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 Consulting Civil Engineers Since 1972

July 7, 2017

Upper Dublin Township
 801 Loch Alsh Avenue
 Fort Washington, PA 19034

Attn: Mr. Paul Leonard, Township Manager

Sub: Traffic Calming and Safety Analysis in the Fort Washington Neighborhood

MEMORANDUM

Boles, Smyth has taken a comprehensive look at traffic calming in the Fort Washington neighborhood bounded by Pennsylvania Avenue to the south, Bethlehem Pike to the west, Highland Avenue to the north and Madison Avenue to the east (See Figure 1). Based on input from concerned residents we have analyzed (1) traffic patterns and previous efforts, (2) safety issues, vehicle speeds and traffic data, (3) potential solutions to improve quality of life for residents in the Fort Washington community, and (4) opinions of probable cost.

As a result of this effort, we have focused on solutions that reduce vehicle speeds to improve safety and discourage cut-through traffic.

(1) Traffic Patterns and Previous Efforts

A Traffic Study completed by McMahon Associates in 1999 analyzed traffic volumes, cut-through traffic, and proposed traffic calming elements. It is our understanding some of these initiatives were implemented but removed after feedback from the community. Based on updated traffic counts obtained by the Delaware Valley Regional Planning Commission (DVRPC), the Average Daily Traffic (ADT) in this neighborhood has decreased through 2012 as shown in the table below. The reduction in daily vehicle traffic is attributed to the reconfiguration of the PA 309 interchange with Pennsylvania Avenue.

The overall ADT on Fort Washington Avenue has decreased from 5000 cars to 4000 vehicles, but traffic is now more concentrated during the morning and afternoon commute hours. Daily traffic on Summit Avenue reduced by over 50% and on Madison Avenue by nearly 50%. A review of historic land uses does not identify any major land use changes. Aside from the PA 309 interchange upgrades, other changes include expansion of the SEPTA Fort Washington Parking Lot, relocation of the Fort Washington Fire Company out of the project area, and relocation of the Montessori School out of the project area. Traffic along Highland Avenue also decreased during the peak hour which indicates a shift of more vehicles onto Fort Washington Ave and Pennsylvania Ave.

| Average Daily Traffic (ADT) | 1998* Average Vehicles per Day | 2012-2014** Average Vehicles per Day |
|------------------------------------|---|---|
| Fort Washington Ave | 5000 | 4000 |
| Summit Avenue | 1900 | 900 |
| Madison Avenue | 900 | 500 |

*Fort Washington Neighborhood Traffic Study

**DVRPC Traffic Count



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Peak Hour counts for the morning and afternoon were obtained at intersections along Fort Washington Avenue and Summit Avenue. The number of vehicles during the morning and afternoon peak hour along Summit Avenue decreased by approximately 50%. However, the number of vehicles on Fort Washington Ave increased by over 300 in the morning peak hour. An explanation for the increase is the traffic signal installation on Fort Washington Ave at Pennsylvania Ave that better enables vehicles to make right turns. The traffic signal did not exist in 1998 and was one of the recommendations of the 1999 traffic study. The table below summarizes the traffic counted on a typical weekday during the school year and represents the highest one hour period in the morning between 7-9 AM and afternoon between 4-6 PM.

| Peak Hour Traffic | Fort Washington Ave Southbound onto Pennsylvania Ave | | | Summit Ave Southbound onto Pennsylvania Ave | | |
|-------------------|--|-----------|-------------|---|-----------|------------|
| | Left | Thru | Right | Left | Thru | Right |
| Morning (1998) | 2 | n/a | 67 | 130 | 47 | 44 |
| Morning (2017) | 97 | 2 | 283 | 80 | 50 | 6 |
| <i>Change</i> | <i>+95</i> | <i>+2</i> | <i>+216</i> | <i>-50</i> | <i>+3</i> | <i>-38</i> |
| Afternoon (1998) | 0 | n/a | 63 | 64 | 4 | 30 |
| Afternoon (2017) | 47 | 4 | 163 | 29 | 5 | 4 |
| <i>Change</i> | <i>+47</i> | <i>+4</i> | <i>+100</i> | <i>-35</i> | <i>+1</i> | <i>-26</i> |

Peak hour intersection counts were also taken along Bethlehem Pike at Montgomery Avenue and Spring Avenue. Each of these counts show less than 20 vehicles turn from these side streets onto Bethlehem Pike in the morning and afternoon peak hours.

