

HIGHWAY ACCESS MANAGEMENT

*Along Pennsylvania Highways
In the Delaware Valley*

Case Study Corridor:
DURHAM ROAD (PA 413)



Wrightstown



Newtown

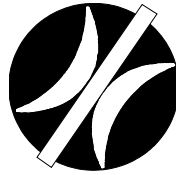
Wrightstown and Newtown Townships, Bucks County, Pennsylvania



Delaware Valley Regional Planning Commission

OCTOBER 2008

The Delaware Valley Regional Planning Commission is dedicated to uniting the region's elected officials, planning professionals and the public with a common vision of making a great region even greater. Shaping the way we live, work and play, DVRPC builds consensus on improving transportation, promoting smart growth, protecting the environment and enhancing the economy. We serve a diverse region of nine counties: Bucks, Chester, Delaware, Montgomery and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester and Mercer in New Jersey. DVRPC is the federally designated Metropolitan Planning Organization for the Greater Philadelphia Region - leading the way to a better future.



Our logo is adapted from the official DVRPC seal, and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

DVRPC is funded by a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. This report was primarily funded by the Pennsylvania Department of Transportation. The authors, however, are solely responsible for its findings and conclusions, which may not represent the official views or policies of the funding agencies.

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EXECUTIVE SUMMARY

This access management case study addresses a 4-mile-long congested segment of Durham Road (PA 413)—a two-lane, north–south, principal arterial highway traversing suburban and developing settings in Newtown and Wrightstown Townships, Bucks County, Pennsylvania.

Highway access management techniques were assembled into a conceptual plan for the corridor to improve safety and mobility and to prolong the highway’s serviceability in light of ongoing regional growth and development. The work was performed by DVRPC staff in support of PennDOT’s effort to promote wider planning for and application of access management procedures within the Commonwealth. The procedures are applicable to both state **and** local highways, and the strategies are most effectively delivered through municipal ordinances that govern the land development design, application, review and approval process. As such, principal guidance for developing the plan work was obtained from PennDOT’s publication *Access Management Model Ordinances for Pennsylvania Municipalities Handbook*.¹

The foundation of the conceptual access management plan for Durham Road lies within its classification as a principal arterial highway. Principal arterials should emphasize and provide for mobility for longer distance trips and through-travel, versus direct access to abutting property and local trips. Accordingly, to support its purpose and functional integrity for the foreseeable future, changes to property access, and recommendations for geometric improvements and traffic control were integrated into the plan. Within Newtown, the more developed portion of the corridor, current access designs and practices are established and well defined. More opportunities were identified in the Wrightstown portion of the corridor due to its developing nature.

Improvement recommendations were developed with municipal, county and PennDOT staff participation. In summary, the conceptual plan recommends:

- closing or modifying selected existing driveways along Durham Road;
- identifying potential future access points for developable properties;
- providing traffic signals and additional dedicated turn lanes for key intersections along Durham Road;
- establishing cross easements between adjacent properties to manage / direct traffic to full movement access points regulated by traffic signals; and
- integrating internal development roadways, trails and sidewalks to distribute vehicles more effectively, reduce reliance on higher order highways for local trips, and serve / encourage non-motorized travel.

¹ The document is available on-line at:
<ftp://ftp.dot.state.pa.us/public/bureaus/CPDM/WEB/Access%20Management%20Model%20Ordinances%20for%20PA%20Municipalities.pdf>

1. INTRODUCTION

ac-cess \ˈak-,ses /so ik-'ses\ *n* **2a** : permission, liberty, or ability to enter, approach, or pass to and from a place or to approach or communicate with a person or thing

man-age-ment \ˈma-nij-mənt\ *n* **2** : judicious use of means to accomplish an end²

ac-cess man-age-ment \ˈak-,ses 'ma-nij-mənt\ *n* **1** : systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway³

Highway access management is one of many strategies available to prolong and/or improve the function of a state or local roadway. The methods employed in access management seek to identify corridor needs, optimize the existing transportation infrastructure, and accommodate eventual change. Access management strategies generally work toward eliminating turning movements at driveways, reducing through travel interruptions, and making vehicle entrances and exits to/from driveways and roadways more predictable.

Because the strategy is so closely related to land development, and land use and development are municipal responsibilities, implementation can most effectively be achieved through the practices, plans, and ordinances which guide and support the municipality's land development design, application, review and approval processes (e.g., the Official Map, the Comprehensive Plan, the Zoning Ordinance and the Subdivision and Land Development Ordinance). In turn, formal placement and design of new intersecting streets and driveways along important state **and** municipal highways within its jurisdiction can be regulated by the municipality. Where state highways are involved, formalized access management plans can also be supported by PennDOT's highway occupancy permitting process. The plan's successful outcome, for both highway systems, very often is hinged upon early and frequent communication, coordination and cooperation between the developer, the municipality, and PennDOT (where state highways are involved).

Access management can be a relatively low cost means of reducing congestion and increasing both the efficiency and safety of a roadway if implemented through the land development design and approval process. Access management techniques can be introduced on a case-by-case basis by retrofitting access at individual parcels along developed highway corridors or incrementally along growing corridors. The key to each is to have a defined plan of approach and the legal basis for requiring compliance.

According to the Transportation Research Board the goals of access management are accomplished by applying the following principles:

1. Provide a specialized roadway system – design and manage roadways according to the transportation function they are expected to serve;
2. Limit direct access to major roadways – limiting points of interruption favors travel mobility;
3. Promote intersection hierarchy – transitions between differing highway classes should be logical and efficient;
4. Locate traffic signals to favor through movement – long, uniform spacing between signalized intersections is more amenable to coordinated traffic control systems that provide for continuous traffic movement at desired speeds;
5. Preserve the functional areas of intersections and interchanges – areas within an intersection where deceleration and maneuvering decisions are made, as a result of the intersection's design / control, should remain free of external, extraneous influences;

² Merriam-Webster's Collegiate Dictionary. – Eleventh edition

³ Access Management Manual (Transportation Research Board, 2003)

6. Limit the number of conflict points (places where the paths of vehicles intersect) – to simplify the driving experience, and reduce decision making and the chances for making mistakes that can lead to collisions;
7. Separate conflict areas – provide sufficient distance and time for decision making;
8. Remove turning vehicles from through-traffic lanes – separate / protect turning vehicles with lanes that accommodate deceleration and storage to reduce stopping interruptions and conflicts along the main thoroughfare;
9. Use nontraversable medians to manage turning movements – effective for improving roadway safety; and
10. Provide a supporting street and circulation system – networks of local and collector streets which accommodate development, and unify property access and circulation systems are highly desirable for dispersing traffic demand and eliminating local travel from higher order highways. Interconnected streets, sidewalks and trails also provide alternate routes for bicyclists and pedestrians.

National studies indicate that where access management techniques are consistently implemented along a highway corridor, collisions can be reduced by as much as 50 percent;⁴ capacities increased between 23 and 45 percent; and travel times and delays reduced as much as 40 to 60 percent⁵ versus highway segments with un- or under regulated access management practices. Other studies have concluded that increasing driveway interferences (e.g., conflict points) from 10 to 20 per mile can result in a 30 to 40 percent increase in crashes along a highway.

Highway functional classification is a term that implies the hierarchy and interconnectivity of a highway network. Typically, freeways, expressways, and arterial highways provide for through-travel and mobility over longer distances. Local travel, composed of shorter trips, is served by collector roads and local streets. More often than not, trips include both local and longer-distance elements, hence the importance of interconnectivity and continuity of the system to serve all highway trips. Functional classification is an important parameter in determining the extent to which access management strategies should be applied.

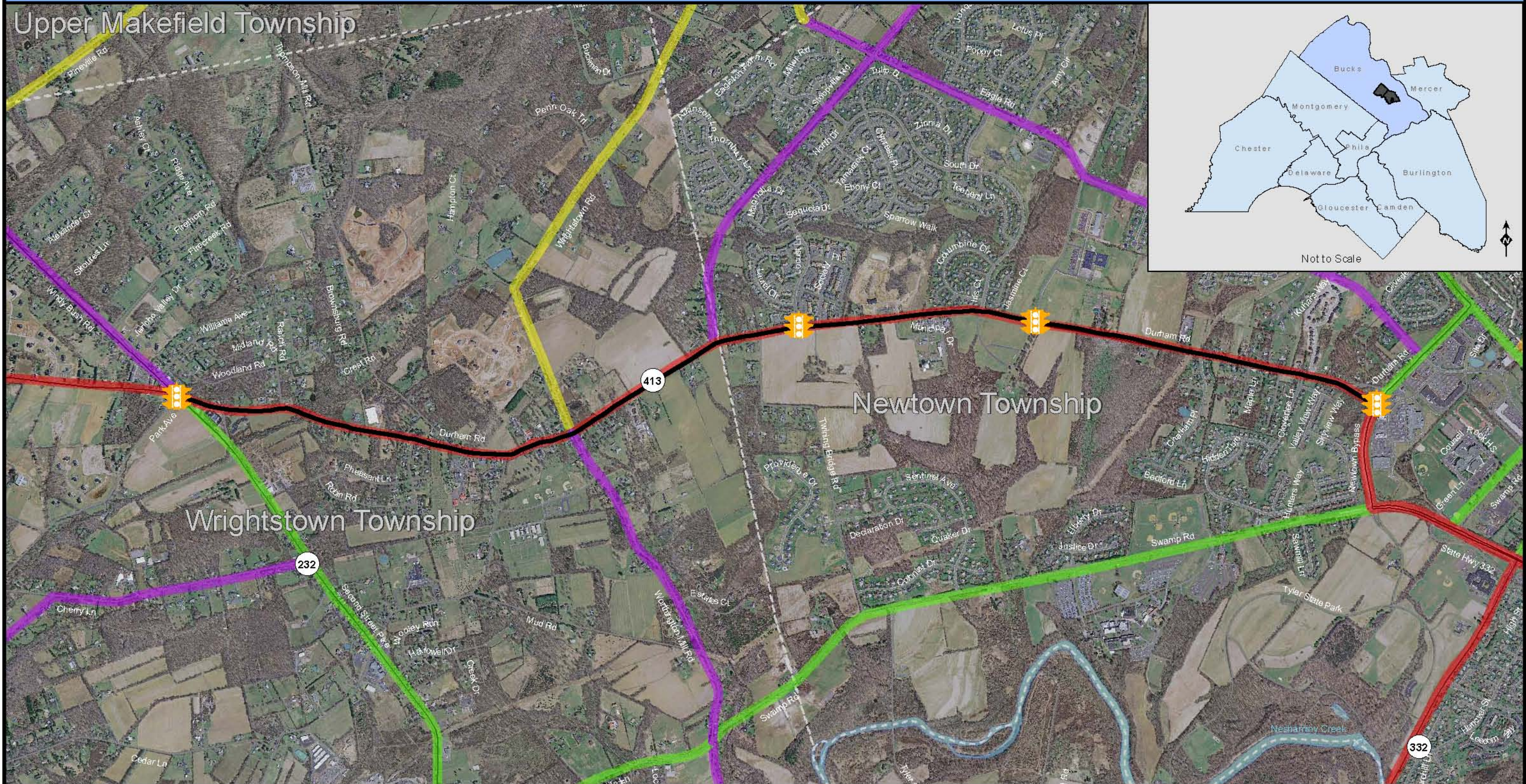
The federal aid highway functional classification system for the study corridor is illustrated in **Figure 1**. Besides defining a network of highways that are most important locally, regionally, and nationally; highways designated in the system may also be eligible for federal funding assistance when transportation improvement projects are contemplated.

