TECHNICAL MEMORANDUM

To: Juanita Wieczoreck, Dover/Kent County Metropolitan Planning Organization

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Subject: US 13 Circulation Study – Scarborough Road to Jefferic Boulevard

Background

In 1997, the Dover/Kent County Metropolitan Planning Organization (D/KC MPO) conducted a workshop to generate ideas for improving the appearance and operation of the US 13 and US 113 corridors through the City of Dover. The ideas generated were reviewed, analyzed and refined through an interactive public process culminating in a November 2000 future concept plan for each of the six segments identified in the US 13 and US 113 corridors.

In the northern most segment of US 13, Leipsic Road to Denney's Road, development activity caused the Delaware Department of Transportation (DelDOT) to conduct additional analyses in 2003. Some proposed roadway connections contained in the 2000 Concept Plan were viewed as incompatible with site plans for some properties or ineffective for proposed developments. To support this effort, Rummel, Klepper & Kahl, LLP (RK&K) was contracted by DelDOT to develop a traffic model, using the SYNCHRO/SimTraffic analysis tool, to assist the Department and a local working group in evaluating proposed new development and interconnecting roadways in the north Dover US 13 Corridor. The results of that effort did not produce a consensus regarding the future development of US 13 and the effort was abandoned when certain development proposals were dropped or delayed.

In 2007, the Dover/Kent MPO initiated a new study to reevaluate land use and roadway interconnections in this corridor with the intent of developing a consensus plan for the future development of the north Dover US 13 corridor. RK&K was requested to assist in that effort by updating the 2003 traffic model and then using it to evaluate alternatives developed by the Dover/Kent MPO. In addition to modeling and simulating the traffic flow on US 13 for each of the alternatives, the MPO requested that RK&K prepare graphics and visual aids and assist the MPO staff in conducting meetings on the project to develop an acceptable concept plan for the north Dover US 13 corridor. This Technical Memo documents the procedures followed and the results of the coordination process.

Study Area

The study area for the US 13 North Dover Corridor Study is centered on US 13 and bounded by the US 13/Jefferic Boulevard intersection to the south, the US 13/Scarborough Road intersection to the north, SR 1 to the east and Silver Lake to the west. The study area is shown in Figure 1, at the end of this memorandum.

Analysis of Potential Roadway Connections

The goal of this project is to determine how future development and general traffic growth will affect the operation of the US 13 corridor in north Dover and to develop potential roadway connector options that could be utilized to redistribute traffic in an effort to provide interconnection between adjacent land uses, thereby providing additional alternatives to motorists aside from traveling on US 13. In order to complete this analysis, data was collected regarding existing

intersection turning movement volumes, intersection geometry and signal timings. This data was compiled and input into a traffic model using the SYNCHRO/SimTraffic software package and results of the modeling effort were used to determine the advantages and disadvantages of the proposed roadway connections.

Data Collection Procedures

RK&K reviewed and updated the existing US 13 SYNCHRO Model to reflect 2007 conditions. Intersection traffic counts, taken since the original model was developed, were collected from DelDOT and the MPO. Recent traffic counts from the following intersections were found to be available and were used in updating the model:

- US 13 @ Lepore Road (from the Berry Property Traffic Impact Study)
- US 13 @ State Street (from the Berry Property Traffic Impact Study)
- US 13 @ College Road (from the DSU Commercial Center Traffic Impact Study)
- US 13 @ Dover Downs (from the Berry Property Traffic Impact Study

Critical intersections that had not been counted since the 2003 Model was developed were counted to provide updated information. Traffic counts were taken for 3 hours during the afternoon weekday peak period and 4 hours during the midday Saturday peak period to match the counts taken for the original model. New traffic counts were taken at the following locations:

- US 13 @ Rustic Lane (June, 2007)
- US 13 @ Wal-Mart (June, 2007)
- US 13 @ Scarborough Road (June, 2007)
- Scarborough Road @ Crawford Carroll Boulevard (June, 2007)

Data from the DelDOT permanent traffic counter on US 13 near Dover Downs was collected and used to adjust the base traffic volumes at all other intersections in the corridor. These intersections included the following:

- US 13 @ Delaware State University
- US 13 @ South Entrance to Dover Mall
- US 13 @North Entrance to Dover Mall
- Us 13 @ Kentwood Drive/Cedar Chase Drive

All traffic volumes were adjusted using seasonal adjustment factors provided by DelDOT to reflect seasonal variations in the traffic counts. Additional adjustments were also made to the model to reflect changes since 2003 in roadway geometry, including intersection modifications. Current signal timings used by the DelDOT TMC were also collected and adjustments to the base SYNCHRO Model were made using this information.

