

# Westown Circulation Concept Plan Update

Prepared for:

Town of Middletown  
and  
Delaware Department of Transportation

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**Table of Contents**

List of Figures ..... ii  
List of Tables ..... ii  
EXECUTIVE SUMMARY ..... iii  
I. INTRODUCTION..... 1  
II. EXISTING CONDITIONS ..... 7  
III. PROPOSED DEVELOPMENT..... 25  
IV. FUTURE CONDITIONS ..... 29  
V. MULTI-MODAL CONSIDERATIONS ..... 49  
VI. CONCLUSIONS / NEXT STEPS ..... 51

Appendices

- A. Traffic Count Data
- B. LOS and Queuing Results for 2012 Existing Conditions
- C. Crash Data
- D. Trip Generation & Distribution for Proposed Unbuilt Developments
- E. LOS and Queuing Results for 2017 Base Conditions
- F. LOS and Queuing Results for 2017 with Proposed Improvements

**List of Figures**

**Figure 1:** Project Location Map ..... 4  
**Figure 2:** Study Area Map ..... 5  
**Figure 3:** Westown Master Plan ..... 6  
**Figure 4:** Middletown Zoning Map ..... 8  
**Figure 5:** 2012 Existing AM Peak Hour Volumes ..... 16  
**Figure 6:** 2012 Existing PM Peak Hour Volumes ..... 17  
**Figure 7:** Locations of Proposed Unbuilt Developments ..... 28  
**Figure 8:** 2017 Full Development – AM Peak Hour Base Volumes ..... 31  
**Figure 9:** 2017 Full Development – PM Peak Hour Base Volumes ..... 32  
**Figure 10:** Proposed Intersection Geometry (1 of 4)..... 38  
**Figure 11:** Proposed Intersection Geometry (2 of 4)..... 39  
**Figure 12:** Proposed Intersection Geometry (3 of 4)..... 40  
**Figure 13:** Proposed Intersection Geometry (4 of 4)..... 41  
**Figure 14:** 2017 AM Peak Hour Volumes with Proposed Improvements ..... 42  
**Figure 15:** 2017 PM Peak Hour Volumes with Proposed Improvements ..... 43

**List of Tables**

**Table 1:** Proposed Developments from 2005 Report with 2012 Status Update ..... 9/10  
**Table 2:** 2012 Annual Average Daily Traffic Volumes ..... 14  
**Table 3:** Intersection Turning Movement Count Information ..... 15  
**Table 4:** Summary LOS Results for 2012 Existing Conditions ..... 19  
**Table 5:** Crash Rates ..... 22  
**Table 6:** Proposed Unbuilt Developments ..... 27  
**Table 7:** Summary LOS Results for 2017 Base Conditions ..... 35  
**Table 8:** Summary LOS Results for 2017 Conditions with Proposed Improvements . 46  
**Table 9:** Summary Comparison of LOS Results for Signalized Intersections ..... 47

## EXECUTIVE SUMMARY

The Westown Project is a public-private partnership that addresses the growth of a large area of the west side of the Town of Middletown. Over the past 10 years, the study area has developed rapidly at times with new housing, commercial, office, and industrial facilities. In cooperation with the local developers, the Town of Middletown has taken the lead on coordinating infrastructure improvements required to serve the new developments, including transportation facilities and utilities. The Delaware Department of Transportation (DeIDOT) is also a partner in the effort to ensure adequate transportation improvements were implemented in a timely manner, consistent with the planned development.

The planning, design, and implementation of infrastructure improvements within the study area has been carried out based on the Westown Master Plan. Following a Master Plan approach for an area such as this has many benefits, including:

- Ensuring that development takes place in targeted growth areas, in coordination with transportation and other infrastructure improvements.
- Establishes a partnership between the Town of Middletown, Delaware Department of Transportation, other state agencies and developers in the coordination of land planning and infrastructure improvements on a larger and more meaningful scale.
- Provides for regional planning for recreational, educational and transportation facilities.
- Provides an opportunity to plan, design, engineer, and build a community, coordinating and scheduling residential, commercial, and recreational components together with the appropriate transportation and other infrastructure improvements.
- Reduces time and cost for all parties by:
  1. Consolidating traffic studies required by developers, rather than each developer conducting independent studies, resulting in an improved circulation system.
  2. Facilitating a program of transportation system improvements that can be developed comprehensively rather than in a piecemeal fashion, minimizing the need to construct and then reconstruct improvements at the same location.
  3. Allowing for the development and implementation of an integrated stormwater management program, comprehensively addressing stormwater issues as development and roadway improvements are considered together.

In 2005, McCormick Taylor worked with the Town of Middletown, DeIDOT, and area developers to develop a Circulation Concept Plan to serve as a guide for transportation improvements required as part of the Westown Master Plan. That report and accompanying traffic analysis incorporated a number of planned DeIDOT projects (which have since been completed) and identified additional proposed transportation

## Westown Circulation Concept Plan Update

improvements for a Design Year of 2011. Due in part to transportation infrastructure projects completed since that time along with recently completed and planned development activity being different than what had been projected in 2005, preparation of an updated Circulation Concept Plan was initiated in 2012.

This report, the Westown Circulation Concept Plan Update, documents the latest traffic analysis conducted for this project and outlines the recommended transportation infrastructure improvements that should be constructed to handle full build-out of the proposed developments in the study area.

The types of transportation improvements recommended in the study area include:

- **Improvements to existing roadways and intersections:** features additional through lanes, turn lanes, and signalization. Highlights of selected proposed improvements are as follows:
  - Levels Road / Levels Road Extension & Existing US 301 – dual left-turn lanes (all) and add second through lane on Levels / Levels Extension approaches
  - Levels Road Extension & Poole / Von Croy access – signalize intersection and allow lefts from eastbound Levels Road Extension into Poole Property
  - Levels Road Extension – widen to 2 lanes each direction from Existing US 301 to US 301 Bypass (should be built this way when road is constructed)
  - Levels Road (east of US 301) – widen to 2 lanes each direction from US 301 to beyond proposed Westown North Industrial Park entrance.
  - Levels Road & St. Annes Church Road roundabout – add right-turn bypass lane on eastbound Levels Road approach (continuation of proposed Levels Road widening)
  - Add signals and some separate turn lanes at the following intersections:
    - Levels Road & Patriot Drive (existing intersection)
    - Bunker Hill Road & Merrimac Avenue / Sleepy Hollow Drive (existing)
    - St. Annes Church Road & SR 71 (existing)
    - US 301 & Money’s Entrance (new)
    - Levels Road & Westown North Industrial Park (new)
- **Construction of internal development connector roadways:** these roadways will be built by individual property owners as the land develops, and will serve as cross circulation between land uses in the study area, thereby providing internal connections linking larger roadways and reducing the amount of traffic required to use existing state roadways and travel through congested signals.
- **Improved Bicycle, Pedestrian and Transit Facilities and Services:** includes sidewalks along roadways and within developments, pedestrian signals as appropriate, designated bike lanes where appropriate, potentially rerouting Delaware Bicycle Route 1, and added transit service in the form of more frequent service and/or more stop locations on existing Bus Route 43, new bus routes that

## Westown Circulation Concept Plan Update

cover different roadways and development sites, and shuttle service for large employment sites.

Through this study, DeIDOT and the Town now have an assessment of the locations and magnitude of anticipated problematic traffic operations as more developments in the Westown study area are built and traffic volumes increase. DeIDOT and the Town can now begin to formulate and prioritize the proposed improvement projects identified in this report, and move them into the project development process.

The analysis of future conditions with the proposed improvements also serves to identify the “hot spots” that would need more extensive fixes beyond the reasonable level of improvements identified in this study. In particular, more extensive improvements may be needed in the part of the US 301 corridor that includes the intersections with Levels Road and Merrimac Avenue, as well as the nearby intersection of Merrimac Avenue and Walmart / Texas Roadhouse. Moving forward through this process, another update of the Westown Circulation Concept Plan Traffic Study should be conducted in approximately five years once the actual completion date of the US 301 Bypass is known and more up to date information is available regarding proposed developments in the Westown study area.

It should be noted that this study and the potential improvements identified do not include assessment of SR 299 through downtown Middletown, where capacity is much more limited and poor traffic operations often exist, or consideration of the seasonal fluctuations in traffic volumes that occur with the Amazon fulfillment center and with retail land use in general.

# I. INTRODUCTION

## A. Project History

In early 2003, the Town of Middletown and a group of landowners and developers on the west side of Middletown worked together to develop a Master Plan of proposed development and future land use. The goal of the Master Plan was to establish an orderly growth pattern that incorporated “smart growth” techniques, including higher density, mixed-use developments, a compact arrangement of streets and houses, a mixture of housing choices, preservation of farmland and natural resources, and internal multi-modal transportation connections allowing for efficient infrastructure and a better quality of life. Additionally, the Master Plan allowed for the close coordination with the Town for future services such as sewer and electrical improvements.

In 2004, the Town and developers approached the Delaware Department of Transportation (DeIDOT) to become a partner in the effort. The goal of DeIDOT’s participation was to ensure adequate transportation improvements were implemented in a timely manner, consistent with the planned development. Without DeIDOT’s involvement as a partner in this process, each individual development would be required to perform a separate Traffic Impact Study, and would then be required to perform certain roadway improvements based on the result of that study. This would result in a piece-meal set of roadway improvements that encourages sprawl and loss of natural resources. In addition, some of the potential improvements would be difficult to accomplish if studied separately due to right of way limitations. Therefore, DeIDOT, the Town, and developers entered into an agreement, with each agreeing to the following responsibilities:

- **Developers:** Under the Westown Transportation Infrastructure Recoupment Agreement they would contribute a set amount of money to the roadway improvement projects, donate required right-of-way for roadway improvements and utility relocations, provide shared stormwater management facilities for both development and roadway impervious areas, cooperate with the project team on issues such as development roadway connections, transit amenities (bus pull-offs), and bicycle/pedestrian connections.
- **Town:** coordinate overall planning effort, plan for and provide sewer and electrical service.
- **DeIDOT:** oversee overall traffic analysis to determine required roadway improvements; prioritize and schedule roadway improvements; design, bid, and manage the construction of individual roadway projects and contribute funding for roadway improvements.

In 2005, McCormick Taylor worked with these parties to develop a Circulation Concept Plan to serve as a guide for transportation improvements required as part of the Westown Master Plan, which originally encompassed approximately 2,500 acres of proposed development. That report and accompanying traffic analysis incorporated a

number of planned DeIDOT projects (which have since been completed) and identified proposed transportation improvements including internal development connector roadways to be implemented by individual property owners as land parcels are developed. It assessed conditions without and with the completion of the proposed US 301 Bypass project. The 2005 report was based on anticipated land use and traffic volume projections for a design year of 2011.

Due in part to recently completed and planned development activity being different than what had been projected in 2005, preparation of an updated Circulation Concept Plan was initiated in 2012. The updated Westown Circulation Concept Plan study was completed in two phases. Phase 1 was completed in January 2013, and included preliminary Design Year 2017 traffic analysis for the PM peak hour based on the future land use assumptions established in late 2012. Phase 2 of this study, which was conducted in 2014, included further updated/refined future land use information and future volume projections, analyses of AM and PM peak hours, crash analyses, and preparation of this report document.

### **B. Updated Project Description and Study Area**

This Circulation Concept Plan will serve as an update to the original Westown Circulation Concept Plan, completed in 2005. Since that report was finished, the Westown area experienced a period rapid development, including the construction of a new public high school and elementary school, various shopping centers/businesses, housing developments, new roadways and major improvements to the existing transportation infrastructure network. While the rate of growth has not always been steady, many stalled and other planned developments are starting to move forward.

The project area for the updated study includes the following existing roadways:

- US 301 from Peterson Road to Levels Road
- Bunker Hill Road from US 301 to Merrimac Avenue
- West Main Street (SR 299) from US 301 to Industrial Drive
- Levels Road from US 301 to the roundabout at St. Annes Church Road
- St. Annes Church Road from Broad Street (SR 71) to Levels Road
- Merrimac Avenue from Industrial Drive to Bunker Hill Road
- Sandhill Drive from Bunker Hill Road to US 301
- Industrial Drive from Main Street to Merrimac Avenue
- Wiggins Mill Road from St. Annes Church Road to Green Giant Road

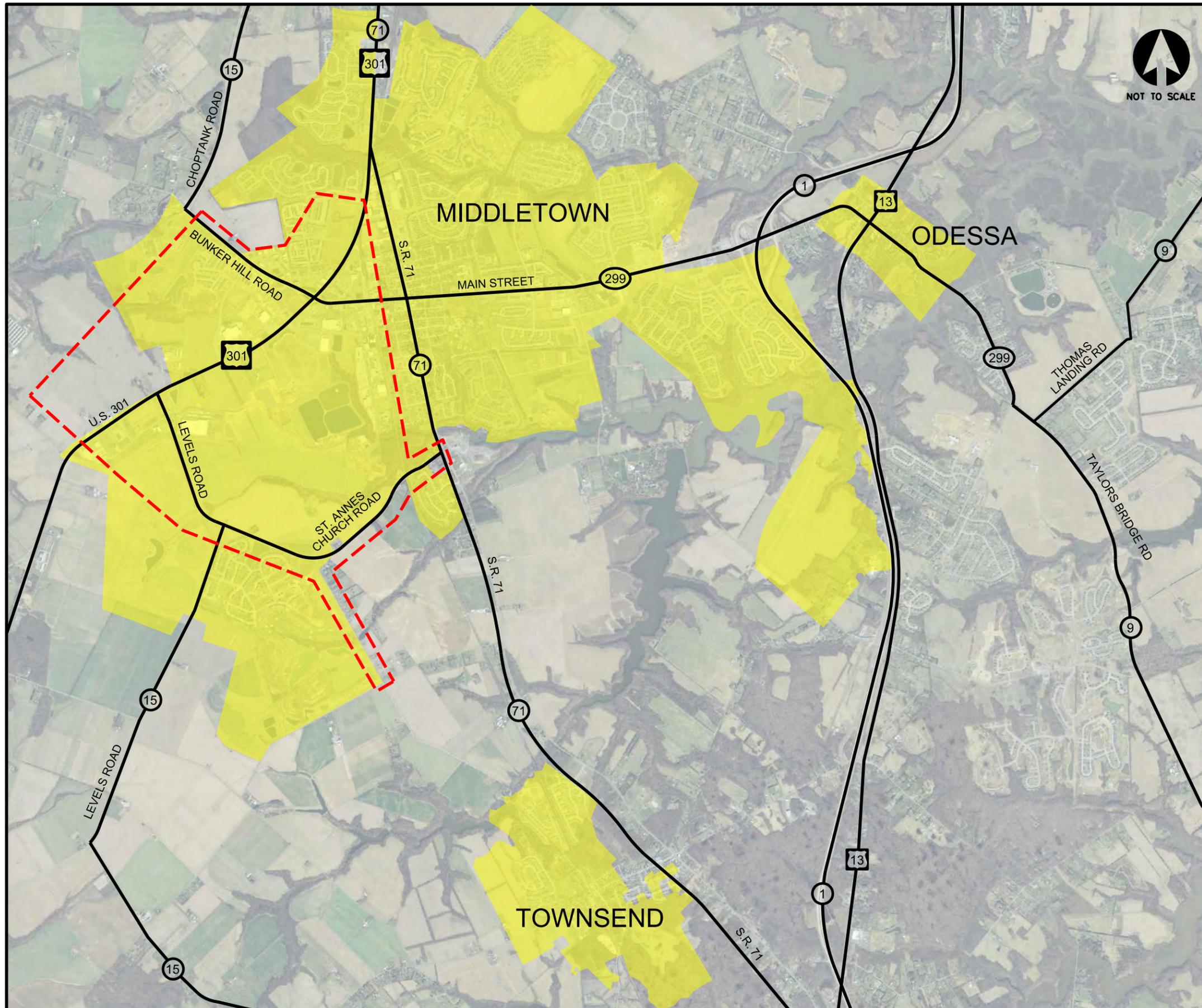
**Figure 1** shows the Westown project location area with relation to the Town of Middletown. **Figure 2** shows an aerial view of the study area. **Figure 3** shows the Westown Master Plan (as completed in 2004).

### **C. US 301 Bypass Project**

DelDOT has essentially completed design on the US 301 Bypass project that will result in construction of a new roadway connecting with existing US 301 near the Delaware/Maryland state line and the south end and running west and north of Middletown to connect with SR 1 just south of the Roth bridge at the north end. The US 301 project was initiated to address the issues of managing truck traffic, improving safety and reducing roadway congestion, which are all problematic issues at various times and locations along existing US 301 and other nearby roadways that would see benefits due to the added capacity of the US 301 Bypass. The US 301 Bypass would be a limited access toll road. The project is currently awaiting final approvals and, barring any further setbacks, construction is anticipated to begin in late 2015 or 2016. As of the Phase 2 update of this Circulation Concept Plan Update in 2014, it no longer appears that the proposed US 301 Bypass will be completed by the study design year of 2017. However, the Town and DelDOT agreed that the future conditions analyses for this study should still include the US 301 Bypass.

In the Westown area, the alignment of the proposed US 301 Bypass would run west of existing US 301 and would cross over Bunker Hill Road between Merrimac Avenue and Choptank Road. The Westown area would be served by the US 301 Bypass via an interchange at a proposed extension of Levels Road. The so-called Levels Road Extension would be a new roadway to connect existing US 301 to the future US 301 Bypass. The project development process of the US 301 Bypass included an origin-destination study that was utilized by McCormick Taylor to determine anticipated traffic volume on the Levels Road Extension, as well as traffic pattern shifts on other area roadways including existing US 301. The proposed alignment of the US 301 Bypass can be seen in **Figures 4 and 7** of this report.

FIGURE 1 -  
PROJECT LOCATION MAP



LEGEND	
	Municipalities
	Study Area
	U.S. Route
	Delaware State Route

WESTOWN  
CIRUCULATION CONCEPT  
PLAN UPDATE

JANUARY 2015



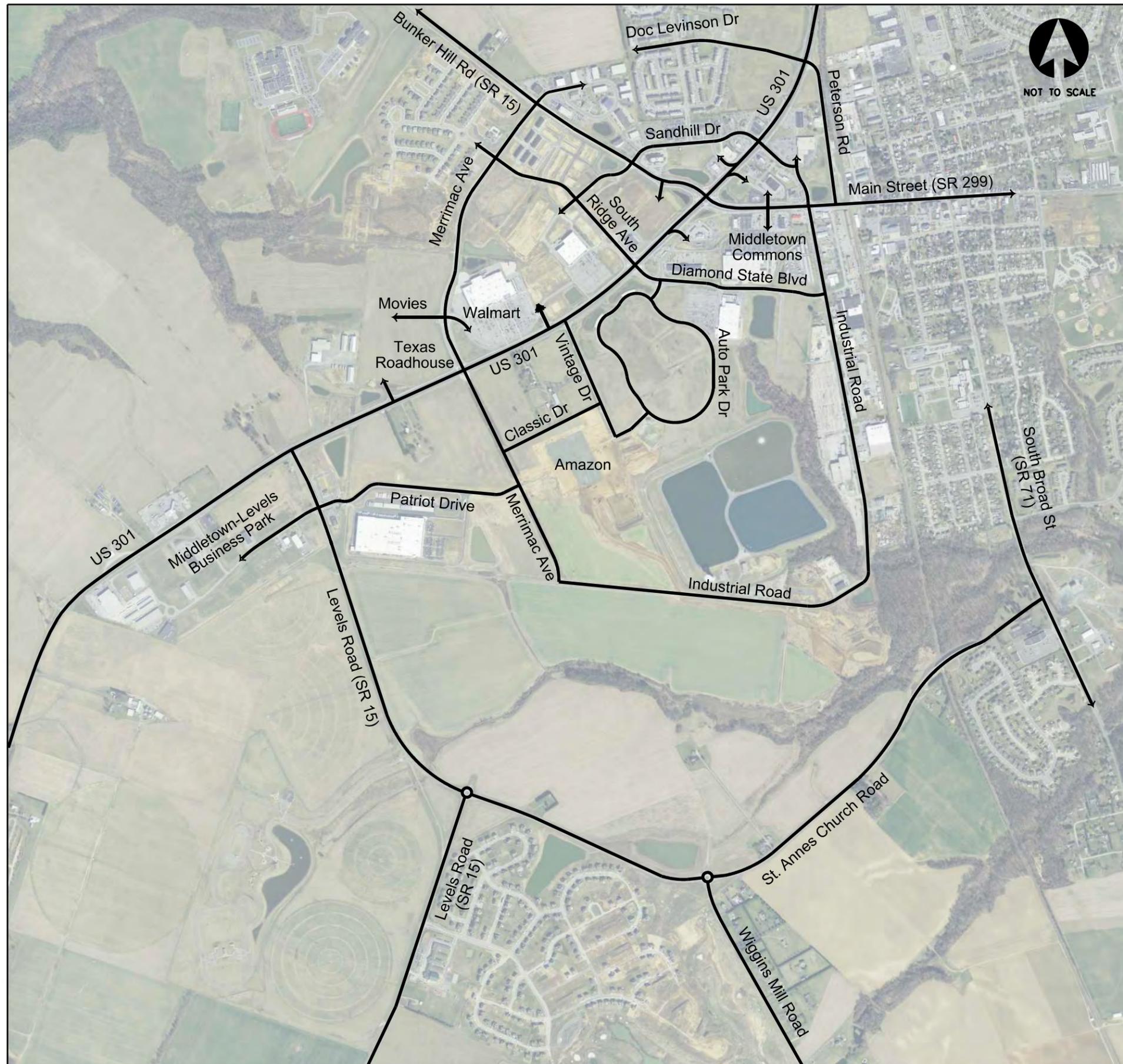


FIGURE 2 - STUDY AREA MAP

WESTTOWN  
CIRCULATION CONCEPT  
PLAN UPDATE

JANUARY 2015



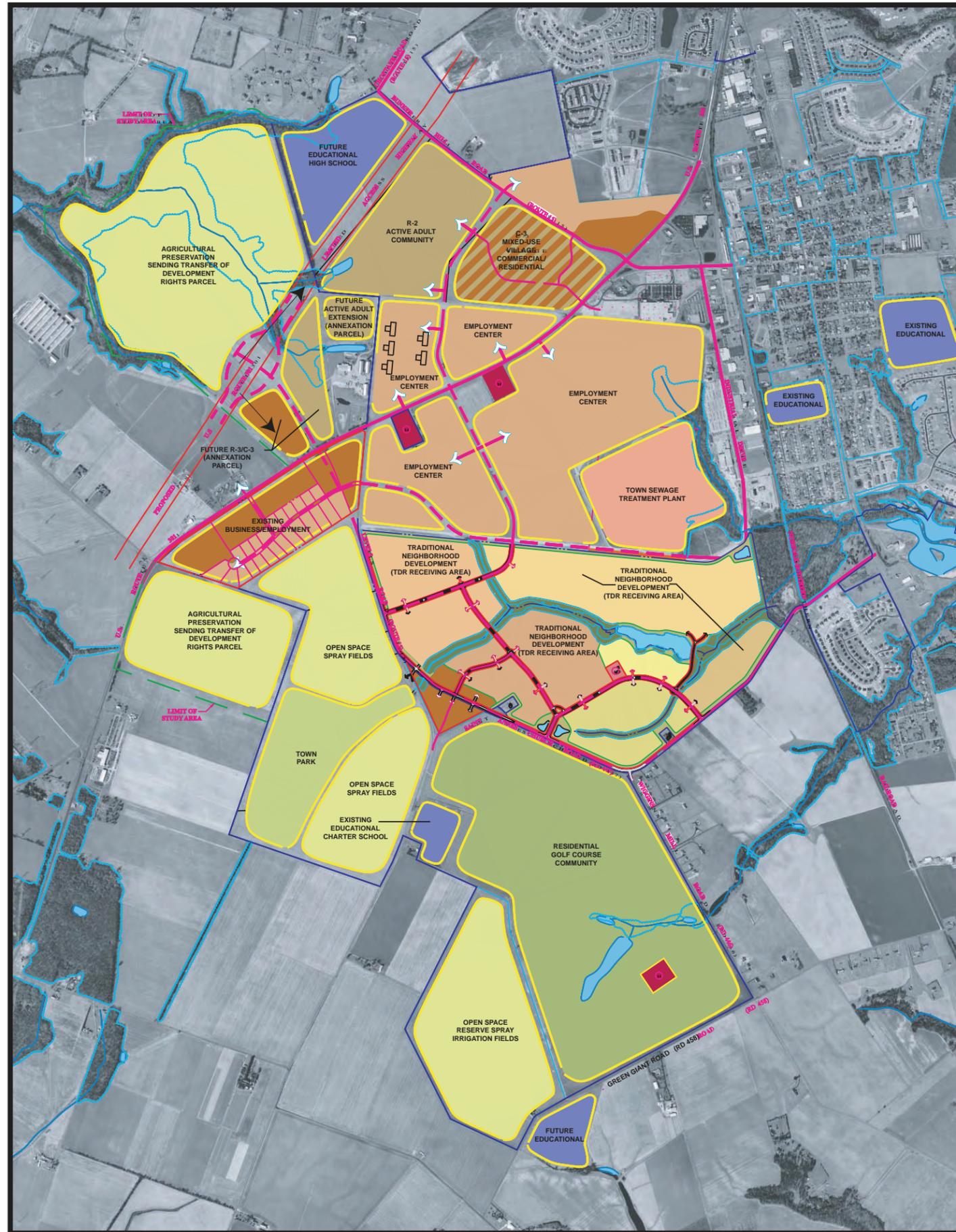


FIGURE 3 -  
WESTTOWN MASTER PLAN  
(SUMMER 2004)

WESTTOWN  
CIRCULATION CONCEPT  
PLAN UPDATE

JANUARY 2015



## II. EXISTING CONDITIONS

### A. Land Use

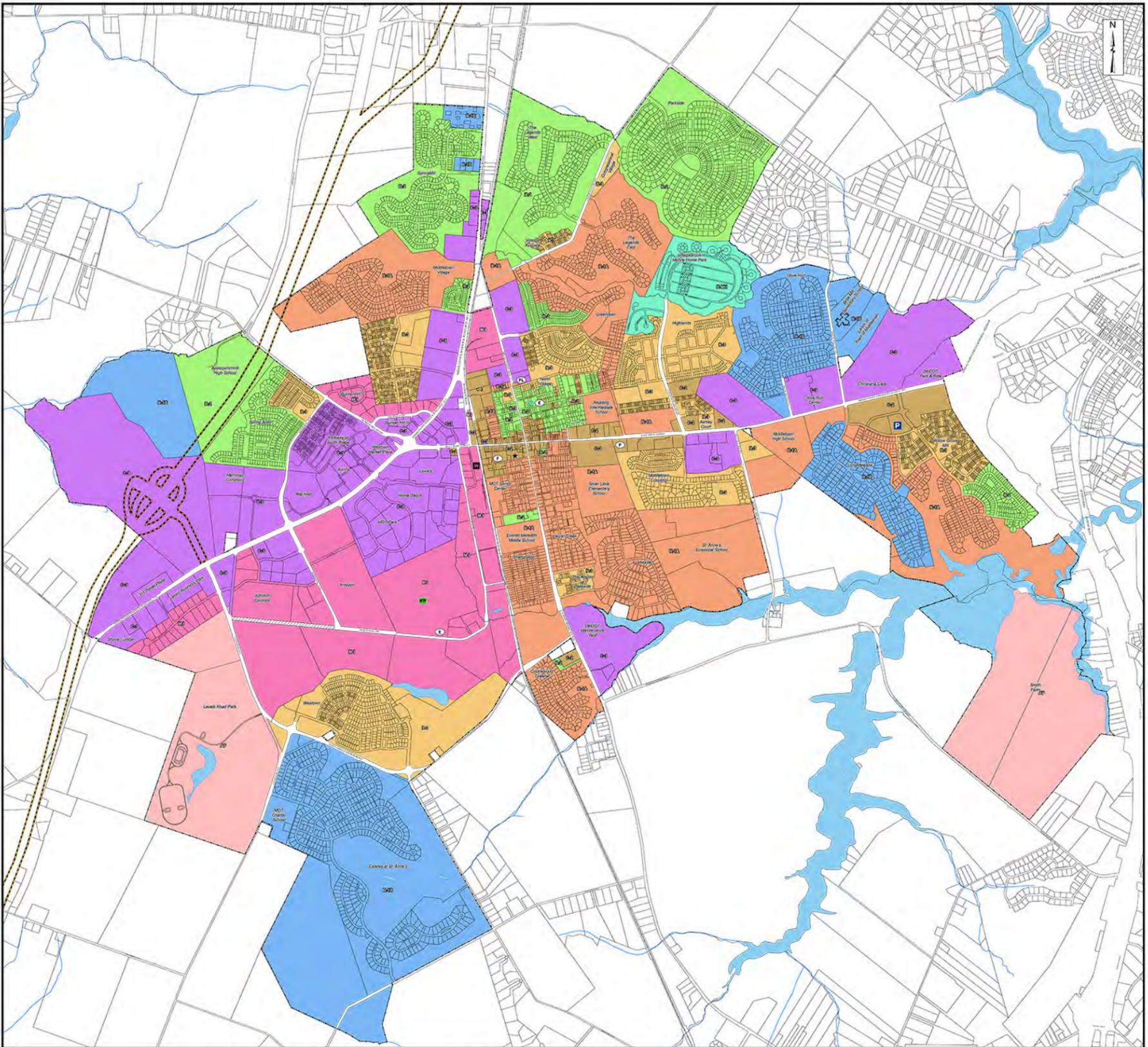
The original Westown Circulation Concept Report was prepared in 2005. The current update of the Circulation Concept Plan has a base year (for existing conditions) of mid-2012. From 2005 to 2012, the land use in the study area has changed from predominantly agricultural to a mix of retail/employment, industrial, residential, and agricultural land uses. The Town of Middletown Zoning Map (as of November 2012) is shown in **Figure 4**. The US 301 corridor from Levels Road to Peterson Road has experienced rapid growth in retail and employment activity in the last decade with the opening of a Walmart, Kohl's department store, Home Depot, a Hampton Inn hotel, medical and business offices, and several retail and restaurant sites. Industrial activity has also grown along the corridor with the opening of the Johnson Controls facility and several business park tenants in the Levels Road and Patriot Drive area. Housing developments including single family homes, multi-family homes and an active adult (55+) community have been built or are in development within the area.

Developments that opened after mid-2012 are not included in the assessment of 2012 existing conditions. These include, but are not limited to, the following:

- Amazon fulfillment center
- Westown Movies
- Advance Auto Parts
- Texas Roadhouse restaurant
- Portions of several housing developments

These developments that opened after mid-2012, along with many other proposed developments that have not yet been built, are included in our assessments of 2017 future conditions.

The original 2005 Westown Circulation Concept Report identified developments which were proposed at that time, and which served as the basis for developing the traffic volume projections for the year 2011. **Table 1** below lists the assumed proposed developments at the time of the 2005 study along with their updated status as of September 2012. The proposed future land use and transportation network assumptions are described in more detail in **Sections III and IV** of this updated report.