Full peak hour traffic count information from 2017 compared to the peak hour traffic figures from the 1999 study are included in **Appendix A**.

(2a) Vehicle Speeds

Critical to traffic safety in residential areas is the control of vehicle speeds and ensuring adequate sight distance/sight lines at intersections. Research shows the majority of drivers will naturally travel at a speed that is perceptively safe given roadway conditions. For example, a wide, open roadway is conducive to higher vehicle speeds while a narrow roadway with on-street parking, crosswalks, and tight corners encourages slower speeds. Roadway design has a psychological component on driver speeds.

Recent speed studies conducted by the Upper Dublin Police Department in 2017 support the research. Summit Avenue has a more residential feel due to the presence of on-street parking on both sides of the road. This causes friction between vehicles and cars must slow down. On the other hand, Fort Washington Avenue permits parking on the east side only and most cars are parked in driveways. This is perceived as a more comfortable environment for higher vehicle speeds. Speed data is included on Figure 1, in **Appendix B** and summarized below.

| 2017 Speed Studies | Posted Speed Limit | Average Speed | Percentage Above Limit | NB 85th Percentile (See Note) | SB 85th Percentile (See Note) | Combined 85th Percentile (See Note) |
|--------------------------------|--------------------|---------------|------------------------|-------------------------------|-------------------------------|-------------------------------------|
| Fort Washington Ave. 200 Block | 35 MPH | 38 MPH | 8.4% | 40 MPH | 44 MPH | 43 MPH |
| Fort Washington 500 Block | 35 MPH | 38 MPH | 9.5% | 44 MPH | 42 MPH | 43 MPH |



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| 2017 Speed Studies | Posted Speed Limit | Average Speed | Percentage Above Limit | NB 85th Percentile (See Note) | SB 85th Percentile (See Note) | Combined 85th Percentile (See Note) |
|----------------------------|--------------------|---------------|------------------------|-------------------------------|-------------------------------|-------------------------------------|
| Summit Avenue 300 Block #1 | 25 MPH | 31 MPH | 22.6% | 37 MPH | 35 MPH | 36 MPH |
| Summit Avenue 300 Block #2 | 25 MPH | 29 MPH | 16.5% | 36 MPH | 34 MPH | 35 MPH |

Note: 85th Percentile Speed is the speed at which 85% of the vehicles travel at or below along the road. It is the value used by PennDOT and other transportation agencies to set roadway Speed Limits.

(2b) Crash Data

Crash data was requested from PennDOT for the last three available years, 2013-2015, along Fort Washington Avenue (State Route 2022). Crash data was also obtained from the Upper Dublin Police Department (UDPD) between January 2011 and February 2017, approximately 6 years. See Figure 1 and Appendix C for more information.

Per the Upper Dublin Police Department crash data for this study, between January 2011 and February 2017 there were 68 crashes on Fort Washington Avenue. For this analysis, the crashes occurring at the intersections with Pennsylvania Avenue and Highland Avenue are excluded so as to only account for crashes in the residential section of the corridor. There were 28 crashes identified by UDPD considered significant enough to be reportable to PennDOT's crash data system.

Being a State Route, Fort Washington Ave can be compared to similar roadways Statewide which experience an **average crash rate of 2.18 crashes** per million vehicle miles based on PennDOT statistics. Based on PennDOT reportable crashes recorded by UDPD, the crash rate between 2011-2017 for Fort Washington Ave is nearly twice as high at **3.81 crashes** per million vehicles miles. The crash rate recorded by PennDOT between 2013-2015 is **2.45 crashes** per million vehicle miles.

$$\text{Crash Rate (CR)} = \frac{C * 1,000,000}{365 * N * V * L}$$

C = Number of crashes at the location during the study period (generally 3-5 years)

N = Number of years of data

V = Average Daily Traffic (ADT)

