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May 6, 2010

Ms. Sharon McCullough, Administrator
Borough of Haddonfield
242 Kings Highway East
Haddonfield, New Jersey 08033

**RE: Letter Report
Euclid Avenue Traffic Calming Feasibility
Our File #04-17-T-404**

Dear Ms. McCullough:

Remington & Vernick Engineers is pleased to submit this letter report documenting the results of the traffic calming feasibility study for the above referenced project. Activities completed as part of the work included providing oversight and review of the video inspection of sanitary sewer and storm sewer piping along portions of Euclid Avenue and Estaugh Avenue, conducting field survey and the preparation of base plans for portions of Euclid Avenue, the review of existing drainage areas, and infrastructure issues in the study area.

Background

The purpose of this feasibility study is to evaluate several design considerations that would need to be addressed prior to the implementation of the recommended traffic calming measures along Euclid Avenue. The recommended traffic calming measures were proposed for the New Jersey Department of Transportation (NJDOT) by Parsons Brinkerhoff, Quade & Douglas (Parsons Brinkerhoff) as part of a Borough-wide traffic calming study conducted in 2004. This study, which was conducted by NJDOT at the request of the Borough, focused on five (5) primary corridors identified by the Borough's Transportation and Pedestrian Safety Committee (TAPS) and two (2) secondary corridors identified by Parsons Brinkerhoff during the implementation of the study. One of the primary corridors identified by the TAPS Committee was Euclid Avenue between Haddon Avenue (County Route No. 561) and West End Avenue (County Route No. 641).

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As part of their study, Parsons Brinkerhoff prepared a comprehensive final report, which detailed their observations and recommendations for each of the studied corridors. For Euclid Avenue, Parsons Brinkerhoff recommended landscape medians at Euclid Avenue and Westmont Avenue and raised intersections along Euclid Avenue at the intersections of Linden Avenue, Estaugh Avenue, and West End Avenue.

A copy of the relevant sections (Primary Focus Area No. 3) of the Parsons Brinkerhoff Final Report is included as Attachment A.

Traffic Calming Final Report Summary for Primary Focus Area No. 3

As shown in Attachment A, the area of Euclid Avenue that was included in the Parsons Brinkerhoff study was from Haddon Avenue to West End Avenue. The study; however, primarily focused on the area between the PATCO Hi-Speed Line Bridge and West End Avenue. This section of Euclid Avenue connects Haddon Avenue to West End Avenue and provides access to the rear of the PATCO Hi-Speed Line station. The width of Euclid Avenue in the study area varies between 32 feet and 36 feet wide and is bordered by primarily single family residential dwellings, with the exception of the area adjacent to the PATCO line, which is a mixture of multi-family and single family residential dwellings and the referenced PATCO Hi-Speed Line station. The speed limit along the roadway, as with all roads in the Borough, is posted at 25 miles per hour (mph) and there are no traffic control devices (i.e., stop signs and/or traffic lights) along Euclid Avenue in the primary study area, with the exception of a stop sign, which is located at the intersection with West End Avenue.

According to the Parson's report, residents in the study area reported excessive automobile speeds and aggressive driving behavior. The summary provided in the report indicated that few vehicles travel at or below the posted 25 mph speed limit and there is a high percentage of vehicles that travel above 35 mph. Additionally, the report indicated that Euclid Avenue also functions as an alternate route for Kings Highway East and that this use and the lack of traffic control devices contribute to the reported high vehicle speeds. During traffic counts conducted as part of the study, Parson's observed approximately 700 vehicles entering Euclid Avenue from Haddon Avenue and/or Tanner Street between 4:45 p.m. and 5:45 p.m. The date of these observations is not clear in the report. However, it does indicate that some of the observed traffic may be using the roadway to access the adjacent PATCO parking lot.

