMENTAL SUSTAINABILITY AND A CHANGING CLIMATE

By 2100, climate change in Pennsylvania is anticipated to result in higher temperatures, more days of over 90°F, and a consequential increase in rainfall. Argonne National Laboratory's climate models anticipate a maximum increase of annual rainfall a little over 160% from present day values.[1] Even a doubling of rainfall prediction in some parts of the state means an increase of 2"-3" of annual rainfall every 10 years.[2] If correct, today's 99th percentile design standards, based on FEMA's mapping of flood-prone locations, are already out of date.

Just as buildings are coming under more climate and energy scrutiny, including stringent onsite stormwater retention and energy codes that stress efficient use, transportation systems should be planning and implementing environmental design best practices. A couple of examples illustrate the point: greater use of AVs will necessitate the fast removal of rainwater and snow from corridor roadways because surface retention distorts the surface geometry causing occlusion issues. Most asphalt roadways are designed for a 20- to 25-year life. Not considering a healthier infrastructure resilience/redundancy factor beyond that lifespan may be short-sited.

As environmental information becomes more available to the public, communities are also becoming more attuned to environmentally responsible design and not expecting to become burdened with design decisions not within their control. For example, where possible stormwater retention should be achieved within the right-of-way and not diverted to local systems.

EQUITY AND OTHER SOCIAL CHALLENGES

The multimodal use of roadways as policy is also an equity issue. Multimodal policy recognizes that pedestrians and self-powered vehicles have just as much right to use the roadway as motorized vehicles, which necessitates equalizing priorities when instigating design improvements.

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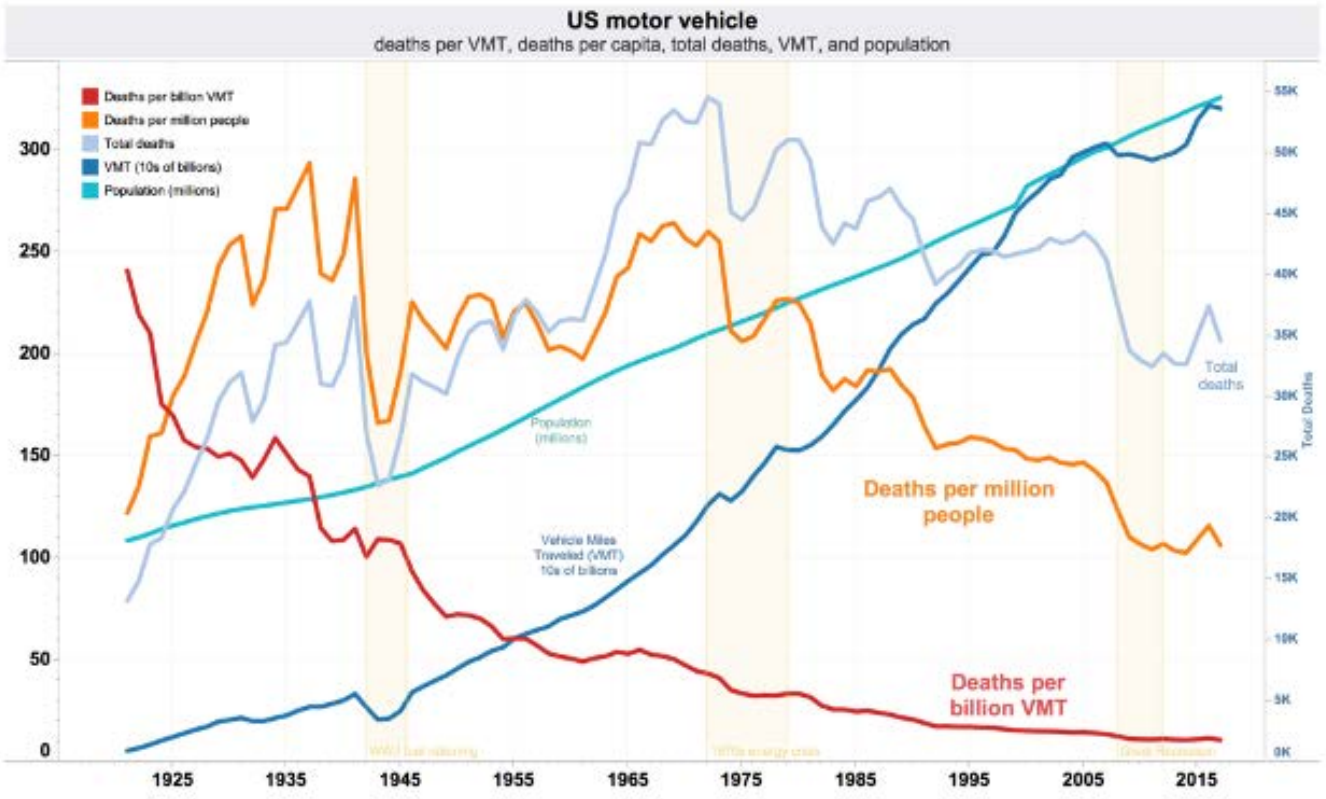
1. "… models predict that the amount of rain falling during the wettest 1% of days per year could potentially double in some parts of the state by the end of the century." Thomas Wall, Argonne National Laboratories, 2017. See Chapter 7 for a condensed review of previous work.
2. Pittsburgh's 34" of annual rainfall used as the basis for the calculation.

It can be argued that traffic deaths have continued to decline since the mid-1970s because of safer vehicle design, the introduction of traffic calming measures, the adoption of safer bicycle facilities, and lowering speed limits, all outcomes of multimodal policy, have had a similar effect. As a result of policy and these best practices, multimodal and complete street agendas are now, or should be, common to everyday transportation design.



Source: https://en.wikipedia.org/wiki/Motor_vehicle_fatality_rate_in_U.S._by_year#/media/File:US_traffic_deaths_per_VMT,_VMT,_per_capita,_and_total_annual_deaths.png

What is often forgotten, though, are accommodations for persons who do not drive. They may not be able to afford an automobile or even public transit, cannot physically drive due to disabilities, or are too young to drive. Often activities of daily living and entertainment are located on corridors, such as inexpensive fast food restaurants and low-cost and big box retail stores. Not all are located on the same side and require safe crossing of a 4- or 6-lane heavily trafficked arterial highway. Requiring a wheelchair-bound individual to negotiate a ramped pedestrian overpass is not an equitable design solution. The public should be provided choices and all persons, whatever their choice, are entitled to safe access.

COMMUNITY IMPACT CHALLENGES

Residents are concerned with safety and solving traffic problems but are also open to how transportation and related infrastructure projects can provide other benefits. It is not often that communities can engage with transportation professionals, but it would be an opportunity lost if either party is satisfied with just solving immediate problems.

Successful projects contribute to overall community benefit when they provide for building both the tangible physical improvements and the intangible assets, such as assistance with collateral transportation impacts off the PennDOT roadway, a safer public realm, beautification, community identity, and pride. Integrated planning and design require a holistic approach and one that reaches beyond the usual physical boundaries. Planning and design professionals should be responsible for initiating this perspective when working locally and documenting them as recommendations for current or future application.

CIVIC ENGAGEMENT CHALLENGES

PennDOT policy encourages active engagement between local communities, MPO/RPOs, and the agency when planning improvements and later TIP initiatives. This is not an easy task for any professional or community. Civic engagement can be frustrating for many community residents as many projects, whether for a neighborhood plan or a development project, do not yield tangible results or fully embody community intentions. While community participation is a requirement of public projects, many feel they have been “over engaged” or “used” by others to achieve agendas they did not set. Engagement fatigue can set in, especially when citizens feel they have not been heard or taken seriously.

There are stronger models for engagement that develop a sense of shared expertise, combining community and professional knowledge, when approaching a planning and design challenge. Techniques such as using real-time design tools, exploring numerous alternatives, and responding to community ideas with in-depth consideration enable meaningful participation. Understanding the context that brings parties together and learning from one another can form the foundation for reaching shared objectives. Understanding project parameters and requirements as well as community concerns, such as core community values and expectations, are necessary to shape and realize desired outcomes.

The process of building trust, respect, and commitment takes time, clear communication, and empathy. One must assume the engagement process will take just as long as the time for design and funding approval combined, and commit to keeping citizens informed throughout implementation.

PHYSICAL DESIGN CHALLENGES

Corridor Cohesion

Today's corridors are physical legacies of trail and local street amalgamations based on a multiplicity of decisions, available funding, different engineering and design ideas and trends, configurations, sizes, and scales. Unless conceived for a single purpose, such as a ceremonial boulevard, corridors exhibit little physical cohesion. Their physical design is an inconsistent patchwork.

Corridor land uses reflect local community zoning, which is typically written to continue historic patterns and encourage investment. Consequently, corridor municipalities economically compete with one another and are reluctant to share resources or development, inhibiting integrated corridor planning.

Corridor uses have also evolved to reflect a corridor's purpose. For example, commuter corridors attract auto-oriented businesses, service stations, fast-serve restaurants, and retailers who favor those who drive. And to complete the cycle, zoning institutionalizes this type of land use.

What has become lost is the appreciation that regional highway corridors are the front doors to most of the communities they serve. Community identity is eventually lost. Corridors take on a life of their own, separated from the communities they serve.

Roadway Design Criteria

In 2016 the Federal Highway Administration published revisions to the 1985 controlling criteria for design and how they are to be applied in different contexts on the National Highway System. All PennDOT highway roadways qualify. On roadways less than 50 mph, eight of the 10 mandated design criteria for highway roadways were dropped; however, all remain mandatory for speeds above 50 mph.

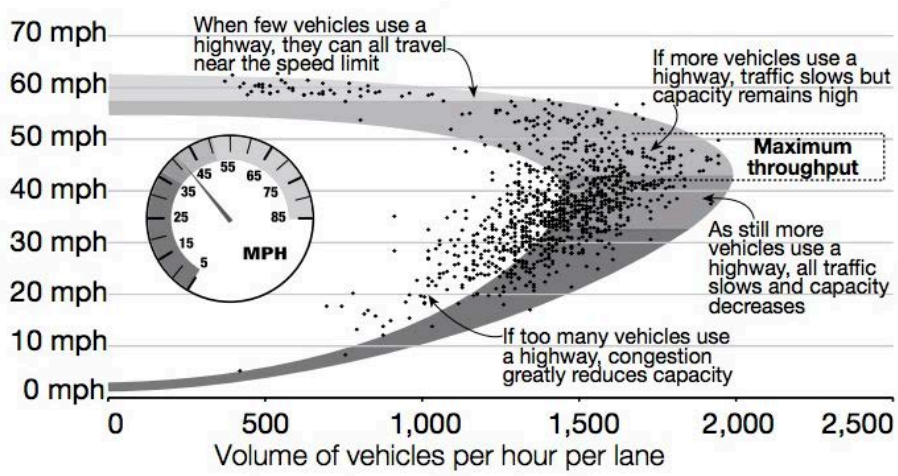
Mandated Design Criteria for Highways with Speeds Below 50 mph
- Design speed
- Design loading structural capacity

Mandated Design Criteria for Highways with Speeds 50 mph and Higher
- Design speed
- Design loading structural capacity
- Lane width
- Shoulder width
- Horizontal curve radius
- Superelevation rate[3]
- Stopping sight distance
- Maximum grade
- Cross slope
- Vertical clearance

[3] Rotation of pavement on approach and through a horizontal curve.

These changes call for careful evaluation and application. On highways with speeds of less than 50 mph, providing more flexibility has benefits for multimodal accommodation, but at the same time may lead to challenges for emerging technology such as occlusion difficulties for autonomous vehicles. On highways with speeds over 50 mph, the ability to adjust lane widths will be helpful for finding right-of-way space for multimodal facilities while also assisting traffic calming.

The FHWA criteria also complement recent modifications to the efficient traffic flow and speed chart. Automobiles per lane is now estimated to be most efficient at speeds from 40 mph to 50 mph per NHS findings, up from the previous 25 mph to 30 mph. However, noted traffic designers, Walter Kulash among them, have argued that the practical efficiency is closer to 25 mph to 30 mph when considering multimodal design factors, such as the inclusion of pedestrians, bicycles, and a variety of transit vehicles.



Souce: https://www.theurbanist.org/2020/12/15/five-road-widening-myths-that-are-delaying-climate-action/

Pedestrian safety increases with slower speeds. There is a significant increase in fatality probability when the speed limit exceeds 35 mph. The lowest speed limit on Route 65 is 40 mph. Maintaining it consistently throughout the corridor (with some areas at 35 mph) correlates well with optimal flow and pedestrian safety.

Souce: https://www.sfmta.com/blog/vision-zero-spreading-word-about-safer-streets-sf

More accidents occur at signalized intersections than elsewhere on the Route 65 corridor, mostly due to rear-end and turning collisions. Pedestrians are vulnerable due to heavy traffic volumes and short traffic light sequencing, especially if there is not a pedestrian-only sequence. Wide roadways take longer to cross and are difficult for seniors and persons with disabilities. Decreasing the crossing distance is one of the most effective design strategies for increasing pedestrian safety.

Source: https://ftp.dot.state.tx.us/pub/txdot/commission/2019/0724/2a-presentation.pdf

Placemaking

Placemaking is a multifaceted approach to the design and management of public space. It is both a process and a philosophy that embodies fundamental principles of urban design. It is also political due to the nature of place identity and placemaking can visually represent community values. Good placemaking also makes use of underutilized areas to create design cohesion at smaller scales that further enhance the overall spatial experience.

Creating an integrated corridor-to-community attachment or connection can be supported through placemaking. It capitalizes on a community's assets, inspiration, and potential with the intention of creating a public realm that promotes people's health, happiness, and well-being. Attachment occurs when three factors are achieved: social offerings, openness, and aesthetics. Places that foster face-to-face interaction build trust where people know and care about one another. Openness, a measurement of community inclusiveness, is achieved when the perception of place is good for all persons. Aesthetics is about the beauty of place. Attachment can result when communities take an active role in corridor planning (and later with longer-term maintenance) if corridor ownership is achieved through the process.

Design resources to create and sustain attachment include: multimodal and complete street agendas, whether fully achievable or only partially; good pedestrian accommodations such as traffic light pedestrian sequencing, pedestrian-oriented crosswalk intersection design; appropriate traffic calming measures that help create an atmosphere of safety (and measurable reduction in accidents); incorporation of technological improvements that increase safety and visibility; and the inclusion of aesthetic and greening features like street trees to enhance visual quality.

Placemaking is important for creating and sustaining the attachment of corridors to their context.
Souce: https://704shop.com/blogs/fact-friday/fact-friday-150-dilworth-neighborhood

Placemaking can be fundamental to greater safety and better design for corridors, especially in older settlements, where the corridor can be designed, or redesigned, to embody their purpose and the values of their communities. Placemaking can also be integrated into a roadway safety design approach by removing distractions and standardizing elements, leading to significantly fewer crashes and a more holistic design.

DESIGN CHALLENGES & OPPORTUNITIES FOR THE CASE STUDIES

ROUTE 65 CORRIDOR STUDY AREA ISSUES

This chapter takes a closer look at design challenges and issues pertinent to Route 65 along with a review of design inquiries for use during the case study workshops to gain additional feedback on both corridor-wide and local design interventions.

Safety, clarity, and aesthetic concerns previously noted are covered in more informational detail for facilitation and use during the workshops. They provide specific details for understanding important design factors requiring attention.

Many of these same issues can be found with other regional highway corridors, particularly those in older and more developed areas of Pennsylvania.

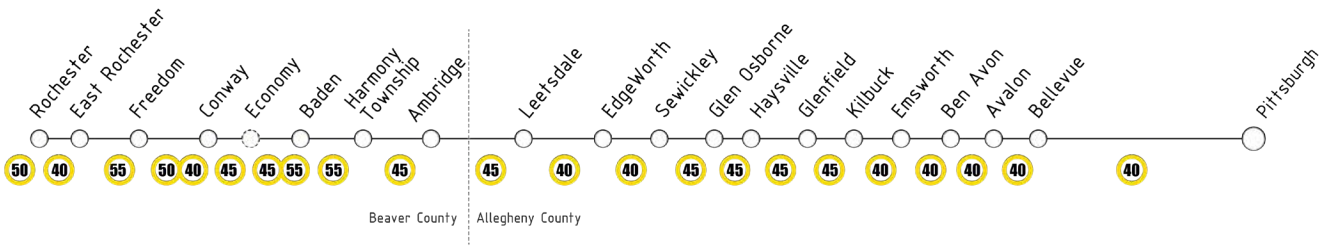
SAFETY

Inconsistent Speed Limits and High Speeds

Route 65 traverses a wide variety of landscapes, from denser outer-city suburbs built to the urban grid with substantial corridor development to rural stretches where the corridor bypasses local development. Where possible, the right of way has been widened and speed limits adjusted by the 85th percentile method, a standard measure of setting a speed at which 85% of drivers will travel at or below under free-flowing conditions. Nonetheless, driver behavior results in most vehicles traveling faster than posted limits by as much as 10-20 mph and, from QVCOG surveys, drivers are often frustrated because of it. Frequent users are scared. Project team observations found this to be true and that the corridor does not appear or feel safe for pedestrians, bicyclists, and other users including those waiting for transit. Similar conditions are found on other arterial corridors in the Pittsburgh region.

Corridor speed limits on Route 65 range from 40 mph to 55 mph. In some cases the speed limits align with the roadway design's message to drivers, but this is not consistent. The mismatch between posted speeds and roadway design characteristics can message that it is permissible to ignore posted limits. The range is greater in Beaver County where sections are designed as a limited access highway. Between Kilbuck and Glen Osborne in Allegheny County, designated as a consistent 45 mph, traffic moves the fastest on the corridor and often at 65 to 70 mph. This section resembles a rural environment with few trees or other landscaping, few buildings, long vistas, and the widest right-of-ways of the corridor, all of which perceptually invite faster movement. Assuming its roadway design is safe and consistent with the 85th percentile assumption, the lack of placemaking and right-of-way edge calming features influence the speed of drivers in a negative way.

Posted Speed Limits



(Note: Spacing between municipalities is proportionately scaled to actual distances in the study area)

Accidents and Frequency

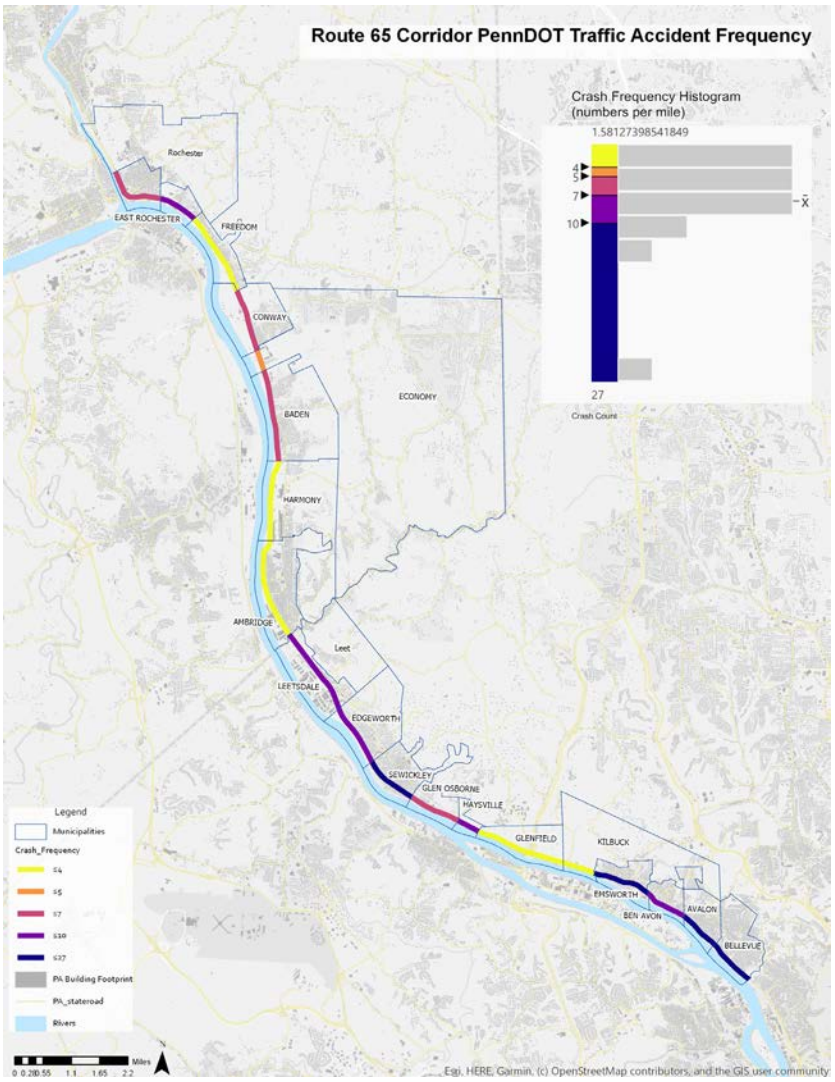
PennDOT accident numbers in 2017 are higher in municipalities within the older sections of the corridor. The highest accident rate (<27 per mile/year) occured only in Bellevue, Avalon, and Emsworth, where business and homes line Route 65 and where the highest number of curb cuts occur among the 19 corridor communities. The second highest locations of municipal accidents also correspond to high numbers of curb cuts in Ben Avon, Leetsdale, as well as major intersections, such as Sewickley's Route 65 intersection at the Sewickley Bridge and in Haysville at the junction of I-79 and the corridor.

Three deaths occurred during 2017: one each in Emsworth, Kilbuck, and Conway. Data indicates that two happened at T intersections and one Mid-block (Emsworth).

PennDOT Crash Frequency by Numbers/Mile Per Year

Highest (<27), 2nd Highest (<10), 3rd Highest (<7), 4th Highest (<5), Lowest (<4)

Municipality	Speed Limit
Highest Accident Rate/Mile: <27 Bellevue, Avalon, Emsworth 2nd Highest: <10 Ben Avon, Sewickley, Edgeworth, East Rochester 3rd Highest: <7 Conway (partial)	**40 mph**
2nd Highest: <10 Haysville, Leetsdale 3rd Highest: Glen Osborne, Baden (partial) 4th Highest: <5 Economy Lowest: <4 Kilbuck, Glenfield, Ambridge	**45 mph**
3rd Highest: <7 Conway (partial), Rochester	**50 mph**
3rd Highest: <7 Baden (partial) Lowest: <4 Harmony, Freedom	**55 mph**



Looking closer, 2017 accident types in both Allegheny and Beaver Counties were led by rear-end, angle, and hit fixed object collisions. These comprised 62% of Allegheny County and 78% of Beaver County collisions.

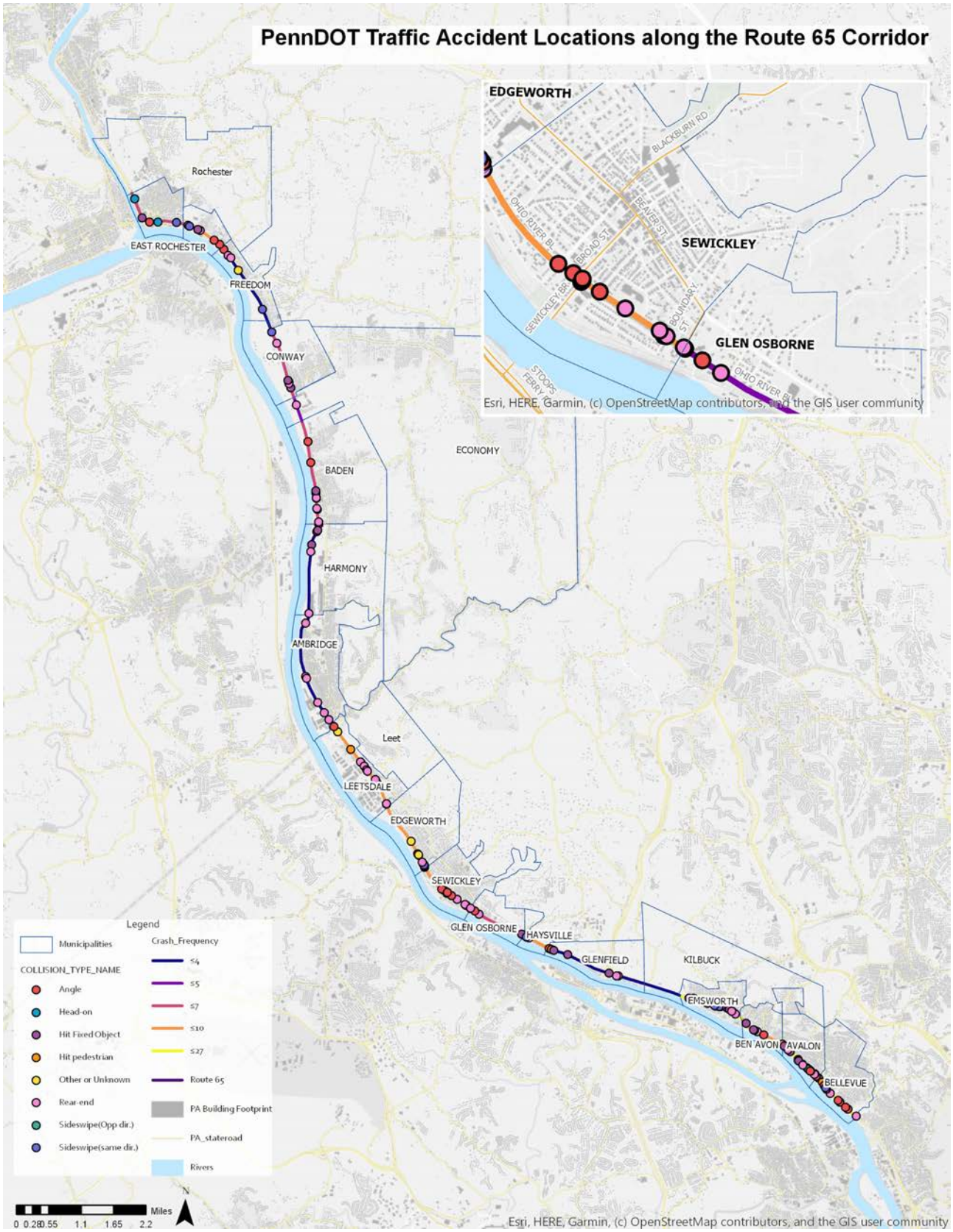
Accident Type:	
Rear-end	24% Allegheny and 35% Beaver
Angle	22% Allegheny and 24% Beaver
Hit Fixed Object	16% Allegheny and 19% Beaver

Correlating accident type by location produced useful information regarding Route 65 safety. Intersections and left-turn locations were the most problematic, whether turning across traffic at signaled/un-signaled intersections or mid-block locations aligning with curb cuts onto private property.

Accident Type:	**Location:**	
Rear-end	Four-way Intersection	3% Allegheny and 4% Beaver
	Mid-block	17% Allegheny and 21% Beaver
	T Intersection	6% Allegheny and 5% Beaver
Angle	Four-way Intersection	12% Allegheny and 11% Beaver
	Mid-block	9% Allegheny and 4% Beaver
	T Intersection	6% Allegheny and 7% Beaver

The types of collisions occurred at similar locations for both counties. The majority of rear-end collisions occurred at mid-block locations, followed by T Intersections, and four-way Intersections. Most angled collisions occurred at Four-way Intersections, followed by Mid-block locations, and T Intersections.

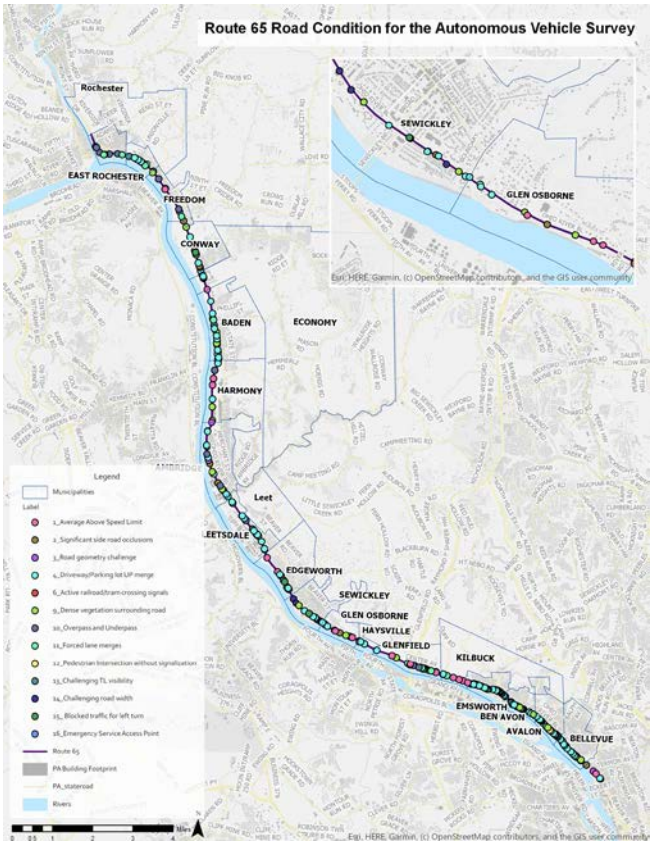
Rear-end collisions in Allegheny County at mid-block locations were most likely due to rear ending a stopped vehicle making a left-hand turn to a business, service, or residence directly fronting Route 65 on the opposite side of the roadway. The Allegheny County portion of Route 65 has a large quantity of curb cuts for business and residential uses along this older section of the corridor. In Beaver County, where there are significantly fewer mid-block curb cuts, rear end collisions mostly occurred at signaled intersections, where drivers collide with stopped vehicles in the movement lanes.

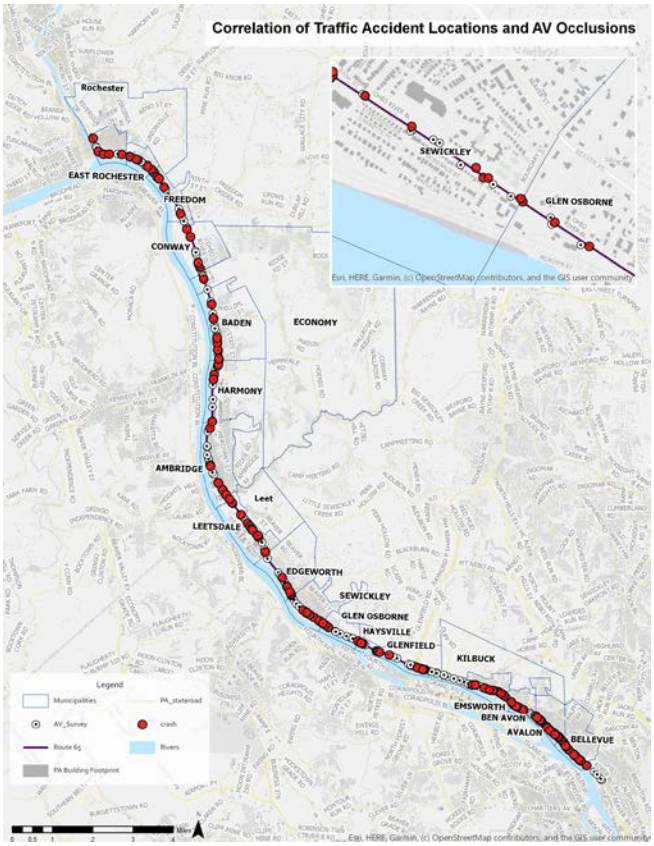

PennDOT Traffic Accident Locations along the Route 65 Corridor
EDGEWORTH
BLACKBURN RD
OHIO RIVER BL
BROAD ST
BEAVER ST
SEWICKLEY
SEWICKLEY BR
BOUNDARY ST
GLEN OSBORNE
STOOPS FERRY
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Rochester
EAST ROCHESTER
FREEDOM
CONWAY
ECONOMY
BADEN
HARMONY
AMBRIDGE
Leet
LEETSDALE
EDGEWORTH
SEWICKLEY
GLEN OSBORNE
HAYSVILLE
GLENFIELD
KILBUCK
EMSWORTH
BEN AVON
AVALON
BELLEVUE
Legend
Municipalities
COLLISION_TYPE_NAME
Angle
Head-on
Hit Fixed Object
Hit pedestrian
Other or Unknown
Rear-end
Sideswipe(Opp dir.)
Sideswipe(same dir.)
Crash_Frequency
≤4
≤5
≤7
≤10
≤27
Route 65
PA Building Footprint
PA_stateroad
Rivers
Miles
0 0.28 0.55 1.1 1.65 2.2
N
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Accident Locations Correlated with Autonomous Vehicle Occlusions

These maps compare typical AV occlusions observed along the study corridor with recorded accidents. The first map plots the occlusions by type and the second overlays the AV occlusion locations atop the recorded accidents.

While not exact, there is a strong correlation between the two sets of data. Reported human driver accident locations closely align with the autonomous vehicle occlusions and other AV challenges—the most likely locations for potential accidents involving driver-assist and autonomous vehicle technology. The most prominent correlation identifies rear-end collisions at major intersections. For AVs, speeding by human-operated vehicles, as well as snow, fog, and heavy rain conditions are major factors.





CONSISTENCY

Inconsistent Curb-to-Curb and Right-of-Way Dimensions

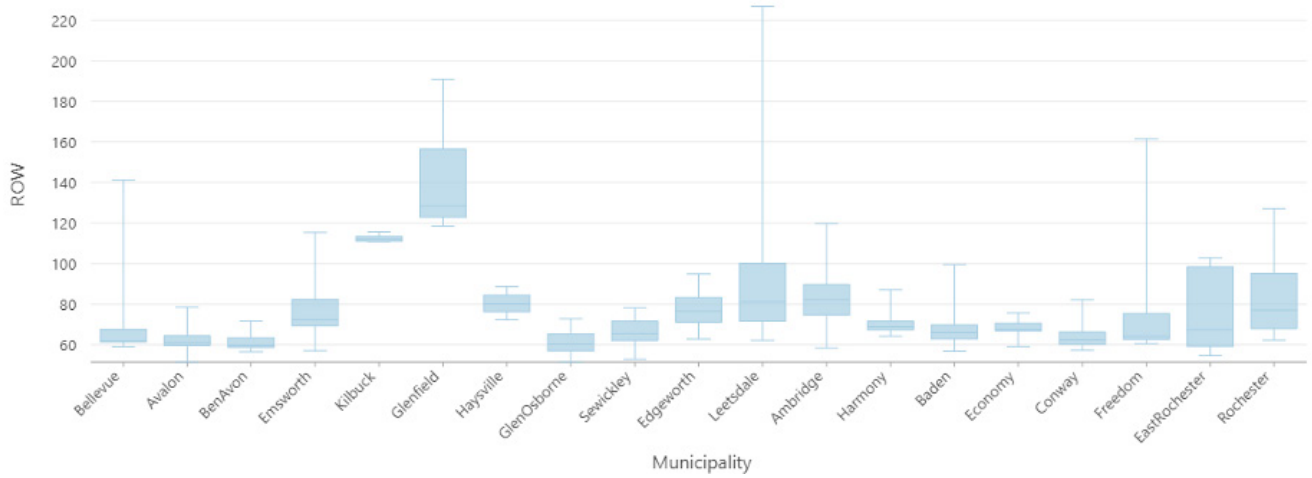
A closer look at rights-of-way widths illustrates the wide spatial range of the corridor's public realm while maintaining four travel lanes, two in each direction, for its full length. Where space permits and where curb cuts proliferate, a shared center turn lane serving commercial activity has been inserted and left-turn lanes have been added at signaled intersections.

Route 65, which opened in 1931, was originally designed as a 40-foot-wide four-lane boulevard running from the McKees Rocks Bridge where Pittsburgh transitions to the Borough of Bellevue and continuing to the northern limit of Emsworth Borough. It was subsequently widened to the widths shown in the table below as traffic increased due to population growth in the northern suburbs. Closely-spaced sycamores were planted at the edges of the widened curbs in Ben Avon to calm traffic, which today form a magnificent treed allee through this residential section. Unfortunately, visibility is compromised for both residents and motorists by their wide tree trunks. With its narrow roadway, left-hand turns into residential driveways stops traffic in the two center movement lane. Other dangerous conditions occur where businesses line the corridor between intersections requiring cross-traffic turns into parking lots.

