
Chapter 6.0 Indirect and Cumulative Effects

6.1 Introduction and Methodology

This chapter identifies and describes the potential indirect (secondary) and cumulative effects of implementing any one of the Action Alternatives or recommended LPA design options.

Indirect effects are defined as “effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems” (40 CFR 1508.8(b)).

Cumulative effects are defined as the “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7). Cumulative effects include the direct and indirect impacts of a project together with the past, present, and reasonably foreseeable future actions of others.

This assessment is in accordance with the NEPA and Council on Environmental Quality (CEQ) regulations and is consistent with the CEQ’s 1997 *Considering Cumulative Effects under the National Environmental Policy Act*. The assessment follows the basic steps identified in the CEQ guidance:

- Identify resources of interest
- Establish geographic and temporal boundaries
- Determine past, present, and reasonably foreseeable future projects to be assessed as part of the indirect and cumulative effects analyses
- Assess indirect and cumulative effects to resources of interest within the defined geographic and temporal boundaries

This indirect effects assessment focuses on the station areas as the stations are where access to the Project service would be provided. The ability to access the proposed transit service directly relates to whether indirect development could occur because of the Project. The cumulative effects assessment examines the potential for the entirety or any part of the Action Alternatives or recommended LPA design options, including station areas, the guideway or other associated facilities, because the Action Alternatives or recommended LPA design options in combination with other activities can result in cumulative effects on the natural and human environment. When the potential effects of each Action Alternative and recommended LPA design options are similar, the discussion in this chapter covers all Action Alternatives and recommended LPA design options by referring to the Project in general. Where effects differ

among the Action Alternatives and recommended LPA design options, specific discussion of each is provided.

The primary data sources included demographic data and projections, land use/land cover data, local land use plans, and information on planned development projects. The analysis employed a combination of methodologies to assess indirect and cumulative effects. These techniques included trend analysis and mapping analysis to assess patterns of past, existing and future land use and the effects of development on resources of interest.

6.1.1 Resources of Interest

Resources selected for analysis are those that would be affected directly by the Action Alternatives or recommended LPA design options, those that would be affected by potential Project-related indirect development associated with the station areas and those that are particularly susceptible to effects from other foreseeable projects over time that, in aggregate, result in a cumulative effect. Transportation is presented in this analysis in terms of the role it plays in affecting other resources. The resources assessed in the indirect and cumulative effects analysis are the following:

- Transportation Systems and Facilities
- Human Environment
 - Community Facilities
 - Parks, Recreational Land and Open Space
 - Historic and Archaeological Resources
 - Visual and Aesthetic Resources
 - Air Quality
 - Noise
 - Vibration
 - Energy
 - Environmental Justice
- Natural Environment

Resources that are not assessed in this indirect and cumulative effects analysis are those, such as hazardous materials, which would not be affected indirectly by the Action Alternatives or recommended LPA design options and are not particularly susceptible to cumulative effects from other foreseeable projects.

6.1.2 Geographic Study Areas

In general, indirect impacts of the Action Alternatives or recommended LPA design options would be localized on and around the station areas because potential indirect effects typically occur in close proximity to the parts of a transit project where access is provided to the transit service. In this context, the indirect effects study area for the Action Alternatives and

recommended LPA design options is defined by geographic areas one-half mile around each station area. One-half mile is the generally accepted maximum distance that transit patrons would walk to a transit service, based on an average walking speed between 2 and 3 miles per hour and a 10-minute time period. This “walkshed” standard encompasses an area of about 500 acres. Figure 6-1.1 shows the indirect effects study area as a composite of the one-half mile distances around the station areas of all Action Alternatives and recommended LPA design options.

The cumulative effects study area differs from the indirect effects study area because it encompasses resources that are potentially affected by multiple projects considered in aggregate. For example, the effect of multiple projects on community facilities such as parks should be examined at the municipal level to determine the effect of all projects on the inventory and availability of such facilities to Township residents. In this assessment and as shown in Figure 6-1.1, three cumulative effects study areas have been defined to appropriately assess the resources of interest:

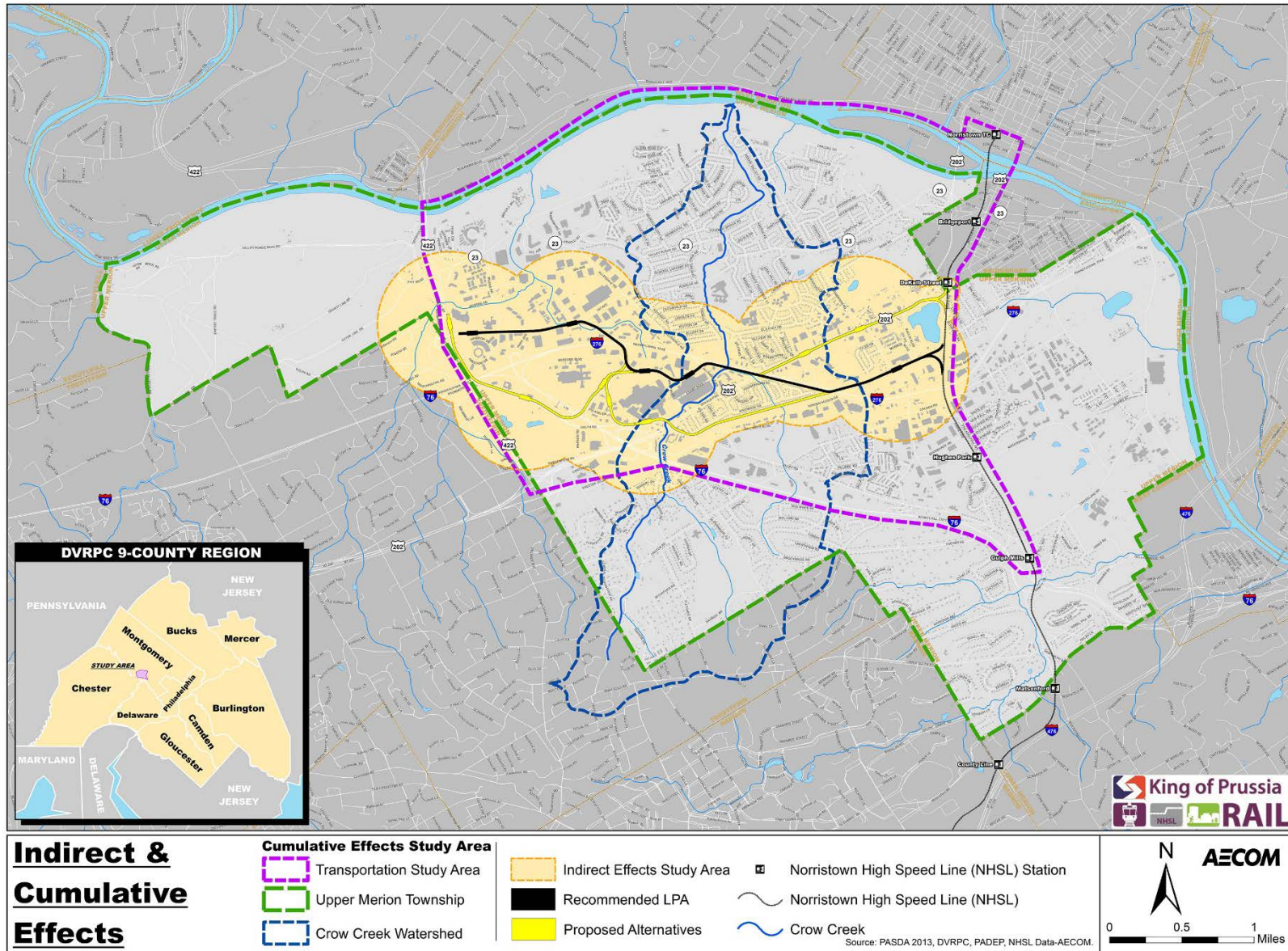
- Upper Merion Township boundary - The municipal boundary contains the transportation study area and Project study areas within which the following resources are analyzed in the DEIS: transportation, historic and archaeological resources, visual impacts, noise and vibration impacts and environmental justice.
- Watershed boundary – Crow Creek is the drainage area within which four of the Action Alternatives would potentially impact wetlands near the creek’s crossing under I-276. Examining the potential impacts of the Project and other projects on the wetlands in the watershed is helpful in evaluating the potential for cumulative change or loss of wetlands functions in that watershed.
- DVRPC’s nine-county region¹ - DVRPC as the source for data on vehicle trips in the Greater Philadelphia region, NHSL ridership and transit boardings in the NHSL service area, provides context for air quality and energy use as measured by change in VMT.

6.1.3 Temporal Boundaries

The timeframes for the cumulative effects analysis range from the 1950’s in the past to 2040 in the future. The 1950’s coincides with the beginning of the post-World War II suburban housing boom that led to significant outmigration from Philadelphia, suburban development including the King of Prussia Mall, and the convergence of the PA Turnpike, Schuylkill Expressway, US Route 422, and US Route 202 at King of Prussia (Section 4.7). Present actions are those defined to occur through 2020, as 2020 is the latest year that county-level capital improvement project and budget information is available. Future actions (after 2020) are those that can reasonably be anticipated based on DVRPC long-range planning documents.

¹ DVRPC’s nine-county region includes the counties of Bucks, Chester, Delaware, Montgomery and Philadelphia in PA as well as Burlington, Camden, Gloucester and Mercer Counties in NJ.

Figure 6-1.1: Indirect and Cumulative Effects Study Areas



6.1.4 Past, Present, and Reasonably Foreseeable Future Projects

Following the end of World War II in 1945, the trend of suburbanization accelerated nationwide. While outlying areas remained generally more rural in nature, suburban development in King of Prussia began to increase. Initially, transportation access constraints limited growth, but significant efforts by federal and state agencies began to improve regional mobility. With better transportation access, residential development increased and will continue to increase as evidenced by the population data in Section 4.2.2.

