

## Design Consultants, Inc.

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### MEMORANDUM

DCI JOB NO. 2014-106

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**TO:** Peter O'Callaghan, The Herb Chambers Companies

**CC:**

**FROM:** Tom Bertulis, M.S., P.E., PTOE

**SUBJECT:** **Trip Generation Study at 161-165 Linwood Street  
Somerville, Massachusetts**

**DATE:** October 27, 2015

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The purpose of this memorandum is to provide a trip generation study for the proposed redevelopment at 161-165 Linwood Street in Somerville, Massachusetts. This memorandum was prepared by Design Consultants, Inc. (DCI) dated October 26, 2015.

The current site is a one floor auto body shop referred to as Pat's Auto body. There is also an existing two floor warehouse building behind Pat's Auto Body, which is currently unoccupied and unused.

The proposed redevelopment calls for demolishing the existing one story building and building a new auto body shop on the property. The existing two story building will remain and be utilized as a storage warehouse. The existing building (body shop) is approximately 14,500 square foot (SF), the new proposed building will be approximately 7,900 SF and the proposed storage warehouse will be approximately 9,000 SF.

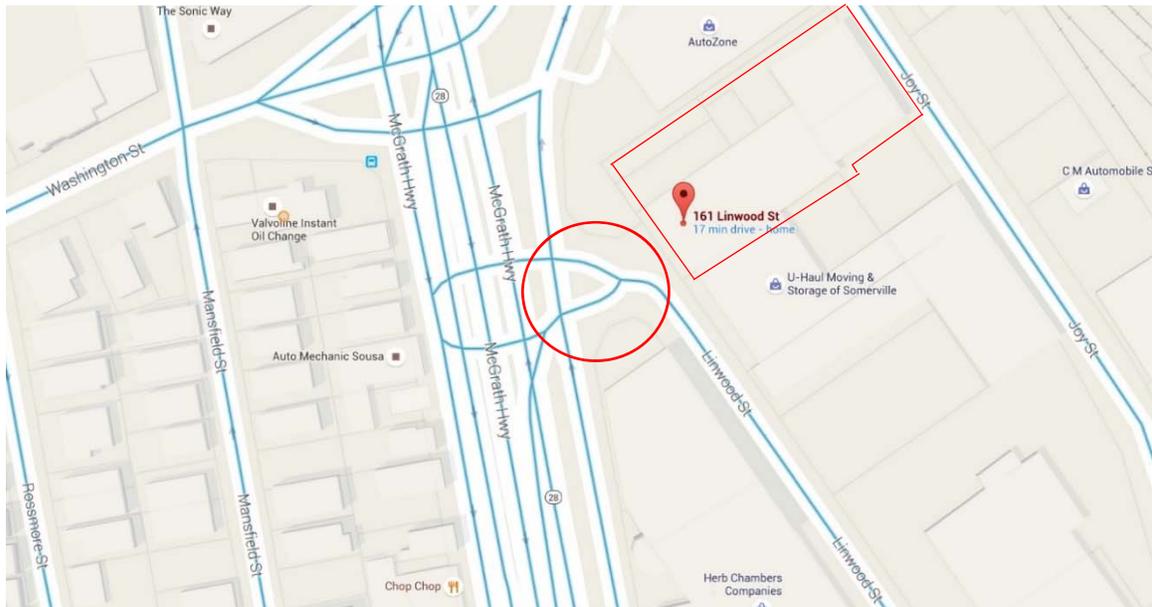
#### **Existing Conditions**

The property is located at the northern end of Linwood Street, as shown in Figure 1. Linwood Street is a local street that carries two-way traffic with a curb-to-curb width of 39 feet. It runs in a generally southeast-northwest direction. Its northwestern limit is at its intersection with McGrath Highway northbound off ramp and its southeastern limit end lies at its intersection with Somerville Avenue Extension and Fitchburg Street. Two hour parking is located along

both sides of the street. Linwood Street has no centerline or other pavement markings. Currently, Linwood Street serves mostly industrial land uses. Figure 1 shows the project location.

The intersection of Linwood Street and McGrath highway is a signalized, four-legged intersection. The McGrath Highway southbound off-ramp approaches the intersection via a u-turn under the bridge. This approach carries one lane. The McGrath Highway northbound off-ramp approaches from the south and carries two travel lanes. Northbound vehicles are provided with an option to access McGrath Highway southbound via another u-turn under the bridge. The northeastbound approach on McGrath Highway carries one travel lane. Linwood Street approaches from the east.