The relationship between mobility and land access represented by a highway's functional class is conceptualized in **Figure 2**. With the exception of limited access highways (e.g., expressways, where movements to and from the highway occur only at interchanges) and some principal arterial highways (the Newtown Bypass being an example), properties abutting highways are legally entitled to access. Proper emphasis of the highway's main purpose can be achieved through recognition and definition—to carry traffic or serve abutting property—and design. Access management plans / designs supported by ordinances reinforce the desired purpose of the highway.

A foundation for understanding the hierarchy of roads is represented by the federal aid highway classification system. Typically, functional classification maps and highway designations are also found in municipal comprehensive plans. Highway design standards, contained in PennDOT manuals and

⁴ National Cooperative Highway Research Program (NCHRP) Report 420.

⁵ National Highway Institute (NHI).



Federal Aid Highway Functional Classification System:

- Principal Arterial Highway
- Major Collector
- Minor Arterial
- Minor Collector

Map Features

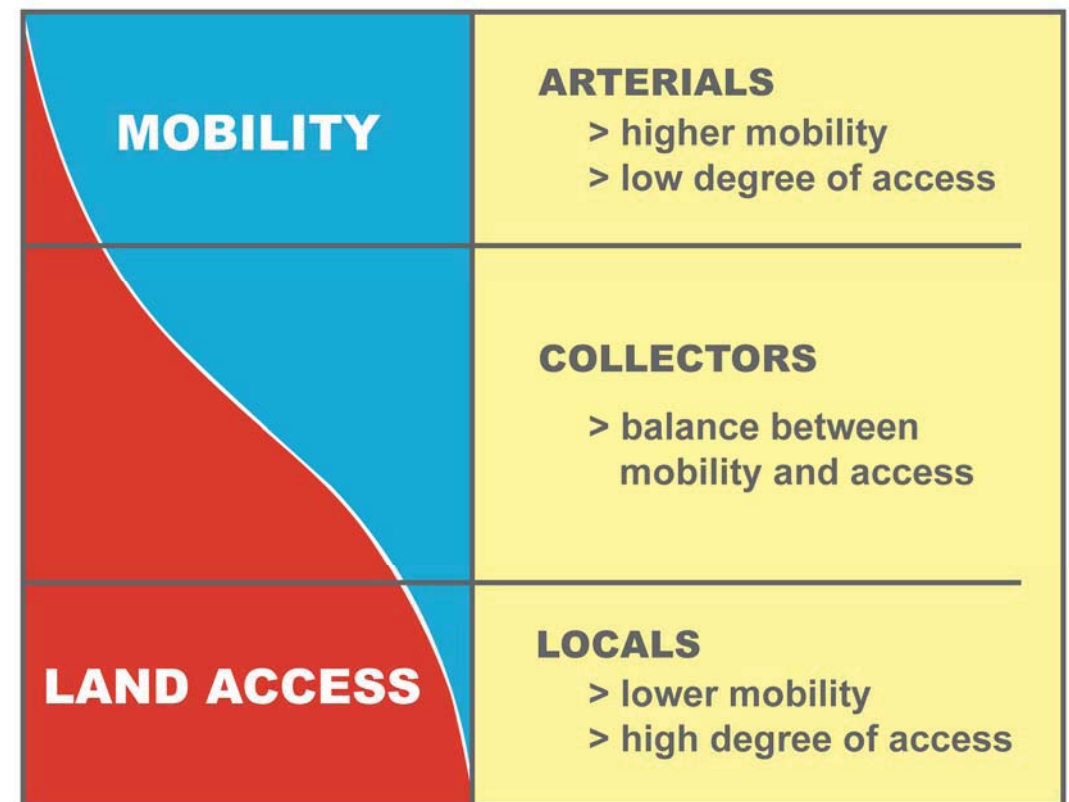
- Municipal Boundary
- Hydrography
- Local Road Network
- ☘ Signalized Intersection
- PA 413 - Study Corridor

municipal ordinances, reinforce the intended function of a highway. PennDOT’s Access Management Model Ordinances Handbook also arranges its guidelines in relation to a highway’s functional classification.

DVRPC’s access management work program was created to promote and support PennDOT’s Model Access Management Ordinance project with the participation of the membership and the municipalities. To do this, DVRPC’s approach focuses on identifying and selecting appropriate corridor segments from ongoing plans and studies, and conducting a highway access management case study which may be more clearly understood and/or put into practice by the involved municipality(ies).

Principally, DVRPC’s highway access management planning methodology draws from the region’s federally mandated Congestion Management Process (CMP), which aims to minimize congestion and enhance the mobility of both people and goods along a defined network of highways. The CMP acts as a connection between the region’s Long Range Plan and the region’s Transportation Improvement Program (TIP) to ensure that appropriate strategies are applied to improve regional transportation facilities. An initial step in the CMP was to define congested corridors⁶ throughout the Delaware Valley. The process then considered characteristics within each corridor and preliminarily identified strategies—including access management techniques—to mitigate congestion. Consequently, with the direct participation of the local municipality in the case study evaluation, DVRPC’s access management corridor approach provides a more detailed evaluation of the CMP’s general recommendations and a sounding board for its acceptance.

Figure 2 – Roadway Purpose and Classification



Source: Safety Effectiveness of Highway Design Features Volume 1, Access Control, FHWA, 1992

A suitable balance between land access and mobility—reinforced by design—promotes a highway’s intended purpose (i.e., its functional classification).

⁶ Both existing and emerging congested corridors.

A multijurisdictional, multimodal steering committee was formed in January 2007 to help initiate and guide the regional work program, and provide comments on the individual case study products. The steering committee was represented by regional and county transportation and community planners, staff from the City of Philadelphia's Planning Commission and its Department of Streets, PennDOT District 6-0's Traffic Engineering and Highway Permits units, and SEPTA's Service Planning Department. Usually, the "host" steering committee member participated in working meetings with the local municipality. Municipal representatives that participated in the corridor case study planning exercises were also given the opportunity to review and make comments on the draft report.

The congested corridor subject for this case study evaluation is Durham Road (PA 413)—between Second Street Pike (PA 232), in Wrightstown Township, and the Newtown Bypass (PA 413 / PA 532), in Newtown Township, Bucks County, Pennsylvania. DVRPC's current CMP identifies the portion of PA 413 within Newtown Township in association with the PA 332 and the Newtown Bypass as congested corridors. The limits of the study corridor were extended to PA 232, in Wrightstown, to provide a logical terminus on the north. The corridor extends approximately 4 miles. Roughly half of the corridor is situated in each township. The study roadway is a two-lane highway and has dedicated left-and/or right-turning lanes provided at selected locations.

2. ROADWAY, TRAFFIC and TRANSPORTATION CHARACTERISTICS

Durham Road (PA 413) is an undivided, two-lane, state-owned and -maintained highway, signed for north-south travel. Speed limit signs are posted for 45 miles per hour throughout, and there is no parking along the highway. Travel lane widths are 12 feet, and 4-foot-wide paved shoulders are typical along both sides of the highway. Auxiliary / separate left- and/or right-turning lanes and wider shoulders are common at driveways and along frontages of newer developments in the corridor. Within Newtown, the more developed portion of the corridor, access designs are relatively well defined. In Wrightstown, more opportunity exists to influence future conditions because of the less developed nature of the land abutting the corridor.

The highway is classified as an urban principal arterial in the federal aid highway functional classification system. The highway carries an average of between 13,000 and 15,000 vehicles per day, with a spike in volume—to 17,000 or 18,000 vehicles per average day—occurring in the segment between the Worthington Mill / Wrightstown roads and Stoopville Road intersections (**Figure 3**).

Other noteworthy roadways intersecting Durham Road are described below.

- Windy Bush Road (PA 232, north of PA 413) – a two-lane Urban Collector, serving approximately 5,000 vehicles per day on average;
- Second Street Pike (PA 232, south of PA 413) – a two-lane Urban Minor Arterial, serving approximately 6,000 vehicles per day on average;
- Wrightstown Road – a two-lane Rural Minor Collector, serving approximately 2,000 vehicles per day on average;
- Worthington Mill Road – a two-lane Urban Collector, serving approximately 2,000 vehicles per day on average;
- Stoopville Road – a two-lane Urban Collector, serving about 6,000 vehicles per day on average;
- Newtown Bypass (PA 532, north of PA 413) – a two-lane Urban Minor Arterial, serving approximately 10,000 vehicles per day on average; and
- Newtown Bypass (PA 413 / PA 532, south of Durham Road) – a four-lane Urban Principal Arterial, serving approximately 18,000 vehicles on average.

Each is a state owned and maintained highway.

Other intersecting roadways are owned and maintained by the townships. Their primary function is to serve local travel and abutting properties; they serve low volumes of traffic and are not part of the federal aid highway system. Although in the scheme of circulation within the townships, they too reflect a hierarchy for local travel. A variety of commercial and residential driveways also intersect Durham Road.

The following intersection lane assignments and methods of intersection traffic control are encountered along Durham Road, traveling southbound from the PA 232 intersection.