6.1.4.1 Land Development Projects

Due to the already developed nature of most land in King of Prussia, the primary type of development activity occurring today is redevelopment of lands previously converted to human uses. The redevelopment activity at the Village at Valley Forge is an example of redevelopment in the transportation study area. In the case of the Village, the former use of the land was a golf course.

Upper Merion Township identifies planned development projects in meeting memoranda and other resources on their website. Table 6-1.1 lists these projects, which include land development and redevelopment projects, most of which are within the transportation study area. If the planned development is near a proposed Project station, the name of the station is indicated. Many of the projects are at the Village at Valley Forge, which would be served by the N. Gulph Station in the PECO/TP-N. Gulph or US 202-N. Gulph Action Alternatives. Notably, six of the planned projects are not located near a proposed Project station. If each of these projects is implemented, the stock of residential and non-residential development in Upper Merion Township, particularly in the transportation study area, will increase.

It is important to understand that actual development may not occur at the densities proposed by current plans. In addition to the possibility that the plans may be revised, future development may be limited by various factors including market conditions, developer preferences, environmental permitting issues, and infrastructure availability. Future development may also be greater than forecasted depending on the same factors.

Table 6-1.1: Planned Development Projects in Upper Merion Township

Applicant	Proposed Development	Proximity to Project Station	Board of Supervisors Approval Date
401 N. Gulph Road Realen Valley Forge Greenes Associates	132-townhome development at the Village of Valley Forge	N. Gulph	9/17/15
401 N. Gulph Road Realen Valley Forge Greenes Associates	339-unit multifamily residential building at the Village of Valley Forge	N. Gulph	7/16/15
751 Vandenberg Road Mirabella Investment Properties, L.P.	311-unit multifamily residential units, 1,500 SF retail space in the King of Prussia Mixed Use District	No	9/17/15
Next Door Bar and Grill Village at Valley Forge	10,818 SF free standing restaurant	N. Gulph	11/12/15
Restaurant Pad King of Prussia Mall	8,400 SF restaurant pad, north side of the King of Prussia Mall, south of Mall Boulevard	Court or Mall Blvd North	11/12/15
Bozutto Development	232-unit multifamily residential building on the VR-3 site at Village at Valley Forge	N. Gulph	12/3/15
611 W DeKalb Pike DKF11, LLC	Consolidate 611 W DeKalb and 107 Forge, demolish structures, construct 18,000 SF retail building	No	1/14/2016
AVE King of Prussia	276-unit multi-family building at the Village at Valley Forge	N. Gulph	1/14/2016
2901 Renaissance Boulevard	300-unit multi-family residential building	No	Under review
GSK Building 400	Demolish existing warehouse buildings, construct 60,650 SF warehouse	No	7/21/2016
Conlin Copy Center	6,469 SF building addition and truck dock	1 st & Moore	9/22/2016
750 Moore Road	248-unit apartment building	No	9/22/2016
VR5 Hanover	339 residential units at Village at Valley Forge	N. Gulph	12/1/2016
Mancill Mill Final	112-unit hotel; preliminary development approval	No	Under review
Doubletree Hotel	Retail development along US Route 202	DeKalb Plaza	Conceptual plan, no formal application
Woodspring Suites 651 Park Ave.	4-story hotel	1 st & Moore	Reviewed at workshop meeting in Nov. 2016

Source: Upper Merion Township website, accessed December 2016.

6.1.4.2 Transportation Projects

The following are major transportation projects that contributed to the changes in land use patterns and resource context in the King of Prussia area of Upper Merion Township since World War II. The confluence of these several transportation projects increased the accessibility of the King of Prussia-Valley Forge area to Philadelphia as well as locations to the west:

- US Route 202 – Consisting of various older roads between Bangor, Maine and State Road, Delaware, US Route 202 was officially and uniformly numbered by the American Association of State Highway Transportation Officials (AASHTO) in 1934.
- I-276, Pennsylvania Turnpike – Although parts of the Pennsylvania Turnpike were initiated in the 1930's, it was not until 1950 that the Turnpike was extended east as far as Valley Forge. In 1954, the Turnpike was extended from Valley Forge to the Delaware River, completing its cross-state route.
- I-76 (Schuylkill Expressway) – Completed in 1949, the “Schuylkill” connects the King of Prussia-Valley Forge area with Philadelphia in a north-to-south orientation. It was originally planned to tie into the east end of the Pennsylvania Turnpike at Valley Forge before the extension to the Delaware River was built.
- US Route 422 – Comprised of two segments in Ohio and PA, and originally made up of older roads, US Route 422 is a spur route of US Route 22. The eastern spur extends from Hershey to Valley Forge. Reconstruction of the US Route 422 eastern spur to a multi-lane highway in the 2000's was spurred by increases in traffic volumes.
- Norristown High Speed Line – The NHSL began rail service in 1907 as the Philadelphia and Western Railway. At the time it ran from 69th Street in Upper Darby to Strafford. It was extended to Norristown in the 1930's. SEPTA began service on the line in 1969.