Right-of-Way Dimensions by Route 65 Municipality
(Dimensions reflect rights-of-way, not the actual roadway for traffic)

Municipality	MPH Limit	Min ROW Width	Median Width	Max ROW Width
Bellevue	40	59.1	61.8	141.3
Avalon	40	51.4	61.0	78.5
Ben Avon	40	56.5	59.6	71.6
Emsworth	40	57.1	72.4	115.4
Kilbuck	45	110.8	112.3	115.6
Glenfield	45	118.4	128.4	190.9
Haysville	45	72.3	80.2	88.7
Glen Osborne	45	51.4	60.4	72.8
Sewickley	40	52.8	65.5	78.2
Edgeworth	40	62.8	76.6	94.9
Leetsdale	45	62.2	81.2	226.9
Ambridge	45	58.4	82.3	119.8
Harmony	55	64.2	68.8	87.0
Baden	45 & 55	56.9	66.0	99.5
Economy	45	59.1	67.6	75.6
Conway	40 & 50	57.2	62.4	82.2
Freedom	55	60.5	64.1	161.6
East Rochester	40	54.6	67.4	102.9
Rochester	50	62.2	77.1	127.1

Distribution of Right-of-Way by Municipality



Data Souce: Western Pennsylvania Regional Data Center. (2019). Parcel https://data.wprdc.org/dataset/allegheny-county-parcel-boundaries.

Patchwork of Improvements

Typical of older corridors, improvements appear to be tailored to specific contexts intended to solve specific traffic concerns. The results are a variety of roadway widenings, such as widening to increase capacity and installing center-turning and right-turn lanes. Over time these improvements, all made with proper and good intentions, have created a patchwork instead of consistency.

AESTHETIC QUALITIES

Physical Environment Lacks Coherence

The corridor's incremental growth and variety of roadway improvements have resulted in an infrastructure with limited visual appeal. Landscaping is minimal. Signage is insufficient and inconsistent. Except for the short Ben Avon segment, the southern approach into Sewickley, and the parklike setting on Edgeworth's western side, the study area has little right-of-way vegetation or an integrated landscape. Infrastructure features are concrete- and steel-based, with little use of color. Sidewalks are generally in disrepair and where there are no sidewalks businesses have extended their uses out to the curb line. Maintenance varies. In commercial areas, traffic signals visually compete with advertising signage. The cluttered visual appearance of the corridor provides little driver pleasure and interferes with wayfinding.

Corridor Functionality is Unclear

When there is little visual order, one's tendency is to look for other clues of orientation and wayfinding.

Land use is a good indicator because of their familiar building and use types. The earlier Phase 1 study identified three basic physical and land use models that describe the 19 corridor communities; however, their relationships between one another are not necessarily consistent; where one physical type may identify a similar corridor-to-main street relationship between four or more adjacent communities, their land uses are not always consistent.

Municipality	Physical Typology	Economic Typology
Bellevue	Parallel	Bedroom-Commuter
Avalon	Parallel	Bedroom-Commuter
Ben Avon	Parallel	Bedroom-Commuter
Emsworth	Parallel	Bedroom-Commuter
Kilbuck	Bypass	Bedroom-Commuter
Glenfield	Bypass	Bedroom-Commuter
Haysville	Parallel	Bedroom-Commuter
Glen Osborne	Parallel	Bedroom-Commuter
Sewickley	Parallel	Mixed-Economy
Edgeworth	Parallel	Bedroom-Commuter
Leetsdale	Through	Mixed-Economy
Ambridge	Parallel	Mixed-Economy
Harmony	Through	Bedroom-Commuter
Baden	Parallel	Job-Concentrated
Economy	Parallel	Bedroom-Commuter
Conway	Parallel	Job-Concentrated
Freedom	Bypass	Job-Concentrated
East Rochester	Through	Bedroom-Commuter
Rochester	Bypass	Mixed-Economy

The Ohio River's relationship with the corridor contributes to the inconsistency. The Norfolk-Southern Railroad parallels the Ohio River on the corridor's western side, sometimes located at the river's edge and sometimes at the corridor's edge depending on topography and the space between the river and the corridor. Industrial and office park uses occupy the larger spaces with residential and recreational uses in the narrower one.

The functional landscape changes from municipality to municipality, sometimes due to geographic and topographic conditions but often because of local zoning which allow for a complex variety of conditions, from driveways to shopping center parking lots to freight access along the roadway. From an economic development perspective, and through the lenses of roadway safety and community identity, both roadway design and zoning can address this.

Local ordinances contribute. While geographic and topographic conditions affect physical placement, local zoning creates functional location-based patterning representing local values and municipal-centric decision-making. Not all municipalities think alike along any corridor and this is reflected in the land use physical environment and often create a community's identity or image.

The wide range of land use patterns along the corridor points to the need for making the roadway and corridor design as clear and consistent as possible.

DESIGN TOPICS AND INQUIRIES FOR CASE STUDY FACILITATION

The information developed for this project and previous work on Route 65 led to the following design queries and dialogue opportunities for use by the project team during the case study workshops and assistance with later findings and recommendations.

Engagement
Encourage participation from all citizens who live and work in the corridor. Discuss broad corridor-wide items while illustrating local possibilities. Use design items to create dialogue and understanding.

Identity
Use case studies to identity citizen values and interest by illustrating contextual design possibilities and explaining the differences between local and corridor-wide identity. Use the dialogue to discuss differences between corridor functionality and local responses to land uses and zoning; determine if citizens are fine with them. Identify opportunities for distinguishing primary community entrances, truck locations, local entrances and exits. Identify off-the-corridor community attractions where the community would welcome visitors and discuss which corridor access and community routes would be most acceptable. Illustrate and discuss how signage and artwork can enhance local identity as well as wayfinding.

Growth
Anticipated industrial growth by the natural gas industry is anticipated for Beaver County which will create new jobs and likely result in local residential and business population increases. Currently, Route 65 is a one-way commuter destination to and from Pittsburgh; however, depending on growth the corridor may become an everyday two-way commute. While not a subject for the case study workshops, a two-way commuter corridor could have a significant impact on corridor frontage and transit. Corridor design interventions should consider both directions as equally viable.

Truck Activity
Truck activity will likely increase due to anticipated industrial growth in Beaver and possibly growth within existing industry locations along the corridor. Delivery activity has been increasing on the corridor within communities as door-to-door delivery has become commonplace. Discuss whether heavier truck activity should be limited to designated community streets and how might corridor intersections be configured to make those community entrances visually apparent. Determine which local streets are more desirable for this traffic and whether improvements are also needed to make them more functional.

AV Activity
Autonomous vehicles are now a highway design factor, and their usage will increase including AV single and connected trucks. Visual and structural occlusions will require attention and will affect some traditional corridor practices as they intermix with driver-operated vehicles. Rear end collisions will likely increase as AVs will not violate speed limits and currently cannot anticipate driver behavior. Designing for AVs will ultimately result in safer-designed corridors but will require increased visibility and longer turning lanes.

Multimodal Use
Gather feedback on existing (very limited) pedestrian, bicycle, and other micromobility vehicle activity on the corridor and where it is desired. Are there locations where shared-ride vehicles are desired, accepted, or should be discouraged? Explore how residents would recognize "safe accommodation." Determine locations where these facilities could be appropriate and welcomed by community residents and whether they should be continuous throughout the corridor or only in limited locations.

Sustainability
Opinion surveys noted environmental concerns. Discuss and illustrate various stormwater management alternatives to gain further feedback on desirability and acceptance. Discuss landscape as both a greening and sustainable initiative and illustrate types and locations for feedback.

Corridor Speed
Determine locations where residents have speeding concerns and where intersections or highway stretches are dangerous. Ask if moderating speed through roadway design, posted speed limits, or other means is desirable and garner participant ideas for solutions.

Intersection Design
Identify intersections where pedestrians are fearful of traffic and test various pedestrian interventions for opinions. Determine if drivers have similar concerns regarding pedestrians or other vehicles at these intersections. Illustrate how left and righthand turning lanes work and seek opinions whether tradeoffs of curb and pedestrian space are acceptable. Determine if there are specific intersections that require reconfiguration and why. Determine if any of the participants walk on these portions of the corridor and what would make them feel safe. Determine where parking alternatives and curb cuts would be acceptable. If participants were wheelchair users, what would concern them the most and how might the intersection be reconfigured, or signalization changed for them to feel comfortable. Railroad crossings were noted as dangerous intersections; determine why and discuss design alternatives to the corridor that could resolve these situations.

Mid-Block Design
Rear-end collisions should be given careful consideration. Test design alternatives such as center turn lanes and medians for citizen reaction. Ask if there are other acceptable design alternatives, such as U-turns at intersections. In high-speed locations explore slip lanes when the right-of-way widths allow them. At T-intersection locations determine if there are street system alternatives that would encourage using signaled intersections for cross-traffic access.

Driver Confusion and Visibility

Angled intersections, narrow connecting streets, and unexpected property entrances are some of the corridor anomalies that make driving difficult and often the cause of accidents. Ask where participants have experienced concerns and test various design alternatives that will provide clarity while maintaining corridor traffic flow. Note whether there are conditions that may warrant signalization or closure to the corridor. Determine where there are corridor infrastructure locations that result in confusion or poor visibility and explore design solutions, including the use of color or landscape. Discuss corridor signage and wayfinding to determine adequacy or need.

Aesthetics

Citizen feedback noted that street trees and landscaping are desired amenities for the corridor. Discuss where participants have enjoyed driving on corridors and what visual or physical amenities contributed to their enjoyment. Illustrate their descriptions using existing corridor backgrounds. Explore how important aesthetics are to citizens and their value as assets or maintenance headaches. Discuss if there is a relationship between corridor aesthetics and community identity, and try to determine if better corridor aesthetics would create a sense of personal and/or community pride in where they live.

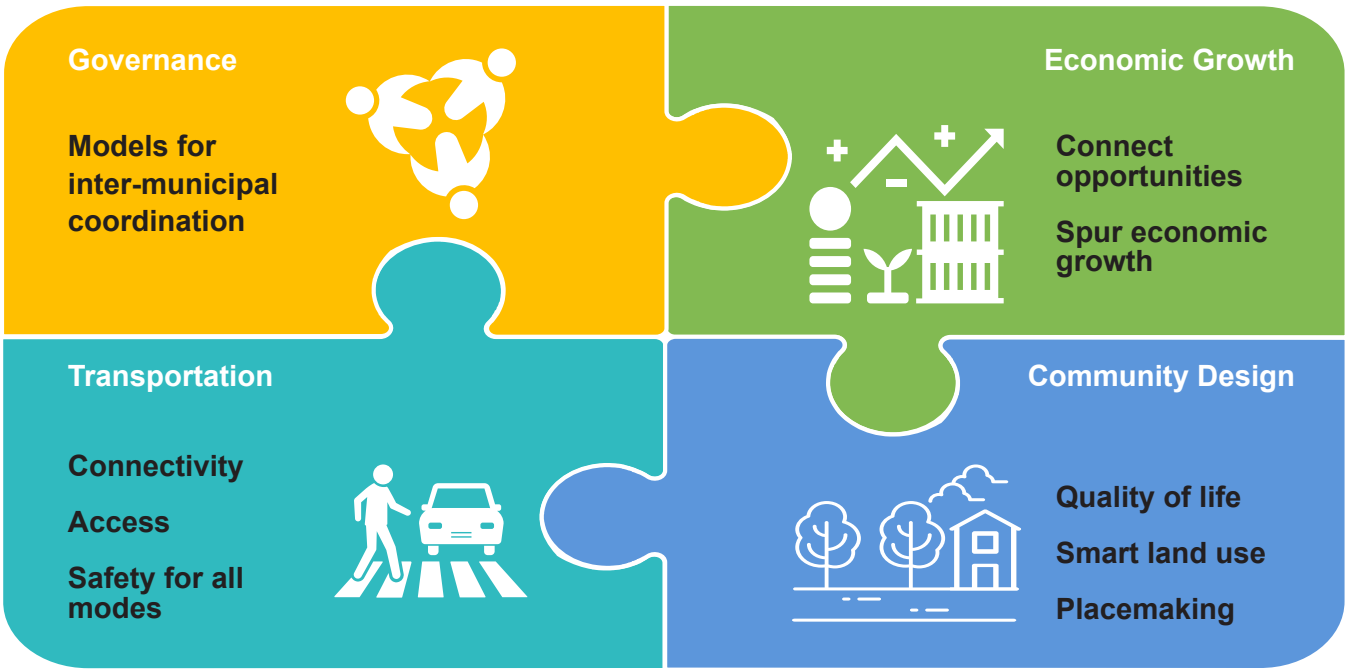
CASE STUDY DESIGN TESTING

2 Corridor Municipalities

VALUE

The Route 65 Ohio River Boulevard is a significant transportation route between counties, as well as primary access point into numerous municipalities along the way. The varied right-of-way, community adjacencies and connectivity, and access conditions create very different experiences along this route and varying speed.

In building upon the typologies developed by the 2019 Regional Highways Corridor Benefit Research Study, this process selected two municipalities to examine and test alternate road designs in greater detail. The primary goals were to assess the areas with high crash rates, explore and understand further safety concerns; recommend design and operational improvements that further the four key values of Community Design, Transportation, Economic Development, and Governance; and model a collaborative design process with integrated community engagement.



Why These Two Locations?
Emsworth and Ambridge were selected as case study locations that represent a range of typical or common conditions along the corridor. The Route 65 corridor spans two counties, so one municipality from each county was selected. Emsworth is an example of a community in Allegheny County, with primarily residential uses, and presents Route 65 as a central thoroughfare with some commercial uses. Ambridge is an example of a community in Beaver County, with an active mixed use Main Street, where Route 65 behaves as a bypass. Together, these two case studies led to design and functional solutions that address many common and shared characteristics and issues along the corridor.

Civic Engagement
The Route 65 Case Studies involved members of the adjacent municipalities in continuation of the civic engagement begun through previous work performed by Carnegie Mellon University and the QVCOG. In December 2019, a project website www.65corridor.org was created to share information and updates about the process and the events planned. The website also included links to the previous study and the Commenter on Ohio River Blvd (CORBi) online mapping tool. CORBi remained active throughout the workshops and continued to gather information about safety, accessibility, destinations, and other concerns shared by residents of communities throughout the Ohio River Boulevard corridor, in both Allegheny County and Beaver County. This data gathering portal enabled comments allowed ongoing self-led participation.

More interactive civic engagement was fostered through a series of design workshops held with community members. A series of four online sessions were hosted via Zoom and shared information about the project, solicited resident comments, used visual note taking to promote transparent communication, and engaged in an interactive charrette methodology to achieve meaningful collaboration and shared visualization of concepts between the design team and all participants in those sessions. Recordings of each workshop were then posted on the project website, making them available to a wider audience.

The four events were advertised by the Quaker Valley COG. QVCOG publicized the event through direct reporting to member municipalities, Beaver County COG meeting and email notices, social media and both the QVCOG and 65corridor.org website. These events were open to all who were interested, including representatives from all the municipalities located along the corridor.

Attendance at each session included residents and representatives from each of the following municipalities:

- **Emsworth**
- **Ambridge**
- **Leet**
- **Ross**
- **Pittsburgh**
- **Sewickley**
- **Monaca**
- **Haysville**
- **Glenfield**
- **Bellevue**
- **Ben Avon**
- **Kilbuck**
- **Economy**
- **Aleppo**
- **Glen Osbourne**
- **Avalon**
- **Conway**

January 27, 2021

1 Introductory Session

The opening session was held on January 27, 2021 and formatted as an informational presentation about the project history, status, and goals. The two case studies were described through an analysis of their relationship to Route 65, issues and constraints in each location, and documented crash history. Examples of design approaches used by other cities under conditions with similar design and speed limitations were also shared. Although the road types shown in the examples were not all classified as arterials, they did depict road design treatments and configurations that are appropriate to a 35 mph speed limit and provided examples of alternate road design that achieves safer conditions for pedestrians and vehicles alike.

February 11, 2021

2 Emsworth Workshop

The first interactive workshop was held on February 11, 2020 with a focus on Emsworth.

March 4, 2021

3 Ambridge Workshop

The first interactive workshop was held on March 4, 2020 with a focus on Ambridge.

March 17, 2021

4 Presentation of Findings

A summary of workshop findings and results was presented on March 17, 2021 in an hour-long presentation. This summary shared the ideas generated by both workshops, organized them into an initial toolbox to illustrate the potential for application across all municipalities in the Ohio River Boulevard corridor as well as relevant for highway corridors elswewhere in Pennsylvania, and set the stage for the publication of this toolkit.

CASE STUDY #1: EMSWORTH

BACKGROUND

Historical Context

The Borough of Emsworth is a community of approximately one square mile in size located along the east bank of the Ohio River, east of the Borough of Ben Avon and southwest of Kilbuck Township. The Borough began as land which was purchased by the State from heirs of William Penn in the 1700s and given to soldiers who fought in the Revolutionary War as payment for their service. The name Emsworth was derived from one of these tracts of land, which was thought to be named after an English duke. Following the Revolutionary War, families seeking to find their fortunes in the west were drawn to Emsworth because of its scenic beauty and position along the Ohio River. A historically significant trail, the McIntosh Trail, was an important road which connected Fort Pitt and Fort McIntosh during the War and extended through the Borough at the approximate location of the modern-day Route 65 Corridor. The Borough was officially incorporated in 1896, and by the early 1900s the Emsworth Dam was constructed across the Ohio River. The Dam has become the most recognizable feature of the Borough, and historically contributed to river commerce by reducing water level fluctuations at the Ohio River's harbors. As a bedroom community of the Pittsburgh region the Borough's economic success has mirrored regional trends.

Existing Conditions

Like many municipalities along the Route 65 Corridor, the Borough of Emsworth is generally urban in character, with single- and multi-family housing and neighborhood retail along its main interior street of Center Avenue. The Borough is located within the Avonworth School District and is currently home to 2,381 residents and approximately 1,112 households. Though the Borough does not contain large industrial employers like many other municipalities on the Route 65 Corridor, residents benefit from a high quality of life in a well-managed and maintained bedroom community. The Borough has been designated a Banner Community over multiple consecutive years by the Allegheny League of Municipalities, a non-profit, non-partisan membership association which recognizes communities that demonstrate a dedication to professional development, prudent fiscal management, transparency, and accounting. In addition, the Borough contains several conveniently located parks including Marmo Park and Avonworth Community Park, which provide residents of the Borough with amenities such as a public pool, recreational facilities, playground equipment, pavilions, and rental meeting spaces. The Holy Family Institute is a regionally significant provider of child and family services located on the Route 65 Corridor in the Borough of Emsworth. The institute established a formal governing body in 1904 and provides families and children with educational support, therapy and mental health services, and addiction recovery services, among others. The institute is located south of the Route 65 Corridor and has had a major presence in the Borough since its formal creation in 1904.

Households

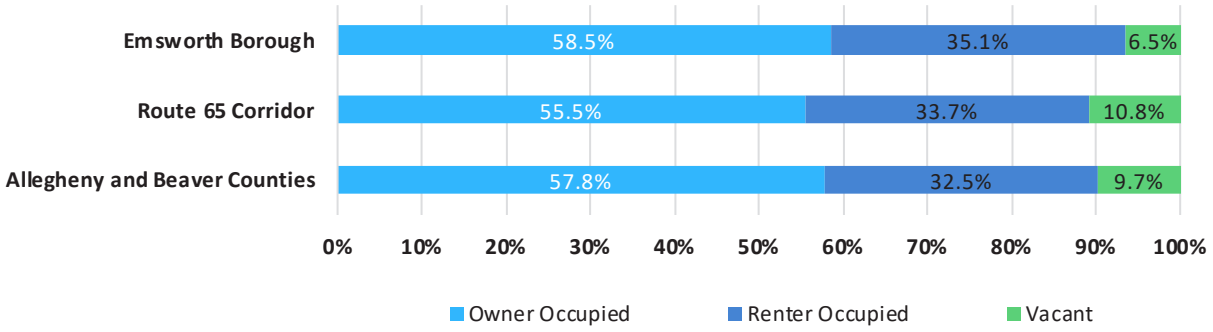
As of 2018, there were a total of 1,112 households in the Borough, with an average household size of 2.08. Of these households, approximately 46% are family households, and 54% nonfamily households. In comparison, Allegheny and Beaver County's household type composition in 2018 included 60% family and 40% nonfamily households. The Borough's housing tenure is typical of urbanized areas and is consistent with county trends.

Housing

In 2020, the Borough of Emsworth contained a total of 1,203 housing units. Between 2010 and 2020, the number of housing units in the Borough increased by approximately two units, or 0.27%. This minimal increase in housing is consistent with the Borough's low population growth and built-out character. In comparison, housing units throughout the Route 65 Corridor decreased by approximately 4.31% from 2010 to 2020, while Allegheny and Beaver County housing units increased by 1.61%.

Income

Median household income, and changes in median household income over time, can provide insight into the potential spending power of consumers in an area. Residents of the Borough of Emsworth had a median household income of $59,041 in 2020. Comparatively, the Route 65 Corridor had a median household income of $54,133, and the collective median household income for Allegheny and Beaver Counties is $59,831 in 2020. The median household income of the Borough suggests that consumers in the Emsworth community have a spending power which is consistent with regional trends, and slightly stronger than the Route 65 corridor average.



Emsworth Housing Tenure, 2020
Source: ESRI Business Analyst

Economic Typology

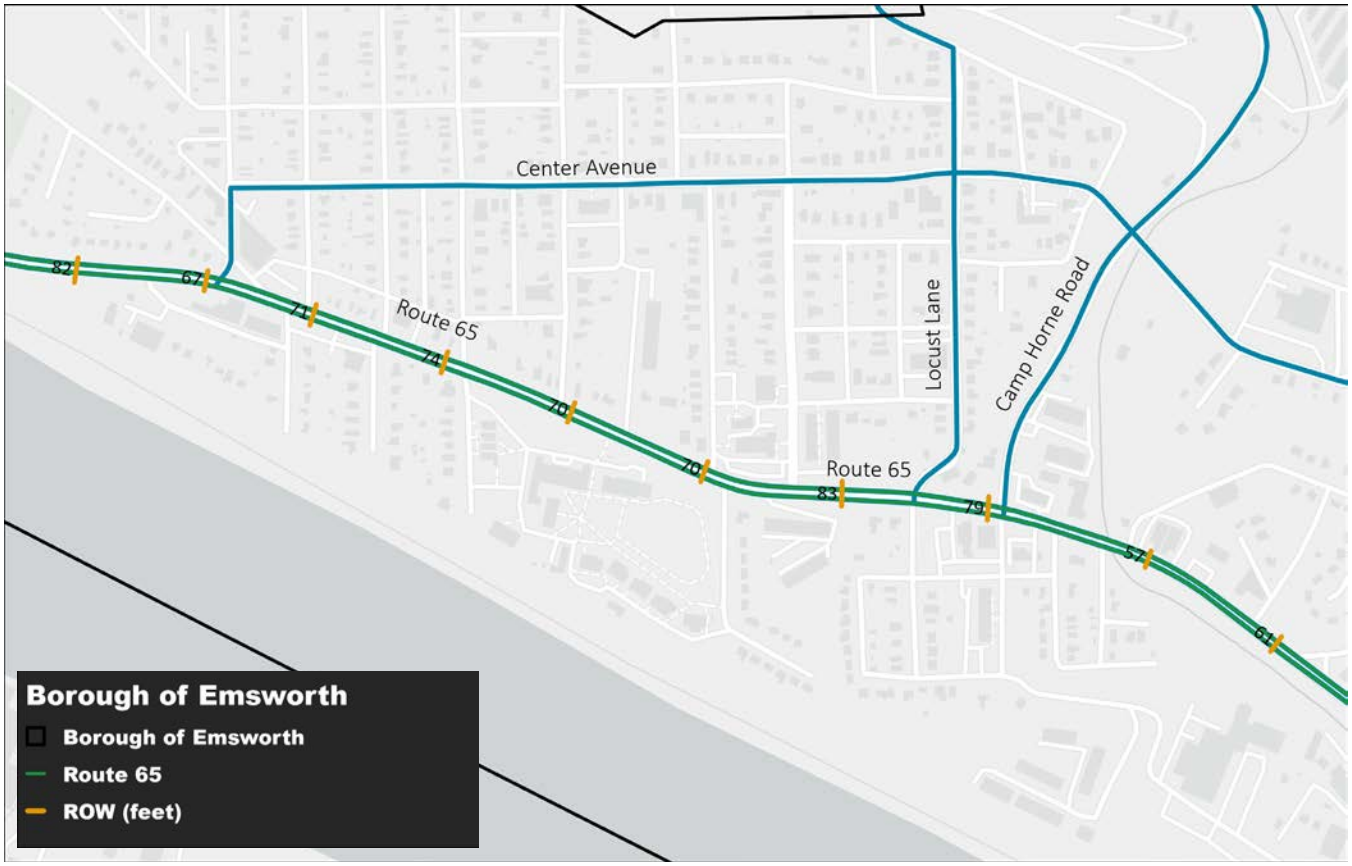
In the 2019 corridor research study, Emsworth was primarily categorized as fitting into the Bedroom-Commuter typology, which refers to communities dominated by residential uses.

Transportation Infrastructure

Using PennDOT's statewide roadway categorizations, Route 65 is a Principal Arterial Highway which bisects the Emsworth community and connects with the Borough's local roads at 16 intersections, including at a Minor Arterial called Center Avenue, and another Principal Arterial Highways known as Camp Horne Road. Center Avenue represents the Borough's main street, which is located in the Borough's interior and extends parallel to Route 65. Within the Borough of Emsworth, Route 65 has an annual average daily traffic (AADT) count of 8,238 to 12,445 depending on the location along the corridor. In comparison, traffic on the Borough's main street of Center Avenue has an AADT count of 1,964 to 10,119 vehicles per day. Block by block counts are not available.

Right-of-Way

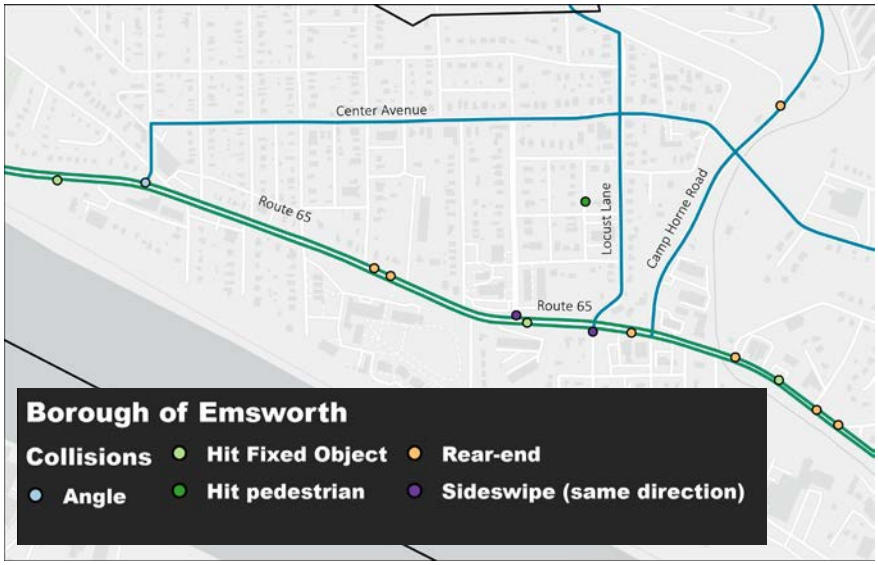
The PennDOT Right-of-Way (ROW) along the Route 65 Corridor in the Borough of Emsworth ranges in width from 57 feet near Hiland Drive to 115 feet at Heron Avenue. Typically, right-of-way widths increase at intersections along the Corridor to accommodate additional turning lanes but rights-of-way within the Borough varies widely overall. Route 65 consists of two lanes on each side of the road along the entire length of the Route 65 Corridor through the Borough, with no turning lanes except at a left-hand turn at the intersection of Camp Horne Road. At the intersection of Camp Horne Road and Route 65, the Corridor is approximately 79 feet wide, including all four lanes of traffic, one turning lane, and sidewalks.



PennDOT Right-of-Way
Source: Pennsylvania Department of Transportation

Collisions

In 2019, there were a total of 21 reportable vehicular crashes within the Borough of Emsworth. A total of 15 crashes, or 71% of total crashes in Emsworth, occurred on Route 65 in 2019.



Total Vehicular Crashes in the Borough of Emsworth, 2019
Source: Pennsylvania Department of Transportation

Retail Trends

A retail gap analysis is a tool used to better understand the potential for new retail businesses in a community by comparing the supply, represented by the number of sales to customers, and demand, represented by consumer spending. A positive value represents 'leakage' of retail opportunity outside the community where residents are leaving the community for their shopping needs. A negative value represents a surplus of retail sales where stores within an area are drawing customers from outside the community. Based on estimates using Esri Business Analyst, there are retail leakages in all retail sectors operating in the Borough of Emsworth. There is no saturation of demand for any of the six retail sectors within the Borough, however there are gaps in the provision of the remaining seven retail sectors. The Borough contains a total of 11 businesses, six of which are Food Service & Drinking Places that are mainly clustered around Route 65 and Center Avenue.

2017 Industry Group	NAICS	Demand	Supply	Retail Leakage
Motor Vehicle & Parts Dealers	441	$6,410,589	$1,389,108	$5,021,481
Food & Beverage Stores	445	$5,776,327	$1,252,074	$4,524,253
Food Services & Drinking Places	722	$3,228,104	$1,952,699	$1,275,405
Clothing & Clothing Accessories Stores	448	$1,767,863	$522,516	$1,245,347
Miscellaneous Store Retailers	453	$1,364,072	$468,326	$895,746
Furniture & Home Furnishings Stores	442	$1,093,816	$718,596	$375,220

Emsworth Retail Gap Analysis and Leakages
Source: ESRI Business Analyst

Zoning and Land Use

The Borough of Emsworth encompasses 437 acres, or approximately 0.68 square miles, and is located northwest of the City of Pittsburgh. A Norfolk Southern rail line runs parallel to Route 65 and the Ohio River at the southern boundary of the Borough. The Borough's interior primarily contains residential housing, with some commercial retail uses along Center Avenue. Mixed-use, commercial, and light industrial uses are located on both sides of the Route 65 Corridor, with open space and conservation land extending northward through the Borough along Camp Horne Road and Lowries Run. Non-residential land uses are clustered around the Borough's major local roads of Center Avenue, Camp Horne Road, and Route 65, but quickly shift to predominantly residential housing to the north and west.

The Borough of Emsworth Zoning Map, adopted in 2004, illustrates the current zoning of the Borough, which is comprised of seven zoning districts. The current zoning in the Borough of Emsworth has its foundation under the Borough's first Zoning Ordinance, which was enacted in 2002. Under the ordinance, the Town's zoning included predominantly residential uses with some commercial uses mixed throughout the Borough, as well as limited light-industrial uses and open space designations. The Borough's zoning ordinance has remained majorly unchanged since its adoption in 2002. In 2007, ordinance number 955 added conditions to existing land uses which restrict agricultural uses in light industrial and commercial districts within the Borough. Additionally, in 2010 the Borough of Emsworth issued ordinance number 975, in which the Borough's open space and conservation district was redefined to better articulate the districts purpose within the context of the Borough's 1997 Future Land Use Plan recommendations.

The zoning districts established by the Borough's zoning ordinance are summarized below:

- R-1 – Household Residential District was created to develop and protect single-family homes within the district by promoting the development of vacant land and requiring proper design standards.
- R-2 – Multi-Household Residential Districts was established to create a supply of affordable housing within the Borough of Emsworth and allow the district's older homes to be partitioned so that they may remain economically viable.
- R-3 – Mixed Use Residential District defines areas of the Borough which are primarily residential but allow for commercial institutions which are regulated to ensure compatibility with the district's residential character. Additionally, the R-3 zone allows for the construction of Multi-Family residences to expand affordable housing in the Borough.
- C-1 – Neighborhood Commercial Districts designate areas of the Borough where neighborhood-oriented businesses may be located so that they area compatible with nearby residential uses. Residential housing is a permitted use in this district, in addition to compatible commercial uses.
- C-2 – Highway Commercial District is a zoning classification created to establish heavy commercial uses in the Borough along major corridors such as Route 65 and provide regulations to ensure that these uses are compatible with nearby residential housing.
- LI – Light Industrial District was created to promote a mix of economically viable commercial and light industrial uses that are compatible with each other and to keep the involved uses from becoming a burden on the appearance and socioeconomic character of the Borough.
- O/C – Open Space/Conservation Districts allow for the appropriate development of floodplains and high slopes (25% or greater) within the Borough and protect excessively vulnerable or recreationally valuable lands from development.

Borough of Emsworth Land Use, 2020
Source: ESRI Business Analyst

CORRIDOR DESIGN ANALYSIS

Physical Context and Urban Form

Parallel Typology

In the 2019 corridor research study, Emsworth was primarily categorized as fitting into the parallel typology. Route 65 crosses through the municipality, with commercial and residential uses located on both sides and within the borders of Emsworth. It is parallel to Center Avenue, which presents as the traditional “main street” of the borough. Center Avenue is a two-lane street with parallel parking on both sides. The Borough office, Fire Department, and several local businesses are located along Center Avenue. There is bus service also along Center Avenue with stops placed on most blocks. Center Avenue continues to the east through neighboring municipalities of Ben Avon, Avalon, Bellevue, and into the City of Pittsburgh. The road changes names regularly as it passes through each new community, but the road alignment allows a continuous connection through each town, in parallel to Route 65. Many surrounding communities also have commercial uses on Center Avenue, so it acts as a multi-municipal “main street” spine. In Emsworth however, Center Avenue transitions towards the west to include primarily residential uses, and finally ends at Hazelwood Avenue. Beyond Emsworth, through traffic heading must use Route 65.

Through Typology

At a more detailed level, Emsworth presents elements of the through typology as well. Development on both sides of the road interacts with Route 65 through frontage and access onto Route 65. Commercial development especially around Camp Horne Road and the blocks between Allegheny Avenue and Hazelwood Avenue resemble a through typology. Bus service is provided along Route 65, with stops placed every few blocks. Although Center Avenue does offer a parallel local “main street”, Route 65 directly supports small and local commercial uses as well. Residential uses, frequent street connections, curb cuts for businesses, and frequent bus stops make this segment of Route 65 a community spine that needs to be safe and accessible for local vehicular and pedestrian movements.

Street and Intersection Analysis

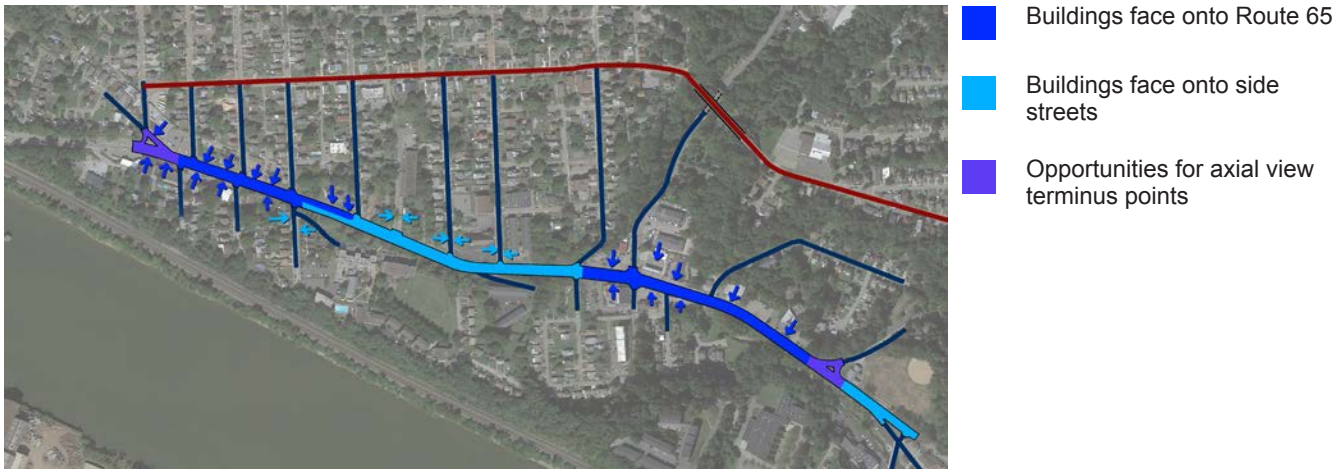


Diagram of Frontage Conditions in Emsworth

An analysis of the street network and connectivity across Route 65 identified three primary types of intersection through Emsworth. Only three intersections are signalized, and only two of those are 4-way stops that allow cross movement over Route 65. Many street connections allow access to or from only one side of Route 65. Several locations have more complicated geometry that present complications as well as opportunities.

- Central access: These are streets that cross Route 65 and connect blocks and uses on both sides. Allegheny Avenue and Camp Horne are signalized.
- Local access: These are streets that do not cross Route 65 and are designed to serve only one side of the community. Many streets in Emsworth fall into this category. Pennsylvania Avenue and North Avenue are examples of local streets. Some of these streets are one-way.
- Gateway access: This intersection type is designed to prioritize shifting drivers to and from another preferred route, such as the community main street. Hazelwood Avenue and Memorial Drive are each at entrance points to Emsworth, and each also use a triangular intersection with slip lane to separate turning movement.