- A five-legged signalized intersection at PA 232 / Park Avenue permitting all traffic movements without dedicated left or right turn lanes;
- An unsignalized (minor street stop sign controlled) “T” intersection with Anchor Road (one way toward PA 413) allowing only right turns from Anchor Road to PA 413 southbound;
- A series of unsignalized (minor streets stop sign controlled) “T” intersections with public roads (Midland Road, Wrenwood Road, Brownsburg Road, and Penns Park Road) which permit all traffic movements and do not provide dedicated turning lanes;

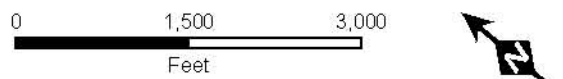
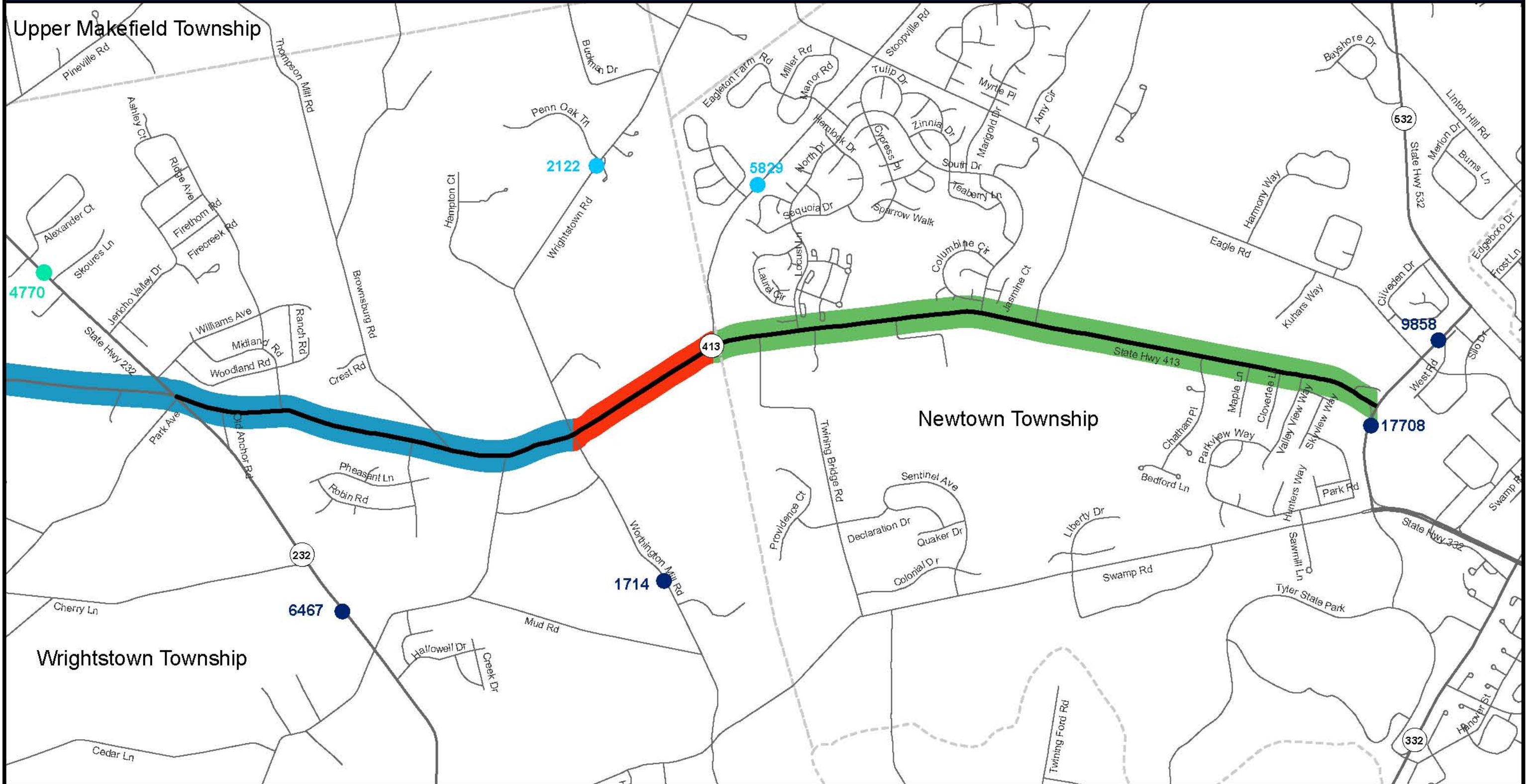
- An unsignalized (minor street stop sign controlled) four-way intersection with Wrightstown Road / Worthington Mill Road which permits all movements without dedicated turning lanes (as a result of a developer agreement, the township has installed separate center left tuning lanes on the PA 413 approaches with traffic signalization of the intersection anticipated by the end of October 2008);
- An unsignalized (minor street stop sign controlled) “T” intersection with Stoopville Road which permits all traffic movements without dedicated turning lanes;
- An unsignalized (minor street stop sign controlled) “T” intersection with Twining Bridge Road which provides for all traffic movements without dedicated turning lanes;
- A signalized “T” intersection with North Drive which permits all traffic movements, and has dedicated lanes for southbound left turns and northbound right turns;
- An unsignalized (minor street stop sign controlled) “T” intersection with Municipal Drive which allows all traffic movements and has a dedicated southbound right turn lane;
- An unsignalized (minor street stop sign controlled) four-way intersection with South Drive / All Saints Cemetery allowing all traffic movements with a dedicated center left turn lane on PA 413, and a separate northbound right turn lane to South Drive;
- A signalized “T” intersection with Wrights Road which permits all traffic movements and has dedicated lanes for southbound left turns and northbound right turns;
- A series of unsignalized (minor streets stop sign controlled) “T” intersections with roadways serving abutting residential developments (Chatham Place, Maple Lane, Cloverlee Lane, and Valley View Way) which permit all traffic movements, only the Chatham Place intersection is afforded a dedicated northbound left turn lane; and
- A four-way signalized intersection with the Newtown Bypass / Newtown Shopping Center serving all traffic movements with dedicated left and right turn lanes throughout.

Crash data, covering the years 2001 through 2005, was obtained for PA 413 and evaluated. PennDOT's database of reportable crashes⁷ occurring along state highways is confidential and was used in a general fashion to assess relative traffic safety conditions along the corridor. Organizing traffic crashes by location and type is a logical way of assessing traffic safety at a particular location or throughout a corridor. In turn, numbers of crashes, patterns of crashes, and related causation factors can be determined; and general countermeasures can be identified where concerns exist.

The majority of crashes along the Durham Road corridor involved property damage only, and the leading crash types were rear end crashes and angle accidents. No individual location (intersection or midblock) stood out as a serious traffic safety concern.

SEPTA operates one bus route in the wider study area. The Route 130 bus operates between the Franklin Mills Mall and the Newtown Campus of the Bucks County Community College located on Swamp Road. The bus route does not operate along Durham Road.

⁷ Reportable crashes in Pennsylvania are defined to be those resulting in injury or death and/or requiring a tow-away. The crash data used in this report was provided by the Pennsylvania Department of Transportation for DVRPC's traffic safety related transportation planning and programming purposes only. The raw data remains the property of PennDOT and its release to third parties is expressly prohibited without the written consent of the Department.



Average Annual Daily Traffic (AADT) by Year*

Individual Traffic Counts - Year

- 2005
- 2003
- 2002

AADT Ranges

- 13,000 - 14,000
- 14,000 - 15,000
- 17,000 - 18,000

*Number shown on map is the two-direction AADT

Map Features

- Municipal Boundary
- Local Road Network
- PA 413 - Study Corridor

3. LAND USE, and HUMAN and NATURAL ENVIRONMENTS

The relationship between land use and transportation facilities is central to any traffic study. The use of the land—where people live, work and play—and its intensity is responsible for trip generation and its magnitude. The aerial spread of the uses and the transportation facilities connecting or serving the uses are responsible for how trips are made (e.g., by highway, transit, walking, etc.).

Natural and cultural resources sustain environmental functions, provide recreational opportunities, and enhance the quality of life for local residents.

LAND USE

Figure 4a and Figure 4b display the categories and spread of land coverage in 2005 for the Wrightstown and Newtown portions, respectively. The corridor is suburban in nature within Newtown Township but more lightly developed within Wrightstown. Single-family subdivisions and large undeveloped tracts presently wooded, vacant, or devoted to agriculture are typical along the corridor. Two townhome communities are present in Newtown Township, and retail concentrations are found at the PA 232 and Newtown Bypass ends of the corridor.

Anticipated growth in the corridor is reflected in development data obtained from the *Bucks County Regional Traffic Study* (DVRPC, 2007, Publication No. 07026) and Wrightstown and Newtown townships.

- 1) CVS Pharmacy (now open for business) at Anchor Road and PA 413
- 2) Toll-Chapman Corners: at the intersection of Wrightstown Road and PA 413, 46 single-family homes all accessing Wrightstown Road
- 3) Toll-Highlands at Chapman Corners: 22 single-family homes with access on Wrightstown Road across from Toll-Chapman Corners
- 4) Matthews Ridge: 16 single-family homes on Brownsburg Road
- 5) Baltimoral: 7 single-family homes, down the street from Matthews Ridge, accessing Brownsburg Road
- 6) Reeve Tract in Upper Makefield Township: approximately 65 single-family homes accessing Brownsburg Road, just north of the Wrightstown township line
- 7) Potentially two new Council Rock School District schools: accessing Durham Road across from Stoopville Road
- 8) Delancy Court: a 120 unit age-qualified townhome community currently being constructed across Durham Road from the Newtown Township municipal complex, accessing Durham Road opposite from and aligned with Municipal Drive
- 9) Woll Tract Park: a Newtown Township park located on Durham Road adjacent to the Newtown Elementary School and opposite the Newtown Township Nature Center; access is proposed via a driveway intersecting Durham Road aligned with the nature center's driveway, and via Wrights Road through the Newtown Elementary School's parking lot

Where possible, the development locations have been identified on the corridor's conceptual access management plan.

HUMAN AND NATURAL ENVIRONMENTS

To the degree that federal funding might be involved in any aspect of developing or implementing recommendations from this study, it deserves mentioning that some advance inventorying work was performed in identifying human and natural environments along the corridor. As projects are developed,

the information may be helpful in engaging selected, targeted residents; helping identify avoidance steps; and/or preparing for the eventuality of compliance with the requirements of federal mandates. Federal law states that no person or group shall be excluded from participation in, or denied the benefits of, any program or activity utilizing federal funds. Each federal agency is required to identify any disproportionately high and adverse health or environmental effects of its programs on minority and low-income populations. In turn, Metropolitan Planning Organizations (MPO), as part of the United States Department of Transportation's certification requirements, are charged with evaluating their plans and programs for environmental justice sensitivity, including expanding their outreach efforts to low-income, minority or other disadvantaged population groups.

As the MPO for the Philadelphia metropolitan region, DVRPC's "Degrees of Disadvantage" process was applied to the study corridor using data from the 2000 Census. The finding of that process indicated that there are no census tracts along the Durham Road corridor containing disadvantaged populations exceeding defined regional thresholds. As such, special outreach activities to address environmental justice mandates will not be necessary.

Cultural landmarks and historic resources along the corridor include schools, colleges, municipal services buildings, medical sites, and historic sites. Those identified for the immediate PA 413 corridor are shown in **Figure 5**.⁸ As indicated, two houses of worship and the Newtown Township municipal complex abut the highway. The Wrightstown Historical District (centered at the intersection with Wrightstown and Worthington Mill roads) is bisected by Durham Road. The district is eligible for listing on the National Register of Historic Places.

Any impacts to these sites may require special review and clearances from:

- local interest groups
- the Pennsylvania Historical and Museum Commission

Local preservation codes may limit the scale or appearance of any improvements.