Based upon their observations and other findings, Parson's recommended the construction of two (2) landscape medians immediately east and west of Westmont Avenue. According to the report, the purpose of these medians would provide a visual transition from the PATCO parking lot and station to the adjacent residential areas. Also, the medians would provide a "pinch point" to slow vehicle speeds and enhance aesthetics in this area of Euclid Avenue. The report also recommended the installation of 4 inch high raised intersections, with curb extensions along Euclid Avenue at the intersections of Linden Street, Estaugh Avenue and West End Avenue. The recommended intersections included optional "textured brick "paver" crosswalks

for aesthetic and visual reasons. According to Parson's, the proposed intersections would reduce the crossing distances for pedestrians and create pinch points and vertical measures that would encourage slower vehicle speeds. Also, Parson's indicated that the result of the recommendations would be to create more of a "pedestrian zone" along the roadway and that the motorists would be provided with "visual and physical cues" to encourage slower speeds and less aggressive driver behavior.

The report estimated the costs for the raised intersections to be upward of \$20,000 for each intersection. The costs for the curb extensions were between "\$10,000 and \$50,000 per corner". Parson's also recommended several lower cost alternatives that would visually reduce the roadway width and reduce pedestrian crossing distances. These alternatives included centerline and shoulder striping and the installation of steadily reducing "transverse" markings along the shoulders of the roadway.

Feasibility Study Background

Since the completion of the Parson's report, the Borough has installed three (3) recommended raised intersections with curb extensions. All three raised intersections have been installed on Lincoln Avenue (Primary Focus Area No. 2) at the Walnut Street, Centre Street and Chestnut Street intersections. The raised intersections at Walnut Street and Centre Street were installed in 2006 and the raised intersection at Chestnut Street was installed in 2009. All three intersections required extensive underground utility improvements prior to the construction of the intersection itself. The required underground utility work included the installation of new storm sewer piping along the length of Lincoln Avenue and portions of Chestnut Street and East Park Avenue and the replacement of the sanitary sewer manhole and piping and the water main beneath the Chestnut Street intersection. Additionally, the costs for the intersections, not including the required underground utility work, ranged from \$42,000 for each of the Walnut Street and Centre Street intersections to \$17,500 for the Chestnut Street intersection.

In order to determine technical issues and feasibility associated with the proposed traffic calming measures along Euclid Avenue, our office was retained by the Borough to evaluate the existing infrastructure conditions in the proposed project area and determine the scope of required and/or recommended underground utility improvements. This evaluation involved a review of the existing infrastructure and obtaining field survey data along portions of Euclid Avenue and Estaugh Avenue. The existing infrastructure evaluated included the existing sanitary sewer system, the existing municipal potable water system and the storm water runoff collection system. The collected field survey data included the ground surface elevation and all accessible underground pipe invert data from portions of Euclid Avenue and Estaugh Avenue.

This information, as well as information obtained during an ongoing sanitary sewer pump station study, was analyzed to determine whether the proposed raised

intersections, with curb extensions were feasible to construct without extensive underground utility upgrades and/or relocations.

Sanitary Sewer System

The sanitary sewer system along Euclid Avenue discharges directly to the Euclid Avenue Sanitary Sewer Pump Station, located on northwest corner of the Westmont Avenue intersection. This pump station, built as part of the required improvements to depress the PATCO tracks, is approximately 40 years old and is one of the newest sewer pump stations in the Borough. The sewer service area for the main beneath Euclid Avenue is generally bounded by Elm Avenue to the north, Kings Highway West to the south, the PATCO Hi-Speed Line to the east, and Birchall Drive and portions of Haddon Township to the west. The area includes the Elm Avenue Sanitary Sewer Pump Station, which is located at the intersection of Elm Avenue and Estaugh Avenue. The force main from the Elm Avenue Pump Station runs beneath Estaugh Avenue from the station to a manhole located at the Euclid Avenue and Estaugh Avenue intersection. This force main, which is approximately 80 years old, is located directly over portions of the existing sanitary sewer and storm sewer piping along Estaugh Avenue.

Along Euclid Avenue, the sanitary sewer piping consists of 12 inch diameter terra cotta piping (TCP) located between West End Avenue and Estaugh Avenue and 18 inch diameter TCP between Estaugh Avenue and the Euclid Avenue Pump Station. Based upon the video pipe inspection of the sewer mains, the existing piping is in generally in good condition; however, several areas could not be inspected due to the high flow conditions that were encountered during the video inspection survey.