DCI reviewed the MassDOT Crash Database to find the crash history for the intersection of Linwood Street and McGrath Highway. Only two accidents occurred at this intersection over the ten year period of 2004-2013. Given this low crash rate, it can be said that the existing conditions do not provide a glaring need for safety improvements as part of this project.



**Figure 1: Project Location**

### **Trip Generation**

Table 1 below compares trip generation rates for the existing conditions at the site with the proposed conditions. Land use code (LUC) 942, Automobile Care Center was used to estimate trips for the existing conditions. In addition to LUC 942, LUC 150, Warehousing, was used to generate estimates for the proposed conditions. These calculations are based on the Institute of Transportation Engineers (ITE) Trip Generation Manual (9<sup>th</sup> Edition, 2012). Detailed trip-generation calculations are included the appendix attached to this memorandum.

**Table 1: Site-Generated Vehicle Trips**

	Existing			Proposed		
	Entering	Exiting	Total	Entering	Exiting	Total
Weekday Morning Peak Hour (vehicles per hour)	23	18	41	14	10	24
Weekday Afternoon Peak Hour (vehicles per hour)	25	26	51	14	17	31
	<i>Based on ITE LUC 942 – Automobile Care Center</i>			<i>Based on ITE LUC 942 – Automobile Care Center and LUC 150 Warehousing</i>		

As indicated in Table 1, the current land use is expected to generate approximately 41 vehicle-trips during the weekday morning peak hour, and 51 vehicle-trips during the weekday afternoon peak hour. The project as proposed is expected to generate approximately 24 vehicle-trips during the weekday morning peak hour, and 31 vehicle-trips during the weekday afternoon peak hour. Relative to the existing development, this is a significant reduction in site generated trips. The expected reduction is estimated to be **17 vehicle-trips** in the morning peak hour and **20 vehicle-trips** during the afternoon peak hour. The detailed trip generation calculation was attached in the appendix.

### **Trip Distribution**

The vehicle-trips that will be generated by the proposed project will be then distributed onto the surrounding roadways. To develop trip distribution patterns, Journey-to-Work (JTW) data was obtained from the ACS 2006-2008 3-year Estimates, Special Tabs for the Census Transportation Planning Package (CTPP). These data indicate where residents of Somerville travel to work. These data are included in the Appendix attached to this memorandum. The likely routes of the vehicle-trips leaving the project site are based on commuter's ultimate destination for work. It is indicated that approximately 60% of residents in Somerville will commute to Boston, Cambridge, and cities at the southern part of greater Boston area. 40% of residents in Somerville will commute within Somerville and cities in the northern part of greater Boston area. The journey-to-work data was attached in the appendix.

### **Conclusion**

The site at 161-165 Linwood Street is currently a one floor, 14,500 SF auto body shop. Additionally, there is an existing 9,000 SF warehouse on site that is currently unoccupied.

The proposed project will demolish the existing auto body shop to build a new 7,900 SF body shop, and utilize the existing warehouse space.

DCI obtained the crash information from MassDOT database for the years 2004-2013. There were only 2 vehicle crashes that occurred at the intersection of the McGrath Highway northbound on-ramp and Linwood Street over this ten year period.

The trip generation analysis indicates that the proposed new Herb Chambers auto body shop at 161-165 Linwood Street will have minimal impacts to the operations of the surrounding roadways and intersections. Relative to the existing development, there is expected to be a

significant reduction in site generated trips. The expected reduction is estimated to be **17 vehicle-trips** in the morning peak hour and **20 vehicle-trips** during the afternoon peak hour. The proposed development is expected to reduce morning peak hour trips from **41** to **24** and reduce afternoon peak hour trips from **51** to **31**.

# APPENDIX

**Design Consultants, Inc.**

161-165 Linwood Street, Somerville MA  
Preliminary Trip Generation Calculations

Based on ITE's Trip Generation Manual, 9th Edition (2012)

Existing

Land Use: 942, Automobile Care Center

**Gross Floor Area (ksf) 15**

	<b>Weekday AM Peak</b>	<b>Weekday PM Peak</b>
Average Rate (per 1000 sf)	2.83	3.51
Percent Entering	56%	49%
Percent Exiting	44%	51%
Entering Trips	23	25
Exiting Trips	18	26
<b>Total Trips</b>	<b>41</b>	<b>51</b>

Proposed

Land Use: 942, Automobile Care Center

**Gross Floor Area (ksf) 8**

	<b>Weekday AM Peak</b>	<b>Weekday PM Peak</b>
Average Rate (per 1000 sf)	2.83	3.51
Percent Entering	56%	49%
Percent Exiting	44%	51%
Entering Trips	12	13
Exiting Trips	9	14
<b>Total Trips</b>	<b>21</b>	<b>27</b>

