



Design Consultants, Inc.

Civil Engineering
Transportation/Traffic
Water/Wastewater
Geotechnical
Land Surveying
Environmental
Planning

January 19, 2017

Town of Andover
Dascomb Road Task Force
c/o Mike Morris - Chairman
36 Bartlet Street
Andover, MA 01810

**RE: Traffic Impact Assessment Comparative Analysis
The Dascomb Road Project (146 Dascomb Road)
Andover, MA**

Dear Mr. Morris:

Design Consultants, Inc. (DCI) is pleased to provide the Town of Andover, through their Dascomb Road Task Force, with this Traffic Impact Assessment Peer Review for the Dascomb Road Project (“Project”), located at #146 Dascomb Road in Andover, MA. The intent of this review is to provide a comparative analysis for two potential site alternatives, relative to traffic impacts, for consideration at Town Meeting. The Project site is located within the southwest corner of the Dascomb Road and I-93 interchange in the southwesterly corner of Andover, near the Tewksbury town line. TEC, Inc. prepared Traffic Impact and Access Studies (TIAS) for two site alternatives for the Project:

- Traffic Impact and Access Study (TIAS) – Planned Unit Development; October 27, 2017
- Traffic Impact and Access Study (TIAS) – All Commercial; November 17, 2017

DCI’s review of each TIAS focused on the adequacy of the study with regard to industry best practices for analyzing traffic operations, estimating site-generated trips, and related potential impacts. Discussion of the study area, Existing, and No-Build conditions are identical between each of the reports. Only the proposed development alternatives, proposed site-generated traffic, and Build traffic operations analyses differ. This review did not include an assessment of site circulation and proposed mitigation plans, or in-depth examination of all assumptions or calculations.

DCI’s initial review indicates that each report was prepared in general conformance with standard engineering practices. There were some deviations and assumptions that required further explanation and clarification. A meeting was held on January 10, 2018 with representatives from the Town of Andover and TEC to discuss these particular aspects of the studies and to provide TEC the opportunity to respond. TEC provided a follow-up technical memorandum to address the issues raised during the meeting. To provide a comparison of these two alternatives and assess the responses in TEC’s technical memorandum, this Peer Review letter is structured as follows:

- Section 1: Common Remarks on the TIASs
- Section 2: TIAS - Planned Unit Development
- Section 3: TIAS – All Commercial
- Section 4: Technical Memorandum
- Section 5: Differences Between Alternatives
- Section 6: Recommendations

Section 1: Common Remarks on the TIASs

Section 1 provides a review of the sections of the two reports that are identical, in addition to DCI's observations of the Project site. Both reports include the construction of a ±600,000 square foot mixed-use development, but the proposed uses differ.

- 1.1 **Study Area:** The TIASs describe Dascomb Road and Frontage Road within the vicinity of the Project site, as well as each of the study area intersections. The roadways and intersections are adequately described and contain the salient information regarding geometry, classification, jurisdiction, and functionality.

Both reports prepared by TEC analyze a study area of six (6) intersections in the vicinity of the site. The six (6) intersections include:

- Dascomb Road at East Street and Shawsheen Street
- Dascomb Road at Hewlett Packard Site Driveway
- Dascomb Road at Smith Drive
- Dascomb Road at Frontage Road
- Dascomb Road at Interstate 93 NB Ramps [Interchange 42]
- Frontage Road at Interstate 93 SB Ramps [Interchange 42]

The reports describe the availability of local transit, specifically, the Haverhill Commuter Rail Line and the Lowell Regional Transit Authority (LRTA) Route 11. Currently, these transit services provide limited support to the Project site, with the closest service being approximately 1.7 miles east of the Project site.