Traffic Analysis for Alternatives

RK&K utilized the SYNCHRO traffic model developed for US Route 13 in 2003, with the adjustments discussed previously to reflect current conditions, to evaluate traffic impacts of the various land development and roadway connector alternatives developed by the Dover/Kent MPO. The year 2017 was chosen to establish a 10 year planning horizon to evaluate full development conditions. In consultation with DelDOT, RK&K utilized a 2% per year growth factor for all traffic counts and added specific projected turning movement information for two specific developments, The DSU Commercial Center and the Dover Crossroads Shopping Center. Traffic growth projections were made from historical data to verify the choice of the 2% growth factor. Traffic growth projection charts are provided at the end of this memorandum (Figures 2 – 4).

Following calibration of the model with existing traffic, a 2017 "No Build" SYNCHRO Model was developed as a baseline to measure various build options against. Recommended improvements were then tested under three options:

Option 1 included a minimum number of new roadway connections, including the base network plus the following new connections:

- Extension of Crawford Carroll Boulevard to the south through the Pet Smart/Circuit City Parking lot to the north access road of Dover Mall.
- A new commercial connector road from Jefferic Boulevard through the Berry Property (Dover Crossroads Shopping Center) to Leipsic Road opposite the existing commercial road behind the Home Depot.

Option 2 included the base network, the new roadway connections included in Option 1, plus the following new connections:

- An east side service road connecting the Dover Downs main entrance and Dover Mall to the connecting road from SR 1 to US 13 at Scarborough Road.
- A connecting road from the Walmart signal at US 13 to the new east side service road.

Option 3 included the base network, the new roadway connections included in Options 1 and 2, plus the following new roadway connections:

- Interconnection of the east side service road in Option 2 with the commercial connector road through the Berry Property in Option 1.
- A further extension of Crawford Carroll Boulevard in Option 1 to the south around the west side of Delaware State University connecting to College Road.
- Connection of the hotels on the north end of the corridor to Cedar Chase Drive through an extension of Hilton Garden Way.
- A third travel lane on northbound and southbound US 13 between Scarborough Road and the Wal-Mart intersection. North of the Scarborough Road intersection, the northbound travel lane would be dropped as the right-turn lane at the Denny's Road intersection.

A separate SYNCHRO model was developed for each option and traffic volumes were manually reassigned based on experience, observations and local knowledge. Working with DelDOT, a subset of the Department's traffic demand model (the Peninsula Model) was run for the north Dover US 13 corridor to derive the amount of regional traffic that might divert to the continuous service roads identified in Option 3. Results of the tests for the three options were then compared to the base line conditions for 2017 to develop some conclusions about the effectiveness of the various new roadway connections proposed.

A map showing the full range of roadway connections tested is provided at the end of this memorandum (Option 3).

Results of the SYNCHRO Model Tests

Results of the SYNCHRO model tests were compared to the base line conditions for the year 2017 for each intersection in the study area. Travel time between major intersections along US 13 was used as the measure of effectiveness to determine the impact of each roadway connection option. Additionally, the Level of Service and delay was used as a secondary measure of effectiveness at each signalized intersection within the study area.

The results of the traffic analysis showed that travel time on northbound US 13, between Jefferic Boulevard and Scarborough Road, would increase from approximately 6 minutes to approximately 13 minutes between existing (2007) and no-build (2017) conditions. In the

southbound direction, within the same section, travel time would increase from approximately 6 minutes to almost 14 minutes between existing (2007) and no-build (2017) conditions. The section of US 13 between Dover Downs and the north entrance to Dover Mall would see the most dramatic increase in travel time, especially in the southbound direction. Providing the connections proposed in Option 3 (including those for Options 1 and 2), the travel time would be approximately 9 minutes in the northbound direction and 12 minutes in the southbound direction, an improvement over no-build conditions. However, the section between Dover Downs and the north entrance to Dover Mall would still experience travel times in excess of 5 minutes. A comparison of travel times for the 2007 existing conditions, the full development 2017 "No Build" conditions and the full development, full build (Option 3) conditions is provided in Tables 1A and 1B, at the end of this memorandum. A comparison the Levels of Service at each signalized intersection for existing, no-build and the full build (Option 3) is provided as Table 2 at the end of this memorandum.

