



K2C2 Transportation

Critical Sums Analysis - Central Square

July 11, 2012



Overview of Critical Sums Analysis

- Critical Sums Analysis is a planning tool used to evaluate build-out scenarios
- Compares how different levels of build-out impacts specific intersections in general way
- Not a traffic engineering tool
- Same methodology used in prior planning studies:
 - 2001 Citywide Rezoning
 - 2001 ECaPS
 - 2004 Concord-Alewife Plan

Critical Sums Methodology



Street 1: $(A + 2) + D$ or $(C + 2) + B$, whichever is more

Street 2: $E + H$ or $G + F$, whichever is more

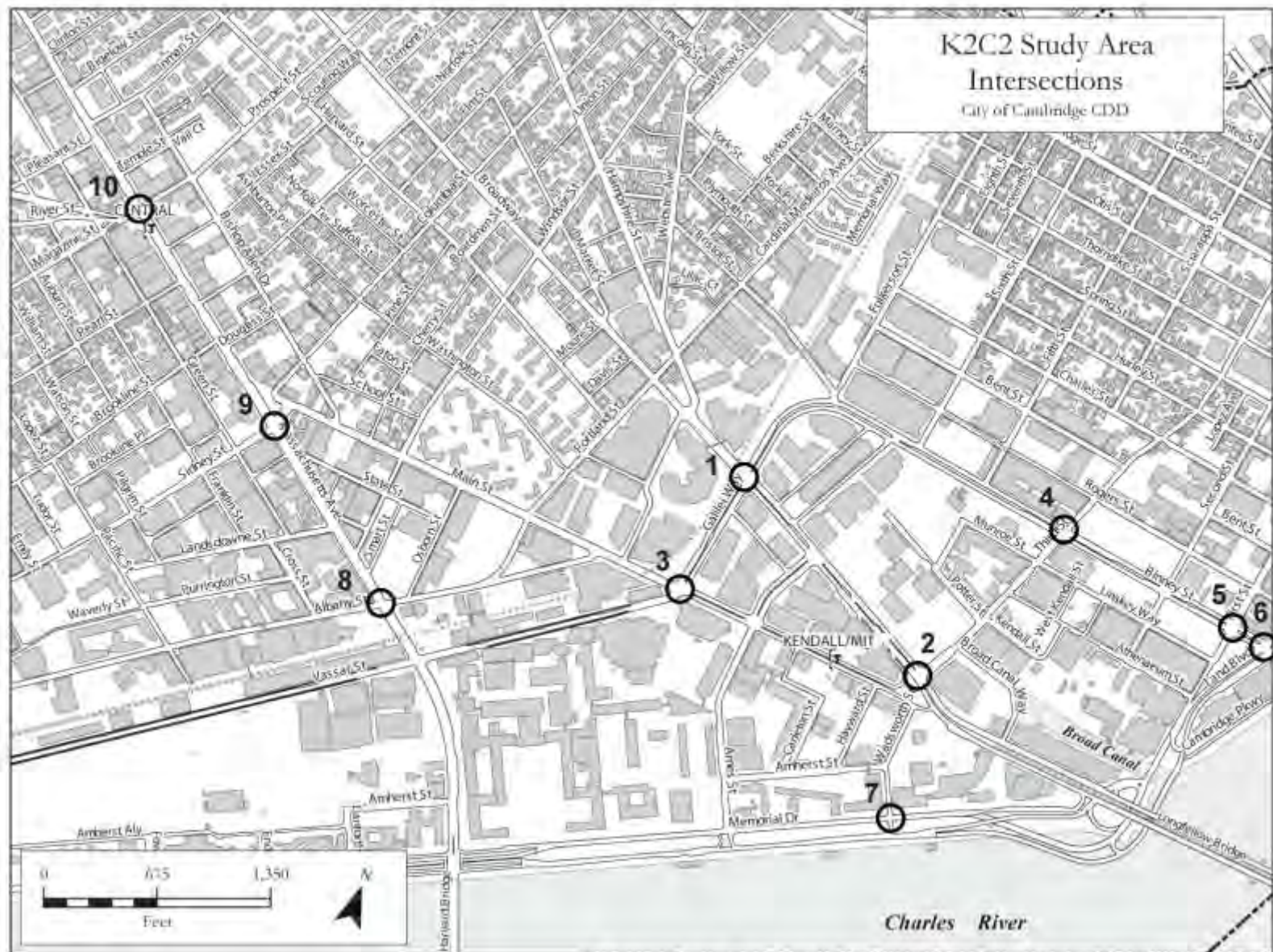
Critical Sum = Result of Street 1 + Street 2

Critical movement volume at an intersection is the sum of all conflicting traffic movements (vehicles per hour).