ZONE	DESCRIPTION	MINIMUM LOT SIZE	MINIMUM LOT AREA	MINIMUM FRONT YARD SETBACK	MINIMUM SIDE YARD SETBACK	MINIMUM REAR YARD SETBACK	MINIMUM BUILDING HEIGHT	MINIMUM BUILDING FOOTPRINT COVERAGE	MINIMUM OPEN SPACE COVERAGE	MINIMUM OPEN SPACE PERCENTAGE	MINIMUM OPEN SPACE PER FOOTPRINT COVERAGE	MINIMUM OPEN SPACE PER PERCENTAGE
R-1A	Single Family Residential (9,750 Sq. Feet Min. Lot Size)	9,750	9,750	10	5	5	35	25	25	25	25	25
R-1B	Single Family Residential (12,500 Sq. Feet Min. Lot Size)	12,500	12,500	10	5	5	35	25	25	25	25	25
R-2	Single Family Residential (5,000 Sq. Feet Min. Lot Size)	5,000	5,000	10	5	5	35	25	25	25	25	25
R-3	Multi Family Residential											
R-MH	Mobile Home Residential											
C-2	Downtown Commercial											
C-3	Employment/Regional Retail											
M-1	Manufacturing Industrial											
AP	Agricultural Preservation											

# Middletown Zoning Map

(Official)



November 20, 2012

1 in = 900 Feet



## Legend

- ### Middletown Points of Interest
- Middletown Water Treatment Plant
  - Middletown Town Hall
  - Middletown Electric Substation
  - Middletown Fire Company
  - Middletown Police Department
  - Middletown Public Works Building
  - Post Office
  - Middletown Waste Water Treatment Plant
  - New Castle County Police Southern District

### Transportation, Political, and Landform Features

- Middletown Corp Limits (Approx. 11.96 SQ. MILES)
- Bypass Footprint
- Railroad
- Parcel Boundary
- Water
- Streams

### Zone Types

- R-1A Single Family Residential (9,750 Sq. Feet Min. Lot Size)
- Utility Easement
- R-1B Single Family Residential (12,500 Sq. Feet Min. Lot Size)
- R-2 Single Family Residential (5,000 Sq. Feet Min. Lot Size)
- R-3 Multi Family Residential
- R-MH Mobile Home Residential
- C-2 Downtown Commercial
- C-3 Employment/Regional Retail
- M-1 Manufacturing Industrial
- AP Agricultural Preservation

**Table 1A: Proposed Developments from 2005 Report with 2012 Status Update**

<b>DEVELOPMENT</b>	<b>DESCRIPTION</b>	<b>SIZE</b>	<b>2012 STATUS (as of Sept. 2012)</b>
Educational Campus	High School, Middle School, Elementary School and Daycare	Approximately 2850 students	Campus Complete (although not all of the originally-envisioned facilities were included)
Levels Business Park	Manufacturing/Industrial Park	100 acres	Some parcels occupied with businesses  <u>Remaining to be developed:</u> 70 acres remain to be developed
Southridge	Active Adult Community, Townhouses, and retail	622 dwelling units and 310 ksf retail	Some units built and occupied  <u>Remaining to be developed:</u> 559 dwelling units and 239 ksf retail
Bunker Hill Center	Mixed use office park with some commercial	10.6 ksf Manufacturing, 245.4 ksf Office, 71 room Hotel, 11.4 ksf restaurant	Complete
Auto Mall Facility	Auto Mall, Home Depot, misc. retail and Industrial property	210 ksf Auto Mall, 398 ksf retail (including Home Depot), 54 acre industrial property	Home Depot complete  <u>Remaining to be developed:</u> Amazon fulfillment center (opened late 2012), 458 ksf retail (including formerly planned auto mall land use now assumed as retail), 227 acre industrial park (“Westown North”)
Kohl Commercial Property	Wal-Mart, misc. retail, office space and hotels	460 ksf retail (including Wal-Mart), 250 ksf office, 550 rooms of hotel	Walmart, Kohl’s, Walgreen’s, and Chick-fil-A complete  <u>Remaining to be developed:</u> 1.41 million sf retail/commercial (including Westown Movies (opened late 2013) and Texas Roadhouse (opened October 2014)), 250 ksf office, 300 apartments, 550 rooms of hotel
Kohl Industrial Center	Light Industrial	500 employees	Johnson Controls facility complete  Remaining property now considered part of Kohl Commercial Property (see above)

**Table 1B: Proposed Developments from 2005 Report with 2012 Status Update (continued)**

DEVELOPMENT	DESCRIPTION	SIZE	2012 STATUS (as of Sept. 2012)
Cochran Farm Property	Retail/commercial, possible relocation of liquor store, office space	relocation of existing 10 ksf liquor store, 10 ksf general retail, 25 ksf office space (farm house prop.)	Nothing built and nothing planned
Westown Development	Single Family Homes, Age Restricted Community, Town homes, Offices, future retail area/town center	1000 single-family detached homes, 260 units of duplex restricted age community, 540 townhomes, 30 ksf office space, 30 ksf town center retail	Nothing built yet, and proposed elements have changed. Part of this property (the "Westown North" industrial park) is now considered part of the Auto Mall Facility for purposes of "Remaining to be developed" (see above)  <u>Remaining to be developed:</u> 499 single-family detached homes and 142 townhomes
Estates at St. Annes	Single Family Homes and Golf Course	465 single-family detached homes, 18 hole golf course	Some houses built, and golf course was started but not completed.  <u>Remaining to be developed:</u> 261 single-family detached homes and 18-hole golf course
Town Park	Town Park	100 acres	Complete
Ramunno Property	Expansion of Food Lion Shopping Center	240 ksf retail	<u>Remaining to be developed:</u> 121 ksf retail and Convenience market / fueling station with 20 fuel pumps
Future Recreational Space	Possible ball fields for adjacent educational campus	100 acres	Athletic fields complete for adjacent Appoquinimink High School. Nothing further planned.
Future Goldey Beacom Campus	Full college campus	500 students by 2011	Nothing built and nothing planned
Commercial	Commercial including Pharmacy and Ice Cream Parlor	40.5 ksf retail	Bruster's Ice Cream, Rite-Aid, Taco Bell, and M&T Bank complete  <u>Remaining to be developed:</u> 6.9 ksf Advance Auto Parts (opened 2014)
Middletown Commons	Misc. Retail	29.6 ksf retail	Complete

## **B. Roadway Conditions**

Much of the roadway network within the study area has been rebuilt since the 2005 Concept Circulation Report. In the 2005 report, traffic operations were projected for 2011, and several proposed roadway and intersection improvements described in that report that have since been built. Most notably, US 301 was widened to provide two through lanes in each direction with major intersection improvements along the entire study corridor. Other new roadways and connections completed by mid-2012 include, but are not limited to, the following:

- The construction of Merrimac Avenue from Bunker Hill Road to US 301 and further east to the Amazon Fulfillment Center and to Industrial Drive
- The extension of Industrial Drive to the Amazon Fulfillment Center and to Merrimac Avenue (which connects to US 301)
- The construction of South Ridge Avenue from US 301 to Merrimac Avenue, which provides access to Kohl's, Walgreen's, and residential developments closer to Merrimac Avenue
- The construction of Diamond State Boulevard from US 301 (opposite South Ridge Avenue) to Industrial Drive, which provides access to Home Depot
- The widening and reconstruction of Bunker Hill Road from US 301 to west of Merrimac Avenue / Sleepy Hollow Drive
- The construction of Auto Park Drive
- The realignment of Levels Road at US 301 and associated intersection improvements
- The realignment/conversion of the intersection of Levels Road and St. Annes Church Road to a roundabout
- The reconstruction of the bridge on St. Annes Church Road over the railroad tracks between Wiggins Mill Road and South Broad Street
- The construction of Patriot Drive, serving the Levels Business Park and linking Levels Road to Merrimac Avenue

Described below are roadway geometric conditions as of mid-2012.

**US Route 301** is classified as a Principal Arterial and it currently has two 12' travel lanes in each direction with 10' shoulders from south of Levels Road to north of Peterson Road. The two directions are divided by a concrete/grass median of varying width. Exclusive left and right turn lanes currently exist at the intersections with Peterson Road, Sandhill Drive and SR 299 / Bunker Hill Road. Right-turn lanes and dual left-turn lanes are provided at the intersections with South Ridge Avenue / Diamond State Boulevard and Merrimac Avenue. At Levels Road, a southbound left-turn lane and northbound right-turn lane currently exist.

**Main Street (SR 299)** is classified as a Minor Arterial. It currently consists of a varying typical section from US 301 to Industrial Drive due to the closely spaced intersections along the roadway. The westbound Main Street approach to US 301 contains two left-

turn lanes to southbound US 301, two through lanes to Bunker Hill Road and a channelized right turn lane to northbound US 301. In the eastbound direction east of US 301, there are 2 receiving lanes with the right lane becoming a right-turn-only lane into Middletown Commons/Lowe's. At this unsignalized intersection, there is an eastbound left-turn lane and westbound right-turn lane providing access to the Market Place shopping center and various pad sites, and a westbound left-turn lane for access to Middletown Commons/Lowe's as well. The southbound approach from the Market Place shopping center consists of one shared left/through/right-turn lane and the northbound approach from Middletown Commons/Lowe's consists of a right-turn lane and a shared through/left-turn lane. Note that the northbound through movement has since become prohibited (sign was installed after mid-2012). The study area along Main Street ends at the signalized intersection with Industrial Drive. This intersection contains a left-turn lane and a shared through/right-turn lane on the eastbound Main Street approach and exclusive through, left and right-turn lanes on the westbound Main Street approach. The northbound Industrial Drive approach contains exclusive through/left/right-turn lanes and the southbound approach from the Market Place shopping center contains a left-turn lane and shared through/right-turn lane.

**Bunker Hill Road** is classified as a Major Collector and currently consists of one lane in each direction from Choptank Road to the intersection of Merrimac Avenue / Sleepy Hollow Drive. At this intersection, Bunker Hill Road has separate left and right turn lanes in both the eastbound and westbound directions. Meanwhile, the stop-controlled northbound Merrimac Avenue approach contains one right-turn lane and one shared through/left-turn lane, and the stop-controlled southbound approach of Sleepy Hollow drive contains one shared left/through/right-turn lane. A quarter-mile east of the intersection with Merrimac Avenue / Sleepy Hollow Drive, Bunker Hill Road intersects Sandhill Drive. Bunker Hill Road has exclusive left and right-turn lanes in both directions, while the northbound and southbound stop-controlled approaches of Sandhill Drive each contain a right-turn lane and shared through/left-turn lane. The eastbound departure lane opens up to two through lanes east of Sandhill Drive to the intersection with US 301. The eastbound Bunker Hill Road approach to US 301 contains two left-turn lanes, two through lanes, and one channelized right-turn lane. Meanwhile, the westbound Bunker Hill Road departure from US 301 contains two through lanes, with the right lane becoming a right-turn only lane for Sandhill Drive.

**Levels Road** is classified as a local road and currently consists of one lane in each direction from US 301 to St. Annes Church Road. The westbound/northbound Levels Road approach to US 301 has separate left and right-turn lanes at the signalized T-intersection. Approximately 800' south of US 301, Levels Road intersects Patriot Drive at the Middletown-Levels Business Park. At this intersection, Levels Road has exclusive left-turn lanes and shared through/right-turn lanes in each direction of travel. Both Patriot Drive approaches are stop-controlled and contain one shared right/through/left-turn lane. A little less than one mile south of Patriot Drive, Levels Road intersects St. Annes Church Road as a single-lane roundabout.

**St. Annes Church Road** is also classified as a local road and has one travel lane in each direction from the Levels Road roundabout to the intersection with South Broad Street (SR 71). Between Levels Road and SR 71, St. Annes Church Road also intersects Wiggins Mill Road at a single-lane roundabout. At the intersection with SR 71, the eastbound St. Annes Church Road approach is stop-controlled with a single shared left/right-turn lane. Northbound SR 71 contains one shared through/left-turn lane with a bypass lane for through traffic, while southbound SR 71 contains one through lane and an exclusive right-turn lane.

**Merrimac Avenue** has one travel lane in each direction from Bunker Hill Road to the signalized intersection with the Walmart access and the Westown Movies/Texas Roadhouse access. The southbound Merrimac Avenue approach to this intersection contains one through lane and exclusive left and right-turn lanes, while the northbound Merrimac Avenue approach contains two left-turn lanes, two through lanes, and one right-turn lane. The rightmost through lane drops just past the intersection. The eastbound approach from Westown Movies/Texas Roadhouse did not exist in 2012, but it did open once the movie theater was built in late 2013. That eastbound approach has one exclusive left-turn lane, one shared through/left-turn lane and one right-turn lane. The westbound approach from Walmart has two left-turn lanes, one through lane, and one right-turn lane. South of this intersection, Merrimac Avenue contains two through lanes in each direction to the intersection of US 301. In both directions, the Merrimac Avenue approaches to US 301 have two left-turn lanes, two through lanes and one channelized right-turn lane. Merrimac Avenue continues south/east of US 301 towards the Amazon fulfillment center with two lanes in each direction. There are T-intersections with Classic Drive and Patriot Drive, at which the minor side street is stop-controlled at both intersections. Merrimac Avenue connects with Industrial Drive at a two-leg, 90-degree intersection at which both approaches are stop-controlled.

**South Ridge Avenue** originates at Merrimac Avenue as a continuation of Spring Arbor Drive (north of Kohl's) and has a multi-lane roundabout at the access points to Kohl's and the adjacent Walgreen's. Heading southeast from the roundabout, South Ridge Avenue intersects US 301 at a signalized intersection. The southbound/eastbound South Ridge Avenue approach has two left-turn lanes, one through lane and one channelized right-turn lane. The northbound departure from US 301 contains two through lanes, with the right lane becoming a right-turn only at the roundabout to access the Walgreen's. As South Ridge Avenue crosses US 301, the road becomes Diamond State Boulevard.

**Diamond State Boulevard** contains one travel lane in each direction from US 301 to Industrial Drive. At the northbound/westbound approach to US 301, Diamond State Boulevard has two left-turn lanes, one through lane, and one channelized right-turn lane. With a four-leg, two-way stop-controlled intersection located less than 400 feet east of US 301, Diamond State Boulevard provides access to the proposed "Auto Mall" property, the Middletown Commons Shopping Center, and Home Depot. Diamond

State Boulevard continues east to Industrial Drive where the eastbound approach is stop-controlled with a shared left/through/right-turn lane.

**C. Traffic Conditions**

1. *Existing Traffic Volumes & Characteristics*

US 301 serves the dual purposes of a regional transportation corridor and local access roadway. Regionally, US 301 serves as a southwest-northeast connection from the Annapolis and Washington D.C. areas to Wilmington, Philadelphia, and New Jersey. Although the travel time is typically higher for motorists using US 301 as an alternate route instead of I-95, the toll charges are significantly less. This contributes to the high percentage of heavy vehicles traveling on US 301 through the study area during the peak hours (varying from 10 to 25 percent depending on the location/direction and time of day, based on mid-2012 intersection count data).

Main Street (SR 299) is the primary east-west roadway in the area, which connects US 301 to SR 1 east of Middletown. It also serves regional traffic, and is the main east-west local access street through downtown Middletown. Annual Average Daily Traffic (AADT) volumes for US 301, Main Street, and other major roads within the study area are shown in **Table 2**.

**Table 2 – 2012 Annual Average Daily Traffic Volumes**

Roadway	2012 AADT (vpd)
US 301	16,600
Main Street (SR 299)	16,200
Bunker Hill Road (SR 15)	2,800
Levels Road	2,800
St. Annes Church Road	2,500
Broad Street (SR 71)	7,700

*Source: 2012 DelDOT Traffic Summary*

Weekday peak hour turning movement data was needed for traffic operational analysis. For most intersections in the study area, new counts were conducted in late September or early October of 2012 (just before the Amazon fulfillment center opened). **Table 3** lists the intersections for which peak hour turning movement count data was gathered, when the data was gathered, and the source of the data. Raw traffic count data for the intersections listed in **Table 3** is provided in **Appendix A**. Some adjustments were made to the raw data to address volume imbalances based on knowledge of the study area including mid-block access points. To complete the existing conditions volume set used for the purpose of analysis, volumes for minor intersections in the study area that were not included in the traffic counts were estimated/interpolated based the land use served by the side streets and the count

## Westtown Circulation Concept Plan Update

data of adjacent intersections. The resulting 2012 AM and PM peak hour turning movement volumes are provided as **Figures 5 and 6**.

**Table 3 – Intersection Turning Movement Count Information**

Intersection	Date	Count Times	Source
US 301 & Peterson Road	9/27/2012	AM – 7:00 to 9:00 PM – 3:30 to 6:30	McCormick Taylor
US 301 & Sandhill Road	9/27/2012	AM – 7:00 to 9:00 PM – 3:30 to 6:30	McCormick Taylor
US 301 & Main Street (SR 299) / Bunker Hill Road	10/4/2012	AM – 7:00 to 8:00 PM – 4:45 to 5:45	US 301 – 2013 Spur Monitoring Report (RK&K)
US 301 & Diamond State Blvd / South Ridge Ave	9/27/2012	AM – 7:00 to 9:00 PM – 3:30 to 6:30	McCormick Taylor
US 301 & Merrimac Avenue	10/3/2012	AM – 7:00 to 9:00 PM – 3:30 to 6:30	McCormick Taylor
US 301 & Levels Road	10/3/2012	AM – 7:00 to 9:00 PM – 3:30 to 6:30	McCormick Taylor
Main Street & Middletown Commons (Lowe's)	10/2/2012	AM – 6:00 – 9:00 PM – 3:30 – 6:00	McCormick Taylor
Main Street & Industrial Drive	10/2/2012	AM – 6:00 – 9:00 PM – 3:30 – 6:00	McCormick Taylor
Levels Road & St. Annes Church Road	10/3/2012	AM – 7:00 to 9:00 PM – 3:30 to 6:30	McCormick Taylor
Bunker Hill Road & Merrimac Avenue	10/3/2012	AM – 7:00 to 9:00 PM – 3:30 to 6:30	McCormick Taylor
Bunker Hill Road & Sandhill Drive	1/30/2014	AM – 7:00 to 9:00 PM – 3:00 to 6:00	McCormick Taylor
South Broad Street (SR 71) & St. Annes Church Road	2/4/2014	AM – 7:00 to 9:00 PM – 3:00 to 6:00	McCormick Taylor



NOT TO SCALE

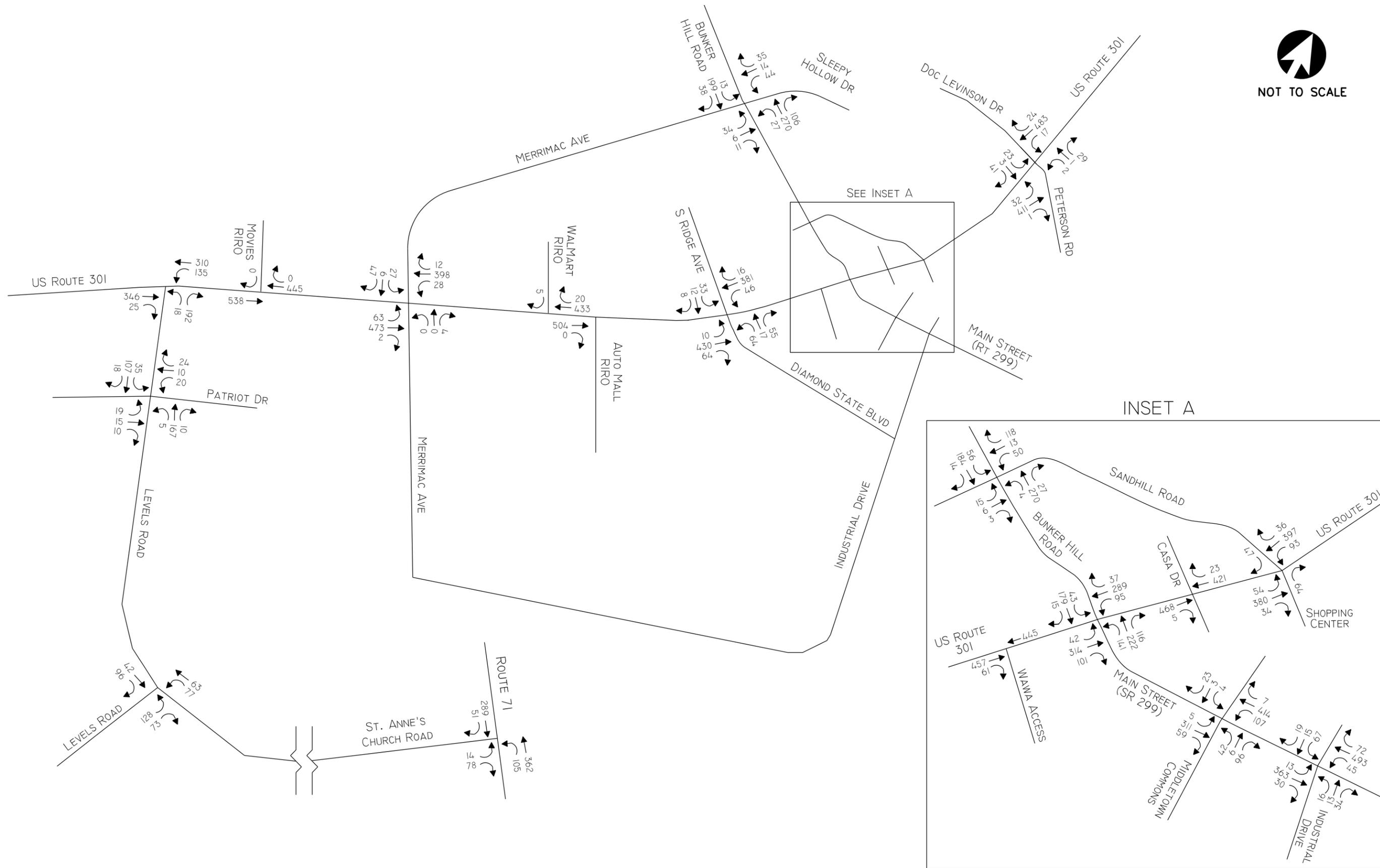


FIGURE 5 -  
2012 EXISTING AM PEAK HOUR VOLUMES



## 2. *Level of Service (LOS) Analysis*

This Circulation Concept Plan Report Update incorporates information and analysis normally included in a traffic impact study. Traffic analysis was conducted based on the methodology established in the *2000 Highway Capacity Manual* that describes the operation of an intersection controlled by a traffic signal or a stop sign. The traffic simulation software package Synchro/SimTraffic was used to analyze the study area network of intersections, with the exception of the isolated intersection of SR 71 and St. Annes Church Road (analyzed using HCS+) and the intersection of Levels Road and St. Annes Church Road (analyzed using SIDRA roundabout analysis software).

It should be noted that DeIDOT frequently does not consider delay on the minor-street approaches of unsignalized intersections as a measure of whether the transportation system can handle traffic generated by proposed developments. As such, the delay and LOS information provided for unsignalized intersections in this study is generally for comparison purposes only. However, analysis of unsignalized intersections does help the project team assess whether new traffic signals may be justified.

A summary of existing conditions operational analysis is provided in **Table 4**, which includes basic LOS and delay results for each intersection. The analyses are of existing AM and PM peak hour conditions as of mid-2012, without any improvements. While **Table 4** provides a summary of the results, more detailed LOS and delay results are provided in **Appendix B** in which results for signalized intersections are reported for the overall intersection and for each approach. For unsignalized intersections in **Appendix B**, LOS and delay are reported for each minor street approach and the major street left turns, if applicable. Level of service criteria are also provided in **Appendix B**.

Queuing analyses of 2012 existing conditions were also conducted, with detailed results provided in **Appendix B**.

### AM Peak Hour

Existing level of service analysis reflected that all intersections operate acceptably during the AM peak hour, with hardly any operational deficiencies. The signalized intersection with the highest overall average delay is US 301 and SR 299 / Bunker Hill Road, which operates at LOS D. The unsignalized intersections also generally operate well with the worst minor street delay occurring on the southbound Sleepy Hollow Drive approach to Bunker Hill Road, which was reported at LOS E. The existing conditions analysis showed no significant queuing problems at any intersections during the AM peak hour. The LOS and queuing results for the AM peak hour generally reflect our field observations.

### PM Peak Hour

Traffic conditions throughout the study area are known to be generally more congested during the existing PM peak period than during the AM peak period. Many of the traffic

generators contributing to volumes in the Westtown area are retail stores, which typically attract more business in the afternoon and evening hours as opposed to the morning. As such, the analysis of PM peak hour existing conditions reflects moderately worse delays and queues than the AM peak hour, although all signalized intersections still operate at LOS D or better. The intersection of US 301 and SR 299 / Bunker Hill Road again has the highest overall delay and operates at LOS D. The intersection of US 301 and Diamond State Boulevard / South Ridge Avenue also operates at LOS D. Most of the unsignalized intersections also operate fairly well overall during the PM peak period, with the only major delays (LOS F conditions) occurring on the northbound Middletown Commons approach to Main Street (exiting Lowe’s), the southbound Market Place approach to Main Street (opposite Lowe’s), and the southbound Sandhill Drive approach to Bunker Hill Road. The longest queues occur on the northbound Middletown Commons approach to SR 299, the southbound Sandhill Drive approach to Bunker Hill Road, both directions of SR 299 at Industrial Drive, northbound US 301 at SR 299, and southbound US 301 left-turn movements at SR 299 and Levels Road. These PM peak hour results again generally reflect our observations during traffic data collection.

**Table 4 – Summary LOS Results for 2012 Existing Conditions**

Intersection	Control Type	LOS (Delay (sec/veh))	
		AM Peak	PM Peak
US 301 & Peterson Road / Doc Levinson Road	signalized	B (14.2)	B (14.2)
US 301 & Sandhill Drive / Market Place	unsignalized	a (10.0)	b (11.9)
US 301 & Bunker Hill Road / West Main Street	signalized	D (41.6)	D (50.4)
US 301 & Diamond State Blvd / South Ridge Ave.	signalized	C (26.7)	D (35.1)
US 301 & Walmart RIRO	unsignalized	a (9.7)	a (10.8)
US 301 & Merrimac Ave	signalized	C (25.0)	C (26.3)
US 301 & Levels Road	signalized	C (21.5)	C (27.3)
West Main Street & Middletown Commons	unsignalized	c (19.9)	f (349.0)
West Main Street & Industrial Drive	signalized	A (7.9)	B (11.6)
Bunker Hill Road & Sandhill Drive	unsignalized	d (31.6)	f (194.2)
Bunker Hill Road & Merrimac Avenue	unsignalized	e (43.0)	e (45.3)
Levels Road & Patriot Drive	unsignalized	b (12.0)	b (14.6)
Levels Road & St. Annes Church Road	roundabout	a (8.4)	a (7.5)
SR 71 (S. Broad St.) & St. Annes Church Road	unsignalized	b (13.0)	c (19.8)

**NOTE:** For signalized and roundabout intersections, the result shown in the table is the overall intersection LOS/delay. For unsignalized analyses, the result shown in the table is the LOS/delay for the approach with the highest delay at each intersection.

### 3. *Crash Analysis*

Crash data was collected for the three-year study area for the period from September 2009 to September 2012. During that period, a total of 133 crashes were reported in the study area. Of those, 62 crashes were reported along US 301 (47% of total crashes), 46 were reported along West Main Street (34%), and 17 were reported along Bunker Hill Road (13%). The remainder of the crashes were reported on Levels Road (7 crashes) and St. Annes Church Road (1 crash). Most of the 133 crashes occurred at or near an intersection, with only 10 crashes (8%) occurring on study area roadways at mid-block locations (not near an intersection). It should be noted that during the initial portion of the three-year study period, the US 301 and Main Street / Bunker Hill Road corridors were under construction.

Of the 133 total crashes, 38 crashes (29%) resulted in personal injury and 4 crashes (3%) involved alcohol. Only one fatal crash was reported during the study period, which involved a pedestrian who was under the influence of alcohol when they were struck by a passenger vehicle. This crash occurred at night along northbound US 301 just south of the intersection with Main Street / Bunker Hill Road.

A summary of crashes by intersection (within 1/10<sup>th</sup> mile) is provided below:

#### US 301 & Levels Road (signal):

- 7 total crashes – 2 injury crashes
- 5 rear end crashes, 1 angle crash, 1 other
- 4 crashes caused by driver inattention/distraction
- 4 crashes during daylight, 2 dark-lit, 1 dusk
- All crashes during clear weather / dry surface

#### US 301 & Merrimac Avenue (signal):

- 9 total crashes – 4 injury crashes
- 5 rear end crashes
- 3 crashes caused by driver inattention/distraction
- 7 crashes during daylight
- 7 crashes during clear weather / dry surface, 2 during rain / wet surface

#### US 301 & Diamond State Boulevard / South Ridge Avenue (signal):

- 19 total crashes – 6 injury crashes
- 7 rear end crashes, 10 angle crashes, 2 same-direction sideswipe
- 47% driver inattention/distraction, 42% disregard traffic signal / failed to yield right-of-way
- 53% during daylight, 42% dark-lit
- 74% during clear weather / dry surface

## Westown Circulation Concept Plan Update

### US 301 & W Main Street / Bunker Hill Road (signal):

- 25 total crashes – 1 pedestrian fatality, 7 injury crashes
- 72% rear end crashes, 32% angle crashes, 12% other
- 48% driver inattention/distraction, 16% following too close, 12% failed to yield right-of-way / disregard signal
- 76% during daylight
- 88% during clear weather / dry surface

### US 301 & Sandhill Drive (unsignalized):

- 6 total crashes – 3 injury crashes
- 4 angle crashes, 1 head-on, 1 opposite-direction sideswipe
- 4 crashes caused by failure to yield right-of-way
- 3 crashes during daylight, 2 dark-lit, 1 at dusk
- 5 crashes during clear weather / dry surface

### US 301 & Peterson Road (signal):

- 5 total crashes – 3 injury crashes
- 2 same-direction sideswipe, 1 rear end, 1 angle, 1 other
- 2 crashes caused by failure to yield right-of-way
- 3 crashes during daylight, 2 dark-not lit
- 3 crashes during clear weather / dry surface, 2 on wet / snowy surface

### Bunker Hill Road and Merrimac Avenue (unsignalized):

- 4 total crashes – 2 injury crashes
- 2 angle crashes, 1 opposite direction sideswipe, 1 other
- 2 crashes caused by environmental circumstances, 1 roadway circumstance, 1 other
- 3 crashes during daylight
- 2 crashes during clear weather / dry surface, 2 during snowy/icy conditions

### Bunker Hill Road & Sandhill Drive (unsignalized):

- 10 total crashes – 4 injury crashes
- 6 angle crashes, 3 head-on crashes, 1 rear-end
- 5 driver inattention/distraction, 5 failure to yield right-of-way
- 8 crashes during daylight, 1 dark-lighted, 1 dusk
- 9 crashes during clear weather / dry surface
- This intersection is included in DeIDOT's Hazard Elimination Program (HEP) as 2014 HEP Site G, due to the cluster of angle crashes

## Westtown Circulation Concept Plan Update

### Main Street & Middletown Commons (Lowe's) Entrance (unsignalized):

- 17 total crashes – 4 injury crashes
- 13 angle crashes, 3 rear end crashes, 1 head-on
- 35% failure to yield right-of-way, 30% driver inattention/distraction, 35% other
- 76% during daylight
- 82% during clear weather / dry surface

### Main Street & Industrial Drive (signal):

- 19 total crashes – 1 injury crash
- 11 rear-end crashes, 5 angle crashes, 3 other
- 47% driver inattention/distraction, 16% following too close, 37% other
- 42% during daylight, 37% dark-lighted
- 74% during clear weather / dry surface

In addition to the intersection crashes listed above, there was one non-injury, head-on crash reported at the intersection of Levels Road and St. Annes Church Road which occurred at night during rainy weather and was caused by driving in a reckless manner. One non-injury, same-direction sideswipe crash was also reported at the intersection of Levels Road and Patriot Drive, which occurred during the day with fair weather conditions and was caused by improper passing.

Crash rates were calculated for the sections of West Main Street, Bunker Hill Road and US 301 within the study area, for the years 2010 and 2011 (the only full calendar years in the crash data timeframe for this study). These were compared to the statewide and New Castle County crash rates for the corresponding roadway classification, as shown in **Table 5**. US 301 had crash rates below the average state and county rates, but crash rates on Bunker Hill Road and West Main Street were much higher than the average rates.