Based on the results of the SYNCHRO Model tests, the conclusion of the MPO and the study team was that the full set of proposed new roadway connections (Option 3), nor either subset (Options 1 or Option 2) from previous studies, could reasonably mitigate the traffic impacts of the anticipated traffic growth and planned development in the US 13 corridor. Additional adjustments in the proposed roadway network would need to be made to maintain reasonable traffic operations on US 13 in the future.

Public Coordination Process

The results of the traffic modeling effort and a map of the proposed roadway connections were presented to business and development community leaders in the north Dover US 13 corridor, the City of Dover, Kent County and DelDOT in a workshop on February 28, 2008. A history of the traffic growth in a north/south direction through Dover was presented along with the specific connectors studied. In summary, the group was shown that the connectors proposed from past studies would not sufficiently support future traffic growth plus all planned development and the travel time would be unacceptable when all development was complete. Business leaders also pointed out that some of the connections proposed through their properties, even if they had worked to mitigate traffic impact, would cause internal operational problems within their sites and would not be acceptable as shown.

The MPO then agreed to meet with individual businesses and agencies to revise and add roadway connections to areas more acceptable to the business community and to locations which might provide greater traffic benefit to US 13. The goal of the process was to develop a "Consensus Plan" agreeable to the business community and more efficient in providing traffic benefits to US 13. Individual meetings with businesses and agencies were conducted from March 2008 through June 2008.

The result of the meetings with the businesses and agencies was the development of a revised set of interconnections. The new or realigned interconnections were placed in locations viewed by the businesses as being compatible with their current and future site plans and site operations. In addition the new and realigned interconnections were placed in locations where it was felt they would help mitigate future impacts at the most congested points on US 13. Consideration was also given to the mitigation of traffic impacts caused by the two annual NASCAR races held at Dover Downs. A map of the "Consensus Plan", developed through this process, is provided at the end of this memorandum.

"Consensus Plan" Analysis

Based on the results of the initial meeting with the business and development communities and the subsequent individual meetings with business owners, a "Consensus Plan" was developed for the US 13 corridor. The plan consists of the following elements:

- On the west side of US 13:

  - Extension of Crawford Carroll Boulevard to the south, through the west side of the Delaware State University property to College Road. The western portion of College Road would be realigned to form a three-legged intersection with the extended Crawford Carroll Boulevard and the eastern portion of College Road.
  - An east/west connector between extended Crawford Carroll Boulevard and US 13 through the Pet Smart / Circuit City parking lot. The proposed roadway would tie into US 13 approximately 160 feet north of the existing signalized intersection for the northern Dover Mall access.
  - Connection of the hotels on the north end of the corridor to Cedar Chase Drive through an extension of Hilton Garden Way.

- On the east side of US 13:

  - A north/south roadway (East Side Connector), parallel to US 13 and SR 1, located just west of the SR 1 alignment. This road would extend south from Scarborough Road, under existing Leipsic Road and then turn to the west and intersect US 13 opposite Lepore Drive. The intersection of the East Side Connector with the Scarborough Road connector would require modifications to the existing Denny's Road interchange with SR 1 and would require the construction of a signalized intersection on the connecting road from the north Dover interchange with SR 1 to US 13. Two options for interchange modifications were considered and will be discussed later in this memorandum.
  - Where existing Leipsic Road crosses over SR 1, the roadway would be curved to the east to tie into the proposed East Side Connector. Existing Leipsic Road from Dover Downs to US 13 would become a service road for Dover Downs, Dover Crossroads (Berry Property) and the Home Depot store. A connection between the Leipsic Road service road and the East Side Connector would also be provided.
  - Interconnection from Kentwood Drive into the Wilmington University property.
  - An east/west connector roadway from the Best Buy entrance to the proposed East Side Connector. Access to the Dover Mall would be provided on this roadway and access to Dover Downs would be accommodated if desired in the future.
  - Interconnection from the Best Buy entrance to Dover Litho.
  - Relocation of the north entrance to Dover Mall, approximately 160 feet to the north, to line up with the proposed connector road from the west side of US 13. The north Dover Mall access would be modified to provide for all turning movements. A left-turn lane would be provided on the access road to Dover Mall to allow left-turns into the Volkswagen dealership.
  - Interconnection from relocated Leipsic Road into the Dover Crossroads Shopping Center (the Berry Property).
  - Improved interconnection from the Dover Downs entrance behind Denny's, Boston Market and Atlantic Books.

In addition to the roadway connections discussed above, a third lane is proposed for northbound and southbound US 13 between Scarborough Road and the Wal-Mart entrance. A figure displaying all of the proposed road connections is provided at the end of this Technical Memorandum ("Consensus Plan").