Natural features include floodplains, wetlands, and protected lands, etc., and are illustrated in **Figure 6**.⁹ Protected lands, under municipal ownership, exist in Newtown Township and in Wrightstown Township, and a floodplain crosses PA 413 at the northern end of the corridor in Wrightstown.

Impacts to water and wetlands features, as a consequence of physical changes financed with federal money, will require proper mitigation emanating from review and approvals by:

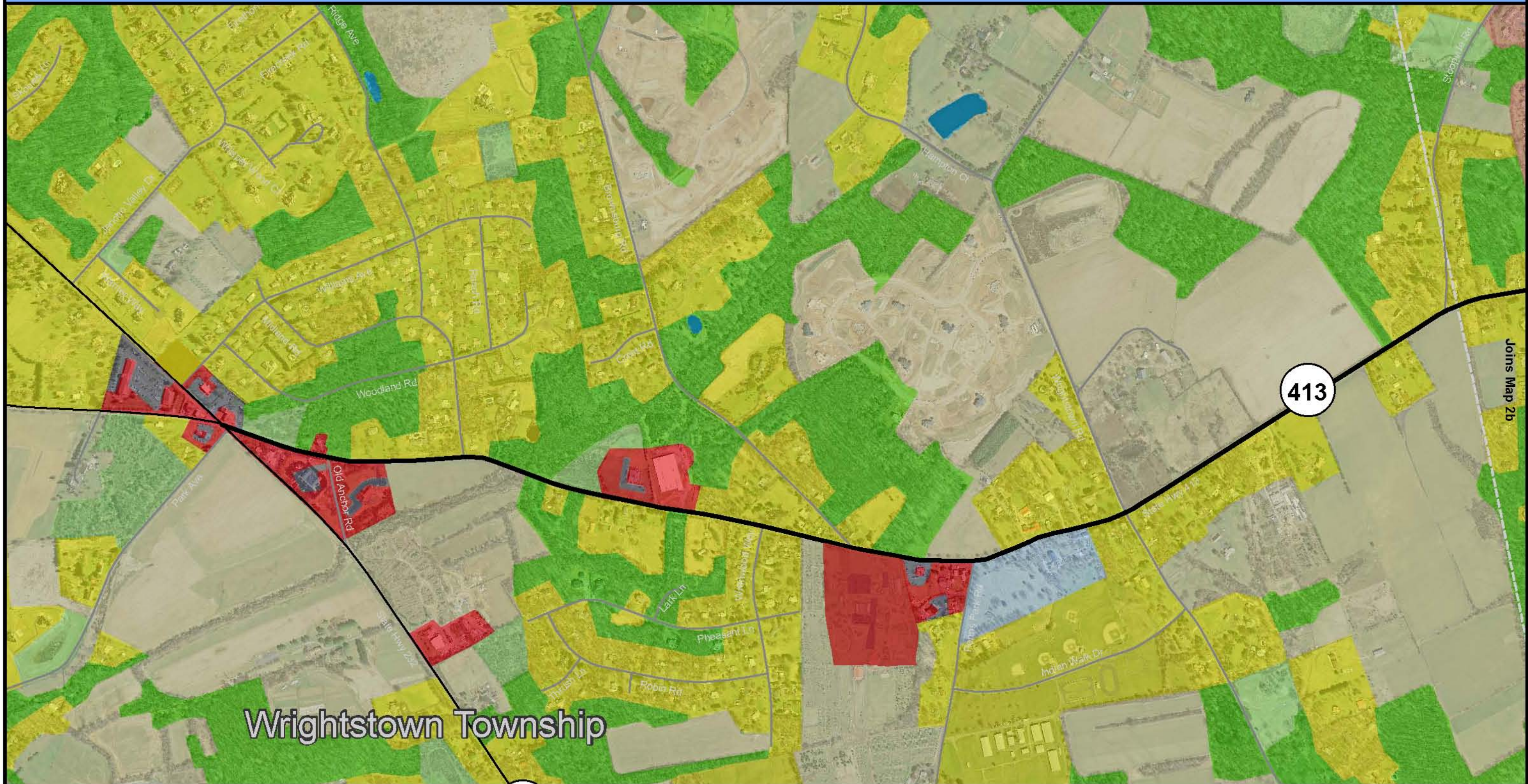
- the Pennsylvania Department of Environmental Protection
- the U.S. Army Corps of Engineers, and
- the municipality, where local ordinances require

Impacts upon public lands will necessitate the involvement of:

- the Pennsylvania Department of Conservation and Natural Resources, and
- county and municipal owners for public lands

⁸ Sources: Cultural landmarks - *Pennsylvania Cultural Resources GIS.ADC Map Book Series*, and DVRPC's GIS files.

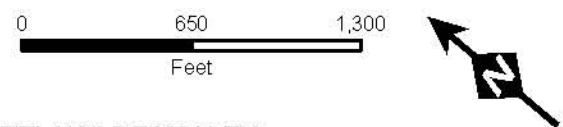
⁹ Sources: *Floodplain, FEMA; Wetlands, US Fish & Wildlife Service; Water Features, DVRPC's 2005 Land Use file.*



Wrightstown Township

413

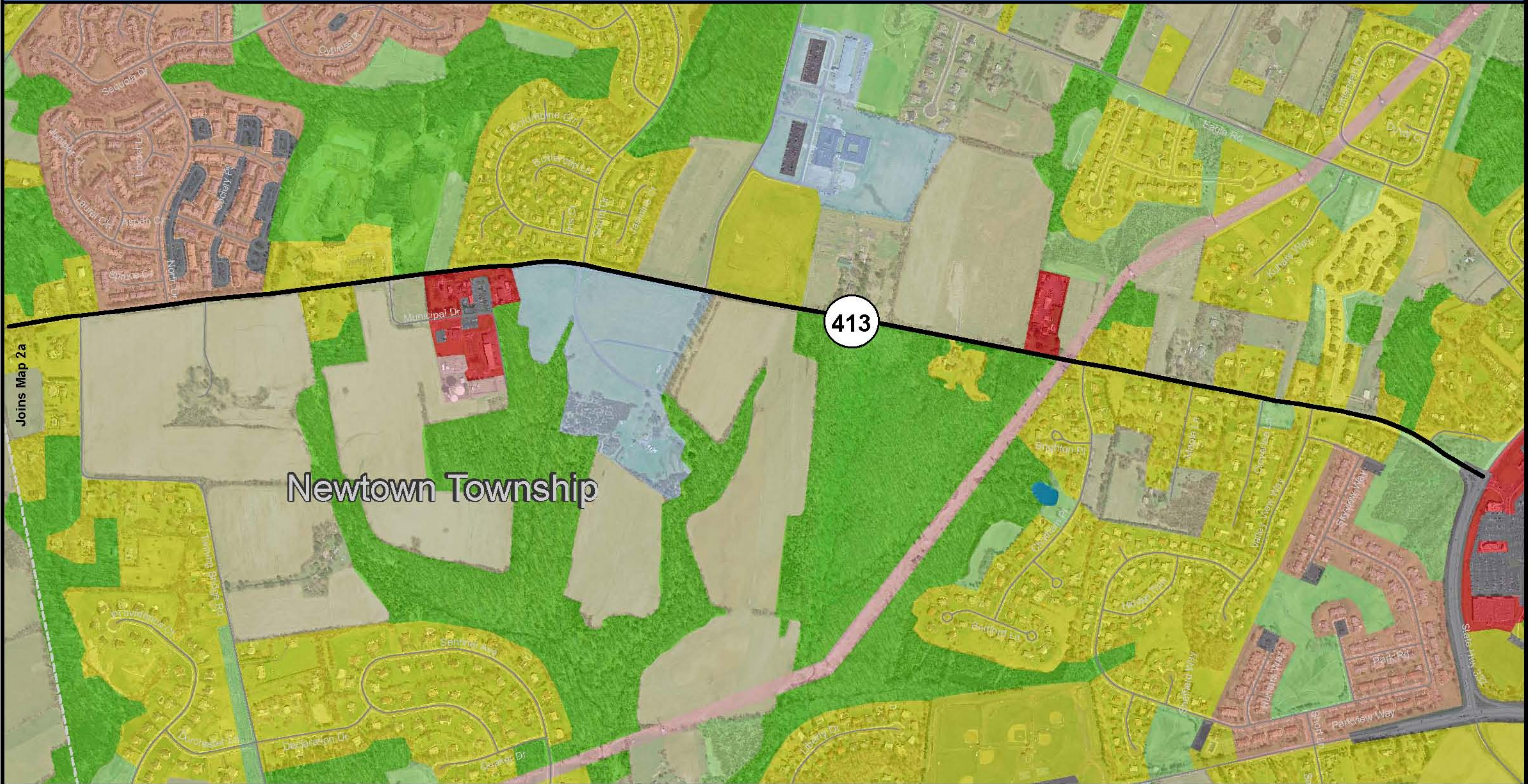
Joins Map 2b



DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
JUNE 2008*
**Aerial photos from the year 2005*

Land Use (2005)			
	Agriculture		Vacant
	Commercial		Parking
	Community Services		Recreation
	Residential: Multi-Family		Residential: Single Family
			Water
			Wooded

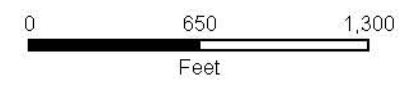
Map Features	
	Municipal Boundary
	Local Road Network
	PA 413 - Study Corridor