- 1.2 **Site Visit:** DCI conducted a site visit during the evening peak hour on Wednesday, December 20, 2017 to identify any potential concerns pertaining to the capacity of the roadways and intersections used by or providing access for traffic from the Project. A notable queue of approximately 1,100 feet was observed on the I-93 northbound ramp at Dascomb Road, resulting in delays of approximately 4 minutes. Beyond the study area, a queue length of 14 vehicles, approximately 350 feet long was observed on Clark Road at Dascomb Road resulting in delays exceeding 1 minute. ***Based on DCI's site visit, described below, and knowledge of the area, the study area should be expanded in future traffic studies to understand how the development will impact other locations in the Town of Andover.***

- 1.3 **Existing Traffic Volumes:** Traffic counts included in the TIASs were performed between October 6 and October 8, 2016. Turning movement counts (TMCs) at each of the study area intersections were conducted on Thursday during the morning and evening peak periods and on Saturday during the midday peak period. Automated Traffic Recorder (ATR) counts were performed on Dascomb Road east of Smith Drive and on Frontage Road south of the I-93 southbound ramps during this 3-day period. ***The count data collected on the Thursday are representative of a typical weekday, however DCI questioned the validity of the Saturday traffic counts because they were conducted during the Columbus Day holiday weekend, which is a long weekend for many and may affect traffic volumes. Traffic counts should be collected during a week not including a holiday when school is in session.***

The TIASs referenced MassDOT Permanent Count Station 5022 in Andover on Route I-93 and MassDOT Permanent Count Station 4094 in Tewksbury on Route I-495 to determine whether the traffic counts collected in October required a seasonal adjustment to reflect average conditions. The data from these two locations indicates that regional traffic volumes in October are approximately 2.0 percent greater than the Average Annual Daily Traffic (AADT). As such, the collected turning movement counts used in the analyses were left unadjusted to represent a more conservative analysis. DCI concurs with this methodology.

Section 2: TIAS – Planned Unit Development

A TIAS was prepared for a Planned Unit Development (PUD) consisting of a mix of residential, hotel, general office, restaurant, and retail uses by TEC in October 2017. Following is a brief review of the trip generation, trip distribution, and operational analyses prepared for this build alternative.

2.1 **Site-Generated Traffic:** Upon razing the site, the Planned Unit Development would construct ±600,000 square feet of mixed-use development. Site-generated trips were calculated using the *Trip Generation Manual, 9th Edition*, published by the Institute of Transportation Engineers (ITE) in 2012. This manual, which provides a sampling of trips generated by various sites based on Land Use Codes (LUC), is the industry standard for determining the number of trips expected to be generated by a site. The following land uses were used for estimation of the site-generated trips in this TIAS:

- LUC 252 – Senior Adult Housing - Attached (225 residential units)
- LUC 310 – Hotel (100 rooms)
- LUC 710 – General Office Building (150,000 square feet)
- LUC 820 – Shopping Center (105,000 square feet: includes 50,000 square feet of general retail, a 15,000 square foot fitness center, a 35,000 square foot market, and a 5,000 square foot recreational center)
- LUC 931 – Quality Restaurant (10,000 square feet)
- LUC 932 – High-Turnover (Sit-Down) Restaurant (10,000 square feet)

Based on the land uses available in the *Trip Generation Manual, 9th Edition*, the selected land use codes are appropriate for the proposed development. The *Trip Generation Manual* provides guidance for calculating the number of vehicular trips expected to be generated for each specific land use using either an Average Rate or a Regression (Fitted Curve) Equation based upon data collected by ITE for similar land uses.

DCI questioned TEC's use of the Average Rate versus the Regression Equation to determine the proposed trips being generated for LUC 820 – Shopping Center. TEC noted that the Average Rate was utilized to estimate the expected number of trips generated because the size of the proposed “shopping center” was at the lower range of the data series. It is DCI's opinion that the Regression Equation would be more appropriate to calculate the expected number of trips as the size of the shopping center is within the range of the data series, meets statistical requirements for using the Regression Equation outlined in the *Trip Generation Manual*, and yields a higher volume of trips generated, which will provide a more conservative analysis. ***DCI recommended that TEC re-evaluate the intersections for the PUD using the higher trip generation estimates.***

The ITE *Trip Generation Handbook, 3rd Edition* provides guidance for reducing the estimated trips to better reflect the total number of new trips expected to be added to the surrounding roadway network as a result of the proposed development. Trip reduction measures include factors for multi-purpose trips, known as internal capture, transit trips, and pass-by traffic. Trip reduction factors applied in the TIAS appear to be reasonable and in accordance with standard engineering practice.

