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MEMORANDUM

TO: Kevin J. Murphy, City Manager
FROM: Nicolas Bosonetto, Transportation Engineer

SUBJECT: **COUNCIL MOTIONS OF 3/21/17 BY MAYOR KENNEDY**
REQUEST CITY MANAGER HAVE TRAFFIC ENGINEER CONDUCT A TRAFFIC STUDY THAT WOULD CONSIDER THE IMPACT ON THE PROJECTED INCREASE IN TRAFFIC IN THE BELVIDERE NEIGHBORHOOD AND ON ROUTE 133 AND ROUTE 38 IF THE HIGH SCHOOL WERE TO RELOCATE OUT OF THE DOWNTOWN

CITY MANAGER REPORT TO THE CITY COUNCIL REGARDING ANTICIPATED COSTS DUE TO INFRASTRUCTURE AND TRAFFIC IMPROVEMENTS NECESSARY IF THE HIGH SCHOOL WERE TO MOVE OUT OF DOWNTOWN INCLUDING ANY SIDEWALKS, ROAD IMPROVEMENTS AND TRAFFIC LIGHTS THAT WERE NEEDED

REQUEST CITY MANAGER REPORT ON PARKING SOLUTION REGARDING THE CAWLEY SITE

A comprehensive transportation impact study for the High School project has been completed by Bryant Associates under contract with Skanska/Perkins Eastman. The scope of the traffic study was to analyze the downtown and Cawley High School alternatives as presented – no alterations to the proposed site plans were made.

The Transportation Engineer has analyzed the results of the traffic study based on three factors:

- 1) Traffic Impacts to Neighborhood
- 2) Transportation Infrastructure and Service Costs
- 3) Transportation Equity

Ultimately, the City Council will weigh these three factors along with many others to reach a decision on the location for the new LHS building. From a transportation perspective, the downtown site would have minimal traffic impacts because the City has already built the transportation infrastructure to support it and the downtown location allows the majority of students to access it via transit and walking. The Cawley site on the other hand would create new traffic impacts to the residential neighborhood, would require construction of new transportation infrastructure, and due to its peripheral location does not lend itself to equitable access.

I. Traffic Impacts to Neighborhood

The Downtown LHS is located in the urban core of the City. It is accessible by various modes of transportation including public transit buses operated by the LRTA, bicycle facilities, pedestrian facilities, and vehicular infrastructure including traffic signals. Downtown also offers various parking garages and on-street parking.

Access to the Downtown LHS location is achieved via a system of arterial roadways with signalized intersections. In this type of urban environment, the level of service (LOS) at intersections is the factor which determines how long drivers are delayed in seconds. Rebuilding the LHS downtown would have minimal effects on traffic. (see Table 16)

Table No. 16
School P.M. Peak Hour - Level of Service Summary
Downtown Signalized Intersections

Intersection/ Critical	Level of Service (Delay-Second/Vehicle)	
	2024 No-Build	2024 Build
Father Morissette Boulevard/Arcand Drive		
Overall Intersection	C (22.3)	C (24.0)
Eastbound Approach	B (12.8)	B (13.2)
Westbound Approach	B (19.5)	B (19.5)
Northbound Approach	C (32.6)	D (37.0)
Southbound Approach	C (22.7)	C (23.3)
French Street/Bridge Street		
Overall Intersection	B (19.0)	B (19.3)
Eastbound Approach	A (9.0)	A (9.2)
Northbound Approach	C (27.0)	C (28.0)
Southbound Approach	B (14.8)	B (14.8)
Merrimack Street/Dutton Street/Arcand Drive		
Overall Intersection Eastbound Approach	C (29.9)	C (30.5)
Westbound Approach	B (15.2)	B (15.9)
Northbound Approach	C (22.7)	C (23.6)
Southbound Approach (Arcand)	D (40.5)	D (40.6)
Southbound Approach (Dutton)	D (35.3)	D (35.6)
	D (40.0)	D (41.0)
Merrimack Street/Central Street		
Overall Intersection	C (23.6)	C (23.8)
Eastbound Approach	C (29.6)	C (29.8)
Westbound Approach	B (17.5)	B (17.8)
Northbound Approach	C (32.7)	C (32.8)
Merrimack Street/Kearney Square/Prescott Street		
Overall Intersection	C (21.9)	C (22.0)
Eastbound Approach	B (16.1)	B (16.0)
Westbound Approach	C (31.4)	C (31.7)
Northbound Approach	B (19.4)	B (19.6)
Southbound Left Turn Lane	D (40.0)	D (40.0)
Southbound Right Turn Lane	A (9.7)	A (9.8)