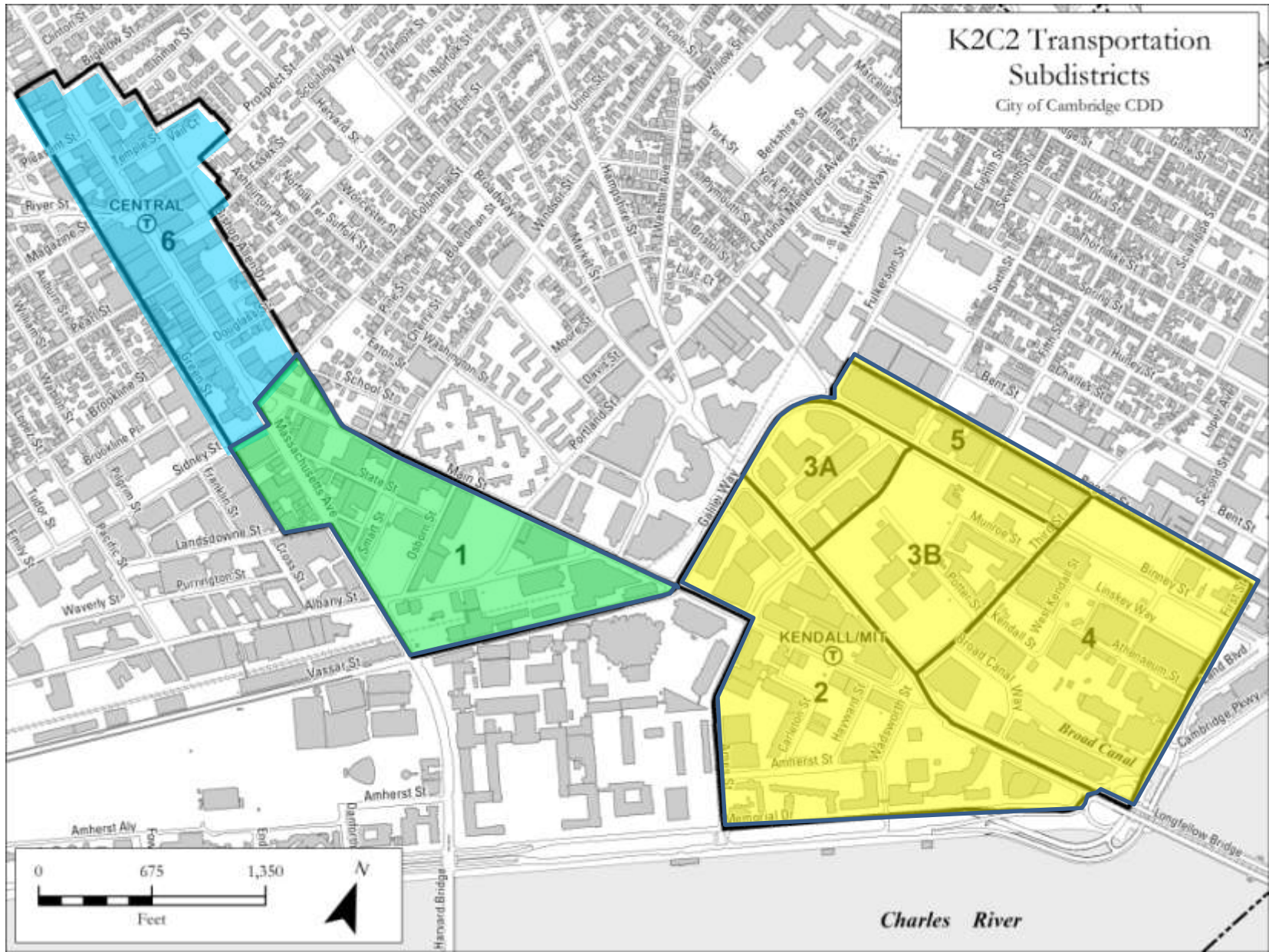
Intersections with 1,500 or fewer vehicles per hour considered to operate adequately, i.e. motorists will wait no more than two light cycles to get through the intersection.

When thresholds are exceeded, intersection operation starts to deteriorate exponentially.