Table 6-1.2 lists planned transportation projects in Upper Merion Township as reported in the DVRPC's adopted *FY2017 Transportation Improvement Plan* for Pennsylvania. This table includes planned projects in the DEIS transportation study area as well as planned projects in other areas of Upper Merion Township. With the exception of the County's planned Chester Valley Trail Extension, each project is a road-based project intended to increase capacity, resolve operational constraints or address maintenance issues.

Table 6-1.2: Planned Transportation Projects in Upper Merion Township

Project	Type	Description
Transportation Study Area		
New US Route 422 Bridge crossing over Schuylkill River	Highway	New 4-lane bridge westbound; replace bridge eastbound.
Widen US Route 422 from US Route 202 to PA 363	Highway	Widen this 2-mile segment from 4 lanes to 6.
Full interchange at US Route 422 and PA 363	Highway	Complete to a full interchange, with movements in both directions.
PA Turnpike widening from Morgantown exit to Valley Forge	Highway	Widen to 6 lanes throughout.
Lafayette Street extension and new Turnpike exit in Norristown	Highway	Construction on extension underway. Construction on Turnpike exit could start in 2018.
1 st Avenue Streetscape and Multi-use Trail (known also as the 1 st Avenue Road Diet project)	Multimodal	Funded through statewide TAP program. Road Diet, streetscaping and multi-use trail along the length of 1 st Avenue to enhance multi-modal access.
Relocate PA 23/Valley Forge Road and N. Gulph Road	Highway	Move roadway 300 feet east of current entrance with Valley Forge National Historical Park to improve operations and reduce traffic impacts at the entrance to the Park, and create a new Gateway entrance.
Widen Henderson Road and South Gulph Road	Highway	Widen South Gulph Road from Crooked Lane to I-76 intersection at Gulph Mills, and widen Henderson Road from South Gulph Road to Shoemaker Road.
Chester Valley Trail Extension	Multimodal	Extend the Chester Valley Trail to connect with the Schuylkill River Trail in Norristown, a 3.5 mile extension.
Elsewhere in Upper Merion Township		
Replace Church Road bridge over NHSL	Highway	Address bridge conditions
PA 320 rehabilitation	Highway	Address roadway conditions at Hanging Rock
Reconstruct portion of Valley Forge Road	Highway	Address roadway conditions between Moore Road and Geerdes Boulevard

Source: DVRPC, FY2017 Transportation Improvement Plan for Pennsylvania (FY2017-2020), adopted on July 28, 2016.

6.2 Indirect Effects Assessment

It is reasonable to expect that the new transit access provided by any one of the Action Alternatives or recommended LPA design options would enhance and encourage development and redevelopment near station areas in terms of timing, scale of planned projects, or geographical extent because of the connections, convenience and reliability the new service would provide. The Project would be available to transport a customer and population base for

future development in the King of Prussia and Upper Darby areas. The Project would provide additional transportation capacity as an alternative to travel on existing, congested roadways.

The potential for development to occur around proposed station areas as a result of any one of the Action Alternatives or recommended LPA design options was assessed by examining the Upper Merion Township zoning ordinance for transit-supportive provisions, including allowable density, provisions for pedestrians and parking policies. Several zoning classifications allow greater development intensity, such as KPMU, SC-Shopping Center, C-O-Commercial Office and LI-Light Industry, compared to other zoning designations. Using GIS analysis, the amount of square footage of higher intensity development allowable within a ½-mile radius of each proposed station area was calculated. Table 6-2.1 reports the results of this assessment. Land within ½ mile of proposed station areas in the King of Prussia Business Park and the King of Prussia Mall area has the potential for more square feet of higher density/intensity development compared to land around other proposed stations. In particular, the 1st & Moore, 1st Ave. East and Mall Blvd West station areas have the largest areas of higher intensity zoning within a ½ mile radius (19.4, 18.6 and 18.8 million square feet, respectively). In contrast, the DeKalb Plaza and Court stations have the smallest areas of higher intensity zoning within ½ mile radius (5.1 and 9.6 million square feet, respectively).

In addition to zoning implications for future redevelopment, planned and recent projects within ½ mile of proposed stations areas may also be an indicator of future redevelopment potential. For example, the 1st & Moore, 1st Ave East and Convention Center station areas are within or near limits of Upper Merion Township's 1st Avenue Road Diet project. In addition, each is near the American Baptist Churches property on the south side of 1st Avenue and the Devon property at 1100 1st Avenue, which are identified as having potential for future redevelopment.