**Table 5 – Crash Rates**

Roadway	Actual Crash Rate (cpmvmt) (2010 / 2011)	Statewide Rate (cpmvmt) (2010 / 2011)	New Castle County Rate (cpmvmt) (2010 / 2011)
US 301	2.24 / 2.14	3.43 / 3.41	3.78 / 3.81
Bunker Hill Road	19.70 / 12.62	2.10 / 2.08	2.91 / 2.80
West Main Street	8.13 / 9.56	4.04 / 4.07	4.19 / 4.39

NOTE: cpmvmt = crashes per million vehicle miles traveled

Statewide and County Rates obtained from DeIDOT's Safety Section

**Appendix C** contains detailed summary information regarding the crashes along US 301, Bunker Hill Road and West Main Street.

#### 4. *Existing Pedestrian, Bike and Transit Facilities*

##### Existing Bike and Pedestrian Facilities

Most of the major roads within the study area, including US 301, Main Street, Bunker Hill Road, Levels Road, and Merrimac Avenue accommodate bicyclists with ample shoulders and, in some areas, designated bike lanes. However, many sections of US 301 lack shoulders due to right-turn lanes at several major intersections, and there are no designated bike lanes on US 301. Considering the high percentage of heavy vehicle traffic on US 301, it is not an ideal situation for bicyclists. According to the New Castle County Bicycle Map, Delaware Bicycle Route 1 runs through the study area, as it comes from the south of Middletown along Broad Street (SR 71), turns west onto Main Street (SR 299), continues through US 301 onto Bunker Hill Road, and turns north onto Choptank Road.

Sidewalks are present in many locations throughout the study area, including:

- US 301 (west side from north of Levels Road to south of Peterson Road, and east side from Diamond State Boulevard to south of Peterson Road)
- Main Street (both sides from US 301 to east of Industrial Drive)
- Bunker Hill Road (south side from US 301 to Choptank Road and the Appoquinimink High School campus)
- Merrimac Avenue from US 301 to Bunker Hill Road (both sides except for a section on the east side between South Ridge Avenue and Merrimac Avenue)
- Diamond State Boulevard (both sides from US 301 to Industrial Drive except a section on south side near Industrial Drive)
- Sandhill Drive (both sides from Bunker Hill Road to US 301)

Sidewalks are non-existent or very limited along Levels Road, St. Annes Church Road, Broad Street (in the vicinity of St. Annes Church Road), Industrial Drive (south of Diamond State Boulevard), and Merrimac Avenue east of US 301.

There are crosswalks and pedestrian signals in place at the following intersections:

- US 301 & Merrimac Avenue
- US 301 & Diamond State Boulevard / South Ridge Avenue
- US 301 & SR 299 / Bunker Hill Road
- Main Street & Industrial Drive

##### Existing Transit Services and Facilities

As of June 2014, DART Route 43 provides weekday bus service within the Westtown study area with 21 round trips each weekday from 5:45 AM to 8:04 PM, running between the Amazon fulfillment center and the SR 299 Park and Ride just off SR 1 on the east side of Middletown. Route 43 includes stops at Amazon, Middletown Walmart, Southridge development, Hampton Inn, Middletown Village development, Middletown Commons shopping center, several stops along Main Street in the central and eastern parts of Middletown, and the SR 299 Park and Ride. Route 43 does not provide services on weekends. The only bus stops with bus shelters and benches are

## Westown Circulation Concept Plan Update

at Amazon, the SR 299 Park and Ride, and on eastbound Main Street at Catherine Street.

At the SR 299 Park and Ride, Route 43 connects with DART Route 301 (Intercounty Connector). Route 301 provides weekday and Saturday service between Wilmington and Dover, including Christiana Mall and Smyrna. On weekdays, northbound Route 301 stops at the SR 299 Park and Ride 16 times throughout the day from 6:10 AM to 8:02 PM, while southbound Route 301 stops at the SR 299 Park and Ride 18 times each day from 6:41 AM to 7:34 PM.

There is currently no passenger rail service in the Middletown area. However, that may change in the future as DelDOT is planning to develop a design for a Middletown Train Station. The future train station would likely be located in Westown along Industrial Drive where it runs parallel with the railroad tracks.

### III. Proposed Development

A primary goal of this study is to assess future traffic conditions that include traffic generated by the numerous development projects proposed to be built in the Westown study area. To account for traffic that will be generated by proposed developments, it was important to first establish the planned developments to include in the study, along with their land use characteristics. In October 2012, the Town of Middletown provided up-to-date information on commercial, residential, and industrial developments in the Westown vicinity. The information included the current status of each development, whether construction was completed, in progress, or yet to begin, and included details on the assumed remaining unbuilt land use (locations, types, and sizes/units). The developments and land use assumptions to be used in the traffic study were discussed and agreed upon at an October 2012 meeting with the Town, DeIDOT, and McCormick Taylor. Proposed developments that could feasibly be constructed by the design year of 2017 were included in the future traffic projections.

In 2012, it appeared feasible that the section of the proposed US 301 Bypass nearest the Westown area would be complete or nearly complete by 2017, so the US 301 Bypass was included in this study for the purpose of future conditions traffic analyses.

The updated Westown Circulation Concept Plan study was completed in two phases. Phase 1 was completed in January 2013, and included preliminary design year 2017 traffic analysis for the PM peak hour based on the future land use assumptions established in late 2012. Phase 2 of this study, which was conducted in 2014, included updated/refined future land use information and volume projections, analyses of AM and PM peak hours, crash analyses, and preparation of this report document.

As of the Phase 2 update in 2014, it no longer appears that the proposed US 301 Bypass will be built by 2017. The project is still planned for construction, but will not be complete by 2017. It also became apparent that many of the proposed developments that had been assumed during Phase 1 to be complete by 2017 would not actually be built by 2017. The sense from the Town and DeIDOT was that once the US 301 Bypass project breaks ground, many on-hold development projects will quickly start moving forward towards construction. So while 2017 is no longer a realistic year for full build-out of all the proposed Westown-area development projects, the Town and DeIDOT agreed that the future conditions analyses for this study should still include the US 301 Bypass and full build-out of the proposed Westown-area developments. While it is acknowledged that not all of the proposed development will be built by 2017, the design year of the future conditions analysis will still be identified as 2017.

While **Table 1** illustrates the 2012 update of proposed developments that had been assumed in the original 2005 Westown Circulation Concept Report, **Table 6** describes just the unbuilt portions (as of September 2012) of proposed developments used to project future traffic volumes for design year 2017. The land use characteristics of these unbuilt developments were discussed and agreed upon in October 2012 during

## Westown Circulation Concept Plan Update

Phase 1 of this updated study, but were later refined during Phase 2 based on August 2014 coordination with the Town of Middletown. This August 2014 update regarding proposed unbuilt developments is reflected in **Table 6**. As stated above in **Section II**, developments that have opened after September 2012 are not included in the analyses of 2012 existing conditions, but they are included in the analyses of 2017 future conditions (along with many other proposed developments that had not yet been built as of January 2015). These recently-built developments include, but are not limited to, the following:

- Amazon fulfillment center
- Westown Movies
- Advance Auto Parts
- Texas Roadhouse restaurant
- Portions of several housing developments

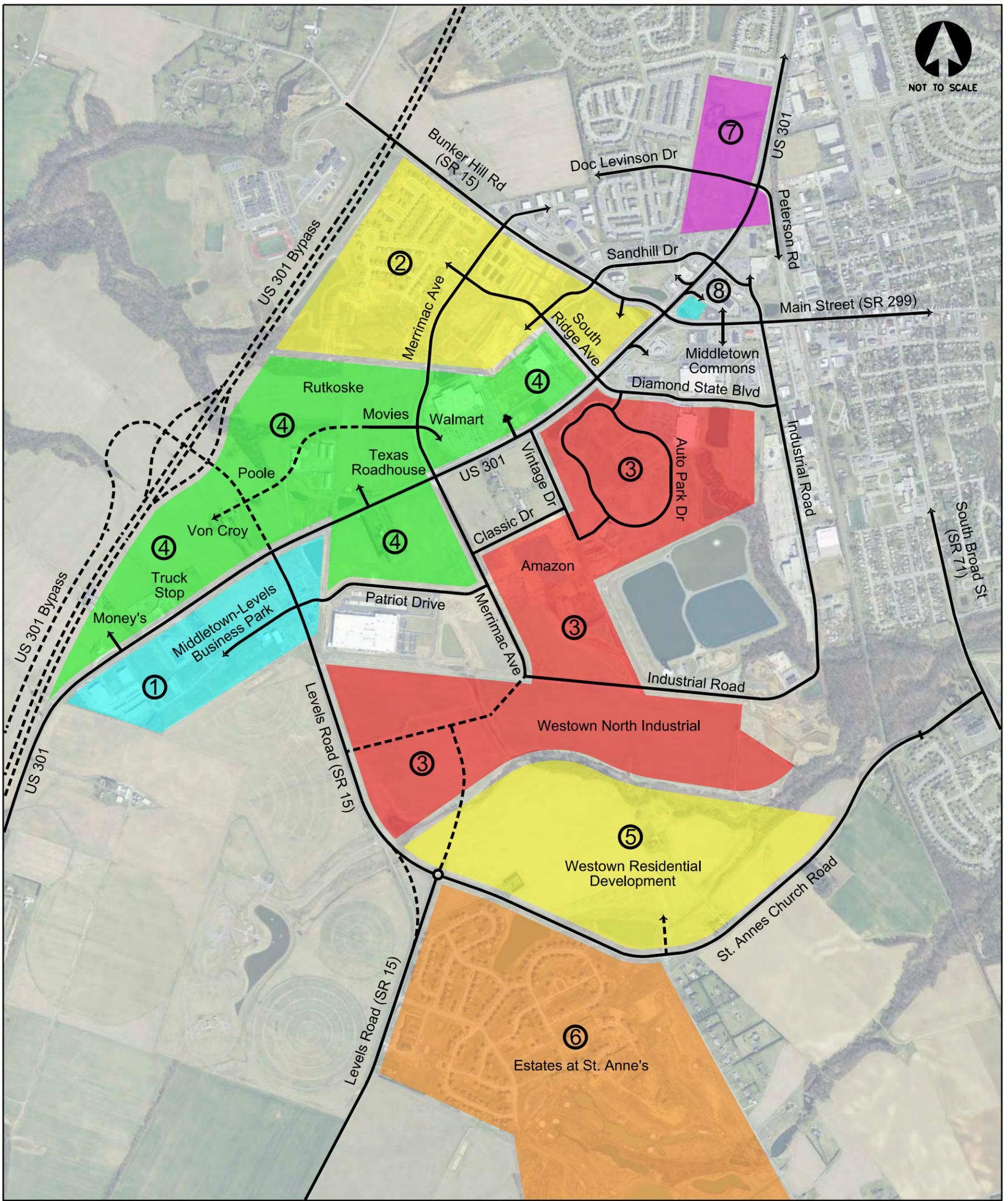
In addition to the list above, a handful of other specific future tenants were tentatively identified during 2014 coordination efforts (i.e., Petco, Michael's, Wendy's, and Grotto Pizza to name a few). It was agreed that the recently-built developments and the handful of known or rumored future tenants generally fit within the profile of or were similar to the assumed development land use types shown in **Table 6**, so in general they are not individually identified in **Table 6**. The only exceptions were Amazon (since it is a unique land use with a relatively large impact) and Advance Auto Parts (since it was the only unbuilt property in the Market Place area).

Locations of all proposed unbuilt developments included in **Table 6** are shown in **Figure 7**.

**Table 6 – Proposed Unbuilt Developments**

Development #	Name	Description	Size	
1	Levels Business Park	Industrial Park	70	acres
2	Southridge (Westown Town Center + Phase 2)	Senior Detached	115	units
		Apartment	204	units
		Townhouse	240	units
		Retail	239	ksf
3	Auto Mall Facility	Retail	248	ksf
		Westown North Industrial Park	227	acres
		Retail (former Auto Mall)	210	ksf
		Amazon	1.2	million sf
4	Kohl Commercial	3-Story Office	250	ksf
		Von Croy - apartments	300	units
		Truck Stop - retail	83	ksf
		Money - retail	462	ksf
		Poole - retail	166	ksf
		Rutkoske - retail	183	ksf
		Retail	254	ksf
		Hotel	550	rooms
5	Westown Residential Development	Commercial	264	ksf
		Single Family Homes	499	units
6	Estates at St. Annes	Townhouse	142	units
		Single Family Homes	261	units
7	Ramunno Property	Golf Course	18	holes
		Retail	121	ksf
8	Market Place	Conv/Gas Station	20	pumps
		Advance Auto Parts	6.9	ksf

Note: The information shown above reflects developments that were proposed (or under construction but not yet occupied) as of September 2012. This information was updated in August 2014, but still reflects the development status as of September 2012.



LEGEND	
	Middletown-Levels Business Park
	Southridge
	Auto Mall Facility
	Kohl Commercial
	Existing Roads
	Westtown Residential Development
	Estates at St. Anne's
	Ramunno Property
	Market Place
	Proposed Roads

## IV. Future Conditions

### A. Traffic Projections

#### 1. Trip Generation

Trips were determined for each proposed unbuilt development by using the *ITE Trip Generation* report (8<sup>th</sup> Edition). Future 2017 traffic volumes were then determined by projecting 2012 traffic volumes to the year 2017 using background growth rates of 0-3% per year (based on guidance provided by DeIDOT) and adding development-specific trips. Trips were generated for each proposed unbuilt development described previously in **Section III**, and these new trips were distributed throughout the study network using a gravity distribution. Pass-by trips, internal trips, study area trips, and external trips were determined before distributing the trips throughout the network. These terms are described below:

**Pass-by trips:** Trips that are not new to the study area. These are existing trips that are accessing a new development and then continuing along their original path. Although these trips do not add traffic to the system, they are reflected by an increase in turn movements and a decrease in through movements at site access points.

**Internal Trips:** Internal trips are trips that occur entirely within a new development (the motorists' origin and destination both occur within the same development). These trips are not included in the overall trips generated for the project area and do not show up as new trips. Developments that have internal trips are developments that have a combination of residential, retail, and/or offices within the same property, accessible to each other via internal roads.

**Study area trips:** Study area trips are applicable to a master plan type of study such as this Westown Circulation Concept Plan. For example, if a trip originates from Estates at St. Annes (residential) and heads for a retail store in the Auto Mall property along US 301 or to the offices in the Kohl Commercial Property, this is considered a study area trip. These trips originate and find their final destination all within the Westown study area limits.

**External trips:** Defined as trips that are generated outside the project area and bring "new" traffic to the study area.

**Appendix D** contains detailed summaries regarding pass-by trips, internal trips, study area trips, and external trips as determined for future AM and PM 2017 conditions.

2. *Trip Distribution and Assignment*

Trip distribution assumptions were based on existing volumes and expected traffic patterns (gravity distribution) within and surrounding the study area. These assumptions are shown in **Appendix D**. Specific trip assignments to the roadway network were based on the trip distribution assumptions and engineering judgment.

Design Year 2017 morning and afternoon peak hour traffic projections for base conditions are shown in **Figures 8 and 9**.

For the purpose of volume projections and analysis, the future transportation network includes the proposed US 301 Bypass project with an interchange in the Westown area served by an extension of Levels Road. Some motorists that use existing US 301 (including US 301 through traffic *and* traffic with an origin or destination within the Westown study area) would shift to the US 301 Bypass. In addition, a percentage of future traffic that would be generated by proposed unbuilt developments in the Westown area would also use the US 301 Bypass via the extension of Levels Road. For the future base conditions it was assumed that the Levels Road Extension connecting existing US 301 to the proposed US 301 Bypass would have one lane in each direction and would also provide direct access to the proposed Poole and Von Croy properties via an unsignalized right-in/right-out intersection located midway between existing US 301 and the US 301 Bypass. This intersection configuration is reflected in **Figures 8 and 9**.



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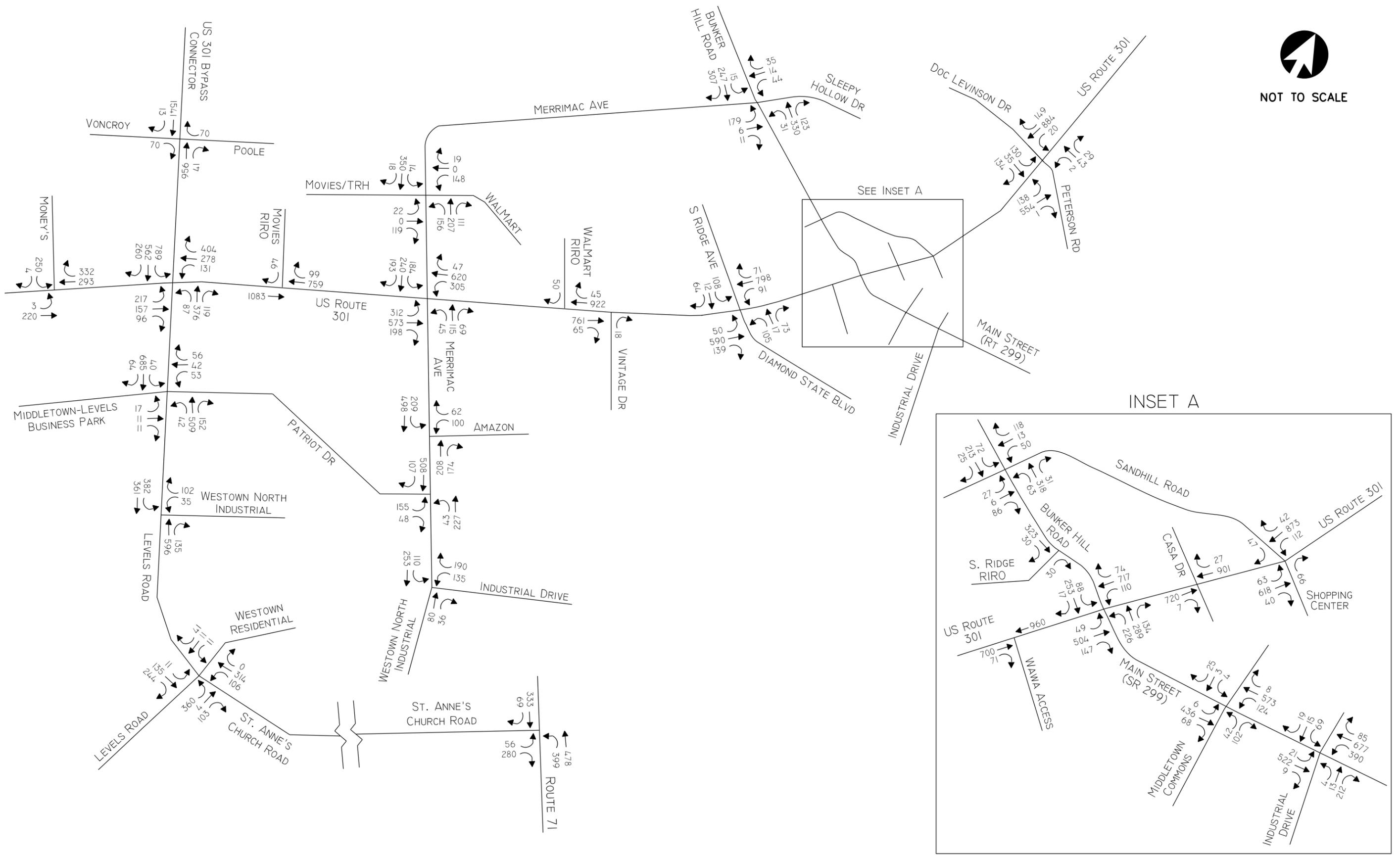


FIGURE 8 -  
 2017 FULL DEVELOPMENT -  
 AM PEAK HOUR BASE VOLUMES



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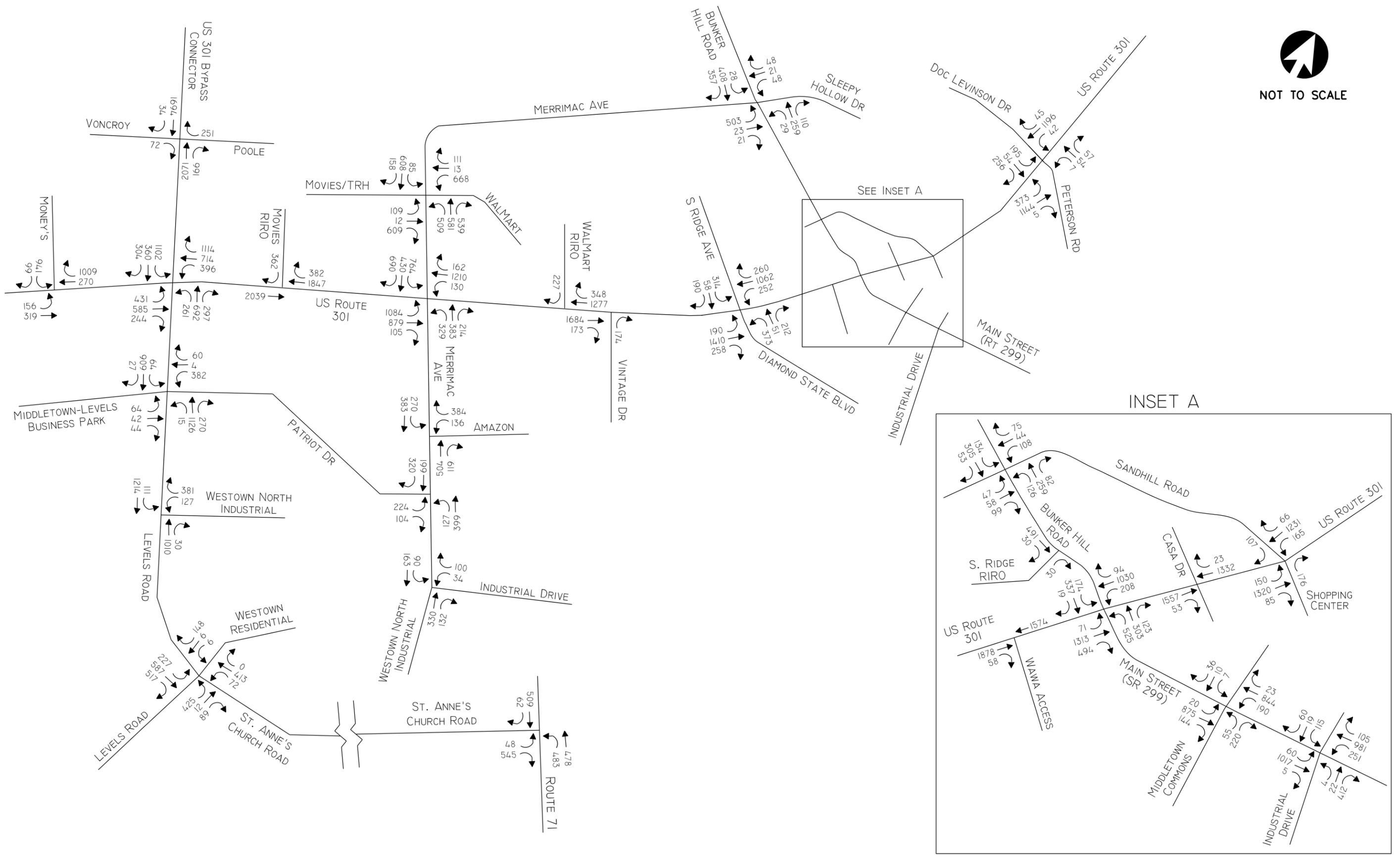


FIGURE 9 -  
 2017 FULL DEVELOPMENT -  
 PM PEAK HOUR BASE VOLUMES

## **B. Traffic Analysis of Design Year 2017 Base Conditions**

Traffic analysis was conducted for design year 2017 AM and PM peak hour conditions. Future base conditions include a full build-out of all proposed unbuilt developments, completion of the US 301 Bypass, and improved signal timings at all signalized intersections, but no other improvements. The results of the future base conditions analysis indicate where problematic traffic operations are anticipated if no other capacity improvements are made.

For analysis purposes, future heavy vehicle percentages were assumed to be the same as existing. Future peak hour factors (PHF) were assumed to be 0.92 for all intersections.

A summary of 2017 base conditions operational analysis is provided in **Table 7**, which includes basic LOS and delay results for each intersection. More detailed LOS and delay results for 2017 base conditions are provided in **Appendix E** in which results for signalized intersections are reported for the overall intersection and for each approach. For unsignalized intersections in **Appendix E**, LOS and delay are reported for each minor street approach and the major street left turns, if applicable.

Queuing analyses of 2017 base conditions were also conducted, with detailed results provided in **Appendix E**.

### AM Peak Hour

LOS analysis of 2017 base conditions reflected that most intersections would operate acceptably during the AM peak hour, with a few notable deficiencies. The signalized intersection with the highest overall average delay would be US 301 and Levels Road (LOS E), which would be a four-leg intersection in the base condition (Levels Road Extension to the US 301 Bypass is added as the fourth leg). All other signals would operate at LOS C or better.

Unsignalized intersections with LOS E or LOS F operations include the Patriot Drive approaches to Levels Road, the Merrimac Avenue approach to Bunker Hill Road, the St. Annes Church Road approach to SR 71, the Von Croy property approach to Levels Road Extension, and the Westown North Industrial Park approach to Levels Road.

Queues are anticipated to be particularly long on the eastbound Levels Road Extension approach to existing US 301, the St. Annes Church Road approach to SR 71, and the southbound Patriot Drive approach to Levels Road.

### PM Peak Hour

The PM peak hour would have significant congestion and extremely poor traffic operations at most intersections in the study area during 2017 base conditions without targeted capacity improvements. Due in part to much of the proposed unbuilt development being commercial/retail which generates more traffic during the afternoon

than the morning, PM peak conditions would deteriorate more than AM peak conditions (when comparing 2017 base conditions to 2012 existing conditions). Four of the seven signalized intersections analyzed for 2017 PM base conditions are anticipated to operate at LOS F. As with the AM peak, the PM peak would have highest delays at the intersection of US 301 and Levels Road / Levels Road Extension, largely due to the high volume of traffic projected to travel between existing US 301 and the US 301 Bypass during the PM peak hour. The other signals anticipated to operate at LOS F are US 301 and Merrimac Avenue, Merrimac Avenue and Commerce Drive (Walmart / Westown Movies / Texas Roadhouse), and US 301 and Peterson Road. The intersection of US 301 and SR 299 / Bunker Hill Road is expected to operate at LOS E, which is not a big dropoff from LOS D during 2012 existing conditions. The intersection of US 301 and Diamond State Boulevard / South Ridge Avenue is actually anticipated to have less delay than in 2012 existing conditions. Delays at these two intersections aren't expected to increase much if at all primarily because of signal timing improvements and because the main growth areas are further south along US 301 so the volumes at these two intersections won't increase by as much.

There would be many unsignalized intersections with LOS F operations, with the worst delays occurring at the following locations:

- single-lane roundabout at Levels Road and St. Annes Church Road (especially poor on the eastbound and northbound approaches),
- Patriot Drive approaches to Levels Road
- Middletown Commons and Market Place approaches to Main Street (exiting and opposite Lowe's)
- Merrimac Avenue approach to Bunker Hill Road
- Sandhill Drive approach to Bunker Hill Road
- St. Annes Church Road approach to SR 71
- Poole property and Von Croy property approaches to Levels Road Extension
- Westown North Industrial Park approach to Levels Road
- Money's property approach to US 301

Queues are anticipated to be lengthy throughout the study area, with the worst locations being the same as the intersections and approaches with lengthy delays listed above. Details are provided in **Appendix E**.

**Table 7 – Summary LOS Results for 2017 Base Conditions**

Intersection	Control Type	LOS (Delay (sec/veh))	
		AM Peak	PM Peak
US 301 & Peterson Road / Doc Levinson Road	signalized	C (21.4)	F (80.9)
US 301 & Sandhill Drive / Market Place	unsignalized	b (10.3)	b (15.0)
US 301 & Bunker Hill Road / West Main Street	signalized	C (24.2)	E (68.7)
US 301 & Diamond State Blvd / South Ridge Ave.	signalized	B (15.0)	C (31.1)
US 301 & Walmart RIRO	unsignalized	b (12.8)	d (29.6)
US 301 & Merrimac Ave	signalized	C (23.6)	F (145.3)
US 301 & Levels Road	signalized	E (62.1)	F (273.5)
West Main Street & Middletown Commons	unsignalized	c (22.9)	f (*)
West Main Street & Industrial Drive	signalized	B (11.9)	D (45.1)
Bunker Hill Road & Sandhill Drive	unsignalized	c (17.2)	f (632.3)
Bunker Hill Road & Merrimac Avenue	unsignalized	e (47.4)	f (884.1)
Levels Road & Patriot Drive	unsignalized	f (*)	f (*)
Levels Road & St. Annes Church Road	roundabout	b (11.6)	f (149.8)
SR 71 (S. Broad St.) & St. Annes Church Road	unsignalized	f (273.8)	f (847.0)
Merrimac Ave & Walmart / Texas Roadhouse	signalized	C (24.2)	F (115.7)
Levels Road Extension & Poole / Von Croy access (RIRO)	unsignalized	f (81.9)	f (*)
Merrimac Ave & Patriot Drive	unsignalized	d (28.0)	f (64.0)
Merrimac Ave & Industrial Drive	unsignalized	c (17.1)	b (12.3)
US 301 & Vintage Ave (Auto Mall RIRO)	unsignalized	b (11.4)	e (44.7)
US 301 & Texas Roadhouse RIRO	unsignalized	a (9.3)	c (16.7)
Merrimac Ave & Classic Drive (Amazon)	unsignalized	c (23.6)	e (44.1)
Levels Road & Westown North Industrial Park	unsignalized	f (89.1)	f (*)
US 301 & Money's Property	unsignalized	c (18.5)	f (9048)
Bunker Hill Road & South Ridge RIRO (between Sandhill Drive and US 301)	unsignalized	a (9.6)	b (10.3)

**NOTE:** For signalized and roundabout intersections, the result shown in the table is the overall intersection LOS/delay. For unsignalized analyses, the result shown in the table is the LOS/delay for the approach with the highest delay at each intersection.

Results showing (\*) indicate that Synchro does not report a numeric value due to excessive delay.

## C. Potential Improvement Alternatives

### 1. Proposed Improvements

Based on an evaluation of the 2017 base conditions operational analysis, several potential capacity improvements were developed to target locations of anticipated lengthy delays and queues throughout the study area. Analysis of the proposed improvements was conducted to determine the degree of operational benefit that might be achieved.

Proposed improvements that have been identified through this study are listed below. These improvements are in addition to the planned US 301 Bypass (assumed to be completed as part of 2017 base conditions) and any new development-specific site entrances. Many of these potential improvements are depicted in **Figures 10 through 13**, which show conceptual layouts of proposed intersection configurations.