L = Length of road segment (miles)

$$\text{UDPD Crash Rate (CR)} = \frac{28 \text{ crashes} * 1,000,000}{365 * 6 \text{ years} * 4000 \text{ ADT} * 0.84 \text{ miles}} = 3.81$$

$$\text{PennDOT Crash Rate (CR)} = \frac{9 \text{ crashes} * 1,000,000}{365 * 3 \text{ years} * 4000 \text{ ADT} * 0.84 \text{ miles}} = 2.45$$



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Summit Avenue is not a State Route, and there is no means for a Statewide comparison. There are 20 total crashes and the crashes at the intersections with Pennsylvania Avenue and Highland Avenue are excluded for this analysis. There are 6 crashes considered significant enough to be reportable to PennDOT's crash data system. The crash rate is calculated as 3.62 crashes per million vehicle miles traveled.

$$\text{Crash Rate (CR)} = \frac{6 \text{ crashes} * 1,000,000}{365 * 6 \text{ years} * 900 \text{ ADT} * 0.84 \text{ miles}} = 3.62$$

Conclusion: Speeds on Fort Washington Avenue and Summit Avenue while not reaching the threshold of a high enforcement rating are high for a residential street. This has contributed to an increased crash rate and is evidenced by the types of crashes occurring along the corridors, namely side street traffic proceeding without clearance. With higher speeds, longer sight lines are required at intersections.

(3) Neighborhood Meeting and Potential Traffic Calming Measures Discussed

After the data collection effort, a Neighborhood Meeting was held at the Fort Washington Fire House on April 20th, 2017. A copy of the agenda and summary of comments received at, or subsequent to the meeting has been included as **Appendix D**.

Over 35 people attended the meeting and over 100 people have requested to be included on the email distribution list. To effectively reduce vehicle speeds, potential traffic calming features were discussed, including:

- Creating a more residential atmosphere on Fort Washington Ave through crosswalks, completing missing segments of sidewalk, and restricting on-street parking limits at intersections. Combining these elements will encourage vehicles to slow down and be alert for pedestrians and cross traffic. See **Appendix E** for inventory of sidewalks, crosswalks, and on-street parking.
- Bumpouts/Sidewalk Extensions on Fort Washington Ave. These traffic calming features will narrow the roadway at intersections which will reduce vehicle speeds. Bumpouts also have the added benefit of reducing the roadway crossing width that pedestrians need to travel, as well as increase the visibility of pedestrians to motorists. See **Appendix F** for potential bumpout configurations.
- Mini-roundabouts on Summit Ave. These traffic calming features effectively slow down vehicles and are used in low-vehicle-volume neighborhoods throughout the country. They should be used for roads with less than 4000 vehicles per day, and may be as simple as flexible curbing with interior pavers in the middle of the intersection. See **Appendix G** for potential mini-roundabout configurations.
- Flashing Pedestrian Beacons on Fort Washington Ave and/or Summit Ave. When activated by a pedestrian, a pair of flashing lights alert drivers that a pedestrian is waiting to cross the road.



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- Digital Speed Radar Signs on Fort Washington Ave and/or Summit Ave. The presence of these "Your Speed" signs serves to actively inform the driver of their speed and its relation to the posted speed limit and provides speed reduction benefits.
- Mid-block Speed Humps and/or Speed Tables. A popular choice for slowing vehicle speeds, there are a variety of potential design choices and they are wider and more effective than smaller speed bumps.
- Raised Crosswalks. Similar to a speed hump or speed table but located at intersections and with adequate width for pedestrians to cross.
- Longitudinal white lane lines for the outside travel lanes which may be supplemented with speed deterring features which serve to narrow the roadway from the driver's perspective.

As a State Route, changes to Fort Washington Ave are subject to PennDOT review and approval through the Highway Occupancy Permit process. Improvements to Summit Ave are more easily implementable if supported by the municipality and local residents.

Photos, examples, and probable costs of these traffic calming features are included in **Appendix H**.