In their 2015 report, *Understanding the Economic Impacts of SEPTA's Proposed King of Prussia Rail Project*, the Economy League of Greater Philadelphia notes that growth in resident and worker populations, caused by the Project as well as redevelopment spurred by Upper Merion Township actions, would potentially change the types of business sectors, income levels, and the commute to work pattern, as well as increase the numbers of visitors to the transportation study area. Thus, future development with any one of the Action Alternatives or recommended LPA design options could be greater than with the No Action Alternative, resulting in economic benefits and potential indirect effects on the human and natural environment.

As described in Sections 4.3.3.2 and 8.4.2, the Action Alternatives and recommended LPA design options would differ from one another in the extent of future redevelopment potential each would have. Those with station areas along 1st Avenue would have higher future redevelopment potential than those with station areas along N. Gulph because the 1st Avenue area is centrally located in the King of Prussia Business Park and the KPMU zoning district. Specifically, the recommended LPA, each recommended LPA design option, the PECO-1st Ave. and US 202-1st Ave. Action Alternatives have station areas along 1st Avenue, resulting in higher future redevelopment potential than the PECO/TP-N. Gulph and US 202-N. Gulph Action Alternatives.

Table 6-2.1: Areas of Potential Higher Intensity Zoning Within ½ Mile of Proposed Station Areas

Station Areas	Existing and Potential Land Use (Zoning as of 9/2016)	Land Area Zoned for Higher Intensity Development Within ½ Mile of Station Areas (SF millions)				
		PECO-1st Ave.	PECO/TP-1st Ave. (recommended LPA)	PECO/TP-N. Gulph	US 202-1st Ave.	US 202-N. Gulph
Convention Center (park-and-ride)	Office/hotel/light industry (KPMU)	-	-	11.3	-	11.3
Court (kiss-and-ride)	Office/hotel/light industry (Shopping Center/Commercial)	-	9.6	9.6	9.6	9.6
DeKalb & Henderson (kiss-and-ride)	Retail/office/hotel/village residential (Commercial/Village Residential)	-	-	-	12.4	12.4
DeKalb Plaza (kiss-and-ride)	Retail/office/hotel/village residential (Shopping Center/Commercial/Residential)	-	-	-	5.1	5.1
1 st & Moore (park-and-ride)	Office/hotel/light industry (KPMU)	19.4	19.4	-	19.4	-
1 st Avenue East (kiss-and-ride)	Office/hotel/light industry (KPMU)	18.6	18.6	-	18.6	-
Henderson Road (park-and-ride)	Office/hotel/light industry/ village residential (Heavy Industrial/Commercial/ Residential)	10.3	10.3	10.3	-	-
Mall Blvd North (kiss-and-ride)	Office/hotel/light industry (Shopping Center/Commercial)	-	13.7	13.7	13.7	13.7
Mall Blvd West (kiss-and-ride)	Office/hotel/light industry (Shopping Center/Limited Industrial/Commercial)	-	-	18.8	-	18.8
North Gulph (kiss-and-ride)	Office/hotel/light industry (Commercial/Court approved master plan development)	-	-	16.7	-	16.7
Plaza (kiss-and-ride)	Office/hotel/light industry (Shopping Center/Commercial)	12.9	-	-	-	-
Plaza West (kiss-and-ride)	Office/hotel/light industry (Shopping Center/Limited Industrial/Suburban Metropolitan)	16.4	-	-	-	-

Notes: “-“ indicates station areas would not be provided by a particular Action Alternative.

Source: AECOM, 2016.

6.2.1 Human environment

While not the sole or primary driver of change, the Project would contribute to social and economic forces that transform the indirect effects study area over time. The effects of development and redevelopment could include changes in housing values and affordable housing opportunities, increased employment opportunities, greater availability of consumer goods and services, changes to business revenues and operations, changes in neighborhood character (such as noise and visual change), and changes in demand for community facilities and parks. These potential impacts could be felt most acutely by environmental justice populations in this indirect effects study area because environmental justice populations tend to be more sensitive than non-environmental justice populations to changes in housing values

(rents), changes in their business revenues and operations, and the availability of employment and public transportation.

Studies of the effect of transit on property values using sales data typically have indicated increases in residential real estate values in close proximity to stations, with a reduced influence beyond a one-half mile radius². This premium depends on several factors, including the design of the station, the level of ridership, local real estate market conditions, neighborhood characteristics, and adjacent land uses. These economic effects can be both a benefit and a burden. While the Project may help communities achieve positive economic growth, the diversity and the economic needs of the entire community must be considered. During evaluation of the Action Alternatives and recommended LPA design options, SEPTA has been engaged with Project study area residents to understand their concerns. SEPTA will continue working with the Township regarding the effects of land use changes on residents.

Planned development and redevelopment projects have the potential to threaten historic and archaeological sites and may increase demands on community facilities.

6.2.2 Natural environment

Indirect impacts on the natural environment from additional development could occur, such as increased energy use, stormwater runoff and water quality impacts resulting from impervious surfaces.

