Review of:

Dolan & Dean, Consulting Engineers, LLC
Traffic Impact Analysis for
201 Homestead Road
Proposed Warehouse
Block 200.10, Lots 32 & 38
Township of Hillsborough
Somerset County, New Jersey
December 22, 2021

Prepared for:

LCAT: Local Citizens Against Traffic
Hillsborough, NJ

Prepared by:
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NJ License Number: 36155

Date: October 6, 2022

Professional Qualifications

My name is Kenneth J. Hausman, PE. I have two degrees, Bachelors and Masters, in Civil Engineering from the University of Maryland of College Park in 1984 and 1986, respectively. I moved to New Jersey several years after graduation and have lived and worked as a transportation engineer in New Jersey since then. I received my Professional Engineering license in October 1991. For most of my career, I had my own successful small engineering consulting firm and had the opportunity to work on some of the largest transportation projects in the region including: Redevelopment of the World Trade Center Site after the Events of September 11; the New Jersey Turnpike Widening between Interchanges 6 and 9; the Second Avenue Subway in New York City; the new Goethals Bridge; and the PATH Extension to Newark Liberty International Airport (frequently studied but still not built). I also served as the co-founder and initial Deputy Director of the International Intermodal Transportation Center (IITC), a transportation research center located at NJIT in Newark. I have served as an Adjunct Professor / Instructor for undergraduate and graduate Transportation Classes at both NJIT and Rutgers University. My consulting career has focused on working for the major transportation agencies in the region, however I have testified before planning and/or zoning boards for Edison Township and City of Orange Township.

I have been asked by LCAT: Local Citizens Against Traffic, a group of Hillsborough Township residents, to review the: "Traffic Impact Analysis for 201 Homestead Road Proposed Warehouse, Township of Hillsborough" prepared by Dolan & Dean, LLC, dated December 22, 2021. I have independently prepared this review and the conclusions presented herein solely reflect my own professional opinions. No one else has provided any guidance or direction.

Overview

The proposed development is located north of Homestead Road between US 206 to the west and Willow Road to the east. The intersection of Homestead Road at US 206 is signalized; Homestead Road is under stop control to Willow Drive. The proposed development consists of two buildings:

- 368,995 square foot warehouse with 58 loading docks and 150 truck parking spaces (report differs from plan that shows 75 truck parking spaces)
- 168,304 square foot warehouse with 29 loading docks and 59 truck parking spaces

Considering the two buildings as a single development for the purposes of traffic analysis, the total would be:

- 537,299 square of warehouse space with 87 loading docks and 209 truck parking spaces

The Traffic Impact Study follows the typical steps of: Data Collection; Trip Generation; Trip Distribution; Route Assignment; Traffic Analysis; and Conclusions. This review includes separate sections for each step.

Data Collection

Weekday peak period ((7-9 AM and 4-6 PM) traffic counts were conducted at the signalized intersection of Homestead Road with Route 206 and the unsignalized intersection of Homestead Road with Willow Road. Although the development will likely impact other intersections on US 206 north and south of Homestead Road, no other locations were considered in the analysis.

In addition to vehicular counts, data collection typically includes several other items which appear to be deficient:

- Vehicle classification counts should be done rather than total vehicles so that the computation of the percentage of trucks, or heavy vehicles, in the existing traffic flow can be determined.
- The vehicle counts typically include the computation of the peak hour factor. The peak hour factor is an adjustment factor to convert the hourly count an equivalent peak hour flow for the traffic analysis. Peak hour factors were presented in the Data Collection but were then ignored in the Traffic Analysis.
- The presence of significant truck volumes along Homestead Road will impact safety for both vehicles and non-motorized travel (pedestrians and bicyclists). The number of pedestrians and bicyclists should have been counted.
- If the proposed truck traffic will be significant during times other than the weekday commuter peak periods, then additional counts should be performed during these times.
- Trucks also have an outsized impact on air quality, noise, and the physical infrastructure. Existing conditions related to these issues should have been included as part of the data collection and the proposed impacts should have been determined and presented as part of the analysis.