#### **Proposed Improvements**

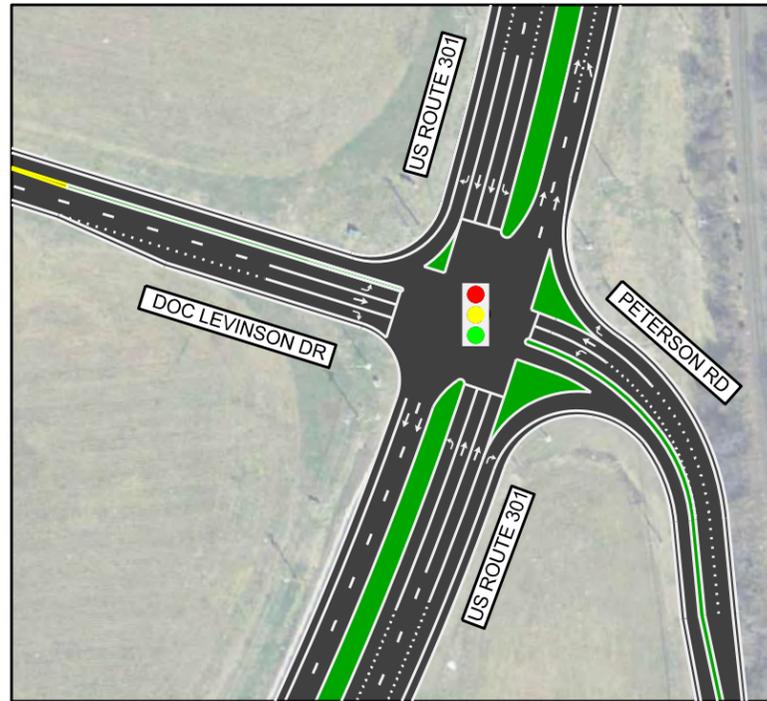
- Levels Road / Levels Road Extension & Existing US 301 – dual left-turn lanes (all approaches), add second through lane on Levels / Levels Extension approaches
- Levels Road Extension & Poole / Von Croy access – signalize intersection and allow lefts from eastbound Levels Road Extension into Poole Property
- Levels Road Extension – widen to 2 lanes each direction from Existing US 301 to US 301 Bypass (should be built this way when road is constructed)
- Levels Road (east of Existing US 301) – widen to 2 lanes each direction from Existing US 301 to beyond proposed Westown North Industrial Park entrance. On eastbound Levels Road, carry second lane to St. Annes Church Road roundabout.
- Levels Road & Patriot Drive – signalize intersection, add turn lanes and add second through lane on Levels Road approaches
- Merrimac Avenue & US 301 – longer turn lanes
- Bunker Hill Road & Merrimac Avenue / Sleepy Hollow Drive – signalize intersection and add separate turn lanes on side street approaches
- Peterson Avenue & US 301 – add separate turn lanes on side street approaches
- Levels Road & St. Annes Church Road roundabout – add right-turn bypass lane on eastbound Levels Road approach (continuation of proposed Levels Road widening)
- St. Annes Church Road & SR 71 – signalize intersection, and create separate turn lanes on eastbound St. Annes Church Road approach and full left-turn lane on northbound SR 71 approach
- Add signals at the following new intersections:
  - US 301 & Money's Entrance
  - Levels Road & Westown North Industrial Park

In addition to the proposed intersection and roadway widening improvements listed above, at least two new **internal street connections** should be constructed:

- A continuous roadway between Levels Road Extension and Merrimac Avenue. This connection would be located west of Existing US 301, and would run through the Poole and Rutkoske Property sites. This connector would handle a lot of traffic going between the US 301 Bypass (via Levels Road Extension) and areas such as Westown Movies, Texas Roadhouse, Walmart, and various proposed Rutkoske Property and Southridge development sites. This would relieve some of the anticipated congestion on the US 301 corridor between Levels Road and Merrimac Avenue, which would otherwise have much higher turning movement volumes at both intersections.
- A continuous roadway connecting the Westown Residential Development to Merrimac Avenue and Industrial Drive. This roadway would run through the proposed Westown North Industrial Park. While this would not be designed as an attractive cut-through route for truck traffic or other motorists coming to/from Levels Road, it would allow local traffic with an origin or destination in the Westown Residential Development to directly access Merrimac Avenue and Industrial Drive (and, from there, US 301 and other areas of the larger Westown study area and beyond) without having to take Levels Road and US 301. This connection through the Westown Residential Development and the Westown North Industrial Park should include accommodations for pedestrians and bicyclists such as sidewalks and designated bike lanes or a shared-use path.

With the proposed improvements, there was some redistribution of traffic volumes from the base conditions. Design Year 2017 morning and afternoon peak hour traffic volume projections for conditions with proposed improvements are shown in **Figures 14 and 15**.

US 301 & Peterson Rd

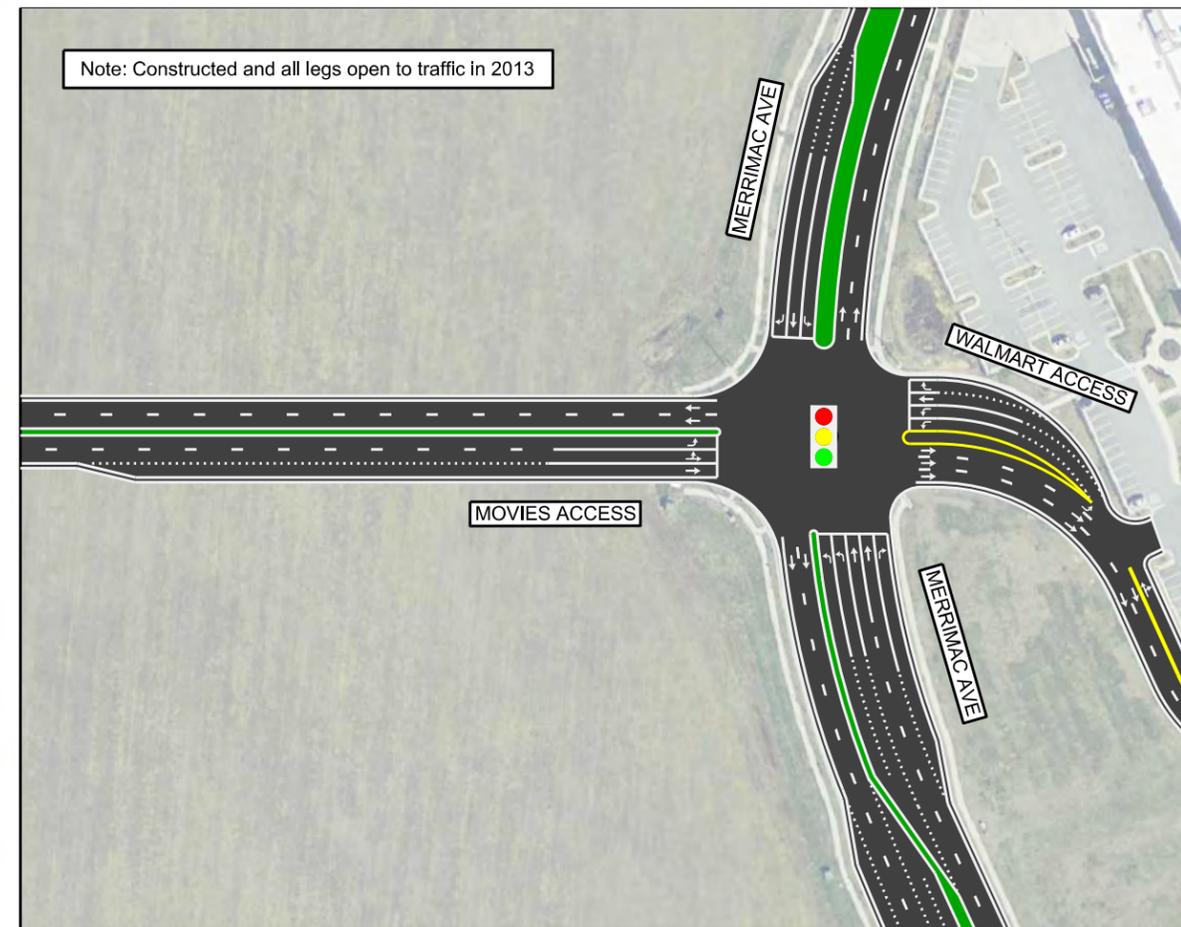


West Main Street (SR 299) & Middletown Commons /Market Place



NOT TO SCALE

Merrimac Avenue & Walmart Access / Movies Access



Bunker Hill Road & Merrimac Avenue /Sleepy Hollow Drive



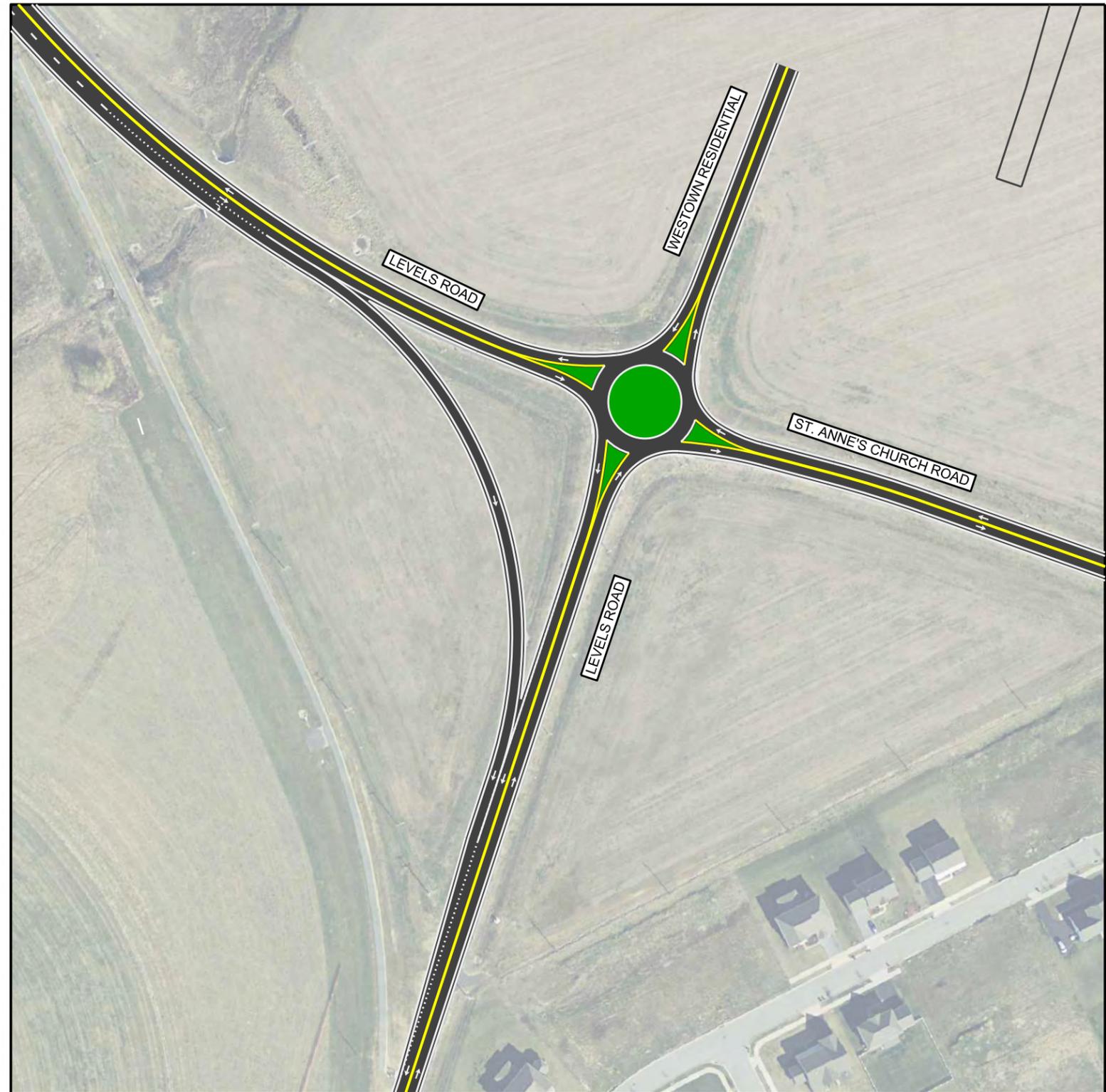
Merrimac Avenue & Industrial Drive



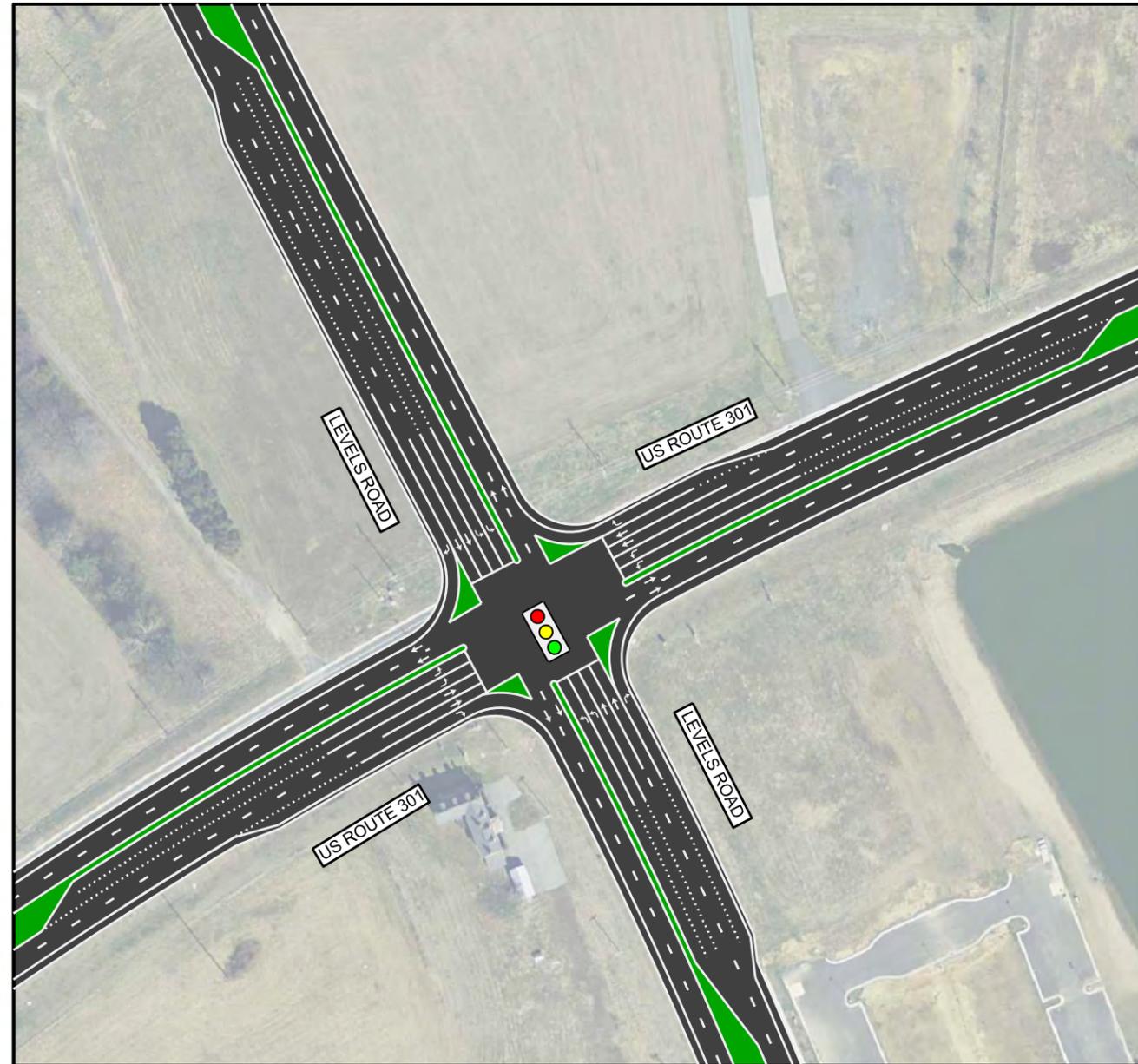
SR 71 (S. Broad Street) & St. Anne's Church Road



Levels Road & St. Anne's Church Road



US 301 & Levels Road



Levels Road & Patriot Drive





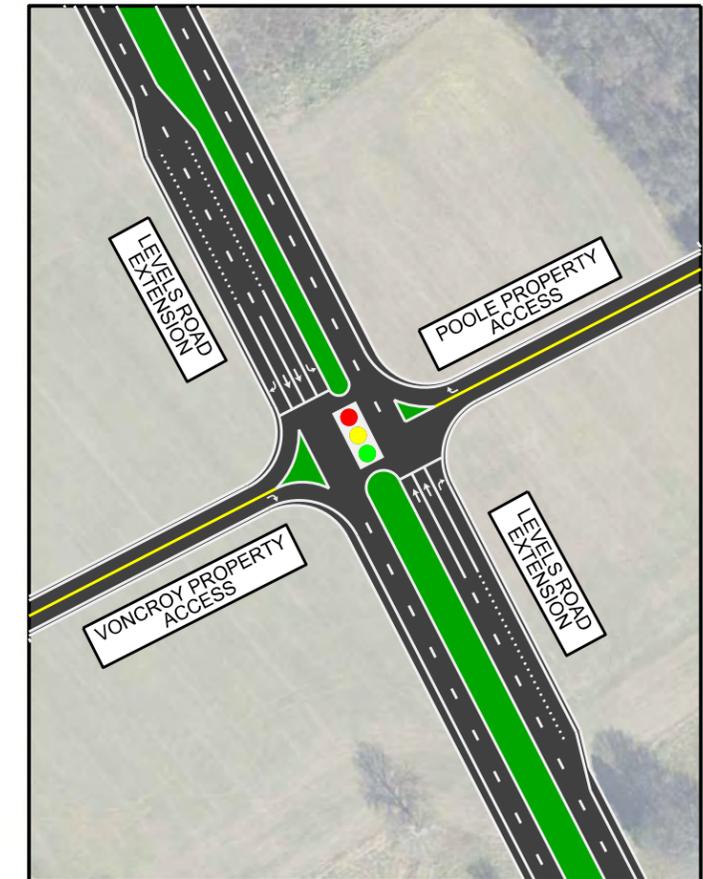
Merrimac Ave & Classic Drive and  
Merrimac Ave & Patriot Drive



US 301 & Money's Retail Access



Levels Road Extension &  
Poole Property Access / Voncroy Property Access





NOT TO SCALE

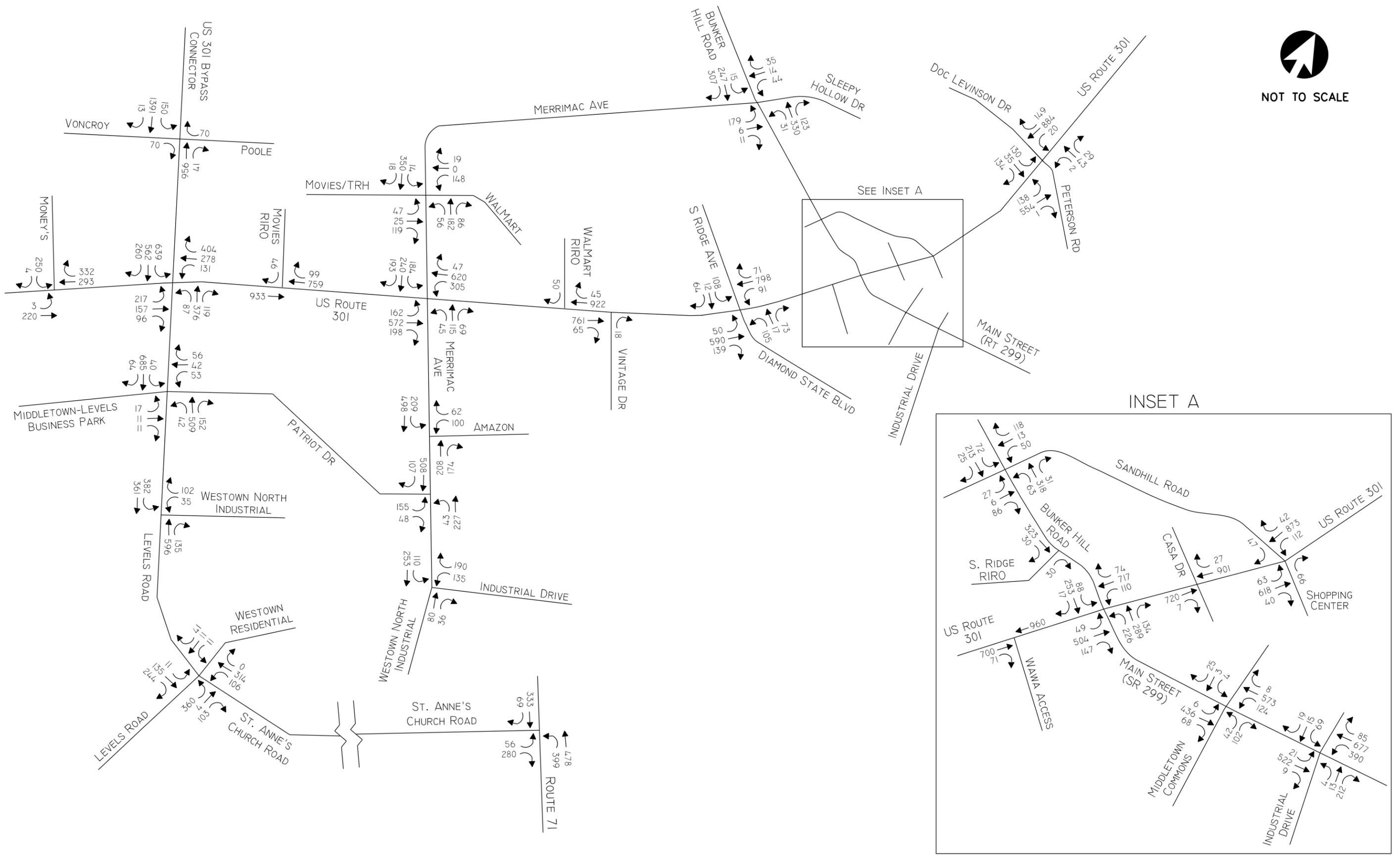
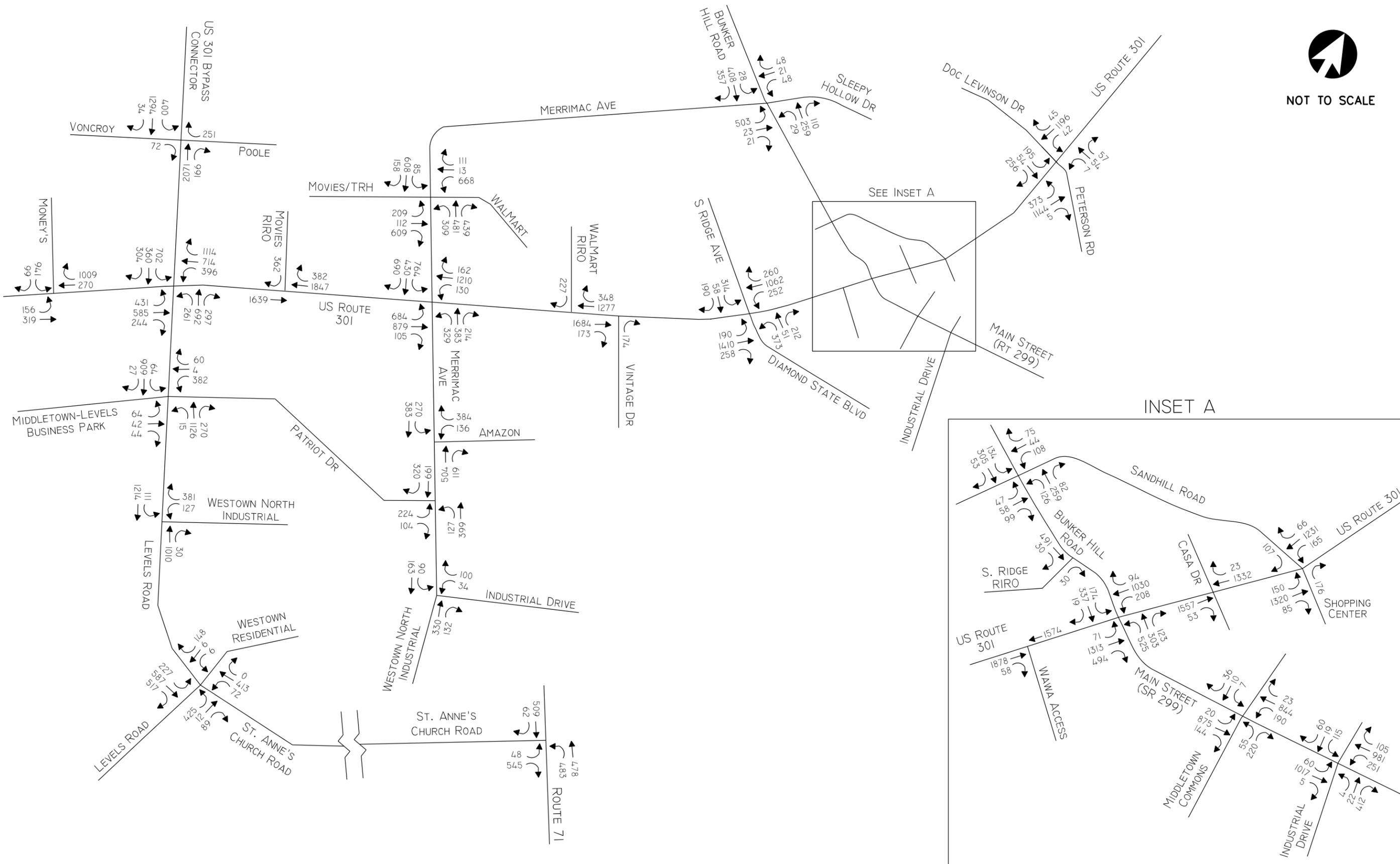


FIGURE 14 -  
 2017 AM PEAK HOUR VOLUMES  
 WITH PROPOSED IMPROVEMENTS



NOT TO SCALE



## 2. *Traffic Analysis of 2017 Conditions with Proposed Improvements*

After evaluating the 2017 base conditions operational analysis and identifying/developing potential capacity improvements targeting anticipated lengthy delays and queues, traffic analyses were conducted for design year 2017 AM and PM peak hour conditions with proposed improvements. This scenario incorporates all of the proposed improvements described in the previous section of this report. The analysis results indicate that the proposed improvements would effectively address many of the worst intersections in terms of peak hour delay and LOS. Even with the proposed improvements, however, five intersections would still operate at overall LOS F during the peak hour.

A summary of operational analyses for 2017 conditions with proposed improvements is provided in **Table 8**, which includes basic LOS and delay results for each intersection. More detailed LOS and delay results for 2017 conditions with proposed improvements are provided in **Appendix F** in which results for signalized intersections are reported for the overall intersection and for each approach. For unsignalized intersections in **Appendix F**, LOS and delay are reported for each minor street approach and the major street left turns, if applicable.

Queuing analyses of 2017 conditions with proposed improvements were also conducted, with detailed results provided in **Appendix F**.

### AM Peak Hour

LOS analysis of 2017 conditions with all of the proposed improvements described in the previous section of this report indicates that all of the signalized intersections in the study area would operate at LOS C or better during the AM peak hour. Only one unsignalized intersection would operate at LOS D: the eastbound Patriot Drive approach to Merrimac Avenue. These results represent a significant improvement compared to 2017 base conditions for the AM peak hour.

Queues are not anticipated to be problematic anywhere in the study area, with the longest queues reaching only 200-300 feet in a few locations such as westbound Main Street at Industrial Drive and both SR 71 approaches at St. Annes Church Road.

### PM Peak Hour

While the proposed improvements would not completely resolve all the problematic traffic operations seen in the 2017 PM peak hour base conditions, they would address many of the issues and would result in better traffic operations throughout the study area compared to 2017 base conditions. Three of the four signalized intersections that would be LOS F in 2017 base conditions would remain at LOS F with the proposed improvements, but the magnitude of the delay would be diminished. Although it would still be the signalized intersection with the highest delays, the overall average delay at the intersection of US 301 and Levels Road / Levels Road Extension would decrease by over 100 seconds compared to base conditions. Many of the unsignalized

intersections that would have LOS F operations with average delays into the hundreds of seconds in the base conditions would be better than LOS F or would at least have significantly lower delays when analyzed with proposed improvements. When considering all the signalized and unsignalized intersections together throughout the entire study area, the PM peak hour with proposed improvements would have a total of 16 different approaches operating at LOS F. Compared to 31 approaches at LOS F during the 2017 base conditions PM peak hour, it shows the considerable benefit on traffic operations of the proposed improvements.

Queues are still anticipated to be lengthy in different locations throughout the study area, but the proposed improvements would result in much shorter queues on most of the turn lanes and approaches that exhibited the longest anticipated queues for 2017 PM peak hour base conditions. Detailed queuing results are provided in **Appendix F**.

**Table 9** is provided below to illustrate a summary comparison of LOS at signalized intersections for 2012 Existing Conditions, 2017 Base Conditions, and 2017 Conditions with Proposed Improvements.

**Table 8 – Summary LOS Results for 2017 Conditions with Proposed Improvements**

Intersection	Control Type	LOS (Delay (sec/veh))	
		AM Peak	PM Peak
US 301 & Peterson Road / Doc Levinson Road	signalized	B (13.7)	D (42.2)
US 301 & Sandhill Drive / Market Place	unsignalized	a (10.6)	b (14.5)
US 301 & Bunker Hill Road / West Main Street	signalized	C (24.2)	D (42.8)
US 301 & Diamond State Blvd / South Ridge Ave.	signalized	B (12.3)	C (29.1)
US 301 & Walmart RIRO	unsignalized	b (12.8)	d (29.6)
US 301 & Merrimac Ave	signalized	C (23.7)	F (115.7)
US 301 & Levels Road	signalized	C (24.2)	F (159.6)
West Main Street & Middletown Commons	unsignalized	c (23.7)	f (*)
West Main Street & Industrial Drive	signalized	B (12.1)	D (44.3)
Bunker Hill Road & Sandhill Drive	unsignalized	c (17.2)	f (632.5)
Bunker Hill Road & Merrimac Avenue	<b>signalized</b>	A (9.7)	B (15.7)
Levels Road & Patriot Drive	<b>signalized</b>	A (8.5)	D (42.4)
Levels Road & St. Annes Church Road	roundabout	b (11.4)	f (56.0)
SR 71 (S. Broad St.) & St. Annes Church Road	<b>signalized</b>	B (12.1)	B (19.3)
Merrimac Ave & Walmart / Texas Roadhouse	signalized	C (20.2)	F (111.5)
Levels Road Extension & Poole / Von Croy access (RIRO)	<b>signalized</b>	A (7.9)	C (22.1)
Merrimac Ave & Patriot Drive	unsignalized	d (28.0)	f (64.0)
Merrimac Ave & Industrial Drive	unsignalized	b (11.3)	b (11.4)
US 301 & Vintage Ave (Auto Mall RIRO)	unsignalized	b (11.4)	e (44.7)
US 301 & Texas Roadhouse RIRO	unsignalized	a (9.6)	c (16.8)
Merrimac Ave & Classic Drive (Amazon)	unsignalized	c (23.6)	e (44.1)
Levels Road & Westtown North Industrial Park	<b>signalized</b>	A (5.2)	B (15.1)
US 301 & Money's Property	<b>signalized</b>	B (16.7)	F (108.7)
Bunker Hill Road & South Ridge RIRO (between Sandhill Drive and US 301)	unsignalized	a (9.6)	b (10.3)

**NOTE:** Intersections to be signalized as part of Proposed Improvements listed in **bold** for Control Type.

For signalized and roundabout intersections, the result shown in the table is the overall intersection LOS/delay. For unsignalized analyses, the result shown in the table is the LOS/delay for the approach with the highest delay at each intersection.

Results showing (\*) indicate that Synchro does not report a numeric value due to excessive delay.

**Table 9 – Summary Comparison of LOS Results for Signalized Intersections**

Intersection	2012 Existing Conditions		2017 Base Conditions		2012 With Proposed Improvements	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
US 301 & Peterson Road / Doc Levinson Road	B	B	C	F (81)	B	D
US 301 & Bunker Hill Road / West Main Street	D	D	C	E (69)	C	D
US 301 & Diamond State Blvd / South Ridge Ave.	C	D	B	C	B	C
US 301 & Merrimac Ave	C	C	C	F (145)	C	F (116)
US 301 & Levels Road	C	C	E (62)	F (274)	C	F (160)
West Main Street & Industrial Drive	A	B	B	D	B	D
Merrimac Ave & Walmart / Texas Roadhouse	N/A	N/A	C	F (116)	C	F (111)
Bunker Hill Road & Merrimac Avenue	N/S	N/S	N/S	N/S	A	B
Levels Road & Patriot Drive	N/S	N/S	N/S	N/S	A	D
SR 71 (S. Broad St.) & St. Annes Church Road	N/S	N/S	N/S	N/S	B	B
Levels Road Extension & Poole / Von Croy access (RIRO)	N/A	N/A	N/S	N/S	A	C
Levels Road & Westtown North Industrial Park	N/A	N/A	N/S	N/S	A	B
US 301 & Money's Property	N/A	N/A	N/S	N/S	B	F (109)

**NOTE:** N/A indicates intersection does not exist or was not included for analysis in the given scenario.

N/S indicates intersection is treated as unsignalized in the given scenario.