2.2 **Trip Distribution:** Trip distribution is a process for determining how to apply new trips to the roadway network. Trip distribution to/from the proposed general office land use was determined using a Workplace-to-Residence Gravity Model. This model utilized the most recent available US Census Bureau Journey-to-Work data to consider the top 30 cities and towns from which workers in the Town of Andover originate. The percentages of employees from each locale were assigned to the roadway network along the five potential routes from which they would arrive. Similarly, a gravity model for Residence-to-Workplace was developed for the senior adult housing component. This model utilized the most recent available US Census Bureau Journey-to-Work data to consider the top 30 cities and towns to which residents from the Town of Andover travel to work. The

percentages of employees traveling to each locale was assigned to the roadway network along the five potential routes on which they would most likely travel. Lastly, a separate gravity model was prepared for trips for the retail/restaurant uses from surrounding locales. This model was based on population centers, competing land uses, and a travel time factor between uses. The trip distribution percentages presented in the report appear to be reasonable based on surrounding population centers and access to the site.

- 2.3 **Planned Unit Development Build Capacity Analysis:** DCI did not review the Build Capacity Analysis as presented in the TIAS for the Planned Unit Development pending further evaluation the trip generation rates used for LUC 820 – Shopping Center. ***Capacity analyses presented in the TIAS should be revised as a result of any modifications to the proposed trip generation.***

Section 3: TIAS – All Commercial

A second TIAS for an All Commercial development consisting of a mix of general office, restaurant, and commercial/retail uses was prepared by TEC in November 2017. Following is a brief review of the trip generation, trip distribution, and operational analyses prepared for this build alternative.

- 3.1 **Site-Generated Traffic:** Upon razing the site, the All Commercial alternative would construct ±600,000 square feet of mixed-use development. The following land uses were used for estimation of the site-generated trips:

- LUC 492 – Health/Fitness Club (30,000 square feet)
- LUC 710 – General Office Building (435,000 square feet)
- LUC 820 – Shopping Center (115,000 square feet: includes 80,000 square foot general retail and 35,000 square foot neighborhood market)
- LUC 931 – Quality Restaurant (10,000 square feet)
- LUC 932 – High-Turnover (Sit-Down) Restaurant (10,000 square feet)

Based on the land uses available in the ITE *Trip Generation Manual, 9th Edition*, the selected land uses are appropriate for the proposed development. ***For this alternative as well, DCI questioned the use of the Average Rate versus the Regression Equation for LUC 820 – Shopping Center.*** TEC noted that the decision was made to use the Average Rate because the size of the proposed shopping center was at the lower range of the data series. It is DCI's opinion that the Regression Equation would be more appropriate as the size of the shopping center is within the range of the data series, meets statistical requirements for using the Regression Equation outlined in the *Trip Generation Manual*, and yields a higher volume of trips generated, which will provide a more conservative analysis. ***DCI recommended that TEC re-evaluate the intersections using the higher trip generation rates.***

Trip reduction measures for this alternative include factors for multi-purpose trips, also known as internal capture, transit trips, and pass-by traffic. Trip reduction factors applied in the TIAS appear to be reasonable and in accordance with standard engineering practice.

- 3.2 **Trip Distribution:** Trip distribution to/from the general office use was determined using the same Workplace-to-Residence gravity model developed for the Planned Unit Development. Similarly, a second gravity model was prepared for the trips for the retail/restaurant use from surrounding locales. The trip distribution percentages appear to be reasonable based on surrounding population centers and access to the site.