Emsworth has several pairs of streets that do not fully conform to a central or local access type. These pairs come close to aligning with each other, but do not include signalization to organize movement through the intersection. Slight misalignment also complicates crossing movement. Near alignment of the intersections encourages drivers to want to cross through. Examples include Walliston Avenue, Greenwood Avenue/Olliver Avenue, Orchard Avenue/Maple Avenue, and Locust Street. The form and function of these intersections should be improved to identify which movements are supported and provide for them clearly.

Diagram of Street Network in Emsworth

4-way cross traffic

Connecting streets

“Main Street” Center Avenue

EMSWORTH RIGHT-OF-WAY – TYPICAL SECTION

70’ Right-of-way

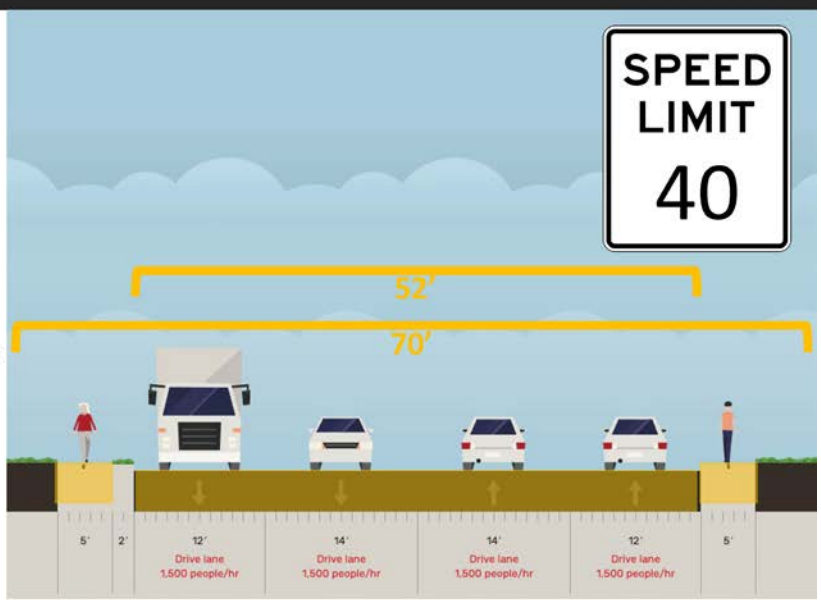
52’ Curb-to-curb

Drive lanes too wide for local context

- Design speed and observed speed significantly higher than posted speed limit

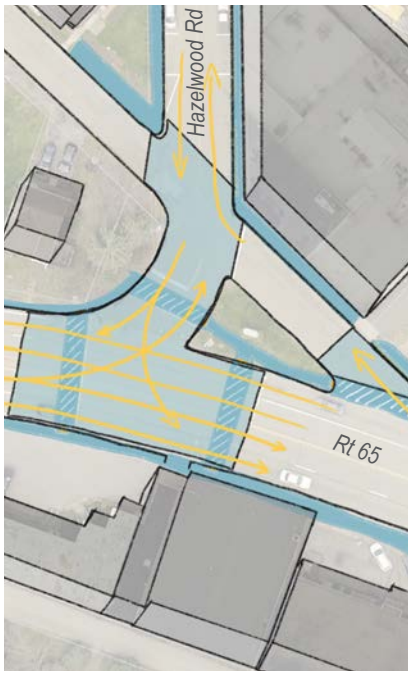
Sidewalks too narrow with little/no separation from traffic

- Minimum 6’ should be provided

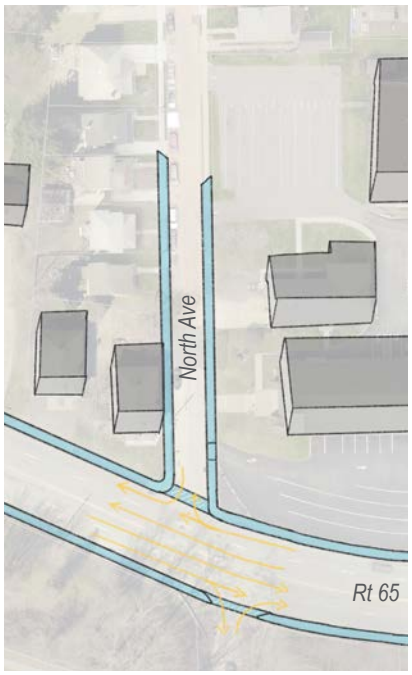


Typical Street Section on Route 65 through Emsworth
Image created by interactive street design tool streetmix.net

Sidewalk placement at Camp Horne Road



Sidewalk placement at Hazelwood Road



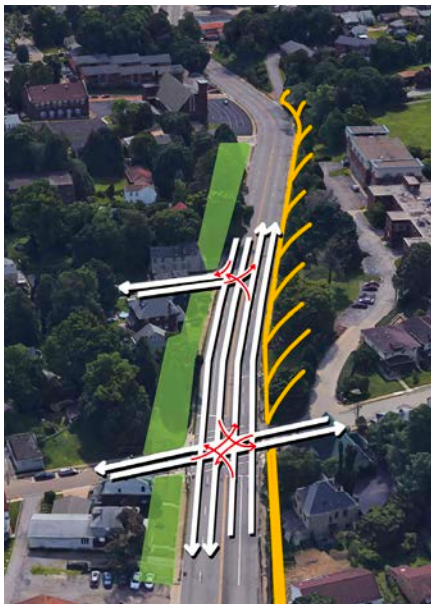
Sidewalk placement at North and Orchard Avenues

Area of cross movement within the intersection

Topography and Environment

Natural land features impact the development and connectivity potential of Emsworth throughout the borough. Emsworth is nestled between the river and hills. The railroad is a barrier between residential blocks and river access, but it otherwise tucked out of the way with minimal impact on connectivity within the community. Topography has a more direct impact on Route 65. Between Allegheny Avenue and Camp Horne Road, varying slopes require retaining walls along the street and place homes and businesses high above. While sidewalks are provided, slope and retaining walls create physical barriers that make the space feel smaller and more constrained for pedestrians, especially when multiple people are trying to walk together or pass each other within the 5' sidewalk width. The slope and curve in the road at Orchard Avenue limit visibility for drivers. Visibility and speed are a risk in these blocks, as supported by both community feedback and the crash data for Emsworth. Similarly to the west, the road curves as it enters Emsworth and limits visibility. Drivers can gain speed, then have to brake abruptly as road curves and the stoplight at Huntington Avenue comes into view.

At the eastern end of Emsworth, land uses are set back from the road behind Lowries Run creek, which limits crossing points for vehicles and pedestrians. Commercial uses on the north side of the road are accessed from Route 65, and Lance Corporal Patrick B. Kenny Memorial Field and park is located at the eastern boundary. While the creek imposes physical constraints in some places, there is a strong opportunity to strengthen visibility and continuity of uses from Camp Horne Road to the park to improve visibility and connectivity for those in car and on foot.



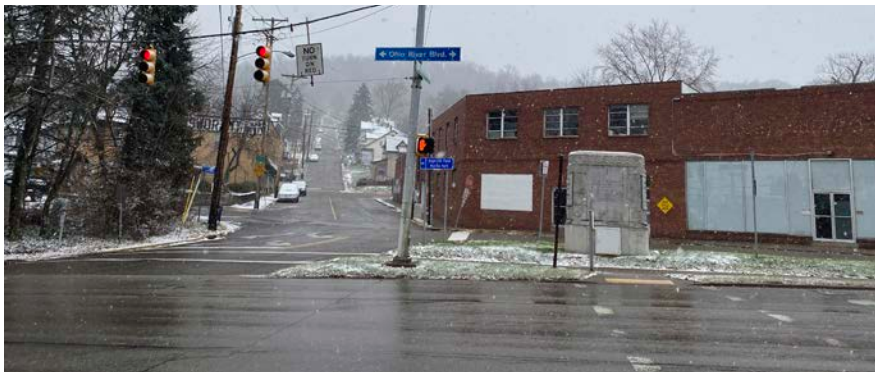
Steep embankment on south side

Large building set back on north side

Diagram of Urban Conditions in Emsworth

Urban Form

Buildings set far back from the street, and front-facing parking lots, create an uninviting streetscape with few plants or shade. Enhancing views through town to draw more attention to the uphill streets can better highlight the town's charm.



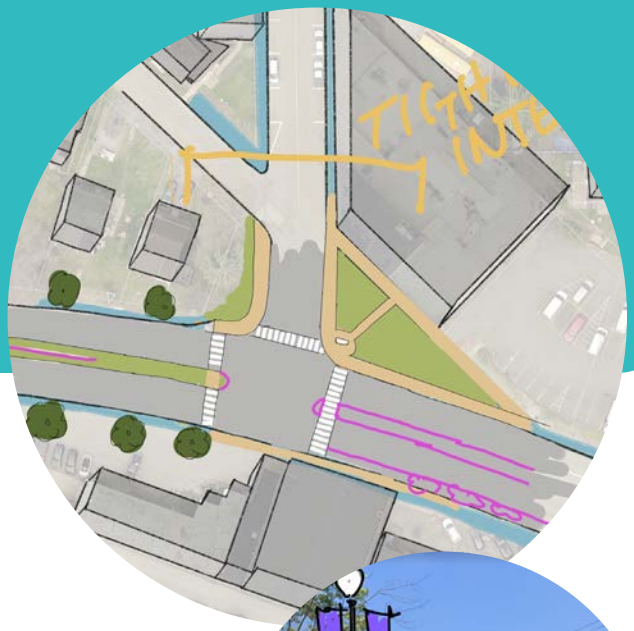
DESIGN SCENARIOS

Overall Workshop Summary

The Emsworth workshop was held on February 11, 2021 with participants from Emsworth and several surrounding communities. Throughout the morning and afternoon discussions and breakout rooms, participants shared their thoughts, concerns, and ideas about safety on Route 65 and the desired character they wish to see for their community. The workshop focused on three key areas and intersection types and assessed each area along with the participants to explore how it can better support transportation safety, community quality of life, economic growth. It also acknowledged that what happens in Emsworth impacts others municipalities as well, and collaboration is beneficial.

Gateway at Hazelwood Avenue and Huntington Avenue

The morning session looked at the western entry to Emsworth. Speed is a noted concern here, and there is a perception that drivers arriving from the west and from I-79 are often speeding. Participants expressed an interest in changing Route 65 to a boulevard and making it a more attractive street for the community. The current four-lane design uses 12' wide lanes at this location. For a 40 mph road, 11' lane width is sufficient. The space regained by redesigning the lane width and use of the shoulder can be reallocated for green space, trees, signage, and pedestrian use.



Some of the ideas discussed included:

- A central green median to turn Route 65 into a traditional boulevard.
- A wider central green median paired with a reduction in lanes. There was interest in reducing Route 65 to two lanes in Emsworth, although this would require further study to understand the traffic impacts.
- There was interest in providing more protection for cars turning onto and off of local roads. The workshop discussion explored ways to reduce through lanes to two lanes only, but keep turn lane capacity at needed intersections only.
- Slowing traffic upon entry from the west was highly desired. Signage, wayfinding, and narrowed lanes starting west of Huntington Avenue were viewed as important steps to announce arrival into town sooner and prompt slower speeds earlier.
- Pedestrian and multimodal paths were discussed for their desired treatment and feasibility. Route 65 is not seen as a desired bike route through Emsworth, but protected multimodal path heading west from Huntington Avenue would be desirable to connect to other communities.
- The bus stop placement at this intersection is not well synced with the crosswalk location. A better location was discussed near Allegheny Avenue, which is also a more central location to serve the community. A bus stop already exists there and could be prioritized further.

Local Access at Orchard Avenue and North Avenue

The afternoon session tested applying the boulevard and lane narrowing ideas to local intersections throughout the corridor. Specifically, the one-way streets of Orchard Avenue and North Avenue were tested. The lanes currently are 11' wide at this point, so lane narrowing is not an option.

Ideas tested included:

- Protecting turning movements by providing a discontinuous turn lane. Curb extensions beyond the intersection would prevent the turn lane from being used to pass on the right, which participants mentioned is a frequently observed behavior.
- Raised curbs between the turn lane and through lane are an option to further separate movement in areas with frequent conflicts.
- This is a major entrance into town. Although it is classified as a "local access" street, Emsworth residents described North Street as a gateway into the community.
- Lighting and more sidewalk space would help the pedestrian connectivity in this area.

Opportunity at Camp Horne Road

The afternoon session also explored the traffic congestion issues at Camp Horne Road and ways to improve the character and functionality of the area. Participants noted that traffic backs up regularly, and all lanes are well-used. Camp Horne Road does not connect into Emsworth at all, so while this is a major intersection, it is not a gateway and does not direct anyone into the community. The commercial uses located on all four sides include frequent curb cuts with little organization of turning movements into each property. Sidewalks exist, but are dominated by parking lot access so it is a difficult area to walk.

The workshop discussion focused on several key improvements:

- Reduce curb cut size and quantity, to clearly delineate where cars should enter and exit and remove excessively wide openings.
- Improve pedestrian safety. Reducing curb cuts will help with this, as will adding barriers between parking lots and the sidewalk. Small planters, seating walls, and landscaping are techniques to physically separate the sidewalk from the parking.
- Add pedestrian-scaled lighting.
- Long term, promote smaller building setbacks and parking placed behind rather than in front of the building.

KEY THEMES

The primary themes that emerged throughout each session and each breakout room were as follows:

1 BEAUTIFY THE BOULEVARD

Green plantings and landscaping, and added trees were repeatedly favored. Beautification can occur within a median or along the sides of the road.

2 CREATE CLEAR GATEWAYS

Attractive signage at the entry points reflects the character of the community, creates a sense of arrival, and encourages drivers to slow down.

3 SLOW TRAFFIC

Ensuring slower speeds and improving safety along the corridor is a high priority for everyone.

HOW WERE THE 4 GOALS ADDRESSED?

TRANSPORTATION

- *Narrowed lanes reduce speed.*
- *Protected turn lanes reduce conflict points.*
- *Advanced signage provides earlier direction to drivers.*

COMMUNITY

- *Added green space beautifies the roadway.*
- *Pedestrians are protected.*
- *Attractive signage and art enhance community identity.*
- *Curb extensions improve pedestrian safety.*

ECONOMIC GROWTH

- *Businesses gain increased visibility.*
- *Businesses gain increased access.*
- *Future growth can be supported by improved zoning and pedestrian infrastructure that allow walkable business models.*

GOVERNANCE

- *Coordinated signage and landscaping standards between municipalities.*
- *Shared maintenance.*
- *Shared investment efforts and sources.*
- *Consistent design standards.*

A Two-Sided Boulevard

The Emsworth workshop revealed a strong interest in a boulevard treatment for Route 65, although there were various ideas about what that might look like. Ultimately, this workshop showed that the relationship of Route 65 to a community "main street" was a less important typology than the relationship of Route 65 to community streets and uses at large. Emsworth has active community uses and local streets on both sides of Route 65, so the road necessarily interacts with the community on every block. An arterial in this type of urban setting must reflect the character and speed appropriate to an urban street.

A "two-sided boulevard":

- *Neighborhood uses on both sides*
- *Frequent cross traffic from local roads*
- *Regular pedestrian movement*

Key issues and conflicts to resolve

Although this case study approach included community input during a one-day workshop, further discussion and study is needed to understand the preferred option for Emsworth. Some of the issues that need further consideration include:

- Location of the green space in a median or on the edge
- Location of turn lanes, if used
- Continuity of preferred block and intersection solutions throughout Emsworth
- Riverfront connectivity is still constrained and was not addressed, but it is a community concern from other sources
- Multimodal routes were not located but may still be desired

CASE STUDY #2: AMBRIDGE

BACKGROUND

Historical Context

The Borough of Ambridge is a 1.74 square mile community located along the east bank of the Ohio River, north of the Borough of Leetsdale and Leet Township, and southwest of Harmony Township and Economy Township. Home to 6,690 residents, the Borough is 30 minutes from Downtown Pittsburgh and is intersected by important roadways including Route 65, Interstate 76, and Interstate 376. The Borough of Ambridge is an important regional employment center along the Route 65 corridor, containing industrial centers such as the Port Ambridge Industrial Park, Ambridge Regional Development Center, and New Economy Business Park. In addition to its diverse industrial uses, the Borough is home to various family-owned businesses, regional attractions including the Old Economy Village Historic Site, 21 churches, four public parks, numerous specialty shops, a hotel, and a National Historic Landmark District.

Existing Uses and Conditions

The Borough of Ambridge has a generally urban character, with urban-type housing and retail businesses along Merchant Street and suburban dwellings and open space near the Borough's eastern and northeastern boundary. The Borough is located in the Ambridge Area School District and contains approximately 3,142 households. Residential property values in the Borough have risen in recent years following speculative investment in anticipation of the opening of a Shell cracker plant, which is under construction in Potter Township and is expected to begin operations in 2022, leading to the employment of an estimated 6,000 regional workers. As a result of this investment, the Borough is being actively revitalized at a grassroots level through numerous resident-formed clubs and initiatives, as well as through direct investment of private and public capital.

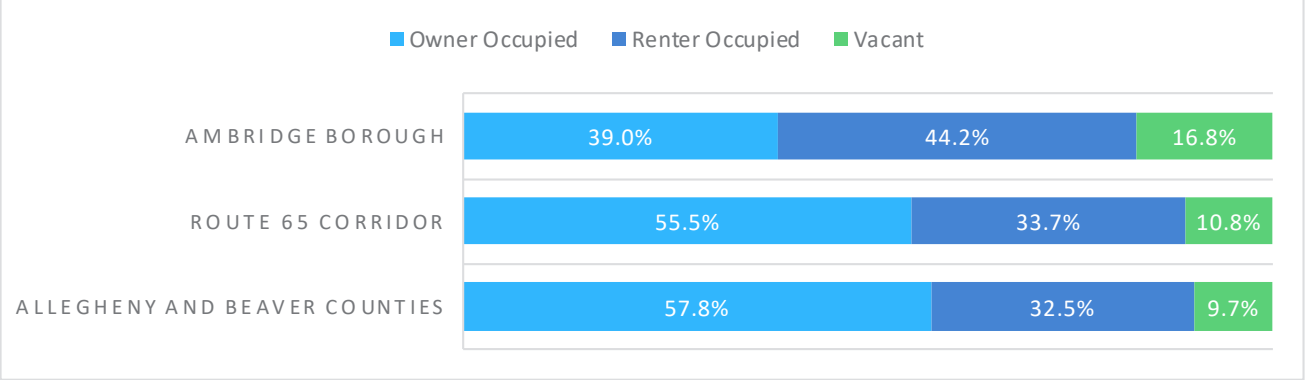
As a dominantly built-out community, opportunities for economic development in the Borough are limited to redevelopment and revitalization of current buildings and infrastructure. Recognizing the opportunity for downtown development and growth in the wake of the Shell cracker plant project, the Borough completed a Main Street Streetscape project in 2020 costing approximately $3,000,000. The project included the following improvements:

- removal of overhead utilities
- new storm sewers
- new sidewalks and curbs
- addition of street trees
- a new parklet
- improvements to traffic signals
- ornamental lighting
- traffic calming upgrades

Households

As of 2018, there were a total of 3,142 households in the Borough, with an average household size of 2.12. Of these households, approximately 52% are family households, and 48% nonfamily households. In comparison, Allegheny and Beaver County's household type composition in 2018 included 60% family and 40% nonfamily households. The Borough's housing tenure is typical for semi-urbanized areas and is consistent with county trends. Between 2000 and 2020, the number of housing units in the Borough decreased by 12.6% in conjunction with population growth. Housing decreased from 3,505 to 3,142, or 453 households between 2000 and 2020. Throughout the Route 65 Corridor, total housing decreased by approximately 3.6% in the same time period, while Allegheny and Beaver County households increased by 0.4%. The Borough's high vacancy may indicate an overall lower demand for housing in the local area, which is consistent with the Borough's aging population and the regional trend of negative natural increase.

The Borough has a higher percentage of renter occupied housing and a lower percentage of owner-occupied housing when compared with the Route 65 Corridor and Allegheny and Beaver Counties. This is likely due to the urban character of the Borough when compared with the more suburban municipalities along the corridor.



Ambridge Housing Tenure, 2020
Source: ESRI Business Analyst

Income

Median household income, and changes in median household income over time, can provide insight into the potential spending power of consumers in an area. The Borough of Ambridge had a median household income of $34,005 in 2020. Comparatively, the Route 65 Corridor had a median household income of $54,133 in 2020. In comparison to the Corridor, the collective median household income Allegheny and Beaver Counties is $59,831 in 2020, suggesting consumers along the Route 65 Corridor have less spending power than those in the host counties.

Economic Typology

In the 2019 corridor research study, Ambridge was primarily categorized as fitting into the Mixed Use typology, which refers to communities with a combination of commercial and residential uses and a flow of traffic both in and out of the community throughout the day.

Transportation Infrastructure

Route 65 is a Principal Arterial Highway intersecting the Borough of Ambridge, where is connects with 15 intersections, including Major Collectors such as Merchant Street, and Minor Arterials including 11th Street and 8th Street. In the Borough, Route 65 has an annual average daily traffic (AADT) count of 11,000 to 21,000 vehicles depending on the location along the corridor. In comparison, traffic on the Borough's main street of Merchant Street has an AADT count of 6,900 to 9,700.

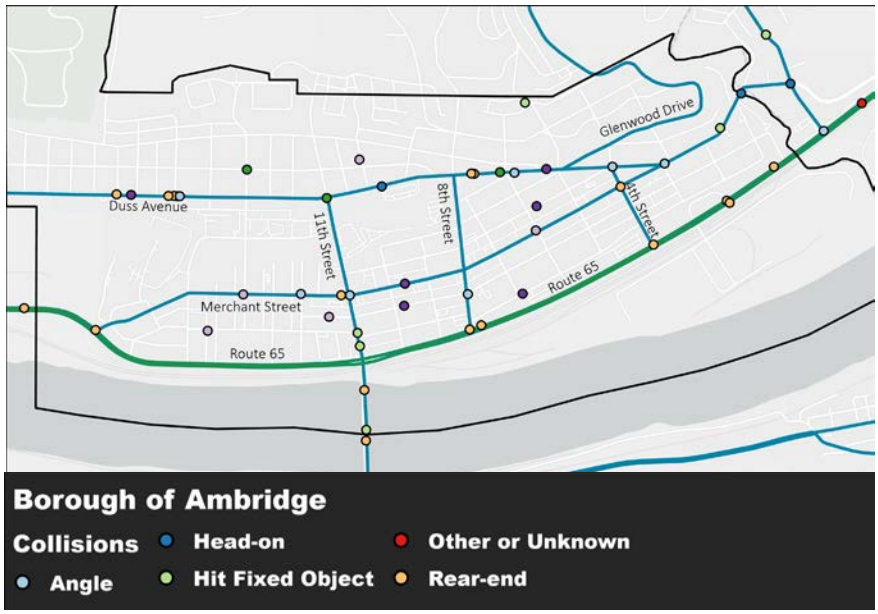
Road Width

The PennDOT Right-of-Way (ROW) along the Route 65 Corridor in the Borough of Ambridge ranges in width from 64 feet near the Borough's northern border to 120 feet at the Laughlin Memorial Bridge. Typically, rights-of-way widths increase at intersections along the Corridor to accommodate additional turning lanes but varies widely overall. Route 65 consists of two lanes along the entire length of the corridor, with no turning lanes except at its intersection with 8th Street. At the intersection of 8th Street and Route 65, the Corridor is approximately 87 feet wide, including both lanes of traffic and one turning lane.

Collisions

In 2019, there were a total of 50 reportable vehicular crashes within the Borough of Ambridge. A total of 7 crashes occurred on Route 65 in this time frame, all of which were rear-end type crashes.

PennDOT Right-of-Way
Source: Pennsylvania Department of Transportation



Total Vehicular Crashes in the Borough of Ambridge, 2019
Source: Pennsylvania Department of Transportation

Retail Trends

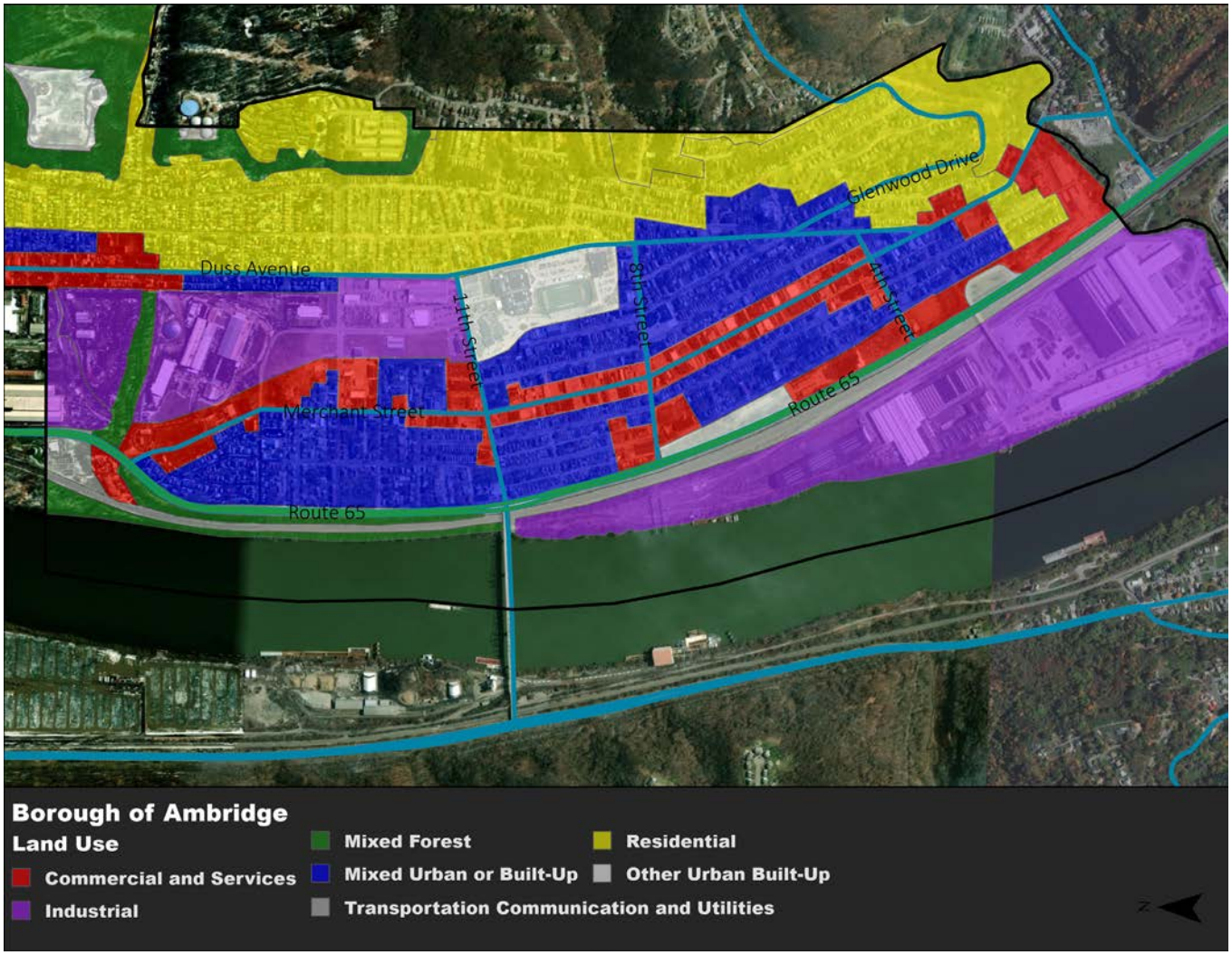
A retail gap analysis is a tool used to better understand the potential for new retail businesses in a community by comparing the supply, represented by the number of sales to customers, and demand, represented by consumer spending. A positive value represents 'leakage' of retail opportunity outside the community where residents are leaving the community for their shopping needs. A negative value represents a surplus of retail sales where stores within an area are drawing customers from outside the community. Based on estimates using Esri Business Analyst, there are retail leakages within the Borough of Ambridge. The retail gap analysis revealed that demand for six retail sectors is saturated within the Borough. The Borough contains a surplus of Food Services & Drinking Places, with 28 total businesses, mainly clustered around Merchant Street. This means that it serves a greater clientele beyond Ambridge and draws users into the community to dine.

2017 Industry Group	NAICS	Demand	Supply	Retail Leakage
Health & Personal Care Stores	446	$4,155,203	$10,900,029	($6,744,826)
Bldg Materials, Garden Equip. & Supply Stores	444	$4,144,220	$5,871,505	($1,727,285)
Gasoline Stations	447	$6,939,214	$8,382,695	($1,443,481)
Electronics & Appliance Stores	443	$1,985,222	$2,853,695	($868,473)
Food Services & Drinking Places	722	$6,132,456	$6,622,934	($490,478)
Sporting Goods, Hobby, Book & Music Stores	451	$1,750,565	$1,763,284	($12,719)

Ambridge Retail Gap Analysis and Leakages
Source: ESRI Business Analyst

Regulatory Context

The Borough of Ambridge encompasses 1,111 acres, or approximately 1.74 square miles, and is located northwest of the City of Pittsburgh. A Norfolk Southern rail line follows Route 65 to the west for the complete length of the Borough, along with industrial and commercial uses, many of which are directly supported by the multimodal access provided by the rail line and Ohio River ports in addition to Route 65. The eastern portion of the Borough features a more diverse variety of land uses, with a concentration of commercial, industrial, and urban build-up areas along the Route 65 corridor. These land uses quickly change to predominantly residential and open space to the east and northeast, with some commercial and other services along Duss Avenue. Land uses beyond the Borough boundary are similar to the overall urban and industrial character of the Borough to the north and south, however uses beyond the Borough's east boundary quickly evolve into predominantly residential, commercial, and open space.



Borough of Ambridge Land Use, 2020

The Borough of Ambridge Zoning Map, adopted in 2016, illustrates the current zoning of the Borough, which is comprised of seven zoning districts. The current zoning has its foundation under the Town's first Zoning Ordinance enacted in 1955. Under the ordinance, the Town's zoning included residential uses and widespread industrial zones, as well as commercial business. The Historic District and Highway Commercial District were added in 1971 and 1993, respectively, in response to growth in historic downtown areas and along the Route 65 Corridor. In 1995, the Public/Civic District was added to the Borough's zoning ordinance to centralize the functions of the Borough into one location, among other purposes. Additionally, an amendment of the zoning ordinance in 2016 established Commercial Subdistricts to reinforce the viability of downtown Ambridge.

The zoning districts established by the Borough's zoning ordinance are summarized below:

- S – Slope District was created to limit the Borough growth and expansion in areas with steep slope, asserting that no building, structure, or land may be expanded except for reservation, forestation, and recreation land and structures.
- R – Residential areas allow for the construction of a wide variety of residence types and similar structures, including: Single-family dwelling; multiple-family dwelling; apartments; Education, religious, philanthropic use; hospitals; community garages; and many more.
- C – Commercial Districts define areas of the Borough which allow for uses identified in the residential zoning district, as well as the sale and storage of retail goods, electronic offices and stations, hotels, and a variety of trade shops, restaurants, and entertainment.
- M – Manufacturing and Industrial Districts were created to provide a suitable location for industrial and nonretail commercial uses within the Borough where these uses do not create a nuisance or safety hazard to residents and businesses within the Borough.
- H – Historic District is a zoning classification created to promote the general welfare, education, and culture of the Borough, and to preserve the historic resources of the Borough.
- C2 – Highway Commercial Districts were created to capitalize on the high visibility and traffic volumes of Route 65 and develop a highway retail zone. This zone does not allow for industrial uses, instead encouraging synergy with the Corridor through uses such as hotels and shopping centers.
- P – Public/Civic Districts are zones created to centralize the governmental and educational functions of the Borough into one location. Uses in this zone are generally limited to schools, community centers, emergency service enters, and other medical educational, or government buildings.
- Commercial Subdistricts are not zoning designations, but sub-categories created for the purpose of defining commercial districts in the Borough's downtown. The Commercial Subdistricts are defined as follows:
    - CBD – Community Business District was created to advance principles of urban design and downtown revitalization to foster retail prosperity and attract pedestrian activity.
    - MID – Midtown District serves as a transitional zone between the CBD and the Historic District, providing the flexibility to mix in modern, more vehicle-oriented uses among the Borough's traditional storefronts while also promoting pedestrian activity.
    - GWS – Gateway South District is intended to create a well-demarcated and attractive entrance to the Borough from Route 65, and therefore create an environment supportive of the CBD.

CORRIDOR DESIGN ANALYSIS

Physical Context and Urban Form

Bypass Typology

In the 2019 corridor research study, Ambridge was primarily categorized as fitting into the bypass typology. Most land uses are located on the north side. The south side of Route 65 includes the rail line and riverfront, though the rail line impedes access to the riverfront and there is no pedestrian access. Some industrial uses on the south are accessible from Route 65 in one location only, and very few buildings front onto Route 65. Most residential lots are accessed from local streets, and most commercial businesses are located along Merchant Street or Duss Avenue. Merchant Street is clearly the heart of the downtown and has continuous retail and mixed use buildings for many blocks. Merchant Street connects directly to Route 65 at the north end of town, and continues into Beaver Street at the south end of town which continues to the adjacent municipality of Leetsdale. Duss Street connects Ambridge to its northern neighbor, Harmony Township. Despite this local road connectivity, Route 65 is still used as a primary route between adjacent municipalities.

Parallel Typology

Ambridge also presents elements of a parallel typology. Around Old Economy Village and to the southern end of town near Cross Street, businesses and residences do front onto Route 65 and would benefit from slower speeds and safer access from the corridor. Between 6th Street and 8th Street, a large green park separates buildings from Route 65 but provides nice views into town and so a visual connection is established.

Borough of Ambridge Lot Frontage Diagram

- Buildings face onto Route 65
- Buildings face onto side streets
- Opportunities for axial view terminus points

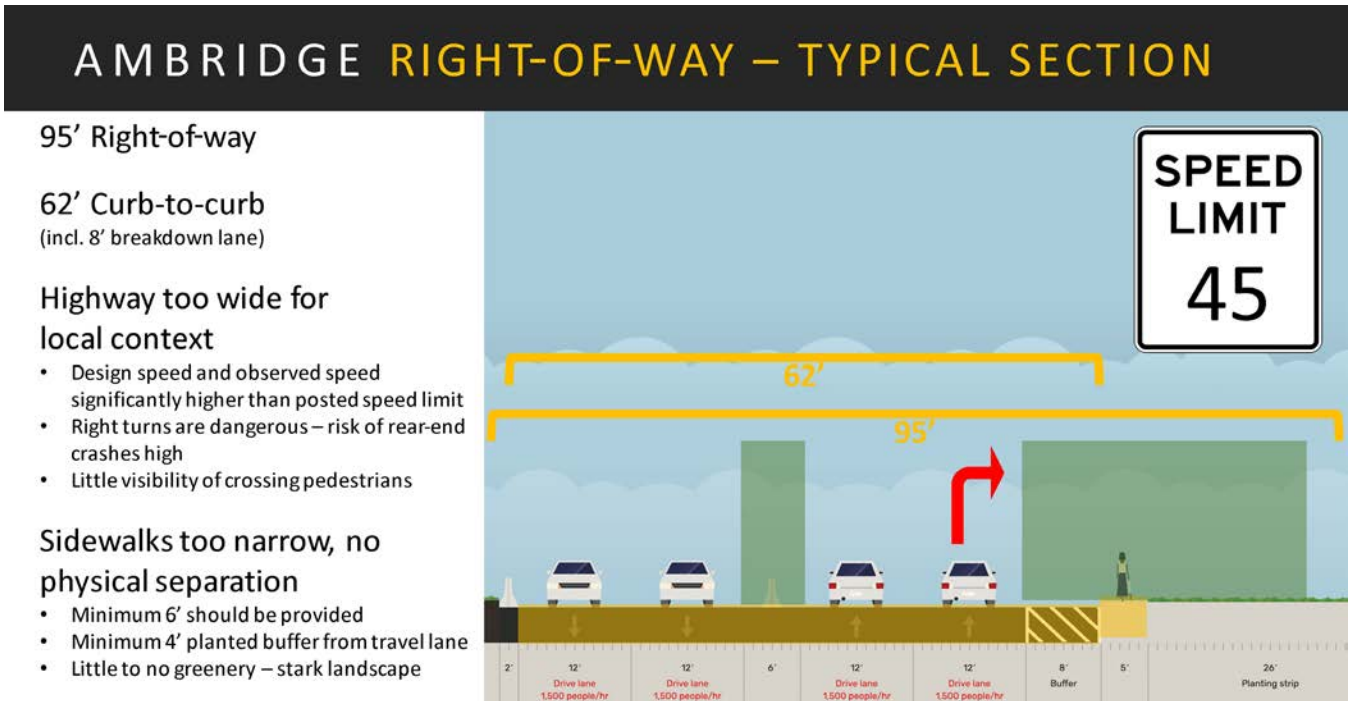
Street and Intersection Analysis

An analysis of the street network and connectivity across Route 65 identified three primary types of intersection through Ambridge. Only three intersections are signalized, and all of those are three-way intersections that only access Ambridge on one side.