The result shown in the table is the overall intersection LOS (with average delay in parentheses). Average delay (sec/veh) provided only for those intersections with LOS E or worse.

While the analysis results indicate markedly better future traffic operations in many areas with the Proposed Improvements compared to the Base Conditions, they also reveal several additional matters as listed below that will require further consideration as the area continues to develop.

- The analysis identifies the “hot spots” that would need more extensive improvements beyond the reasonable level of improvements identified in this study. In particular, more extensive improvements may be needed in the part of the US 301 corridor that includes the intersections with Levels Road and Merrimac Avenue, as well as the nearby intersection of Merrimac Avenue and Walmart / Texas Roadhouse.
- Some of the proposed developments may need to be scaled back to avoid severe traffic congestion problems. Furthermore, any proposed zoning changes to intensive land use properties within Westown should include an assessment of the resulting effect on traffic impacts.
- Consider additional internal connections. One example would be installing a connector street from Middletown Commons near the Lowe’s to Industrial Drive, along with turning movement restrictions at the intersection of West Main Street and Middletown Commons to help alleviate the lengthy delays at that unsignalized intersection.
- Access management and site entrance-specific improvements will need to be closely considered.
- Transit and other multi-modal improvements will need to be considered (further discussed in **Section V** of this report).

Through this study, DeIDOT and the Town now have an assessment of the locations and magnitude of anticipated problematic traffic operations as more developments in the Westown study area are built and traffic volumes increase. Potential roadway projects that will improve operations have also been identified. DeIDOT and the Town can begin to formulate and prioritize these projects, and move them into the project development process, including obtaining funding for design and construction. Moving forward through this process, another update of the Westown Circulation Concept Plan Traffic Study should be conducted in approximately five years once the actual completion date of the US 301 Bypass is known and more up to date information is available regarding proposed developments in the Westown study area.

## **V. Multi-Modal Considerations**

### **A. Pedestrian and Bicycle Accommodations**

Internal sidewalk networks should be installed within all residential developments proposed or currently under construction in the area. Consideration should be given to pedestrian and bicycle interconnections between adjacent developments. In particular, a local roadway connection should be constructed from the proposed Westown Residential Development to Merrimac Avenue and Industrial Drive, and it should include accommodations for pedestrians and bicyclists such as sidewalks and designated bike lanes or a shared-use path. This connection would run through the proposed Westown North Industrial Park.

Crosswalks and pedestrian signals should be included with the new signal recommended to be added at Bunker Hill Road and Merrimac Avenue. These types of accommodations should also be provided at the intersections of US 301 & Peterson Road (existing signal), Levels Road & Patriot Drive (proposed signal) if sidewalks are extended to these locations. Sidewalks and bike lanes should be considered on all approaches to the intersection of St. Annes Church Road & SR 71 (proposed signal), and crosswalks and pedestrian signals should be included if sidewalks are added.

It is recommended that consideration be given to rerouting Delaware Bike Route 1 as follows:

- FROM: SR 71 → West Main Street (SR 299) → Bunker Hill Road
- TO: SR 71 → Green Giant Road → Wiggins Mill Road → St. Annes Church Road → Merrimac Avenue → Bunker Hill Road

The connection from St. Annes Church Road to Merrimac Avenue could be made via a route through the proposed Westown Residential Development and the proposed Westown North Industrial Park (described above) or via Levels Road to Patriot Drive. Cycling conditions along these roads would be better than those that presently exist along SR 71 and West Main Street.

### **B. Transit**

Delaware Transit Corporation (DTC) frequently assesses the need for revised or additional bus service in their coverage areas including Middletown. While DTC now serves the Westown study area with DART Bus Route 43, additional bus service will become valuable as developments fill in the area. Added service can be in the form of more frequent service and/or more stop locations on existing Bus Route 43, or new routes that cover different roadways and development sites.

## Westown Circulation Concept Plan Update

In addition to added bus service, DeIDOT is planning to develop a Park and Ride facility in the Westown area. This future Park and Ride would be located west of existing US 301 and north of the future Levels Road Extension. It would be ideal for carpooling and would serve as a new stop location for DART bus service.

Another type of transit service that should be considered is an employee shuttle to serve the Amazon fulfillment center and potentially other large employers. This would be particularly useful during the peak holiday season at Amazon when there are thousands of workers entering and leaving the facility within a short timeframe for a shift change that occurs during the PM peak hour. In late 2014, this scenario led to significant congestion throughout the west side of Middletown during the weekday PM peak hour, and it could be alleviated to some extent with alternative transportation options such as employee shuttles to a Park and Ride or other remote parking facility.

A Downstate Rail Study completed for DTC in 2013 examined the possibility of establishing passenger rail service from Northern Delaware to Central and Southern Delaware and to Ocean City, MD. This would potentially include stops in Middletown, Dover, and Georgetown. The study concluded that the expense of upgrading the existing rail lines and associated passenger service facilities would cost well into the hundreds of millions of dollars, posing a major hurdle to implementation. While the timeframe for implementation is uncertain due to the high costs involved, DeIDOT has begun planning to develop a design for the Middletown Train Station. The station would likely be located in Westown along Industrial Drive where it runs parallel with the railroad tracks. Should it come to fruition, it would give residents and workers an alternative travel mode and would certainly serve the Westown study area well. Passenger rail service would likely help to reduce automobile traffic volumes in the Westown area to some extent, thereby helping alleviate congestion issues.

## VI. Conclusions / Next Steps

The Westown Master Plan developed in 2003 provided an overall blueprint for development growth within the study area, and a general plan for the location and types of infrastructure improvements that would be required to support that development. This updated Circulation Concept Plan documents a recent analysis of the transportation systems within the study area, and defines specific roadway, pedestrian, bicycle, and transit improvements that could be implemented to help alleviate anticipated problematic traffic operations as development occurs. This study and the potential improvements identified do not include assessment of SR 299 through downtown Middletown, where capacity is much more limited and poor traffic operations often exist, or consideration of the seasonal fluctuations in traffic volumes that occur with the Amazon fulfillment center and with retail land use in general.

Through this study, DeIDOT and the Town now have an assessment of the locations and magnitude of anticipated problematic traffic operations as more developments in the Westown study area are built and traffic volumes increase. Anticipated traffic operations for Design Year 2017 conditions assuming full build-out of all proposed Westown area developments, but without significant roadway improvements other than completion of the US 301 Bypass, are detailed in **Section IV.B** of this report. In general, the PM peak hour conditions would be much worse than the AM peak hour, with the highest delays at the intersection of US 301 and Levels Road / Levels Road Extension, largely due to the high volume of traffic projected to travel between existing US 301 and the US 301 Bypass. Other signals anticipated to operate at LOS F are US 301 & Merrimac Avenue, and Merrimac Avenue & Commerce Drive (Walmart / Westown Movies / Texas Roadhouse). Numerous unsignalized intersections would have LOS F operations. Based on an evaluation of the 2017 base conditions operational analysis, several potential capacity improvements were developed to target locations of anticipated lengthy delays and queues throughout the study area.

DeIDOT and the Town should begin to formulate and prioritize the proposed improvement projects identified in **Section IV.C** of this report, and move them into the project development process, including obtaining funding for design and construction. A portion of the funding will come from the Westown Transportation Infrastructure Recoupment Agreement funded by developers based on land use and anticipated impacts. The improvements should be implemented as development occurs and traffic operations become more congested throughout the study area. Improvements to existing state roadways will be designed, bid and constructed in a manner consistent with DeIDOT standards. Internal roadway connections and bike/ped accommodations should be built in logical sections by each developer as the surrounding area develops.

Moving forward through this process, another update of the Westown Circulation Concept Plan Traffic Study should be conducted in approximately five years once the actual completion date of the US 301 Bypass is known and more up to date information is available regarding proposed developments in the Westown study area.

# **Westown Circulation Concept Plan Update**

## **Appendix A**

### **Traffic Count Data**

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

File Name : US 301 & Peterson-Doc Levinson

Site Code : 1

Start Date : 9/27/2012

Page No : 1

Groups Printed- Cars - Trucks

Start Time	US 301 Southbound					Peterson Rd Westbound					US 301 Northbound					Doc Levinson Dr Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	9	149	5	0	163	0	0	5	0	5	8	100	0	0	108	10	2	20	0	32	308
07:15 AM	2	119	7	0	128	2	1	8	0	11	9	120	0	0	129	3	0	7	0	10	278
07:30 AM	2	106	5	0	113	0	0	8	0	8	5	89	1	0	95	4	0	11	0	15	231
07:45 AM	4	134	7	0	145	0	0	8	0	8	9	94	0	0	103	6	1	5	0	12	268
Total	17	508	24	0	549	2	1	29	0	32	31	403	1	0	435	23	3	43	0	69	1085
08:00 AM	10	136	0	0	146	0	1	6	0	7	6	101	0	0	107	2	2	9	0	13	273
08:15 AM	5	110	1	0	116	0	1	3	0	4	7	115	0	0	122	4	1	13	0	18	260
08:30 AM	4	123	2	0	129	0	1	2	0	3	4	106	0	0	110	4	0	14	0	18	260
08:45 AM	6	110	5	0	121	0	1	4	0	5	5	117	0	0	122	5	0	8	0	13	261
Total	25	479	8	0	512	0	4	15	0	19	22	439	0	0	461	15	3	44	0	62	1054
*** BREAK ***																					
03:30 PM	2	158	3	0	163	0	1	11	0	12	9	143	1	0	153	6	1	9	0	16	344
03:45 PM	2	181	6	0	189	0	1	13	0	14	12	152	1	0	165	4	0	10	0	14	382
Total	4	339	9	0	352	0	2	24	0	26	21	295	2	0	318	10	1	19	0	30	726
04:00 PM	1	179	7	0	187	0	2	11	0	13	12	146	0	0	158	11	0	2	0	13	371
04:15 PM	6	184	8	0	198	0	0	4	0	4	14	151	1	0	166	3	0	6	0	9	377
04:30 PM	5	182	3	0	190	0	0	10	0	10	8	176	1	0	185	7	0	6	0	13	398
04:45 PM	5	192	7	0	204	0	2	14	0	16	12	136	0	0	148	8	0	17	0	25	393
Total	17	737	25	0	779	0	4	39	0	43	46	609	2	0	657	29	0	31	0	60	1539
05:00 PM	4	188	12	0	204	0	3	16	0	19	21	164	0	0	185	4	1	12	0	17	425
05:15 PM	9	171	7	0	187	0	3	17	0	20	22	170	2	0	194	9	1	7	0	17	418
05:30 PM	12	177	12	0	201	0	3	8	0	11	17	159	2	0	178	7	0	16	0	23	413
05:45 PM	4	189	8	0	201	0	1	7	0	8	18	143	0	0	161	11	0	16	0	27	397
Total	29	725	39	0	793	0	10	48	0	58	78	636	4	0	718	31	2	51	0	84	1653
06:00 PM	5	200	9	0	214	0	1	9	0	10	14	127	0	0	141	5	1	8	0	14	379
06:15 PM	4	154	10	0	168	0	1	7	0	8	20	112	0	0	132	4	0	6	0	10	318
Grand Total	101	3142	124	0	3367	2	23	171	0	196	232	2621	9	0	2862	117	10	202	0	329	6754
Apprch %	3	93.3	3.7	0		1	11.7	87.2	0		8.1	91.6	0.3	0		35.6	3	61.4	0		
Total %	1.5	46.5	1.8	0	49.9	0	0.3	2.5	0	2.9	3.4	38.8	0.1	0	42.4	1.7	0.1	3	0	4.9	
Cars	96	2761	124	0	2981	2	22	158	0	182	227	2259	6	0	2492	111	8	196	0	315	5970
% Cars	95	87.9	100	0	88.5	100	95.7	92.4	0	92.9	97.8	86.2	66.7	0	87.1	94.9	80	97	0	95.7	88.4
Trucks	5	381	0	0	386	0	1	13	0	14	5	362	3	0	370	6	2	6	0	14	784
% Trucks	5	12.1	0	0	11.5	0	4.3	7.6	0	7.1	2.2	13.8	33.3	0	12.9	5.1	20	3	0	4.3	11.6

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

File Name : US 301 & Peterson-Doc Levinson

Site Code : 1

Start Date : 9/27/2012

Page No : 2

Start Time	US 301 Southbound					Peterson Rd Westbound					US 301 Northbound					Doc Levinson Dr Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	9	149	5	0	163	0	0	5	0	5	8	100	0	0	108	10	2	20	0	32	308
07:15 AM	2	119	7	0	128	2	1	8	0	11	9	120	0	0	129	3	0	7	0	10	278
07:30 AM	2	106	5	0	113	0	0	8	0	8	5	89	1	0	95	4	0	11	0	15	231
07:45 AM	4	134	7	0	145	0	0	8	0	8	9	94	0	0	103	6	1	5	0	12	268
Total Volume	17	508	24	0	549	2	1	29	0	32	31	403	1	0	435	23	3	43	0	69	1085
% App. Total	3.1	92.5	4.4	0		6.2	3.1	90.6	0		7.1	92.6	0.2	0		33.3	4.3	62.3	0		
PHF	.472	.852	.857	.000	.842	.250	.250	.906	.000	.727	.861	.840	.250	.000	.843	.575	.375	.538	.000	.539	.881
Cars	16	442	24	0	482	2	1	24	0	27	30	332	0	0	362	22	3	41	0	66	937
% Cars	94.1	87.0	100	0	87.8	100	100	82.8	0	84.4	96.8	82.4	0	0	83.2	95.7	100	95.3	0	95.7	86.4
Trucks	1	66	0	0	67	0	0	5	0	5	1	71	1	0	73	1	0	2	0	3	148
% Trucks	5.9	13.0	0	0	12.2	0	0	17.2	0	15.6	3.2	17.6	100	0	16.8	4.3	0	4.7	0	4.3	13.6
Peak Hour Analysis From 01:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	4	188	12	0	204	0	3	16	0	19	21	164	0	0	185	4	1	12	0	17	425
05:15 PM	9	171	7	0	187	0	3	17	0	20	22	170	2	0	194	9	1	7	0	17	418
05:30 PM	12	177	12	0	201	0	3	8	0	11	17	159	2	0	178	7	0	16	0	23	413
05:45 PM	4	189	8	0	201	0	1	7	0	8	18	143	0	0	161	11	0	16	0	27	397
Total Volume	29	725	39	0	793	0	10	48	0	58	78	636	4	0	718	31	2	51	0	84	1653
% App. Total	3.7	91.4	4.9	0		0	17.2	82.8	0		10.9	88.6	0.6	0		36.9	2.4	60.7	0		
PHF	.604	.959	.813	.000	.972	.000	.833	.706	.000	.725	.886	.935	.500	.000	.925	.705	.500	.797	.000	.778	.972
Cars	29	646	39	0	714	0	10	48	0	58	76	563	2	0	641	31	2	51	0	84	1497
% Cars	100	89.1	100	0	90.0	0	100	100	0	100	97.4	88.5	50.0	0	89.3	100	100	100	0	100	90.6
Trucks	0	79	0	0	79	0	0	0	0	0	2	73	2	0	77	0	0	0	0	0	156
% Trucks	0	10.9	0	0	10.0	0	0	0	0	0	2.6	11.5	50.0	0	10.7	0	0	0	0	0	9.4

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

File Name : US 301 & sandhill-shopping center

Site Code : 2

Start Date : 9/27/2012

Page No : 1

Groups Printed- Cars - Trucks

Start Time	US 301 (Middletown Warwick Rd) Southbound					Shopping Center Driveway Westbound					US 301 (Middletown Warwick Rd) Northbound					Sandhill Dr Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	23	129	6	0	158	0	0	16	0	16	9	95	5	0	109	0	0	14	0	14	297
07:15 AM	22	99	7	0	128	0	0	14	0	14	15	113	15	0	143	0	0	10	0	10	295
07:30 AM	20	88	12	0	120	0	0	19	0	19	26	75	7	0	108	0	0	10	0	10	257
07:45 AM	17	104	8	0	129	0	0	15	1	16	20	87	11	0	118	0	0	18	0	18	281
Total	82	420	33	0	535	0	0	64	1	65	70	370	38	0	478	0	0	52	0	52	1130
08:00 AM	19	114	13	0	146	0	0	17	0	17	15	88	8	0	111	0	0	13	0	13	287
08:15 AM	30	91	11	0	132	0	0	13	0	13	12	112	7	0	131	0	0	9	1	10	286
08:30 AM	23	104	4	0	131	0	0	16	0	16	13	102	11	0	126	0	0	12	0	12	285
08:45 AM	21	88	8	0	117	0	0	18	1	19	19	113	11	0	143	0	0	13	0	13	292
Total	93	397	36	0	526	0	0	64	1	65	59	415	37	0	511	0	0	47	1	48	1150
*** BREAK ***																					
03:30 PM	25	126	12	1	164	1	0	14	0	15	22	137	14	0	173	1	0	22	1	24	376
03:45 PM	23	162	18	0	203	0	0	32	0	32	18	130	23	0	171	0	0	26	0	26	432
Total	48	288	30	1	367	1	0	46	0	47	40	267	37	0	344	1	0	48	1	50	808
04:00 PM	24	147	14	0	185	0	0	35	2	37	22	124	9	0	155	0	0	22	1	23	400
04:15 PM	25	143	14	0	182	0	0	26	0	26	16	129	12	0	157	0	0	16	0	16	381
04:30 PM	27	153	16	0	196	0	0	22	0	22	24	156	12	0	192	0	1	24	0	25	435
04:45 PM	34	158	12	0	204	0	0	23	0	23	31	118	12	0	161	0	0	21	0	21	409
Total	110	601	56	0	767	0	0	106	2	108	93	527	45	0	665	0	1	83	1	85	1625
05:00 PM	38	146	16	0	200	0	0	34	0	34	24	141	8	0	173	0	0	22	0	22	429
05:15 PM	33	125	15	0	173	0	0	46	0	46	26	127	15	0	168	0	0	26	0	26	413
05:30 PM	35	145	15	4	199	0	0	38	0	38	36	140	19	0	195	0	1	18	0	19	451
05:45 PM	44	153	17	0	214	0	0	50	0	50	25	119	18	0	162	0	0	29	0	29	455
Total	150	569	63	4	786	0	0	168	0	168	111	527	60	0	698	0	1	95	0	96	1748
06:00 PM	42	162	10	0	214	0	0	37	1	38	31	100	16	0	147	0	0	34	0	34	433
06:15 PM	28	134	21	0	183	0	0	50	2	52	25	87	11	0	123	0	0	36	0	36	394
Grand Total	553	2571	249	5	3378	1	0	535	7	543	429	2293	244	0	2966	1	2	395	3	401	7288
Apprch %	16.4	76.1	7.4	0.1		0.2	0	98.5	1.3		14.5	77.3	8.2	0		0.2	0.5	98.5	0.7		
Total %	7.6	35.3	3.4	0.1	46.4	0	0	7.3	0.1	7.5	5.9	31.5	3.3	0	40.7	0	0	5.4	0	5.5	
Cars	548	2194	247	5	2994	1	0	528	6	535	424	1910	241	0	2575	1	2	393	3	399	6503
% Cars	99.1	85.3	99.2	100	88.6	100	0	98.7	85.7	98.5	98.8	83.3	98.8	0	86.8	100	100	99.5	100	99.5	89.2
Trucks	5	377	2	0	384	0	0	7	1	8	5	383	3	0	391	0	0	2	0	2	785
% Trucks	0.9	14.7	0.8	0	11.4	0	0	1.3	14.3	1.5	1.2	16.7	1.2	0	13.2	0	0	0.5	0	0.5	10.8

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

File Name : US 301 & sandhill-shopping center

Site Code : 2

Start Date : 9/27/2012

Page No : 2

Start Time	US 301 (Middletown Warwick Rd) Southbound					Shopping Center Driveway Westbound					US 301 (Middletown Warwick Rd) Northbound					Sandhill Dr Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	19	114	13	0	146	0	0	17	0	17	15	88	8	0	111	0	0	13	0	13	287
08:15 AM	30	91	11	0	132	0	0	13	0	13	12	112	7	0	131	0	0	9	1	10	286
08:30 AM	23	104	4	0	131	0	0	16	0	16	13	102	11	0	126	0	0	12	0	12	285
08:45 AM	21	88	8	0	117	0	0	18	1	19	19	113	11	0	143	0	0	13	0	13	292
Total Volume	93	397	36	0	526	0	0	64	1	65	59	415	37	0	511	0	0	47	1	48	1150
% App. Total	17.7	75.5	6.8	0		0	0	98.5	1.5		11.5	81.2	7.2	0		0	0	97.9	2.1		
PHF	.775	.871	.692	.000	.901	.000	.000	.889	.250	.855	.776	.918	.841	.000	.893	.000	.000	.904	.250	.923	.985
Cars	93	339	36	0	468	0	0	64	1	65	57	310	37	0	404	0	0	47	1	48	985
% Cars	100	85.4	100	0	89.0	0	0	100	100	100	96.6	74.7	100	0	79.1	0	0	100	100	100	85.7
Trucks	0	58	0	0	58	0	0	0	0	0	2	105	0	0	107	0	0	0	0	0	165
% Trucks	0	14.6	0	0	11.0	0	0	0	0	0	3.4	25.3	0	0	20.9	0	0	0	0	0	14.3
Peak Hour Analysis From 01:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:15 PM																					
05:15 PM	33	125	15	0	173	0	0	46	0	46	26	127	15	0	168	0	0	26	0	26	413
05:30 PM	35	145	15	4	199	0	0	38	0	38	36	140	19	0	195	0	1	18	0	19	451
05:45 PM	44	153	17	0	214	0	0	50	0	50	25	119	18	0	162	0	0	29	0	29	455
06:00 PM	42	162	10	0	214	0	0	37	1	38	31	100	16	0	147	0	0	34	0	34	433
Total Volume	154	585	57	4	800	0	0	171	1	172	118	486	68	0	672	0	1	107	0	108	1752
% App. Total	19.2	73.1	7.1	0.5		0	0	99.4	0.6		17.6	72.3	10.1	0		0	0.9	99.1	0		
PHF	.875	.903	.838	.250	.935	.000	.000	.855	.250	.860	.819	.868	.895	.000	.862	.000	.250	.787	.000	.794	.963
Cars	153	508	57	4	722	0	0	170	1	171	118	414	68	0	600	0	1	107	0	108	1601
% Cars	99.4	86.8	100	100	90.3	0	0	99.4	100	99.4	100	85.2	100	0	89.3	0	100	100	0	100	91.4
Trucks	1	77	0	0	78	0	0	1	0	1	0	72	0	0	72	0	0	0	0	0	151
% Trucks	0.6	13.2	0	0	9.8	0	0	0.6	0	0.6	0	14.8	0	0	10.7	0	0	0	0	0	8.6

# Rummel, Klepper & Kahl, LLP

Consulting Engineers  
81 W Mosher St  
Baltimore MD 21217

US 301 & West Main Street (SR 299) / Bunker Hill Road  
traffic count obtained from the 2013 US 301 Spur  
Monitoring Report

File Name : US301-SR299  
Site Code : 00000000  
Start Date : 10/4/2012  
Page No : 4

Start Time	US 301 Southbound					US 301 Northbound					Bunker Hill Rd (SR299) Westbound					Main St (SR299) Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 06:30 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	24	74	9	0	107	12	87	22	2	123	30	76	23	0	129	15	49	4	0	68	427
07:15 AM	22	68	9	1	100	11	81	23	0	115	31	59	33	0	123	9	44	2	1	56	394
07:30 AM	26	79	8	0	113	4	68	28	0	100	38	40	35	0	113	13	45	2	1	61	387
07:45 AM	23	68	11	0	102	15	78	28	0	121	42	47	25	0	114	6	41	7	0	54	391
Total Volume	95	289	37	1	422	42	314	101	2	459	141	222	116	0	479	43	179	15	2	239	1599
% App. Total	22.5	68.5	8.8	0.2		9.2	68.4	22	0.4		29.4	46.3	24.2	0		18	74.9	6.3	0.8		
PHF	.913	.915	.841	.250	.934	.700	.902	.902	.250	.933	.839	.730	.829	.000	.928	.717	.913	.536	.500	.879	.936
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	40	121	5	0	166	25	158	57	0	240	61	43	11	0	115	19	66	3	0	88	609
05:00 PM	30	126	8	0	164	12	133	64	0	209	84	39	39	0	162	36	50	7	0	93	628
05:15 PM	50	115	9	0	174	15	121	53	1	190	87	70	27	1	185	41	79	1	0	121	670
05:30 PM	59	103	9	0	171	9	153	76	0	238	78	59	29	0	166	17	53	5	0	75	650
Total Volume	179	465	31	0	675	61	565	250	1	877	310	211	106	1	628	113	248	16	0	377	2557
% App. Total	26.5	68.9	4.6	0		7	64.4	28.5	0.1		49.4	33.6	16.9	0.2		30	65.8	4.2	0		
PHF	.758	.923	.861	.000	.970	.610	.894	.822	.250	.914	.891	.754	.679	.250	.849	.689	.785	.571	.000	.779	.954



56 W. Main St, Suite 300  
 Newark, DE 19702  
 302-738-0203

US 301 & Diamond State Blvd/S Ridge Ave

File Name : Diamond and South Ridge  
 Site Code : 3  
 Start Date : 9/27/2012  
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	US 301 (Middletown Warwick Rd) Southbound					Diamond State Blvd Westbound					US 301 (Middletown Warwick Rd) Northbound					S Ridge Ave Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	11	81	2	0	94	15	2	19	0	36	2	120	10	0	132	20	2	4	0	26	288
07:15 AM	11	83	9	0	103	11	3	10	0	24	2	117	9	0	128	16	2	1	0	19	274
07:30 AM	12	117	2	0	131	10	4	12	0	26	1	86	9	0	96	10	1	1	0	12	265
07:45 AM	9	100	7	0	116	23	3	12	1	39	1	117	15	0	133	6	5	2	0	13	301
Total	43	381	20	0	444	59	12	53	1	125	6	440	43	0	489	52	10	8	0	70	1128
08:00 AM	12	102	4	0	118	14	4	11	0	29	8	107	10	0	125	9	3	2	0	14	286
08:15 AM	16	83	5	0	104	17	6	20	0	43	0	120	30	1	151	8	3	3	0	14	312
08:30 AM	12	84	5	0	101	18	3	11	0	32	5	87	13	0	105	15	5	2	0	22	260
08:45 AM	15	77	11	0	103	18	4	22	0	44	1	118	21	0	140	7	2	3	0	12	299
Total	55	346	25	0	426	67	17	64	0	148	14	432	74	1	521	39	13	10	0	62	1157
*** BREAK ***																					
03:30 PM	11	134	15	0	160	29	10	11	0	50	5	156	20	0	181	26	9	6	0	41	432
03:45 PM	4	185	35	0	224	29	6	18	0	53	8	160	26	0	194	28	9	9	0	46	517
Total	15	319	50	0	384	58	16	29	0	103	13	316	46	0	375	54	18	15	0	87	949
04:00 PM	12	173	25	0	210	31	8	17	0	56	5	131	21	0	157	42	8	13	0	63	486
04:15 PM	17	170	19	0	206	43	13	19	2	77	6	141	27	0	174	36	14	11	0	61	518
04:30 PM	6	194	27	0	227	32	10	22	4	68	9	165	14	0	188	34	13	10	0	57	540
04:45 PM	4	177	38	5	224	26	7	9	0	42	10	162	19	0	191	37	10	13	0	60	517
Total	39	714	109	5	867	132	38	67	6	243	30	599	81	0	710	149	45	47	0	241	2061
05:00 PM	21	176	25	0	222	29	9	33	0	71	9	162	17	0	188	39	10	10	0	59	540
05:15 PM	19	167	20	0	206	43	10	26	2	81	8	145	24	0	177	49	11	9	0	69	533
05:30 PM	16	168	31	0	215	30	8	23	0	61	2	174	23	0	199	37	8	5	0	50	525
05:45 PM	13	148	23	0	184	22	13	31	0	66	9	149	23	0	181	35	10	10	0	55	486
Total	69	659	99	0	827	124	40	113	2	279	28	630	87	0	745	160	39	34	0	233	2084
06:00 PM	20	171	31	0	222	38	7	23	0	68	6	132	19	0	157	32	13	8	0	53	500
06:15 PM	13	142	35	0	190	33	9	17	0	59	15	120	18	0	153	41	13	5	1	60	462
Grand Total	254	2732	369	5	3360	511	139	366	9	1025	112	2669	368	1	3150	527	151	127	1	806	8341
Apprch %	7.6	81.3	11	0.1		49.9	13.6	35.7	0.9		3.6	84.7	11.7	0		65.4	18.7	15.8	0.1		
Total %	3	32.8	4.4	0.1	40.3	6.1	1.7	4.4	0.1	12.3	1.3	32	4.4	0	37.8	6.3	1.8	1.5	0	9.7	
Cars	243	2413	368	5	3029	503	139	348	7	997	112	2365	351	1	2829	526	150	127	1	804	7659
% Cars	95.7	88.3	99.7	100	90.1	98.4	100	95.1	77.8	97.3	100	88.6	95.4	100	89.8	99.8	99.3	100	100	99.8	91.8
Trucks	11	319	1	0	331	8	0	18	2	28	0	304	17	0	321	1	1	0	0	2	682
% Trucks	4.3	11.7	0.3	0	9.9	1.6	0	4.9	22.2	2.7	0	11.4	4.6	0	10.2	0.2	0.7	0	0	0.2	8.2



56 W. Main St, Suite 300  
 Newark, DE 19702  
 302-738-0203

US 301 & Diamond State Blvd/S Ridge Ave

File Name : Diamond and South Ridge  
 Site Code : 3  
 Start Date : 9/27/2012  
 Page No : 2

Start Time	US 301 (Middletown Warwick Rd) Southbound					Diamond State Blvd Westbound					US 301 (Middletown Warwick Rd) Northbound					S Ridge Ave Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	12	117	2	0	131	10	4	12	0	26	1	86	9	0	96	10	1	1	0	12	265
07:45 AM	9	100	7	0	116	23	3	12	1	39	1	117	15	0	133	6	5	2	0	13	301
08:00 AM	12	102	4	0	118	14	4	11	0	29	8	107	10	0	125	9	3	2	0	14	286
08:15 AM	16	83	5	0	104	17	6	20	0	43	0	120	30	1	151	8	3	3	0	14	312
Total Volume	49	402	18	0	469	64	17	55	1	137	10	430	64	1	505	33	12	8	0	53	1164
% App. Total	10.4	85.7	3.8	0		46.7	12.4	40.1	0.7		2	85.1	12.7	0.2		62.3	22.6	15.1	0		
PHF	.766	.859	.643	.000	.895	.696	.708	.688	.250	.797	.313	.896	.533	.250	.836	.825	.600	.667	.000	.946	.933
Cars	44	352	18	0	414	62	17	51	1	131	10	364	58	1	433	33	11	8	0	52	1030
% Cars	89.8	87.6	100	0	88.3	96.9	100	92.7	100	95.6	100	84.7	90.6	100	85.7	100	91.7	100	0	98.1	88.5
Trucks	5	50	0	0	55	2	0	4	0	6	0	66	6	0	72	0	1	0	0	1	134
% Trucks	10.2	12.4	0	0	11.7	3.1	0	7.3	0	4.4	0	15.3	9.4	0	14.3	0	8.3	0	0	1.9	11.5