Joins Map 2a

Newtown Township

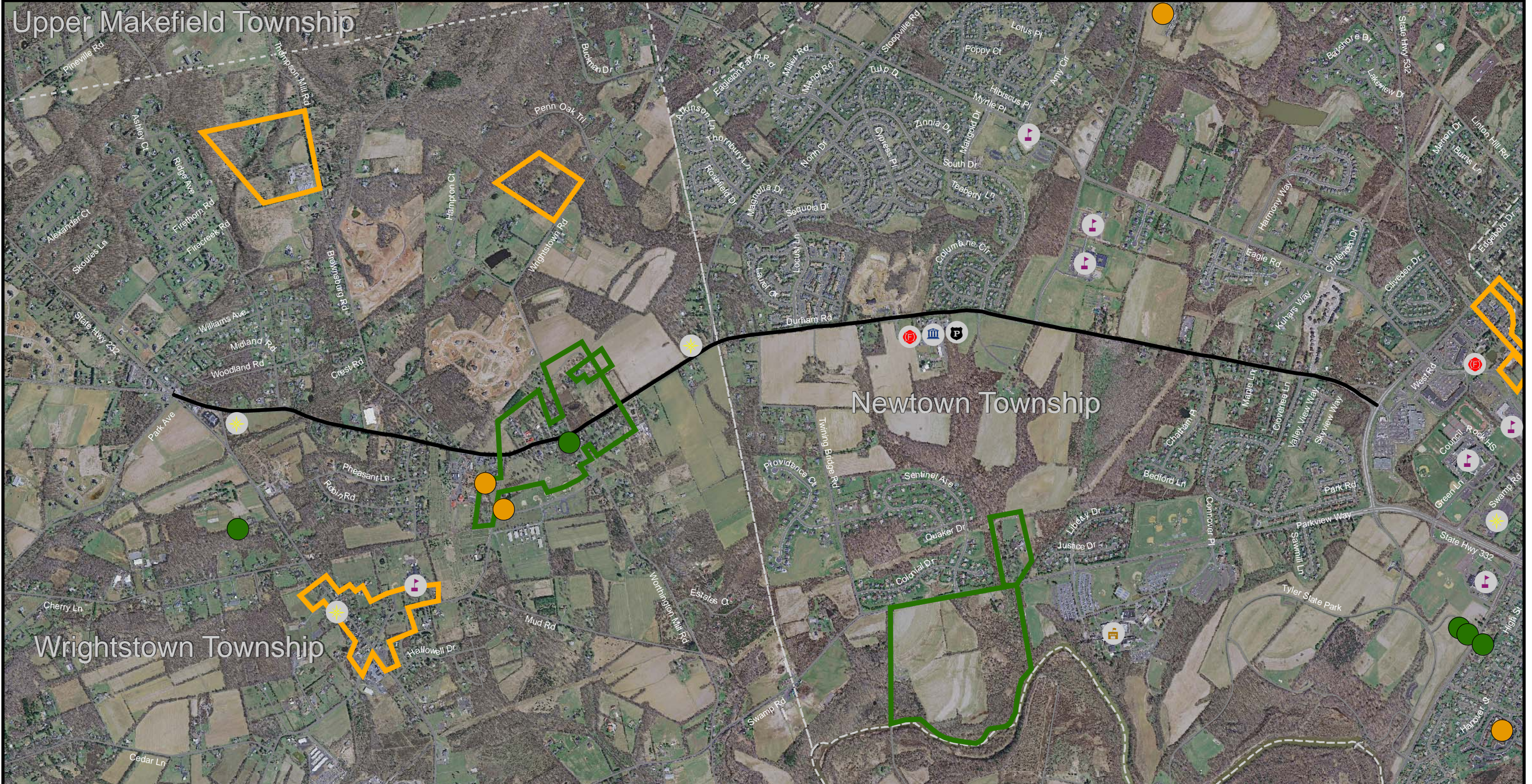
413



DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
JUNE 2008*
**Aerial photos from the year 2005*

Land Use (2005)			
	Agriculture		Vacant
	Commercial		Water
	Community Services		Wooded
	Residential: Multi-Family		Utility
	Residential: Single Family		Transportation
	Recreation		
	Parking		

Map Features	
	Municipal Boundary
	Local Road Network
	PA 413 - Study Corridor



0 1,500 3,000 Feet

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
JUNE 2008*
**Aerial photos from the year 2005*

Cultural Features

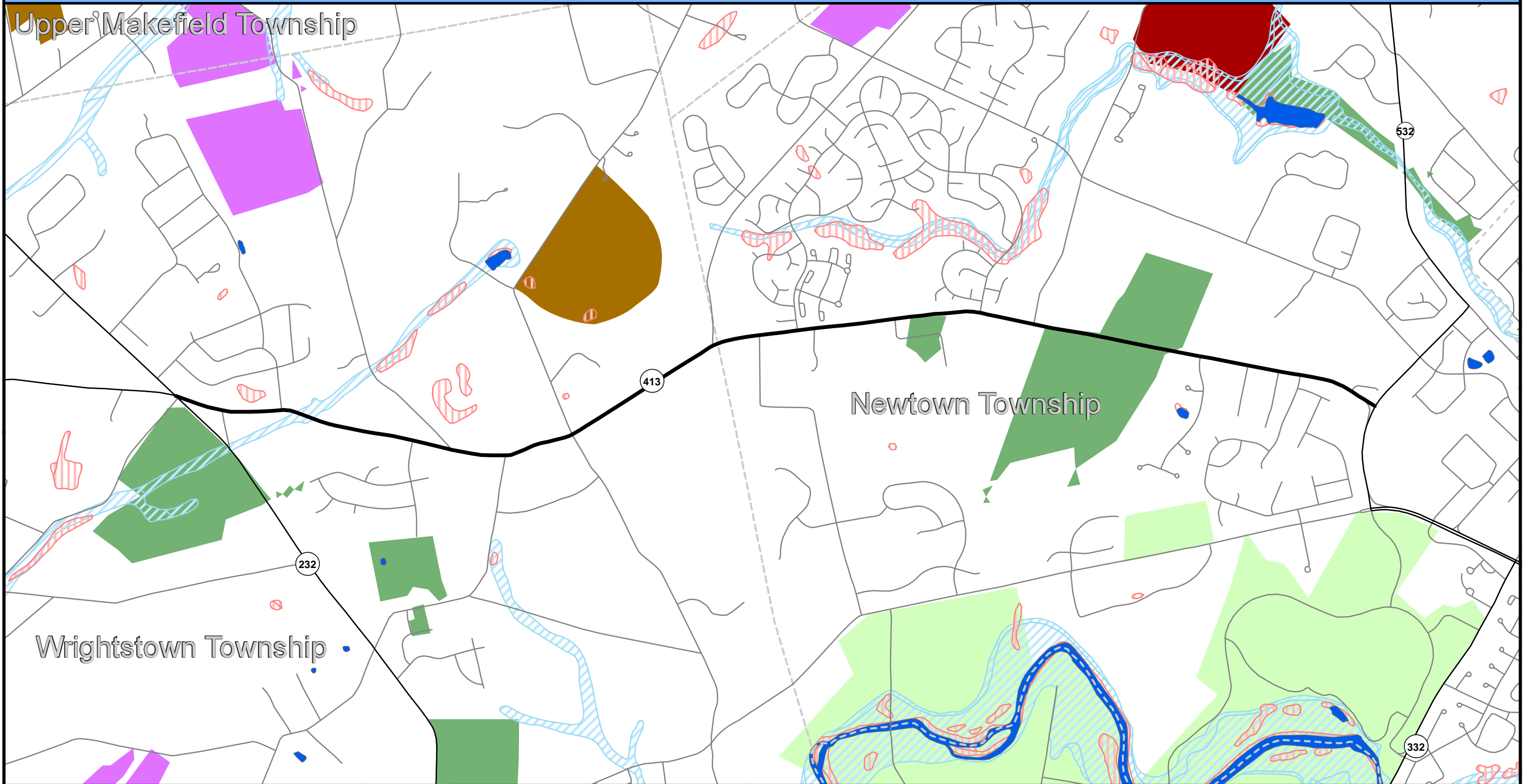
- Place of Worship
- Fire Department
- School
- College
- Municipal Building
- Police Station

Historic Landmarks

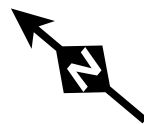
- Eligible Location
- Listed Location
- Eligible Area
- Listed Area

Map Features

- Municipal Boundary
- Local Road Network
- PA 413 - Study Corridor



0 1,500 3,000 Feet



Protected Lands

- State
- County
- Municipal
- Preserved Farmland
- Land Trust

Hydrographic Features

- Water Features (Normal Conditions)
- USFWS Wetlands
- FEMA Floodplains

Map Features

- Municipal Boundary
- Local Road Network
- PA 413 - Study Corridor

4. CORRIDOR CONCEPTUAL PLAN

PennDOT's publication *Access Management Model Ordinances for Pennsylvania Municipalities Handbook* was the prime resource used in generating recommendations in the study corridor. Access management strategies and applications within the model ordinances are structured in three tiers in which differing techniques are applied over different physical limits or geographic areas. The first tier focuses on applications suitable for individual parcels (i.e., number, placement, and design of driveways serving a parcel). The second tier addresses techniques for roadways (i.e., provisions for separate turning lanes along, and driveway placement within, a given roadway segment; traffic signal spacing). The third tier includes more comprehensive traffic and land use planning practices (including zoning overlay districts, official maps, continuous two-way left turn lanes versus nontraversable medians, etc.).

DVRPC staff drew from all three tiers and took the developments and traffic related improvements proposed by the townships into consideration, to develop the improvement scheme. To finalize the corridor's conceptual plan, staff met and reviewed the suggestions with the municipal, county and PennDOT project advisory group.

General design guidelines underlying the conceptual plan were taken from the *Handbook*. The conceptual access management plan assumes that direct land access is more suited to secondary roadways than a principal arterial highway (Durham Road). Other guidelines were:

- Signalization along PA 413 should be limited to intersections with public streets. The locations would yield a minimum spacing of 1,000 feet between traffic signals.
- Primary development access, with all traffic movements permitted, should be aligned with the signalized locations to reduce conflict points for safety and to lessen interruptions to through travel.
- Cross easements and shared roadways should be pursued which will provide ingress and egress for multiple developments at the signalized locations.
- Other primary, full movement driveways should be directed to intersect secondary cross streets, or shared with adjacent developments and spaced at intervals of 600 feet (minimum) along Durham Road.
- Minor or secondary driveways serving properties along Durham Road should be restricted to right turns only.

The conceptual plan is illustrated in **Figures 7a, 7b and 7c**. Physical improvement elements within the plan include:

- closing or modifying selected existing driveways along Durham Road;
- identifying potential future access points for developable properties;
- providing traffic signals and additional dedicated turn lanes for key intersections along Durham Road (PA 232, Midland Road, Brownsburg Road, Penns Park Road, Wrightstown / Worthington Mill roads, Stoopville Road, North Drive and Wrights Road);
- establishing cross easements between adjacent properties to manage / direct traffic from multiple properties / developments to full movement access points regulated by traffic signals; and
- integrating internal development roadways to distribute vehicles more effectively, reduce reliance on higher order highways for local trips, and serve / encourage non-motorized travel.

Figures 8, 9, 10 and 11 provide enlargements of selected corridor recommendations, which are also briefly described in the following sections.

Intersection of Durham Road, PA 232 and Park Avenue



*Durham Road northbound, near Anchor Road: The automotive repair shop (on the left) has "open" access to PA 413 along its entire frontage.
Photo by DVRPC*

Ideally, relocating the Park Avenue leg of the intersection (to make a conventional four-legged intersection) would be most effective as an initial step in accommodating traffic volume, but the strategy was considered undesirable to Wrightstown Township.

Alternatively, widening the PA 413 approaches to provide separate northbound and southbound left turn lanes and adding a protected left turn phase for the approaches is the basic traffic improvement recommendation for the intersection (**Figure 8**).