- 3.3 **All Commercial Build Capacity Analysis:** DCI did not review the Build Capacity Analysis presented in the TIAS for the All Commercial Development pending further evaluation of the trip generation rates used for LUC 820 – Shopping Center and resulting modifications to the analyses. ***Capacity analyses presented in the TIAS should be revised as a result of any modifications to the proposed trip generation.***

Section 4: Technical Memorandum

TEC prepared a technical memorandum on January 15, 2018 in response to concerns raised by DCI during a peer review meeting held at Andover Town Hall on January 10, 2018.

- 4.1 **Traffic Counts:** TEC provided historic count data from nearby MassDOT count stations #502 on Route 114 (north of Andover Bypass/Route 125) and #5127 on Route 125 (south of Route 28) to demonstrate that traffic volumes on the Thursday and Saturday prior to Columbus Day were comparable to average October weekday and Saturday volumes. The counts performed on the Thursday were generally higher than the average annual daily traffic (AADT), while TEC concluded that the Saturday counts were approximately average for October, but generally lower than the Saturday AADT. DCI has reviewed this additional data and has determined that the counts provided are adequate to perform this comparative analysis.
- 4.2 **Trip Generation:** TEC provided trip generation calculations for the PUD and All-Commercial alternatives using the regression equation in comparison to the average rate for LUC 820 – Shopping Center. TEC stated that they “strongly disagree” with using the fitted curve equation for this land use because the Dascomb Road Project is not intended to include a typical “shopping center” as defined by ITE for LUC 820. The data series included in LUC 820 of ITE’s *Trip Generation Manual, 9th Edition* represent a wide range of shopping centers, varying in size from 1,700 to 2.2 million square feet of gross leasable area (GLA), which results in a significant deviation in trip generation across the spectrum of data.

TEC conducted a further examination of the proposed site’s trip generation by breaking out each individual land use originally combined under LUC 820. Below is a table summarizing the total number of trips calculated for the average weekday daily, weekday morning and evening peak hours, Saturday, and Saturday mid-day peak hour for each scenario.

Trip Generation Summary			
Time Period	TIAS – LUC 820 Avg Rate	Using LUC 820 Fitted Curve	Individual LUC Breakout
Planned Unit Development			
Weekday Daily	5,296	7,012	6,576
Weekday Morning	357	393	407
Weekday Evening	500	632	609
Saturday Daily	5,030	8,198	7,096
Saturday Middy	455	741	602
All Commercial			
Weekday Daily	8,036	9,760	9,315
Weekday Morning	641	673	669
Weekday Evening	895	1,029	972
Saturday Daily	5,862	9,084	8,130
Saturday Middy	290	943	799

As shown in the table above, there is a significant increase in the expected trip generation if the fitted curve equation is utilized for LUC 820 instead of the average rate. Breaking out the individual land uses that were included under LUC 820 results in a notable increase in the expected trip generation, although it is not as extreme as the volume estimated using the fitted curve equation. While the quantity of studies sampled in ITE’s *Trip Generation, 9th Edition* for each of these individual land uses may not be as substantial as the number of studies collected under LUC 820, it may provide a more reasonable estimation of the number of trips expected to be generated by the Project. Therefore, DCI recommends using the break out of the individual land use codes originally contained in LUC 820 to estimate the number of trips expected to be generated by the Project. In

the technical memorandum, TEC utilized the trip generation volumes calculated for the individual land uses to update the intersection capacity analyses.

- 4.3 **Study Area:** TEC has noted that these TIASs are the first of a series that will be developed as this project advances through the state and local permitting processes and has agreed to expand the study area for future studies. *The study area provided in the TIAS is adequate for the purposes of this comparative analysis, but should be expanded for future traffic studies.*

Section 5: Differences Between Alternatives

The following section is intended to summarize the differences between the Planned Unit Development and the All Commercial alternative presented in the two TIAS.