Land Use: 150, Warehousing

**Gross Floor Area (ksf) 9**

	<b>Weekday AM Peak</b>	<b>Weekday PM Peak</b>
Average Rate (per 1000 sf)	0.42	0.45
Percent Entering	65%	19%
Percent Exiting	35%	81%
Entering Trips	2	1
Exiting Trips	1	3
<b>Total Trips</b>	<b>3</b>	<b>4</b>

<b>Combined Trips</b>	<b>Weekday AM Peak</b>	<b>Weekday PM Peak</b>
Entering Trips	14	14
Exiting Trips	10	17
<b>Total Trips</b>	<b>24</b>	<b>31</b>



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2009-2013 American Community Survey 5-Year Estimates

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Data and Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Subject	Census Tract 3515, Middlesex County, Massachusetts				
	Total		Male		Female
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
Workers 16 years and over	1,355	+/-233	669	+/-139	686
<b>MEANS OF TRANSPORTATION TO WORK</b>					
Car, truck, or van	52.8%	+/-12.2	57.2%	+/-12.7	48.4%
Drove alone	41.8%	+/-9.4	52.5%	+/-13.3	31.5%
Carpooled	10.9%	+/-6.5	4.8%	+/-3.8	16.9%
In 2-person carpool	4.4%	+/-2.9	3.4%	+/-3.1	5.2%
In 3-person carpool	6.5%	+/-6.5	1.3%	+/-2.4	11.5%
In 4-or-more person carpool	0.1%	+/-0.4	0.0%	+/-5.1	0.1%
Workers per car, truck, or van	1.14	+/-0.09	1.05	+/-0.04	1.28
Public transportation (excluding taxicab)	20.0%	+/-6.6	17.8%	+/-8.5	22.2%
Walked	19.9%	+/-10.7	15.7%	+/-9.2	23.9%
Bicycle	4.2%	+/-3.3	4.6%	+/-3.7	3.8%
Taxicab, motorcycle, or other means	2.7%	+/-2.9	4.6%	+/-5.6	0.7%
Worked at home	0.5%	+/-1.1	0.0%	+/-5.1	1.0%
<b>PLACE OF WORK</b>					
Worked in state of residence	100.0%	+/-2.5	100.0%	+/-5.1	100.0%
Worked in county of residence	70.0%	+/-8.6	80.4%	+/-8.8	59.8%
Worked outside county of residence	30.0%	+/-8.6	19.6%	+/-8.8	40.2%
Worked outside state of residence	0.0%	+/-2.5	0.0%	+/-5.1	0.0%
<b>Living in a place</b>					
Living in a place	100.0%	+/-2.5	100.0%	+/-5.1	100.0%
Worked in place of residence	16.9%	+/-6.2	15.8%	+/-8.5	17.9%
Worked outside place of residence	83.1%	+/-6.2	84.2%	+/-8.5	82.1%
Not living in a place	0.0%	+/-2.5	0.0%	+/-5.1	0.0%
<b>Living in 12 selected states</b>					
Living in 12 selected states	100.0%	+/-2.5	100.0%	+/-5.1	100.0%
Worked in minor civil division of residence	16.9%	+/-6.2	15.8%	+/-8.5	17.9%
Worked outside minor civil division of residence	83.1%	+/-6.2	84.2%	+/-8.5	82.1%
Not living in 12 selected states	0.0%	+/-2.5	0.0%	+/-5.1	0.0%
Workers 16 years and over who did not work at home	1,348	+/-232	669	+/-139	679
<b>TIME LEAVING HOME TO GO TO WORK</b>					
12:00 a.m. to 4:59 a.m.	6.5%	+/-6.7	5.8%	+/-7.4	7.1%
5:00 a.m. to 5:29 a.m.	1.6%	+/-2.0	2.2%	+/-2.5	1.0%