Conclusion: A common request to address vehicle speeds is to lower the speed limit or install stop signs. Both of these requests are reviewed and approved after standard warrants are evaluated. As noted above, Speed Limit is based on the 85th Percentile speed along the corridor. Stop signs are placed based on major/minor intersection volumes and other factors. If not warranted, then there is a high risk of non-compliance. Another request is to install speed bumps (different from speed humps and speed tables) along the roadway. However, extensive research and experience show this is not an effective method and can be a hindrance to cyclists, schools buses, emergency responders, and public works.

(4) Recommended Traffic Calming Measures

First and foremost, the success of this traffic calming proposal requires support from those that live in the neighborhood.

Second, many of the proposed traffic calming features can be field tested with temporary, low-cost equipment before formally making physical changes. This provides an opportunity to determine the effectiveness of these features to mitigate vehicle speeds and obtain community feedback with an understanding that final configurations may be more appropriate or alternate measures may be required.

Therefore, we recommend a phased approach starting with lower cost measures associated mainly with pavement markings, signs and pedestrian flashing signals. After a period of four to six months, the effectiveness may be checked through updated Upper Dublin Police Department crash records and Speed Study(ies).



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The next sections provide specific recommendations for consideration and presentation to the concerned Fort Washington neighborhood residents, Township Board of Commissioners, Township Staff, Upper Dublin Police Department, Fort Washington Fire Department and PennDOT.

(4a) Fort Washington Avenue Recommendations (See Figure 2 for a graphical representation and Opinion of Probable Cost)

Fort Washington Avenue is designated as State Route 2022; therefore, any traffic calming measures will require PennDOT review and approval through the Highway Occupancy Permit (HOP) process. It is noted that independent to this study, PennDOT performed a Safety Assessment in February/March, 2017 on the Fort Washington corridor from Pennsylvania Avenue to Susquehanna Road and has committed to installing pavement markings with the intent of providing speed reduction and safety benefits. The following is a list of the PennDOT initiatives and the complimentary recommendations from this study:

1. PennDOT recommended installing white edge lane lines to establish 11 foot lanes in each direction. This will allow for a seven (7) foot parking lane in the eastbound direction and three (3) foot shoulder in the westbound direction. We would further recommend coordinating with PennDOT to discuss whether ten (10) foot travel lanes are more appropriate which would provide adequate width for a five (5) foot shoulder in the westbound direction. While not proposed to be a formal bike lane, this is a standard width for bike lanes and provide an area for bicyclists destined for the SEPTA Regional Rail station or Cross County Multi-Use Trail behind the station.
2. Install white pavement marking legends in the direction of travel indicating "35" and "MPH" to reinforce to drivers the 35 MPH speed limit and warn them this is an area where speeding has been observed.
3. Install Continental Crosswalks (ie. railroad tracks) across Fort Washington Avenue at Montgomery, Spring and Prospect Avenue and more traditional transverse crosswalks across the side streets. The more densely applied continental crosswalks across Fort Washington Avenue inform drivers that they should anticipate pedestrian activity.
4. Install side mounted solar powered Pedestrian Flashing Beacons with Pedestrian Crossing signs facing both directions at Montgomery Avenue and Prospect Avenue. As cited by the Federal Highway Administration, these signals have proven to increase vehicle yielding to pedestrians at pedestrian crossings from 18% without beacons to 81% with beacons.
5. To reinforce the residential nature of the corridor, Speed Display Radar signs are recommended to be mounted at the Pedestrian Flashing Beacon locations.
6. PennDOT also recommended adding a second Stop Sign facing Spring Street in each direction based on review of crash history at the intersection.
7. Restrict parking within 35 feet of corner at Montgomery, Spring and Prospect Avenue to increase sight distance for the side street traffic at the Stop Signs.

After installation of the Phase 1 improvements recommended above, an After Study would be recommended to determine their effectiveness. If further Phase 2 traffic calming measures are required, then bump-outs are proposed at the Montgomery, Spring and Prospect Avenue intersections. Bump-outs physically narrow the roadway through either flexible curbing (if approved by PennDOT) or permanent curb. These are more costly because they also include installation of new American with Disability Act (ADA) ramps and analysis of drainage. However, they are effective because they have



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proven to reduce speeds, provide a more visible area for pedestrians to queue before crossing and reduce the pedestrian crossing distance.