Trip Generation

Trip generation is the process of determining the number of auto and truck trips generated by the proposed development. The ITE Trip Generation Manual provides trip generation data based on traffic counts conducted throughout the country over many years. In recent years, the growth and the changing nature of warehousing (ITE Land Use Code 150), i.e. the creation of fulfillment and distribution centers by Amazon and other major retailers, has made the use of a single land use code difficult to accurately estimate truck trip generation. Similar to Restaurant, Retail, or Office, warehouse now includes multiple types of facilities with much different trip-making characteristics. In response to these changes, ITE completed a study in 2016 to develop multiple warehouse land uses to reflect the different types of warehouses. The study grouped 107 individual warehouse sites into six warehouse types as summarized in **Table 1** below.

Table 1: ITE Trip Generation Rates
(Sources: ITE Trip Generation Manual, ITE,
"High-Cube Warehouse Vehicle Trip Generation Analysis", 2016)

Warehouse Type	Daily Trip Generation Rates (Daily Trucks per 1000 Square Feet]				Loading Dock to SF Ratio	Truck Parking vs. Loading Docks
	All	Cars	Trucks	5+ Axle		
Standard			0.60		1:20,000	Limited parking
Transload	1.432	1.000	0.454	0.233	1:10,000	Large parking area
Short-Term Storage					1:10,000	
Cold Storage	2.115	1.282	0.836	0.749		Ratio is 1:1
Fulfillment Center / Distribution Center	8.178	7.461	0.717	0.242	Min 1:10,000	Higher Ratio
Parcel Hub	10.638	6.631	4.007	0.982	Highest Ratio	Highest Ratio 2:1
Proposed Site 1			0.60		1:6,000	2.5:1
Proposed Site 2			0.60		1:6,000	2:1

As seen in **Table 1**, the "standard" warehouse generates much fewer trips than several other warehouse types. A closer look at the ITE Trip Generation further reveals how the average truck trip generation rate for "standard" warehouses is inappropriate for the proposed development and greatly underestimates the anticipated truck trip generation.

Figure 1 shows the ITE daily truck trip generation rate for warehousing (Land Use Code 150). The proposed developed is two warehouse buildings of 168,304 square feet and 368,995 square feet. As noted in the figure, only four of the twelve sites used in the development of the ITE average rates are greater than 100,000 square feet. A warehouse facility of less than 50,000 square feet serves a totally different function than larger warehouse facilities. ITE recommended practice is that only sites of similar size should be used in the development of average rates and therefore the use of the much smaller sites in Warehousing (Land Use Code 150) is inappropriate. Instead, the Recommended Practice is that a separate trip generation study should be conducted of similar facilities to the proposed development. Specifically, a separate trip generation study is warranted if:

- The range in development size in the I*TE Trip Generation* data plots does not cover the local range in development sizes"; and/or
- [The proposed] land use[s] . . . are more specific than the generalized categories in *ITE Trip Generation*.

Looking more closely at the ITE Trip Generation graph for Warehousing (Land Use Code 150) reveals the following. For three of the four larger sites, defined as 150,000 to 400,000 square feet, the truck trip generation is relatively constant at 200 to 250 truck trips per day regardless of the size of the facility. If truck trip generation is constant, then it is not a function of warehouse size. Rather, it is likely a function of the warehouse use and the number of loading docks and truck parking spaces provided.