Peak Hour Analysis From 01:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	6	194			227		10		4			165					13				540
04:45 PM	4	177	38	5	224	26	7	9	0	42	10	162	19	0	191	37	10	13	0	60	517
05:00 PM	21	176	25	0	222	29	9	33	0	71	9	162	17	0	188	39	10	10	0	59	540
05:15 PM	19	167	20	0	206	43	10	26	2	81	8	145	24	0	177	49	11	9	0	69	533
Total Volume	50	714	110	5	879	130	36	90	6	262	36	634	74	0	744	159	44	42	0	245	2130
% App. Total	5.7	81.2	12.5	0.6		49.6	13.7	34.4	2.3		4.8	85.2	9.9	0		64.9	18	17.1	0		
PHF	.595	.920	.724	.250	.968	.756	.900	.682	.375	.809	.900	.961	.771	.000	.974	.811	.846	.808	.000	.888	.986
Cars	50	631	110	5	796	129	36	90	5	260	36	574	72	0	682	158	44	42	0	244	1982
% Cars	100	88.4	100	100	90.6	99.2	100	100	83.3	99.2	100	90.5	97.3	0	91.7	99.4	100	100	0	99.6	93.1
Trucks	0	83	0	0	83	1	0	0	1	2	0	60	2	0	62	1	0	0	0	1	148
% Trucks	0	11.6	0	0	9.4	0.8	0	0	16.7	0.8	0	9.5	2.7	0	8.3	0.6	0	0	0	0.4	6.9

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

File Name : US 301 & Merrimac all

Site Code : 4

Start Date : 10/3/2012

Page No : 1

Groups Printed- Cars - Trucks

Start Time	US 301 Southbound					Merrimac Ave Westbound					US 301 Northbound					Merrimac Ave Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:15 AM	13	86	1	0	100	2	1	4	0	7	15	121	2	0	138	3	2	6	0	11	256
07:30 AM	9	88	3	0	100	1	0	0	0	1	12	105	1	0	118	5	3	13	0	21	240
07:45 AM	8	103	3	0	114	0	0	3	0	3	23	118	1	0	142	3	3	11	0	17	276
Total	30	277	7	0	314	3	1	7	0	11	50	344	4	0	398	11	8	30	0	49	772
08:00 AM	11	115	6	0	132	0	0	1	0	1	12	129	2	0	143	6	1	9	0	16	292
08:15 AM	9	90	1	0	100	0	0	3	0	3	25	111	0	0	136	3	4	13	0	20	259
08:30 AM	3	93	2	0	98	0	0	0	0	0	13	117	0	0	130	8	0	16	0	24	252
08:45 AM	7	123	4	0	134	0	0	0	0	0	13	133	0	0	146	10	1	9	0	20	300
Total	30	421	13	0	464	0	0	4	0	4	63	490	2	0	555	27	6	47	0	80	1103
09:00 AM	8	88	3	0	99	0	3	1	0	4	13	118	0	0	131	10	1	2	0	13	247
*** BREAK ***																					
Total	8	88	3	0	99	0	3	1	0	4	13	118	0	0	131	10	1	2	0	13	247
*** BREAK ***																					
03:30 PM	16	125	2	0	143	4	0	22	0	26	25	139	1	0	165	13	1	19	0	33	367
03:45 PM	3	156	4	1	164	0	0	5	0	5	21	116	0	0	137	16	1	32	0	49	355
Total	19	281	6	1	307	4	0	27	0	31	46	255	1	0	302	29	2	51	0	82	722
04:00 PM	2	161	4	0	167	1	0	5	0	6	21	133	1	0	155	21	0	40	0	61	389
04:15 PM	1	182	4	0	187	0	0	4	0	4	23	126	1	0	150	12	0	31	0	43	384
04:30 PM	1	171	3	0	175	0	2	11	2	15	30	159	0	0	189	17	0	44	0	61	440
04:45 PM	1	133	2	0	136	0	0	4	0	4	23	144	0	0	167	21	0	36	0	57	364
Total	5	647	13	0	665	1	2	24	2	29	97	562	2	0	661	71	0	151	0	222	1577
05:00 PM	8	150	0	0	158	1	1	11	0	13	20	157	0	0	177	21	0	32	0	53	401
05:15 PM	13	126	2	0	141	0	3	8	0	11	20	129	0	0	149	13	2	27	1	43	344
05:30 PM	2	166	2	0	170	7	6	49	0	62	33	122	0	0	155	9	1	30	0	40	427
05:45 PM	3	164	4	0	171	5	2	11	0	18	22	128	0	0	150	19	0	29	0	48	387
Total	26	606	8	0	640	13	12	79	0	104	95	536	0	0	631	62	3	118	1	184	1559
06:00 PM	7	138	4	0	149	1	5	32	0	38	23	145	0	0	168	19	3	29	0	51	406
06:15 PM	5	135	3	0	143	1	3	23	0	27	31	112	0	0	143	13	1	23	0	37	350
Grand Total	130	2593	57	1	2781	23	26	197	2	248	418	2562	9	0	2989	242	24	451	1	718	6736
Apprch %	4.7	93.2	2	0		9.3	10.5	79.4	0.8		14	85.7	0.3	0		33.7	3.3	62.8	0.1		
Total %	1.9	38.5	0.8	0	41.3	0.3	0.4	2.9	0	3.7	6.2	38	0.1	0	44.4	3.6	0.4	6.7	0	10.7	
Cars	119	2285	43	1	2448	23	25	191	2	241	397	2220	8	0	2625	231	23	430	1	685	5999
% Cars	91.5	88.1	75.4	100	88	100	96.2	97	100	97.2	95	86.7	88.9	0	87.8	95.5	95.8	95.3	100	95.4	89.1
Trucks	11	308	14	0	333	0	1	6	0	7	21	342	1	0	364	11	1	21	0	33	737
% Trucks	8.5	11.9	24.6	0	12	0	3.8	3	0	2.8	5	13.3	11.1	0	12.2	4.5	4.2	4.7	0	4.6	10.9

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

Start Time	US 301 Southbound					Merrimac Ave Westbound					US 301 Northbound					Merrimac Ave Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:15 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	11	115	6	0	132	0	0	1	0	1	12	129	2	0	143	6	1	9	0	16	292
08:15 AM	9	90	1	0	100	0	0	3	0	3	25	111	0	0	136	3	4	13	0	20	259
08:30 AM	3	93	2	0	98	0	0	0	0	0	13	117	0	0	130	8	0	16	0	24	252
08:45 AM	7	123	4	0	134	0	0	0	0	0	13	133	0	0	146	10	1	9	0	20	300
Total Volume	30	421	13	0	464	0	0	4	0	4	63	490	2	0	555	27	6	47	0	80	1103
% App. Total	6.5	90.7	2.8	0		0	0	100	0		11.4	88.3	0.4	0		33.8	7.5	58.8	0		
PHF	.682	.856	.542	.000	.866	.000	.000	.333	.000	.333	.630	.921	.250	.000	.950	.675	.375	.734	.000	.833	.919
Cars	27	369	9	0	405	0	0	4	0	4	59	394	2	0	455	25	5	42	0	72	936
% Cars	90.0	87.6	69.2	0	87.3	0	0	100	0	100	93.7	80.4	100	0	82.0	92.6	83.3	89.4	0	90.0	84.9
Trucks	3	52	4	0	59	0	0	0	0	0	4	96	0	0	100	2	1	5	0	8	167
% Trucks	10.0	12.4	30.8	0	12.7	0	0	0	0	0	6.3	19.6	0	0	18.0	7.4	16.7	10.6	0	10.0	15.1

Peak Hour Analysis From 01:00 PM to 06:15 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:15 PM

04:15 PM	1	182	4	0	187	0	0	4	0	4	23	126	1	0	150	12	0	31	0	43	384
04:30 PM	1	171	3	0	175	0	2	11	2	15	30	159	0	0	189	17	0	44	0	61	440
04:45 PM	1	133	2	0	136	0	0	4	0	4	23	144	0	0	167	21	0	36	0	57	364
05:00 PM	8	150	0	0	158	1	1	11	0	13	20	157	0	0	177	21	0	32	0	53	401
Total Volume	11	636	9	0	656	1	3	30	2	36	96	586	1	0	683	71	0	143	0	214	1589
% App. Total	1.7	97	1.4	0		2.8	8.3	83.3	5.6		14.1	85.8	0.1	0		33.2	0	66.8	0		
PHF	.344	.874	.563	.000	.877	.250	.375	.682	.250	.600	.800	.921	.250	.000	.903	.845	.000	.813	.000	.877	.903
Cars	8	571	7	0	586	1	3	27	2	33	92	528	1	0	621	69	0	138	0	207	1447
% Cars	72.7	89.8	77.8	0	89.3	100	100	90.0	100	91.7	95.8	90.1	100	0	90.9	97.2	0	96.5	0	96.7	91.1
Trucks	3	65	2	0	70	0	0	3	0	3	4	58	0	0	62	2	0	5	0	7	142
% Trucks	27.3	10.2	22.2	0	10.7	0	0	10.0	0	8.3	4.2	9.9	0	0	9.1	2.8	0	3.5	0	3.3	8.9



# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

Start Time	US 301 Southbound					SR 15 (Levels Rd) Westbound					US 301 Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:15 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	44	78	0	0	122	4	0	51	0	55	0	104	11	0	115	0	0	0	0	0	292
08:00 AM	32	86	0	0	118	4	0	35	0	39	0	104	3	0	107	0	0	0	0	0	264
08:15 AM	36	65	0	0	101	6	0	76	1	83	0	70	4	0	74	0	0	0	0	0	258
08:30 AM	24	83	0	0	107	4	0	41	0	45	0	87	7	0	94	0	0	0	0	0	246
Total Volume	136	312	0	0	448	18	0	203	1	222	0	365	25	0	390	0	0	0	0	0	1060
% App. Total	30.4	69.6	0	0		8.1	0	91.4	0.5		0	93.6	6.4	0		0	0	0	0		
PHF	.773	.907	.000	.000	.918	.750	.000	.668	.250	.669	.000	.877	.568	.000	.848	.000	.000	.000	.000	.000	.908
Cars	122	265	0	0	387	15	0	185	1	201	0	298	24	0	322	0	0	0	0	0	910
% Cars	89.7	84.9	0	0	86.4	83.3	0	91.1	100	90.5	0	81.6	96.0	0	82.6	0	0	0	0	0	85.8
Trucks	14	47	0	0	61	3	0	18	0	21	0	67	1	0	68	0	0	0	0	0	150
% Trucks	10.3	15.1	0	0	13.6	16.7	0	8.9	0	9.5	0	18.4	4.0	0	17.4	0	0	0	0	0	14.2
Peak Hour Analysis From 01:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	68	161	0	0	229	1	0	31	0	32	0	117	11	0	128	0	0	0	0	0	389
04:30 PM	54	158	0	0	212	4	0	71	1	76	0	138	4	0	142	0	0	0	0	0	430
04:45 PM	63	120	0	0	183	7	0	69	0	76	0	112	8	0	120	0	0	0	0	0	379
05:00 PM	48	150	0	0	198	4	0	85	0	89	0	99	6	0	105	0	0	0	0	0	392
Total Volume	233	589	0	0	822	16	0	256	1	273	0	466	29	0	495	0	0	0	0	0	1590
% App. Total	28.3	71.7	0	0		5.9	0	93.8	0.4		0	94.1	5.9	0		0	0	0	0		
PHF	.857	.915	.000	.000	.897	.571	.000	.753	.250	.767	.000	.844	.659	.000	.871	.000	.000	.000	.000	.000	.924
Cars	225	531	0	0	756	16	0	251	1	268	0	413	27	0	440	0	0	0	0	0	1464
% Cars	96.6	90.2	0	0	92.0	100	0	98.0	100	98.2	0	88.6	93.1	0	88.9	0	0	0	0	0	92.1
Trucks	8	58	0	0	66	0	0	5	0	5	0	53	2	0	55	0	0	0	0	0	126
% Trucks	3.4	9.8	0	0	8.0	0	0	2.0	0	1.8	0	11.4	6.9	0	11.1	0	0	0	0	0	7.9

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

File Name : Merrimac & Bunker Hill

Site Code : 5

Start Date : 10/3/2012

Page No : 1

Groups Printed- Cars - Trucks

Start Time	Sleepy Hollow Dr Southbound					Bunker Hill Rd Westbound					Merrimac Ave Northbound					Bunker Hill Rd Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:15 AM	13	2	11	0	26	11	141	15	0	167	8	0	1	0	9	4	47	6	0	57	259
07:30 AM	4	3	10	0	17	3	32	20	0	55	8	4	4	0	16	3	42	12	0	57	145
07:45 AM	7	6	6	0	19	5	38	22	0	65	6	1	2	0	9	1	41	11	0	53	146
Total	24	11	27	0	62	19	211	57	0	287	22	5	7	0	34	8	130	29	0	167	550
08:00 AM	10	3	8	0	21	4	25	36	0	65	12	1	1	0	14	5	21	9	0	35	135
08:15 AM	4	4	5	0	13	8	33	23	0	64	10	1	2	0	13	6	37	14	0	57	147
08:30 AM	8	0	15	0	23	6	51	23	0	80	13	2	3	0	18	3	34	8	0	45	166
08:45 AM	8	2	10	0	20	6	42	20	0	68	16	1	2	0	19	3	76	6	0	85	192
Total	30	9	38	0	77	24	151	102	0	277	51	5	8	0	64	17	168	37	0	222	640
09:00 AM	6	1	22	0	29	5	27	24	0	56	13	2	2	0	17	5	34	2	0	41	143
*** BREAK ***																					
Total	6	1	22	0	29	5	27	24	0	56	13	2	2	0	17	5	34	2	0	41	143
*** BREAK ***																					
03:30 PM	7	5	11	0	23	5	37	9	0	51	17	4	3	0	24	4	81	7	0	92	190
03:45 PM	9	1	6	0	16	12	47	14	0	73	14	3	2	0	19	1	47	12	0	60	168
Total	16	6	17	0	39	17	84	23	0	124	31	7	5	0	43	5	128	19	0	152	358
04:00 PM	17	1	8	0	26	10	56	17	0	83	25	2	5	0	32	7	52	14	0	73	214
04:15 PM	13	1	8	0	22	10	43	15	0	68	25	5	2	0	32	1	53	13	0	67	189
04:30 PM	17	1	10	0	28	5	43	16	1	65	22	5	4	0	31	5	44	18	0	67	191
04:45 PM	19	2	9	0	30	8	50	14	1	73	21	2	4	0	27	5	57	11	0	73	203
Total	66	5	35	0	106	33	192	62	2	289	93	14	15	0	122	18	206	56	0	280	797
05:00 PM	17	3	15	0	35	2	56	24	0	82	26	7	5	0	38	6	77	17	0	100	255
05:15 PM	11	4	11	0	26	11	51	22	0	84	27	4	7	0	38	7	89	20	0	116	264
05:30 PM	10	7	10	0	27	6	55	19	0	80	31	3	2	0	36	4	58	22	0	84	227
05:45 PM	10	7	12	0	29	7	55	36	0	98	34	9	5	0	48	7	70	13	0	90	265
Total	48	21	48	0	117	26	217	101	0	344	118	23	19	0	160	24	294	72	0	390	1011
06:00 PM	15	3	5	0	23	12	34	14	0	60	31	6	4	0	41	3	79	10	0	92	216
06:15 PM	14	1	6	0	21	11	40	8	0	59	12	3	0	0	15	2	47	8	0	57	152
Grand Total	219	57	198	0	474	147	956	391	2	1496	371	65	60	0	496	82	1086	233	0	1401	3867
Apprch %	46.2	12	41.8	0		9.8	63.9	26.1	0.1		74.8	13.1	12.1	0		5.9	77.5	16.6	0		
Total %	5.7	1.5	5.1	0	12.3	3.8	24.7	10.1	0.1	38.7	9.6	1.7	1.6	0	12.8	2.1	28.1	6	0	36.2	
Cars	214	55	179	0	448	142	934	385	2	1463	364	64	58	0	486	82	1086	233	0	1401	3798
% Cars	97.7	96.5	90.4	0	94.5	96.6	97.7	98.5	100	97.8	98.1	98.5	96.7	0	98	100	100	100	0	100	98.2
Trucks	5	2	19	0	26	5	22	6	0	33	7	1	2	0	10	0	0	0	0	0	69
% Trucks	2.3	3.5	9.6	0	5.5	3.4	2.3	1.5	0	2.2	1.9	1.5	3.3	0	2	0	0	0	0	0	1.8





56 W. Main St, Suite 300  
 Newark, DE 19702  
 302-738-0203

Middletown - Westown Update  
 Intersection: Bunker Hill Rd &  
 Sandhill Dr  
 Date Counted: Thurs, 1/30/14

File Name : Bunker Hill Rd & Sandhill Rd  
 Site Code : 1  
 Start Date : 1/30/2014  
 Page No : 1

Groups Printed- Cars - Trucks - Buses

Start Time	Sandhill Dr Southbound					Bunker Hill Rd Westbound					Sandhill Dr Northbound					Bunker Hill Rd Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	16	0	47	0	63	2	173	8	0	183	4	0	2	0	6	8	78	3	0	89	341
07:15 AM	19	6	32	0	57	1	46	6	1	54	4	1	2	0	7	13	70	4	0	87	205
07:30 AM	22	2	20	0	44	1	57	11	0	69	4	2	0	0	6	11	56	1	0	68	187
07:45 AM	15	5	19	0	39	1	66	9	0	76	3	3	0	0	6	24	58	6	0	88	209
Total	72	13	118	0	203	5	342	34	1	382	15	6	4	0	25	56	262	14	0	332	942
08:00 AM	20	0	16	0	36	0	37	15	0	52	2	3	1	0	6	7	42	2	0	51	145
08:15 AM	13	1	29	0	43	3	43	14	0	60	0	3	1	0	4	12	42	1	0	55	162
08:30 AM	21	3	23	0	47	5	58	14	0	77	2	1	1	0	4	25	86	4	0	115	243
08:45 AM	23	4	15	0	42	1	37	16	0	54	2	0	1	0	3	15	35	1	0	51	150
Total	77	8	83	0	168	9	175	59	0	243	6	7	4	0	17	59	205	8	0	272	700
*** BREAK ***																					
03:00 PM	26	2	18	0	46	1	48	19	0	68	2	2	3	0	7	14	73	7	0	94	215
03:15 PM	22	5	18	0	45	1	53	14	0	68	7	2	0	0	9	14	76	3	0	93	215
03:30 PM	25	6	11	0	42	2	46	20	0	68	7	10	5	0	22	27	54	6	0	87	219
03:45 PM	27	11	20	0	58	2	57	8	0	67	6	5	4	0	15	15	62	3	0	80	220
Total	100	24	67	0	191	6	204	61	0	271	22	19	12	0	53	70	265	19	0	354	869
04:00 PM	20	6	19	0	45	3	60	19	0	82	6	5	5	0	16	16	79	2	0	97	240
04:15 PM	32	14	23	0	69	0	42	9	0	51	10	6	1	0	17	21	67	3	0	91	228
04:30 PM	22	7	15	0	44	2	52	19	0	73	4	7	2	0	13	12	79	2	0	93	223
04:45 PM	27	7	20	0	54	2	56	13	0	71	7	3	0	0	10	19	87	2	0	108	243
Total	101	34	77	0	212	7	210	60	0	277	27	21	8	0	56	68	312	9	0	389	934
05:00 PM	23	10	21	0	54	5	73	18	0	96	2	5	2	0	9	21	80	6	0	107	266
05:15 PM	19	7	16	0	42	3	57	20	0	80	8	14	1	0	23	36	84	10	0	130	275
05:30 PM	29	2	15	0	46	5	54	20	0	79	11	14	1	0	26	26	62	6	0	94	245
05:45 PM	43	10	23	0	76	4	62	22	0	88	12	11	0	0	23	26	53	10	0	89	276
Total	114	29	75	0	218	17	246	80	0	343	33	44	4	0	81	109	279	32	0	420	1062
Grand Total	464	108	420	0	992	44	1177	294	1	1516	103	97	32	0	232	362	1323	82	0	1767	4507
Apprch %	46.8	10.9	42.3	0		2.9	77.6	19.4	0.1		44.4	41.8	13.8	0		20.5	74.9	4.6	0		
Total %	10.3	2.4	9.3	0	22	1	26.1	6.5	0	33.6	2.3	2.2	0.7	0	5.1	8	29.4	1.8	0	39.2	
Cars	455	108	407	0	970	43	1158									1282					
% Cars	98.1	100	96.9	0	97.8	97.7	98.4	99.3	100	98.5	99	97.9	96.9	0	98.3	97	96.9	100	0	97.1	97.8
Trucks	4	0	1	0	5	0	10	1	0	11	0	1	1	0	2	1	9	0	0	10	28
% Trucks	0.9	0	0.2	0	0.5	0	0.8	0.3	0	0.7	0	1	3.1	0	0.9	0.3	0.7	0	0	0.6	0.6
Buses	5	0	12	0	17	1	9	1	0	11	1	1	0	0	2	10	32	0	0	42	72
% Buses	1.1	0	2.9	0	1.7	2.3	0.8	0.3	0	0.7	1	1	0	0	0.9	2.8	2.4	0	0	2.4	1.6



56 W. Main St, Suite 300  
 Newark, DE 19702  
 302-738-0203

Middletown - Westtown Update  
 Intersection: Bunker Hill Rd &  
 Sandhill Dr  
 Date Counted: Thurs, 1/30/14

File Name : Bunker Hill Rd & Sandhill Rd  
 Site Code : 1  
 Start Date : 1/30/2014  
 Page No : 2

Start Time	Sandhill Dr Southbound					Bunker Hill Rd Westbound					Sandhill Dr Northbound					Bunker Hill Rd Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:00 AM

07:00 AM	16	0	47	0	63	2	173	8	0	183	4	0	2	0	6	8	78	3	0	89	341
07:15 AM	19	6	32	0	57	1	46	6	1	54	4	1	2	0	7	13	70	4	0	87	205
07:30 AM	22	2	20	0	44	1	57	11	0	69	4	2	0	0	6	11	56	1	0	68	187
07:45 AM	15	5	19	0	39	1	66	9	0	76	3	3	0	0	6	24	58	6	0	88	209
Total Volume	72	13	118	0	203	5	342	34	1	382	15	6	4	0	25	56	262	14	0	332	942
% App. Total	35.5	6.4	58.1	0		1.3	89.5	8.9	0.3		6.0	2.4	1.6	0		16.9	78.9	4.2	0		
PHF	.818	.542	.628	.000	.806	.625	.494	.773	.250	.522	.938	.500	.500	.000	.893	.583	.840	.583	.000	.933	.691
Cars	70	13	114	0	197	4	334	34	1	373	14	5	3	0	22	52	245	14	0	311	903
% Cars	97.2	100	96.6	0	97.0	80.0	97.7	100	100	97.6	93.3	83.3	75.0	0	88.0	92.9	93.5	100	0	93.7	95.9
Trucks	1	0	0	0	1	0	4	0	0	4	0	0	1	0	1	0	2	0	0	2	8
% Trucks	1.4	0	0	0	0.5	0	1.2	0	0	1.0	0	0	25.0	0	4.0	0	0.8	0	0	0.6	0.8
Buses	1	0	4	0	5	1	4	0	0	5	1	1	0	0	2	4	15	0	0	19	31
% Buses	1.4	0	3.4	0	2.5	20.0	1.2	0	0	1.3	6.7	16.7	0	0	8.0	7.1	5.7	0	0	5.7	3.3

Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 05:00 PM

05:00 PM	23	10				5	73			96			2								
05:15 PM	19	7	16	0	42	3	57	20	0	80	8	14	1	0	23	36	84	10	0	130	275
05:30 PM	29	2	15	0	46	5	54	20	0	79	11	14	1	0	26	26	62	6	0	94	245
05:45 PM	43	10	23	0	76	4	62	22	0	88	12	11	0	0	23	26	53	10	0	89	276
Total Volume	114	29	75	0	218	17	246	80	0	343	33	44	4	0	81	109	279	32	0	420	1062
% App. Total	52.	13.	34.	0		5	71.	23.	0		40.	54.	4.9	0		26	66.	7.6	0		
	3	3	4			5	7	3			7	3				26	4				
PHF	.66	.72	.81	.00	.717	.85	.84	.90	.00	.893	.68	.78	.50	.00	.779	.75	.83	.80	.00	.808	.962
Cars	114	29	75	0	218	17	245	79	0	341	33	43	4	0	80	107	277	32	0	416	1055
% Cars	100	100	100	0	100	100	99.	98.	0	99.4	100	97.	100	0	98.8	98.	99.	100	0	99.0	99.3
Trucks	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	0	2	0	0	2	4
% Trucks	0	0	0	0	0	0	0	1.3	0	0.3	0	2.3	0	0	1.2	0	0.7	0	0	0.5	0.4
Buses	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2	0	0	0	2	3
% Buses	0	0	0	0	0	0	0.4	0	0	0.3	0	0	0	0	0	1.8	0	0	0	0.5	0.3

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

File Name : w main & shopping center all

Site Code : 7

Start Date : 10/2/2012

Page No : 1

Groups Printed- Cars - Trucks

Start Time	Shopping Center Southbound					W Main St (RT 299) Westbound					Shopping Center Northbound					W Main St (RT 299) Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	2	1	2	0	5	21	107	2	0	130	9	1	21	0	31	2	92	16	0	110	276
07:15 AM	0	1	5	0	6	32	98	3	0	133	0	1	20	0	21	1	88	15	0	104	264
07:30 AM	1	1	9	0	11	33	87	2	0	122	16	3	22	0	41	0	87	23	0	110	284
07:45 AM	1	0	5	0	6	21	88	0	0	109	14	1	33	0	48	2	88	14	0	104	267
Total	4	3	21	0	28	107	380	7	0	494	39	6	96	0	141	5	355	68	0	428	1091
08:00 AM	0	0	3	0	3	21	82	1	0	104	12	0	28	0	40	3	51	19	0	73	220
08:15 AM	1	0	8	0	9	29	85	0	0	114	5	0	26	0	31	1	66	16	0	83	237
08:30 AM	1	1	2	0	4	22	98	3	0	123	13	0	24	0	37	1	71	19	1	92	256
08:45 AM	0	3	6	0	9	54	96	1	0	151	11	5	37	0	53	2	87	21	0	110	323
Total	2	4	19	0	25	126	361	5	0	492	41	5	115	0	161	7	275	75	1	358	1036
*** BREAK ***																					
03:30 PM	0	2	8	0	10	31	111	4	0	146	15	4	45	0	64	3	114	19	0	136	356
03:45 PM	2	0	8	0	10	33	139	2	0	174	9	2	43	0	54	5	94	35	0	134	372
Total	2	2	16	0	20	64	250	6	0	320	24	6	88	0	118	8	208	54	0	270	728
04:00 PM	0	0	9	0	9	34	109	5	0	148	10	3	40	0	53	3	99	26	0	128	338
04:15 PM	2	3	4	0	9	35	109	5	0	149	10	1	34	0	45	4	104	26	0	134	337
04:30 PM	1	1	9	0	11	41	101	5	0	147	20	4	35	0	59	6	112	26	0	144	361
04:45 PM	2	1	10	0	13	41	116	1	0	158	13	3	40	0	56	2	111	30	0	143	370
Total	5	5	32	0	42	151	435	16	0	602	53	11	149	0	213	15	426	108	0	549	1406
05:00 PM	1	1	3	0	5	24	113	2	0	139	12	3	42	0	57	5	134	22	0	161	362
05:15 PM	3	0	5	0	8	40	119	6	0	165	10	7	47	0	64	1	125	25	0	151	388
05:30 PM	1	5	13	0	19	45	110	3	0	158	8	8	43	0	59	8	112	29	0	149	385
05:45 PM	2	1	13	0	16	33	132	5	0	170	16	5	48	0	69	3	115	22	0	140	395
Total	7	7	34	0	48	142	474	16	0	632	46	23	180	0	249	17	486	98	0	601	1530
06:00 PM	1	4	8	0	13	46	113	6	0	165	15	4	58	0	77	3	111	30	0	144	399
06:15 PM	1	4	12	0	17	29	88	2	0	119	13	1	50	0	64	7	88	21	0	116	316
Grand Total	22	29	142	0	193	665	2101	58	0	2824	231	56	736	0	1023	62	1949	454	1	2466	6506
Apprch %	11.4	15	73.6	0		23.5	74.4	2.1	0		22.6	5.5	71.9	0		2.5	79	18.4	0		
Total %	0.3	0.4	2.2	0	3	10.2	32.3	0.9	0	43.4	3.6	0.9	11.3	0	15.7	1	30	7	0	37.9	
Cars	21	29	141	0	191	661	2068	58	0	2787	217	56	729	0	1002	62	1904	445	1	2412	6392
% Cars	95.5	100	99.3	0	99	99.4	98.4	100	0	98.7	93.9	100	99	0	97.9	100	97.7	98	100	97.8	98.2
Trucks	1	0	1	0	2	4	33	0	0	37	14	0	7	0	21	0	45	9	0	54	114
% Trucks	4.5	0	0.7	0	1	0.6	1.6	0	0	1.3	6.1	0	1	0	2.1	0	2.3	2	0	2.2	1.8

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

File Name : w main & shopping center all

Site Code : 7

Start Date : 10/2/2012

Page No : 2

Start Time	Shopping Center Southbound					W Main St (RT 299) Westbound					Shopping Center Northbound					W Main St (RT 299) Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	2	1	2	0	5	21	107	2	0	130	9	1	21	0	31	2	92	16	0	110	276
07:15 AM	0	1	5	0	6	32	98	3	0	133	0	1	20	0	21	1	88	15	0	104	264
07:30 AM	1	1	9	0	11	33	87	2	0	122	16	3	22	0	41	0	87	23	0	110	284
07:45 AM	1	0	5	0	6	21	88	0	0	109	14	1	33	0	48	2	88	14	0	104	267
Total Volume	4	3	21	0	28	107	380	7	0	494	39	6	96	0	141	5	355	68	0	428	1091
% App. Total	14.3	10.7	75	0		21.7	76.9	1.4	0		27.7	4.3	68.1	0		1.2	82.9	15.9	0		
PHF	.500	.750	.583	.000	.636	.811	.888	.583	.000	.929	.609	.500	.727	.000	.734	.625	.965	.739	.000	.973	.960
Cars	4	3	21	0	28	105	372	7	0	484	36	6	94	0	136	5	344	67	0	416	1064
% Cars	100	100	100	0	100	98.1	97.9	100	0	98.0	92.3	100	97.9	0	96.5	100	96.9	98.5	0	97.2	97.5
Trucks	0	0	0	0	0	2	8	0	0	10	3	0	2	0	5	0	11	1	0	12	27
% Trucks	0	0	0	0	0	1.9	2.1	0	0	2.0	7.7	0	2.1	0	3.5	0	3.1	1.5	0	2.8	2.5
Peak Hour Analysis From 01:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:15 PM																					
05:15 PM	3	0	5	0	8	40	119	6	0	165	10	7	47	0	64	1	125	25	0	151	388
05:30 PM	1	5	13	0	19	45	110	3	0	158	8	8	43	0	59	8	112	29	0	149	385
05:45 PM	2	1	13	0	16	33	132	5	0	170	16	5	48	0	69	3	115	22	0	140	395
06:00 PM	1	4	8	0	13	46	113	6	0	165	15	4	58	0	77	3	111	30	0	144	399
Total Volume	7	10	39	0	56	164	474	20	0	658	49	24	196	0	269	15	463	106	0	584	1567
% App. Total	12.5	17.9	69.6	0		24.9	72	3	0		18.2	8.9	72.9	0		2.6	79.3	18.2	0		
PHF	.583	.500	.750	.000	.737	.891	.898	.833	.000	.968	.766	.750	.845	.000	.873	.469	.926	.883	.000	.967	.982
Cars	7	10	39	0	56	164	472	20	0	656	46	24	195	0	265	15	458	105	0	578	1555
% Cars	100	100	100	0	100	100	99.6	100	0	99.7	93.9	100	99.5	0	98.5	100	98.9	99.1	0	99.0	99.2
Trucks	0	0	0	0	0	0	2	0	0	2	3	0	1	0	4	0	5	1	0	6	12
% Trucks	0	0	0	0	0	0	0.4	0	0	0.3	6.1	0	0.5	0	1.5	0	1.1	0.9	0	1.0	0.8