- 5.1 **Build Alternatives:** Table 5.1 below presents a side-by-side comparison of the proposed build-out Planned Unit Development and All Commercial alternatives.

Table 5.1 Build-Out Comparison

ITE Land Use Code (LUC)	Planned Unit Development	All Commercial
LUC 252: Senior Adult Housing - Attached	225 Units	-
LUC 310: Hotel	100 Rooms	-
LUC 492: Health and Fitness Center	15,000 SF	30,000 SF
LUC 495: Recreational Community Center	5,000 SF	-
LUC 710: General Office Building	150,000 SF	435,000 SF
LUC 826: Specialty Retail	50,000 SF	80,000 SF
LUC 850: Supermarket	35,000 SF	35,000 SF
LUC 931: Quality Restaurant	10,000 SF	10,000 SF
LUC 932: High-Turnover (Sit-Down) Restaurant	10,000 SF	10,000 SF
TOTAL	600,000 SF	600,000 SF

- 5.2 **Site-Generated Traffic:** The All Commercial alternative is expected to generate significantly more new trips on the local roadway network than the Planned Unit Development on a daily basis and during each peak period. Table 5.2 illustrates the total new site generated trips anticipated to be introduced to the roadway as a result of the proposed alternatives.

Table 5.2 New Site Generated Primary¹ Trip Comparison²

Time Period	Planned Unit Development	All Commercial	Difference between Alternatives
Weekday Daily	6,576	9,315	+42%
Weekday Morning	407	669	+64%
Weekday Evening	609	972	+60%
Saturday Daily	7,096	8,130	+15%
Saturday Midday	602	799	+33%

¹ Primary trip generation is the number of vehicular trips resulting after reductions for multi-use trips, transit trips, and pass-by trips.

² Trip generation based on the breakout of individual land uses in lieu of LUC 820.

5.3 **Intersection Capacity Analysis:** Relative to the No-Build Condition, the Build conditions for both the Planned Unit Development and All Commercial alternatives are expected to degrade levels of service at all intersections during the AM, PM, and Saturday MIDDAY peak hours. Off-site mitigation recommended in each TIAS is required to offset the increased delays expected at the study area intersections. The scope of the off-site improvement plan proposed is identical for both the Planned Unit Development and the All-Commercial alternative. Of the six (6) intersections included in the Study Area, only two (2) of the intersections are currently signalized. Upon completion of the off-site improvement program, only the intersection of Dascomb Road at the Hewlett Packard site driveway will remain unsignalized. Table 5.3 below provides a side-by-side comparison of the projected overall intersection level of service (LOS) for both the PUD and the All Commercial Development build conditions with mitigation, based on the anticipated trip generation using the individual land use codes presented in the technical memorandum in lieu of LUC 820-Shopping Center. The intersection of Dascomb Road at the Hewlett Packard Site Driveway, which is not expected to experience any noticeable changes in operations, has been omitted from the table since overall intersection LOS is not calculated for unsignalized intersections.

Table 5.3 2027 Overall Intersection LOS Comparison

	2016 Existing Condition	2027 No-Build Condition	2027 Build with Mitigation ¹	
			Planned Unit Development	All Commercial
<i>Dascomb Road/East Street/Shawsheen Street</i>				
Weekday AM	C	C	B	B
Weekday PM	C	C	A	C
Saturday MIDDAY	B	B	B	B
<i>Dascomb Road/Smith Drive</i>				
Weekday AM	-	-	A	B
Weekday PM	-	-	B	D
Saturday MIDDAY	-	-	B	C
<i>Dascomb Road/Frontage Road</i>				
Weekday AM	B	B	C	C
Weekday PM	B	B	C	D
Saturday MIDDAY	A	A	C	C
<i>Dascomb Road/I-93 Northbound Ramp</i>				
Weekday AM	-	-	B	B
Weekday PM	-	-	B	B
Saturday MIDDAY	-	-	C	C
<i>Frontage Road/I-93 Southbound Ramp</i>				
Weekday AM	-	-	B	B
Weekday PM	-	-	B	C
Saturday MIDDAY	-	-	B	B

¹ The 2027 Build with Mitigation LOS based on the breakout of individual land uses in lieu of LUC 820.