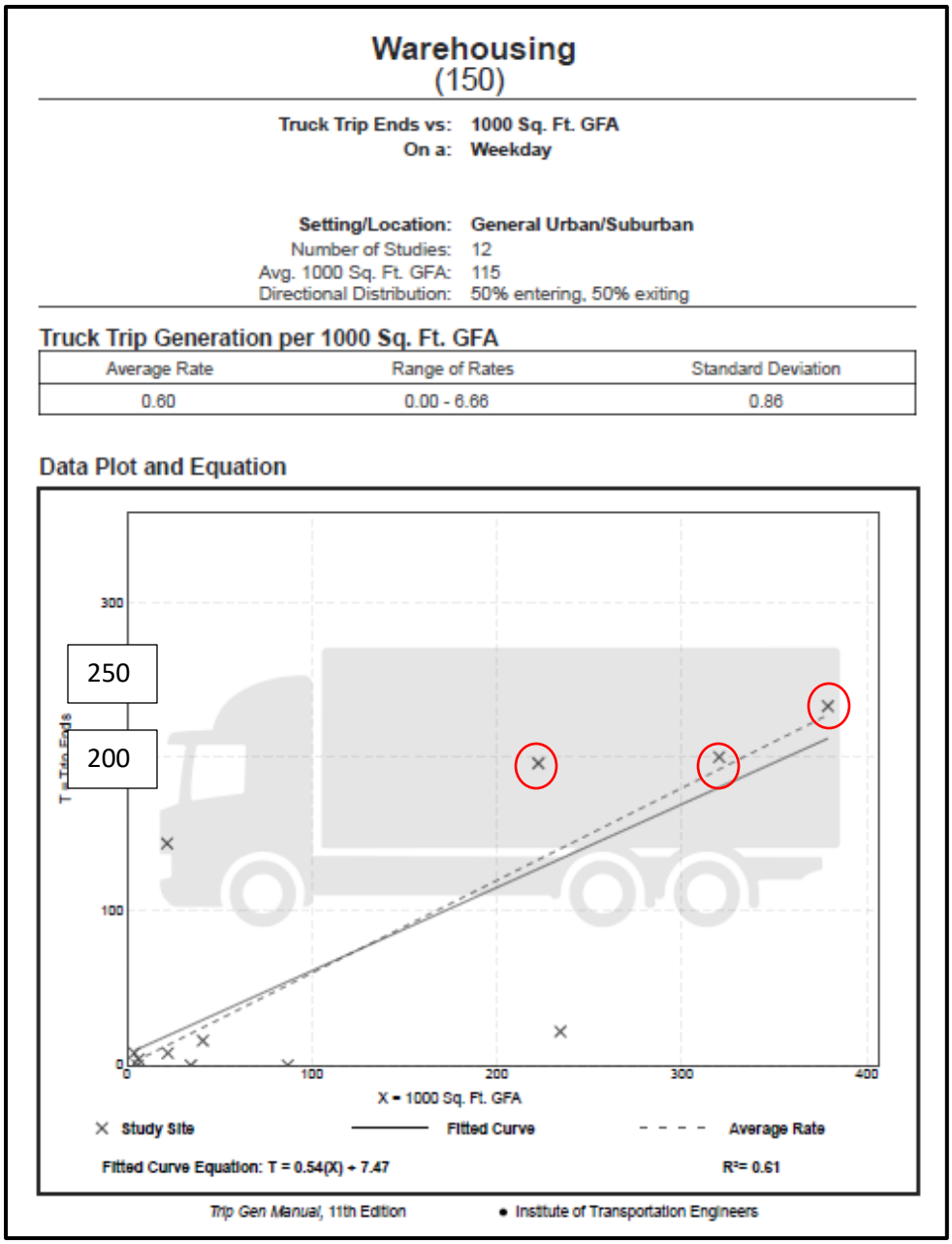

Figure 1: Daily Truck Trip Generation – Warehousing (Land Use Code 150)
Source: ITE Trip Generation Manual, 11th edition

The required number of loading docks for warehouses in Hillsborough Township are 6 and 10 for the two proposed warehouses or 16 in total, as shown in **Figure 2** below. The applicant is proposing to construct ***87 loading docks***, five times the requirement. The assumption that underlies the traffic study however is that the number of daily, morning peak hour, and evening peak hour trucks would be the same if the number of loading docks was 16 or 87! This assumption is simply not reasonable and is not consistent with ITE Recommended Practice.