Based upon the age (approximately 80 years old) and condition of the piping, it may not be necessary to replace the existing piping; however, the existing eight (8) brick manholes should be replaced as part of any future roadway and/or traffic calming project. Also as part of any future project in the area, all individual sanitary sewer laterals should be replaced prior. This recommendation is based upon the age of the laterals, many of which still have "traps" installed at the curb line. These "traps", which were originally installed to prevent sewer main gas from entering buildings, are no longer required due to modern plumbing code requirements which provide that each fixture inside the residence must have its own internal trap. The traps are also a source of ongoing maintenance issues, since it is easy for debris and grease to accumulate and cause backups in the pipe.

As part of a recently completed study of the Borough's entire sanitary sewer system, there is a potential for the elimination of the existing Elm Avenue Pump Station. This station, which is over 80 years old, will need replacement and/or significant upgrades in the near future. The elimination of the pump station is based upon the feasibility of installing a new and deeper sanitary sewer main along portions of Estaugh Avenue, Westmont Avenue and Euclid Avenue. This new sanitary sewer line would impact the installation of the proposed raised intersections and possibly the proposed median strip at Westmont Avenue.

Municipal Water System

The municipal public water main along Euclid Avenue consists of 4 inch diameter cast iron piping from West End Avenue to Linden Avenue. At Linden Avenue, the main changes to a 6 inch diameter cast iron pipe that runs from Linden Avenue to the PATCO Bridge. The water main beneath Euclid Avenue connects to existing 6 inch diameter piping at each intersection, with the exception of Linden Avenue, where it connects to an existing 4 inch diameter water main and Estaugh Avenue, where it connects to a 4 inch diameter pipe on the east side of the intersection only. Based upon the Borough's current water allocation and the usage, the minimum size for water mains is 8 inch diameter piping. All undersized water mains along Euclid Avenue and at each intersection should be replaced with new 8 inch diameter, cement-lined, ductile iron piping. Also, all valves, fire hydrants and water services in the project area will also need to be replaced with appropriately sized materials.

Storm Sewer System

The main storm sewer system in the study area is primarily located beneath Estaugh Avenue from Kings Highway West to Elm Avenue. This storm sewer piping eventually discharges to a drainage swale that is located along Elm Avenue between Estaugh Avenue and West End Avenue. The drainage swale connects to the Newton Creek just behind the last two houses along West End Avenue in the Borough. There is also a smaller section of storm sewer piping located at the intersection of Euclid Avenue and Westmont Avenue, which discharges to the adjacent depressed PATCO Hi-Speed Line. This drainage area, which is approximately 137 acres, is the source of several ongoing drainage issues and complaints by the residents in the area. The major drainage issues are due to the age of the storm water infrastructure, most of which is over 80 years old. This older infrastructure obviously does not meet current storm water runoff regulations and will need to be upgraded over time to address the ongoing issues and complaints.

The storm sewer system along Estaugh Avenue from Euclid Avenue to Elm Avenue primarily consists of 36 inch diameter Terra Cotta Clay Pipe (TCP) with primarily four (4) inlets installed at each intersection. The inlets are connected to the large diameter TCP main by a variety of pipe materials, such as newer plastic piping, and TCP. These connections from the inlets to the 36 inch diameter storm sewer main range in size from 8 inch diameter to 15 inch diameter pipes. There is no storm sewer piping located along Euclid Avenue between West End Avenue and Estaugh Avenue and Estaugh Avenue and Linden Avenue. Based upon the size of the drainage area and the lack of any storm water detention facilities in the area, the existing piping frequently surcharges during high intensity rain events. These surcharges cause local flooding of the streets; however, they do not appear to have a major impact on the homes and garages along Estaugh Avenue and Elm Avenue. Since the proposed raised intersections require two (2) new storm water inlets at each corner, it would be necessary to extend the existing storm sewer piping along Euclid Avenue from Estaugh Avenue to Linden Avenue.

As part of this study, a video inspection of the existing storm sewer piping beneath Estaugh Avenue from Euclid Avenue to Elm Avenue was conducted. Based upon the results of this inspection, which indicated numerous cracking and other defects with the existing storm sewer mains and inlet connections and the previously referenced drainage issues, it is recommended that the existing storm sewer line along Estaugh Avenue be replaced with a larger diameter pipe and additional inlets at each intersection. This long term replacement project should be completed prior to any extension of the storm sewer system and the installation of the proposed raised intersections.