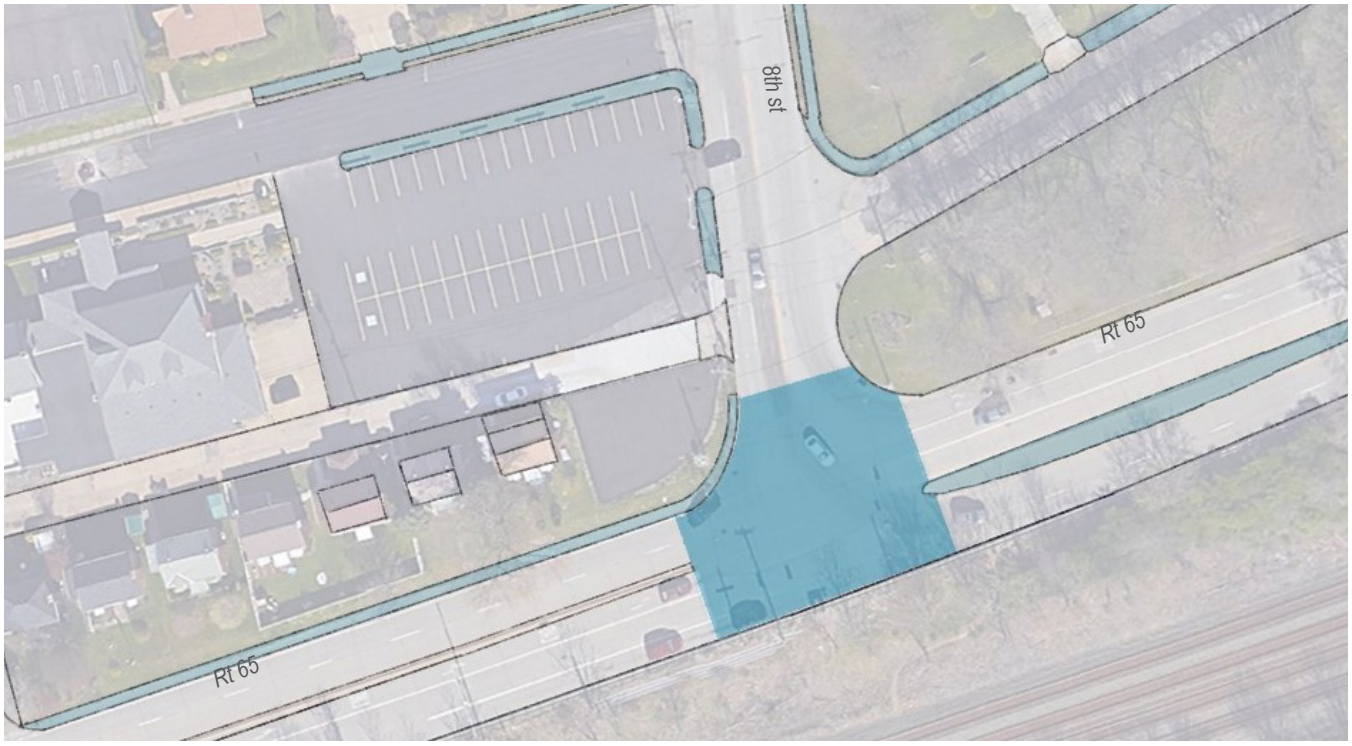
- Central access: These are streets that are primary connections into Ambridge. Most notably, 8th Street and 4th Street offer central access.
- Local access: These are streets that are unsignalized, and serve mostly residential neighborhoods. There are many local access streets in Ambridge. Arterial highways are not designed for local access, so the frequency of these intersections poses safety concerns.
- Gateway access: This intersection type is designed to prioritize shifting drivers to and from another preferred route. Merchant Street is a gateway access location. Cross Street, while outside of the Ambridge boundary, is another gateway intersection that leads drivers into Ambridge. However, many workshop participants noted that the centrally located intersections of 4th Street and 8th Street are more commonly used as entrances from Route 65.
- Undetermined: Ambridge has several unique street forms, including a flyover bridge which accesses the south side of Route 65. The 11th Street bridge is also a major route which does not connect to Route 65 at all and instead forces drivers to pass through a residential neighborhood.

Borough of Ambridge Street Network Diagram

- 4-way cross traffic
- Connecting streets
- “Main Street” Center Avenue



Typical Street Section on Route 65 in Ambridge
Image created by interactive street design tool streetmix.net



Sidewalk Placement at 8th Street in Ambridge

Area of cross movement within the intersection

Topography and Environment

Natural land features impact development opportunities in Ambridge. Slopes, river, and railroad all located south of Route 65 make the land challenging to access and build upon. The town is concentrated to the north. Route 65 is relatively straight in this area, but does drop below the surrounding blocks in several locations and passes underneath the 11th Street bridge. Large concrete retaining walls separate the road from the town in this places. Visibility along the road is only slightly impacted, but visibility from the road into town is completely blocked by the retaining walls. This separation leads Route 65 to feel like a highway and encourage a higher speed than it is designed for. The retaining wall and topography also limit visibility of upcoming unsignalized intersections around Old Economy Village.

Diagram of Urban Conditions in Ambridge

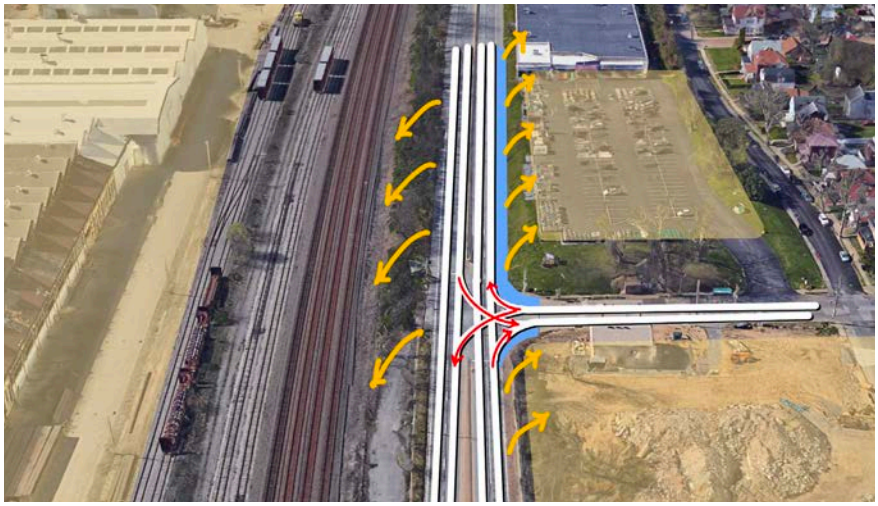


Diagram of Urban Conditions in Ambridge

Urban Form

The rail line and topography significantly impact Ambridge's urban form. In some locations, views into town are obstructed. However, this also creates opportunities to enhance views where they are available. As topography flattens between 4th Street and 8th Street, the town suddenly becomes more visible and creates a sense of arrival. Similarly, as northbound traffic passes under the 11th Street bridge, the roadway rises towards Old Economy Village. Buildings are set back and have minimal streetscaping in these locations, but there are opportunities for new development, paths, or landscaping to be located closer to the road and make these views more urban and reflective of Ambridge's local identity.

- Retaining wall
- Steep slope
- Opportunities for future development
- Pedestrian connectivity lacking

DESIGN SCENARIOS

Overall Workshop Summary

The Ambridge workshop was held on March 4, 2021 with participants from Ambridge and several surrounding communities. Throughout the morning and afternoon discussions and breakout rooms, participants shared their thoughts, concerns, and ideas about safety on Route 65 and the desired character they wish to see for their community. The workshop focused on three key areas and assessed each area along with the participants to explore how it can better support the four goals of transportation safety, community quality of life, economic growth, and collaborative governance.

North Ambridge: Gateway at Merchant Street and Old Economy Village Area

The morning session focused on the northern blocks from Merchant Street to the 11th Street bridge. This area includes numerous residential streets that connect from Route 65 into Ambridge, and lead into Economy Village as well. At 12th Street, signs for Old Economy Village encourages traffic to turn off Route 65 to visit the historic site. Numerous issues were discussed in this area to address visibility and safety concerns.

Key concepts and discussion items that arose include:

- Slow speed in this area to provide drivers more time to slow down and make turns safely into neighborhood streets.
- Consider adjustments to the one-way street system to better manage the flow of vehicles on and off of Route 65. Prioritizing a preferred entrance point at 12th Street into Old Economy Village may also improve visibility of the historic site and manage traffic entering and exiting Route 65. Making 12th Street a two-way street with advance signage, deceleration turn lanes, and clear pedestrian crossings would reduce traffic at the residential-only streets and create a safer entrance point. Alternately, creating a slip lane would allow more space for cars to slow down, room for advance signage and wayfinding into Old Economy Village, and protect local turning movements at multiple intersections.
- The Merchant Street gateway leads to several areas undergoing redevelopment currently or available for future redevelopment. A new community park is under construction and new residential units are planned also. More traffic can be anticipated on Merchant Street as these are built. vacant parcels at the northern edge of town offer for opportunity for future growth. The Merchant Street gateway should include better wayfinding to direct southbound drivers into Ambridge.
-

Central Ambridge: Entrances into Downtown

The afternoon session looked at the 8th Street area and access to the 11th Street bridge. Route 65 does not directly connect to the bridge, so drivers exit on 8th Street and cut through local streets to get to the bridge. Merchant Street, recently repaved with attractive streetscape features and traffic calming elements, is often avoided by cut through traffic which uses residential streets instead.

Workshop participants indicated an interest in the following:

- Designate an alternate truck route that avoids 8th Street. Narrow the curb radius, using a mountable curb, to prioritize car traffic. The narrowed intersection with tighter curbs also allows safer pedestrian crossing and slows traffic turning into this street, while a mountable curb allows necessary truck traffic to proceed.
- Add a gateway with median along 8th Street. The median slows traffic, creates a clear visual entrance and aids wayfinding, and blocks traffic turning onto 8th Street from making immediate left turns into residential streets. Removing this left turn option reduces conflicts created by having too many turning movements located within very close proximity, and encourages drivers headed for the bridge to use Merchant Street as a preferred route.
- Pedestrian paths and crosswalks to the bridge are desired. Routes for biking and walking are currently preferred on local streets though, as the speed on Route 65 is deemed too high for comfortable pedestrian use.

South Ambridge: Gateway at Cross Street and Opportunities for Multi-municipal Connectivity

The afternoon session also explored opportunities to expand and grow to the south.

Key discussion items include:

- 4th Street is also an ideal location for gateway treatment with a median, narrowed intersection, and large signage.
- Widening the right-of-way can allow an additional right turn lane. This would require shifting the through lanes, which is also a traffic calming feature.
- Development around 4th Street would be supported by improved access and safety.
- Extending the truck route south onto Beaver Street, if the existing bridge can support it.
- Alignment along the creek could be an attractive pedestrian link to the riverfront.

KEY THEMES

The primary themes that emerged throughout each session and each breakout room were as follows:

1 MOVE TRUCK TRAFFIC OFF OF LOCAL AND DOWNTOWN STREETS

Designate a truck route elsewhere, and adjust the intersection design at non-truck route locations to prioritize car and pedestrian movement only.

2 HIGHLIGHT AND PROTECT THE HISTORIC DISTRICTS

Add wayfinding and signage earlier and more consistently along the corridor to direct visitors on where to turn and where to find destinations.

3 IMPROVE SIGNAGE AND WAYFINDING

This is desired in general along the corridor to ensure drivers do not pass through town without noticing businesses and destinations, and can find their way easily.

4 SLOW TRAFFIC ALONGSIDE THE NEIGHBORHOOD

Use narrowed lanes, raised crosswalks, signage, and designated turn lanes to slow traffic and protect drivers that are entering and exiting Route 65.

HOW WERE THE 4 GOALS ADDRESSED?

TRANSPORTATION

- *Narrowed lanes reduce speed.*
- *Protected turn lanes reduce conflict points.*
- *Advanced signage provides earlier direction to drivers.*
- *A designated truck route removes trucks from local roads.*

COMMUNITY

- *Added green space beautifies the roadway.*
- *Pedestrians are protected.*
- *Attractive signage and art enhance community identity.*
- *Medians protect residential neighborhoods.*

ECONOMIC GROWTH

- *Businesses gain increased visibility.*
- *Businesses gain increased access.*
- *Medians and gateway design draw new traffic into town.*
- *New development is supported by improved access.*

GOVERNANCE

- *Coordinated signage and landscaping standards between municipalities.*
- *Shared maintenance.*
- *Shared investment efforts and sources.*
- *Consistent design standards.*

A One-Sided Boulevard

The Ambridge workshop revealed less interest in a full boulevard treatment for Route 65 than Emsworth. Ambridge has active community uses and local streets on only one side of Route 65, and substantial constraints on the other side. An arterial in this type of setting must acknowledge that while it functions as a limited access bypass in some blocks, it functions as a connector road in other blocks. Roadway design can be less urban than the Emsworth example, but should include regular boulevard elements and narrower urban intersections to ensure slower speeds and town visibility within the Ambridge boundaries.

A "one-sided boulevard":

- *Neighborhood uses on one side only*
- *No cross traffic from local roads*
- *Lower expectation of pedestrian movement*

Key issues and conflicts to resolve

Although this case study approach included community input during a one-day workshop, further discussion and study is needed to understand the preferred option for Ambridge. Some of the issues that need further consideration include:

- Preferred traffic calming approach for residential streets around Old Economy Village
- Need for pull-off space on long blocks
- Potential use of the Cross Street bridge
- Future use of opportunity sites
- Location of truck route
- Feasibility of riverfront connections along the creek
- Multimodal and pedestrian routes were not located but may still be desired

TESTING SCENARIOS

The workshop discussions explored site-specific solutions and needs in each of the two case study municipalities. Many solutions were shared between both case studies, which reflects the common constraints to access, safety, and community design imposed by the presence of an arterial through town. The concepts discussed at the workshop were further tested and augmented by the following considerations as the toolbox was assembled.

Safety
Each concept was assessed according to current standards and best practices to identify the safety benefits and design requirements to ensure safety. In changing intersection design, size, and placement, safety must be assessed for each specific site. The size of intersections and curb radius must be appropriate to the speed of traffic at that location. Similarly, the spacing of intersections and geometry of roads should be appropriate to the speed and traffic volume.

Visibility
Along an arterial, visibility for long distances is a critical element for safety. Any new curb cuts, landscaping and trees, public art, signage and lighting, or other new features added along an arterial must consider how they impact visibility and ensure drivers can see and anticipate conflicts, intersections, and directions.

Volume of Traffic
Volume of traffic impacts road diets, removal of lanes, and may also impact where truck routes and narrowed intersections may be used. The workshop discussion largely focused on better utilization of land outside the recommended 11' driving lanes. However, some of the discussions also explored removing driving lanes entirely and creating a traditional town boulevard with wide median and landscaped edges. Both the median and the shoulder provide flexible space than can be green and/or used for turning lanes as needed. Volume of traffic will guide the size and placement of these at any given location.

Land Use of Rights-of-Way
Many of the workshop concepts worked within the available right-of-way. However, the right-of-way varies widely along the corridor and has varied land utilization outside the right-of-way. At any given location, the available land should be assessed to

understand what uses can fit within the right-of-way, whether there is a need for additional features beyond the right-of-way, and the feasibility of expanding.

Intersections

Narrowed lanes and tighter curb radii may apply differently based on the travel demand and type of vehicle access needed. At each intersection, municipalities must consider who the users are and which users to prioritize. When truck and emergency vehicle traffic needs to be accommodated, a wider radius and/or mountable curb is more appropriate. When pedestrian movement is prioritized, a raised crosswalk and narrow curb radius is appropriate. Depending on the surrounding context and traffic flow, each intersection may vary in size and design elements.

Setbacks

Building setbacks vary widely along the corridor. Each municipality may need to look at its local zoning requirements regarding setbacks. The PennDOT right-of-way does not include or control the placement of buildings outside the right-of-way, but municipal setback requirements do govern what is permitted. Building setbacks closer to the street are ideal in a town setting where businesses face onto the street and pedestrian connectivity is high.

Length of Turn Lanes

The provision of turning lanes/deceleration lanes must be assessed in conjunction with PennDOT requirements, traffic volume, and block length. In some locations with closely spaced intersections, deceleration lanes may not be able to be provided at each intersection. In that case, either a continuous travel lane may be maintained (as is the current case), or the slip lane option may be ideal if there is available space.

Curbside Management

As technology and new mobility options advance, the roadway users are rapidly evolving. Along with autonomous vehicles, rideshare has grown in popularity and delivery services are increasingly using road and curb space. These new trends mean that the curb, especially in urban and/or commercial areas, is high in demand as vehicles come and go for short stops to drop off and pick up people and goods. Curbside management refers to techniques and processes that manage the use of the curb and organize who may use it, when, and for how long. There are many techniques to explore, and municipalities should consider how to best utilize their curbs and maximize their value.

WORKSHOP CONCLUSION

Real Performance of the Urban Arterial
Many commonalities arose between both case studies. Despite the differences in physical and economic typologies, both Emsworth and Ambridge workshops focused on similar design strategies and roadway improvements that support a safer environment and slower speed. Many of the issues and concerns arise from the dual nature of the corridor as both a regional arterial and local route. Thus, a roadway design standard for corridors of this kind is needed that recognizes this dual nature of an urban arterial and is capable of moving traffic safely at both regional and local scales.

Two Boulevard Approaches
Emsworth and Ambridge did present some differences, most notably their approach to the use of a boulevard. The one-sided or two-sided relationship of the corridor to the community is significant. In Emsworth, uses on both sides of Route 65 strongly support the transformation of Route 65 into a green boulevard which physically slows traffic, visually connects all blocks through the Borough, and provides ample protection at crossings for pedestrians. In Ambridge, the added cost to construct and maintain a green median was not enticing. As a one-sided corridor in that case, Route 65's peripheral character is seen as appropriate. Investment in medians was most desired at the cross streets that mark major entrance points into Ambridge, and off of Route 65.

Municipal Improvements
Some of the roadway improvements that received the most consistent support from both communities did not involve roadway design directly. Signage, wayfinding, and aesthetic improvements were highly desired in both locations. Both case study participant groups acknowledged that drivers tend to speed through their communities partly because the road design makes it easy to do so, and partly because there is little indication not to. The concepts for signage, art, and landscaping discussed in the workshops will require some collaboration with PennDOT but will also fall largely on the municipalities to implement their own design improvements. Public art, attractive street lights in urban areas, wayfinding, and landscaping may be implemented outside of the right-of-way with municipal funds or grants. And whether they are within or outside the right-of-way, improvements that are not PennDOT standard designs will most often require ongoing maintenance from the municipality once installed.

Design Outcomes and Priorities

Collaboration to decide upon certain standards is a high priority. Each municipality has unique conditions and opportunities to pursue customized solutions that suit their needs, but an overarching standard will help streamline all corridor improvements and provide for clear and consistent use that will improve safety. Lane width, speed, signage, and clear zones to ensure advance warning of changes in the roadway or conflicts ahead should be consistent throughout the corridor. Coherent planning amongst the municipalities on these baseline standards will promote clear navigation and clear user legibility of the system.

Commonalities Between All Corridor Communities

Widespread application of these concepts is shared in more detail in the following toolbox pages. For each municipality along an urban arterial, the toolbox will walk through strategies to prioritize, the outcomes they achieve, how they can be pursued together, and technical processes to pursue for each. In all urban arterial corridor communities, the dichotomy between the standard roadway design focused on limited access and urban reality of neighborhood connections requires traffic calming measures that are suited to similar conditions of traffic volume and speed typically seen on urban arterials.

Unique and Specific to Only One or Two Corridor Communities

In each of the case studies, some unique characteristics were discussed. Emsworth has some acute geometries that are not seen in all communities, though some will have similar conditions. Straightening geometry is an example of a workshop concept, developed in the toolbox, which may not apply in all cases. In Ambridge, two bridges serve the community without connecting to Route 65. At 11th Street, the bridge is disconnected from the arterial and traffic is forced through local streets. In other municipalities, access from the arterial to the bridge may be the preferred scenario, but this was not an option in our case study.

In many municipalities, historic constraints or existing development patterns create unique conditions. Each municipality will want to address their unique needs in addition to considering the toolbox standards as a starting point.

BOULEVARD TYPOLOGY

The case study workshops revealed that transportation and community design patterns differ most notably in their orientation to the community. Two boulevard typologies emerged: a central spine road and a peripheral edge road. Despite differences in economic and local main street relationships, this one-sided or two-sided characteristic played the more prominent role in guiding the community's interest in a boulevard and preferred targets for corridor investment and maintenance.

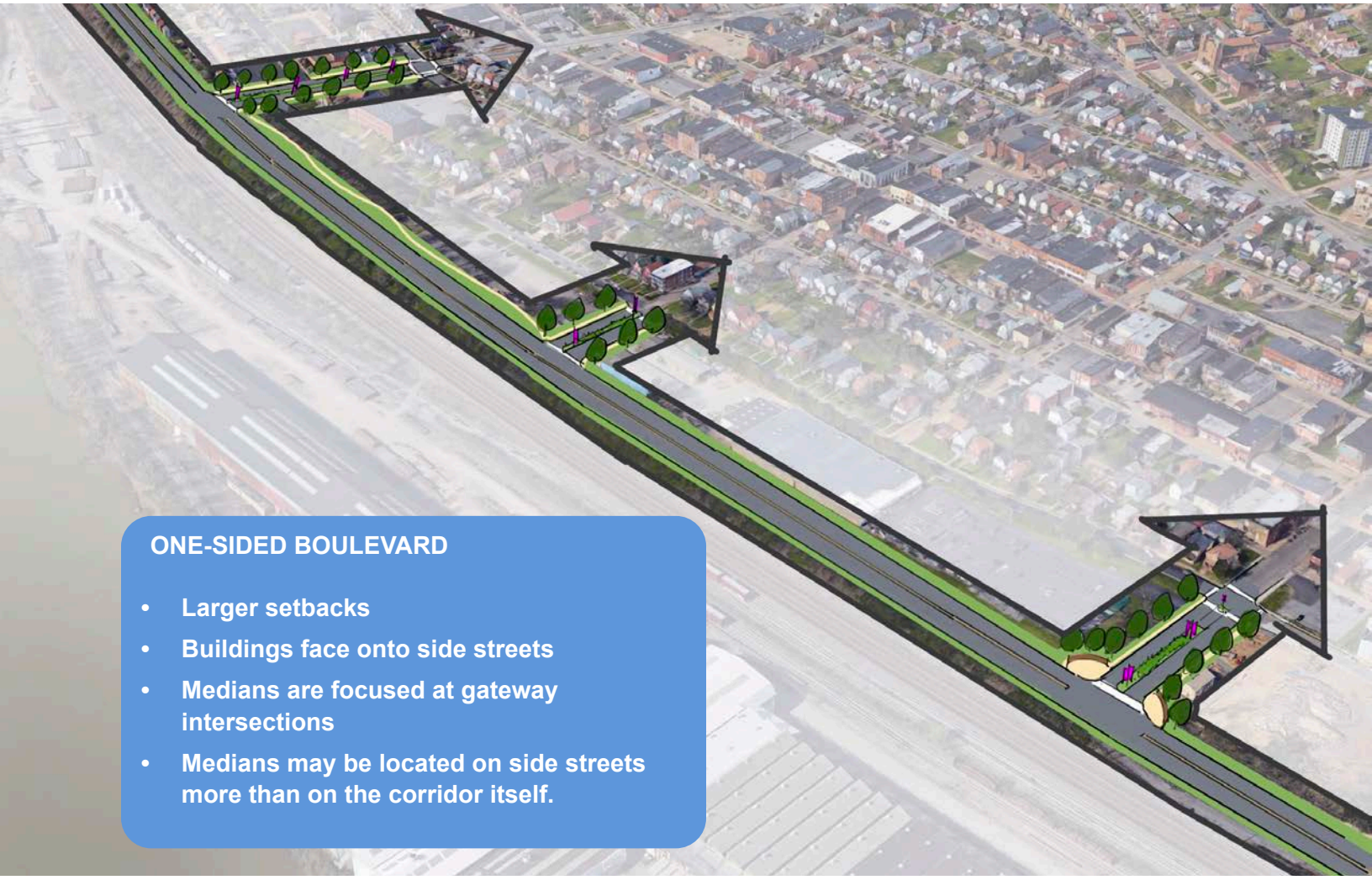
For other similar urban arterials, the corridor's relationship not solely to the main street but to the full network of roads in and out of the community is a major determining factor in guiding the applicable tools and more specifically the priorities in how and where to focus those tools.

TWO-SIDED BOULEVARD: CENTRAL SPINE

The two-sided boulevard passes through the heart of the community and has active uses on both sides. This typology is highly visible and includes frequent cross traffic, by both cars and pedestrians, to connect each side across the corridor. Frequent intersections and curb cuts require advance notice, slow speeds, and clear protection for pedestrians as well as local traffic turning onto and off of the busy corridor.

ONE-SIDED BOULEVARD: PERIPHERAL EDGE

The one-sided boulevard passes along the edge of the community and has active uses on one side only. The town is less visible, so emphasizing clear and prominent entrances is important to support connectivity into town. Cross traffic is minimal, with no uses across the corridor, so there are fewer signalized intersections and stops. This allows traffic to move faster than is ideal given that one side does still have many local intersections. Traffic calming is critical to protect safety of drivers and pedestrians. Lanes should be no wider than necessary. Signage, medians, and intersection treatments should convey that this is an urban setting within a town and avoid the appearance of a highway so that drivers do not feel comfortable with higher speeds.



ONE-SIDED BOULEVARD

- **Larger setbacks**
- **Buildings face onto side streets**
- **Medians are focused at gateway intersections**
- **Medians may be located on side streets more than on the corridor itself.**

2

PROJECT APPLICATION

CORRIDOR DESIGN Toolbox

WHAT IS A TOOLBOX?

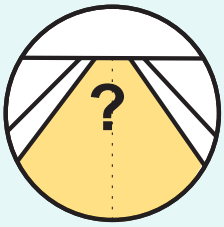
STANDARD TOOLS, CUSTOMIZED DESIGNS

In transportation terms, corridors are linear geographic areas that facilitate movement and connect communities. Thus they often include varied conditions along their length. Right-of-way width, number and configuration of lanes, access, adjacent uses, and traffic volumes as well as other roadway design features may vary throughout the length of any given corridor. The toolbox is intended to provide step-by-step "tools" or strategies to improve the safety and functionality of any corridor. Some tools may apply more widely, while others will only apply in blocks or at intersections that meet specific criteria. Many tools can be combined for optimal results.

Applying improvements to a road/highway corridor is a highly customized process. Even for corridors that are relatively homogeneous special cases abound—curb cuts accumulate over the years, pavement materials degrade, small pieces are haphazardly repaired/replaced, and land uses change. Since no single slate of improvement measures will apply to each highway or situation, a "kit of parts" or "toolbox" approach works best in order to implement industry best practices within a complex and highly varied environment.

HOW TO APPLY TOOLS FOR ALL CORRIDOR COMMUNITIES

The case studies used in the workshops reflected common typologies found along the Route 65 corridor and similar urban arterial corridors. Typologies allow each municipality to see solutions available for similar conditions found in their community. Each municipality can thus use this toolkit to find potential ideas appropriate to them, understand the basic requirements, and find steps and processes to pursue them. For ease of use, and recognizing that conditions vary along urban arterial corridors, each strategy is presented and discussed individually. The toolbox presents strategies in three tiers:

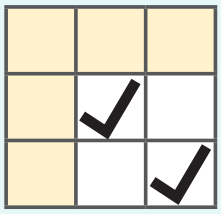


OUTCOME-ORIENTED DESIGN

Physical improvements to the roadway, depicted by what they achieve

ENGINEERING PROCESS

Technical processes that enable the study and implementation of the desired outcomes



TOOL MATRIX

User guide that identifies which processes can be used to achieve which outcomes

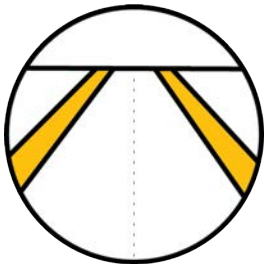
TOOLBOX APPLICATION GUIDE - FLOW CHART

Which tool to reach for? The Application Guide at the end of this chapter is a user guide for identifying the applicable tools per municipality. This chart guides municipalities through the priority improvements and base requirements. Space, geography, and funding are never unlimited, and each municipality will need to consider their local constraints as they select the preferred and appropriate road design tools. The Application Guide is a first step for municipalities to review to help them sort through the more applicable tools for their further consideration.

O.1 NARROW TRAVEL LANES

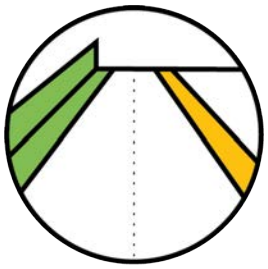
SPEED REDUCTION

Throughout the Route 65 corridor, lane width fluctuates between 11' and 12' (with some small segments over 12'). Since Route 65 is consistently four lanes wide throughout the Ohio River Boulevard corridor, narrowing all lanes to 11' as a standard width will reclaim one foot per lane for a total of four feet added space in applicable sections. Reclaimed space can be reallocated for other uses, including adding medians or buffers, green space, and additional space for pedestrians.



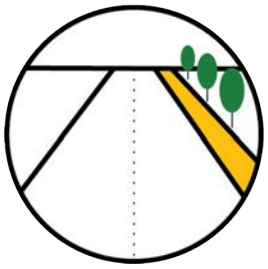
Lane narrowing

In communities where Route 65 passes through the core of a town, there are often sidewalks along the corridor that can feel unsafe without any buffer between pedestrians and fast moving vehicles. Emsworth falls into this category. By simply narrowing 12' lanes to 11', an additional two feet can be added on either side as a layer of protection for pedestrians on the sidewalk that is filled with grass or low plantings that deter drivers from veering too close to the sidewalk. Where sidewalks are less than six feet wide (the width necessary for two personal mobility devices or strollers to safely pass each other) additional space gained from lane narrowing can be allocated for them.



Buffer on the edge of the road

Further, in many locations there is a sizable paved shoulder. Although these (unofficially) accommodate turning movements and emergency pull-off spaces when needed, a continuous shoulder is not necessary for general traffic. Excess pavement creates the perception of a much wider road, suitable for higher speeds. Road design should pave only the driving lane widths that are appropriate for the intended speeds.



Natural buffer on the edge of the road

Where this applies:

Applies when lanes are over 11' wide or a median already exists.

Pair with:
O.2 Add a Median
O.6 Enhance Gateways

Safety Assessment

Where observed speeds are higher than the desired speed that is appropriate for the context, narrowing lanes is the most basic and effective tool for traffic calming.

Economic Assessment

Calmer streets not only flow better, but can support local businesses by making access safer, easier, and clearer. Businesses that can attract foot traffic in addition to vehicles can broaden their customer base, and calmer streets allow for this mix.

BENEFITS:

Driver safety: reduce speed

Pedestrian safety: reduce crossing time, increase buffer from traffic

AV: reduce conflicts with movements in shoulder

Community: adds usable space

Space Gained:

4’

EMSWORTH EXAMPLE

Narrowing the lanes allows:

- *Pedestrian buffer*
- *Reduced crossing time*
- *Reduced speed*

AMBRIDGE EXAMPLE

Narrowing the shoulder allows:

- *Pedestrian buffer*
- *Reduced speed*
- *Reduces turning movement in shoulder conflicts*

Space Gained:

8’

O.1 NARROW TRAVEL LANES

DEFINE PULL-OFF ZONES IN THE SHOULDER

In many areas, a wide shoulder is currently offered. The added width along the driving lane, even when it is outside a painted line, is perceived by drivers as a wide unobstructed roadway. Regardless of the posted speed limit, driver behavior responds to the context and perceived level of comfort. The wide shoulder makes the road resemble a highway and is comfortable to drive on at an elevated speed, so drivers behave accordingly.

However, the shoulder is important for certain uses. It allows vehicles in distress to pull over and not block the driving lanes. It also allows police and emergency vehicles additional space to stop or bypass traffic when needed, which helps ensure the corridor can be properly monitored and served.

Instead of continous shoulder, limited lengths of shoulder only should be maintained as pull-off zones along the corridor in locations where intersections are spaced far apart. Where intersections are frequent, vehicles have many options to turn onto side streets and towards a stopping point, so pull-off zones are not needed in this setting. However, when blocks are very long or the corridor is separated from side streets by retaining walls or other constraints, vehicles have few options. The size and spacing of pull-off zones should respond to the local context: the longer the distances are between local streets, the more pull off space is appropriate to consider.

Where this applies:

Applies when an 8' shoulder is possible, AND the nearest intersection is more than 500' away.

Pair with:
O.1 Narrow Lanes to 11'
O.8 Enhance Gateways

Safety Assessment

Regularly spaced pull off zones in the shoulder allow space for police, AVs, and vehicles in distress to stop in emergency. Keeping these non-continuous, meanwhile, avoids the perception of highway conditions and accompanying speed.

Economic Assessment

Streets that can adapt to emergencies without clogging traffic, and are safely and regularly policed, feel more comfortable. Lacking these conditions, drivers and pedestrians alike may avoid using the roadway and thus also bypass adjacent towns.

BENEFITS:

Driver safety: reduces speed while retaining safe pull off

Pedestrian safety: provides more separation between road and sidewalk

AV: allows safe pull off out of the driving lane

Community: adds usable space

AMBRIDGE EXAMPLE

Although a continuous wide shoulder encourages speeding and can be removed, periodic shoulder areas are ideal to allow pull-off space. These can also be locations for increased signage or beautification.

O.2 ADD A GREEN MEDIAN

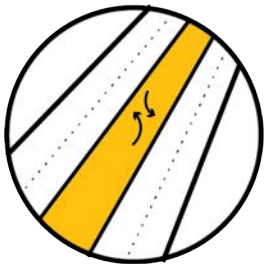
TRAFFIC CALMING AND BEAUTIFICATION

A traditional boulevard includes a median between the two traffic directions, typically populated with plantings and decorative pavers. A central green median provides opportunities for grass and plantings, other landscaping, trees, signage/banners, lighting, or other decorative features.

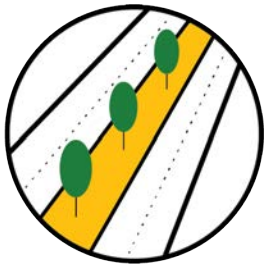
Beautification of medians can vary widely depending on the space available, the character of the street, and the conditions of access along a given area.

- Narrow medians can include artistic murals and wayfinding features. This should be concentrated around entrances to towns or major destinations.
- Green and planted medians can include low grass and low-impact native plants that are easy to maintain.
- Medians should be at least six feet wide to accommodate trees and pedestrian refuges at crossings. A larger eight foot width is recommended where possible. Trees should be sized and spaced to allow clear visibility through the understory.

Access also impacts median placement and design. In locations with frequent intersections and curb cuts, the use of a median will limit where cars can cross driving lanes and make left turns. Frequent breaks in the median are discouraged, as they reduce the visual impact and safety value of the median. Left turn lanes that allow U-turns may be needed to allow this movement at intersections only. Medians may also use mountable pavement at specific locations for emergency vehicles or for general traffic where only occasional left turns are needed. Decorative paving continues the visual appearance of a median while allowing midblock turns where needed.



Median with turn lanes



Continuous median

Mountable median

BENEFITS:

Driver safety: eliminate head-on collisions, concentrate turning movements

Pedestrian safety: reduce conflicts from turning vehicles, create refuge areas at crossings

AV: reduce conflicts with turning traffic, create highly visible edge of pavement with minimal occlusions

Community: adds visual appeal and lighting

Where this applies:

Applies when lanes are over 11' wide or a median already exists.

Pair with:
O.1 Narrow Lanes to 11'
O.6 Enhance Gateways

Economic Assessment

When paired with other traffic calming measures, medians can help to create order on an otherwise chaotic street that is filled with expanses of concrete, conflicting vehicular movements, and an inconsistent pedestrian experience. The aesthetic benefits of landscaped medians also provide a more attractive environment for higher property values and increased retail sales.