Schedule of Minimum Loading Requirements

Use	Minimum Number Spaces[1]	Gross Floor Area (square feet) At Which First Berth is Required[1]	Gross Floor Area (square feet) At Which Second Berth is Required	Number Additional Square Feet For Each Additional Berth
Theater	0	None required		
Truck sales	1	10,000	40,000	40,000
Utilities	0	10,000	100,000	100,000
Veterinarian hospital	1	10,000	100,000	100,000
Warehouse	1	5,000	40,000	30,000

[1]NOTE: The minimum number of spaces shall prevail for uses that have not attained the gross floor area where the first space is required.

Figure 2: Required Number of Warehouse Loading Docks – Hillsborough Township

Consider the following two examples of warehouse operations from Secaucus in Hudson County, New Jersey. The first warehouse, shown in **Figure 3A**, has approximately 125,000 square feet of gross floor area and 6 loading docks. The second warehouse, shown in **Figure 3B**, has approximately 250,000 square feet of gross floor area and 25 loading docks. Two facts are very apparent from the warehouses shown in the figures. The first fact is that loading docks are used, not empty, when the facility is in operation. As seen in both examples, all, or virtually all, of the loading docks are in use. Second, the number of truck trips generated by each site is a function of the warehouse type and the number of loading docks, not the gross floor area. There are roughly three to four times as many trucks visible in **Figure 3B** compared to **Figure 3A**.

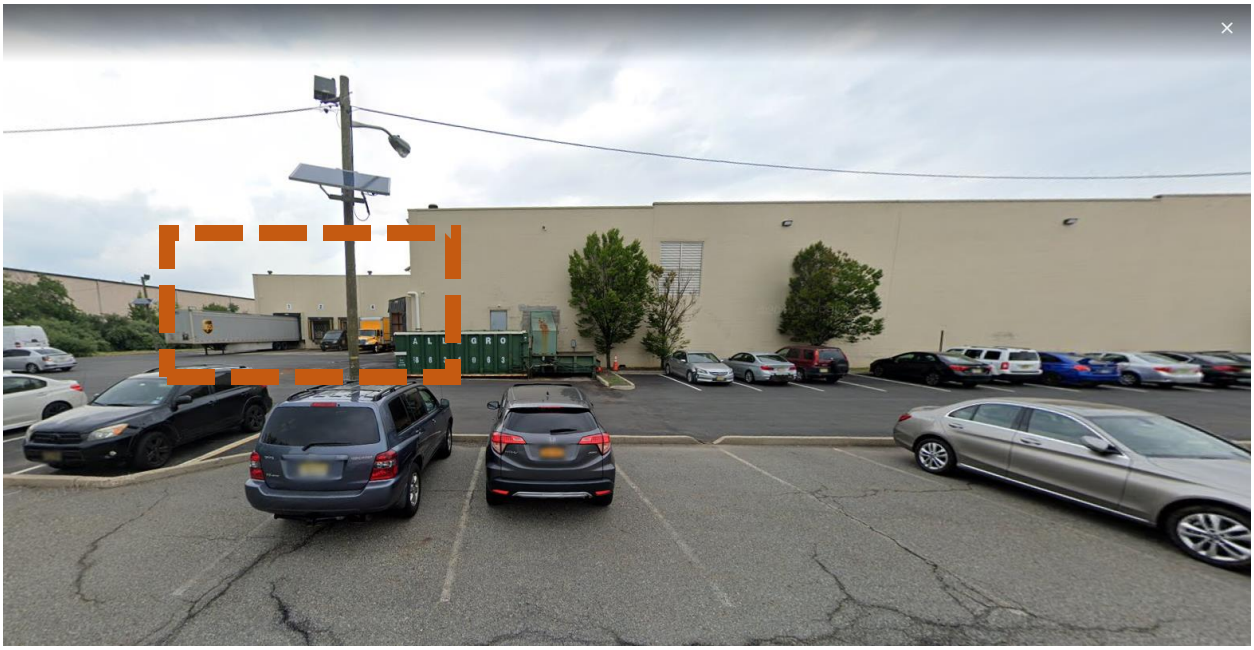

Figure 3A: Typical Warehouse in Secaucus – 125,000 Square Feet and 6 Loading Docks