The proposed roadway connections discussed above were input into the traffic model and traffic was manually reassigned based on experience, observations and local knowledge of the roadway system. The results of the modeling effort were compared to values for existing (2007) conditions and no-build (2017) conditions. The results indicate that travel time will increase by 32% in the northbound direction (6 minutes versus 8 minutes) and 48% in the southbound direction (6 minutes versus 9 minutes) over existing conditions with the construction of the proposed connector roads for the "Consensus Plan". Comparing no-build to the "Consensus" option, travel

times will decrease on the order of 41% (13 minutes versus 8 minutes) in the northbound direction and 34% (14 minutes versus 9 minutes) in the southbound direction, indicating that the proposed connector roads will provide some future relief on US 13. In addition, Levels of Service and delay should be improved at the majority of the signalized intersections on US 13. This can be attributed to the provision of interconnection between adjacent land uses, the reduction in the number of U-turns and left-turns at signalized intersections and improved regional connectivity.

Denny's Road Interchange Modifications

The proposed East Side Connector road will create an intersection on the Scarborough Road connector between US 13 and the Denny's Road interchange with SR 1. Provision of an intersection on the Scarborough Road connector has been opposed by DelDOT throughout the entire process of this study. Concerns over unexpected stopping conditions, additional weaving and high speeds have prompted DelDOT's concerns. RK&K evaluated two options for connecting the East Side Connector to the Scarborough Road connector. The options are as follows:

- Interchange Option 1 creates a four-legged signalized intersection just east of the existing toll plaza on the Scarborough Road connector. The East Side Connector would create the southern leg of the intersection. The southbound off-ramp from SR 1 would be modified to allow for a split in traffic so that motorists wanting to get to the East Side Connector would be able to stop at the traffic signal and motorists wanting to continue on the Scarborough Road connector to get to US 13 would be able to continue freely as they do today. This option would also require a new southbound on-ramp that would be part of the northern leg of the intersection and then loop to the east and tie into SR 1.
- Interchange Option 2 creates a three-legged intersection with limited movements on the Scarborough Road connector, located approximately half way between the interchange and US 13. The East Side Connector would create the southern leg of the intersection. The only movements that would be allowed at this intersection are the right-turn movement from the East Side Connector onto the Scarborough Road connector and the left-turn movement from the Scarborough Road connector onto the East Side Connector. Additionally, the southbound off-ramp from SR 1 is proposed to be modified to allow traffic to split just beyond the gore area. Traffic wanting to go to the Dover Mall, Dover Downs or other points south within Dover could utilize a new flyover ramp that connects directly to the East Side Connector. Provision of the flyover ramp would greatly reduce weaving in the westbound direction at the new signalized intersection.

Conceptual layouts of both interchange/intersection options are provided as attachments at the end of this memorandum.

Due to DelDOT's concerns for the two options presented, RK&K completed additional traffic analyses to determine the length of queues at the proposed signals and to determine the Level of Service and delay that would be expected at the proposed signal locations. In order to complete this analysis, traffic counts were collected on each of the ramps at the Denny's Road interchange for a period of one week between November 18, 2008 and November 26, 2008. The counts were tabulated and the directional split of traffic was utilized to develop turning movements at the proposed signalized intersection for each interchange option. The results of the analysis indicate the following:

- For Interchange Option 1, the signalized intersection is proposed to operate at LOS B with approximately 16 seconds of overall delay. The worst movement at the intersection would be the left-turn movement from the northbound off-ramp onto the East Side Connector. This movement could operate at LOS D with delay of approximately 42 seconds per vehicle. The 95th-percentile queue length for this movement is expected to be approximately 105 feet long. Additionally, the eastbound left-turn movement (traffic turning left to utilize the southbound

on-ramp) could operate at LOS D with delay of approximately 42 seconds per vehicle. The 95th-percentile queue length of this movement is expected to be approximately 250 feet long.

- For Interchange Option 2, the limited movement signalized intersection is proposed to operate at LOS A with approximately 6 seconds of overall delay. As in Option 1, the worst movement at this intersection would be the left-turn movement onto the East Side Connector. This movement could operate at LOS F with delay of approximately 80 seconds per vehicle. The 95th-percentile queue length for this movement is expected to be approximately 140 feet long. Additionally, the eastbound movements between US 13 and the proposed signal could experience some weaving issues due to the volume of traffic turning onto the Scarborough Road connector from southbound US 13.