Safety Assessment

Reducing conflict points is essential for safer and more consistent traffic flow. Medians control left turns and consolidate them into locations with signals and better sight lines. The addition of vertical elements such as trees or lights in the center of the roadway also narrows drivers' field of vision, which contributes to slower overall speeds and reductions in overall number and severity of crashes.

EMSWORTH EXAMPLE

Replacing the concrete barrier and narrowing the lanes makes space to add grass and low plantings. Small trees on the outside of the roadway do not block visibility. A more attractive median, along with improved signage, can be used in the blocks leading into town. The change in scale and character indicates an approach into a more urban setting and prompts drivers to slow down.

AMBRIDGE EXAMPLE

At 4th Street, the intersection is very wide to accommodate turning movements of large trucks. The south side of the road is undeveloped, so expanding the right-of-way slightly gives space for a designated right turn lane as well as a median to separate and organize conflicting traffic flows.

O.3 STRAIGHTEN INTERSECTIONS

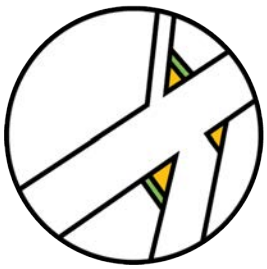
CONTROLLED, STANDARDIZED TURNING MOVEMENTS

The most desirable angle for intersection design is a 90-degree angle. While not always possible, this geometry is preferred to facilitate consistent turns and clear visibility for vehicles approaching from all sides. Where roads meet at a different angle, the intersection is referred to as skewed. Engineering standards for intersection design recommend a 60-degree minimum, when the 90-degree ideal cannot be achieved.

Irregular geometry results in obtuse angles for turns from one direction. In this case, the primary road can be unclear. From the other direction, turning movements have an acute angle that forces drivers to make sharp turns with limited visibility. When the driver has not anticipated the sharp turn in advance, they may veer out of their lane. Straight and regular geometry is clear for users and avoids confusion.

Four-way intersections are also considered the ideal maximum. When more than two roads meet, the angles are mathematically guaranteed to include angles under 90 degrees. Traffic flow through the intersection must shift cars into multiple directions within one intersection. These intersections often use staggered signal phasing or designated turn lanes to direct movements appropriately. While there are many examples of five- and six-way intersections and solutions to design them safely, avoiding these complex geometries is best where possible.

Intersections that have available space and right-of-way should prioritize using angles as close to 90 degrees and consolidate exit points where possible.



Fix intersection geometry

Where this applies:

Applies to sharply angled or crowded intersections.

Pair with:
O.3 Reduce Curb Cuts

Safety Assessment

Slower and more predictable intersection geometry increases safety for all modes. Using more pavement than necessary can cause confusion and ambiguity.

Economic Assessment

Intersections with multiple vehicular approaches can create traffic bottlenecks, which prevent easy access to businesses. Driver confusion and apprehension deters repeat business.

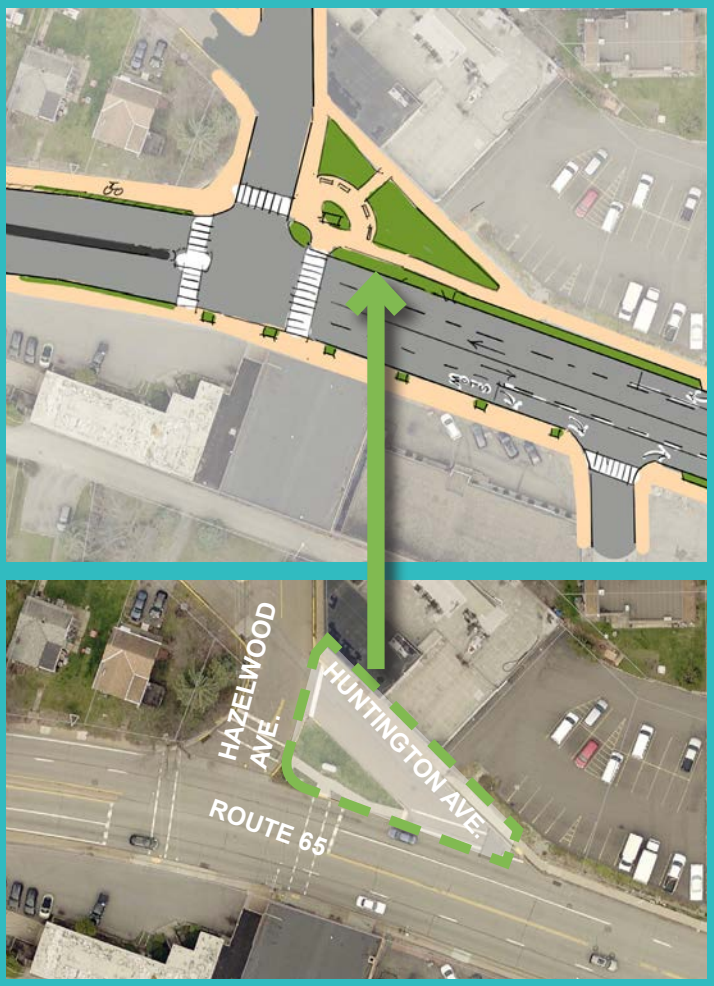
BENEFITS:

Driver safety: reduce confusion, force slower and more consistent turns

Pedestrian safety: reduce conflicts from turning vehicles, shorten crossing distances

AV: create more consistent roadway geometry, avoid ambiguity for AI decision-making

Community: potential for reclaiming road space for landscaping/ beautification



EMSWORTH EXAMPLE

The intersection of Route 65 with Hazelwood Avenue is a three-way signalized intersection which primarily serves local traffic. Huntington Avenue acts as a slip lane that separates right turning movements before the intersection. In this location, the added slip lane is not needed to organize traffic or relieve congestion. Instead, it adds two extra curb cuts very close to the traffic light. This ambiguity is confusing and potentially dangerous for people driving and walking.

Removing this section of road and adjusting the geometry to use a 90 degree angle improves clarity and visibility at the intersection. The closed roadway segment can be used as community space and provide room for pedestrian paths, trees, landscaping, or other beautification and gateway features.

O.4 REDUCE CURB CUTS

MINIMIZE REAR-END CRASHES AND PEDESTRIAN CONFLICTS

The Route 65 Ohio River Boulevard, is categorized, like many regional corridor roadways, as a Principal Arterial Highway, expected to move traffic between collector roads and limited access highways. In reality, at Route 65 and others, regional corridors serve a more complex function when they pass through cities and towns, and act as major thoroughfares with frequent connections into surrounding communities.The typology of an urban arterial boulevard reflects that many urban arterials actually function as main streets and need to intersect with local roads.

When an arterial has an urban setting and character, reducing curb cuts and condensing access points is particularly important. In commercial districts, businesses may want to have direct access from the main road, but private curb cuts from an arterial are generally not appropriate. In residential areas, private driveways should be avoided. Existing land use patterns have already allowed both of these conditions to proliferate in many towns. Moving forward, strategies to consolidate existing curb cuts, reduce excess width of access lanes, and reduce the number of new curb cuts will minimize conflicts.

Key implementation strategies to achieve this include updating zoning and land use policies to prevent new curb cuts and provide alternate access for new developments, such as alleys and consolidated driveways.

More immediate strategies may also focus on better defining existing curb cuts to provide clearer delineation of the access point. Beyond the access point, other pavement or parking areas should be buffered to protect pedestrians and limit vehicle movement to only the designated areas. Curb cuts themselves should prioritize pedestrian safety by maintaining sidewalk level and utilizing driveway aprons rather than lowering sidewalks to street level. This also allows for slower and more deliberate turning movements.

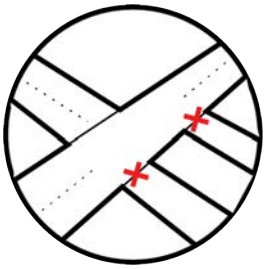
BENEFITS:

Driver safety: reduce conflict points and unnecessary start/stop activity that causes delay

Pedestrian safety: reduce conflicts from turning vehicles, create consistent and uninterrupted space

AV: reduce conflicts with turning traffic, create highly visible edge of pavement with minimal intrusions

Community: allows for consistent streetscape with trees and lighting



Reduce curb cuts

Where this applies:

Applies to blocks with numerous or large curb cuts.

Pair with:
O.3 Straighten Intersections

Safety Assessment

Minimizing conflict points creates smoother and more predictable traffic flow. Inflow and outflow to the arterial can be controlled via signalized intersections, providing better separation of movements for all modes.

Economic Assessment

Each property maintaining its own access point is inefficient and creates additional liability. Breaks in the streetscape also detract from usable frontage and create visual clutter. Better organization of access can improve customer experience.

EMSWORTH EXAMPLE

At Camp Horne Road, a 4-way intersection is heavily traveled and includes commercial uses on all corners. In each corner, several businesses present several entry and exit points, all located within very close proximity of the signalized intersection. To the east of Camp Horne Road, a bidirectional turn lane allow eastbound drivers to turn left into businesses using the same left turn lane that westbound drivers use at the signalized intersection. Sharing lanes between opposing traffic movements right next to a major intersection is not recommended. Further, some businesses have no clearly defined access lane at all and use a continuously accessible parking lot instead. This is unsafe for drivers and pedestrians who do not know when to expect cars to turn. Defining curb cuts with a maximum width and providing a landscape buffer in remaining areas will protect pedestrians and reduce driver conflicts.

O.5 DISTRIBUTE DIRECTIONAL ACCESS

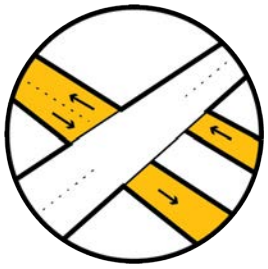
REDUCE CONFLICTS ON ARTERIAL AND SLOW TRAFFIC ON LOCAL STREETS

Given the regional nature of most traffic on arterials, local access should be managed in ways that both reduce excess traffic and speeding on neighborhood streets and reduce the chance for conflict on the arterial itself.

As with the strategy for reducing curb cuts, limiting the number and design of secondary access streets helps to organize local access in a way that focuses safety improvements in fewer but more strategic locations.

Many neighborhood streets leading into arterials pre-date the existence of the arterial itself. Concerns over parking, traffic control, and other hyper-local needs often ignore the safety and traffic needs of adjacent arterials. Access should be managed as a network rather than street-by-street.

Implementing a system of one-way streets strategically spaced in order to minimize conflict is one approach to managing access. This allows for a greater focus on improving safety for each individual access point, depending on its function. Egress from the arterial can be controlled by deceleration lanes to eliminate rear-end crashes and raised crossings to create better pedestrian visibility (and slower speeds approaching a neighborhood street). Ingress to the arterial can be designed to allow for better visibility and an acceleration lane. Instances where two-way access is preferred can be accommodated by a combination of these elements.



Organize on/off flow

Where this applies:

Place access OFF of Route 65 before access ONTO Route 65.

Or combine entry/exit on two-way streets.

Pair with:
O.7 Create Pocketed Turns

Safety Assessment

Distributed entry and exit points from the highway allow for convenient local access while keeping different types of turning maneuvers (acceleration and deceleration) in separate intersections.

Economic Assessment

Safer and more clearly marked entry and exit points to the community allow for simpler wayfinding for customers, creates opportunities for beautification, and controls through traffic, potentially boosting property values.

BENEFITS:

Driver safety: provide safer turning movements and less abrupt speed differences

Pedestrian safety: increased visibility and slowed vehicular traffic at intersections

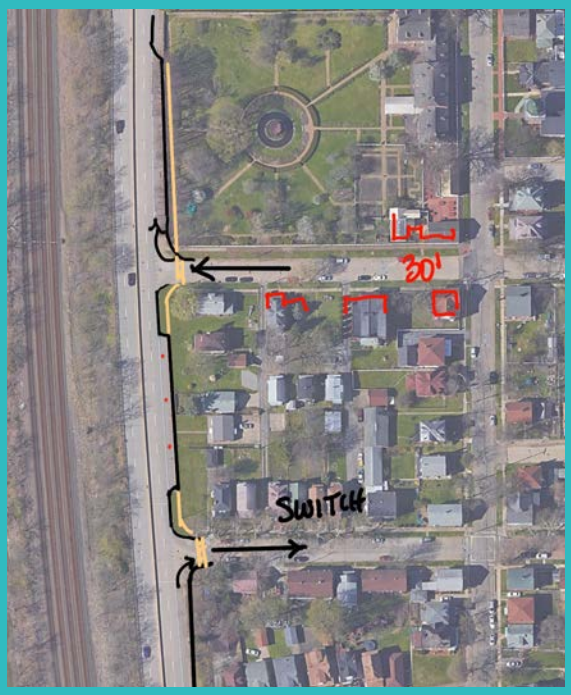
AV: reduce rear-end collisions, consolidate access points to neighborhood

Community: less cut-through traffic, increased opportunities for gateways

AMBRIDGE EXAMPLE

Near the Old Economy Village historical site, Route 65 functions as both a regional highway and as a part of the neighborhood grid. Ensuring access is distributed in the way that makes most sense for safety (primarily), neighborhood character, and access to destinations will overall improve the performance of the main highway. The abrupt transition from traffic moving at expressway speeds (at or above 55 mph) to a context of neighborhood streets designed for 20-25 mph creates safety issues and nuisances.

Employing deceleration space for exiting traffic allows for speed transitions to be more gradual and take place on the highway rather than in the neighborhood.



O.6 NARROW INTERSECTIONS

SLOWER, MORE CONTROLLED TURNING MOVEMENTS

Intersections that are overly wide create large expanses of pavement that are not only unsightly, but present safety hazards for all modes of transportation. The same turns can be permitted for all vehicles using smaller, narrower intersections that visually prioritize small vehicles while allowing large trucks and buses to traverse pavement deigned specially for them.

The majority of vehicles that utilize most intersections are smaller personal vehicles (cars, pickup trucks, SUVs, etc.), and require much smaller turning radii and maneuvering space than large trucks and buses. However, their presence typically dictates that intersections be designed with their needs as a priority. This creates large intersections that cause smaller vehicles to turn faster than they otherwise would, at angles that cause visibility issues for people walking and biking through the intersection. For pedestrians, crossing distances are longer than they otherwise would be, exposing them to danger for longer periods of time as they cross.

Larger turning movements can be accommodated using specially paved truck aprons, which are mountable by large vehicles, but inconvenient for most smaller vehicles. Differentiating the pavement style (using brick or stamped/tinted concrete) creates a visual style that gives the appearance of a significantly narrowed intersection, while allowing full access to vehicles of all sizes.

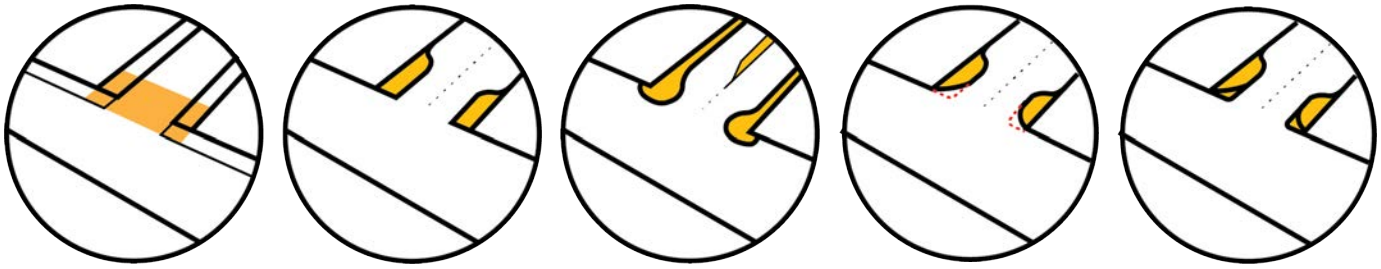
BENEFITS:

Driver safety: provide slower turning movements clearer path of travel

Pedestrian safety: shorter crossing distances and higher visibility to drivers

AV: clearly delineate edge of pavement and path of travel

Community: improved aesthetics and clearer access points



High-visibility crosswalks | **Narrow lanes** | **Narrow lanes with median** | **Narrow curb radius** | **Narrow curb radius with mountable curb**

Where this applies:

Applies to any intersecting street where slower speed is desired.

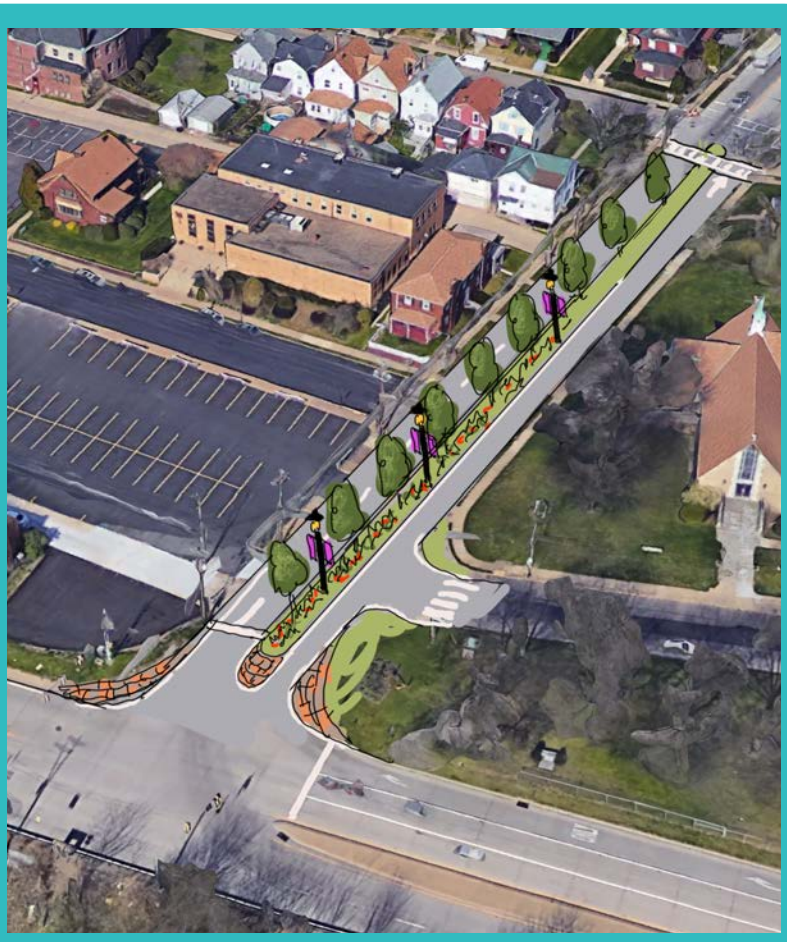
Pair with:
O.7 Create Pocketed Turns
O.9 Designate Pedestrian Space

Safety Assessment

Slower, more deliberate turns are safer when the space for doing so is marked well and does not use more space than necessary. Differentiating turning geometry based on vehicle size provides a visual cue that the street context is changing to that of a neighborhood.

Economic Assessment

Gateway aesthetics are important to a community's value and economic development. A large expanse of pavement does not convey the message that the community has value, but an intersection that is narrower and has varied pavement types with landscaping can.



AMBRIDGE EXAMPLE

The intersection of Route 65 and 8th Street (SR 989) is an example of an arterial highway that intersects a street that is stuck between two contexts: neighborhood street and truck route.

While trucks do utilize 8th Street more than other parallel streets due to its width, status as a state road, and convenience of access, it need not begin at an intersection that is overly wide and lacking in character. The intersection is a major gateway and is adjacent to a community park.

Adding truck aprons to narrow the intersection visually and physically will create a more orderly entrance to the community while still accommodating trucks.

O.7 CREATE POCKETED TURNS

PROTECTED LOCAL ACCESS AND SAFER SPEED TRANSITIONS

Through movements on arterials are prioritized, but in a neighborhood context, perpendicular streets require reasonable levels of local access. While local access would ideally mostly be limited to signalized/controlled intersections, this is not always possible, especially when the arterial has been retrofitted into an existing town street grid.

Local access should still be protected from the conflict points that exist on the arterial, especially at unsignalized intersections. Local streets should also be protected from traffic that may enter the area at higher speeds because they either have not been given sufficient space to decelerate or because drivers are trying to avoid a rear-end collision on the highway.

Where high speed right turns occur from the arterial, drivers visibility of pedestrians is also limited. Pocketed turn lanes with pedestrian-focused traffic calming measures can provide a safe transition between the highway and neighborhood contexts. Deceleration lanes remove turning traffic from the general flow, and raised crossings both provide better visibility for pedestrians and slow traffic to the intended neighborhood speed (20-25 mph).

Where intersections are wider than necessary for the design speed, and/or where the width of a two-way access point is provided where only a one-way lane is needed, space can be reclaimed for greenery or other beautification.

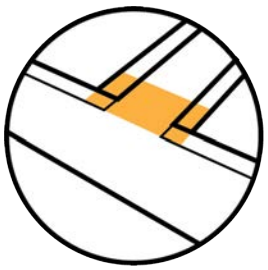
BENEFITS:

Driver safety: provide slower turning movements clearer path of travel

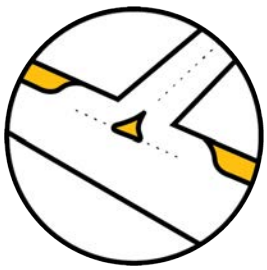
Pedestrian safety: shorter crossing distances and higher visibility to drivers

AV: clearly delineate edge of pavement and path of travel

Community: improved aesthetics and clearer access points



High-visibility crosswalks



Add deceleration lanes

Where this applies:

Applies to unsignalized intersections onto local streets.

Pair with:
O.6 Narrow Intersections
O.9 Designate Pedestrian Space

Safety Assessment

Reducing the chance for rear end crashes for vehicles exiting the roadway is a main safety outcome, with a concurrent benefit of added pedestrian safety for people walking along the highway.

Economic Assessment

Safer transitions between highway and neighborhood allow for better and more confident wayfinding for visitors, and the burden of dealing with speeding traffic along neighborhood streets is lessened when vehicles can slow down before they arrive on them.

AMBRIDGE EXAMPLE: POCKETED TURN/ DECELERATION LANES WITHOUT A SIGNAL

While the use of a deceleration lane and one-way streets is typical, this treatment proposes adding elements that better communicate that once a driver has left the highway, the priority road user has changed. Upon entering a slow neighborhood street, pedestrians are the highest priority, and speeds should match that context (20-25 mph or slower).

After entering the deceleration lane, the driver is presented with a raised pedestrian crossing at the approach to the right turn onto 13th Street from Route 65. This sets the neighborhood context and provides greater visibility for people walking. Additional space reallocated from the intersection allows for gateway treatments as well.

SEPARATED SLIP LANE

A more elaborate version of the deceleration lane, a separated slip lane provides local access by providing a parallel road for local traffic only. The slip lane can serve one or multiple intersections. Many traditional boulevards use slip lanes to allow faster flow in the central boulevard lanes, and facilitate local movement and turns on smaller parallel lanes. Slip lanes are always one-way and enable vehicles entering and exiting a busy road to have ample space to make turns without necessitating a traffic signal. The slip lane also accommodates local traffic looking to navigate from one local street to another, allowing that traffic to avoid the busy central lanes entirely.

Benefits to a slip lane include completely separating local from through lanes. The space between the main road and the slip lane can be landscaped as a median, planted with trees or shrubs, and include lighting and signage. Many traditional boulevards even place the pedestrian walkway in this median, lined by trees on both sides, although this design requires a very large right-of-way and is most appropriate to urban environments with a high degree of pedestrian activity.

For urban arterials that weave in and out of smaller towns, the slip lane is a road treatment to use in town to create clear protection for local movement, provide an attractive front door for residential neighborhoods, and allow space forrows of trees or similar green boulevard landscaping without infringing on sight distances.

Slip lanes are most feasible where there is ample right-of-way available outside the travel lanes. The median between through lanes and slip lanes should be minimum of 6’ for landscaping.

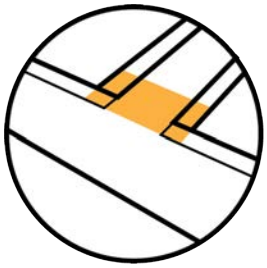
BENEFITS:

Driver safety: provide slower turning movements clearer path of travel

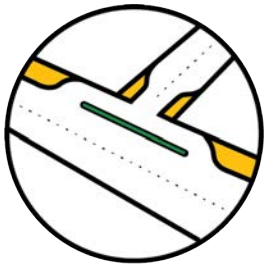
Pedestrian safety: shorter crossing distances and higher visibility to drivers

AV: clearly delineate edge of pavement and path of travel

Community: improved aesthetics and clearer access points



High-visibility crosswalks



Slip Lanes

Where this applies:

Applies to unsignalized intersections onto local streets where there is ample right-of-way.

Pair with:
O.8 Enhance Gateways
O.9 Designate Pedestrian Space

Safety Assessment

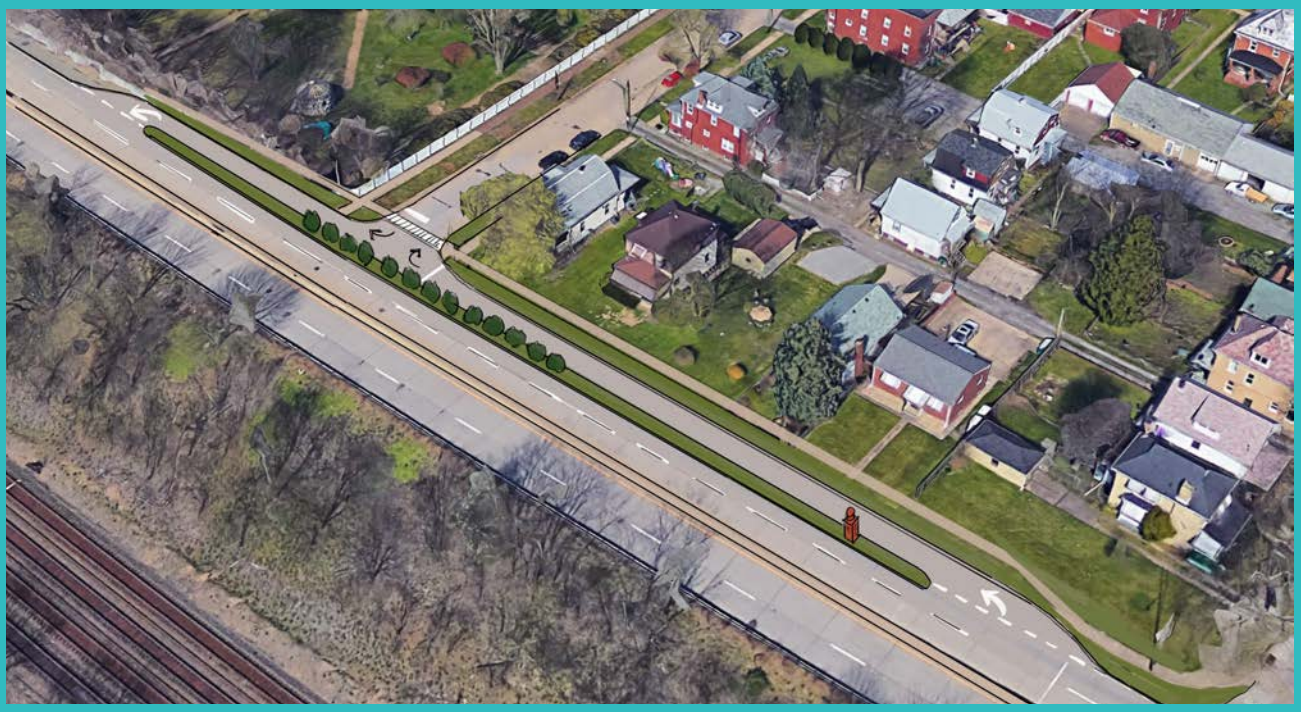
Reducing the chance for rear-end crashes for vehicles exiting the roadway is a main safety outcome.

Economic Assessment

Safer transitions between highway and neighborhood allow for better and more confident wayfinding and facilitates local traffic.

AMBRIDGE EXAMPLE: SEPARATED SLIP LANE

Compared to the previous example showing a turn from Route 65 onto 13th Street where the receiving street is in a one-way configuration, this example could improve safety for a scenario where the community prefers two-way access. Turning movements are completely separated from the general flow of traffic on the arterial, and the transition from highway speeds to neighborhood context is gradually accomplished before vehicles actually enter the community.



O.8 ENHANCE GATEWAYS

CONSISTENT WAYFINDING, COMMUNITY PRIDE AND IDENTITY

As urban arterials pass through towns, they must change in character to better reflect the context of their surroundings and promote a slower speed. It is imperative that roadway standards be sufficiently flexible to permit urban arterials within a town to function safely and appropriately alongside residential uses, pedestrian crossings, and local traffic at intersections.

Wayfinding and identity markers change driver perception of a roadway and establish a clear identity linking the roadway to the town. These tools can be employed at small or large scales, and include efforts within the right-of-way as well as on private and municipal property.

Use consistent architectural features such as stone walls or brick pedestals at town entry points. Use attractive signage with a consistent color and design to indicate local destinations, with signs posted 250' or more in advance of the intersection leading to each destination. Landscaping, banners, and murals in the median and/or along the sides of the roadway can beautify the space and include the town's name.

Consistent wayfinding and identity markers should be applied along the corridor throughout a given municipality. Enhancements should focus most heavily on the entrance points into town, including geographic entrances or notable intersections leading from the corridor into the town's main street. Along corridors, collaboration amongst municipalities to use complementary design features can create a corridor-wide identify and ensure that all signage is clear and uniformly interpreted.

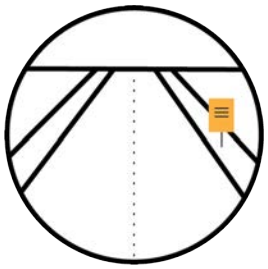
BENEFITS:

Driver safety: provide slower turning movements clearer path of travel

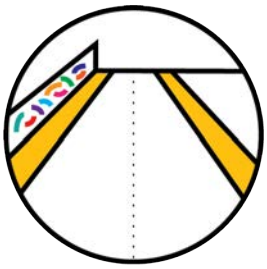
Pedestrian safety: shorter crossing distances and higher visibility to drivers

AV: clearly delineate edge of pavement and path of travel

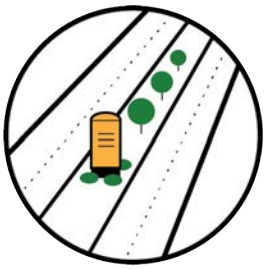
Community: improved aesthetics and clearer access points



Wayfinding



Gateways and public art



Include gateway median

Where this applies:

Applies at entrances to towns, at major intersecting streets, and elsewhere as desired

Pair with: Any or all other tools

Safety Assessment

Clear signage and wayfinding indicate to drivers where to go and allow drivers to anticipate turns and slower speeds in advance.

Economic Assessment

Clear signage and wayfinding advertise destinations and help connect people to shops and businesses.

AMBRIDGE EXAMPLE

Signage, murals, and lighting on the bridge as well as under the bridge can make the existing infrastructure serve as a visual gateway as well. The wide shoulder allows safe pull-off space, then narrows to slow traffic and accommodate a brick gateway element.

EMSWORTH EXAMPLE

Simple improvements such as entry markers, attractive signage, town names on the median, and landscaping change the road's character within town boundaries.

O.9 DESIGNATE PEDESTRIAN SPACE

SAFE CROSSWALKS

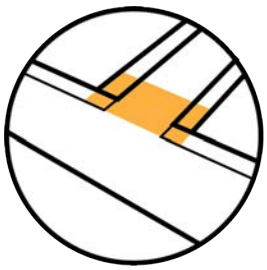
Crosswalks are essential in an urban setting. Especially along an arterial road, traffic moves too quickly for unmarked crossings to be safe for pedestrians or drivers. Clear markings make it obvious where pedestrians may cross and indicate to drivers to slow down and anticipate other users in the roadway.

High-visibility crosswalks with a piano key pattern are a simple, basic improvement. The pattern and reflective cooling are easy to see in day or night, and even in poor weather conditions. Further, raised crosswalks prioritize the pedestrian and allow ADA-accessible crossing. Instead of making pedestrians step down, vehicles must pass over a slightly raised bed. This further slows traffic at highly used crosswalks and at prominent gateway sites.

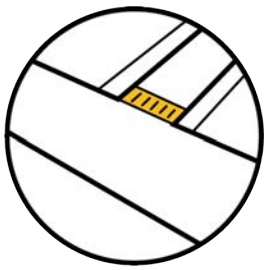
OFF-STREET PATHS AND AMENITIES

Not all solutions are on the street: For example, moving a bus stop to better serves pedestrian flow improves walkability and removes pedestrians from undesirable locations.

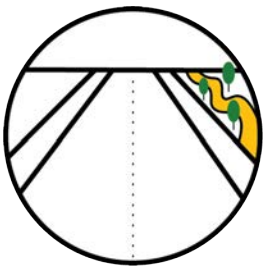
Multimodal paths may be ideally located on parallel streets rather than a busy arterial. However, depending on the context and connectivity possible, multimodal routes may be desired. If so, the path should be physically separated from the roadway with a curb and landscaping to protect bicyclists and pedestrians from fast moving traffic. Multimodal trails and off-street improvements may require a greater right-of-way or collaboration between PennDOT and private (or municipal) ownership to accomplish.



High-visibility crosswalks



Raised crosswalk



Multimodal trails

Where this applies:

Applies wherever pedestrian activity occurs often or is encouraged.

Pair with:
O.7 Create pocketed turns
O.8 Enhance Gateways

Safety Assessment

Delineating where drivers must share space clearly and in advance helps drivers slow down sooner and protects all people involved.

Economic Assessment

Communities that are walkable have higher property values. Walkability between residences and shops supports local businesses by expanding their market appeal without requiring additional land for more parking.

BENEFITS:

Driver safety: pedestrian crossings are more visible, even in poor weather and low light. Clear pedestrian space in safe areas reduces jaywalking and unanticipated conflicts.

Pedestrian safety: crossings are clearly delineated and drivers anticipate them in advance and slow down. Clear pedestrian space in safe areas discourages unsafe behavior elsewhere.

AMBRIDGE EXAMPLE

High visibility crosswalks ensure that pedestrian space is clearly marked. Including medians at major intersections further allows pedestrians a refuge on the median, so they only have to cross one direction of traffic at a time.

EMSWORTH EXAMPLE

An existing bus stop in Emsworth is located near the 5-way intersection of Huntington and Hazelwood with Route 65. The stops are set away from the crosswalks, and pedestrians often jaywalk. Although new crosswalks could be added, another intersection a short distance away is a better suited location. By relocating the bus stop to this signalized 4-way intersection, also more central to the community, there is space for a bus zone and safer pedestrian access.

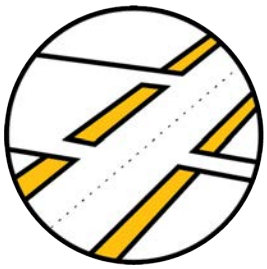
O.10 SUPPORT ECONOMIC GROWTH

PRIORITIZE INVESTMENTS AND PREPARE SUPPORTIVE POLICY

Roadway improvements, including those depicted in the previously listed tools in this section, support economic growth in multiple ways. Safe streets with lower speed and fewer collisions mean that drivers are more likely to notice their surroundings and can more easily stop to visit and access businesses along the corridor. Wayfinding and signage help visitors find destinations and draw more people into the town. When speed is high and turning movements are difficult, or drivers often miss their turn and are unsure where to go, businesses lose out on potential customers. Similarly, when the pedestrian connections are lacking or feel unsafe and uninviting, fewer customers will choose to walk and visit destinations along the corridor. All improvements that improve driver and pedestrian safety also support adjacent economic activity by facilitating easier and more frequent access.

Areas with high visibility and economic activity should be a top focus. Infrastructure improvements can become expensive, and it is understood that municipalities will need to choose where to prioritize their funding. Locations that are gateways into commercial main streets, have commercial uses with high pedestrian use, and/or are available for commercial and mixed use development are areas to prioritize localized improvements such as intersection upgrades, gateway design, and turn lanes.

Looking ahead, it is also important for municipalities to review their zoning and ensure that local policies support the vision they want along the corridor. Land use and setback policies guide what future development and change is possible and are critical to promoting and permitting walkable communities.



Prioritize improvements near available sites

Pursue land use and zoning policies that support walkable development

BENEFITS:

Driver safety: place new uses on roadways with safe access and capacity

Pedestrian safety: coordinate placement of pedestrian infrastructure near development

AV: plan new development to anticipate future mobility changes

Community: coordinate growth cohesively to match community vision

Where this applies:

Applies wherever pedestrian activity occurs and space for separated paths is available.