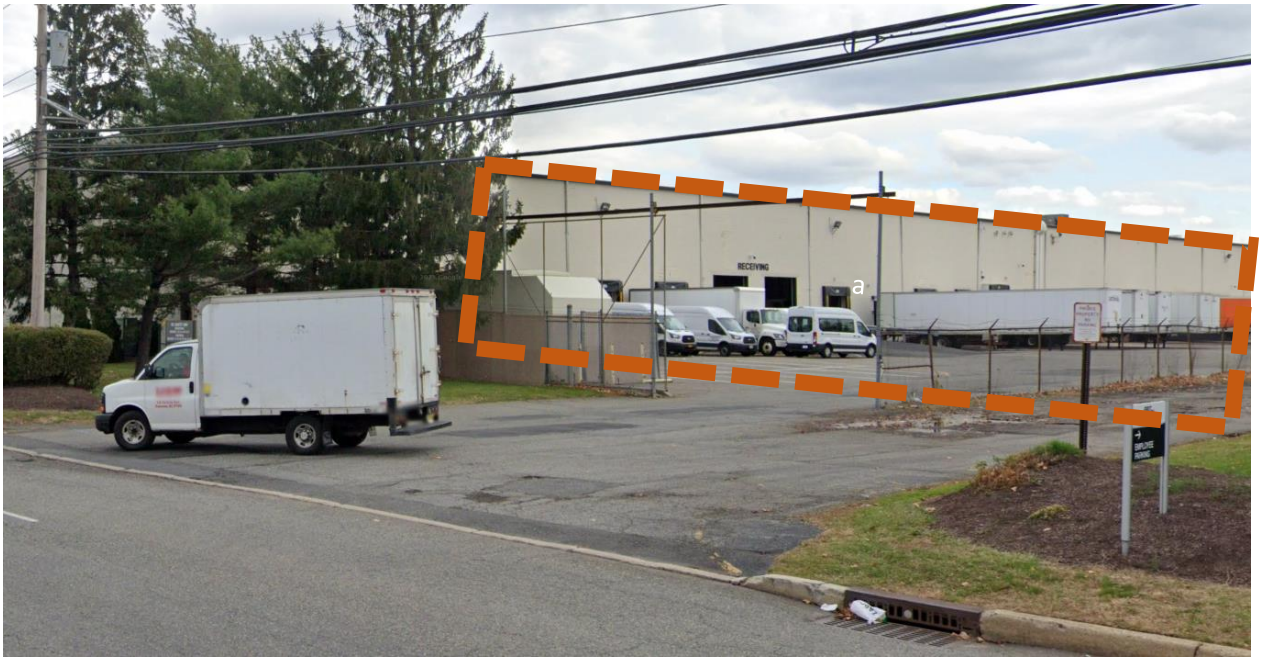

Figure 3A: Typical Warehouse in Secaucus – 250,000 Square Feet and 25 Loading Docks

For any development, housing, commercial or retail, the applicant is responsible for presenting appropriate analysis and proposed mitigation assuming that the ***development would be fully occupied***. An appropriate approach to estimating truck trip generation at a warehouse must include information about how the warehouse would be used and how the loading docks would be occupied.

As stated above, loading docks are constructed and staffed to be used. If the plan for the loading docks at the proposed development to remain empty for most or all of a typical day, then the applicant would

not provide an additional 150 to 200 truck parking spaces to address anticipated conditions when all loading docks are occupied. The peak hour trip generation analysis shown on Page 7 (Table 1) of the Traffic Impact Analysis states that during the morning and evening peak hours, with the maximum truck activity presented, only 10 and 16, respectively, of the loading docks would be in use – in other words, 71 of the 87 loading docks would never be used at any time throughout the day. It is interesting that the maximum truck activity presented by the applicant lines up perfectly with the minimum required number of loading docks. If only the minimum number of loading docks, 16, was provided for the two warehouses, then all loading docks would be in use at some point throughout the day. An example of a similar facility to the proposed development is shown in **Figure 4**. The National Distribution Center in Secaucus has approximately 50 loading docks, i.e. 1 dock per 5,000 square feet, and between 50 and 100 truck/trailer parking spaces.