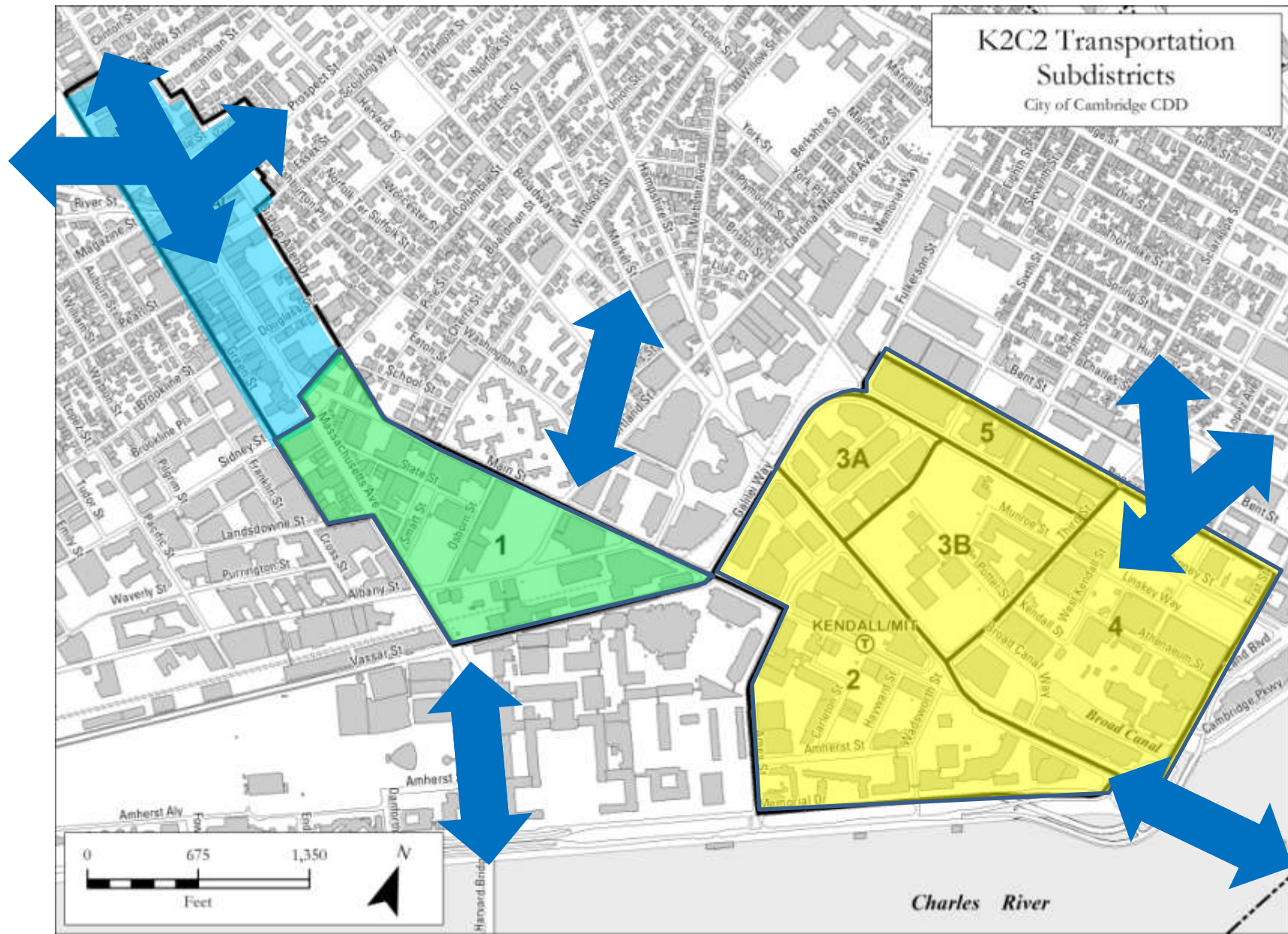
Intersections in Study Area



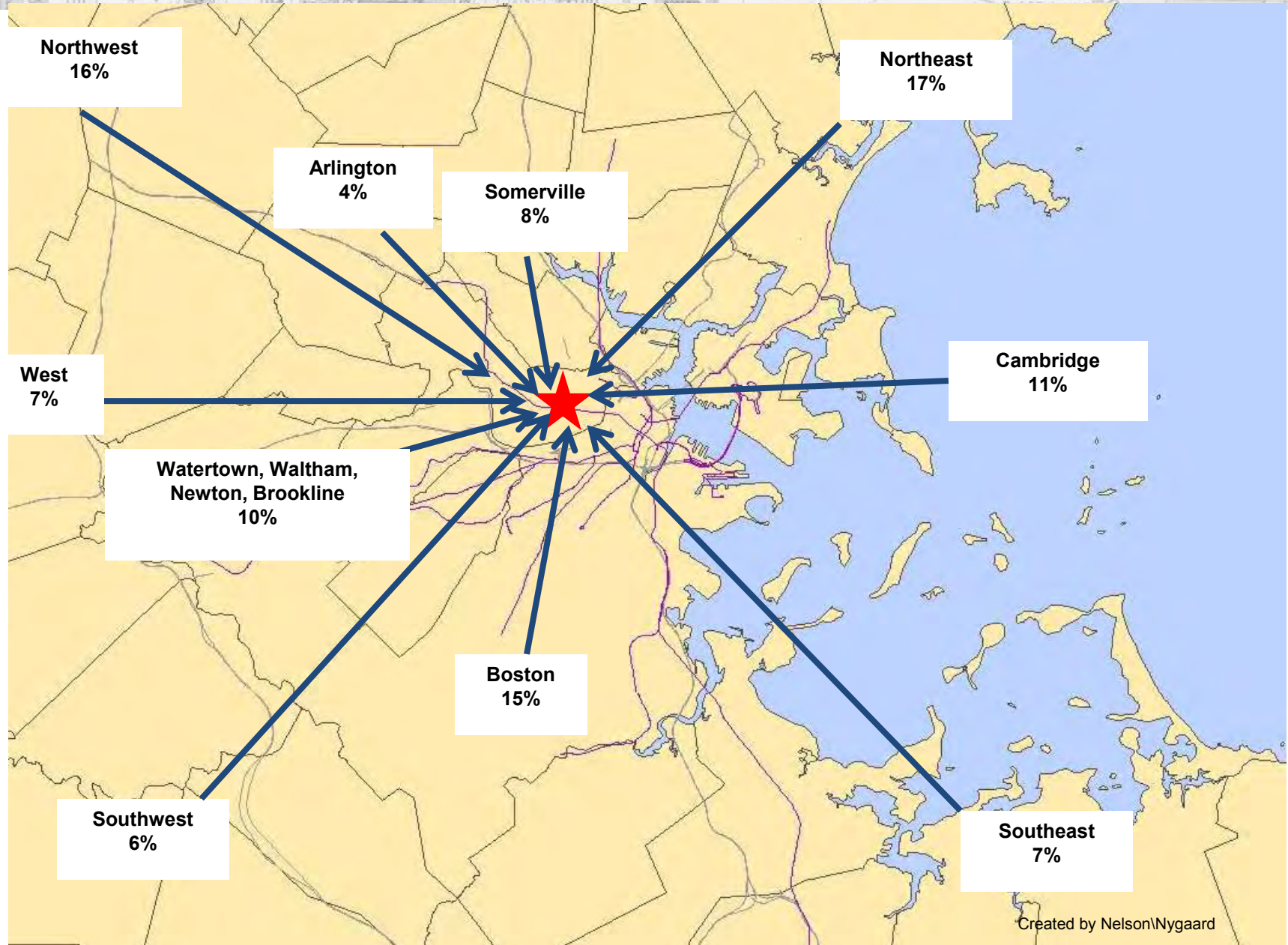
Sub-areas in Study Area



Trips for the Study Area

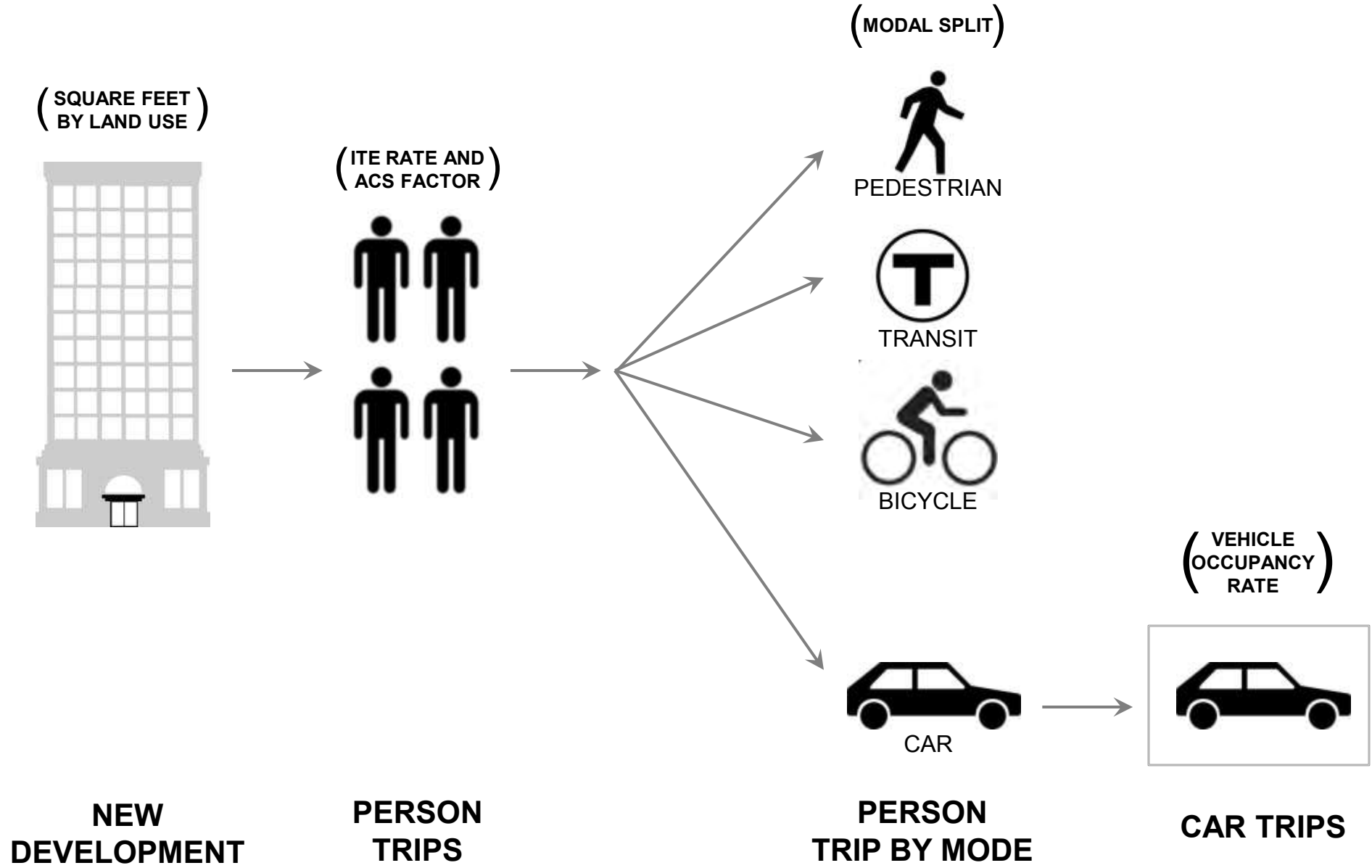


Commute to Work





Calculating New Trips