Pair with:
O.7 Create pocketed turns
O.8 Enhance Gateways
O.9 Designate Pedestrian Space

Safety Assessment

Coordinating new development with improved driver and pedestrian safety ensures that increased traffic volumes are safely accommodated.

Economic Assessment

Coordinating new development with improved driver and pedestrian safety acts as a catalyst for the corridor's growth, implements community vision, and grows the market appeal to support the development.

AMBRIDGE EXAMPLE

At 4th Street, an improved intersection with a median on 4th Street and narrowed curb radius makes a clear entry gateway into town. Slower speed, attractive streetscape design, and clear walkability across the intersection will make the land around this area more attractive to future development and could encourage this block growing into a commercial front door into Ambridge.

T.1 ROAD DIET

TECHNICAL PROCESS:

A road diet is generally described as reducing the number or width of lanes and repurposing that space for other uses. The extra space may be utilized to accommodate other modes of transportation (transit, bicyclists, and pedestrians) or things like parking or turn lanes. Existing resources can be utilized for reference when considering a road diet and its applicability to a roadway facility. The road diet does not necessarily prioritize vehicular traffic and gives more consideration in design to active transportation, public transportation, and usable community space with the goal of improving quality of life.

EXISTING GUIDANCE, STANDARDS, AND CASE STUDIES

- FHWA: Road Diet Informational Guide: This comprehensive resource "includes safety, operational, and quality of life considerations from research and practice, and guides readers through the decision-making process to determine if Road Diets are a good fit for a certain corridor. It also provides design guidance and encourages post-implementation evaluation."
- FHWA: Road Diet Resources: This link provides numerous links to additional road diet resources With a wide variety of topics that range from studies on economic impacts of road diets to public outreach to safety and operational impacts.
- FHWA: Safety – Proven Countermeasures: This link provides information about the overall crash reduction rate that a road diet implementation can result in.
- FHWA: Road Diet Case Studies: Includes case studies that highlight road diet implementations in the United States.
- PennDOT standards

BENEFITS

- Improved Safety: reduces speed differentials; reduces speeds; calms traffic, reduces vehicle-to-vehicle conflicts
- Operational Benefits: separate left turns; side-street traffic crossings improved; speed differential reductions
- Pedestrian, Bicyclist, and Public Transit Benefits: reallocate space from travel lanes to other modes of travel; reduced crossing distances
- Livability Benefits: can improve comfort for users if bicycle and pedestrian improvements are made and speed differentials are reduced; can contribute to a "complete streets" environment
- Economic: the environment created by a road diet has been shown to positively affect local business sales and property values by making the area a place people drive to, rather than driving through. Increased foot traffic generates more economic activity than vehicular trips.

APPLICABILITY

There are several reasons to consider road diets: improve safety, reduce speeds, mitigate queues from left-turning traffic, improve pedestrian and bicyclist environment and enhance transit stops.

1. Four-lane undivided roadway that can be reconfigured to reallocate space to other modes of transportation or other uses (ex: parking/turn lanes/landscaping)
2. Existing roadway operates like a de facto three-lane roadway. A de facto three-lane roadway is one in which the left-turning vehicles along the existing four-lane undivided roadway make up the majority of traffic in the inside lane and the majority of the through traffic using the outside lanes, which not only hinders roadway operation but can also lead to undesirable and potentially hazardous behaviors such as aggressive lane changing.
3. Road diets are applicable when the speed is not appropriate for the surrounding land use.
4. "Applying a Road Diet configuration on a corridor with frequent signalized intersections will have a larger impact on automobile operations than it would on a corridor with more infrequent signal spacing. Frequently spaced signals are more likely to have queued traffic back up into adjacent signals' effective areas, causing congestion issues at multiple intersections. In some cases this impact can be mitigated by optimizing the signal timing and coordinating between signals. The arterial automobile LOS will provide a more accurate view of conditions when there are longer distances between signalized intersections or only unsignalized intersections in the corridor."
5. "The following factors will affect automobile LOS, as measured by vehicle speed: signal spacing, access point frequency, number of left-turning vehicles, and number of lanes."
6. A Road Diet may not be feasible if one or more of the following is true:
   - Traffic volume exceeds 20,000 to 25,000 AADT (Annual Average Daily Traffic), depending on conditions:
   - LOS (Level of Service)/travel time is significantly impacted
   - Proximity of existing intersections/existing business/driveway entrances
   - Adequate space does not exist for midblock transitions between intersections or high-volume access points to allow for a proper transition from four lanes to three lanes.
   - If a municipality is considering a Road Diet on a roadway and the road diet abuts an adjacent municipality, both municipalities need to be involved
   - Freight: the design vehicle of a road must be considered as larger trucks cannot easily maneuver on narrower road and intersections that often serve large trucks should be designed with wider curb radii.

NEXT STEPS

Local Municipality Actions

1. Formal resolution in support of the Road Diet
2. General Consideration in Community Planning
   - Master Plan
   - Transportation Plan
3. Coordination with DOT/Metropolitan Planning Organizations (MPOs)
   - Corridor Plan
   - PennDOT Connects
4. Solicit Public Input

Engineering Consultant Actions

1. Evaluation of applicability (as noted above and through FHWA guidance)
2. Evaluate operational impacts to vehicular movements
3. Safety Evaluation
   - Review of existing crash history
   - Highway Safety Manual evaluation of predicted crashes

T.2 COMPLETE STREET

TECHNICAL PROCESS:

Complete Streets is a design policy intended to direct design decisions towards multimodal transportation methods and not prioritizing motor vehicles. A Complete Streets design policy aims to make street crossings; walking to shops, jobs, and schools; and bicycling easier and safer. It can also better accommodate access to and operation of bus and rail public transit. There is no single description of a Complete Street, it is adapted by communities on a case-by-case basis to support the needs of that community. A Complete Streets policy is not intended to be a single special project, rigid design prescription, or call for immediate retrofit, but to guide the approach to transportation projects for all roadways users that is context sensitive.

EXISTING GUIDANCE, STANDARDS, AND CASE STUDIES

- Introduction to Complete Streets: Smart Growth America provides an overview of complete streets, issues it aims to solve, potential solutions, limitations, and reasons to implement.
- Case studies: Smart Growth America provides several examples where a complete streets policy has been implemented and provides documentation about engaging the community, lessons learned, overall studies of complete streets.
- Elements of a Complete Streets Policy: This Smart Growth America document lays foundation for the individual components of a complete streets policy and guides development of a policy.
- The Best Complete Streets Policies of 2018: This Smart Growth America document grades policies implemented by various communities by the national complete streets coalition and has details about policy elements.
- Complete Streets policy development resources: This Smart Growth America document has documentation to support policy development.
- Policy inventory: This Smart Growth America list has examples of complete streets policies developed by various agencies.
- Complete Streets Local Policy Workbook: This Smart Growth America workbook is a guide for developing a complete streets policy.
- Complete Streets policy implementation: This Smart Growth America site has information on implementation best practices.
- Taking Action of Complete Streets: This Smart Growth America toolkit has a guide for implementation of complete streets policy.

BENEFITS

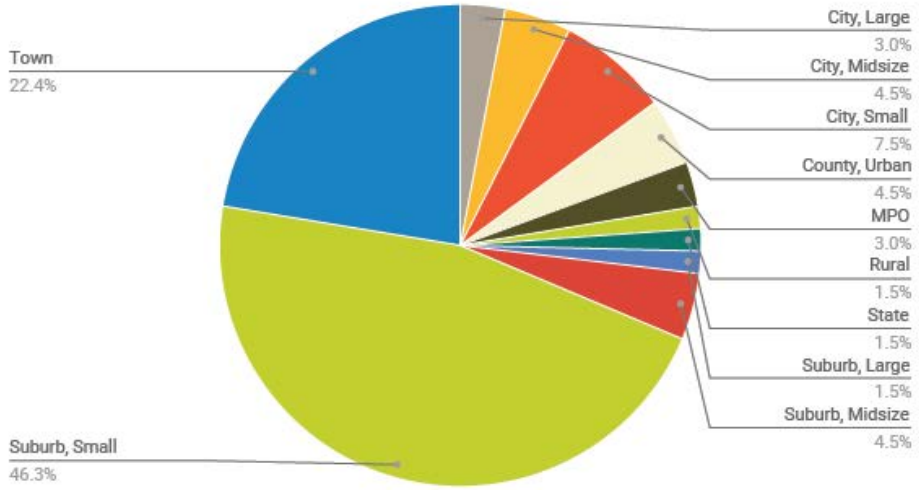
- Develops a policy that identifies and directs the design that better suits community transportation wants and needs
- Bolsters active transportation modes
- Bolsters public transit
- Safer streets for pedestrians and bicyclists
- Balance of safety and convenience for all users of the roadway
- "Ensures right of way is planned, designed, constructed, operated, and maintained to provide safe access for all users" – Intro to Complete Streets

APPLICABILITY

Since a Complete Streets policy is flexible and context sensitive, it can be applied to any community that may be interested. It's applicable to all community types:

- Rural
- Town
- Big city
- Suburb
- Areas with older and disabled populations
- Areas with unmet bicycle and pedestrian needs/demand
- Areas with access to transit
- Areas experiencing congestion conflicting with bike/peds
- Areas experience safety performance issues

Places that passed Complete Streets policies in 2018[5]



Source: The Best Complete Streets Policies of 2018, Smart Growth America. https://smartgrowthamerica.org/wp-content/uploads/2019/05/Best-Complete-Streets-Policies-of-2018.pdf

NEXT STEPS

Local Municipality Actions

1. Evaluate community perception/desire for a complete streets policy
2. Resolution to adopt a complete streets policy
3. Follow Smart Growth America's Complete Streets Policy Implementation guide (listed under Existing Guidance and sourced on page 114):

Implementation planning
- *Designation of oversight*
- *Planning committee*
- *Formal implementation plan*
- *Annual report of progress*
- *Inventory of documentation in need of update to align with complete streets approach*

Change way decisions are made
- *Committee to oversee project decisions*
- *Define exemptions to complete streets policy*
- *Coordination with planners/engineers on complete streets needs*
- *Changes to maintenance and operations to accommodate new policies*
- *Creation of new project development system*

Review and update design guidance
- *Writing new or revising existing street design guidance*
- *Selecting national best practices*
- *Updating local codes*
- *Application of design guidance to public and private projects*

Education
- *Updating municipal staff, maintenance personnel, managers on policy direction*
- *Professional development opportunities offered through DOTs and national complete streets coalition*
- *Engaging the community on projects and benefits of new design policy*

Measuring performance
- *Track use of multimodal facilities*
- *Track safety performance*
- *Before and after studies*
- *Track annual maintenance costs*

Projects
- *Design and execute complete streets projects*

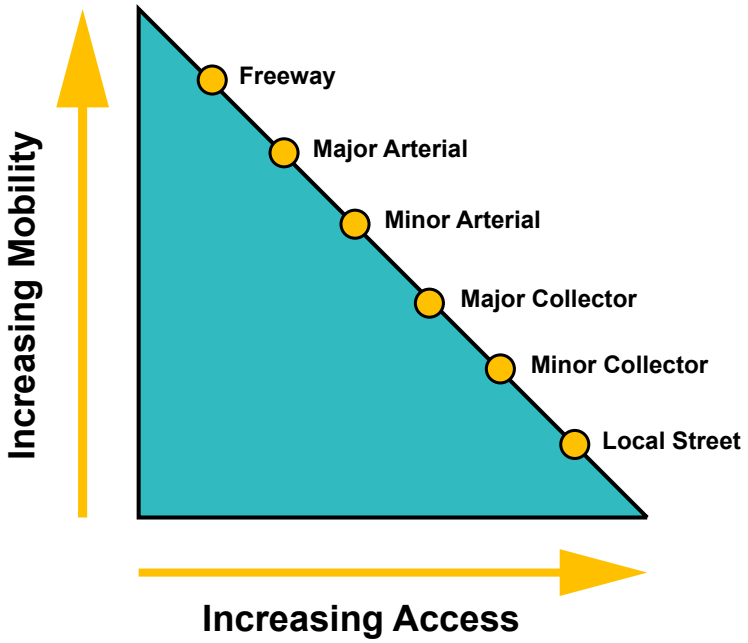
T.3 ACCESS MANAGEMENT

TECHNICAL PROCESS:

Access management is the management of vehicular access along a roadway facility. Different types of roadway facilities prioritize access in different ways. For example, local streets provide for increased access with the least amount of mobility; a vehicle will travel slower on a local street, but have increased access to land parcels. On a freeway, mobility is prioritized and access to surrounding land uses is limited. The techniques used to control access include: access spacing, driveway spacing, safe turning lanes, median treatments, and right-of-way management.

EXISTING GUIDANCE, STANDARDS AND CASE STUDIES

- FHWA Access Management: This resource the Federal Highway Administration defines access management, describes access management techniques, provides measures of success and provides links to other publications and resources.
- PennDOT Publication 574: Access Management – Model Ordinances for Pennsylvania Municipalities Handbook: This handbook provides guidance to municipalities for developing an access management program and provides model ordinances. The handbook provides the following summary of the 10 principles of access management:



Source: US Department of Transportation
https://ops.fhwa.dot.gov/access_mgmt/what_is_accsmgmt.htm

The following list identifies 10 key principles for access management, as prepared by the Transportation Research Board:

The Transportation Research Board's Manual Identifies 10 Principles for Access Management

Access management programs seek to limit and consolidate access points along major roadways, while promoting a supporting street system and unified access and circulation systems for development. The result is a roadway that functions safely and efficiently for its useful life, and a more attractive corridor. The goals of access management are accomplished by applying the following principles:

1. **Provide a specialized roadway system** – it is important to design and manage roadways according to the primary functions that they are expected to serve;
2. **Limit direct access to major roadways** – roadways that serve higher volumes of regional through traffic need more access control to preserve their traffic function;
3. **Promote intersection hierarchy** – an efficient transportation network provides appropriate transitions from one classification of roadway to another;
4. **Locate signals to favor through movements** – long, uniform spacing of intersections and signals on major roadways enhances the ability to coordinate signals and ensure continuous movement of traffic at the desired speed;
5. **Preserve the functional area of intersections and interchanges** – the functional area is where motorists are responding to the intersection (i.e., decelerating, maneuvering into the appropriate lane to stop or complete a turn);
6. **Limit the number of conflict points** – drivers make more mistakes and are more likely to have collisions when they are presented with the complex driving situations created by numerous conflicts. Traffic conflicts occur when the paths of vehicles intersect and may involve merging, diverging, stopping, weaving, or crossing movements;
7. **Separate conflict area**s – drivers need sufficient time to address one potential set of conflicts before facing another;
8. **Remove turning vehicles from through-traffic lanes** – turning lanes allow drivers to decelerate gradually out of the through lane and wait in a protected area for an opportunity to complete a turn, thereby reducing the severity and duration of conflict between turning vehicles and through traffic;
9. **Use non traversable medians to manage turn movements** – they minimize left turns or reduce driver workload and can be especially effective in improving roadway safety; and
10. **Provide a supporting street and circulation system** – a supporting network of local and collector streets to accommodate development, and unify property access and circulation systems. Interconnected streets provide alternate routes for bicyclists, pedestrians, and drivers.

Source: https://www.dot.state.pa.us/public/PubsForms/Publications/PUB%20574.pdf

BENEFITS

Benefits to access management are summarized in the graphic at right, assembled by PennDOT.

APPLICABILITY

There are several reasons to consider access management: increase roadway capacity, improve public safety, and reduce traffic congestion.

NEXT STEPS

Local Municipality Actions

1. Formal resolution
2. General Consideration in Community Planning
   - Master Plan
   - Transportation Plan
3. Coordination with DOT/Metropolitan Planning Organizations (MPOs)
   - Corridor Plan
   - PennDOT Connects
4. Solicit Public Input

Engineering Consultant Actions

1. Evaluation of applicability (as noted above and through FHWA guidance)
2. Evaluate operational impacts to vehicular movements
3. Safety Evaluation
   - Review of existing crash history
   - Highway Safety Manual evaluation of predicted crashes

Summary of Benefits by Stakeholder

Stakeholders	Benefits of Access Management
Community/ Neighborhoods	• Safer transportation system • More attractive roadway corridors • Lower taxes for future roadway investment • Preservation of property values • Safer pedestrian and bicycle travel • Improved appearance of the built environment • Reduced fuel consumption and air emissions
Business Community	• More efficient roadway system captures a broader market area • Stable property values • More consistent development environment • Reduced transportation and delivery costs
Pedestrians	• Safer walking routes due to fewer conflicts with traffic • Refuge areas created by medians
Bicyclists	• Fewer conflicts with traffic • More predictable traffic patterns • Greater choice of alternative travel routes
Transit Riders	• Reduced delay and travel times • Safer walking environment for access to stations
Motorists	• Fewer traffic conflicts which increases driver safety • Fewer traffic delays
Governmental Agencies	• Lower cost of providing a safe and efficient roadway • Improved internal and intergovernmental coordination • More success in accomplishing transportation goals • Lowered accident and accident response costs

Source: PennDOT Access Management Model Ordinances for Pennsylvania Municipalities Handbook https://www.dot.state.pa.us/public/PubsForms/Publications/PUB%20574.pdf

T.4 INTERSECTION DESIGN

TECHNICAL PROCESS:

Geometric intersection design involves the combination of horizontal alignment, vertical alignment, and cross sections to improve operations and safety. An intersection is defined as an area where two roadways meet, creating conflicts, and includes all modes of travel (pedestrian, bicycle, passenger vehicle, truck, and transit). When designing an intersection, the design criteria should be selected that considers all users involved while having the most effective impact on operations and reducing crashes. There are four basic elements that should be considered when designing intersections: human factors, traffic considerations, physical elements, and economic factors.

EXISTING GUIDANCE, STANDARDS AND CASE STUDIES

Reference

- FHWA – Other Intersection Designs
- FHWA – Proven Safety Countermeasures
- Unsignalized Intersection Improvement Guide – Selection of Appropriate Control
- Crash Modification Factors Clearinghouse (CMF)

Design

- PennDOT Publication 13M Design Manual Part 2 – Highway Design: This is the PennDOT highway design manual.
- A Policy on Geometric Design of Highways and Streets, AASHTO 2011 6th Edition (The Green Book)

Case Study

- Improving Safety through Pennsylvania's Intersection Safety Implementation Plan (ISIP): This is a case study outlining Pennsylvania's countermeasures to improve intersection safety throughout the State.

BENEFITS

- Improve safety for all modes of travel
- Reduce amount of conflict points
- Improve operations (Level of Service) for vehicles
- Increase capacity
- Improve sight distance for vehicles
- Improve facilities for pedestrians and bicyclist

APPLICABILITY

Types of intersections

- Three-leg intersections – a single intersecting leg that forms a T with the major roadway.
- Four-leg intersection – two intersecting legs that connect with the major roadway forming a plus sign. The intersecting legs can also be offset from one another to form two three-leg intersections that operate together.
- Multi-leg intersection – intersections with five or more legs. Realignment options should be explored to reduce conflict points and allow for improved operations.

Traffic Control

Traffic control for intersections – often adds delay for users traveling through the intersection and is balanced with the safety added for users. The selection of traffic control for an intersection is based on nine warrants from the Manual on Uniform Traffic Control Devices (MUTCD).

- Signalized – Controlled by a traffic signal
- Unsignalized
- Two-way stop controlled – Minor approaches are controlled by stop signs with the major approach being free flow.
- All-way stop controlled – all approaches are stop controlled with all movements yielding to each other.
- Yield controlled – minor approaches are controlled with yield signs. Yield controlled approaches need more sight distance than stop controlled approaches.
- Roundabout – circular intersections where traffic entering the circle must yield to the circulating traffic. All approaches are yield controlled and channelized.

Driveways and Access to Businesses/Properties

Intersections not only contain the physical area between intersecting legs but also the functional area of each approach. When designing intersections, driveways and access to businesses/properties must be included in the design process along with coordination with necessary shareholders.

NEXT STEPS

Local Municipality Actions

1. Interagency collaboration – collaborate with following stakeholders and get feedback on feasibility, and address any specific concerns each might have
   - PennDOT
   - Businesses
   - Residents
   - Developers
2. Implement plan and maintain infrastructure with support from PennDOT as appropriate

Engineering Consultant Actions

Identification of existing issues

1. Identify intersections that have deficient operations with unacceptable Levels of Service (LOS).
2. Identify crash rates at intersections.
3. Identify if intersections have proper facilities for pedestrians and bicyclists.
4. Identify locations that have poor sight distance and/or skewing alignment.
5. Identify locations that warrant a new turn lane.

Brainstorm solutions

1. Identify locations where pedestrians and bicyclists can be separated from motor vehicles.
2. Identify locations where advanced signing can be placed to improve intersection safety.
3. Propose new roadway alignment that would remove skewness from intersections and allow for proper sight distance.
4. Identify locations where widening for additional laning, pedestrian walkways, and/or bicycle lanes is feasible.

T.5 TRUCK ROUTE PLANNING

TECHNICAL PROCESS:

Truck route planning in the context of this tool is the planning, design, and signing of specified truck routes and access within a community. This is done with the purpose of guiding large trucks through a route that is navigable for trucks, considers regional and local deliveries, and the effects of trucks on the surrounding community in terms of safety and livability. Trucks are an important design consideration as they differ from passenger cars in both size and operation. These differences generate inherent conflicts between other modes, such as wide curb radii being more suited to turning trucks but less favorable for pedestrians.

Truck route planning in the community should consider what possible alternatives are feasible. High pedestrian traffic areas could benefit from rerouting trucks along a different roadway to eliminate conflicts. If conflicts are inevitable, the existing route could be redesigned in a manner that accommodates trucks, rather than specifically designing only for trucks. Bolstering truck route signing and truck restrictions will aide in guiding trucks through the appropriate designated route. In certain circumstances it may also be appropriate to guide pedestrians away from trucks.

EXISTING GUIDANCE/STANDARDS AND CASE STUDIES

Traffic data

- Traffic volumes and truck percentage is available online from PennDOT

References

- Truckers' Guide to PA: This is a map of roadways that can accommodate trucks and restrictions
- FHWA Freight Management and Operations: The FHWA website contains resources and information regarding freight management and operations.
- National Academic Press: Design and Access Management Guidelines for Truck Routes: Planning and Design Guide: This document has guidelines and considerations for truck route planning.
- NCHRP Review of Truck Characteristics as Factors in Roadway Design: This National Cooperative Highway Reserach Program report gives truck characteristics and design accommodations, and how to best accommodate large trucks on the highway system.
- Truck Safety Considerations for Geometric Design and Traffic Operations: This report publiched by NACTO provides a description of truck dimensions and operating characteristics, an in-depth analysis of turning widths, sight distances, and acceleration/deceleration requirements.
- Effects of Turns by Larger Trucks at Urban Intersections: NACTO has made available this report published by the Institute of Transportation Studies Library provides an analysis of safety impacts of pedestrian and bike movement at large curb radii designed for trucks.

Design

- PennDOT Publication 13M Design Manual Part 2 – Highway Design: This is the PennDOT highway design manual.
- PennDOT Publication 212 Official Traffic Control Devices: This document has Pennsylvania rules and regulations on traffic control devices.
- PennDOT Publication 236 Handbook of Approved Signs: This handbook details signs approved for use in Pennsylvania.
- PennDOT Traffic Engineering Manual: Chapter 2 of the Appendix includes official forms and documentation to propose a traffic route change to the state of Pennsylvania.

Case Study

- Designing for Truck Movements and Other Large Vehicles in Portland: This case study has guidelines for design of trucks in various contexts such as freight districts, Centers and Main streets, and residential areas.

BENEFITS

- Control over truck operations
- Improvement of existing truck routes and operation
- Potential separation of conflicts with other modes of travel
- Trucks using routes that are better designed for trucks or designed to accommodate trucks

APPLICABILITY

There are several reasons to consider truck route planning, rerouting, or redesign. Firstly, in areas with size or weight restrictions, these roads cannot support passage of the truck. Trucks frequently using undesirable roads can cause operational, maintenance, and livability issues. Trucks using properly designed corridors can benefit all modes of travel.

Land use considerations:
Consideration should be given to sites that generate truck traffic and the types of trucks generated. Access to and from trucking routes should be considered.

- Industrial generates relatively high volumes of truck traffic, generally designed to favor trucks due to higher truck percentage.
- Urban core – more mixed traffic and modes of travel, careful consideration should be given to all modes and corridor needs. Corridors may need more focus on trucks or more focus on other modes.
- Residential – typically local deliveries, low truck volumes.

Road use

- Road classification – typically considered in conjunction with land use. Truck traffic usually resides on arterials and collectors. PennDOT maintains functional classification mapping on its website which can be used to identify these routes and where key connections exist.
- Identification of strategic freight corridors – The FHWA and PennDOT have identified strategic roadways for freight and trucking. These roadways require close cooperation with DOT's to maintain that their purpose is being met.
- National network – developed by the USDOT and states, the national network establishes a national truck route system and limits restrictions states may place on those routes. Federal regulations indicate that no states or local jurisdiction may enact or enforce any law denying reasonable access of vehicles between the national network and terminals.
- National highway freight network – funding for the improvement of the freight transportation system
- National highway system – includes interstate as well as other roads important to economy, defense, and mobility. Improvements to these roads require special planning as they are subject to federal review. The NHS considers all modes of travel and not just truck traffic.

Operational and safety characteristics

Consideration should be given to the total volumes of truck traffic and if another roadway can operate acceptable after diverting more truck traffic to it. Intersections control and spacing, road segment operation, turning radii, curb treatments, signals, turning lane storage, and grades should be considered in their effect on truck operations.

Trucks should not be diverted to a roadway that creates unsafe conditions for trucks or other type of traffic. For example, moving trucks to a route where a turn often conflicts with pedestrians may be undesirable.

Truck size and weight

Trucks cannot be rerouted onto roadways with size or weight restrictions that conflict with the provisions of the national network. Upgrading those facilities to handle weight and height restrictions is often costly as this typically is work done to a bridge or culvert and typically requires grade adjustments.

Truck prohibitions

Adding restrictions to roadways where trucks are not intended to travel is useful for keeping trucks on appropriately designed routes. Considerations should be given to local deliveries and the types of trucks making those deliveries.

Route continuity

Continuity between routes is critical for regional truck trips. The connections between truck routes should be considered when upgrading existing routes or rerouting trucks. If a route is redirected, additional work may be necessary to reconnect critical connections.

NEXT STEPS

Local Municipality Actions

1. Interagency collaboration – collaborate with following stakeholders and get feedback on feasibility, and address any specific concerns each might have
   - PennDOT
   - Trucking companies/associations
   - Residents
   - Developers
2. Implement plan and maintain infrastructure with support from PennDOT as appropriate

Engineering Consultant Actions

1. Identification of existing issues
   - Identify locations where trucks frequently conflict with other modes such as pedestrians
   - Identify locations where truck traffic creates operational, safety, or livability issues
   - Identify locations where trucks encroach onto the shoulder or roadside areas
   - Trucks using local roadways that do not suit the road design or the community's desires for local traffic
   - Existing access/driveway issues
   - Roads with high volume of trucks
   - Identification of strategic freight networks, existing truck size and weight restrictions, critical connections
2. Brainstorm solutions
   - Identify possible alternative truck routes
   - Identify corridors where redesign for accommodating trucks would be better suited and design elements
   - Identify if modes are better suited to be separated on different routes
   - Identify locations where additional signing can supplement existing truck routes
   - Analyze solutions for operations, safety, cost, equitability, livability

TOOL MATRIX

Outcome Category		Road Treatment Tool
REDUCE SPEED	O.1	Narrow lanes to 11'. Include Pull-off zones.
BOULEVARD TREATMENT	O.2	Reuse available space for beautification on sides. Reuse available space for beautification in a median.
MINIMIZE CONFLICTS	O.3	Straighten geometry of angled intersections and intersections with five or more roads.
	O.4	Reduce curb cuts. Combine shared curb cuts and reduce size of large and undefined curb cuts.
	O.5	Orient one-way street pairs to provide movement off of the corridor before movement onto the corridor.
ORGANIZE ACCESS	O.6	Narrow the curb radius to slow traffic. Use mountable curb materials to enable trucks where needed. Combine one-way access into two-way streets to and direct traffic to preferred routes.
PROTECT LOCAL MOVEMENTS	O.7	Pocketed turning lanes (non-continuous turn lane). Separated slip lane (turn lane plus green median).
IMPROVE SIGNAGE AND IDENTITY AT GATEWAYS	O.8	Use consistent wayfinding themes and materials through communities. Combine with median, signage, landscaping, and road narrowing. Gateway and entrance treatment at key side streets: use the median, crosswalk, and curb treatment. Include signage & art on retaining walls and overhead structures.
INCORPORATE WALKABILITY	O.9	Include high visibility crosswalks. Include raised crosswalks. Identify priority areas for crosswalks. Create separated trails with landscape and/or topographic separation where space allows.
UNLOCK ECONOMIC GROWTH POTENTIAL	O.10	Prioritize improvements in areas with available parcels. Pursue zoning and land use policies that allow walkable growth.

Application and Comments	Engineering Process Tool
Applies to all segment and intersection types with lanes over 11'.	**T.1 Road Diet** **T.2 Complete Street**
Applies to all intersection types with ROW to spare such as lanes over 11'.	**T.1 Road Diet** **T.2 Complete Street** **T.3 Access Management**
Applies to unsignalized intersections with right and left turning movements. Controls movement with less confusion. Signage should be supporting the road design, not replace road design, in directing movement. *Applies to local one-way streets.*	**T.3 Access Management** **T.4 Intersection Design**
Applies to any intersecting street that is not a preferred truck route.	**T.3 Access Management** **T.5 Truck Route Planning**
Applies to: all intersections. *Slip lanes do not apply at signalized intersections.*	**T.4 Intersection Design**
Applies at entrances to towns, and elsewhere as desired. *Applies at major intersecting streets.*	
Applies to all locations. *Applies to the side street at unsignalized intersections.* *Applies at areas with high foot traffic and transit stops.* *Applies to peripheral/one-sided corridors and corridors with available land next to the corridor.*	**T.2 Complete Street**
Visibility, access, and safety bring increased economic viability.	

DECISION MAKING: GUIDE

WITHIN PENNDOT ROW

Right of Way is <55'

- Four Driving Lanes and a Sidewalk
- Traffic Volume supports a Road Diet

PRIORITIZE ORGANIZING TRAFFIC FLOW AND PEDESTRIAN SAFETY

REMOVE LANES. PROCEED TO LANE NARROWING.

Right of Way is 55' or more

- Lanes are >11'
- There is a shoulder

SELECT HOW TO USE REMAINING SPACE

ORGANIZE TRAFFIC FLOW

- There is existing sidewalk with no buffer.
- Corridor is one-sided.
- ROW >65'
- There is a desire for a boulevard.
- Corridor is two-sided.

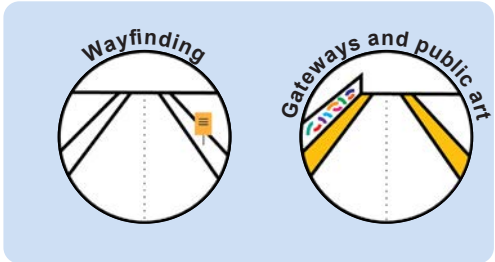
INCLUDE PEDESTRIAN SAFETY

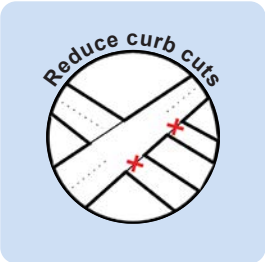
There are 1-way streets

BEYOND PENNDOT ROW

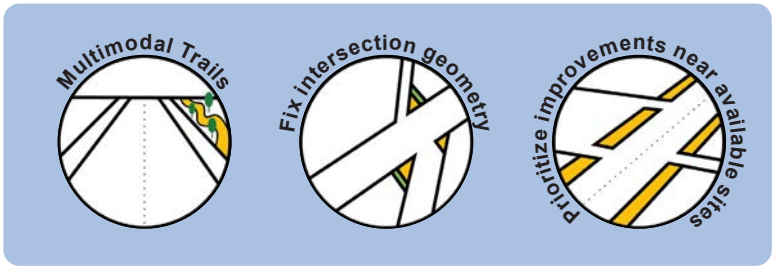
Can you pursue collaboration and municipal funding?

(any ROW)

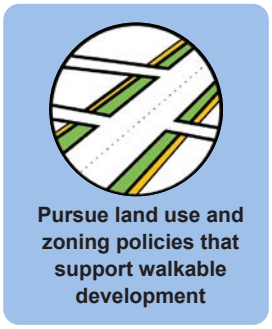




Have available or underutilized property along the corridor?



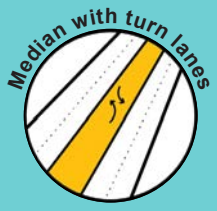
Policy makers



Pursue land use and zoning policies that support walkable development

MIDBLOCK

Want to facilitate access to side streets.



Want to limit access to side streets.

No cross traffic is needed

There are existing properties to accommodate.

There are few/no intersecting streets for >500'

AT INTERSECTIONS

...and discourage truck traffic

...and ROW is >65'

CORRIDOR DESIGN STANDARDIZATION

As discussed earlier and demonstrated with the two case study municipalities, corridors often lack consistency within the roadway, at their edges between the curb and the right-of-way boundary, at most intersections, and where private property interfaces with the corridor. They may exhibit all these conditions or just a few, but inconsistencies have consequences: safety is compromised, visibility is often impaired by occlusions and or visual clutter. Identity and orientation of place, among others, can be ambiguous. Wayfinding is obscure.

Corridor planning should incorporate strategies that seek design consistency across and throughout its right-of-way. The model of standardized practices that has long been practiced by PennDOT can be also beneficial for creating and maintaining corridor design coherence. Identifying conditions where standardization can be a useful and strategic tool can become the foundation for creating an ordered design framework of similar patterns and physical components. The question for designers, planners and engineers is where and how much consistency is needed without jeopardizing uniqueness of place.

As vehicles add more autonomous features, the need for roadway standardization becomes even more important for the vehicles and for drivers as well. Except for limited access highways, roadways and the properties that align them are often full of quirks and in situ solutions that often aggregate into a "patchwork design" of context-specific "improvements." Just as limited-access highways have fewer accidents than other roadways, bringing their principles of standardization into the design realm of faster moving arterials and connectors (e.g., corridors) will produce safer roadways for both humans and AVs at every level of autonomy.

Standardization of corridor elements can achieve a number of positive outcomes:

- A more efficient use of right-of-way space when applied strategically.
- Create a sense of order through repetition and familiarity.
- Contribute to increased visibility and higher predictability for all users including AVs.
- Identify locations for local municipality identity, wayfinding, and access that better control the transition of corridor traffic onto local streets.
- Reduce costs through repetitive application.

Four corridor conditions appropriate for standardization are described in this chapter: roadway standardization, right-of-way edge standardization, identification and wayfinding signage standardization, and construction zone approach standardization. Route 65 Ohio River Boulevard examples are used to describe both existing condition and how standardization can be an intentional design tool for use on all state highway corridors.

ROADWAY STANDARDIZATION

Corridor Speed Limit

Even though drivers are aware of speed limits and may have good intentions, multiple speed limits within a corridor that are raised and lowered numerous times are confusing. For example, Route 65 limits are increased up to 55 mph where the corridor is a limited access highway, up to 50 mph where the roadway lanes and shoulders widen the roadbed visually appears wider, set at 45 mph where the context is both rural and urban, while the slowest limit at 40 mph is appropriate when the roadway is at its narrowest but too low where the perceptual context tells drivers to speed up. Often drivers are unaware of speed limit changes or ignore them where they alter frequently. Drivers also travel above the speed limit where enforcement is difficult, particularly where there are no safe pull-off locations. Drivers have learned there are few consequences for speeding. The study of Route 65 confirmed this, noting that driving speeds across the corridor generally exceed posted limits by 10-20 mph, most notably in locations where limits ranged from 40 to 50 mph. Given that AVs will not exceed the posted limit, driver disconnects will continue to increase and become more of a problem as autonomous features are added to all common vehicles.

Right-of-Way Roadway Route 65

Where available the corridor right-of-way was made as wide as possible resulting in a broad range of right-of-way dimensions and inconsistent roadway widths. Across the 19 corridor municipalities the right-of-way minimums range from 51’ to 118’ and maximums from 72’ to 190’. Accordingly, driving lanes are dimensioned wider as the curb-to-curb dimensions increased. The inconsistency has collectively messaged human operators that driving faster is acceptable across the corridor.

Proposed Speed Limit Standardization:

- Standardize lane widths across the corridor to lower the perceptual speed.
- Use calming design features to lower the perceptual speed.

Route 65 Ohio River Boulevard Specific

- Set two posted speeds, preferably 40 mph and 45 mph for the corridor, with the 45 mph locations applied only where the perceptual context is wide and there are few or no adjacent business or residential uses with direct corridor access.