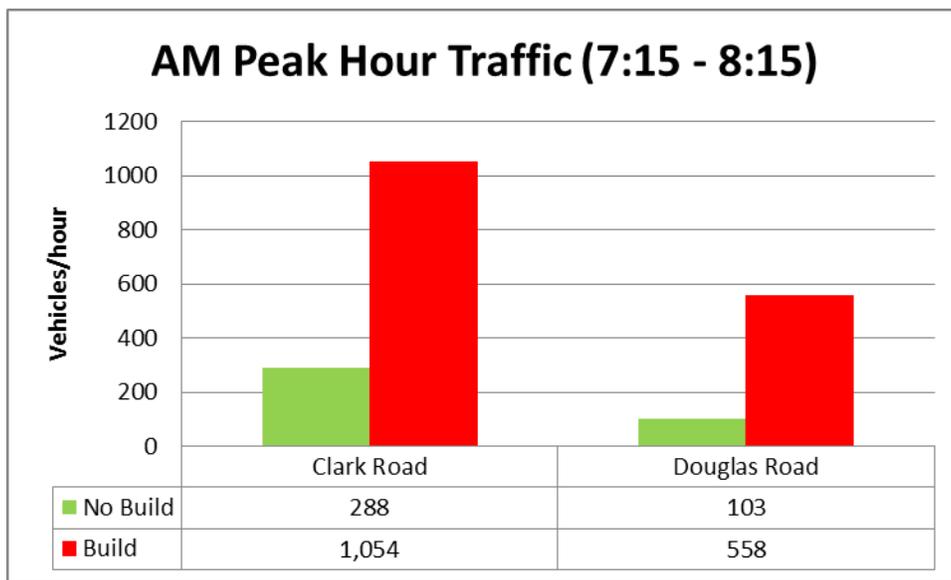
Under build conditions, the signalized capacity analysis shows that the study intersections will continue to operate at equivalent levels of services with similar delays as experienced under no-build conditions during both the school A.M. and school P.M. peak hours.

The Cawley site is located in the residential Belvidere neighborhood. This neighborhood is suburban in character and served by local streets with two minor collector roads (Clark Road and Douglas Road) running through it in a north-south direction between Andover Street (Route 133) and Rogers Street (Route 38). This road system has a residential function and for the most part lacks sidewalks, a drainage system, signalized intersections, adequate geometrics or street lighting. Furthermore this neighborhood has limited public transit service.

The Cawley LHS site is designed with access points from Douglas Road, Clark Road, and Village Street. While the site does not abut Route 38, all three previously mentioned streets intersect with this primary arterial roadway. The internal circulation plan calls for all buses to enter and exit to Route 38 via Village Street, while staff parking is accessed via Clark Road and student parking via Douglas Road.

The Cawley site would generate approximately 2,381 trips during the morning peak and 1,652 during afternoon peak.¹ More than half the traffic (52%) would access Cawley from Andover Street (Route 133). About 33% of the generated traffic would use the Andover Street/Clark Road intersection and about 19% would use the Andover Street/Douglas Road intersection to access the site.² Traffic volumes on Clark and Douglas Road during peak hours would increase anywhere from 222% to 542% over existing volumes as shown in Figures 1 and 2 below.

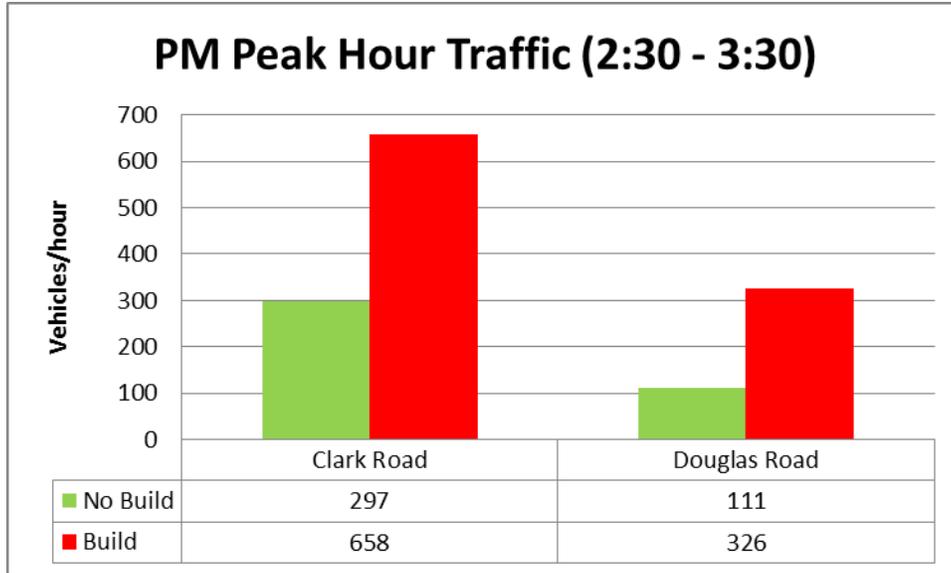
Figure 1 – AM Cawley Traffic Generation From/To Andover Street (Route 133)



¹ Traffic Impact Analysis, Bryant Associates May 2017, Pg. 39

² Ibid, Pages C-86 through C-102

Figure 2 - PM Cawley Traffic Generation From/To Andover Street (Route 133)



The remaining 48% of morning traffic generated would access the Cawley site from Route 38 (Rogers Street/Main Street) at the following intersections:³

- 12% from the Douglas Road/Phoenix Avenue intersection (signalized),
- 22% from the Clark Relocation Road intersection (signalized), and
- 14% from the Village Street intersection (unsignalized).