- Trips created by net new development

Retail	3.73
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General Office	1.49
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Research & Development	1.07
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(new trips per 1000 sf of development)

Residential	0.62
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(new trips per “dwelling unit” added)

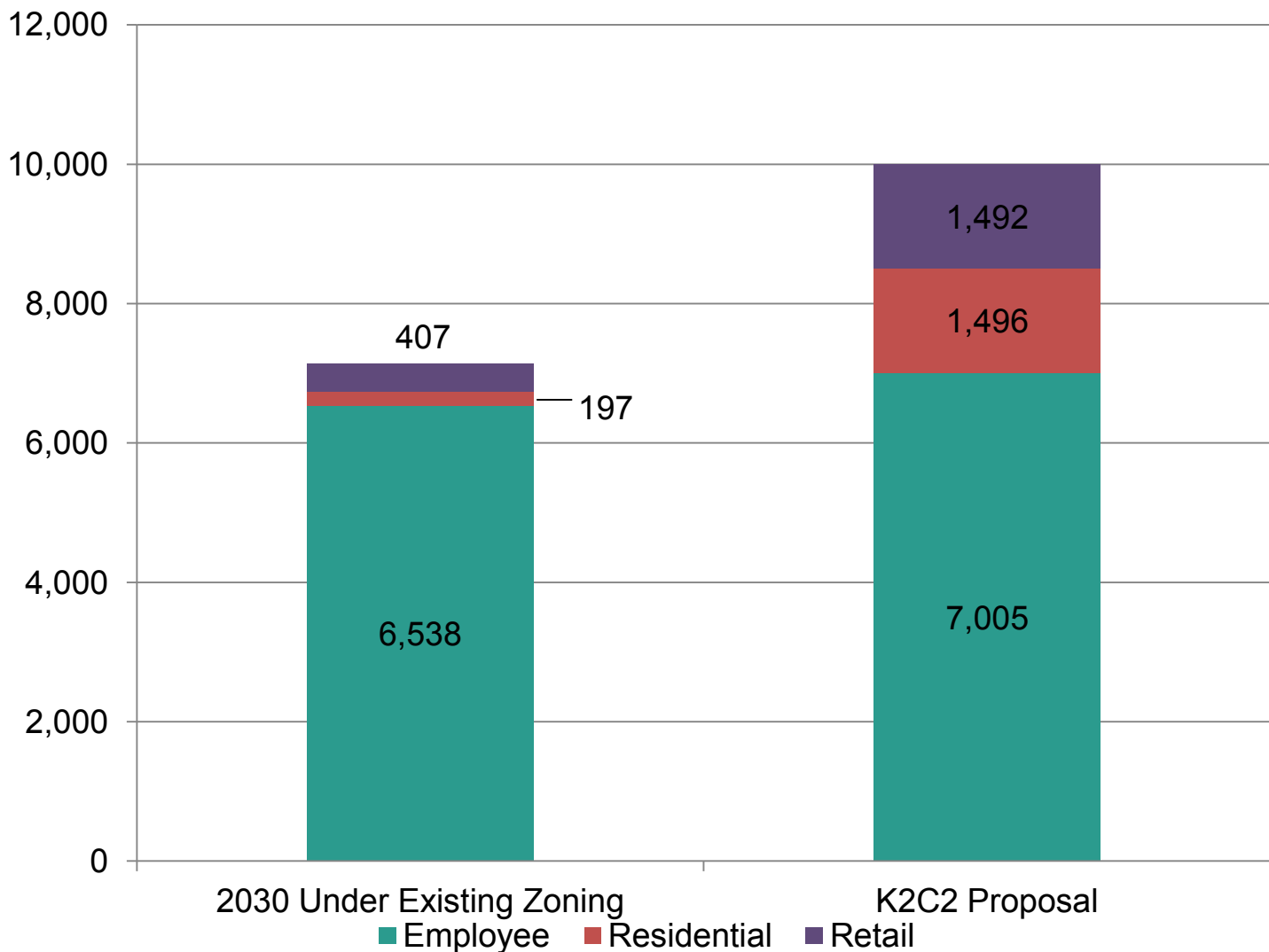
Average rates from the 8th Edition ITE Trip Generation manual