6.3 Cumulative Effects Assessment

Past and present land use patterns in the cumulative effects study area tend to be suburban in character within Montgomery County, but more rural and agricultural in the western extent of the Schuylkill River drainage area. Foreseeable future development and infrastructure projects are programmed by their sponsors to occur independently of the Project, though as described in Section 6.2 above, each of the Action Alternatives and recommended LPA design options may have a catalytic effect on the pace, scale and geographic extent of development within King of Prussia. This effect has the potential to contribute incrementally to the overall human and natural environment effects of all past, present, and reasonably foreseeable actions in the cumulative effects study area. Specifically, population and employment growth in the cumulative effects study area, supported by township and county planning and zoning actions, in conjunction with each Action Alternative or recommended LPA design option, is expected to have the following consequences:

6.3.1 Transportation Systems and Facilities

Increased local travel demand, traffic congestion, and demand for transit services are anticipated to occur. Past and present transportation projects have formed a network of local and regional roadways designed to connect King of Prussia as a focal point of activity with the Greater Philadelphia area and areas west of King of Prussia using road-based transportation

² "Public Transportation Boosts Property Values" in *Transportation: A Toolkit for Realtors* 2nd Edition, National Association of Realtors, 2012, updated 2014
<http://www.realtor.org/articles/public-transportation-boosts-property-values>

such as bus and automobile. Future projects, other than the proposed Project, will primarily serve to address congestion and constraints in the existing roadway network. Each Action Alternative or recommended LPA design option would help to satisfy the demand for transit access to and from King of Prussia and would transfer some demand from private vehicles to transit service. Among the Action Alternatives, as described in Section 3.1.3.2, the recommended LPA and the PECO/TP-N. Gulph Action Alternative would provide the highest ridership increase (9,500 average weekday riders each) compared with the PECO-1st Ave. (8,500 average weekday riders), US 202-1st Ave. and US 202-N. Gulph Action Alternatives (7,500 average weekday riders each).

As described in Section 3.1.3.2 the factors affecting ridership increase are the number and locations of proposed stations, the relative length of each Action Alternative, the types and densities of planned development, and the locations of other stations. Each of these factors also contributes to the differences in forecasted ridership increases between the Action Alternatives.

Also as described in Section 3.1.3.2, each Action Alternative would affect average weekday transit boardings on other transit services in the NHSL service area, including connecting transit services. For example, the Project would increase transit boardings not only on the SEPTA NHSL but also on the SEPTA Market-Frankford Line, which connects the NHSL at 69th Street Transportation Center to Center City Philadelphia. Transit boarding increases are also expected on the SEPTA Frontier Bus division as well as SEPTA 101 and 102 Trolleys as a result of the Project. Each Action Alternative would decrease transit boardings on the SEPTA Victory Bus division and Regional Rail services. These changes potentially could result in adjustments being made to affected transit services in the long-term.

The potential construction impacts of the US 202-1st Ave. or US 202-N. Gulph Action Alternatives were identified by the public and Township as a concern. Specifically, the problems of access and roadway congestion that occurred during reconstruction of the US Route 202 overpass of the PA Turnpike were impactful to the King of Prussia community. Although none of the Action Alternatives being considered in the DEIS would cause the same type of disruption the overpass project caused in terms of US Route 202 closure at the bridge, some construction impacts would occur. Among the Action Alternatives and recommended LPA design options, the US 202-1st Ave. or US 202-N. Gulph Action Alternatives would potentially contribute the largest share of cumulative effects because the guideway would be aligned along and within the US Route 202 ROW. The PECO/TP-1st Ave. Action Alternative, the recommended LPA design options or the PECO/TP-N. Gulph Action Alternative would cross over US Route 202 at the PA Turnpike. The PECO-1st Ave. Action Alternative would cross over US Route 202 at the Gulph Road intersection. These Action Alternatives and recommended LPA design options would have considerably less potential for cumulative construction phase impacts on US Route 202.

The Project and the PA Turnpike interchange project at Lafayette Street in Norristown are in geographically distinct areas approximately three miles apart and do not overlap. However, each project could potentially affect travelers on the PA Turnpike if the construction phases of each project are underway concurrently. Specifically, the proximity of the two projects would warrant coordination between SEPTA and the Turnpike Commission in terms of signage and construction area motorist alerts.

6.3.2 Community Facilities

Increased pressure on public infrastructure and services would occur as a result of the Project. County and local land use plans and regulations serve to direct future growth and limit excessive pressure on public facilities and services. The large number and scale of planned projects listed in Table 6.1-1 could place additional demands on community facilities, a factor Upper Merion Township must take into consideration as they review development applications. As the Project is included in county and local plans, its demands on infrastructure in the context of other planned projects is incremental and would be accounted for in future infrastructure planning, such as safety.