This additional traffic would have impacts upon both the residential neighborhood and upon the roadway capacity on Route 38. It should be noted that 86% of all traffic will be on Douglas and Clark Roads, while mainly the buses will be accessing the site from Village Street.

A speed study conducted as part of the traffic study shows traffic on Clark Road averaging 37 MPH in both directions and 33 MPH for Douglas Road northbound and 36 MPH southbound. The combined volume and speed of traffic will cause fragmentation of the neighborhood by making Clark Road and Douglas Road less permeable to pedestrian traffic. The traffic will also cause noise and air pollution that would impact the approximately 150 residences with frontage on these collector roads. Finally, the necessary sidewalk improvements would necessitate the cutting down of trees and loss of front lawn space.

From a highway capacity perspective the traffic generated by the Cawley site would deteriorate the eastbound traffic level of service (LOS) on Route 38 intersections from A (8.2 second delay) to E and F (90.1 second delay) during the AM peak hour (see Table 19). Delays of 1,220 seconds/vehicle (20 minutes/vehicle) would also be realized at the Route 38 entrance on Village Street (see Table 17). Since Route 38 is a MassDOT owned highway, they will be the ultimate arbiters of whether a new signalized intersection and/or exclusive left turn lanes would be allowed at the Village Street entrance to the Cawley site.

³ Ibid, Pages C-130, C-149, C-161

Table No. 19
School A.M. Peak Hour - Level of Service Summary
Cawley Signalized Intersections

Intersection/Critical Movement	Level of Service (Delay-Second/Vehicle)	
	2022 No-Build	2022 Build
Rogers Street/Douglas Road/Phoenix Avenue		
Overall Intersection	B (12.8)	F (61.3)
Eastbound Approach	A (8.2)	F (90.1)
Westbound Approach	A (7.1)	A (9.6)
Northbound Approach	B (16.7)	B (15.7)
Southbound Approach	D (45.1)	D (44.5)
Main Street/ Clark Road		
Overall Intersection	C (20.7)	D (42.0)
Eastbound Approach	A (8.2)	E (60.9)
Westbound Approach	C (26.8)	C (24.4)
Southbound Approach	D (38.1)	C (33.5)

Traffic Impact Analysis – Bryant Associates Pg. 47

Table No. 17
School A.M. Peak Hour - Level of Service Summary
Cawley Unsignalized Intersections

Intersection/Critical Movement	Level of Service (Delay-Second/Vehicle)	
	2022 No-Build	2022 Build
Andover Street/Douglas Road		
Westbound Approach	A (0.6)	A (2.7)
Northbound Approach	F (97.4)	F (11,525)
Andover Street/Clark Road/Raven Road		
Eastbound Approach	A (0.2)	A (0.1)
Westbound Approach	A (1.7)	A (6.0)
Northbound Approach	F (*)	F (*)
Southbound Approach	F (*)	F (*)
Clark Road/Proposed Clark Road Driveway		
Eastbound Approach	N/A	A (0.0)
Northbound Approach	N/A	F (85.9)
Clark Road/ Village Street		
Eastbound Approach	B (10.4)	F(650)
Northbound Approach	A (0.2)	A (0.3)
Village Street/Proposed Village Street Eastern Driveway		
Southbound Approach	N/A	F (224.3)
Village Street/Proposed Village Street Middle Driveway		
Eastbound Approach	N/A	A (2.6)
Village Street/Proposed Village Street Western Driveway		
Eastbound Approach	N/A	E (39.4)
Rogers Street/Village Street		
Eastbound Approach	A (0.2)	A (4.9)
Southbound Approach	C (15.0)	F (1,220)
Douglas Road/Proposed Douglas Road Middle Driveway		
Southbound Approach	N/A	A (4.7)
Douglas Road/Proposed Douglas Road Northern Driveway		
Westbound Approach	N/A	B (13.5)

* Delay exceeds 300 seconds

Traffic Impact Analysis – Bryant Associates Pg. 45

The traffic analysis conducted by Bryant Associates shows traffic delays at the intersections of Douglas Road and Clark road would be a 11,525 seconds/vehicle (3.2 hours) and 3,221 sec/veh (54 minutes) respectively. It should be noted that these delays are beyond the normal limits of the traffic analysis software. In reality, traffic would likely divert onto Hovey Street and travel to Wentworth Avenue and other relief points.