- ITE trips converted to “person-trips” using National ACS factor



2030 Net New PM Person Trips

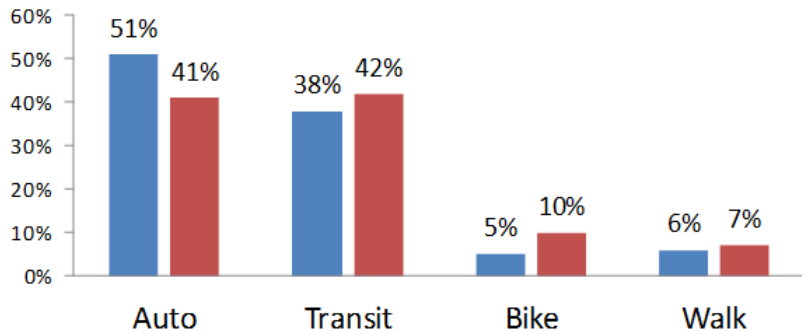
“Person-Trips” for C2, K2 & Transition/South of Main St.



Central Square Mode Shares by Land Use

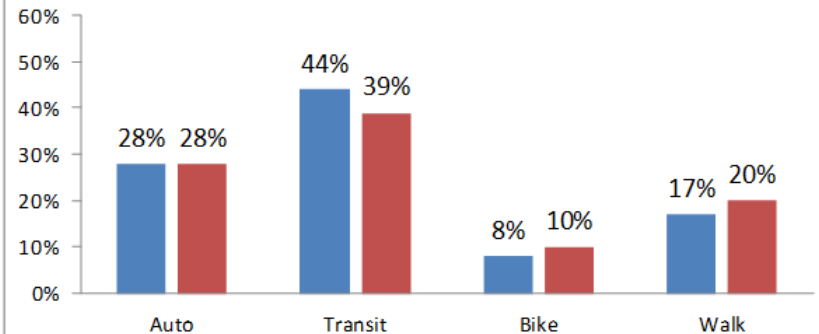
Office and R&D

■ Current ■ Enhanced TDM



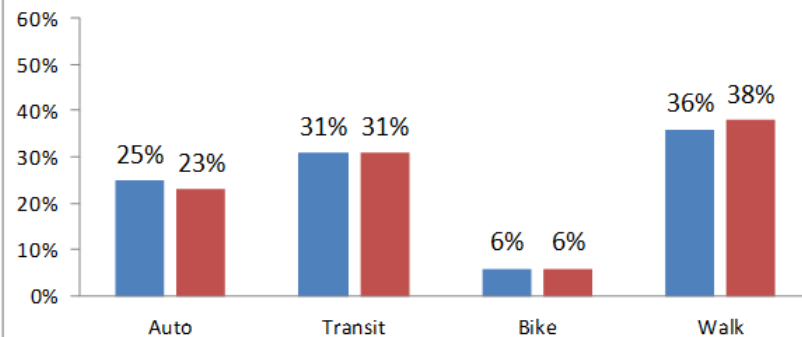
Residential

■ Current ■ Enhanced TDM



Retail

■ Current ■ Enhanced TDM



2030 Net New Trips by Car - PM Peak Hour