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

\*High number of pedestrians due to school track team

File Name : W Main & Industrial-Shopping

Site Code : 8

Start Date : 10/2/2012

Page No : 1

## Groups Printed- Cars - Trucks

Start Time	Shopping Center Southbound					W Main St (Rt 299) Westbound					Industrail Rd Northbound					W Main St (Rt 299) Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	18	2	6	0	26	12	120	22	0	154	4	2	10	0	16	1	106	9	0	116	312
07:15 AM	23	5	6	0	34	12	123	14	0	149	3	5	10	0	18	3	85	7	0	95	296
07:30 AM	13	3	4	0	20	8	111	16	0	135	5	2	8	0	15	3	101	8	0	112	282
07:45 AM	13	5	2	0	20	13	111	20	0	144	3	4	6	0	13	6	101	9	0	116	293
Total	67	15	18	0	100	45	465	72	0	582	15	13	34	0	62	13	393	33	0	439	1183
08:00 AM	11	7	5	0	23	12	98	7	0	117	5	3	14	0	22	1	68	6	0	75	237
08:15 AM	18	2	6	0	26	12	114	11	0	137	6	3	14	0	23	4	80	7	0	91	277
08:30 AM	15	6	4	0	25	7	118	14	0	139	9	2	10	0	21	5	93	2	0	100	285
08:45 AM	21	1	12	0	34	17	142	12	0	171	4	4	5	0	13	6	101	9	0	116	334
Total	65	16	27	0	108	48	472	44	0	564	24	12	43	0	79	16	342	24	0	382	1133
*** BREAK ***																					
03:30 PM	19	2	17	0	38	10	149	21	0	180	14	8	33	0	55	13	153	5	62	233	506
03:45 PM	24	6	18	0	48	9	147	27	0	183	11	5	7	0	23	5	127	5	26	163	417
Total	43	8	35	0	86	19	296	48	0	363	25	13	40	0	78	18	280	10	88	396	923
04:00 PM	27	3	17	0	47	7	144	22	0	173	6	4	20	0	30	4	119	9	0	132	382
04:15 PM	24	2	16	0	42	5	141	21	0	167	6	6	8	0	20	8	133	4	0	145	374
04:30 PM	18	5	19	0	42	16	138	23	1	178	7	8	24	0	39	9	133	8	0	150	409
04:45 PM	32	2	15	0	49	6	151	28	0	185	8	3	15	0	26	6	136	5	0	147	407
Total	101	12	67	0	180	34	574	94	1	703	27	21	67	0	115	27	521	26	0	574	1572
05:00 PM	35	3	15	0	53	12	148	21	0	181	9	5	20	0	34	7	155	4	0	166	434
05:15 PM	37	3	7	0	47	8	149	31	0	188	7	7	25	0	39	7	157	3	0	167	441
05:30 PM	27	7	19	0	53	8	170	25	0	203	5	4	19	0	28	6	146	4	0	156	440
05:45 PM	21	4	16	0	41	7	166	20	2	195	3	6	15	0	24	7	152	7	0	166	426
Total	120	17	57	0	194	35	633	97	2	767	24	22	79	0	125	27	610	18	0	655	1741
06:00 PM	34	3	22	0	59	6	166	19	0	191	3	5	18	0	26	11	145	3	0	159	435
06:15 PM	26	4	12	0	42	5	117	30	0	152	4	6	11	0	21	6	98	17	0	121	336
Grand Total	456	75	238	0	769	192	2723	404	3	3322	122	92	292	0	506	118	2389	131	88	2726	7323
Apprch %	59.3	9.8	30.9	0		5.8	82	12.2	0.1		24.1	18.2	57.7	0		4.3	87.6	4.8	3.2		
Total %	6.2	1	3.3	0	10.5	2.6	37.2	5.5	0	45.4	1.7	1.3	4	0	6.9	1.6	32.6	1.8	1.2	37.2	
Cars	449	73	233	0	755	184	2662	398	3	3247	115	91	287	0	493	114	2326	121	88	2649	7144
% Cars	98.5	97.3	97.9	0	98.2	95.8	97.8	98.5	100	97.7	94.3	98.9	98.3	0	97.4	96.6	97.4	92.4	100	97.2	97.6
Trucks	7	2	5	0	14	8	61	6	0	75	7	1	5	0	13	4	63	10	0	77	179
% Trucks	1.5	2.7	2.1	0	1.8	4.2	2.2	1.5	0	2.3	5.7	1.1	1.7	0	2.6	3.4	2.6	7.6	0	2.8	2.4

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

\*High number of pedestrians due to school track team

File Name : W Main & Industrial-Shopping

Site Code : 8

Start Date : 10/2/2012

Page No : 2

Start Time	Shopping Center Southbound					W Main St (Rt 299) Westbound					Industrial Rd Northbound					W Main St (Rt 299) Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	18	2	6	0	26	12	120	22	0	154	4	2	10	0	16	1	106	9	0	116	312
07:15 AM	23	5	6	0	34	12	123	14	0	149	3	5	10	0	18	3	85	7	0	95	296
07:30 AM	13	3	4	0	20	8	111	16	0	135	5	2	8	0	15	3	101	8	0	112	282
07:45 AM	13	5	2	0	20	13	111	20	0	144	3	4	6	0	13	6	101	9	0	116	293
Total Volume	67	15	18	0	100	45	465	72	0	582	15	13	34	0	62	13	393	33	0	439	1183
% App. Total	67	15	18	0		7.7	79.9	12.4	0		24.2	21	54.8	0		3	89.5	7.5	0		
PHF	.728	.750	.750	.000	.735	.865	.945	.818	.000	.945	.750	.650	.850	.000	.861	.542	.927	.917	.000	.946	.948
Cars	66	15	16	0	97	43	442	69	0	554	14	13	32	0	59	11	369	30	0	410	1120
% Cars	98.5	100	88.9	0	97.0	95.6	95.1	95.8	0	95.2	93.3	100	94.1	0	95.2	84.6	93.9	90.9	0	93.4	94.7
Trucks	1	0	2	0	3	2	23	3	0	28	1	0	2	0	3	2	24	3	0	29	63
% Trucks	1.5	0	11.1	0	3.0	4.4	4.9	4.2	0	4.8	6.7	0	5.9	0	4.8	15.4	6.1	9.1	0	6.6	5.3
Peak Hour Analysis From 01:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:15 PM																					
05:15 PM	37	3	7	0	47	8	149	31	0	188	7	7	25	0	39	7	157	3	0	167	441
05:30 PM	27	7	19	0	53	8	170	25	0	203	5	4	19	0	28	6	146	4	0	156	440
05:45 PM	21	4	16	0	41	7	166	20	2	195	3	6	15	0	24	7	152	7	0	166	426
06:00 PM	34	3	22	0	59	6	166	19	0	191	3	5	18	0	26	11	145	3	0	159	435
Total Volume	119	17	64	0	200	29	651	95	2	777	18	22	77	0	117	31	600	17	0	648	1742
% App. Total	59.5	8.5	32	0		3.7	83.8	12.2	0.3		15.4	18.8	65.8	0		4.8	92.6	2.6	0		
PHF	.804	.607	.727	.000	.847	.906	.957	.766	.250	.957	.643	.786	.770	.000	.750	.705	.955	.607	.000	.970	.988
Cars	119	17	64	0	200	29	648	95	2	774	17	22	77	0	116	31	598	17	0	646	1736
% Cars	100	100	100	0	100	100	99.5	100	100	99.6	94.4	100	100	0	99.1	100	99.7	100	0	99.7	99.7
Trucks	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	0	2	0	0	2	6
% Trucks	0	0	0	0	0	0	0.5	0	0	0.4	5.6	0	0	0	0.9	0	0.3	0	0	0.3	0.3

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

File Name : SR 15 & Annes Church

Site Code : 9

Start Date : 10/3/2012

Page No : 1

Groups Printed- Cars - Trucks

Start Time	Southbound					St Annes Church Rd Westbound					Levels Rd Northbound					Levels Rd (RT 15) Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	5	21	0	1	27	33	0	22	0	55	0	5	14	0	19	101
07:15 AM	0	0	0	0	0	9	26	0	0	35	27	0	13	0	40	0	15	5	0	20	95
07:30 AM	0	0	0	0	0	13	13	0	0	26	22	0	12	0	34	0	14	18	0	32	92
07:45 AM	0	0	0	0	0	14	17	0	0	31	23	0	20	0	43	0	13	22	0	35	109
Total	0	0	0	0	0	41	77	0	1	119	105	0	67	0	172	0	47	59	0	106	397
08:00 AM	0	0	0	0	0	29	11	0	0	40	19	0	9	0	28	0	6	23	0	29	97
08:15 AM	0	0	0	0	0	21	22	0	0	43	64	0	32	0	96	0	9	33	0	42	181
08:30 AM	0	0	0	0	0	3	18	0	0	21	21	0	10	0	31	0	8	14	0	22	74
08:45 AM	0	0	0	0	0	0	18	0	0	18	23	0	8	0	31	0	13	15	0	28	77
Total	0	0	0	0	0	53	69	0	0	122	127	0	59	0	186	0	36	85	0	121	429
09:00 AM	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	1	0	1	3
*** BREAK ***																					
Total	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	1	0	1	3
*** BREAK ***																					
03:30 PM	1	0	1	0	2	11	21	2	0	34	52	0	23	0	75	0	15	23	0	38	149
03:45 PM	0	0	0	0	0	12	11	0	0	23	25	0	8	0	33	1	22	25	0	48	104
Total	1	0	1	0	2	23	32	2	0	57	77	0	31	0	108	1	37	48	0	86	253
04:00 PM	0	0	0	0	0	13	19	0	0	32	25	0	12	0	37	0	15	31	0	46	115
04:15 PM	0	0	0	0	0	9	16	0	0	25	27	0	11	0	38	0	22	49	0	71	134
04:30 PM	0	0	0	0	0	19	21	0	0	40	54	0	20	0	74	0	26	35	0	61	175
04:45 PM	0	0	0	0	0	14	18	0	0	32	36	0	14	0	50	0	25	38	0	63	145
Total	0	0	0	0	0	55	74	0	0	129	142	0	57	0	199	0	88	153	0	241	569
05:00 PM	0	0	0	0	0	6	14	0	0	20	38	0	20	0	58	0	22	36	0	58	136
05:15 PM	0	0	0	0	0	15	17	0	0	32	15	0	10	0	25	0	23	29	0	52	109
05:30 PM	0	0	0	0	0	12	23	0	0	35	18	0	5	0	23	0	15	27	0	42	100
05:45 PM	0	0	0	0	0	6	19	0	0	25	23	0	8	0	31	0	23	32	0	55	111
Total	0	0	0	0	0	39	73	0	0	112	94	0	43	0	137	0	83	124	0	207	456
06:00 PM	0	0	0	0	0	14	14	0	0	28	15	0	7	0	22	0	22	23	0	45	95
06:15 PM	0	0	0	0	0	11	11	0	0	22	18	0	8	0	26	0	26	21	0	47	95
Grand Total	1	0	1	0	2	236	351	2	1	590	579	0	272	0	851	1	339	514	0	854	2297
Apprch %	50	0	50	0		40	59.5	0.3	0.2		68	0	32	0		0.1	39.7	60.2	0		
Total %	0	0	0	0	0.1	10.3	15.3	0.1	0	25.7	25.2	0	11.8	0	37	0	14.8	22.4	0	37.2	
Cars	1	0	1	0	2	229	347	2	1	579	543	0	258	0	801	1	325	492	0	818	2200
% Cars	100	0	100	0	100	97	98.9	100	100	98.1	93.8	0	94.9	0	94.1	100	95.9	95.7	0	95.8	95.8
Trucks	0	0	0	0	0	7	4	0	0	11	36	0	14	0	50	0	14	22	0	36	97
% Trucks	0	0	0	0	0	3	1.1	0	0	1.9	6.2	0	5.1	0	5.9	0	4.1	4.3	0	4.2	4.2

# McCormick Taylor

Two Commerce Square, 2001 Market Street, 10th Floor  
Philadelphia, PA, 19103

*Engineers & Planners Since 1946*

Start Time	Southbound					St Annes Church Rd Westbound					Levels Rd Northbound					Levels Rd (RT 15) Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	13	13	0	0	26	22	0	12	0	34	0	14	18	0	32	92
07:45 AM	0	0	0	0	0	14	17	0	0	31	23	0	20	0	43	0	13	22	0	35	109
08:00 AM	0	0	0	0	0	29	11	0	0	40	19	0	9	0	28	0	6	23	0	29	97
08:15 AM	0	0	0	0	0	21	22	0	0	43	64	0	32	0	96	0	9	33	0	42	181
Total Volume	0	0	0	0	0	77	63	0	0	140	128	0	73	0	201	0	42	96	0	138	479
% App. Total	0	0	0	0	0	55	45	0	0	63.7	63.7	0	36.3	0	63.7	0	30.4	69.6	0	63.7	63.7
PHF	.000	.000	.000	.000	.000	.664	.716	.000	.000	.814	.500	.000	.570	.000	.523	.000	.750	.727	.000	.821	.662
Cars	0	0	0	0	0	72	63	0	0	135	116	0	71	0	187	0	41	84	0	125	447
% Cars	0	0	0	0	0	93.5	100	0	0	96.4	90.6	0	97.3	0	93.0	0	97.6	87.5	0	90.6	93.3
Trucks	0	0	0	0	0	5	0	0	0	5	12	0	2	0	14	0	1	12	0	13	32
% Trucks	0	0	0	0	0	6.5	0	0	0	3.6	9.4	0	2.7	0	7.0	0	2.4	12.5	0	9.4	6.7
Peak Hour Analysis From 01:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	0	0	9	16	0	0	25	27	0	11	0	38	0	22	49	0	71	134
04:30 PM	0	0	0	0	0	19	21	0	0	40	54	0	20	0	74	0	26	35	0	61	175
04:45 PM	0	0	0	0	0	14	18	0	0	32	36	0	14	0	50	0	25	38	0	63	145
05:00 PM	0	0	0	0	0	6	14	0	0	20	38	0	20	0	58	0	22	36	0	58	136
Total Volume	0	0	0	0	0	48	69	0	0	117	155	0	65	0	220	0	95	158	0	253	590
% App. Total	0	0	0	0	0	41	59	0	0	70.5	70.5	0	29.5	0	70.5	0	37.5	62.5	0	70.5	70.5
PHF	.000	.000	.000	.000	.000	.632	.821	.000	.000	.731	.718	.000	.813	.000	.743	.000	.913	.806	.000	.891	.843
Cars	0	0	0	0	0	48	69	0	0	117	154	0	65	0	219	0	93	155	0	248	584
% Cars	0	0	0	0	0	100	100	0	0	100	99.4	0	100	0	99.5	0	97.9	98.1	0	98.0	99.0
Trucks	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	3	0	5	6
% Trucks	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0	0.5	0	2.1	1.9	0	2.0	1.0



56 W. Main St, Suite 300  
 Newark, DE 19702  
 302-738-0203

Middletown - Westtown Update  
 SR 71 & St. Annes Church Rd

Date Counted: Tues, 2/4/14

Note: AM count started at 7:00, not 7:15

File Name : SR 71 & St Annes Church Rd

Site Code : 2

Start Date : 2/4/2014

Page No : 1

Groups Printed- Cars - Trucks - Buses

Start Time	SR 71 (Summit Brg Rd) Southbound					SR 71 (Summit Brg Rd) Northbound					St. Annes Church Rd Eastbound				Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
07:15 AM	0	101	17	0	118	24	99	0	0	123	3	14	0	17	258
07:30 AM	0	67	11	0	78	18	75	0	0	93	3	26	0	29	200
07:45 AM	0	54	11	0	65	34	124	0	0	158	2	19	0	21	244
Total	0	222	39	0	261	76	298	0	0	374	8	59	0	67	702
08:00 AM	0	67	12	0	79	29	64	0	0	93	6	19	0	25	197
08:15 AM	0	56	6	0	62	19	76	0	0	95	11	13	0	24	181
08:30 AM	0	53	1	0	54	10	60	0	0	70	9	10	0	19	143
08:45 AM	0	72	2	0	74	10	74	0	0	84	6	19	0	25	183
Total	0	248	21	0	269	68	274	0	0	342	32	61	0	93	704
09:00 AM	0	53	1	0	54	8	77	0	0	85	8	13	0	21	160
*** BREAK ***															
Total	0	53	1	0	54	8	77	0	0	85	8	13	0	21	160
*** BREAK ***															
03:00 PM	0	99	12	0	111	12	83	0	0	95	3	15	0	18	224
03:15 PM	0	86	9	0	95	19	69	0	0	88	8	20	0	28	211
03:30 PM	0	118	4	0	122	22	74	0	0	96	12	39	0	51	269
03:45 PM	0	112	12	0	124	26	86	0	0	112	7	15	0	22	258
Total	0	415	37	0	452	79	312	0	0	391	30	89	0	119	962
04:00 PM	0	137	14	0	151	24	87	0	0	111	9	24	0	33	295
04:15 PM	0	92	14	0	106	18	78	0	0	96	11	27	0	38	240
04:30 PM	0	110	12	0	122	34	85	0	0	119	9	29	0	38	279
04:45 PM	0	75	10	0	85	25	91	0	0	116	5	31	0	36	237
Total	0	414	50	0	464	101	341	0	0	442	34	111	0	145	1051
05:00 PM	0	132	6	0	138	30	100	0	0	130	8	29	0	37	305
05:15 PM	0	114	6	0	120	30	102	0	0	132	8	36	0	44	296
05:30 PM	0	93	8	0	101	37	93	0	0	130	11	25	0	36	267
05:45 PM	0	104	10	0	114	36	122	0	0	158	6	18	0	24	296
Total	0	443	30	0	473	133	417	0	0	550	33	108	0	141	1164
Grand Total	0	1795	178	0	1973	465	1719	0	0	2184	145	441	0	586	4743
Apprch %	0	91	9	0		21.3	78.7	0	0		24.7	75.3	0		
Total %	0	37.8	3.8	0	41.6	9.8	36.2	0	0	46	3.1	9.3	0	12.4	
Cars	0	1767	175	0	1942	461	1677	0	0	2138	144	427	0	571	4651
% Cars	0	98.4	98.3	0	98.4	99.1	97.6	0	0	97.9	99.3	96.8	0	97.4	98.1
Trucks	0	10	1	0	11	2	24	0	0	26	1	5	0	6	43
% Trucks	0	0.6	0.6	0	0.6	0.4	1.4	0	0	1.2	0.7	1.1	0	1	0.9
Buses	0	18	2	0	20	2	18	0	0	20	0	9	0	9	49
% Buses	0	1	1.1	0	1	0.4	1	0	0	0.9	0	2	0	1.5	1



# **Westown Circulation Concept Plan Update**

## **Appendix B**

### **LOS & Queuing Results for 2012 Existing Conditions**

**Level of Service Criteria for Unsignalized Intersections  
(Two-Way Stop Control, All-Way Stop Control and Roundabouts)**

<b>Level of Service</b>	<b>Average Control Delay (seconds/vehicle)</b>
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F	>50

**Level of Service Criteria for Signalized Intersections**

<b>Level of Service</b>	<b>Average Delay (sec/ veh)</b>	<b>Description</b>
A	0 – 10	This level is assigned when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If it is due to favorable most vehicles arrive during the green indication and travel through the intersection without stopping.
B	>10 – 20	This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.
C	>20 – 35	This level is typically assigned when progression is favorable or the cycle length is moderate. Individual <i>cycle failures</i> (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.
D	>35 – 55	This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.
E	>55 – 80	This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.
F	>80	This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

SOURCE: *Highway Capacity Manual 2010*, pages 18-5, 18-6, 19-2, 20-3, and 21-1

# Westown Circulation Concept Plan Update

## LOS Analysis Results

January 2015

### Year 2012, Existing Conditions

Street		AM Peak Hour										PM Peak Hour									
E/W	N/S	Overall		EB		WB		NB		SB		Overall		EB		WB		NB		SB	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
<b>Peterson Dr</b>	<b>US 301</b>	14.2	B	67.1	E	68.0	E	4.3	A	8.4	A	14.2	B	66.9	E	68.2	E	4.8	A	9.9	A
Sandhill Dr / Food Lion RIROLI	US 301			10.0	A	9.9	A	9.2	A	8.9	A			10.7	B	11.9	B	10.2	B	10.1	B
Casa Dr / AAP entrance	US 301							-	-	-	-							-	-	-	-
<b>SR 299</b>	<b>US 301</b>	41.6	D	63.9	E	60.2	E	23.6	C	23.5	C	50.4	D	63.5	E	57.0	E	50.0	D	36.5	D
Wawa entrance	US 301							-	-	-	-							-	-	-	-
<b>South Ridge</b>	<b>US 301</b>	26.7	C	69.1	E	64.2	E	19.6	B	15.5	B	35.1	D	65.6	E	63.8	E	28.1	C	20.9	C
Kohls East / Walmart RIRO	US 301			9.7	A			-	-	-	-			10.8	B			-	-	-	-
<b>Merrimac</b>	<b>US 301</b>	25.0	C	107.7	F	70.9	E	15.1	B	16.8	B	26.3	C	61.9	E	66.4	E	16.5	B	20.7	C
<b>Levels</b>	<b>US 301</b>	21.5	C			43.4	D	8.7	A	19.2	B	27.3	C			43.5	D	9.6	A	32.3	C
Levels	Patriot			7.7	A	7.5	A	12.0	B	11.4	B			7.8	A	7.8	A	14.6	B	12.5	B
Levels / St. Annes Church	Levels	8.4	A	5.4	A	10.0	A	9.2	A			7.5	A	4.7	A	8.9	A	9.9	A		
Bunker Hill Rd	Merrimac / Sleepy Hollow			9.5	A	8.0	A	34.5	D	43.0	E			8.1	A	8.5	A	45.3	E	24.3	C
Bunker Hill Rd	Sandhill Dr			9.2	A	7.7	A	31.6	D	21.5	C			8.4	A	8.0	A	44.3	E	194.2	F
SR 299	Lowe's			8.4	A	8.5	A	19.9	C	15.6	C			9.0	A	10.1	B	349.0	F	87.9	F
<b>SR 299</b>	<b>Industrial</b>	7.9	A	6.0	A	5.6	A	17.5	B	19.3	B	11.6	B	9.2	A	8.8	A	18.7	B	22.7	C
St. Annes Church	SR 71			13.0	B			8.4	A	-	-			19.8	C			8.8	A	-	-

Note 1: Intersection names in **bold** are signals. Non-bold names are unsignalized intersections.

Note 2: Delay/LOS at Signalized and Unsignalized Intersections are based on HCM 2000 methodology

	Unsignalized Intersection Delay/LOS and Minor Street Approach Delay/LOS
	Unsignalized Major Street Left-Turn Movement Delay/LOS
	No Delay/LOS due to Unsignalized Major Street Non-Stop Movements

	LOS F emphasized in red
	LOS E emphasized in yellow

# Westown Circulation Concept Plan Update

## Queuing Analysis Results

January 2015

### Year 2012, Existing Conditions

Street		AM Peak Hour												PM Peak Hour																																									
		Eastbound			Westbound			Northbound			Southbound			Eastbound			Westbound			Northbound			Southbound																																
E/W	N/S	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right																														
<b>Peterson Dr</b>	<b>US 301</b>	31			9			0			12			64			0			10			151			0			53			31			0			23			97			0			16			248			0		
Sandhill Dr / Food Lion RIROLI	US 301	5			7			6						10									18			28			16						18																				
Casa Dr / AAP entrance	US 301																																																						
<b>SR 299</b>	<b>US 301</b>	42	138	0	109	155	47	59	163	72	157	99	0	87	177	0	211	138	15	106	322	104	326	213	0																														
Wawa entrance	US 301																																																						
<b>South Ridge</b>	<b>US 301</b>	37	32	0	56	42	0	10	172	16	35	173	2	120	87	0	101	77	14	40	258	30	38	275	54																														
Kohls East / Walmart RIRO	US 301	1												3																																									
<b>Merrimac</b>	<b>US 301</b>	30	7	7	0	0	0	54	112	0	32	212	3	65	0	0	2	5	0	80	161	0	12	298	0																														
<b>Levels</b>	<b>US 301</b>				34			7			92			5			166			42						28			27			124			8			362			83														
Levels	Patriot	2			0				7		8				3		0		15		12																																		
Levels / St. Annes Church	Levels	38			37			54						48			21			41																																			
Bunker Hill Rd	Merrimac / Sleepy Hollow	2			3				46		46		87		2		3		128		128		60																																
Bunker Hill Rd	Sandhill Dr	8			0				18		18		54		54		10		1		75		75		389			389																											
SR 299	Lowe's	1			10				48		48		11		3		19		532		532		95																																
<b>SR 299</b>	<b>Industrial</b>	4	149		11		195		7		18		15		0		51		22		9		302		8		277		13		19		23		9		87		20																
St. Annes Church	SR 71	17						9									43									11																													

Note 1: Intersection names in **bold** are signals. Non-bold names are unsignalized intersections.

Note 2: Queue Lengths are 95th% (feet), estimated based on Synchro model

	<b>Movement does not exist</b>
	<b>Movement is free-flow; no queue</b>
	<b>Longer / potentially problematic queues emphasized in orange</b>

# **Westown Circulation Concept Plan Update**

## **Appendix C**

### **Crash Data**

**Westtown Circulation Concept Plan Update**  
**Summary of Crashes**  
**US 301 (Other Principal Arterial) from Peterson Rd to Levels Rd**

Valid Data from 9/18/2009 to 9/18/2012

Year	Crashes	%
2009	9	14.5%
2010	20	32.3%
2011	20	32.3%
2012	13	21.0%
Total	62	100.0%

Month	Crashes	%
JAN	7	11.3%
FEB	1	1.6%
MAR	6	9.7%
APR	2	3.2%
MAY	8	12.9%
JUN	6	9.7%
JUL	5	8.1%
AUG	3	4.8%
SEP	2	3.2%
OCT	6	9.7%
NOV	8	12.9%
DEC	8	12.9%
Total	62	100.0%

Hour	Crashes	%
12AM - 1AM	0	0.0%
1AM - 2AM	0	0.0%
2AM - 3AM	0	0.0%
3AM - 4AM	1	1.6%
4AM - 5AM	0	0.0%
5AM - 6AM	2	3.2%
6AM - 7AM	2	3.2%
7AM - 8AM	2	3.2%
8AM - 9AM	1	1.6%
9AM - 10AM	1	1.6%
10AM - 11AM	5	8.1%
11AM - 12PM	3	4.8%
12PM - 1PM	0	0.0%
1PM - 2PM	4	6.5%
2PM - 3PM	2	3.2%
3PM - 4PM	3	4.8%
4PM - 5PM	11	17.7%
5PM - 6PM	4	6.5%
6PM - 7PM	3	4.8%
7PM - 8PM	4	6.5%
8PM - 9PM	1	1.6%
9PM - 10PM	10	16.1%
10PM - 11PM	1	1.6%
11PM - 12AM	2	3.2%
Unknown	0	0.0%
Total	62	100.0%

Day	Crashes	%
MON	7	11.3%
TUE	6	9.7%
WED	9	14.5%
THU	8	12.9%
FRI	10	16.1%
SAT	12	19.4%
SUN	10	16.1%
Total	62	100.0%

Severity	Crashes	%
Fatal	1	1.6%
Injury	20	32.3%
PDO	41	66.1%
Total	62	100.0%

Drinking	Crashes	%
Yes	3	4.8%
No	59	95.2%
Total	62	100.0%

Light	Crashes	%
Daylight	33	53.2%
Dawn/Dusk	6	9.7%
Dark Lit	18	29.0%
Dark Unlit	5	8.1%
Unknown	0	0.0%
Total	62	100.0%

Weather	Crashes	%
Clear	49	79.0%
Rain	7	11.3%
Snow/Sleet	1	1.6%
Cloudy	4	6.5%
Severe Wind	1	1.6%
Unknown	0	0.0%
Total	62	100.0%

Surface	Crashes	%
Dry	51	82.3%
Wet	9	14.5%
Snowy	1	1.6%
Icy	1	1.6%
Slushy	0	0.0%
Total	62	100.0%

Type	Crashes	%
No Collision	0	0.0%
Head On	4	6.5%
Rear End	29	46.8%
Sidewipe	6	9.7%
Angle	19	30.6%
Other	4	6.5%
Total	62	100.0%

**Westown Circulation Report Update**  
**Summary of Crashes**  
**W. Main Street/Route 299 (Minor Arterial) from US 301 to Industrial Drive**

Valid Data from 9/18/2009 to 9/18/2012

Year	Crashes	%
2009	8	17.4%
2010	13	28.3%
2011	16	34.8%
2012	9	19.6%
Total	46	100.0%

Month	Crashes	%
JAN	2	4.3%
FEB	3	6.5%
MAR	2	4.3%
APR	4	8.7%
MAY	4	8.7%
JUN	1	2.2%
JUL	2	4.3%
AUG	5	10.9%
SEP	8	17.4%
OCT	4	8.7%
NOV	5	10.9%
DEC	6	13.0%
Total	46	100.0%

Hour	Crashes	%
12AM - 1AM	0	0.0%
1AM - 2AM	0	0.0%
2AM - 3AM	0	0.0%
3AM - 4AM	0	0.0%
4AM - 5AM	0	0.0%
5AM - 6AM	0	0.0%
6AM - 7AM	0	0.0%
7AM - 8AM	0	0.0%
8AM - 9AM	0	0.0%
9AM - 10AM	1	2.2%
10AM - 11AM	1	2.2%
11AM - 12PM	3	6.5%
12PM - 1PM	4	8.7%
1PM - 2PM	4	8.7%
2PM - 3PM	4	8.7%
3PM - 4PM	8	17.4%
4PM - 5PM	4	8.7%
5PM - 6PM	6	13.0%
6PM - 7PM	1	2.2%
7PM - 8PM	3	6.5%
8PM - 9PM	5	10.9%
9PM - 10PM	1	2.2%
10PM - 11PM	1	2.2%
11PM - 12AM	0	0.0%
Unknown	0	0.0%
Total	46	100.0%

Day	Crashes	%
MON	7	15.2%
TUE	4	8.7%
WED	9	19.6%
THU	8	17.4%
FRI	12	26.1%
SAT	5	10.9%
SUN	1	2.2%
Total	46	100.0%

Severity	Crashes	%
Fatal	0	0.0%
Injury	8	17.4%
PDO	38	82.6%
Total	46	100.0%

Drinking	Crashes	%
Yes	1	2.2%
No	45	97.8%
Total	46	100.0%

Light	Crashes	%
Daylight	31	67.4%
Dawn/Dusk	3	6.5%
Dark Lit	9	19.6%
Dark Unlit	2	4.3%
Unknown	1	2.2%
Total	46	100.0%

Weather	Crashes	%
Clear	33	71.7%
Rain	10	21.7%
Snow/Sleet	2	4.3%
Cloudy	1	2.2%
Severe Wind	0	0.0%
Unknown	0	0.0%
Total	46	100.0%

Surface	Crashes	%
Dry	33	71.7%
Wet	11	23.9%
Snowy	1	2.2%
Icy	0	0.0%
Slushy	1	2.2%
Total	46	100.0%

Type	Crashes	%
No Collision	0	0.0%
Head On	3	6.5%
Rear End	22	47.8%
Sidewipe	1	2.2%
Angle	19	41.3%
Other	1	2.2%
Total	46	100.0%

**Westtown Circulation Report Update**  
**Summary of Crashes**  
**Bunker Hill Road (Major Collector) from Merrimac Ave to US 301**

Valid Data from 9/18/2009 to 9/18/2012

Year	Crashes	%
2009	2	11.8%
2010	6	35.3%
2011	7	41.2%
2012	2	11.8%
Total	17	88.2%