Driveway modifications in the immediate vicinity of the intersection are also recommended to better define the boundaries of the intersection and to reduce decision and conflict points within the functional area of the intersection. These improvements could be implemented through the municipal land development design, review, and approval process, and PennDOT's Highway Occupancy Permits (HOP) process as adjacent properties develop and/or are redeveloped for change(s) in use or ownership.



*PA 232 southbound approaching the PA 413 / Park Avenue signalized intersection: The Shell station's "open" access and the BP Gas Station's multiple access points.
Photo by DVRPC*

The essence and perhaps majority of the intersection's mobility improvement (e.g., excluding the access modifications) could be captured through a relatively low cost improvement which would update the traffic signal and reconstruct PA 413's shoulders, repave and restripe the intersection to supply the center left turning lanes without affecting adjacent properties. Potentially these improvements could be implemented in partnership with PennDOT maintenance, while engineering and traffic signalization costs would be borne by Wrightstown Township.

More complex alternatives for controlling traffic at the intersection have been identified, including a modern roundabout and far-side jug handles in place of left turn lanes. Both will be more costly to develop and construct, and may involve right-of-way acquisition; but may warrant deeper evaluations, if a conventional style improvement (as that depicted) does not yield sufficient traffic benefit. At the same time, both concepts are well beyond the matter at hand—highway access management.

Intersection of Durham Road, Brownsburg Road and Penns Park Road

Controlling access and managing traffic flow by closing driveways, establishing cross easements, and creating new shared driveways form the basis for the recommendation along Durham Road between the Brownsburg Road and Penns Park Road intersections. The concept is shown in **Figure 9**.



*Durham Road southbound approaching Penns Park Road: Open frontage (on right) blends into and camouflages Penns Park Road intersection.
Photo by DVRPC*

Full movement access to the properties should take place from the secondary roadways (Brownsburg and Penns Park roads) or via the shared development driveways that are in alignment with them. In turn, traffic signalization and left turning lanes on PA 413 should be provided at the newly created four-legged intersections. A nontraversable median is recommended between the signalized intersections to restrict turning movements at the intervening driveways.

Landscaping and curbing are recommended to define the development frontage, and roadway and driveway intersections. Parking (replacement) is situated behind the buildings with convenient access to the circulatory roadways.

The nature of the conceptual plan complements this stretch of Durham Road, where adjacent land use and zoning is a mix of commercial, residential and recreational uses. Were it to develop as such, a “village” might be established. Further, such settings—where posted speeds are 40 miles per hour or less—can also be candidates for traffic calming measures. As an example, textured / decorative crosswalks are depicted in **Figure 9**.

Intersection of Durham Road and Wrightstown Road / Worthington Mill Road

Wrightstown Township will install left turn lanes on PA 413 and a traffic signal at the intersection as a result of an agreement with Toll Brothers home builders (**Figure 10**). The improvement is scheduled for completion by the end of October 2008.

Intersection of Durham Road and Stoopville Road

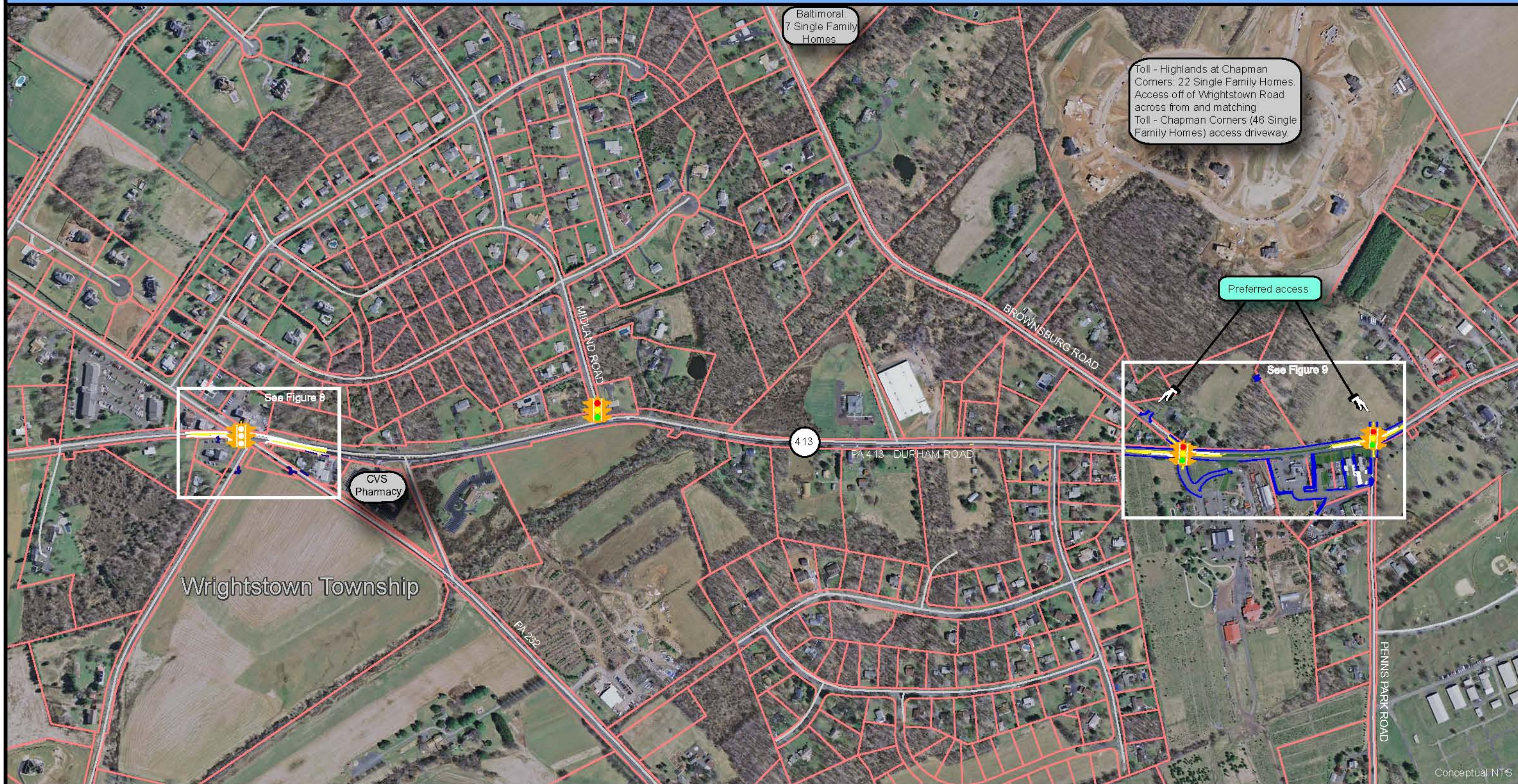


*Durham Road southbound approaching Stoopville Road: Wide shoulder allows through traffic to bypass stopped left turning vehicles (the school bus in the photo).
Photo by: DVRPC*

Suggested intersection upgrades are contingent upon construction and the likely traffic effects of one or possibly two new Council Rock School District schools occupying the property opposite Stoopville Road—with primary access to/from Durham Road in alignment with Stoopville Road (**Figure 11**).

Adding dedicated center left turn lanes on PA 413 and traffic signalization are recommended for the intersection. In conjunction,

pedestrian safety should be addressed with sidewalks or trails connected to adjacent subdivisions, and painted crosswalks and protected phasing accounted for in the signalized intersection design.



0 500 1,000 Feet

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JUNE 2008*
**Aerial photos from the year 2005*

Access Management

Development	Driveway Alignment
DVRPC Note	Driveway Closing / Shoulder
Recommendations	Signal
Traffic Flow	Cross Easement

Map Features

Municipal Boundary	Signalized Intersection
Local Road Network	Parcels



0 500 1,000 Feet

Access Management

- Development
- DVRPC Note
- Recommendations
- Traffic Flow
- Driveway Alignment
- Driveway Closing / Shoulder
- Signal
- Cross Easement

Map Features

- Municipal Boundary
- Local Road Network
- Parcels
- Signalized Intersection



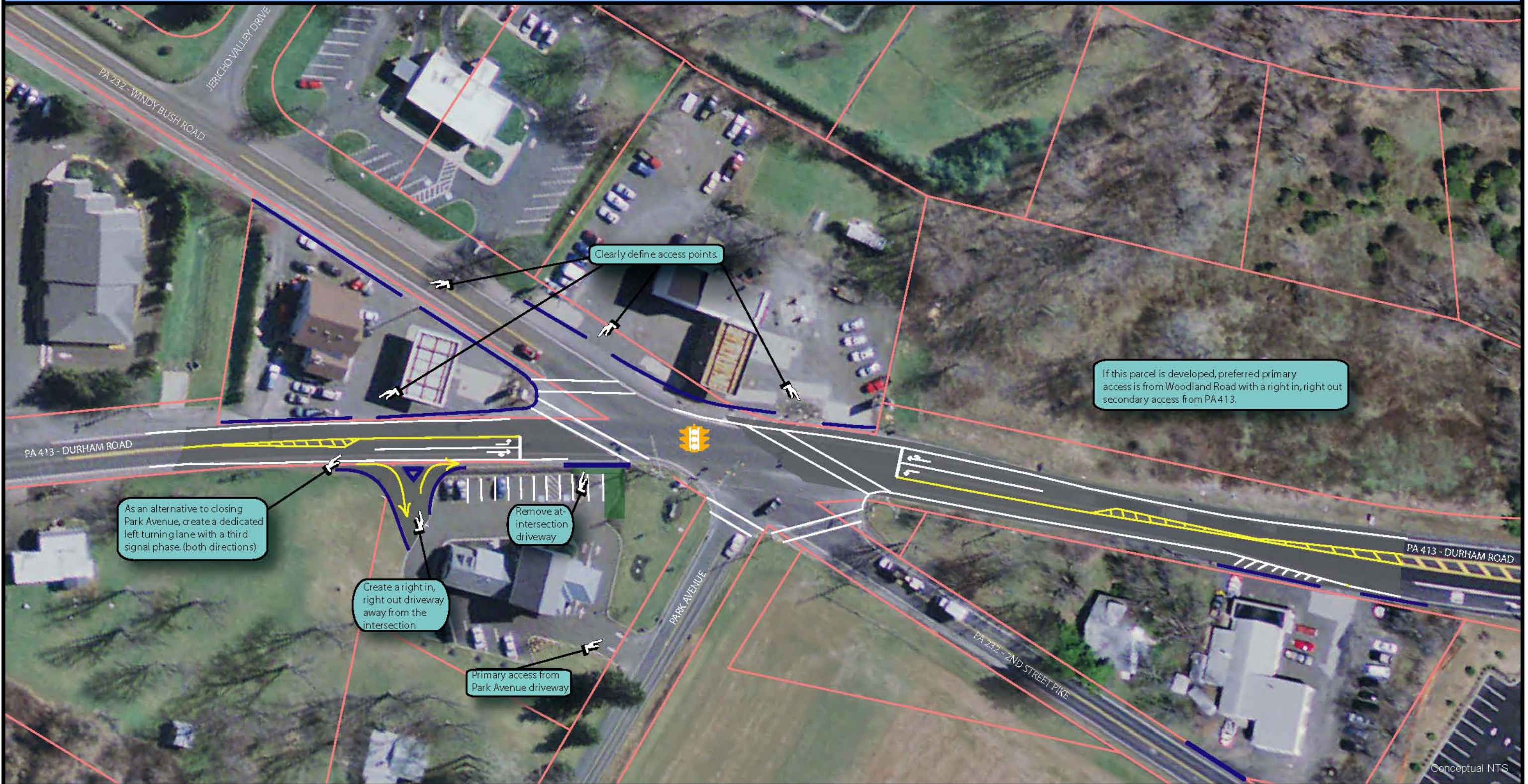
0 500 1,000 Feet

Access Management

- Development
- DVRPC Note
- Recommendations
- Traffic Flow
- Driveway Alignment
- Driveway Closing / Shoulder
- Signal
- Cross Easement