6.3.3 Parks, Recreational Land and Open Space

Increased demand and capacity pressure on public parks and recreation facilities in the region would occur as a result of the Project. Due to limited land availability and funding for acquisitions, future park improvements by the township, county and National Park Service are geared toward investing in and encouraging the use of already protected land to meet recreational demands. Given the large amount of planned land development in the Township, which will increase the residential population of the Township and demand on parks, a long-term decrease in the ratio of park and recreation land area to population could result. To offset this decrease, the Township and County may have to allocate funding to increase the number and size of parks, recreational land and open space in the transportation study area. The Action Alternatives would provide access to some parks and, depending on the Action Alternative or recommended LPA design options, could impact park land and facilities. However, the impact of the Project on parks, recreational land and open space as described in Section 4.6.3 would be incremental in the context of other planned projects.

6.3.4 Historic and Archaeological Resources

A cumulative effect on known historic properties potentially would occur as a result of the Project. Among the planned projects, improvements to US Route 422 and PA 23 have the potential to cumulatively affect the adjacent Valley Forge National Historical Park through direct physical impacts or visual changes. None of the Action Alternatives or recommended LPA design options would contribute to these potential cumulative effects on VFNHP as none would directly impact the Park or cause visual changes that would affect the Park.

The PECO/TP-N. Gulph or US 202-N. Gulph Action Alternatives in conjunction with the PA Turnpike widening project from Valley Forge to Morgantown have the potential to cumulatively affect the historic PA Turnpike: Philadelphia Extension corridor. Ground disturbance at the N. Gulph Road location where these two projects intersect has the potential to cumulatively affect archaeological resources if present. If one of these Action Alternatives is selected, Section 106 consultation for the Project will consider the potential cumulative project effects prior to FTA making a formal determination of effect.

The remaining Action Alternatives, including the recommended LPA and recommended LPA design options, would not contribute to cumulative effects on historic resources as none of the historic resources identified and described in Section 4.7 would be adversely impacted.

6.3.5 Visual and Aesthetic Resources

The assessment of potential cumulative visual and aesthetic impacts focused on the Project in combination with the other planned projects within the viewshed of the Project, such as the 1st Avenue Road Diet and Chester Valley Trail Extension. The proposed Chester Valley Trail Extension will be a ground level multi-use path that is unlikely to create a visual change in the Project study area. However, the Action Alternatives and recommended LPA design options that would use 1st Avenue, namely the recommended LPA, each recommended LPA design options, the PECO-1st Ave. or US 202-1st Ave. Action Alternatives, in conjunction with Upper Merion Township's 1st Avenue Road Diet project would cumulatively change the visual appearance of 1st Avenue between the VFCR and American Avenue. As described in Section 4.8.3.2, each of these Action Alternatives would be a new visual element in the 1st Avenue corridor. The Township would reconfigure travel lanes on 1st Avenue, adding a center median with streetscaping and sidewalks alongside the roadway. The combination of the two projects would change the wide, multi-lane roadway appearance of 1st Avenue to a multi-featured transportation corridor with the roadway and sidewalks at ground level and the elevated Project guideway and stations overhead.

6.3.6 Air Quality

Air quality characteristics in Upper Merion Township are influenced primarily by emissions from road-based transportation as well as regional power generation. Forecasted future land development will potentially increase VMT and emissions from road-based vehicles and power generation over time. While planned roadway capacity improvement projects will help to accommodate VMT growth, congestion and road-based vehicle emissions will likely increase. As indicated in Section 4.9.3.2, each Action Alternative would reduce growth in VMT by diverting some travelers to rail transit. By reducing VMT, the Project would have a positive net benefit on air quality. Among the Action Alternatives, the extent of VMT reduction would differ as a function of several factors, particularly the location of proposed station areas and the provision of one or two park-and-ride facilities. The recommended LPA and the PECO/TP-N. Gulph Action Alternative would provide the most reduction in automobile VMT per year (17.5 and 18.4 million miles). The PECO-1st Ave and US 202-1st Ave. Action Alternatives would provide slightly less annual VMT reduction (16.1 million miles each), and the US 202-N. Gulph Action Alternative would provide the least annual VMT reduction (14.6 million miles). Thus in a cumulative effects context, each Action Alternative would provide an incremental air quality benefit.

6.3.7 Noise and vibration

The assessment of potential cumulative noise and vibration impacts focused on each Action Alternative and recommended LPA design option in combination with the other planned projects within 150 feet of the Project, the distance within which a potential noise impact from the Project could potentially occur (Section 4.10.3.2). The geographic area within which potential vibration impacts could occur is smaller, 65 feet as reported in Section 4.10.3.2, and is within the larger noise impact area. Within these distances are two planned transportation projects: the 1st Avenue Road Diet and the Chester Valley Trail Extension. The proposed Chester Valley Trail Extension will be a ground level multi-use path that is unlikely to contribute to a cumulative noise or vibration change. However, the Action Alternatives and each recommended LPA

design options that would use 1st Avenue and the Township's 1st Avenue Road Diet project could cumulatively change noise levels along 1st Avenue between the VFCD and American Avenue. Action Alternatives that do not use 1st Avenue would not contribute to cumulative changes in noise. As described in Section 4.10.3.2, no potential for direct vibration impacts is expected to occur with each Action Alternative and recommended LPA design options, except the PECO-1st Ave. Action Alternative. Consequently, no cumulative effect would occur with these alternatives. No cumulative vibration impact is anticipated to occur with the PECO-1st Ave. Action Alternative as no other projects are close enough to Kingwood Road Park to cause the potential for a vibration impact.