Month	Crashes	%
JAN	2	11.8%
FEB	3	17.6%
MAR	2	11.8%
APR	1	5.9%
MAY	0	0.0%
JUN	0	0.0%
JUL	0	0.0%
AUG	2	11.8%
SEP	4	23.5%
OCT	1	5.9%
NOV	0	0.0%
DEC	2	11.8%
Total	17	100.0%

Hour	Crashes	%
12AM - 1AM	0	0.0%
1AM - 2AM	0	0.0%
2AM - 3AM	0	0.0%
3AM - 4AM	0	0.0%
4AM - 5AM	0	0.0%
5AM - 6AM	0	0.0%
6AM - 7AM	1	5.9%
7AM - 8AM	0	0.0%
8AM - 9AM	2	11.8%
9AM - 10AM	1	5.9%
10AM - 11AM	2	11.8%
11AM - 12PM	0	0.0%
12PM - 1PM	4	23.5%
1PM - 2PM	1	5.9%
2PM - 3PM	2	11.8%
3PM - 4PM	0	0.0%
4PM - 5PM	2	11.8%
5PM - 6PM	0	0.0%
6PM - 7PM	0	0.0%
7PM - 8PM	0	0.0%
8PM - 9PM	0	0.0%
9PM - 10PM	0	0.0%
10PM - 11PM	2	11.8%
11PM - 12AM	0	0.0%
Unknown	0	0.0%
Total	17	100.0%

Day	Crashes	%
MON	4	23.5%
TUE	3	17.6%
WED	2	11.8%
THU	1	5.9%
FRI	4	23.5%
SAT	2	11.8%
SUN	1	5.9%
Total	17	100.0%

Severity	Crashes	%
Fatal	0	0.0%
Injury	6	35.3%
PDO	11	64.7%
Total	17	100.0%

Drinking	Crashes	%
Yes	0	0.0%
No	17	100.0%
Total	17	100.0%

Light	Crashes	%
Daylight	14	82.4%
Dawn/Dusk	1	5.9%
Dark Lit	2	11.8%
Dark Unlit	0	0.0%
Unknown	0	0.0%
Total	17	100.0%

Weather	Crashes	%
Clear	14	82.4%
Rain	1	5.9%
Snow/Sleet	1	5.9%
Cloudy	1	5.9%
Severe Wind	0	0.0%
Unknown	0	0.0%
Total	17	100.0%

Surface	Crashes	%
Dry	14	82.4%
Wet	1	5.9%
Snowy	1	5.9%
Icy	1	5.9%
Slushy	0	0.0%
Total	17	100.0%

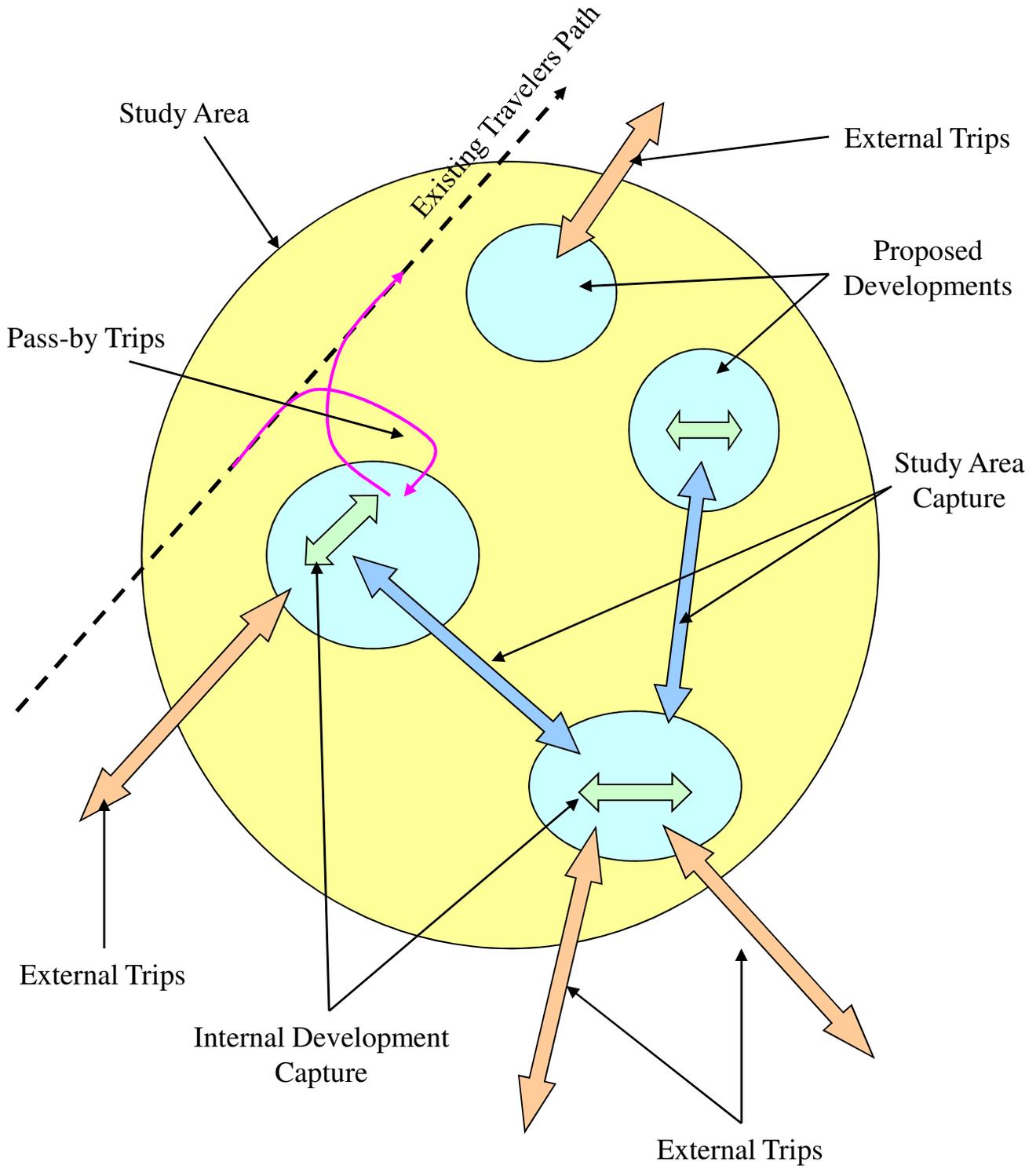
Type	Crashes	%
No Collision	0	0.0%
Head On	3	17.6%
Rear End	3	17.6%
Sidewipe	1	5.9%
Angle	8	47.1%
Other	2	11.8%
Total	17	100.0%

# **Westown Circulation Concept Plan Update**

## **Appendix D**

### **Trip Generation & Distribution for Proposed Unbuilt Developments**

# *Trip Distribution*



## Westown Circulation Concept Plan Update - Trip Generation Summary (AM Peak Hour)

Remaining unbuilt developments included in 2017 volume projections

Dev. #	Name	Description	Size		ITE Code	AM Peak Total Trips			AM Peak Internal Dev. Capture			AM Peak Study Area Capture			AM Peak Pass-By			AM Peak External Trips		
						Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
1	Levels Business Park	Industrial Park	70	Acres	130*	277	74	351	0	0	0	0	0	0	0	0	0	277	74	351
2	Southridge (Westown Town Center + Phase 2)	Senior Detached	115	units	251	18	32	50	0	0	0	0	0	0	0	0	0	18	32	50
		Apartment	204	units	220	21	83	104	0	0	0	0	0	0	0	0	0	21	83	104
		Townhouse	240	units	230	18	86	104	0	0	0	0	0	0	0	0	0	18	86	104
		Retail	239	k-sqf	820	157	101	258	0	0	0	0	0	0	0	0	0	157	101	258
3	Auto Mall Facility	Retail	248	k-sqf	820	160	103	263	0	0	0	0	0	0	0	0	0	160	103	263
		Westown North - industrial	227	Acres	130*	899	238	1137	0	0	0	0	0	0	0	0	0	899	238	1137
		Retail (former Auto Mall)	210	k-sqf	820	146	93	239	0	0	0	0	0	0	0	0	0	146	93	239
		Amazon		volumes provided		460	2	462	0	0	0	0	0	0	0	0	0	460	2	462
4	Kohl Commercial	3-Story Office	250	k-sqf	710	343	47	390	0	0	0	0	0	0	0	0	0	343	47	390
		Von Croy - apartments	300	units	220	31	122	153	0	0	0	0	0	0	0	0	0	31	122	153
		Truck Stop - retail	83	k-sqf	820	84	54	138	0	0	0	0	0	0	0	0	0	84	54	138
		Money - retail	462	k-sqf	820	232	148	380	0	0	0	0	0	0	0	0	0	232	148	380
		Poole - retail	166	k-sqf	820	127	81	208	0	0	0	0	0	0	0	0	0	127	81	208
		Rutkoske - retail	183	k-sqf	820	134	86	220	0	0	0	0	0	0	0	0	0	134	86	220
		Retail	254	k-sqf	820	163	104	267	0	0	0	0	0	0	0	0	0	163	104	267
		Hotel	550	rooms	310	206	132	338	0	0	0	0	0	0	0	0	0	206	132	338
5	Westown Residential Development	Commercial	264	k-sqf	820	167	106	273	0	0	0	0	0	0	0	0	0	167	106	273
		Single Family Homes	499	units	210	90	269	359	0	0	0	0	0	0	0	0	0	90	269	359
6	Estates at St. Annes	Townhouse	142	units	230	12	56	68	0	0	0	0	0	0	0	0	0	12	56	68
		Single Family Homes	261	units	210	48	144	192	0	0	0	0	0	0	0	0	0	48	144	192
7	Ramunno Property	Golf Course	18	holes	430	32	8	40	0	0	0	0	0	0	0	0	0	32	8	40
		Retail	121	k-sqf	820	105	67	172	0	0	0	0	0	0	0	0	0	105	67	172
8	Market Place	Conv/Gas Station	20	pumps	853	166	165	331	0	0	0	0	0	0	104	104	208	62	61	123
		Advance Auto Parts	6.9	k-sqf	843	8	7	15	0	0	0	0	0	0	0	0	0	8	7	15
Totals						4104	2408	6512	0	0	0	0	0	0	104	104	208	4000	2304	6304

Volumes per *ITE Trip Generation, 8th Edition*, except Amazon (provided) and two industrial parks (per revised rate from 2005 study).

Total Trips shown include external trips, internal capture, study area capture, and pass-by.

Amazon internal/study area capture trips unknown. Conservatively assumed all external trips.

### Additional Notes

1. Internal Development Capture = internal trips within development (these trips not shown in network)
2. Study Area Capture = new trip inside study area
3. Pass-By Capture = trips that are already in the network but will enter the development and then continue along their original path
4. External Capture = trips that are entering the developments from outside the study area

## Westown Circulation Concept Plan Update - Trip Generation Summary (PM Peak Hour)

Remaining unbuilt developments included in 2017 volume projections

Dev. #	Name	Description	Size		ITE Code	PM Peak Total Trips			PM Peak Internal Dev. Capture			PM Peak Study Area Capture			PM Peak Pass-By			PM Peak External Trips		
						Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
1	Levels Business Park	Industrial Park	70	Acres	130*	90	286	376	0	0	0	30	23	53	0	0	0	60	263	323
2	Southridge (Westown Town Center + Phase 2)	Senior Detached	115	units	251	31	19	50	5	5	10	5	5	10	0	0	0	21	9	30
		Apartment	204	units	220	82	44	126	13	12	25	14	11	25	0	0	0	55	21	76
		Townhouse	240	units	230	82	41	123	13	11	24	14	11	25	0	0	0	55	19	74
		Retail	239	k-sqf	820	559	582	1141	79	82	161	77	79	156	124	124	248	279	297	576
3	Auto Mall Facility	Retail	248	k-sqf	820	573	596	1169	23	23	46	137	142	279	127	127	254	286	304	590
		Westown North - industrial	227	Acres	130*	293	926	1219	11	10	21	86	66	152	0	0	0	196	850	1046
		Retail (former Auto Mall)	210	k-sqf	820	513	533	1046	17	20	37	126	127	253	117	117	234	253	269	522
		Amazon		volumes provided		125	293	418	0	0	0	0	0	0	0	0	0	125	293	418
4	Kohl Commercial	3-Story Office	250	k-sqf	710	61	298	359	6	7	13	14	17	31	0	0	0	41	274	315
		Von Croy - apartments	300	units	220	121	65	186	12	9	21	28	25	53	0	0	0	81	31	112
		Truck Stop - retail	83	k-sqf	820	275	287	562	24	22	46	53	57	110	83	83	166	115	125	240
		Money - retail	462	k-sqf	820	869	905	1774	75	70	145	168	180	348	160	160	320	466	495	961
		Poole - retail	166	k-sqf	820	438	455	893	38	35	73	84	91	175	110	110	220	206	219	425
		Rutkoske - retail	183	k-sqf	820	467	487	954	40	38	78	90	97	187	114	114	228	223	238	461
		Retail	254	k-sqf	820	582	606	1188	32	45	77	130	122	252	129	129	258	291	310	601
		Hotel	550	rooms	310	172	153	325	18	23	41	39	58	97	0	0	0	115	72	187
5	Westown Residential Development	Commercial	264	k-sqf	820	597	622	1219	52	48	100	115	124	239	128	128	256	302	322	624
		Single Family Homes	499	units	210	281	165	446	0	0	0	93	88	181	0	0	0	188	77	265
6	Estates at St. Annes	Townhouse	142	units	230	54	26	80	0	0	0	18	14	32	0	0	0	36	12	48
		Single Family Homes	261	units	210	157	92	249	0	0	0	52	49	101	0	0	0	105	43	148
7	Ramunno Property	Golf Course	18	holes	430	22	28	50	0	0	0	0	0	0	0	0	0	22	28	50
		Retail	121	k-sqf	820	354	369	723	0	0	0	99	102	201	97	97	194	158	170	328
8	Market Place	Conv/Gas Station	20	pumps	853	191	190	381	0	0	0	53	52	105	91	91	182	47	47	94
		Advance Auto Parts	6.9	k-sqf	843	20	21	41	0	0	0	6	6	12	6	6	12	8	9	17
Totals						7009	8089	15098	458	460	918	1531	1546	3077	1286	1286	2572	3734	4797	8531

Volumes per *ITE Trip Generation, 8th Edition*, except Amazon (provided) and two industrial parks (per revised rate from 2005 study).

Total Trips shown include external trips, internal capture, study area capture, and pass-by.

Amazon internal/study area capture trips unknown. Conservatively assumed all external trips.

### Additional Notes

1. Internal Development Capture = internal trips within development (these trips not shown in network)
2. Study Area Capture = new trip inside study area
3. Pass-By Capture = trips that are already in the network but will enter the development and then continue along their original path
4. External Capture = trips that are entering the developments from outside the study area

**Trip Distribution for Proposed Developments in Westtown Study Area**

Gravity Distribution (external trips)

Destinations	Developments along US 301	Westtown Residential Development	The Estates at St Annes (Western Entrance)	The Estates at St Annes (Eastern Entrance)
US 301 North	37%	25%	23%	20%
US 301 South	23%	8%		
RT 71 South	10%	25%	15%	32%
RT 299 East (Main St)	15%	25%	51%	43%
RT 15 North (Choptank Rd)	5%	2%		
RT 15 South (Levels Rd)	4%	10%	11%	5%
N437 (Bunker Hill Rd)	4%	2%		
N446 (Wiggins Mill Rd)	1%	2%		
N444 (Middle Neck Rd)	1%	1%		
Total	100%	100%	100%	100%

# **Westown Circulation Concept Plan Update**

## **Appendix E**

### **LOS & Queuing Results for 2017 Base Conditions**

## Westtown Circulation Concept Plan Update

### LOS Analysis Results

January 2015

Year 2017 Base Conditions (Improved Signal Timings; No Other Improvements)

Street		AM Peak Hour										PM Peak Hour									
		Overall		EB		WB		NB		SB		Overall		EB		WB		NB		SB	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
<b>Peterson Dr</b>	<b>US 301</b>	21.4	C	42.3	D	41.1	D	8.5	A	22.6	C	80.9	F	142.7	F	127.6	F	56.3	E	81.5	F
Sandhill Dr / Food Lion RIROLI	US 301			9.4	A	9.6	A	10.3	B	9.6	A			11.3	B	12.1	B	12.6	B	15.0	B
Casa Dr / AAP entrance	US 301							-	-	-	-							-	-	-	-
<b>SR 299</b>	<b>US 301</b>	24.2	C	36.8	D	31.9	C	24.0	C	13.9	B	68.7	E	49.9	D	61.0	E	62.6	E	90.4	F
Wawa entrance	US 301							-	-	-	-							-	-	-	-
<b>South Ridge</b>	<b>US 301</b>	15.0	B	39.3	D	39.3	D	6.0	A	12.6	B	31.1	C	45.7	D	49.8	D	18.8	B	32.8	C
Kohls East / Walmart RIRO	US 301			12.8	B			-	-	-	-			29.6	D			-	-	-	-
<b>Merrimac</b>	<b>US 301</b>	23.6	C	34.4	C	36.1	D	16.7	B	21.6	C	145.3	F	186.3	F	231.9	F	104.6	F	96.6	F
<b>Levels / Levels Rd Ext.</b>	<b>US 301</b>	62.1	E	68.1	E	32.8	C	65.7	E	69.0	E	273.5	F	249.7	F	263.3	F	260.9	F	305.2	F
Levels	Patriot			9.4	A	10.4	B	*	F	*	F			14.9	B	11.5	B	*	F	*	F
Levels / St. Annes Church	Levels	11.6	B	6.4	A	16.1	C	12.0	B	10.9	B	149.8	F	223.7	F	42.2	E	106.6	F	20.9	C
Bunker Hill	Merrimac / Sleepy Hollow			8.4	A	8.8	A	47.4	E	19.1	C			8.2	A	9.7	A	884.1	F	26.7	D
Bunker Hill	Sandhill Dr			8.3	A	7.9	A	15.8	C	17.2	C			8.5	A	8.5	A	171.3	F	632.3	F
SR 299	Lowe's			9.0	A	9.1	A	22.9	C	18.6	C			11.4	B	14.7	B	*	F	*	F
<b>SR 299</b>	<b>Industrial</b>	11.9	B	13.7	B	8.0	A	21.9	C	23.0	C	45.1	D	43.7	D	29.8	C	101.7	F	30.9	C
St. Annes Church	SR 71			273.8	F			10.2	B	-	-			847.0	F			12.6	B	-	-
Poole / Voncroy	Levels Rd Extension			81.9	F	22.9	C	-	-	-	-			137.7	F	*	F	-	-	-	-
Patriot	Merrimac			28.0	D			9.2	A	-	-			64.0	F			9.2	A	-	-
Industrial	Merrimac					10.0	A	8.5	A	17.1	C					8.8	A	11.4	B	12.3	B
Vintage	US 301					11.4	B	-	-	-	-					44.7	E	-	-	-	-
Texas Roadhouse	US 301			9.3	A			-	-	-	-			16.7	C			-	-	-	-
Amazon	Merrimac					23.6	C	-	-	9.0	A					44.1	E	-	-	10.9	B
Westtown North Industrial	Levels					89.1	F	-	-	13.9	B					*	F	-	-	12.4	B
Money's Entrance	US 301			18.5	C			9.1	A	-	-			9048.2	F			16.8	C	-	-
South Ridge RIRO	Bunker Hill			-	-	-	-	9.6	A					-	-	-	-	10.3	B		
<b>Walmart / Texas Roadhouse</b>	<b>Merrimac</b>	24.2	C	39.3	D	38.3	D	19.3	B	18.6	B	115.7	F	202.8	F	148.3	F	62.0	E	113.7	F

- Note 1: Intersection names in **bold** are signals. Non-bold names are unsignalized intersections.  
 Note 2: Delay/LOS at Signalized and Unsignalized Intersections are based on HCM 2000 methodology  
 Note 3: Results showing \* indicate that Synchro does not report a numeric value due to excessive delay.

	Unsignalized Intersection Delay/LOS and Minor Street Approach Delay/LOS
	Unsignalized Major Street Left-Turn Movement Delay/LOS
	No Delay/LOS due to Unsignalized Major Street Non-Stop Movements

	LOS F emphasized in red
	LOS E emphasized in yellow

# Westown Circulation Concept Plan Update

## Queuing Analysis Results

January 2015

Year 2017 Base Conditions (Improved Signal Timings; No Other Improvements)

Street		AM Peak Hour												PM Peak Hour												
		Eastbound			Westbound			Northbound			Southbound			Eastbound			Westbound			Northbound			Southbound			
E/W	N/S	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
<b>Peterson Dr</b>	<b>US 301</b>	268			63	0	55	125	0	16	316	34	963			191	0	468	660	0	39	992	0			
Sandhill Dr / Food Lion RIROLI	US 301		5			7	7			12					15			28	25			36				
Casa Dr / AAP entrance	US 301																									
<b>SR 299</b>	<b>US 301</b>	52	116	0	105	120	7	62	228	45	70	280	3	87	187	0	283	134	0	46	731	134	236	377	11	
Wawa entrance	US 301																									
<b>South Ridge</b>	<b>US 301</b>	59	25	0	57	30	0	36	37	0	40	253	20	166	74	111	199	66	137	74	263	2	100	420	62	
Kohls East / Walmart RIRO	US 301			9												107										
<b>Merrimac</b>	<b>US 301</b>	73	115	76	31	62	0	104	36	3	92	255	13	469	194	541	381	475	228	590	151	8	117	1060	81	
<b>Levels / Levels Rd Ext.</b>	<b>US 301</b>	393	789		123	307	0	284	80	0	150	142	218	1135	1301		570	1560	314	1064	626	95	413	371	1426	
Levels	Patriot	4			5			*			*			14			2			*			*			
Levels / St. Annes Church	Levels	109			192			136			31			5245			505			1066			135			
Bunker Hill Rd	Merrimac / Sleepy Hollow	1			3			138			29			2			3			1314			53			
Bunker Hill Rd	Sandhill Dr	5			4			19			34			10			10			285			530			
SR 299	Lowe's	1			12			41		41	10			3			41			*		*	*			
<b>SR 299</b>	<b>Industrial</b>	4	260	109	278	9	9	18	51	61	28			15	827	233	753	21	10	30	337	111	46			
St. Annes Church	SR 71	530					46							1355						77						
Poole / Voncroy	Levels Rd Extension			85			27								116		*									
Patriot	Merrimac	84		84				4						224		224				12						
Vintage	US 301					3											120									
Texas Roadhouse	US 301		4												89											
Amazon	Merrimac				58					19							213					36				
Westown North Industrial	Levels				186		186			74							*		*			18				
Money's Entrance	US 301	72		0				0						*	14				40							
South Ridge RIRO	Bunker Hill									3												4				
<b>Walmart / Texas Roadhouse</b>	<b>Merrimac</b>	24	24	28	73	0	0	33	106	84	12	260	0	115	116	988	655	38	62	224	19	0	96	1162	117	

- Note 1: Intersection names in **bold** are signals. Non-bold names are unsignalized intersections.
- Note 2: Queue Lengths are 95th% (feet), estimated based on Synchro model
- Note 3: Results showing \* indicate that Synchro does not report a numeric value due to excessive delay/queuing.

	<b>Movement does not exist</b>
	<b>Movement is free-flow; no queue</b>
	<b>Longer / potentially problematic queues emphasized in orange</b>

# **Westown Circulation Concept Plan Update**

## **Appendix F**

### **LOS & Queuing Results for 2017 with Proposed Improvements**

# Westtown Circulation Concept Plan Update

## LOS Analysis Results

January 2015

Year 2017, With Proposed Improvements

Street		AM Peak Hour										PM Peak Hour									
E/W	N/S	Overall		EB		WB		NB		SB		Overall		EB		WB		NB		SB	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
<b>Peterson Dr</b>	<b>US 301</b>	13.7	B	18.9	B	26.6	C	8.2	A	15.0	B	42.2	D	37.2	D	36.8	D	18.7	B	72.4	E
Sandhill Dr / Food Lion RIROLI	US 301			9.2	A	9.9	A	10.6	B	9.7	A			10.9	B	12.4	B	13.2	B	14.5	B
Casa Dr / AAP entrance	US 301							-	-	-	-							-	-	-	-
<b>SR 299</b>	<b>US 301</b>	24.2	C	23.7	C	39.1	D	27.2	C	11.3	B	42.8	D	62.1	E	51.4	D	46.5	D	23.6	C
Wawa entrance	US 301							-	-	-	-							-	-	-	-
<b>South Ridge</b>	<b>US 301</b>	12.3	B	25.9	C	24.1	C	10.5	B	8.7	A	29.1	C	45.7	D	54.1	D	20.5	C	23.3	C
Kohls East / Walmart RIRO	US 301			12.8	B			-	-	-	-			29.6	D			-	-	-	-
<b>Merrimac</b>	<b>US 301</b>	23.7	C	22.7	C	23.6	C	29.2	C	19.1	B	115.7	F	174.2	F	94.9	F	79.3	E	95.4	F
<b>Levels / Levels Rd Ext.</b>	<b>US 301</b>	24.2	C	18.6	B	24.6	C	22.6	C	34.8	C	159.6	F	39.1	D	79.6	E	70.0	E	329.3	F
<b>Levels</b>	<b>Patriot</b>	8.5	A	4.9	A	7.4	A	24.1	C	28.5	C	42.4	D	26.6	C	33.9	C	68.3	E	95.8	F
Levels / St. Annes Church	Levels	11.4	B	5.7	A	16.0	C	12.0	B	10.9	B	56.0	F	47.3	E	83.7	F	67.4	F	20.6	C
<b>Bunker Hill</b>	<b>Merrimac / Sleepy Hollow</b>	9.7	A	7.4	A	7.8	A	16.2	B	19.3	B	15.7	B	15.3	B	13.0	B	16.4	B	24.0	C
Bunker Hill	Sandhill Dr			8.3	A	7.9	A	15.8	C	17.2	C			8.5	A	8.5	A	171.3	F	632.5	F
SR 299	Lowe's			9.0	A	9.1	A	23.7	C	12.2	B			11.4	B	15.0	B	*	F	16.6	C
<b>SR 299</b>	<b>Industrial</b>	12.1	B	11.8	B	9.1	A	22.7	C	23.8	C	44.3	D	32.6	C	36.7	D	100.9	F	34.1	C
<b>St. Annes Church</b>	<b>SR 71</b>	12.1	B	11.1	B			11.1	B	15.2	B	19.3	B	19.9	B			13.0	B	29.3	C
<b>Poole / Voncroy</b>	<b>Levels Rd Extension</b>	7.9	A	27.3	C	27.3	C	7.4	A	6.6	A	22.1	C	0.1	A	0.2	A	23.8	C	24.0	C
Patriot	Merrimac			28.0	D			9.2	A	-	-			64.0	F			9.2	A	-	-
Industrial	Merrimac					9.8	A	8.5	A	11.3	B					8.7	A	11.4	B	9.3	A
Vintage	US 301					11.4	B	-	-	-	-					44.7	E	-	-	-	-
Texas Roadhouse	US 301			9.6	A			-	-	-	-			16.8	C			-	-	-	-
Amazon	Merrimac					23.6	C	-	-	9.0	A					44.1	E	-	-	10.9	B
<b>Westtown North Industrial</b>	<b>Levels</b>	5.2	A			24.9	C	3.5	A	3.3	A	15.1	B			42.8	D	11.4	B	7.3	A
<b>Money's Entrance</b>	<b>US 301</b>	16.7	B	11.2	B			12.6	B	20.5	C	108.7	F	22.1	C			18.2	B	212.8	F
South Ridge RIRO	Bunker Hill			-	-	-	-	9.6	A					-	-	-	-	10.3	B		
<b>Walmart / Texas Roadhouse</b>	<b>Merrimac</b>	20.2	C	28.0	C	26.5	C	15.4	B	17.6	B	111.5	F	158.5	F	148.3	F	62.8	E	96.2	F

- Note 1: Intersection names in **bold** are signals. Non-bold names are unsignalized intersections.
- Note 2: Delay/LOS at Signalized and Unsignalized Intersections are based on HCM 2000 methodology
- Note 3: Results showing \* indicate that Synchro does not report a numeric value due to excessive delay.

	Unsignalized Intersection Delay/LOS and Minor Street Approach Delay/LOS
	Unsignalized Major Street Left-Turn Movement Delay/LOS
	No Delay/LOS due to Unsignalized Major Street Non-Stop Movements

	LOS F emphasized in red
	LOS E emphasized in yellow

# Westown Circulation Concept Plan Update

## Queuing Analysis Results

### January 2015

Year 2017, With Proposed Improvements

Street		AM Peak Hour												PM Peak Hour											
		Eastbound			Westbound			Northbound			Southbound			Eastbound			Westbound			Northbound			Southbound		
E/W	N/S	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
<b>Peterson Dr</b>	<b>US 301</b>	78	28	30	6	43	0	68	57	0	10	222	8	219	72	113	15	72	0	293	252	0	60	512	0
Sandhill Dr / Food Lion RIROLI	US 301			4			7	8					12			14			29	27			35		
Casa Dr / AAP entrance	US 301																								
<b>SR 299</b>	<b>US 301</b>	35	82	0	65	77	17	39	140	47	85	33	0	88	200	0	238	100	18	51	780	98	197	61	0
Wawa entrance	US 301																								
<b>South Ridge</b>	<b>US 301</b>	41	18	0	38	20	0	21	52	1	29	130	1	166	74	111	189	62	120	87	252	16	120	201	39
Kohls East / Walmart RIRO	US 301			9												107									
<b>Merrimac</b>	<b>US 301</b>	64	78	34	21	42	0	24	170	65	107	90	0	412	188	690	272	380	212	636	430	25	117	1053	76
<b>Levels / Levels Rd Ext.</b>	<b>US 301</b>	196	141	38	37	130	35	79	60	2	39	88	149	317	125	56	72	490	175	252	285	134	125	252	1783
<b>Levels</b>	<b>Business Park / Patriot</b>	37	10	0	46	51	6	21	16	0	48	40	3	123	348	0	16	443	80	109	60	0	528	4	13
Levels / St. Annes Church	Levels	68			191			133			31			2145			361			2198			108		
<b>Bunker Hill Rd</b>	<b>Merrimac / Sleepy Hollow</b>	11	89	35	18	121	8	56	56	0	41	0	24	269	52	27	143	18	138	141	0	61	0	0	
Bunker Hill Rd	Sandhill Dr	5			4			19			34			10			10			285			530		
SR 299	Lowe's	1			12			43		43	4			3			44			*		*	9		
<b>SR 299</b>	<b>Industrial</b>	3	100	109	278	9	9	18	51	63	29			8	805	276	807	24	11	33	369	129	52		
<b>St. Annes Church</b>	<b>SR 71</b>	45		170				233	268		255	45	65		563				290	250		625	60		
<b>Poole / Voncroy</b>	<b>Levels Rd Extension</b>			1			0	83	0	106	139	1							614	4	745	0			
Patriot	Merrimac	87		87			4						267		267			12							
Vintage	US 301					3											120								
Texas Roadhouse	US 301			5												90									
Amazon	Merrimac				58					19						213						36			
<b>Westown North Industrial</b>	<b>Levels</b>				34		37		67	15	58	1				107		327		252	12	42	186		
<b>Money's Entrance</b>	<b>US 301</b>	64		6			4	38			172	87	397		34				84	76		94	476		
South Ridge RIRO	Bunker Hill									3											4				
<b>Walmart / Texas Roadhouse</b>	<b>Merrimac</b>	41	42	18	56	0	0	29	55	0	12	233	0	260	263	1082	655	38	62	219	47	21	104	1119	94

- Note 1: Intersection names in **bold** are signals. Non-bold names are unsignalized intersections.
- Note 2: Queue Lengths are 95th% (feet), estimated based on Synchro model
- Note 3: Results showing \* indicate that Synchro does not report a numeric value due to excessive delay/queuing.

	Movement does not exist
	Movement is free-flow; no queue
	Longer / potentially problematic queues emphasized in orange