Map Features

- Municipal Boundary
- Local Road Network
- Signalized Intersection
- Parcels



As an alternative to closing Park Avenue, create a dedicated left turning lane with a third signal phase (both directions)

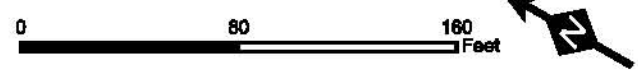
Create a right in, right out driveway away from the intersection

Primary access from Park Avenue driveway

Remove at-intersection driveway

Clearly define access points

If this parcel is developed, preferred primary access is from Woodland Road with a right in, right out secondary access from PA 413.



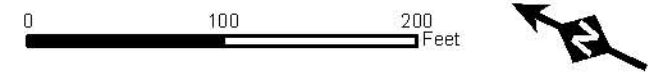
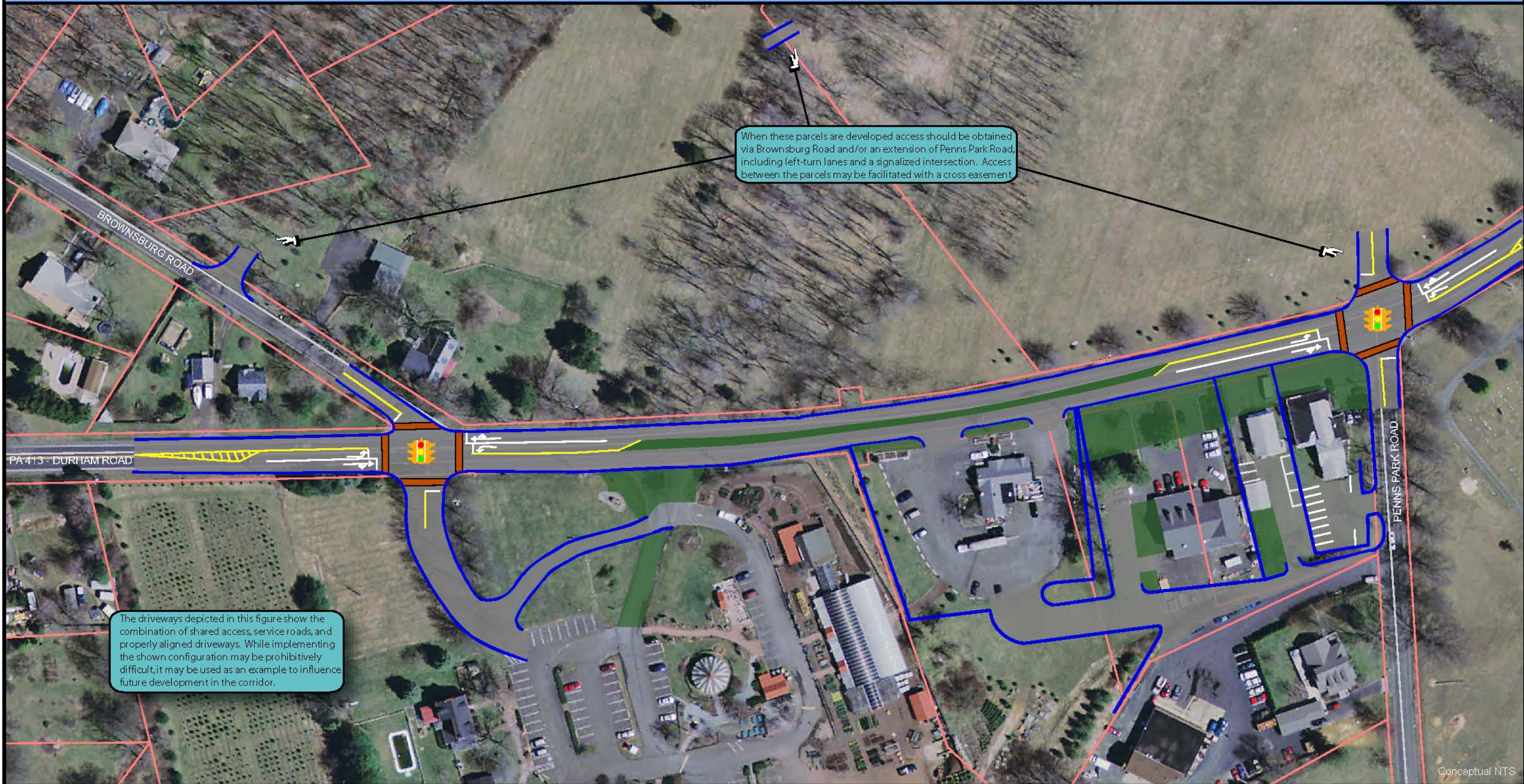
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*Aerial photos from the year 2005

Access Management

- Development
- DVRPC Note
- Recommendations
- Traffic Flow
- Driveway Alignment
- Driveway Closing / Shoulder
- Signal
- Cross Easement

Map Features

- Municipal Boundary
- Local Road Network
- Signalized Intersection
- Parcels



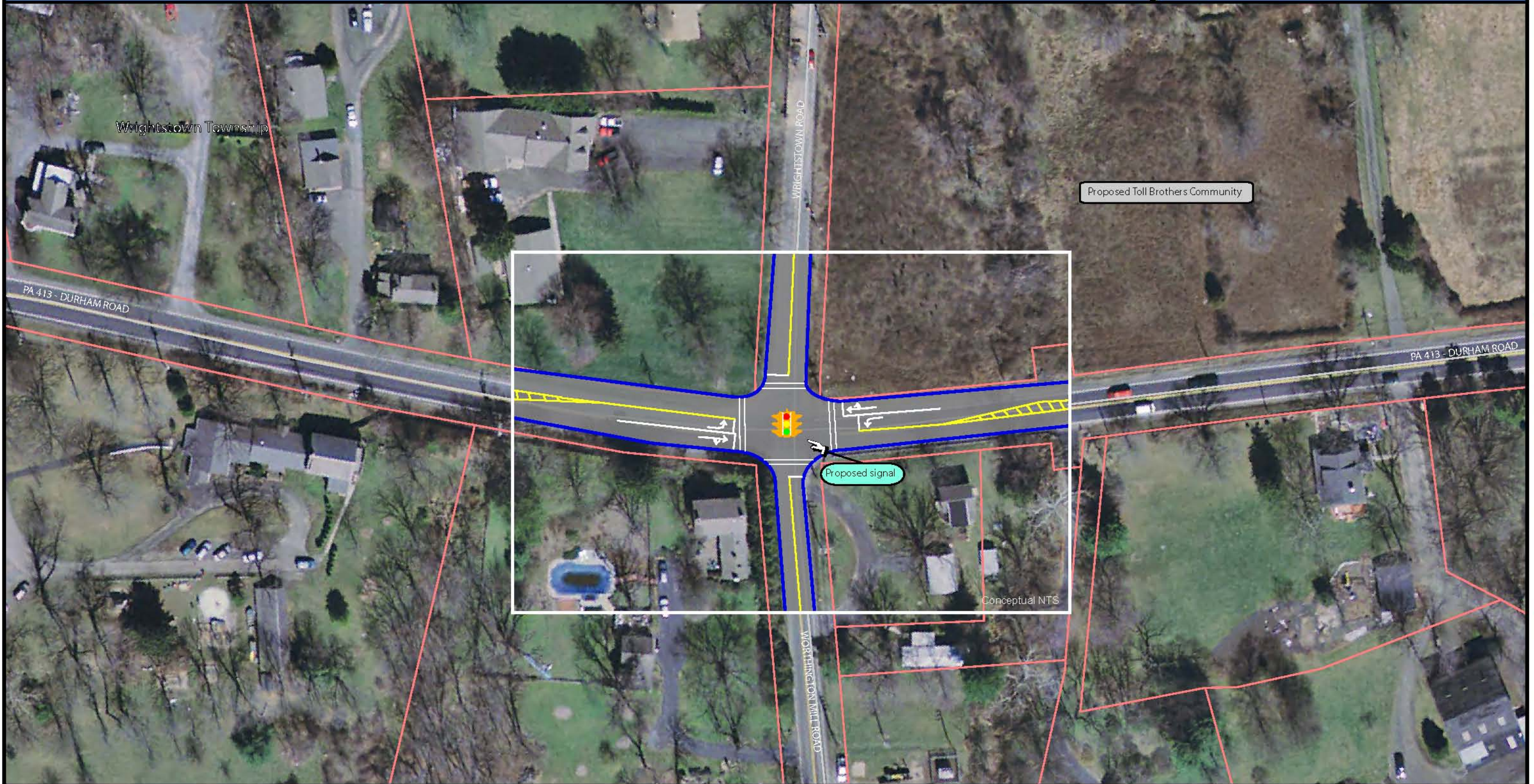

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 JUNE 2008*
 *Aerial photos from the year 2005

Access Management

-  Development
-  DVRPC Note
-  Traffic Flow
-  Median
-  Driveway Alignment
-  Driveway Closing / Shoulder
-  Signal
-  Cross Easement
-  Decorative / textured Crosswalk

Map Features








-  Municipal Boundary
-  Signalized Intersection
-  Local Road Network
-  Parcels