In summary, the Downtown LHS site would generate no traffic impacts since the transportation infrastructure is already built to accommodate it. In contrast, the Cawley site would create impacts on the residential neighborhood by quintupling traffic on Douglas Road and tripling traffic on Clark Road during the AM peak and more than doubling the traffic during the PM peak on these neighborhood roads. This increase in traffic will negatively affect traffic congestion and require mitigation.

II. Transportation Infrastructure and Service Costs

As previously mentioned the Downtown LHS site has no negative impacts on traffic due to the existing transportation infrastructure and services. The City has already invested over a million dollars upgrading traffic signals in the downtown area. Recently, video detection and advanced controllers were installed at the Merrimack Street/Dutton Street intersection. Also, design has commenced on a full replacement of the traffic signals at French Street and Bridge Street intersection. In addition to traffic improvements, the City has also invested in sidewalk and bike lane infrastructure around downtown. Other services available include parking garages near the high school and LRTA busing service.

Reconstruction of the Bridge Street/French Street intersection and upgrades to the French Street/John Street and French Street/Arcand Drive intersections would be beneficial upgrades that would cost approximately \$400,000, and are necessary regardless of whether the high school remains downtown or not.

	Transportation Infrastructure Costs	Busing Costs
Downtown LHS	\$400,000	TBD
LHS at Cawley	\$3.85 Million + ROW Costs	\$3.2 Million/Year

The Cawley site currently lacks the transportation infrastructure and services to support the projected high school traffic demands. In order to accommodate the proposed Cawley site, the following improvements should to be made:

a. Busing - \$3.2 Million/year:

Per the presentation to the Lowell High School Finance Subcommittee on March 29 – approximately 2,000 students will be bused using 46 buses (arriving at 7:40 AM) at a cost of \$3.2 Million dollars. These buses will be using Village Street at Route 38 as the exclusive access point. Also, busing will be limited to students living further than 1 mile from the school. Figure 3 shows a 1 mile radius (blue circle) covering most of the Belvidere and South Lowell neighborhoods. Since Route 38 and 133 (Rogers Street and Andover Street) are dangerous pedestrian crossing points, busing would be provided to anyone living on the other side of these busy roads. The remaining walking zone is therefore shown bounded by a red boundary. The roads highlighted in green are those sections of roadway that would require a sidewalk analysis to assure the safety of children walking to the high school.