Concurrent construction activities could occur if the Township's 1st Avenue Road Diet project and an Action Alternative or recommended LPA design options using 1st Avenue is selected (the recommended LPA, each recommended LPA design options, PECO-1st Ave. or US 202-1st Ave.). Similarly, a construction phase cumulative noise or vibration impact could occur if the County's Chester Valley Trail Extension is built at the same time as any one of the Action Alternatives. The combined construction noise and vibration impacts would occur along the PECO corridor, if the PECO-1st Ave. Action Alternative were selected, or at the point where the trail crosses US Route 202 (with the US 202-1st Ave. or US 202-N. Gulph) or Saulin Boulevard (with the recommended LPA, PECO-1st Ave. or PECO/TP-N. Gulph). As SEPTA develops the construction plan for the Project, it will consider the relationship of the activities with that of other project sponsors and work to avoid or minimize temporary, cumulative effects including noise and vibration.

6.3.8 Natural environment

Past and present development in the cumulative effects study area has impacted natural resources by converting forests, undeveloped land, and water resources including wetlands to manmade uses. Examples of impacts of past and present development impacts on the natural environment include the placement of Crow Creek in an underground pipe under the King of Prussia Mall property and conversion of portions of previously pervious soils on the Village at Valley Forge property to impervious building and pavement cover. Most land area within the Crow Creek watershed between the Schuylkill River and the edge of Tredyffrin Township has been converted to residential or non-residential development. These conditions have reduced the area of natural floodplains and ecosystems that manage flooding, support good water quality and sustain natural productivity.

Examining the Crow Creek watershed indicates that several planned land development and transportation projects will occur aside from the Project: Restaurant Pad at King of Prussia Mall, 611 West DeKalb Pike redevelopment, Doubletree Hotel retail development along US Route 202, the Chester Valley Trail Extension, and reconstruction of the portion of Valley Forge Road between Moore Road and Geerdes Boulevard. Each of these projects, as well as any one of the Action Alternatives or recommended LPA design options would primarily redevelop already developed land. For example, development of the restaurant pad site at the King of Prussia Mall would replace a paved area with a building. In another example, reconstruction of Valley Forge Road would occur along the existing roadway corridor. Although some cumulative reduction in Crow Creek natural areas (wetlands, for example) could occur with implementation of all planned projects, the impact of any one project, including the Project, would be incremental.

Potential impacts on natural resources including wetlands are governed by federal, state, and local laws and regulations, which are intended to guide development to prevent or minimize degradation or loss of natural resources on which human health and welfare depend.

As described in Sections 4.11, each Action Alternative or recommended LPA design option would potentially affect natural resources, including forests, adding new impervious surfaces and affecting wetlands. For example, each Action Alternative and recommended LPA design option would add impervious pavement surface at proposed park-and ride facility sites. The cumulative effect of the Project and other projects is the continuation of the suburbanization process begun in 1945. The role of each Action Alternative and recommended LPA design option is incremental in the larger context of past, present and reasonably foreseeable development effects. As the Project design advances and in consultation with regulatory agencies, SEPTA will examine ways to avoid or minimize natural environment impacts and will mitigate Project-related impacts as required by federal and state laws.

6.3.9 Energy Use

Suburbanization of the study area and its attendant increase in housing since the end of World War II has increased energy needs to power and heat buildings, fuel automobiles and buses, and provide communications, to name a few types of energy use. Currently committed transportation projects, other than the Project and the Chester Valley Trail Extension, are focused on accommodating existing and future road-based travel. Growth in the number of automobiles and other road-based vehicles will increase demand for fuel. Foreseeable development, such as the Village at Valley Forge will incur greater energy demands than those experienced today. As indicated above for air quality, the Project would reduce VMT despite all other planned transportation projects being implemented. Thus, the Project would have a positive net benefit on reducing energy consumption.

6.3.10 Environmental Justice (EJ)

Past, present and reasonably foreseeable projects considered individually or cumulatively, could have benefits and/or impacts on all Project study area populations as described in the DEIS, such as increasing or decreasing affordable housing opportunities, changing employment opportunities, affecting business operations, changing neighborhood character, changing the availability of consumer goods and services, and changing natural resources. As reported in Section 4.14.7, FTA has determined that while each Action Alternative and recommended LPA design option potentially would have benefits as well as impacts, those benefits and impacts would be experienced by EJ as well as by non-EJ populations. None of the benefits or impacts would be predominantly borne by a minority and/or low-income population, and none of the potential impacts on EJ populations would be more severe or greater in magnitude than the potential impacts on non-EJ populations. As a result FTA has determined that each Action Alternative and recommended LPA design option would not have a disproportionately high and adverse effect upon EJ populations.