Proposed Right-of-Way Dimension Standardization:

- Establish a standardized travel lane width for the corridor.
- In some locations setting consistent lane widths will allow for other safety or design features including turn lanes, medians, slip lanes, pull-off areas, and complete street components where desirable. Local conditions will determine appropriateness.

Route 65 Ohio River Boulevard Specific

- Configure the 4 travel lanes at 11’ widths across the corridor, which is adequate for truck, bus, and fire equipment.
- Install center turn lanes with medians for all intersections wherever possible.
- Provide pull-off areas for violation enforcement and breakdowns at spaced intervals throughout the corridor where the right-of-way is wide enough to accommodate them.

ROADWAY EDGE STANDARDIZATION

Frontage Property Access Standardization

Older corridors typically contain at least one curb cut per frontage property, sometimes more and often with larger widths than needed. Locations with wider rights-of-way should explore inserting a new access lane and median within the right-of-way to connect frontage properties and remove curb cuts from the travel lanes. In narrow rights-of-way locations, consider connecting frontage parking lots on private property or a right-of-way/private combination to achieve a similar result. In practice these parallel access lanes/easements would resemble a “Governor’s driveway,” slip lane, or the equivalent of an outside local lane of a wider boulevard. Standardizing roadway lane widths may provide additional space either within the roadway or a right-of-way/private combination to connect frontage properties.

Proposed Standardization for Accessing Frontage Property

- Where feasible, install a connecting access lane to frontage properties within the right-of-way beyond the corridor roadway, provide wide openings to the access lane at both ends, and create a median between the two.
- Where feasible and with the local municipality’s cooperation, connect frontage parking lots to achieve access to frontage uses, provide wide openings at both ends, and create a median between the two.

Street Tree Location and Landscape Standardization

The most aesthetically beautiful location on Route 65 Ohio River Boulevard is the Ben Avon Borough portion where large sycamore trees align both sides of this residential corridor section. In this 40 mph area, the trees were planted next to the curbs as a traffic calming and protective initiative after the Boulevard opened. The trees are now mature with trunks measuring 24”-30”. Mid-block collisions are prevalent with vehicles making left turns from the inner travel lane and also with vehicles entering the corridor from driveways. While attractive, it is not optimal from a safety perspective; trees block views of the entering vehicle and likewise that of oncoming corridor vehicles. Some locations also involve blind curves and roadway elevation changes. Trees close to roadway curbs and edges are occlusions for all drivers and even more problematic for increasingly automated vehicles and full AVs; they have difficulty recognizing vehicles behind trees and cannot predict driveway operator behavior. With some vehicles, the driver’s head position is up to 10’ behind the vehicle’s front end, requiring entering vehicles to pull up close to the curb and inch out into the travel lane to achieve a clear view of oncoming traffic.

Proposed Street Tree Location and Landscape Standardization

- Locate street trees at least 10’ to 12’ back from the front edge of the curb or roadway edge for better entering driver visibility of drivers entering onto the roadway from side locations.
- Trees with mature calipers over 12” should be located at least 15’ from the edge of small-width driveways and farther for wider driveways, and 30’ to 50’ from intersections.
- Trees may be located in center medians spaced no closer than allowed by best practices. Smaller decorative-type trees with 25’ to 30’ mature heights are preferred for medians.
- Maintain at least a 14’ clear height below tree canopies that overhang the roadway and at least 10’ clear height for all others within the right-of-way edge zones.
- Landscaping within the 10’ curb zone should be kept to heights below 30” for vehicle visibility.
- In some cases, locating trees farther from the curb may require partnering with local municipalities to coordinate frontage zoning with corridor standards.

Route 65 Ohio River Boulevard Specific

- Line the full length of the corridor with street trees on both sides, one side, or center medians where appropriate and feasible to create a “boulevard” aesthetic and reinforce traffic calming to maintain the speed limit. Preferred locations are within the right-of-way, but some locations will require coordination with local municipality zoning regulations to coordinate with corridor tree standardization.
- At municipality-designated gateway and other intra-community designated entrances, install street trees for a depth of at least 200’ along these transition zones to integrate the corridor aesthetic with the local street network.

SIGNAGE STANDARDIZATION

There are a myriad of signs found on corridors. Four types of signs are recommended for standardization and described below.

Proposed Signage Standardization

- Standardize corridor identification and wayfinding signage for all corridors. The table describes the proposed sign types, based on PennDOT signage standards as an example for further development.

Type	*Location**	*Description*
Gateway Entrances (Identification)	Municipal gateway entrances	Designated municipal gateway streets (typically near municipal boundaries), include highway and truck logo if appropriate. Street name mounted directly below.
Municipal Entrance(s) (Identification)	Municipal streets designated as public entrances to main street	Designated municipal access to main street (typically located near centers of municipalities), include highway and truck logo if appropriate. Street name mounted directly below.
Truck Access Routes (Wayfinding)	Corridor streets designated for large trucks	Designated streets for large truck access, truck logo, and highway logo if appropriate.
Local Streets (Wayfinding)	Corridor side streets	Local street name, include highway logo if appropriate

(*Locate signs in same location relative to corridor curb/edge/height, and clearly visible)

Proposed Signage Standardization
Route 65 Ohio River Boulevard Specific

- Consider permanent ground-supported, and municipality identification monuments at Gateway locations. Coordinate design with corridor master plan recommendations.

CONSTRUCTION ZONE APPROACH STANDARDIZATION

Standardization of the approach for work zones and detours will benefit all users. Construction zones are context-configured and inconsistent, but standardizing their approach would be helpful for all drivers.

Human drivers can usually accommodate these conditions, but need ample distance to react safely. However, AVs have difficulty approaching construction sites and detours. It is likely that temporary traffic changes have not been recorded into the AV's mapped database or included in any metadata. In these scenarios, AVs will slow down to a speed where they can process and adjust for the new information, which could result in rear-end collisions.

Standardization of construction detours, including approach configuration, distances, widths, edges, and visual cues will make them safer for workers and drivers. Achieving that will require 2- and 3-dimensional visual cues to make them work. With consistency of design, they can be learned by drivers and AVs' artificial intelligence software. Realizing that not all situations will be consistent, there may be recognizable construction zone types that could be modeled and configured without jeopardizing their critical properties. Predictability and consistency are the main objectives.

Some devices are not appropriate. Lane markings or colored surfaces may assist driver-operated vehicles but not AVs. Snow, hail, and rain may cover them

Proposed Construction Zone Standardization

- Locate messaging devices at regular intervals from the construction zone entrance.
- Use standardized, predetermined and tested approach configurations for all construction sites and, where possible, standardized lane widths and edge features. Install them accurately within allowable tolerances.
- Use fixed and consistently sized visual cues, such as signs, barrels, or cones, that are highly visible and located above the road surface at a consistent height.
- If stopping is needed within the construction zone, install temporary devices that can be easily read and understood by drivers and AVs alike.
- Configuration devices should be lit for visibility and preferably by site lighting for camera readings.

Do Not Use:

- Devices that move, such as flags or anything that might sway.

Use With Caution:

- Flaggers to direct traffic. As a first choice, provide electronic messaging that can be easily read by drivers and pathway edge devices that can be read by AVs. Autonomous technology is not currently reliable for safely responding to this occlusion.

or distort their geometries rendering them unrecognizable. Technological advances may render them acceptable in the future, but caution should be taken with waving flags. Flagmen should not be used because their unpredictable motions cannot be interpreted by AVs.

APPLYING STANDARDIZED DESIGN PRINCIPLES AND STRATEGIES

This project began by using case studies to test various design features for specific locations using real-time feedback to better understand citizen concerns and preferences. While very helpful for the project team, this bottom-up approach stimulated immediate citizen participation and, judging from their interest, should lead to increased ownership of their corridor and support for later planning and design activities.

Active engagement and real-time feedback have the potential for citizens to effectively express concerns, priorities, and outcome expectations because they can visualize design ideas and features and, through dialogue, voice opinions and discuss trade-offs.

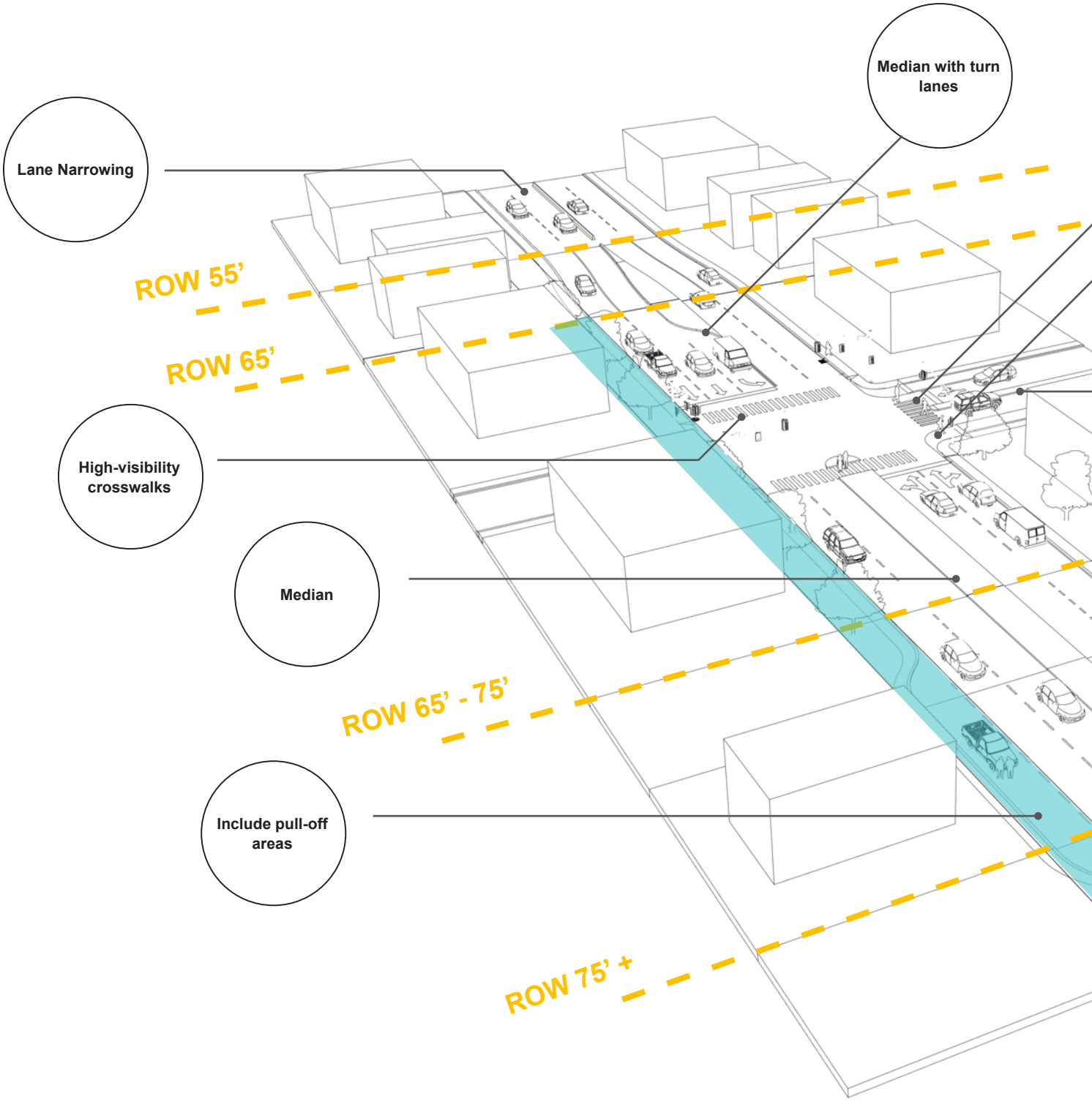
Two ideas emerged from the interactive process that could be helpful for future design workshops: (1) pictorial illustrations of standardized Design Toolbox design and infrastructure components; and (2) an interactive design tool for use during local citizen design workshops that can illustrate the dimensional effect of adding design components into the available right-of-way.

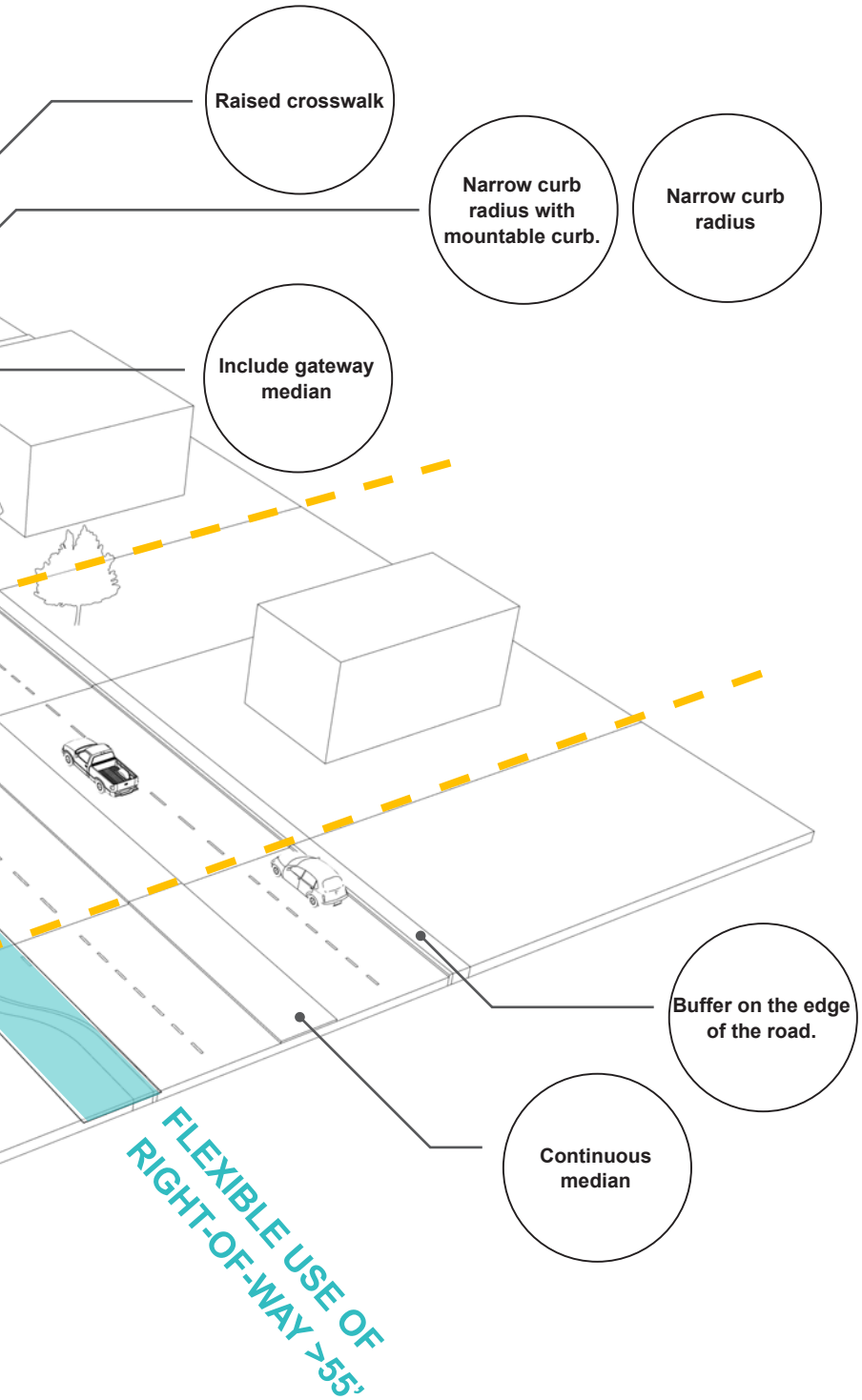
DESIGN TOOLBOX CORRIDOR RIGHT-OF-WAY AND INTERSECTION ILLUSTRATIONS

The corridor infrastructure components described and illustrated in the Corridor Design Toolbox have been organized into three-dimensional (3-D) diagrams for use during community meetings and workshops. As an educational tool, they can assist citizens with familiarization of transportation and design terminology, infrastructure elements, and components. They pictorially illustrate where roadway components are located in two basic corridor situations: *Corridor Standard: Street Sections* and *Corridor Standard: Intersection Treatments.*

This pictorial tool is easy to recognize because it looks “real” and set in commonly understood contexts, even though they are diagrams. They may take a little explanation by the professional team, and can provide the opportunity to provide more detail and answer questions.

CORRIDOR STANDARD: STREET SECTIONS

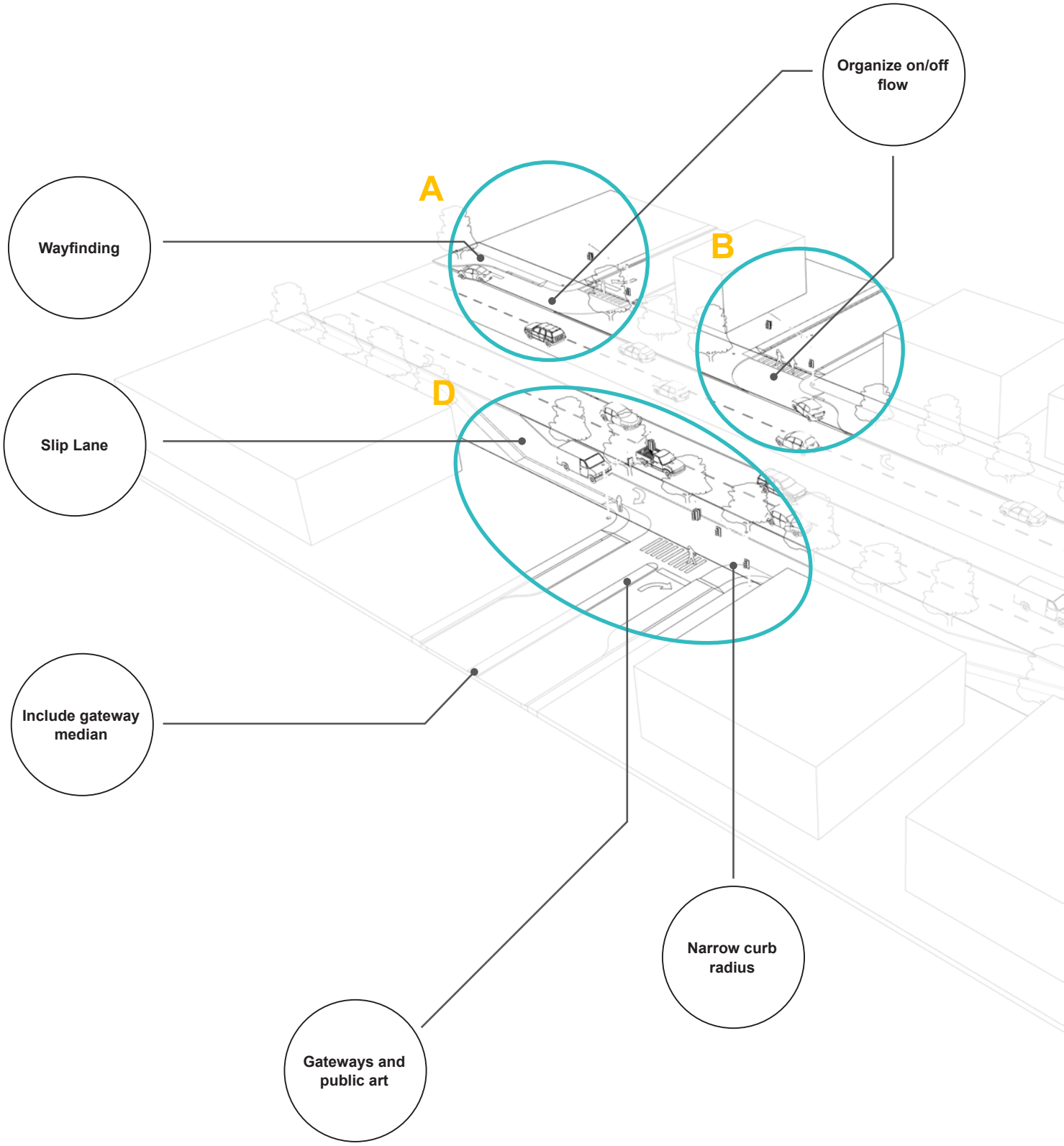


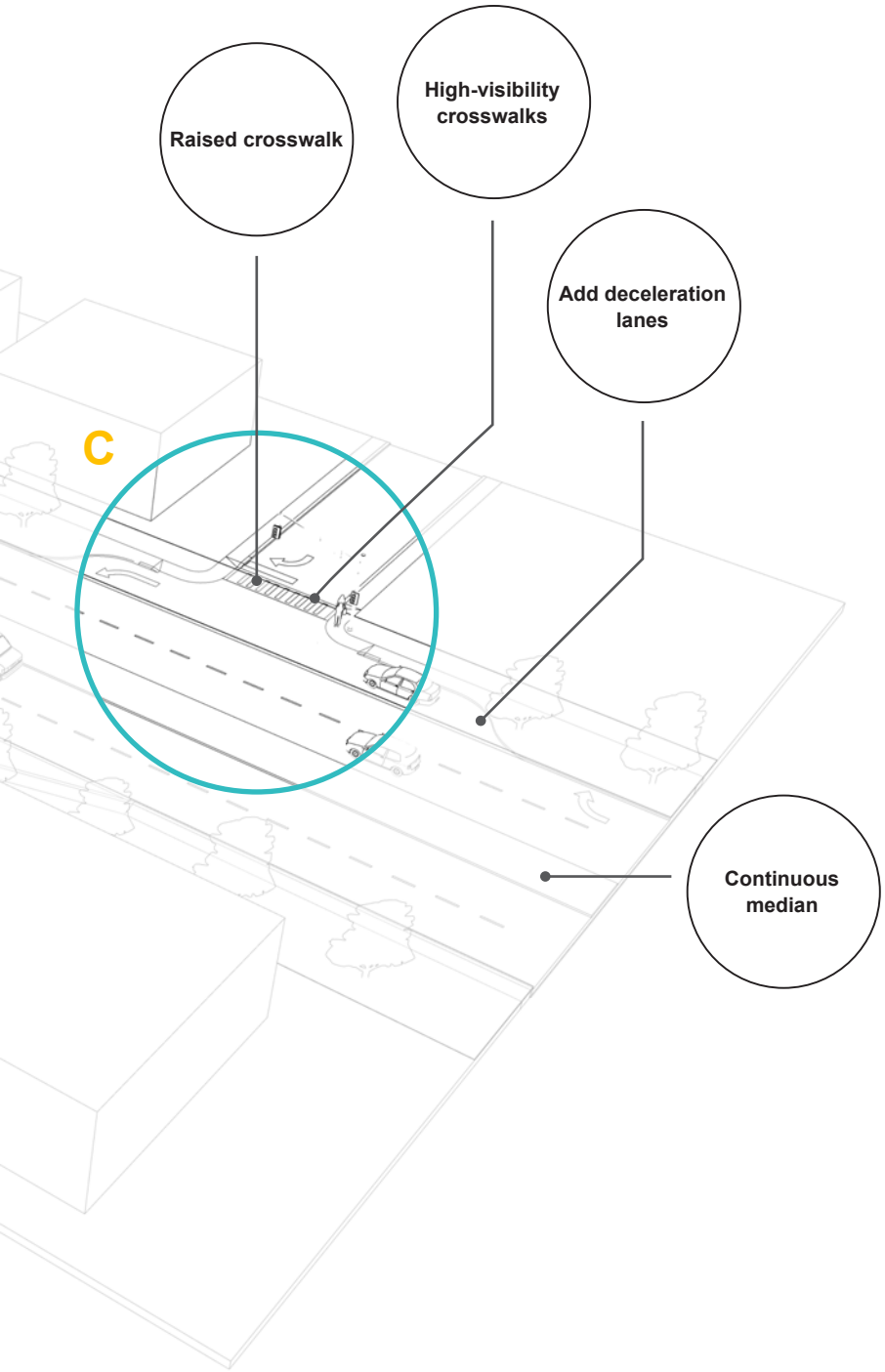


RECOMMENDED DIMENSIONS OF ROADWAY COMPONENTS		
	Minimum width	Maximum width
Drive lane		11'
Sidewalk	6'	
Median	6'	
Median with trees	8'	
Median with turn pockets	10'	
Turn lane	10'	
Planted buffer at side of road	3'	
Planted buffer at side of road with trees	5'	
Pull off area	10'	
Crosswalk	6'	
One-way slip lane	9'	
Bike Lane	6'	

This list reflects best practices as documented within NACTO guidance. Additional guidance on design elements widths can be found in the AASHTO "Policy on Geometric Design of Highways and Streets" manual, known as the AASHTO Green Book, most recently issued as the 2018 7th edition.

CORRIDOR STANDARD: INTERSECTION TREATMENTS





Intersections shown

A Unsignalized Intersection with One-way Traffic: Entering Corridor

B Unsignalized Intersection with One-way Traffic: Exiting Corridor

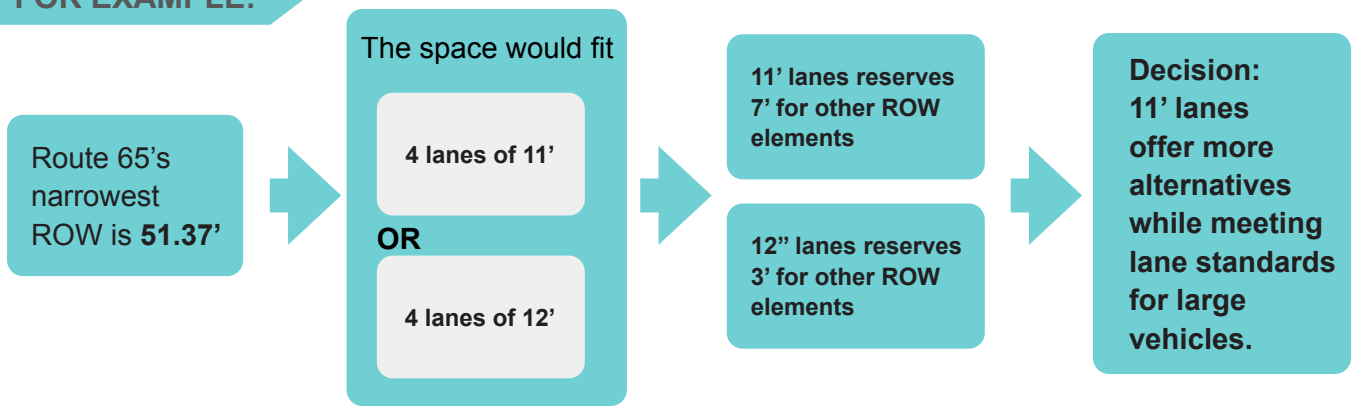
C Unsignalized Intersection with Bidirectional Traffic

D Unsignalized Separated Intersections with Slip Lane

INTERACTIVE CIVIC ENGAGEMENT DESIGN TOOL

The idea for an interactive design tool was generated while rethinking how to standardize corridor travel lanes, a critical inquiry. If the travel lane portion of the roadway could be standardized over the corridor's full length based on dimensions of the narrowest right-of-way, space for other items could be generated in even the narrowest of situations.

FOR EXAMPLE:



Roadway centerlines are the design datum of all roadways. It is the 0 (zero) coordinate for dimensioning and the basis for determining whether there is space for required functionality and infrastructure. For existing highway corridors, it is the only true constant. Working out from the centerline provided the ordering strategy for the Route 65 Ohio River Boulevard recommendations. It is an easy and convenient design starting point for corridor re-envisioning and master planning.

The design decision-making process followed these basic steps:

1. Document existing corridor right-of-way dimensions. Their width will determine the design field boundaries for all right-of-way features and identify the narrowest locations to determine where opportunities exist.
2. Determine how many lanes are needed to meet current, historic, and reasonably predictive future volume. For Route 65, the current 4 lanes are necessary and determined to be adequate for volume increases.
3. Determine the narrowest lane width that will accommodate the corridor's functionality. In the case of Route 65, 11' is the narrowest width for accommodating large vehicles.
4. Determine if a 4-lane roadway with 11'-wide travel lanes is acceptable across the full corridor. Wider roadways were reviewed and some with center Jersey barriers will work at 44' plus the width needed for the barriers. Narrowing roadways will provide space for additional safety infrastructure and create opportunities for desired street trees and other amenities. The smaller lane width is also helpful for traffic calming.

5. With the roadway basic dimensions determined, other corridor-wide infrastructure components can be tested and evaluated for full-corridor inclusion or use as needed.

6. From this point on, design decisions become more localized based on specific safety needs and preferences. This is also a good time to review findings with corridor citizens, explain the strategic value of design consistency and standardization principles, and show proposed recommendations in visual form.

The planning tool was developed using an Excel spreadsheet with GIS-generated right-of-way minimums for each municipality. Working with dimensions for every corridor municipality, intersection and mid-block conditions can be tested for available space. The example below listed 10 basic design components with variants for a total of 18 possibilities, ranging from adding a Center Jersey Barrier @ 4' to a Center Median with Trees @ 8' to a Two-Way Left-Turn Lane @ 14' along with other possibilities outside the roadway. Each time a component is checked the "remaining right-of-way space" is reduced until exhausted; various options can be tested by checking their cells and deleting others.

Excel Spreadsheet Right-of-Way Design Tool Example

11' LANES								4'	6'	3'	...	14'
ROW Minimum Width	Municipality	Intersection with 4 Lanes @ 11'	Available Width for Other Amenities	Remainder	Locations Between Intersections @ 11'	Available Width for Other Amenities	Remainder	Centr Jersey Barrier @ 4'	Sidewalk One Side @ 6'	Trees One Side ROW @ 3'		Two-Way Left-Turn Lane @ 14'
51	Avalon, Glen Osborne	44	7		44	7						
52	Sewickley	44	8		44	8						
53		44	9		44	9						
54	East Rochester	44	10		44	10						
55		44	11		44	11						
56	Baden, Ben Avon	44	12		44	12						
57	Emsworth, Conway	44	13		44	13						
58	Ambridge	44	14		44	14						
59	Bellevue, Economy	44	15		44	15						
60	Freedom	44	16		44	16						
61		44	17		44	17						
62	Edgeworth, Leetsdale, Rochester	44	18		44	18						
63		44	19		44	19						
64	Harmony	44	20		44	20						
65		44	21		44	21						
72	Haysville	44	28		44	28						
110	Kilbuck	44	66		44	66						
118	Glenfield	44	74		44	74					...	

Possible Design Components and Variants

The tool's usefulness could increase as more GIS-generated right-of-way dimensions are added at closer intervals, such as every 5' or 10'. With this information, sectional slices of the right-of-way would identify where the corridor right-of-way changes could, or would not, allow additional components or features. Today's BIM and sophisticated design software can perform these functions easily and at high detail, but too much detail can be confusing in an engagement setting and encumber its ease-of-use intentions.

The Excel tool could be shown on a tablet for easier use and projected onto a monitor or large screen for small or large workshops. Its value lies with its capability as a real-time tool with interactive visualization of design possibilities for immediate feedback. The case study design workshops continued the value of real-time idea visualization and the dialogue they generated.

3

INTER-MUNICIPAL GOVERNANCE

USE OF MUNICIPAL POWERS

Corridors are, by their nature, intergovernmental.

Efforts to address the pros and cons of corridors undertaken by a single municipality ultimately become intergovernmental because corridor users are never from a single municipality. Corridors serve the moving public within and throughout the corridor region.

Historically, it has often been thought that a highway corridor is something local leaders can do nothing about. Operated by the state government, it is present in daily life yet unaddressed; it is an asset to be used or an obstacle to be navigated around. Recent trends, however, indicate that the operators of state highway corridors, in this case PennDOT, recognize the need for better engagement with local communities so they may prioritize the people and communities along the corridors, not just the transportation service their facilities provide. This opening presents a significant opportunity for a regional response to the Route 65 corridor, as "the Boulevard" is ubiquitous for all the municipalities that lie along it.

When examining governance options to respond to multi-modal corridors such as Route 65, it's important to look at action or inaction as an expression of a set of beliefs about the corridor. Visions and plans of individual communities are linked together like a chain connecting each community along the corridor. Because of that unavoidable connection, a fruitful relationship between a corridor and its adjacent communities comes about only when administrative, financial and operational decisions are made intentionally and multi-municipally.

Throughout the community engagement events conducted as part of this study, municipal officials, residents who frequent Route 65, commuters, and others expressed many mutual concerns. These common real world problems have solutions rooted in the structure of government in the region, and indeed all of Pennsylvania.

If the 19 municipalities along the corridor are able to both address common problems and bring to life their visions for their communities, it will be because they found a common voice. Otherwise, the governance challenge presented by overlapping and unconnected state and local governments will obstruct their vision and their neighbors will be a source of interference.

This Section addresses those governance options that can bring about beneficial outcomes for the corridor. Since there is currently no mechanism for regional corridor planning, a bridge is needed between what is present now and the potential of corridor planning. Discussed as, "regional responses," there are three areas of focus:

I. Use of Municipal Powers
II. Administrative Tools
III. Planning Capabilities

USE OF MUNICIPAL POWERS

ORDINANCES

Local governments in Pennsylvania are granted the authority to develop local laws and programs. Done in a coordinated fashion, this power affords Route 65 corridor communities significant control over their own futures. Most notably, municipalities have control over land use and development. Using that authority in a way that considers the implication decisions in context of the corridor as an entire entity will allow 65 Corridor communities to maximize local and regional benefit of the highway.

Ordinances consistent with a corridor plan would allow communities the ability to enact their vision of what activities and uses occur along the corridor. However, the challenge of coordinating the efforts of 19 independent municipalities is great. To do so would require consistent and long-term engagement and education on the benefits of corridor planning and multi-municipal land use planning. As such, in addition to developing multi-municipal plans, an administrative agency will be needed to perform the long-term education and advocacy needed for the 65 corridor.

INTERGOVERNMENTAL AGREEMENTS AS AUTHORIZED IN PENNSYLVANIA

As written in the Pennsylvania Constitution, a municipality, by act of its governing body, may cooperate or agree in the exercise of any function, power or responsibility with one or more governments. It is a power and capability that effectively overcomes the constraints on local communities presented by the municipal codes.

Specific legislation in Pennsylvania, the Intergovernmental Cooperation Act, commonly referred to as “Act 180” allows municipalities to jointly cooperate with other municipalities in the exercise of their governmental functions, powers or responsibilities. Since 2019, municipalities have had the capabilities to do so via Resolution; Ordinances are no longer required.

Intergovernmental agreements may be executed among all or some of the Route 65 Corridor communities as a means to cooperate and coordinate actions and activities.

LAND USE ADMINISTRATION

Zoning and Subdivision and Land Development regulation are powers reserved to municipalities in Pennsylvania. This important function, especially as it relates to development along a major highway corridor, is often a challenge for smaller municipalities to perform due to small staffs or budget constraints.

Professional administration of these regulations can be performed by staff shared by municipalities through intergovernmental agreement. The Quaker Valley Council of Governments currently hosts a

zoning technical assistance program that allows for an AICP planner to have “first eyes” on building projects to verify compliance with zoning, explain regulations to citizens and developers, and usher the variance or special exception process.

This type of approach is available to help in shared governance of the corridor, as well. By establishing greater consistency and professionalism, communities and developers are better served. Multi-municipal land use administration not only improves the zoning and development function along the corridor, it reduces costs for individual municipalities as well.

LOCAL POLICIES AND FUNDING

A variety of programming and funding can be accessed by multi-municipal groups of the Route 65 corridor municipalities in order to utilize the tools recommended in this study. Some examples include:

Speed Control
Coordinated police activity will reduce speed of vehicles on Route 65. This would involve revamping the current occasional efforts into a coordinated multi-municipal gameplan to improve safety and reduce speeding. Ongoing coordination, communication, equipment and information sharing will create a widely known and accepted safety culture for users along the 65 corridor.

Complete Streets
As discussed within the report, Complete Streets provide a variety of benefits to residents. Infrastructure improvements to achieve complete streets in municipalities that have similar characteristics, such as central business districts or rural roads, pursued in a multi-municipal fashion would have the benefit of both consistency and cost savings through joint purchasing.

The Complete Streets Coalition, a national organization, has promulgated model resolutions available for municipalities to use as templates. Walkworks, a Commonwealth of Pennsylvania Health Department program to encourage active transportation provides technical support and funding and in Allegheny County this is aligned with an Active Transportation plan and funding program. Complete Streets is a set of policies that can be pursued very effectively in a multi-municipal fashion.

Regional Convening
Regular stakeholder meetings for Route 65 users and municipal officials to identify mutual concerns, host events such as training, maintain leadership continuity and intermunicipal communication can build off of the existing convening done by the Quaker Valley and Beaver County COGs. This, combined with the 65corridor.org website, can be honed to form specific corridor events.