(4b) Summit Avenue Recommendations (See Figure 2 for a graphical representation and Opinion of Probable Cost)

Summit Avenue is a local roadway which requires Township approval of traffic calming measures to be implemented. The following is a list of recommendations from this study:

1. Install "RESIDENTIAL STREET" signs at either end of Summit Avenue to inform drivers they are entering a residential neighborhood. This sign is not on the approved Manual of Uniform Traffic Control Devices (MUTCD) list and, therefore, may only be used on the local street.
2. Install white pavement marking legends in the direction of travel indicating "25" and "MPH" to reinforce to drivers the 25 MPH speed limit and warn them this is an area where speeding has been observed.
3. Install Continental Crosswalks (ie. railroad tracks) across Summit Avenue at Montgomery, Spring and Prospect Avenue and more traditional transverse crosswalks across the side streets. The more densely applied continental crosswalks across Summit Avenue inform drivers that they should anticipate pedestrian activity.
4. Install side mounted solar powered Pedestrian Flashing Beacons with Pedestrian Crossing signs facing both directions at Montgomery Avenue and Prospect Avenue. As cited by the Federal Highway Administration, these signals have proven to increase vehicle yielding to pedestrians at pedestrian crossings from 18% without beacons to 81% with beacons.
5. To reinforce the residential nature of the corridor, Speed Display Radar signs are recommended to be mounted at the Pedestrian Flashing Beacon locations.
6. Restrict parking within 35 feet of corner at Montgomery, Spring and Prospect Avenue to increase sight distance for the side street traffic at the Stop Signs.
7. Install a mini-roundabout at the Spring Avenue intersection with flexible curbing and interior pavers. The flexible curbing is transversable by buses and emergency vehicles turning left onto the side street. Mini-roundabouts are effective because they force drivers to turn the steering wheel which results in slower speeds approaching and through the intersection. This recommendation is shown as Phase 2 on the corresponding Figure 3; however, it may be installed for a relatively low cost if using flexible curb and pavers.

After installation of the Phase 1 improvements recommended above, an After Study would be recommended to determine their effectiveness. If the mini-roundabout has been proven to be effective, then a more permanent mini-roundabout installation may be considered.

(4c) Other Recommendations

Comments from residents also included additional issues beyond Fort Washington and Summit Avenue. Most notably:

1. There is inadequate parking in the SEPTA Regional Rail Station lot and people are parking on Summit Avenue. It is recommended to engage SEPTA and discuss the percentage of parking spots designated for SEPTA Permit Parking and for general use. Based on a recent field observation, SEPTA permit parking spaces were much more under-utilized than general spaces.



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2. There are missing sections of sidewalk along Fort Washington Avenue and the side streets. It is recommended to prioritize limits of sidewalk installation which may qualify as a Critical Connection between specific destinations, such as the SEPTA Regional Rail Station or the Fort Washington Elementary School. Section designated as Critical Connections may be eligible for grant funding or Upper Dublin Township capital investment.

Boles, Smyth will also support Upper Dublin Township by actively seeking out and pursuing potential funding opportunities for these transportation safety improvements. On behalf of the township, an Automated Red Light Enforcement (ARLE) grant was submitted to PennDOT on June 29, 2017 to propose the Fort Washington Avenue traffic calming measures listed above.

We look forward to engaging with the Township and residents to determine a course of action which will provide a measurable benefit.

Sincerely,

A handwritten signature in black ink, reading "John Smyth Jr.", is written over a light blue horizontal line. The signature is fluid and cursive, with a prominent initial "J" and a trailing flourish.

Attachments (8):

- Appendix A - Peak Hour Traffic Counts from 1998 and 2017
- Appendix B - Fort Washington Avenue Speed Data from 2017
- Appendix C - Municipal Crash Data from 2011 to 2017
- Appendix D - Fort Washington Neighborhood Meeting Agenda and Comments Summary
- Appendix E - Inventory of Sidewalk, Crosswalk, and On-Street Parking
- Appendix F - Potential Traffic Calming Examples for Fort Washington Avenue
- Appendix G - Potential Traffic Calming Examples for Summit Avenue