Existing Zoning

Person-Trips

Residential	197
Employee	6,538
Retail	407
TOTAL	7,142



**25-51% of
Trips in Cars**

Vehicle occupancy

Vehicle occupancy of 1.08-1.09

Car Trips

Residential	63
Employee	3,059
Retail	118
TOTAL	3,240

K2C2 Proposal

Person-Trips

Residential	1,496
Employee	7,005
Retail	1,492
TOTAL	9,993



**25-51% of
Trips in Cars**

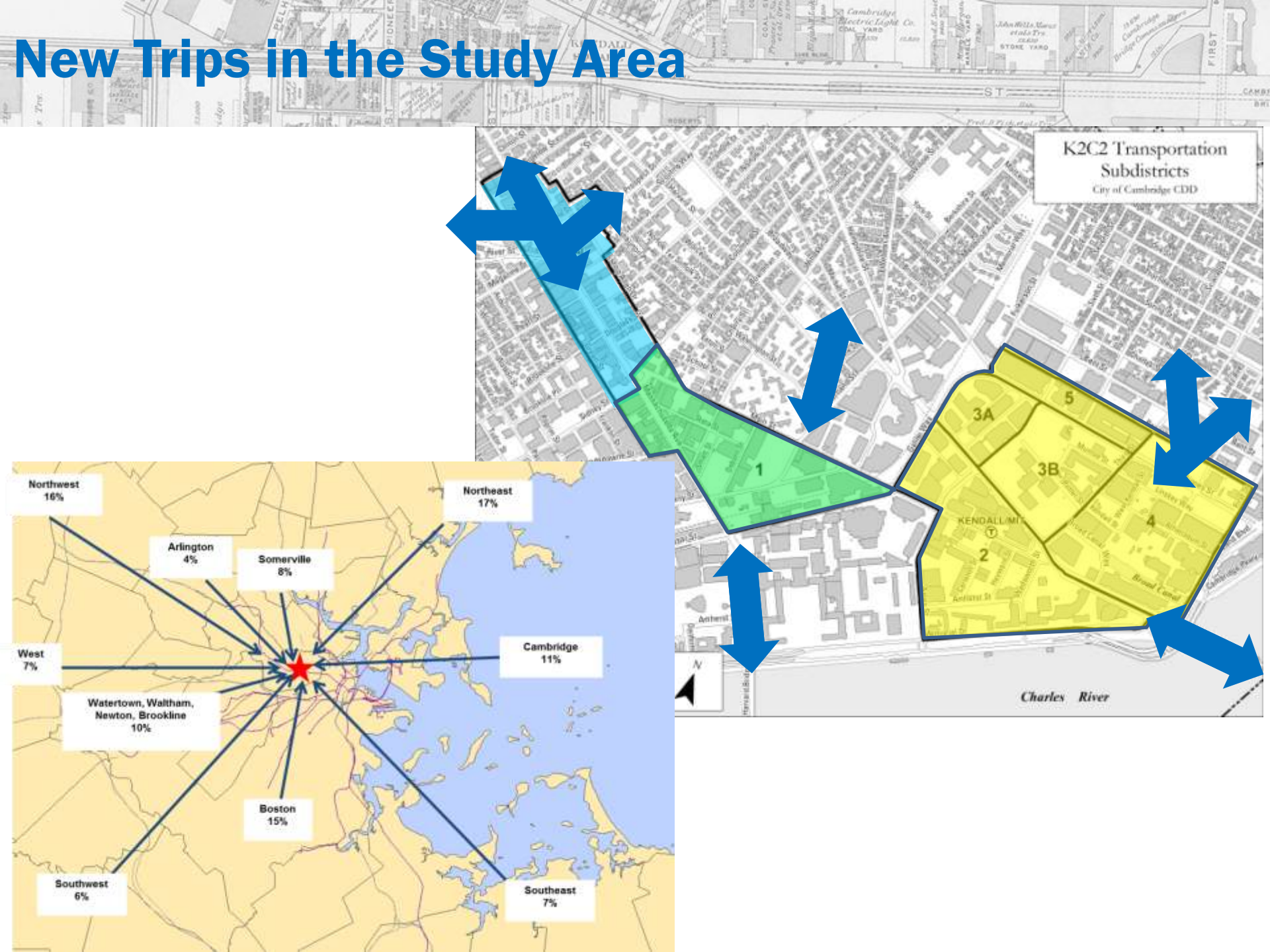
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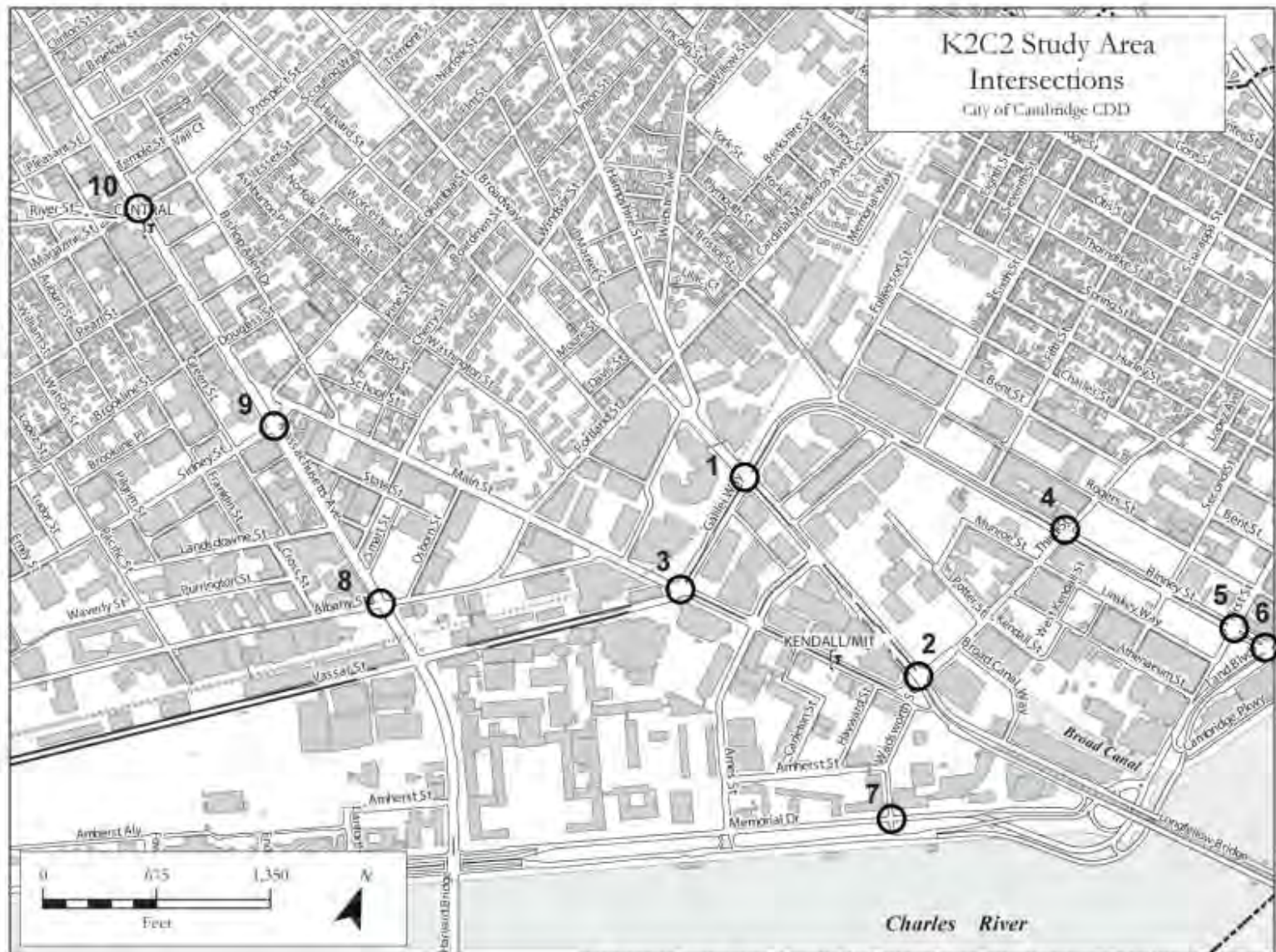
Car Trips