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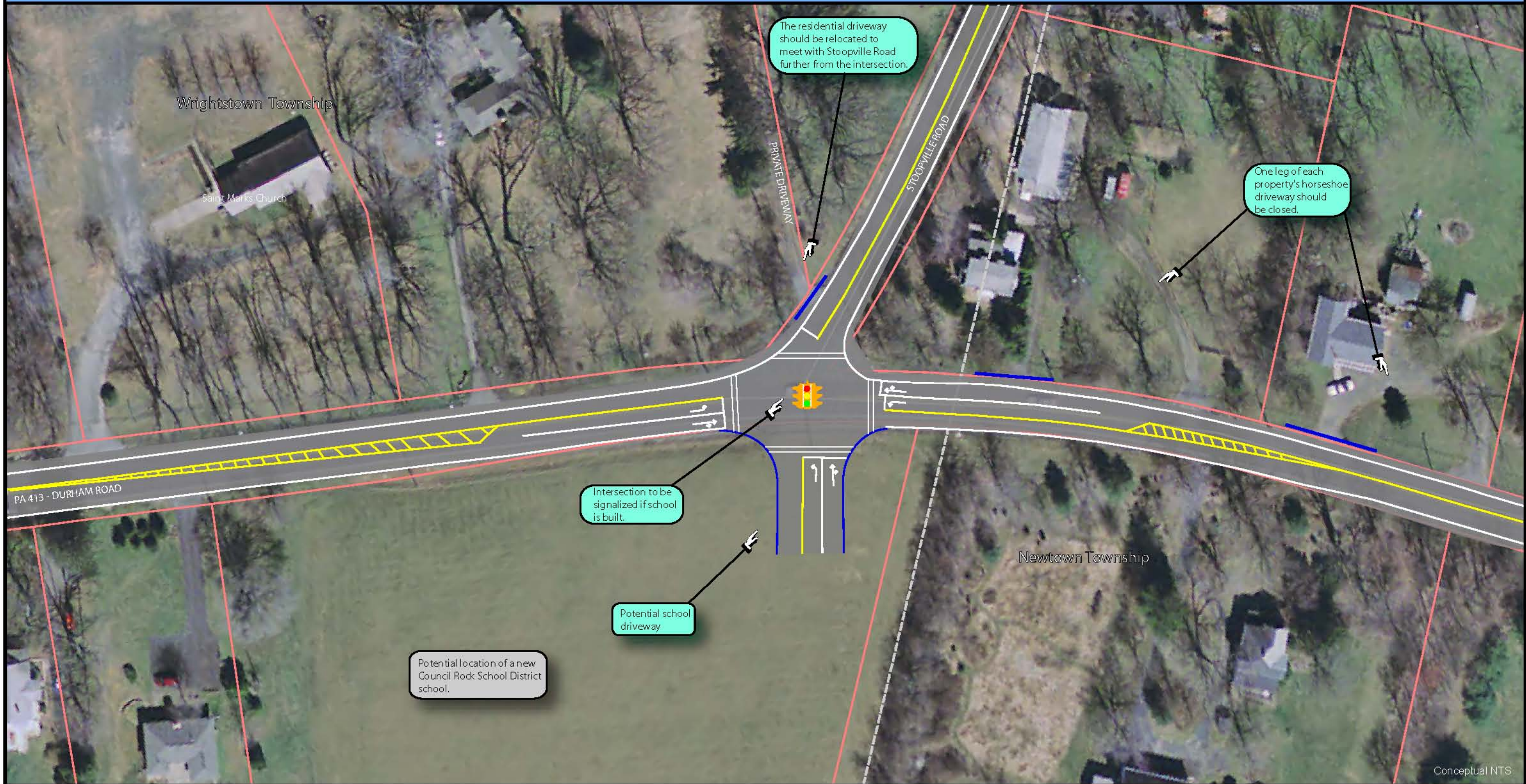
*Aerial photos from the year 2005

Access Management

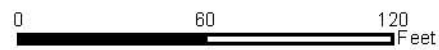
-  Development
-  DVRPC Note
-  Traffic Flow
-  Driveway Alignment
-  Driveway Closing / Shoulder
-  Signal
-  Cross Easement

Map Features

-  Municipal Boundary
-  Local Road Network
-  Signalized Intersection
-  Parcels



Conceptual NTS



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Access Management

- Development
- DVRPC Note
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- Driveway Alignment
- Driveway Closing / Shoulder
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Map Features

- Municipal Boundary
- Local Road Network
- Signalized Intersection
- Parcels

5. CONCLUSIONS and IMPLEMENTATION

This access management case study addresses a 4-mile-long congested segment of Durham Road (PA 413)—a two-lane, north–south, principal arterial highway traversing suburban and developing settings in Newtown and Wrightstown Townships, Bucks County, Pennsylvania.

Highway access management techniques were assembled into a conceptual plan for the corridor to improve safety and mobility and to prolong the highway’s serviceability in light of ongoing regional growth and development. The work was performed by DVRPC staff in support of PennDOT’s effort to promote planning for and application of access management procedures within the Commonwealth. The procedures are applicable to both state **and** local highways, and the strategies are most effectively delivered through municipal ordinances that govern the land development design, application, review and approval process. As such, principal guidance for developing the plan was obtained from PennDOT’s publication *Access Management Model Ordinances for Pennsylvania Municipalities Handbook*.¹⁰

The foundation of the conceptual access management plan for Durham Road lies within its classification as a principal arterial highway. Principal arterials should emphasize and provide for mobility for longer distance trips and through-travel, versus direct access to abutting property and local trips. Accordingly, to support its purpose and functional integrity for the foreseeable future, changes to property access, and recommendations for geometric improvements and traffic control were integrated into the plan. Within Newtown, the more developed portion of the corridor, current access designs and practices are established and well defined. More opportunities were identified in the Wrightstown portion of the corridor due to its developing nature.

Major physical elements contained in the conceptual plan include:

- Selected existing driveways along Durham Road should be closed or relocated and consolidated along the highway and within the functional areas of important intersections to reduce conflict points and simplify the driving experience.
- Potential future access points for developable properties were cited.
- Traffic signalization along PA 413 should be limited to intersections with public streets. Existing and *proposed* intersections for traffic signalization along the corridor are: PA 232, *Midland Road, Brownsburg Road, Penns Park Road, Wrightstown / Worthington Mill roads, Stoopville Road, North Drive, Wrights Road* and the Newtown Bypass. [Note: a minimum spacing of approximately 1,000 feet between traffic signals can be maintained with the identified configuration.]
- Primary development access should be directed to secondary cross streets or aligned with signalized public roads for safety. Cross easements through adjacent properties should be pursued and shared roadways constructed to manage traffic flow, to help warrant traffic signals, to direct left turning vehicles generated by multiple developments to the signalized locations for safer ingress and egress, and to minimize interruptions along PA 413.
- Absent the ability to access secondary roadways or proposed shared driveways aligned with the traffic signals; new full movement, primary development driveways should be spaced at intervals of 600 feet (minimum) along Durham Road.
- Auxiliary lanes, particularly center left turn lanes, are suggested along PA 413 at the signalized intersections to reduce conflicts and enhance corridor mobility. Pedestrian safety elements should

¹⁰ The document is available on-line at:

<ftp://ftp.dot.state.pa.us/public/bureaus/CPDM/WEB/Access%20Management%20Model%20Ordinances%20for%20PA%20Municipalities.pdf>

be addressed in the signalized intersection design (e.g., protected phasing and painted crosswalks).

- Minor or secondary driveways intersecting Durham Road should be designed for right turns only, with separate right turn deceleration lanes provided along the arterial.
- Internal development roadways between adjacent developments should be integrated to distribute vehicles more effectively, to reduce reliance on higher order highways (for local trips), and to encourage non-motorized travel.
- Sidewalks and/or multiuse trails should be provided along internal development streets, and along development frontages to serve non-motorized travel.

Recommendations for developed properties are achievable to the degree that changes in use and or ownership occur through redevelopment. Appropriately designed access for new development is a simpler task to accomplish, but both developed and developing parcels need to be recognized and addressed in the vision—to effect a comprehensive improvement for the corridor.

Desirably, because the municipality is responsible for land use decisions, implementation should formally take place through the municipal land development design, application, review and approval process and be formally made part of the plans (the Official Map, the Comprehensive Plan) and codes (as overlay districts in the Zoning Ordinance, and design requirements in the Subdivision and Land Development Ordinances) for both Wrightstown and Newtown. The access management model ordinance handbook contains a more extensive list of techniques and designs (than are represented in the conceptual plan for the Durham Road corridor) to consider in a formal municipal ordinance.

The ultimate access management plans and municipal access management regulations should be communicated and coordinated with the county and PennDOT. Similarly, access design reviews of actual development proposals should be sought. Acknowledgement and consideration by these experts in these matters will further empower the vision of the municipalities and improve opportunities for implementing the plan (e.g., as add-ons to transportation projects being constructed by others and/or to garner support where significant cost sharing assistance would be sought through the regional Transportation Improvement Program).

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DELAWARE VALLEY REGIONAL PLANNING COMMISSION

Publication Abstract

Title of Report: ACCESS MANAGEMENT ALONG PENNSYLVANIA HIGHWAYS IN THE DELAWARE VALLEY —
Case Study Corridor: Durham Road (PA 413),
Wrightstown and Newtown Townships, Bucks County, PA

Publication No.: 08098

Date Published: October 2008

Geographic Area Covered: Wrightstown and Newtown Townships in Bucks County, Pennsylvania.

Key Words: Access management, congestion management, traffic safety, accident mitigation, corridor planning, model ordinance, growth management

ABSTRACT: The evaluations summarized in this report were performed in support of PennDOT's statewide effort to promote the establishment of formal access management ordinances for state **and** local highways. A case study of Durham Road (PA 413), between PA 232 and the Newtown Bypass, was conducted and a conceptual plan prepared for a segment of Durham Road as a tangible illustration of the benefits of planning and implementing access management strategies; and as a means of combating congestion and enhancing traffic safety.

Principles and procedures outlined within PennDOT's *Access Management Model Ordinances for Pennsylvania Municipalities Handbook*, the Transportation Research Board's *Access Management Manual*, and the PennDOT / NJDOT *Smart Transportation Guidebook* were followed in developing the conceptual plan. The work was performed with the participation of staff from the Bucks County Planning Commission, PennDOT, and representatives from Wrightstown and Newtown townships.

Broadly described, the safety and mobility improvements suggested for the corridor included eliminating turning movements (by closing driveways or restricting movements), reducing through travel interruptions (by adding auxiliary turning lanes at traffic signals and providing a minimum of 1,000 feet between traffic signals), making vehicle entrances and exits to and from driveways and roadways more predictable (by supplying uniform spacing and better defined driveways, and provisions for shared access and integrated roadway, sidewalk and trail networks). Formal access management plans and codified ordinances are recommended, and close coordination with personnel from the PennDOT District 6-0 Traffic Unit and the Bucks County Planning Commission to secure the vision and benefits for PA 413 within Wrightstown and Newtown townships.

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HIGHWAY ACCESS MANAGEMENT

*Along Pennsylvania Highways
In the Delaware Valley*

Case Study Corridor:
DURHAM ROAD (PA 413)



Wrightstown



Newtown

Wrightstown and Newtown Townships, Bucks County, Pennsylvania



Delaware Valley Regional Planning Commission

OCTOBER 2008