Subject	Census Tract 3515, Middlesex County, Massachusetts				
	Total		Male		Female
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
5:30 a.m. to 5:59 a.m.	3.0%	+/-2.7	2.1%	+/-2.4	4.0%
6:00 a.m. to 6:29 a.m.	3.6%	+/-2.7	4.5%	+/-4.4	2.8%
6:30 a.m. to 6:59 a.m.	5.6%	+/-3.7	9.6%	+/-6.3	1.6%
7:00 a.m. to 7:29 a.m.	13.0%	+/-5.8	9.4%	+/-7.7	16.5%
7:30 a.m. to 7:59 a.m.	13.1%	+/-9.1	4.9%	+/-5.8	21.2%
8:00 a.m. to 8:29 a.m.	19.1%	+/-6.8	26.5%	+/-10.4	11.8%
8:30 a.m. to 8:59 a.m.	4.3%	+/-2.6	4.6%	+/-3.9	4.0%
9:00 a.m. to 11:59 p.m.	30.2%	+/-11.3	30.3%	+/-12.0	30.0%
<b>TRAVEL TIME TO WORK</b>					
Less than 10 minutes	5.9%	+/-4.7	1.8%	+/-2.3	10.0%
10 to 14 minutes	14.7%	+/-6.2	15.2%	+/-9.0	14.1%
15 to 19 minutes	15.7%	+/-7.5	16.9%	+/-9.2	14.4%
20 to 24 minutes	10.7%	+/-5.6	10.5%	+/-8.2	10.9%
25 to 29 minutes	5.1%	+/-3.8	8.2%	+/-7.1	2.1%
30 to 34 minutes	16.0%	+/-7.0	18.2%	+/-10.3	13.8%
35 to 44 minutes	16.3%	+/-10.3	13.5%	+/-8.6	19.1%
45 to 59 minutes	7.9%	+/-4.7	7.3%	+/-5.7	8.5%
60 or more minutes	7.6%	+/-4.9	8.4%	+/-7.8	6.9%
Mean travel time to work (minutes)	28.4	+/-4.0	29.0	+/-4.8	27.8
<b>VEHICLES AVAILABLE</b>					
Workers 16 years and over in households	1,350	+/-234	665	+/-139	685
No vehicle available	23.7%	+/-10.7	24.8%	+/-10.3	22.6%
1 vehicle available	43.4%	+/-13.4	33.7%	+/-14.0	52.8%
2 vehicles available	31.1%	+/-15.4	39.1%	+/-16.0	23.4%
3 or more vehicles available	1.8%	+/-3.1	2.4%	+/-4.5	1.2%
<b>PERCENT IMPUTED</b>					
Means of transportation to work	9.3%	(X)	(X)	(X)	(X)
Private vehicle occupancy	7.7%	(X)	(X)	(X)	(X)
Place of work	12.6%	(X)	(X)	(X)	(X)
Time leaving home to go to work	16.5%	(X)	(X)	(X)	(X)
Travel time to work	10.3%	(X)	(X)	(X)	(X)
Vehicles available	1.6%	(X)	(X)	(X)	(X)

Subject	Census Tract 3515, Middlesex County, Massachusetts
	Female
	Margin of Error
Workers 16 years and over	+/-157
<b>MEANS OF TRANSPORTATION TO WORK</b>	
Car, truck, or van	+/-15.0
Drove alone	+/-9.7
Carpooled	+/-13.0
In 2-person carpool	+/-3.7
In 3-person carpool	+/-13.0
In 4-or-more person carpool	+/-0.7
Workers per car, truck, or van	+/-0.22
Public transportation (excluding taxicab)	+/-10.6
Walked	+/-15.2
Bicycle	+/-5.0
Taxicab, motorcycle, or other means	+/-1.1
Worked at home	+/-2.2
<b>PLACE OF WORK</b>	
Worked in state of residence	+/-5.0
Worked in county of residence	+/-16.5
Worked outside county of residence	+/-16.5
Worked outside state of residence	+/-5.0
<b>Living in a place</b>	
Living in a place	+/-5.0
Worked in place of residence	+/-9.9
Worked outside place of residence	+/-9.9
Not living in a place	+/-5.0
<b>Living in 12 selected states</b>	
Living in 12 selected states	+/-5.0
Worked in minor civil division of residence	+/-9.9
Worked outside minor civil division of residence	+/-9.9
Not living in 12 selected states	+/-5.0
Workers 16 years and over who did not work at home	+/-156
<b>TIME LEAVING HOME TO GO TO WORK</b>	
12:00 a.m. to 4:59 a.m.	+/-7.2
5:00 a.m. to 5:29 a.m.	+/-1.8
5:30 a.m. to 5:59 a.m.	+/-5.1
6:00 a.m. to 6:29 a.m.	+/-3.7
6:30 a.m. to 6:59 a.m.	+/-2.3
7:00 a.m. to 7:29 a.m.	+/-8.2
7:30 a.m. to 7:59 a.m.	+/-16.2
8:00 a.m. to 8:29 a.m.	+/-7.6
8:30 a.m. to 8:59 a.m.	+/-3.6
9:00 a.m. to 11:59 p.m.	+/-14.6
<b>TRAVEL TIME TO WORK</b>	
Less than 10 minutes	+/-8.3
10 to 14 minutes	+/-7.9
15 to 19 minutes	+/-8.2
20 to 24 minutes	+/-8.3
25 to 29 minutes	+/-2.5
30 to 34 minutes	+/-8.9
35 to 44 minutes	+/-14.1
45 to 59 minutes	+/-7.0
60 or more minutes	+/-6.1
Mean travel time to work (minutes)	+/-5.1