Figure 4: Distribution Center in Secaucus – 250,000 Square Feet and 50 Loading Docks

As a more reasonable approach, the number of trucks generated should be based on the use of the loading docks. Consider the following assumptions: truck loading docks are in use 90 percent of the time while the warehouse is in operation; the warehouses operate on a 24/7 basis; truck arrivals are scheduled to be uniform throughout the day; and the average load/unload time is 2 hours and 26 minutes (Source: Burdzik, Ciesla and Sladowski, "Cargo Loading and Unloading Efficiency Analysis in Multimodal Transport", Intermodal Transport Review, 2013/2014). Based on these assumptions, the number of daily truck trips is computed as:

87 loading docks * 90% occupied * 24 hrs. / 2.43 hrs. for load/unload = 772 truck trips / day or 31 / hr.

A more refined estimate of the number of daily and hourly trucks can be made once the hours and details of the warehouse operation are provided by the applicant. The computed truck trip generation is much greater than what is presented by the applicant. These additional truck trips will cause much greater traffic impacts than the traffic analysis presented by the applicant. An estimate of 30 to 40 truck trips per hour for warehouses of the proposed size is common. The ITE PM Peak Hour Trip Generation for Warehousing (Land Use 150), presented by the applicant in their Traffic Impact Analysis Appendix and annotated in **Figure 5**, shows:

- Two warehouse sites with 30 to 35 truck trips in the PM peak hour; and
- The goodness-of-fit measure (R^2) could not be computed, indicating that there is no relationship between truck trips and square footage.

Trip Distribution

No analysis or justification is provided for the Site Traffic Distribution Enter (Exit) Peak Hour presented in the Traffic Impact Analysis Appendix as Figure 4. The figure suggests that auto and truck trip distribution would follow the same travel patterns. This is a not a coherent assumption as employees would likely be traveling to and from their homes in residential areas and trucks would be either arriving with their goods from an intermodal or similar facility and would be destined to a major retail store or other similar facility in a commercial or industrial area. The specifics of travel patterns for trucks should be based on details of the proposed development which, unfortunately, is not provided in the Traffic Impact Analysis. In the absence of any detailed information to the contrary, the trip distribution should reflect the worst case scenario with all trucks (and arguably all vehicles) traveling to and from US 206.

Warehousing
(150)

Truck Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	23
Avg. 1000 Sq. Ft. GFA:	308
Directional Distribution:	52% entering, 48% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.03	0.00 - 0.42	0.03