Figure 3 - 1 mile radius walking map

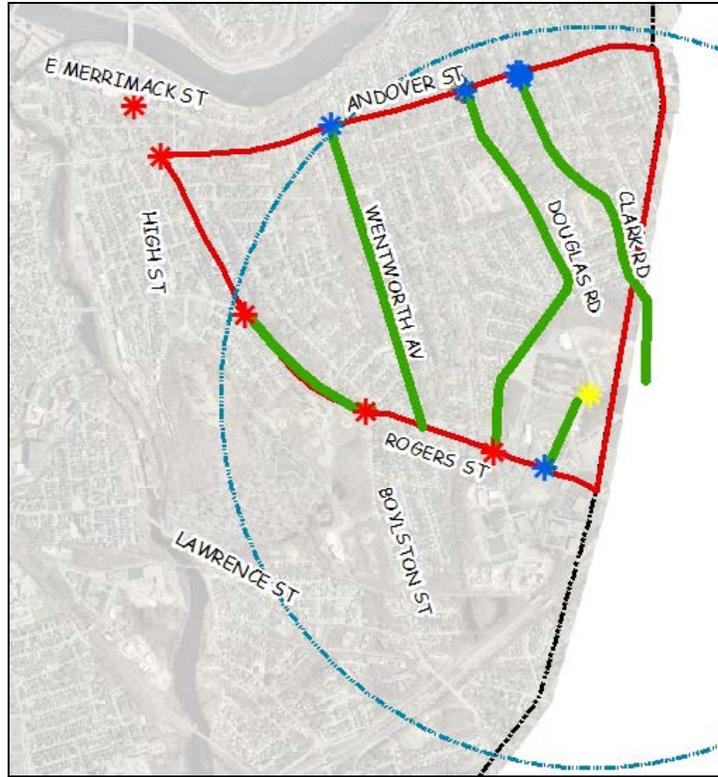
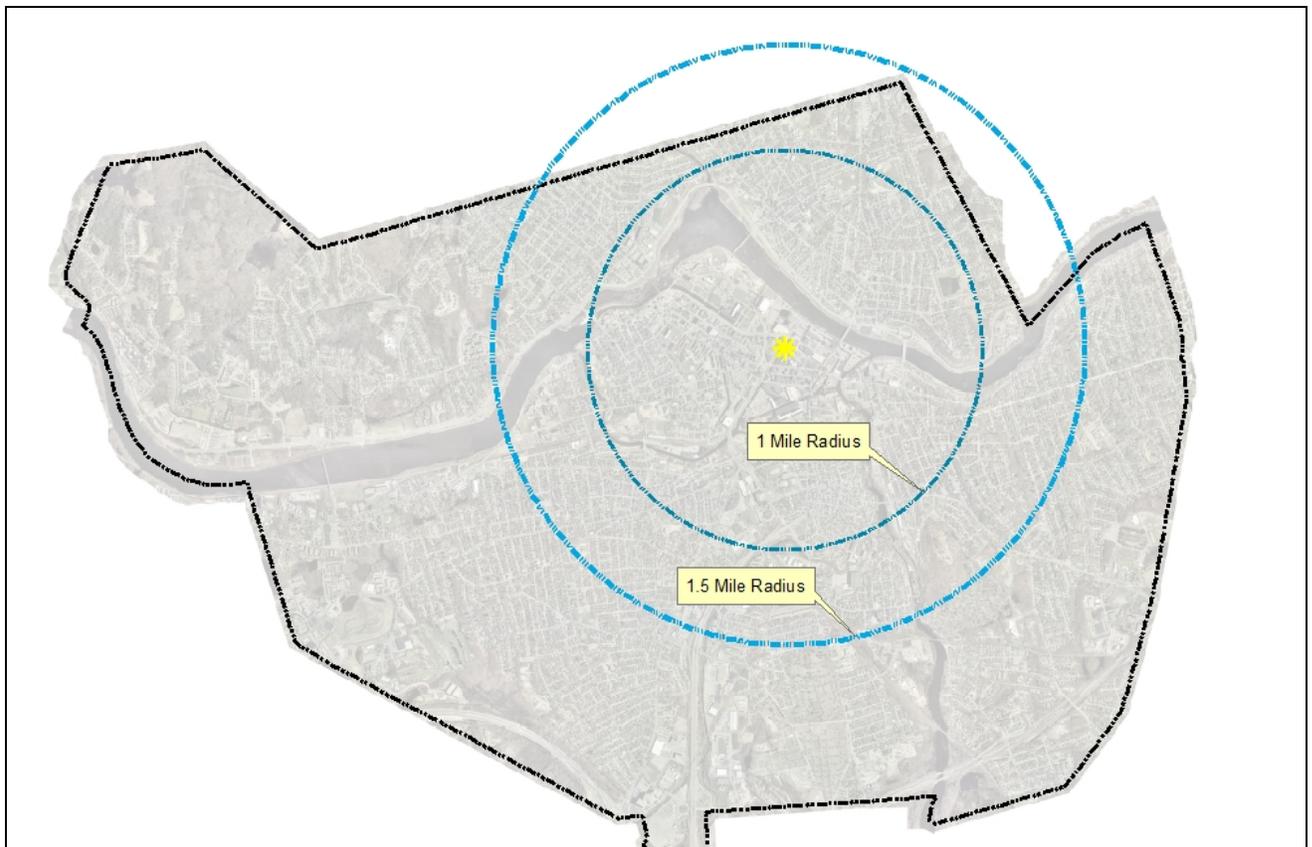


Figure 4- LHS Downtown Walking Radii



The Downtown LHS site is more centrally located and therefore a 1 mile radius covers more area of the City which is also more densely populated. This area also offers more transportation infrastructure and services and could therefore be expanded to a 1.5 mile radius as shown in Figure 4. Busing could still be offered to the far parts of Pawtucketville, Upper Highlands, and South Lowell at a significant cost savings as compared to the 46 buses required for the Cawley Site.

b. Sidewalks - \$1.1 Million:

As previously shown in Figures 1 and 2 above traffic volumes are expected to quadruple in the morning peak hours and triple in the afternoon peak hours along Clark Road and Douglas Road. It is anticipated that about 7-10% of students would walk - amounting to 245 to 350 walkers.⁴ Due to this volume of pedestrian traffic combined with vehicle volumes and speeds averaging 36 MPH, it is recommended that sidewalks be constructed along the length of Clark Road and Douglas Road to assure the safety of children walking to school.

Based on the sidewalk analysis provided in the traffic study, it is estimated that 12,000 feet of sidewalk would need to be constructed which would necessitate the taking down of trees, rock walls, and lawns and some private property may need to be acquired. Additional costs would include relocations of fire hydrants and utility poles as well as addition of drainage systems to adequately handle the stormwater runoff being collected along the newly formed gutter line. Please refer to the City Engineer's motion response for a complete sidewalk construction estimate.

c. Traffic - \$2.75 Million + right-of-way acquisition:

Road widenings and signalized intersections should be considered in order to mitigate the negative effects of generated traffic as shown in Table 19 and Table 17. The following traffic mitigation projects are suggested for further investigation:

- Addition of left turn lane for east bound Route 38 at Douglas Road intersection
 - \$1,000,000 – includes engineering, utility relocation and new signal
 - Does not include right-of-way acquisition costs
- Addition of left turn lane for east bound Route 38 at Village Street intersection
 - \$700,000 – includes engineering and utility relocation
 - Does not include right-of-way acquisition costs
- Addition of traffic signal at Route 38 and Village Street intersection
 - \$300,000 – Includes engineering costs
- Addition of traffic signal at Route 133 and Clark Road intersection
 - \$350,000 – Includes engineering and cement costs
- Addition of traffic signal at Route 133 and Douglas Road intersection
 - \$350,000 – Includes engineering and cement costs
- Improvement to traffic signal at Route 38 and Clark Road intersection
 - \$50,000 – Includes signalization upgrades only

These costs are based on conceptual plans only, and based on similar projects. Route 38 is a MassDOT highway and ultimately the type of improvements will have to be approved by the state.

⁴ Ibid, pg. 37.

Figure 5 - Possible Takings - Douglas at Rogers

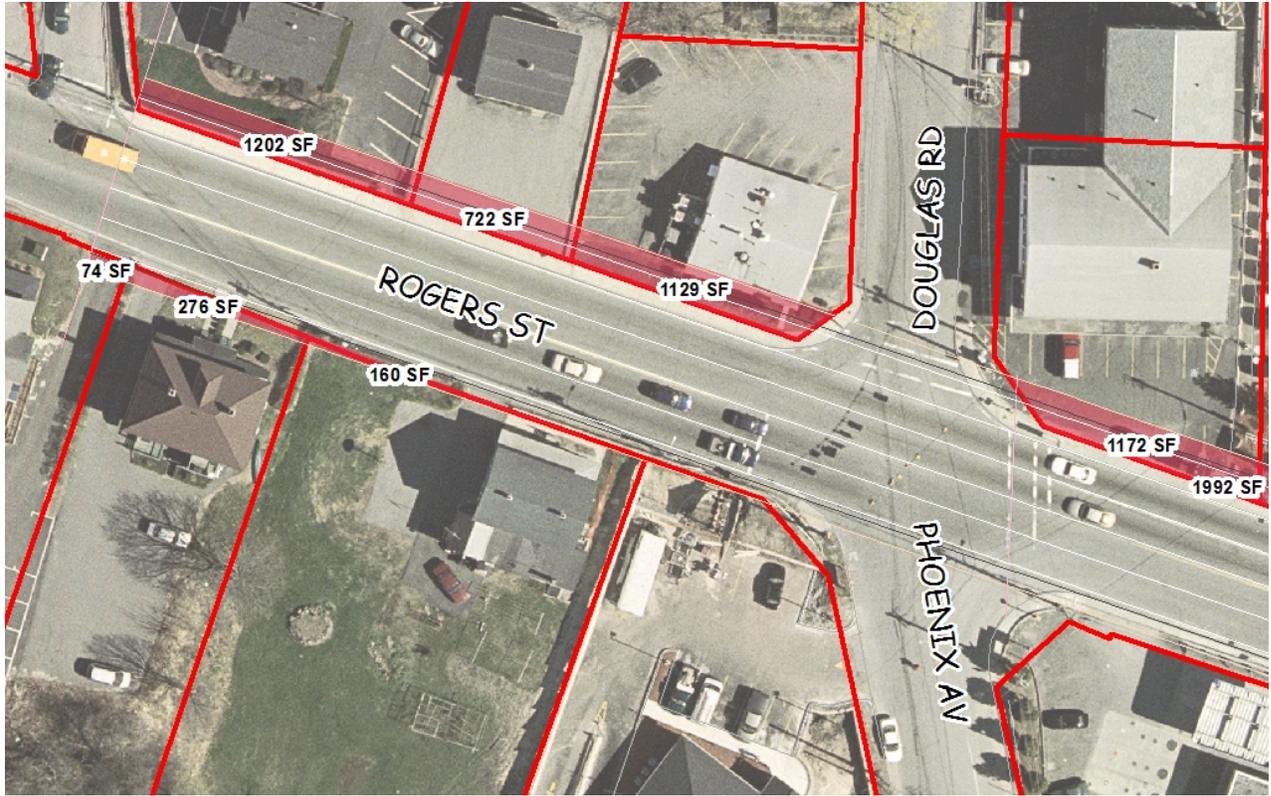


Figure 6 - Possible Takings - Village at Rogers



Adding an 11' turn lane would result in a 70' cross-section (including 2' shoulders, 5.5' sidewalks, and 11' travel lanes). The right-of-way along Route 38 is only 58' wide, and therefore approximately 12' of property will need to be taken to install left turn lanes at the Rogers Street intersections. Figures 5 and 6 above show the possible impacts on right-of-way. Widening to the north would avoid utility relocations and the gas station.

d. Parking:

Downtown LHS parking is currently provided at the Ayotte Garage where approximately 605 parking passes are reserved for about 360 faculty and 245 students. Another 120 vehicles park throughout downtown at other parking facilities according to an April 2017 survey.⁵ Currently only 8% of students and 89% of staff drive to school in the downtown location. Were the high school to remain downtown only 18 additional parking spaces would be required based on existing mode splits.