Subject	Census Tract 3515, Middlesex County, Massachusetts
	Female
	Margin of Error
VEHICLES AVAILABLE	
Workers 16 years and over in households	+/-157
No vehicle available	+/-14.1
1 vehicle available	+/-14.8
2 vehicles available	+/-16.2
3 or more vehicles available	+/-1.9
PERCENT IMPUTED	
Means of transportation to work	(X)
Private vehicle occupancy	(X)
Place of work	(X)
Time leaving home to go to work	(X)
Travel time to work	(X)
Vehicles available	(X)

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

The 12 selected states are Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Wisconsin.

Workers include members of the Armed Forces and civilians who were at work last week.

While the 2009-2013 American Community Survey (ACS) data generally reflect the February 2013 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

Estimates of urban and rural population, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2010 data. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

Source: U.S. Census Bureau, 2009-2013 5-Year American Community Survey

#### Explanation of Symbols:

1. An '\*\*\*' entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.
2. An '-' entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
3. An '-' following a median estimate means the median falls in the lowest interval of an open-ended distribution.
4. An '+' following a median estimate means the median falls in the upper interval of an open-ended distribution.
5. An '\*\*\*\*' entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.
6. An '\*\*\*\*\*' entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.
7. An 'N' entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.
8. An '(X)' means that the estimate is not applicable or not available.

**Design Consultants Inc**

October 2, 2015

161-165 Linwood Street, Somerville

**Journey-to-Work Calculations**

<b>Somerville Residents Commuting to</b>	<b>Total Number of Commuter</b>	<b>Total Share of Commuters</b>
Boston city	13,350	30.8%
Cambridge city	9,100	21.0%
Somerville city	7,745	17.8%
Medford city	1,445	3.3%
Waltham city	1,125	2.6%
Newton city	1,090	2.5%
Lexington CDP	1,030	2.4%
Malden city	640	1.5%
Woburn city	615	1.4%
Brookline CDP	530	1.2%
Everett city	520	1.2%
Burlington CDP	465	1.1%
Arlington CDP	435	1.0%
Lowell city	370	0.9%
Framingham CDP	325	0.7%
Belmont CDP	315	0.7%
Wellesley CDP	310	0.7%
Watertown Town city	305	0.7%
Wakefield CDP	285	0.7%
Quincy city	265	0.6%
Marlborough city	235	0.5%
Wilmington CDP	235	0.5%
Chelsea city	180	0.4%
Lynn city	165	0.4%
Needham CDP	150	0.3%
Winchester CDP	145	0.3%
Maynard CDP	140	0.3%
Worcester city	140	0.3%
Weymouth Town city	135	0.3%
Brockton city	125	0.3%
Stoneham CDP	120	0.3%
Braintree Town city	115	0.3%
Salem city	110	0.3%
Winthrop Town city	110	0.3%
Saugus CDP	105	0.2%
Haverhill city	70	0.2%
Lynnfield CDP	65	0.1%
Beverly city	55	0.1%
Danvers CDP	55	0.1%
Dedham CDP	55	0.1%
Newburyport city	50	0.1%
Franklin Town city	45	0.1%
Melrose city	45	0.1%
Reading CDP	45	0.1%
Cochituate CDP	40	0.1%
Norwood CDP	35	0.1%
Peabody city	35	0.1%
Pittsfield city	35	0.1%
Southbridge Town city	35	0.1%
Milford CDP	30	0.1%
Milton CDP	30	0.1%
Methuen Town city	25	0.1%
Revere city	25	0.1%
Shirley CDP	20	0.0%
Andover CDP	15	0.0%
Gloucester city	15	0.0%
Lawrence city	15	0.0%
Somerset CDP	15	0.0%
South Ashburnham CDP	15	0.0%
Marblehead CDP	10	0.0%
Springfield city	10	0.0%
West Concord CDP	10	0.0%
Woods Hole CDP	10	0.0%
Athol CDP	4	0.0%
Brookfield CDP	4	0.0%
<b>Total</b>	<b>43,393</b>	<b>100.0%</b>