Roadway Condition

The Borough is currently preparing a comprehensive Infrastructure Management Program (IMP) for all Borough-owned roadways. The IMP includes visual condition surveys to assess and rank the existing pavement condition for all existing Borough roadways. Based upon the work completed to date and the traffic volumes of the roadway, the existing pavement on Euclid Avenue between the PATCO Hi-Speed Line and West End Avenue is significantly deteriorated in several areas and will need to be repaired and/or repaved within 5 years.

Conclusions and Recommendations

Based upon the findings of this feasibility study, we offer the following conclusions and recommendation:

1. There is significant underground utility replacement work that should be completed prior to installing the proposed raised intersections along Euclid Avenue at West End Avenue, Estaugh Avenue and Linden Avenue. These infrastructure improvements include the following:
 - a. Removal and replacement with 8 inch diameter ductile iron piping of the all existing 4 inch diameter cast iron water main along Euclid Avenue and at each intersection as noted.
 - b. Removal and replacement with 8 inch diameter ductile iron piping of all existing 6 inch diameter water main at each intersection.
 - c. Removal and replacement of all existing residential water services, with new 1 inch diameter polyethylene services.
 - d. Removal and replacement of all eight (8) existing sanitary sewer manholes along Euclid Avenue.
 - e. Removal and replacement of all existing residential sanitary sewer laterals, with new 4 inch diameter polyvinyl chloride (PVC) laterals and cleanouts.
 - f. Removal and replacement of the existing 36 inch diameter TCP storm sewer piping from Estaugh Avenue to Elm Avenue.

- g. Removal of all existing storm water inlets along Estaugh Avenue and the installation of two (2) new inlets at each corner (a total of 8 per intersection). All connections between the inlets and the storm sewer main shall be a minimum of 15 inch diameter PVC piping.
 - h. Extension of the existing storm sewer main from Estaugh Avenue to Linden Avenue and the installation of eight (8) new storm water inlets at this intersection.
2. Additionally, based upon the Borough-wide sanitary sewer study, it may be necessary and/or advisable to replace the existing sanitary sewer piping along the Estaugh Avenue and Euclid Avenue with a new deeper sanitary sewer main that will result in the elimination of the existing Elm Avenue Pump Station. It should be noted that the elimination of the pump station would result in significant long term costs savings due to the savings associated with the not replacing and/or constructing significant upgrades to the existing station and eliminating the ongoing operations and maintenance costs associated with the existing and/or new pump station.
 3. Based upon the significant utility upgrades and/or replacements identified as part of this study, we do not recommend the installation of the proposed raised intersections until all identified utility upgrades and/or replacements have been addressed. Additionally, it is our opinion that due to the nature of the roadway as detailed in the Parsons Brinkerhoff Final Report, the installation of curb extensions with crosswalks (with or without clay brick pavers) may be a more cost-effective solution to the reported vehicle speed and aggressive driving issues that were identified during the Traffic Calming Study.
 4. The need for any future raised intersections should be evaluated only after the installation of the curb extensions and crosswalks at each of the recommended intersections.
 5. Prior to any further consideration, the proposed raised intersection along Euclid Avenue at West End Avenue (C.R. 641) should be reviewed and approved by the Camden County Department of Public Works.
 6. Based upon the condition of the existing roadway and the identified utility issues, some of which are long term solutions, it may be necessary to repave and or significantly repair the roadway within 5 years or less. This repaving should be coordinated with the utility issues; however, if it is limited to milling and overlay only, it could include some of the proposed traffic calming measures such as the curb extensions and the median at Westmont Avenue. These two proposed measures may not be disturbed or are sufficiently cost effective to replace in the event they are impacted by the future utility work. It should be noted that due to the volume of traffic on Euclid Avenue, the life span of any mill and overlay may be limited to 10 years or less before full reconstruction of the roadway would be necessary.

If you have any questions or require additional information regarding this report or any of our recommendations, please do not hesitate to contact me.

Sincerely yours,

REMINGTON & VERNICK ENGINEERS, INC.



Charles J. Chelotti, P.E.

cc: David Watson, P.E.
Joseph Keating
Transportation and Pedestrian Safety Committee