Data Plot and Equation

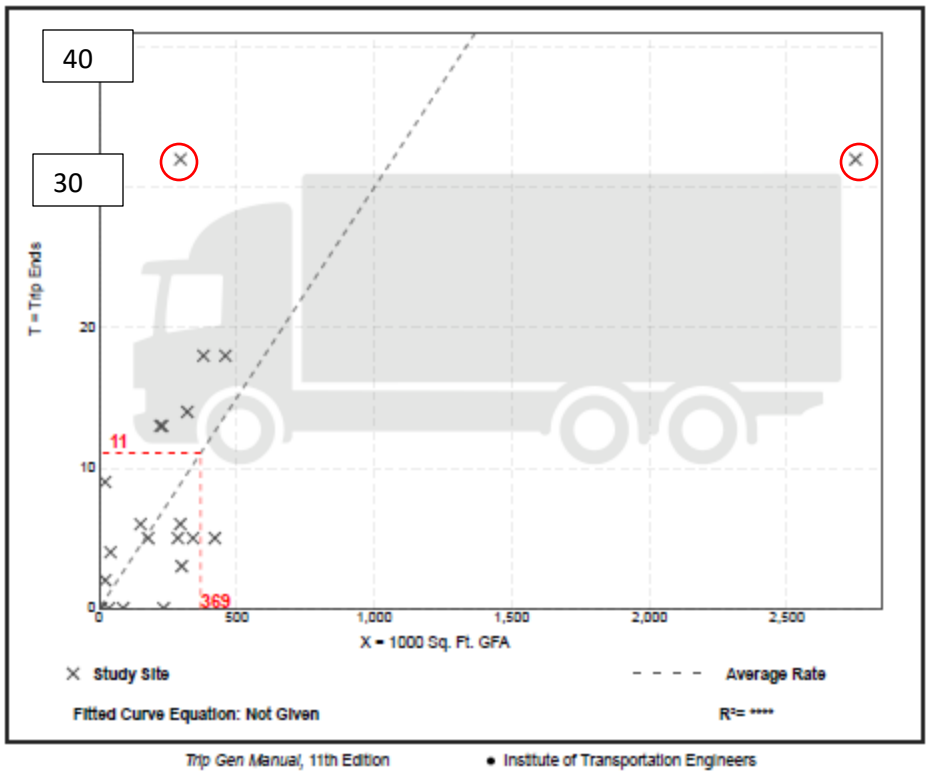

Figure 5: PM Peak Hour Truck Trip Generation – Warehousing (Land Use Code 150)
Source: ITE Trip Generation Manual, 11th edition

Traffic Analysis

As stated earlier, the traffic analysis presented was performed assuming that most of the truck loading docks would be empty all day. As stated earlier, this is not a reasonable assumption and the traffic analysis should be done again once the Trip Generation and Trip Distribution steps have been corrected.

The Traffic Impact Analysis includes other developments in the area, specifically a mixed-use development located on Route 206, northwest of the site; and a manufacturing facility located southeast of the site along Homestead Road west of Willow Avenue. However, the report does not address the proposed development at 279 Homestead Road that will add an 132,750 square foot office / warehouse with 25 additional loading docks. As noted earlier, truck trip generation is a function of the number of loading docks rather than square footage.

In addition, there are several significant errors in the analysis that lead to further questions about the validity of the conclusion:

- ***Such an [warehouse] operation will not negatively impact the traffic in the surrounding area or along the adjacent streets . . .***

The Synchro Traffic Analysis software for the "2023 Build with Mitigation for the PM Peak Hour" is the basis for the conclusion presented above. However, the Synchro output report shows no trucks at all on Homestead Road turning left to US 206 southbound and no increase in trucks turning right to US 206 northbound compared to the no-build condition. It is not reasonable to assume that all trucks would use Homestead Road eastbound to Willow Road to avoid the congestion and unacceptable traffic conditions at the Route 206 intersection. As stated earlier, any assumptions regarding auto and truck travel patterns are not presented in the Traffic Impact Analysis and there are no separate auto and truck trip distributions.

The characterization of no impacts to the roadway network is further belied by the presented Synchro analysis for the existing AM peak hour condition that shows unacceptable LOS F conditions for the Homestead Road westbound left / through lane at Route 206. Diverting 20% of truck traffic to travel east on Homestead Road to Willow Road, as presented in Appendix Figure 4, is not a reasonable mitigation for the impacts that the additional truck traffic would have caused at the signalized intersection.

Conclusions

The "Traffic Impact Analysis for 201 Homestead Road Proposed Warehouse" grossly underestimates the number of daily and peak hour truck trip generation for the proposed facilities. The Analysis presents no background information on how the warehouse facility is to be used, its hours of operations, and the reasons why 87 truck loading docks and 100-200 truck parking spaces are proposed – well in excess of the Township requirements for warehouse facilities. The traffic impacts to the local roadway network is likely to be much greater than the minimal impacts presented in the Traffic Impact Analysis. In contrast to other land uses, truck operations at warehouses are generally constant through the hours of operation. No information is provided in the Analysis how the warehouses will be used or their hours of operation.

The impact of trucks also goes well beyond intersection capacity analysis. There is also no discussion of the additional impacts specifically related to trucks. Trucks cause safety impacts to both other vehicles as well as non-motorized travel (pedestrians and bicyclists). Trucks negatively impact air quality and noise for nearby residents. Finally, trucks have a negative impact on infrastructure – roadways, bridges and culverts – that were not specifically designed for high truck volumes.