Studies typically show retail customers are willing to walk 300-600 feet from parking to their destination and employees are willing to walk 1,200-1,500 feet from parking to their work place. The Ayotte Garage therefore is not close enough to MCC (2,200') or the Merrimack Street corridor (1,900') to adequately satisfy parking demand for downtown needs. A shuttle service would be necessary to make it a viable parking alternative to serve MCC and the HCID. Vacating LHS from downtown would not free up enough parking supply where it is needed and the city would still need to build parking garages near the HCID and East Merrimack Street to satisfy demand.

Table 1 - Parking Demand

	Anticipated Parking Demand			
	Downtown*		Cawley**	
	% Vehicle Trips	Total Spaces	% Vehicle Trips	Total Spaces
500 Staff	89%	445	97%	485
20 Visitors	89%	18	100%	20
3,500 Students	8%	280	10%	350
	TOTAL	743		855

*Based on April 2017 Survey of modes

**Traffic Study, Page 37

Due to the Cawley site's location and lack of transit service, it is anticipated a larger percentage of staff, visitors and students will drive compared to the downtown site. Table 1 above shows how a shift to vehicle trips could increase parking demand by as much as 16%. Note that the downtown mode distribution is based on actual surveys from April 2017, and the Cawley site mode distribution is based on anticipated mode shifts. The traffic study conducted by Bryant Associates included only 10% of students as driving to Cawley, however, this is an optimistic figure considering 8% are already driving to downtown.

It should also be noted that the downtown location offers overflow parking via on-street parking along Father Morissette. The Cawley site does not offer overflow parking and miscalculating the parking needs would cause spill-over onto neighboring streets.