Based on the results of the analysis for the two interchange/intersection options associated with the East Side Connector, it is recommended that Option 1 move forward as the preferred option. Even though some movements in Option 2 operate with slightly less delay and better Levels of Service than Option 1, both options operate at an acceptable overall Level of Service. The significant additional cost to provide the overpass for Option 2 simply cannot be justified. Additionally, Option 1 provides a greater safety benefit over Option 2 because less weaving is required in Option 1. The distance between the proposed signal in Option 2 and the existing signal at the intersection of US 13 and Scarborough Road would not provide an adequate weaving distance, especially in the eastbound direction, which could create a significant safety problem for motorists turning from northbound US 13, trying to get to northbound SR 1. Option 1 would be more economical and would provide for safer movements at the proposed signal.

Conclusions and Recommendations

Traffic volumes on the US 13 corridor between Scarborough Road and Jefferic Boulevard will continue to grow as development along the corridor continues. Since this corridor is at the center of the planned growth area in Dover and central Kent County, the growth is desired by all State and local planning agencies. In order to accommodate additional traffic growth and not have to widen US 13, additional roadway connections between adjacent land uses, parallel to US 13 to the east and the west, need to be provided. The analyses conducted as part of this study show that travel times on US 13 will increase dramatically if no improvements are implemented. Implementing the roadway connections from the "Consensus Plan" should control the increase in travel time in the US 13 corridor, making it more manageable by giving motorists alternative route choices for getting from one property to another, from one side of US 13 to the other or from one end of the corridor to the other.

The following elements of the "Consensus Plan" should be moved forward for further consideration by the Dover/Kent MPO, the City of Dover and the Delaware Department of Transportation and should be included in the MPO's Long Range Plan, the City of Dover's Comprehensive Plan and DelDOT's planning for the US 13 corridor:

- On the west side of US 13:
    - Extension of Crawford Carroll Boulevard to the south, through the west side of the Delaware State University property to College Road. The western portion of College Road would be realigned to form a three-legged intersection with the extended Crawford Carroll Boulevard and the eastern portion of College Road.
    - An east/west connector between extended Crawford Carroll Boulevard and US 13 through the Pet Smart / Circuit City parking lot. The proposed roadway would tie into US 13 approximately 160 feet north of the existing signalized intersection for the northern Dover Mall access.
    - Connection of the hotels on the north end of the corridor to Cedar Chase Drive through an extension of Hilton Garden Way.

- On the east side of US 13:

  - A north/south roadway (East Side Connector), parallel to US 13 and SR 1, located just west of the SR 1 alignment. This road would extend south from Scarborough Road, under existing Leipsic Road and then turn to the west and intersect US 13 opposite Lepore Drive. The intersection of the East Side Connector with the Scarborough Road connector would require modifications to the existing Denny's Road interchange with SR 1 and would require the construction of a signalized intersection on the connecting road from the north Dover interchange with SR 1 to US 13. Two options for interchange modifications were considered and will be discussed later in this memorandum.
  - Where existing Leipsic Road crosses over SR 1, the roadway would be curved to the east to tie into the proposed East Side Connector. Existing Leipsic Road from Dover Downs to US 13 would become a service road for Dover Downs, Dover Crossroads (Berry Property) and the Home Depot store. A connection between the Leipsic Road service road and the East Side Connector would also be provided.
  - Interconnection from Kentwood Drive into the Wilmington University property.
  - An east/west connector roadway from the Best Buy entrance to the proposed East Side Connector. Access to the Dover Mall would be provided on this roadway and access to Dover Downs would be accommodated if desired in the future.
  - Interconnection from the Best Buy entrance to Dover Litho.
  - Relocation of the north entrance to Dover Mall, approximately 160 feet to the north, to line up with the proposed connector road from the west side of US 13. The north Dover Mall access would be modified to provide for all turning movements. A left-turn lane would be provided on the access road to Dover Mall to allow left-turns into the Volkswagen dealership.
  - Interconnection from relocated Leipsic Road into the Dover Crossroads Shopping Center (the Berry Property).
  - Improved interconnection from the Dover Downs entrance behind Denny's, Boston Market and Atlantic Books.

- In addition, a third travel lane should be provided on northbound and southbound US 13 between Scarborough Road and the Wal-Mart entrance.
- Interchange option 1 should be carried forward as the preferred interchange/intersection alternative associated with the East Side Connector.

As development plans come into DelDOT for review and approval, requirements should be placed on the developers to incorporate pieces of the "Consensus Plan". Those pieces that cannot be funded and constructed by developers should become part of the Department of Transportation's Capital Transportation Program and should be prioritized in an effort to have the pieces in place to accommodate future growth within the study area.