As shown in the table, with the proposed off-site improvements, the intersections included within the study area for both the PUD and All Commercial alternatives are expected to operate at acceptable overall intersection levels of service. The All Commercial alternative will have a greater impact on the roadway than the PUD, particularly during the weekday evening peak hour, as exhibited by overall intersection levels of service that are equal to, or lower than those calculated for the PUD. Both alternatives are expected to result in a decline from the Existing and No-Build LOS at the intersection of Dascomb Road at Smith Drive based on the current off-site mitigation program. The proposed mitigation should be thoroughly evaluated to ensure that the LOS on individual movements do not degrade to unacceptable levels of service.

Section 6: Recommendations

The purpose of this TIAS Peer Review was to provide the Town of Andover, through their Dascomb Road Task Force, with a comparative analysis of the traffic impacts anticipated for a 600,000 square foot Planned Unit Development versus a 600,000 square foot All Commercial alternative for the site at 146 Dascomb Road. The goal is to understand the traffic implications that each alternative would have on the roadway network and neighborhood, so that appropriate measures may be deliberated regarding an Article being considered at the upcoming Town Meeting. It is understood that the two TIAS reviewed at this stage are the first step in a series of traffic studies that will be prepared for the site in an effort to determine the most appropriate direction for the proposed development. The TIAS and additional Technical Memorandum, provided by TEC are adequate to provide a comparative analysis of the two site alternatives. Below are recommendations to be considered in the preparation of future traffic studies for the site.

- 6.1 **Traffic Counts:** The traffic counts included in the TIAS were conducted on the Saturday of Columbus Day weekend. ***It is recommended that future traffic studies include new traffic count data conducted during a week/weekend not containing a holiday, when school is in session in accordance with the MassDOT Transportation Impact Assessment (TIA) Guidelines published in March 2014.***
- 6.2 **Study Area:** More than 100 new trips are expected to be generated on Dascomb Road to the east of the I-93 northbound ramps. In accordance with the MassDOT *Transportation Impact Assessment (TIA) Guidelines*, ***it is recommended that, at a minimum, the study area be expanded for future traffic studies to include the intersection of Clark Road at Dascomb Road.*** Advancement of the All Commercial alternative may warrant further expansion of the study area out to the intersection of Andover Street at Central Street and further west along East Street in Tewksbury. Additional mitigation may be required beyond the current study area.
- 6.3 **Site Generated Traffic:** The PUD is expected to generate significantly less traffic on the surrounding roadway network than the All Commercial Development, particularly during the typical weekday. From a traffic impact perspective, ***the PUD will result in fewer impacts to the Town of Andover's roadways than the All Commercial alternative.***
- 6.4 **Methodologies and Assumptions:** There were a few instances in the reports where certain methodologies or assumptions were not clearly documented or defined. Examples include: the balancing of existing intersection turning movement counts; determination of internal trip reduction percentages used for weekday daily, Saturday midday peak hour, and Saturday daily peak hour; and peak hour factor for capacity analyses. ***It is recommended that discussions of all methodologies and assumptions utilized are fully described in future traffic reports.***
- 6.5 **Further Review:** This review was limited to the comparison of traffic impacts relative to the two alternatives presented. ***It is recommended that an additional, more comprehensive peer review be conducted*** for the TIAS, site circulation, and proposed off-site mitigation as the specific development plan is defined to assess the accuracy of the analyses and the adequacy of proposed mitigation relative to impacts to the neighborhood, traffic flow, and safety for all roadway users.

If you have any questions, please do not hesitate to contact me at (617) 776-3350 x 115.

Sincerely,
DESIGN CONSULTANTS, INC.



Tom Bertulis, P.E., PTOE
Manager of Traffic Engineering Department