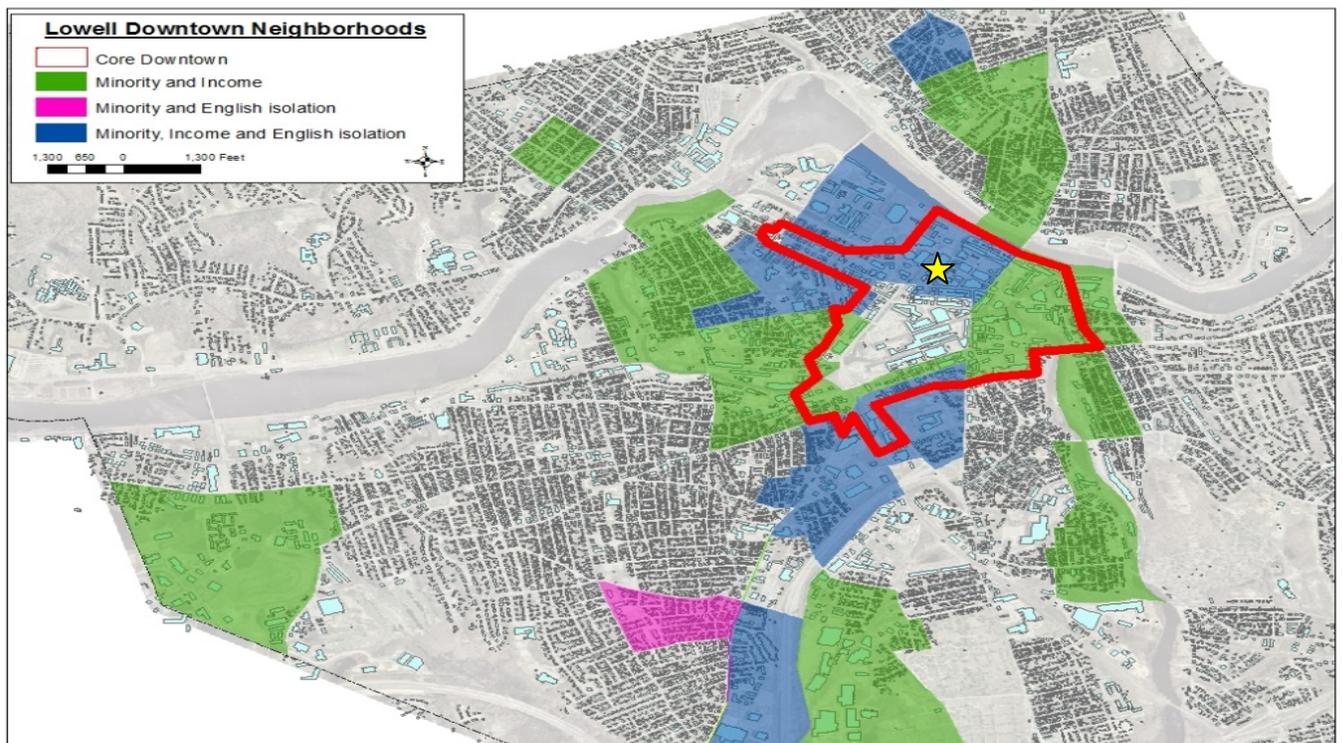
⁵ Ibid, pg. 11

III. Transportation Equity

The City of Lowell has passed a Complete Streets Policy which identifies transportation equity in terms of providing affordable and reliable transportation options that provide equal opportunity for low income individuals, minorities, immigrants, and the disabled to access economic opportunities, social services, and educational institutions. The City's policy applies to all City projects, including the high school project.

The neighborhoods located around the downtown have high concentrations of low income, minority, and low-English proficiency populations residing in the Acre, Lower Belvidere, Centralville, Lower Highlands, Back Central and Downtown neighborhoods as shown in Figure 7. Over 17% of households in the City of Lowell do not have access to a vehicle, and depend on biking, walking and transit for transportation. These households are concentrated within the highlighted areas.

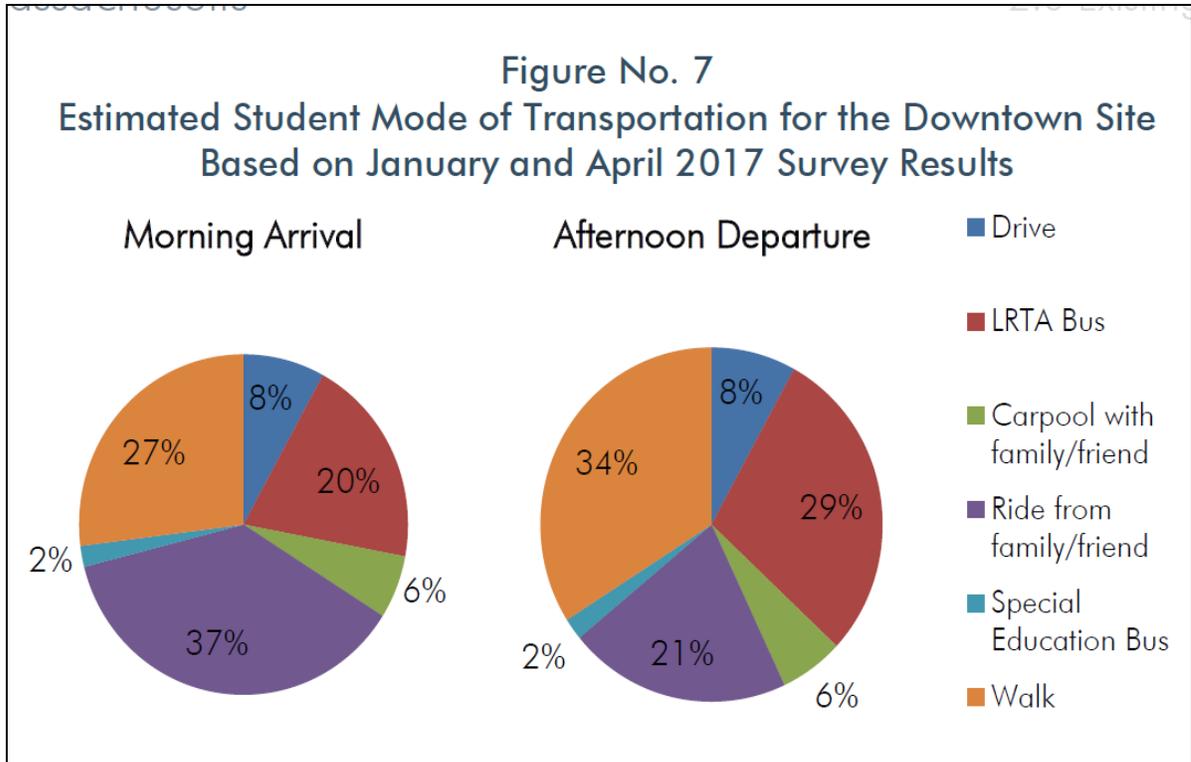
Figure 7- Environmental Justice Populations



The Complete Streets program has focused on providing transportation infrastructure and services to connect these neighborhoods to the economic opportunities, social services, and educational institutions located within downtown. Regardless of age, language, ethnicity, income or ability residents from these neighborhoods have equitable access to everything the city of Lowell has to offer because they can easily walk, bike, or ride a bus to the downtown core. These efforts are evident by the existing mode share of the downtown high school as shown in Figure 8 which shows two third (63%) of high school students walk or ride LRTA home from the high school.

It should also be noted that students' parents and relatives also need access to the high school.

Figure 8 - Mode Share Downtown LHS



NB/ns
6/1/17