Shade Tree Commissions
Boroughs via the Borough Code have mechanisms to manage and fund street trees and this work may be done in an intergovernmental fashion. The Route 51 suburban Pittsburgh communities of Whitehall Borough, Baldwin Borough and Brentwood Borough have successfully formed an intergovernmental Shade Tree Commission. As the Boulevard “greens” to form a greater sense of place, beautify, and slow traffic, Boroughs along it have this tool in their toolbox to facilitate the process.

Development Guidelines and Design Standards
Communities along the 65 Corridor can establish policies for the development along Route 65 to meet shared guidelines for development and design. This is best achieved after the completion of regional planning, but the power to establish such guidelines currently exists within the array of powers of municipalities. For example, 65 corridor communities could work together to adopt ordinances establishing parking maximums for commercial parcels along Ohio River Boulevard toward the goal of achieving consistency in the appearance and access to buildings along the corridor.

Funding Opportunities
Many special purpose funding tools exist for municipalities that could serve to provide financial resources for regional highway corridor improvements. These may be pursued by municipalities along the corridor or through a Council of Governments or other intergovernmental organization.

When coupled with a multi-municipal corridor master plan, these become useful tools for communities to seize control of their transportation future and create a local funding source to match other transportation funding.

1. **Transportation Partnership Districts** involve annual assessments on properties impacting transportation and traffic along the corridor and provide funding for needed improvements to the corridor.

   Numerous municipalities have created partnership districts as a response to development, including McCandless, Bethel Park and Moon Township. These examples demonstrate the ability of local governments to fund improvements from special purpose assessments as opposed to general taxing powers.

2. **Traffic Impact Fees** provide one-time sources of revenue for capital improvements. Charged to developers as part of the permitting process, traffic impact fees are limited to improvements necessary due to the impact of the development and may not be used to correct existing deficiencies. As redevelopment occurs on Route 65, impact fees could be useful to balance the benefits of development with the impact on existing users.

3. **Tax Increment Financing (TIF)** is an often misunderstood tool because of its use in greenfield development. However, along an existing developed corridor such as Route 65, it has the potential to fulfil its intended purpose of financing capital improvements and drawing businesses and residents to a community.

   A TIF District determines the boundaries of the tool's use. The difference in tax revenues generated from properties within the district on the day of its creation and the revenues generated afterwards creates the increment that can be captured and applied to payments for improvement projects. If debt for a project is undertaken, the increment is used for the debt service and after the debt is retired subsequent tax revenues belong to the taxing bodies.

   A successful regional example of a multi-municipal TIF is the Waterfront Development

located along the Monongahela River. In addition to paying for the debt associated with the development's infrastructure, the municipalities of Homestead, West Homestead, and Munhall have continued to calculate the cost of maintaining the shared infrastructure and contribute to a fund that pays for its upkeep. The Steel Rivers Council of Governments serves as the administrator of this program.

4. **Transit Revitalization Improvement Districts (TRID)** are similar to Tax Increment Financing in that they are a provision of Pennsylvania municipal law that allows incremental tax revenues generated by development to be used to pay for infrastructure improvements. In the case of a TRID, the improvements are specific to areas around transit stations or other improvements that facilitate transit usage. Further, a TRID provides the potential for funding from the Commonwealth as an incentive for transit-oriented development.

   A TRID must be in close proximity to transit facilities. As part of an overall Transit Oriented Development (TOD) strategy it is a high-potential infrastructure funding mechanism for local governments. Many of the municipalities within the study area are compact and walkable which puts transit within reach for many residents. Intentionally focusing on TOD may make a TRID a viable governance and project implementation tool.

5. **Multimodal Transportation Fund Program** - There is state funding for Transit Oriented Development (TOD) planning and development, as part of multimodal design efforts. Multimodal funding programs accept competitive applications for planning and improvements that address accessibility and safety for pedestrian, bicycle, and other modes of transportation within a community. Such funding programs exist through both PennDOT and DCED.

6. **Transportation Authority** - A transportation authority provides a mechanism for making transportation improvements with dedicated governance and funding. A transportation authority, like other authorities such as sewer and water, may be multi-municipal and have a dedicated funding stream that exists outside of the general purpose municipal budgets of the entities that form the Authority and appoint its leadership.

   Moon Township has a transportation authority and its purpose is to administer funds obtained from properties within its jurisdiction that have received tax exemption. Tax exemption spurs development and the Authority manages transportation improvements in the designated area with the acquired funds. This is one example how the powers of a municipal authority can be used to make transportation improvements.

COUNCILS OF GOVERNMENTS

Councils of Governments (COGs) are voluntary associations of municipalities that come together on matters of common concern. Activities range from convening to delivery of services.

COGs do not have the ability to tax and exist solely at the discretion of their members. In addition to dues, COGs generate income from programs and grants. In Pennsylvania, COGs have been deployed to handle a variety of local issues. Their potential is truly unlimited as a way of overcoming the challenges faced by groups of numerous small local governments.

Councils of Governments work as regional conveners around corridors in a variety of locations throughout the US. (see table of examples in appendix). A key opportunity for the 65 Corridor is for the two participating COGs to continue to collaborate and facilitate the region's ability to speak with one voice to the Southwestern Pennsylvania Commission and PennDOT, the operator of the highway.

In 2001 the Intergovernmental Cooperation Act was amended to state:

All commonwealth departments and agencies in the performance of their administrative duties shall deem a council of governments, consortiums or other similar entities established by two or more municipalities under this subchapter as a legal entity.

This change empowers Councils of Governments to serve a meaningful role in managing corridors. COGs can receive state grant funds, be recognized by state agencies, and manage projects.

TRANSIT ORIENTED DEVELOPMENT OPPORTUNITIES

In the 65 Corridor region, leadership on Transit Oriented Development (TOD), as an initiative, is being provided by the Port Authority of Allegheny County. Although work to date has focused on facilities of the Port Authority, the agency has issued guidance that supports good corridor governance. Using that guidance as a base, the 65 Corridor communities can begin to pursue a transit-oriented approach to development. As the original streetcar suburbs, many Route 65 Corridor Communities are naturally walkable and transit oriented. However, transit service on Route 65 is often not part of the overall mobility of people in the communities.

Multi-municipal planning, updated zoning and transit oriented development would have a tremendously positive impact in terms of the greater walkability, sustainability and investability it would produce for the corridor towns, especially through the north boroughs.

As an authority, the Port Authority is among the agencies for which intergovernmental cooperative projects could be easily achieved through resolutions due to the aforementioned Pennsylvania Act 180.

This may include Transit Oriented Development pilot projects coordinating transit access in the corridor and improving bus stops or other infrastructure.

TRANSPORTATION MANAGEMENT AGENCIES

Private public partnerships often form to address congestion and mobility challenges. In southwestern Pennsylvania the Oakland Transportation Management Association and the Airport Corridor Transportation Association are well known for engaging employers, commuters and public sector agencies towards the goal of reduced traffic, safer streets, transit and mobility options. Successful governance of the 65 Corridor transportation corridor may include the organizing of such an arrangement, particularly in regard to handling both commuter and truck traffic.

TOURIST ORIENTED DIRECTIONAL SIGN PROGRAM

PennDOT maintains guidelines for the installation of guideway and tourist oriented directional signs and contracts the administration of the program to regional trustees. The Trust works with PennDOT approved vendors and the communities to maintain a system of signs highlighting key attractions and facilitating way making. Erie Area Council of Governments is a successful example of such a program in Pennsylvania. Helping to create a stronger sense of place and identity, co-locating this function with other corridor-focused activities makes sense in the Route 65 Corridor area.

TRANSPORTATION IMPROVEMENT PLANNING AND INTERFACING WITH THE SOUTHWESTERN PENNSYLVANIA COMMISSION.

Improving the communication pipeline with the regional metropolitan planning organization, the Southwestern Pennsylvania Commission, is achieved when a shared governance approach to the corridor is taken.

Dedicating local effort will improve the prospects of Route 65 projects getting on the Transportation Improvement Program (TIP). Furthermore, increased municipal cooperation would reduce project costs for PennDOT by coordinating what otherwise is one-to-many communication.

Developing a single point of contact that is responsible to the member municipalities would help PennDOT achieve more efficient planning and project execution as well as dedicate a resource to addressing local concerns.

MULTI-MUNICIPAL COMPREHENSIVE PLANNING

Article XI of the Pennsylvania Municipalities Planning Code (MPC) allows for municipalities to enter into Intergovernmental Cooperation agreements to jointly plan together. From there municipalities can adopt ordinances that are consistent with the joint plan.

Many municipalities in the Route 65 study area have engaged in multi-municipal planning.

ABBA - Avalon, Bellevue, Ben Avon
ASO - Aleppo, Sewickley, Glen Osborne
GH - Glenfield Haysville

Given the ability to plan together provided in the MPC and the 65 Corridor region's experience in multi-municipal planning, a corridor plan spanning multiple municipalities would help the region form a shared vision, execute their municipal land use responsibilities consistent with that vision, and develop the ability to speak with one voice to other governments.

PA CONNECTS / PLANNING GRANTS

PA Connects is an initiative of the PA Department of Transportation that seeks to develop a more holistic approach to the operation of PennDOT highways within local communities. It allows for transportation needs to be examined from the state, regional and local perspective.

Corridor level planning provides the local level perspective at a scale that can successfully interact with the MPO and PennDOT. Further, corridor-wide planning tees up projects that are regional in scope and therefore more competitive for funding. These can eventually make their way onto the Transportation Improvement Plan.

Planning on the corridor level is the most common form of regional corridor governance. Our research has shown while the stakeholders in planning processes change depending on local conditions, planning is foundational to corridor governance. Without a plan, all solutions to local problems are fragmented and suffer a lower impact.

INTEGRATED CORRIDOR PLANNING

A Route 65 Corridor Master Plan would assist communities and PennDOT develop a set of desired projects and an administrative and management strategy for the corridor. A three-party agreement between a local multi-municipal organization, PennDOT and the Southwestern Pennsylvania Commission would establish a plan for the right of way, curb access/cuts, site access control, site plan review, subdivision and land development, the pre-Highway Occupancy process, lighting, signals, trees and landscaping.

An integrated corridor plan will also provide the foundation to develop a single point of contact in regards to the operation and maintenance of the corridor for both PennDOT and the 19 municipalities identified as within the Route 65 corridor.

CONCLUSIONS AND RECOMMENDATIONS

The 65 Corridor communities have many governance options to optimally capitalize the corridor. In terms of what has been learned in this study, some options stand out more than others.

Utilizing the current capabilities of the Quaker Valley and Beaver County Councils of Governments, a intermunicipal agreement to request that PennDOT complete an integrated master plan should be a top priority. PennDOT should support the formation of this agreement with technical support and funding to the COGs to get the agreement in place.

The benefit of such a planning effort would be the establishment of a future focus for the corridor. Concurrently, during the planning period, the various governance alternatives for implementation of the master plan can be further explored.

Without a plan, however, no forward momentum can be gained and improving the corridor governance will be left to compete with more localized priority. From a simply practical point of view, conducting a master planning process creates the reason to continue to bring the 19 communities together as started by this study. This is the first step towards taking a regional view of the highway and expanding the understanding of the interdependence of communities along it.

During the preparation of a corridor master plan, strategies to implement the plan should be explored. A second multi-municipal arrangement will be crucial to implementation of the plan. The corridor communities should be involved in the strategy to implement the corridor master plan. This includes a role in project prioritization, schedule and design review, and any modifications to the corridor master plan.

Through this second Act 180 intergovernmental agreement, commitment on how the municipalities will support a multi-stakeholder “65 Corridor Commission” will be developed. This “commission” will serve to respond to specific challenges or opportunities fostered through a series of planned projects.

The commission will serve as the network that champions and advocates for corridor. Its administrative and fiscal agency will need to be determined, but its purpose, to the continuous interface with communities, local officials, and the regional and statewide transportation agencies will be clear. The commission will be responsible for corridor sustainability and by establishing such a body, a conduit to serve the unique needs of corridor communities and highway operators is met.

It is important to note that the commission will act on behalf of the 19 municipalities’ interests specifically for the corridor and will be limited to the corridor rights-of-way from Bellevue to Rochester. It will have the ability to accept funding for corridor projects and services, and working with local governments along the corridor, it can develop subsidiary programs for the benefit of the corridor. This would include many of the programs discussed herein such as a TRID, multi-municipal street tree commission, tourist/directional sign program, and so on.

This model allows for flexibility in funding and can provide high visibility for high impact issues. A Memorandum of Understanding with municipalities and establishing a sustainable funding at the

start will serve to foster future collaboration. The commission would be charged with community engagement and education and over time draw out the broader civic support and generate funding.

These governance recommendations are intended to avoid the consequences of inaction. Much of which the communities along the corridor are already struggling to overcome are a result of past inaction. Because land use and transportation planning have been segregated into local and regional entities, the inextricable connection between land use and transportation has been overlooked. Each entity just doing their job results in a familiar pattern: development without transportation planning results in infrastructure changes which create unintended consequences such as traffic. Traffic creates stress on the system that brings about roadway treatments that result in unintended negative impacts such as speeding. More urbanized areas become more blighted because of those impacts (i.e. speeding) resulting in clumsy re-development. Clumsy redevelopment results in uncoordinated access to the highway. Uncoordinated access results in more accidents and attempts to improve safety through traffic control devices. And so on.

This pattern is well established and was the motivation to provide many of the tools outlined in this report. Ultimately, however, these tools are not useful if there is not a keen awareness of the importance of using them with a corridor-wide focus. Governance improvements as outlined herein can serve to provide that focus. For the benefit of the municipalities along the corridor, the travelling public, the environment and the taxpayers ultimately footing the bill, these governance enhancements should coincide with any changes to the built environment.

RESOURCES

- The “Examples of Corridor Governance” is shown in Resources Section.

- DCED Intergovernmental Cooperation Handbook
- Pennsylvania Municipalities Planning Code
- Port Authority of Allegheny County Transit-Oriented Development Guidelines
- Shade Tree Commission Agreement
- Moon Transportation Authority
- McCandless Transportation Partnership District
- PA Transporation Impact fees
- Allegheny County TIF program
- Homestead, Munhall West Homestead post0TIF maintenance fund
- About TRIDs (Delaware Valley Regional Planning Commission)
- Complete Streets Coalition
- Erie County Signing Region Trust
- Multi-municipal Planning
- PA Connects

4

RECOMMENDATIONS AND NEXT STEPS

CONCLUSIONS

Pennsylvania corridors are an anomaly roadway type.

As composites of other roadway types and products of numerous "improvements" to increase their efficiency, older corridors have developed physical, perceptual, and land use inconsistencies and eventually become poor examples of best practices of safety, health, and sustainability. Many have become dangerous and local citizens fear using them. [1]

This project has sought to "thread the needle" with design strategies and recommendations that consider corridors from a different perspective. Its design-centric approach introduced principles of holistic, corridor-wide design initiatives intended to meld safety, efficiency, and aesthetics. It sought to create a level of standardization to maintain efficiency and increase safety while providing opportunities for individual municipal expression. It suggests a way for corridor municipalities to partner more effectively with PennDOT for corridor planning and ways to actively engage citizens in setting priorities.

These are the major takeaways from this project:

CORRIDOR-SPECIFIC GUIDELINES

Corridors Are A Different Roadway Type Than Currently Classified

Corridors connect many places and destinations over longer distances, weaving in and out of urban and suburban environments as well as interstitial settings. When a corridor passes through a town or municipality, it may interact with local roads and carry local movement at a much higher rate than design standards for current roadway classifications indicate, yet they share many commonalities across the broader roadway classification range and different contextual settings. Corridors, be they urban arterials or other types, are defined more by their locational context than by a continuous urban setting.

In order to implement new standards, acknowledging that corridors do not fit neatly into the current idealized classifications of "highway" or "arterial" is key. These classifications rely on consistent design and function. A new classification of "corridor" as a roadway type is recommended to provide a flexible design standard with permitted options to select from as suits the location.

A Separate Corridor Classification System Is Needed

Although standard arterial practices dictate speed limit, roadway width, and other roadway characteristics, these are based upon the assumption that urban arterials are all similar in context, connectivity, and purpose. The case studies highlighted how that is often not the case. The data gathered and community input revealed frequent and repeated disconnects between standard urban arterial design and the varied urban environments they often pass through.

[1] Based on previous and this research, Routes 51 and 65 in the Pittsburgh area are good examples.

A new and more flexible standard should recognize that corridors are often thoroughfares to municipalities. They move both regional traffic and local traffic. They serve as regional highways between towns, boulevards that link adjacent municipalities, and are often main streets within towns. They are the front doors to many municipalities and intrinsically linked to local traffic and pedestrian patterns.

Corridor-Specific Guidelines Should be Developed and Adopted

Under current classifications and design standards, communities have limited recourse to impact the PA-owned roadways through their towns. This situation limits their ability to invest and improve their own town, impedes safety improvements, and can hamper economic growth. Corridors serve people and move them where they need to go, which means that standards must be flexible enough to adapt along with change from other sources.

It is important to develop corridor classification guidelines that recognize the variable functionality and context of corridors. Like the current roadway classification that identifies urban to rural contexts, a corridor classification system should recognize at least four basic relationships to the settings they engage:

- Corridor as a main street (rural and small towns)
- Corridor as a main street (urban and metropolitan)
- Corridor as a parallel to a main street
- Corridor as a bypass

Guidelines Require Both Standardization And Flexibility

Corridor design should provide a range of standards that allow corridor design to shift accordingly as the context changes. In some settings there may be fewer access points, few pedestrians, and a roadway design that prioritized through traffic may be appropriate. When that same roadway enters a town, however, it may serve a much more intrinsic network of local roads, as well as serving as direct access to private properties. In a denser urban context with frequent intersections, that same speed becomes a hazard to turning vehicles, pedestrians, buses, and other mobility modes of user within the urban setting.

The Route 65 Ohio River Boulevard Corridor study determined that a combination of standardized attributes would bring consistency and design cohesion to the corridor. These included setting consistent speed for longer sections, creating a standard lane width for its four travel lanes, adding street trees and landscaping in recognizable patterns to improve its aesthetic and safety visibility, and standardizing identification signage that identified corridor municipalities and their desired entries, where traffic types can be separated and transition zones created for appropriate and safe access.

Corridors Require a Different Relationship Between PennDOT, MPO/RPO Districts, and Local Municipalities

Rather than keeping local leadership apart from state transportation authorities and increasing bureaucratic confusion and opposition, new relationships are recommended along with agreements between entities involved in the design, implementation, and maintenance of multi-municipal corridors.

Corridor planning should be a partnership between state and local municipalities. Currently, local municipalities are expected to behave cooperatively in a competitive environment while having little jurisdictional control or incentive to maintain their shared corridor. Policy-makers foresee them as good examples of equitable transportation achievement yet have not provided the guidance, protocols, and means to achieve them. This is not a healthy situation for all parties.

Corridors are shared assets that can become appealing places for all users and a significant benefit for its contiguous communities, the region, and Pennsylvania. All benefit from developing smoother and more transparent working relationships.

RECOMMENDATIONS

The design process utilized for this project, the tools and procedures it recommends, and its recognition of standardization's value to corridor design are intended to demonstrate an archetypical strategic guide for corridor master planning. Route 65 in Pittsburgh proved to be a worthy example of corridor issues, challenges, and in need of master planning its improvement.

- **Acknowledge that corridors are an independent roadway type that has different needs and characteristics than other roadway typologies.**
- **Adopt a clear statewide process for requesting and commissioning corridor planning in agreement between local municipalities, PennDOT, and district MPO/RPOs.**
- **Create a PennDOT sanctioned Corridor Planning and Design Guide that will provide:**
    - **Planning and design principles, objectives, and advice.**
    - **Civic engagement guidance and/or minimum interface requirements.**
    - **A step-by-step process for determining the need for a corridor master plan and for conducting and submitting a master plan.**
    - **Guidance and a procedure for implementing master plans as a cooperative endeavor between local municipalities, county government, PennDOT, and other state agencies.**
- **5-Year mandatory Master Plan review.**

DESIGN PRINCIPLES AND STRATEGIES

Value of a Holistic Corridor Design

A holistic design concept for Route 65 was developed by drawing both on the workshops and by additional information and input. This included reviewing earlier citizen comments that envisioned a tree-lined corridor where traffic moved more slowly and the drive was a visual pleasure, much like a boulevard, and closer to embodying the name the corridor has had since it first opened as the Ohio River Boulevard more than 90 years ago. This provided the overall framework for ordering amenity decisions, while also raising significant questions about where to find the space for trees when the right-of-way is a narrow 51'.

Recommendations are built on several understandings:

- Shared Design Principles and Community Identity
- Corridors are Assets that can Increase Community Wealth
- Corridors Benefit from a Sense of Purpose and Consistency
- Communities Need to Speak with a Single Voice
- Multimobility is PennDOT Policy but Requires Partnership Cooperation with Local Communities

WHY RE-ENVISION ROUTE 65

Several factors helped predict the need to recalibrate. Individually, non are strong enough. This regional highway corridor and the need for re-envisioning. Not all are necessary to initiate a new master plan, but at some point, the cumulative effect of problematic conditions will trigger the need. Current Route 65 physical conditions and community feedback are giving that signal. Some of the more significant factors are:

Moderate Speed Limit
The existing right-of-way design encourages unsafe speeding which is a danger for all users. Many corridor residents do not feel safe and are fearful using the corridor.

Reduce Visual Occlusions
Advancing vehicle autonomous technologies require greater visibility than driver-controlled vehicles and the current corridor configuration is filled with occlusion conditions.

Accommodate Enforcement
Public safety officials cannot adequately administer their enforcement duties due to the corridor's physical impediments without risking their personal safety.

LESSONS LEARNED

Civic Engagement

Civic engagement requires preliminary work by a project team, including background research of the physical and economic conditions, working with a local citizen or municipal organization to identify interested and helpful citizens, research of contributing issues and challenges that would affect long-range planning, and preparation of visual and other material needed for direct engagement.

Having the participation of design professions with real-time illustration skills are preferred as the public can understand 3-dimensional drawings significantly better than plans, maps, and abstract diagrams.

A pre-design and workshop team presentation of corridor research, a description of the upcoming case study workshops, meeting the design team, and reviewing the role and importance of the project in the larger picture of eventual corridor improvements provided an effective introduction for the workshops. With the preliminary community presentation and a two-week period for everyone to envision the issues, the workshops quickly transitioned to hands-on design discussions. Participant engagement feedback was positive for this process.

An education-oriented process should include:

- Reconnaissance findings
- Regulatory review appropriate to the situation

Civic engagement requires preliminary work by the project team, including background research of the physical and economic conditions, working with a local citizen or municipal organization to identify interested and helpful citizens, research of contributing issues and challenges that would affect long-range planning, and preparation of visual and other material necessary for direct engagement.

Real-time illustrations:

- Hands-on illustrating and dialogue describing benefits and concerns
- Requires good graphics skills

Show consequences of infrastructure inclusions in terms of available right-of-way dimensions:

- Lane width
- Available space
- Width of each infrastructure improvement

NEXT STEPS

There are two types of next steps recommended: (1) Getting Started involves agreements between governmental and advisory entities that have high priority; and (2) TIP Project Recommendations.

GETTING STARTED

These actions are recommended to initiate Route 65 Ohio River Boulevard Corridor improvements. (Listed in anticipated sequencing among the entities.)

- **Quaker Valley and Beaver County Councils of Governments (COGs) request PennDOT Connects (Pennsylvania Department of Transportation program) to commission a Master Plan for the Route 65 Ohio River Boulevard Corridor.**

  Entities:
  - Quaker Valley and Beaver County Councils of Governments initiate the request to begin the process.
  - PennDOT Connects

- **Execute an Intergovernmental Agreement between the Route 65 Ohio Boulevard Corridor municipalities to speak and perform as a unified entity for corridor planning and implementation.** The Quaker Valley and Beaver COGs should provide administrative and communications tasks regarding improvements for the municipalities. Allegheny and Beaver Counties should be co-signatories on the agreement.

  Entities:
  - Agreement between the 19 corridor municipalities and QVCOG and BCCOG
  - Allegheny County
  - Beaver County

- **Execute a different Intergovernmental Agreement, or its equivalent, between Local, Regional, and State Agencies for intergovernmental cooperation and coordinated funding for the Route 65 Ohio River Boulevard Master Plan and its Implementation.**

  Entities:
  - QVCOG and BCCOG for the corridor communities
  - PennDOT Connects
  - PennDOT District 11
  - Southwestern Pennsylvania Commission (SPC)
  - Other State and County Agencies as appropriate

TIP PROJECT RECOMMENDATIONS

These recommendations respond to three differently scaled projects. The COGs should coordinate with SPC (the Metropolitan Planning Organization (MPO) for Southwest Pennsylvania) and PennDOT District 11 for these recommendations. (Listed in order of recommended priority.)

- **Restripe the Route 65 Corridor for Travel Lanes and Unsignalized Intersections**

  Benefits: Reduced speeding from anticipated calming; increased safety at all non-signalized intersections; and create pull-off spaces for safer enforcement.

  Tasks:
  - Restripe the full corridor with 4 (four) 11-foot wide travel lanes and turn lanes per recommendations of this report.
  - Restripe all unsignalized intersections to current standards.
  - Create pull-off spaces for violation enforcement spaced consistently apart on both sides of the corridor where appropriate and possible.
  - Consider lowering speed limits in high-accident locations.

- **Improve Signalized Intersections**

  Benefits: Improved safety for pedestrians and turning vehicles; better accommodation of large trucks at designated intersections; and improved traffic flow to shorten trip and delay times.

  Tasks:
  - Redesign/revise signalized intersections based on the recommendations of this report and current standards.
  - Install right turn lanes and pedestrian bulb-outs where appropriate; lengthen right turn lanes to accommodate potential future traffic volume.
  - Install center medians with left turn lanes and pedestrian refuge spaces; lengthen turn lanes to accommodate potential future traffic volume.
  - Create pull-out space in parallel with left turn lanes.
  - Install new signals and poles with adaptive signalization; provide pedestrian and turn sequencing.

- **Install Wayfinding Signage**

  Benefits: Identification and clarification of corridor intersections for intra-community use including creation of gateway entries to municipal main streets, separation of large trucks from local traffic, and identification of entry points for visitor destinations.

  Tasks:
  - Identify community entry locations for each corridor municipality.
  - Design, fabricate, and install new wayfinding and street signage per recommendations of this report.

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RESOURCES

EXAMPLES OF CORRIDOR GOVERNANCE

Location	Plan Name	Date	Clients	Key Feature
Chicago IL	Harlem Ave	2011	SW Conference of Mayors (COG)	Multi-municipal corridor planning and promotion. A Developers Summit was held to market the area. Complete Streets. Emphasis on balancing multple user needs: "the context of the local community with the travel characteristics of the roadway and the land uses served." Identifies traffic calming, intersection improvements, access management, targeted freight traffic improvements. Transit service improvements sought intergovernmentally with multiple municipalities seeking transfer centers and bus rapid transit. Corridor wide needed mobility improvements and trasnporation elements identified. Pinpointed needed transporation elements at crucial locations along the corridor: roadway improvements, transit improvements, non-motorized improvements. Future land uses identified. Visual identity coordination: median and streetscape improvements in multiple municipalities. Identify natural viewsheds for protection, historical and cultural promotion agencies identified for coordination. Citizen surveys & engagement. Funding and implementation sources identified.
Chicago IL	South Shore Corridor Study	2011	Chicago DOT and DHED	Capturing thru-traffic economic activity. Revitalization; nodes approach. Consists of 2 street corridors: 75th and 79th Street. Three major connector assets: Arts and Culture on Stony island Avenue; Education along Jeffery Ave, Lakefron/South Shore Drive. Bike, Ped, and Road network identified. High thru-traffic volumns and spending that occurs by residents outside the study area present retail market opportunity to capture economic activity from passers-thru and retain wealth of the community. The Corridor study advances three principles - advance community led inititiaves, improve public spaces & transit facilities, and street investment & development. Ten ideas for action including design "blueprint," transit nodes, mareting corridor opportunities, brand around arts and culture, plan for long term capital investment. Equitable development
Arlington Hts IL	South Arlington Heights Road	2018	Village of Arlington Heights	A single municipal plan to improve village gateway. Landscaping, beautification, redevelopment, walkability and identity for the area. This proposal to amend comprehensive plan with overlay zoning district. Use of gateway features such as signs, banners, clocktower or other focal point, brick crosswalks, greenery along the road, bike lanes, sidewalks moved back from roadway, median trees. Branding and marketing/promotion.

Single/ Multi-Municipal	Documents	Participating Jurisdictions	Technical Partners	Steering Committee	Funded By
multi	http://harlemcorridor.com/proj_details.html	10 municipalities	RTA, Pace, Metra, CTA, IDOT	None "Each community along the corridor was invited to have their Mayor serve on the Steering Committee as well as an alternate from each community. All but one of the communities along the corridor are Members of the Southwest Conference of Mayors so we already have a very successful platform for working together and with the other community just being outside of our area, we also have a working relationship with them. Also invited to participate as ex-officio Members were those from the Transportation Service providers along the corridor." Vicky Matyas Smith Executive Director	http://harlemcorridor.com/documents/HACP%20Funding%20Sources%20Report%2020111222.pdf
single, but multiple communities	https://www.chicago.gov/content/dam/city/depts/zlup/Planning_and_Policy/Publications/south_shore_study/south_shore_corridor_study_draft.pdf	8 wards, 13 communities	RTA, Pace, Metra, CTA	civic orgs, community orgs	Regional Transportation Authority
single	https://www.vah.com/UserFiles/Servers/Server_7230689/File/Our%20Community/VillageProjects/South%20Arlington%20Heights%20Road%20Corridor%20Plan%20Jan%2018.pdf	Villagie of Arlington Heights			

Location	Plan Name	Date	Clients	Key Feature
Southlake, TX	SH-114-Corridor-Plan (Comprehensive Plan update)	2017	Southlake, TX	A large planning area divided into sectors. Useful model for a 19 municipality corridor. Aligned with Vision North Texas which is a private public partnership including higher ed akin to 65 corridor study team. Vision North Texas is sponsored by North Central Texas Council of Governments. Provides land use and mobility recommendations and future land use recommendations for the corridor. Makes specific recommendations for future land use of parcels. Identifies and explains how recommendations fulfill larger regional vision plan; recommendations tie to the Vision North Texas on a line-item basis. This drills down into planning and links the development process to performance standards of the regional vision. Approach could be replicated, especially if the a funding process for local municipal projects is established for municipalities along corridor performing projects aligned with corridor vision. Mobility plan includes pathways, which could be replicated with emphasis on greenway or riverfront access/trail priorities in southwestern PA. Makes specific mobility recommendations, consistent with the sector approach of this overall effort.
Rocky Mount NC	Atlantic Arlington Avenue	2019	Rocky Mount NC	Equitable development and Gateways. Low mod income neighborhoods adjacent to new public event space. Identified land uses for revitlization that preserve the cultural history and heritige of the corridor, maintin the overall form of the exisitng built environment, housing afforability, support existing small businesses and create new ones, connect neighborrhoods with economic growth occurring in area and adjacent downtown. Recommends form based codes to facilitate mixed use development, promotion of cultural hsitory to create pride and social interest. Establishes gateways. Multi-modal safety recommendations. Wayfinding signage program. Plan also included housing and vacant property recommendations.
Henrico County VA	Route 5 Corridor Study	2018	Henrico County VA	Multi municipal planning effort lead by County to respond to development threat to the historical/cultural area. State operated highway. Previous efforts to preserve 2 lane by state; eliminate billboards, add bike lane. Byway. Preferred development scearios for urban, suburban and rural parts of the corridor to protect scenic nature of the corridor. Specific approachesspecified that would allow development but also preserve historical nature of appearance of Route 5 such as where to route driveways relative to natural land contours, appropriate plantings and screening.
South Middletown Township PA	Walnut Bottom Corridor Plan	2020	Carlisle PA (?)	Development and Zoning/Master Plan. "Catalyst Sites" spurred community-led visioning process identifying "treasures" and "challenges." Master planning process resulting in findings of need for: cohesive development along the corridor, densities for town center, create civic spaces, prioritize historical assets, safety/ multimodal. Emphasis on development/redevelopment. Updates to Zoning, SALDO and comp plan to incorporate Walnut Bottom Master Plan. Intersection improvements including a roundabout. Active transportation plan (sidwlaks, bike path, planted buffer zones). Parks trails and public plazas schemes proposed. Needed environmental and historical asset protection steps identifed. Goals with funding opportunities identified.

Single/ Multi-Municipal	Documents	Participating Jurisdictions	Technical Partners	Steering Committee	Funded By
single	https://www.cityofsouthlake.com/DocumentCenter/View/14222/SH-114-Corridor-Plan?bidId=	Southlake, TX	n/a	aligned with North Texas COG (MPO)	
single	https://rockymountnc.gov/UserFiles/Servers/Server_230888/File/Government/Mayor%20&%20City%20Council/Agendas%20&%20Minutes/2019/October%2028/Item%2010A.pdf	Rocky Mount NC			
multi	https://henrico.us/pdfs/planning/rt5/Rte5FinalDocument.pdf	Henrico, Richmond, Charles City County, James City County, Williamsburg	Henrico Planning	Rt 5 coalition rt5va.org	
single	https://www.smiddleton.com/DocumentCenter/View/2354/Walnut-Bottom-Master-Plan-Study-PDF?bidId=	South Middleton, Cumberland County, Carlisle	County Planning, MBI	yes	

Location	Plan Name	Date	Clients	Key Feature
Indiana PA	Indiana Community University District Master Plan (Wayne Avenue)	2016	Indiana Borough and White Twp	Multi-municipal master plan around shared asset. Two municipalities, oneUniversity and two roadways. Provides design guidance and also zoning recommendations for borough and SALDO for township. Three typologies of uses identified. P.E.T. analysis performed (Preserve, Enhance, Transform) which may be appropriate next step for 65 Corridor. Recommended physical improvements to Wayne Avenue. Provides Design Guidelines for each municipality to facilitate sense of place including setbacks, number of stories, cub cuts, lot coverage, parking for each typology.
East Whiteland Twp PA	Route 30 Corridor	2018	East Whiteland Twp	Design Guidlines. In this case to promote mixed use centers. Remaining portions of the corridor will be less compact and support wide range of commercial uses. All corridor districts to have cohesive streetscape, sidewalks, grass buffer, street trees, pedestrian amenitieis. Parking and set back rules for consistency along corridor. Specifications for temorary uses such as popup markets, festivals, and foodtrucks.
Smyrna DE	Route 13 Corridor	2012	Smyrna Del, Dover County	Small town with MOU with state and MPO. Provides design guidance for agencies to use for future decision making. Corridor has a short length- 3.5 miles and is in one municipality, however US 13 runs length of state and parrallels DE 1 the limited access highway providing tourist access to beach areas. Examines economic development potential of enhancements that would maximize the historic town. Like the 65 Corridor Study, it is a study not a plan. Takeways: Design Week a public process / charette to inform design standards. With focus on design, goal is to develop a "Boulevard." Three typologies. Inventory of transporation network assets: shoulder width, bus stops, street lights, sidewalks and condition mapped. Suggests actions for implementation. Focuses on land uses-not necessarily improvements to roads or other built environment. Interesting fact: they propose it to the MPO.
Philiadelphia PA	Roosevelt Blvd Route for Change Program	2021	City of Philadelphia	Primary message around safety. "Vision Zero" campaign to eliminate traffic accidents spurs improvements along a major multi-lane boulevard extending from city center to Bucks County. Plan develops a series of improvements to create a more inviting corridor that is safer, accessible, and reliable. Benefiting populations identified as residents, visitors, employees and commuters--including walkers, individuals with wheeled mobility, and bicycle users (as well as cars). Corridor is divided into 6 segments to program improvements. Alternatives for handling up to 6 lanes.

Single/ Multi-Municipal	Documents	Participating Jurisdictions	Technical Partners	Steering Committee	Funded By
multi	https://www.iup.edu/adminfinance/offices/facilities-planning/	Indiana Borough, White Township, IUP, Indiana County Planning	Smith Group		
single	http://www.eastwhiteland.com/DocumentCenter/View/544/Appendix-E-Design-Guidelines---Zoning	Chester County PA	TCA		
single	https://evogov.s3.amazonaws.com/164/media/146481.pdf	Dover Kent MPO; Smyrna	McCormick Taylor	Town of Smyrna	
single	rooseveltblvd.com	City and County of Philadelphia; SEPTA	https://www.phila.gov/documents/roosevelt-boulevard-route-for-change-report/	City of Philly, SEPTA, PADOT, DVRPC	

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