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Retail	459
TOTAL	4,213

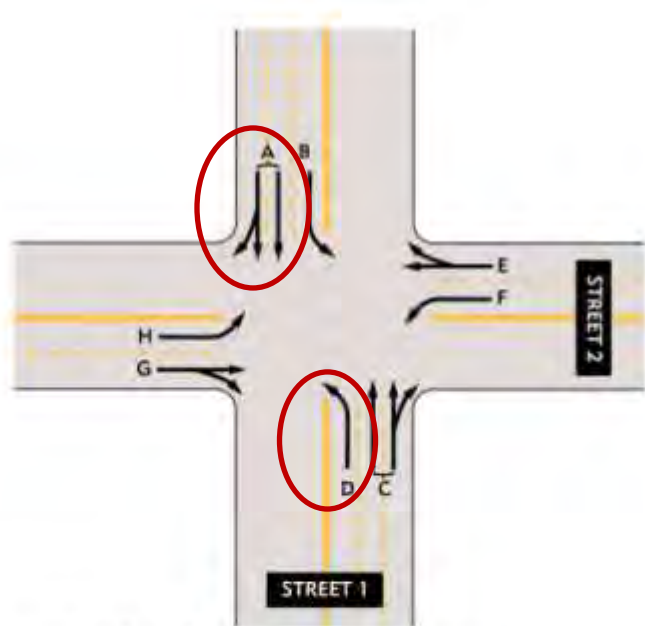
New Trips in the Study Area



Intersections in Study Area



Critical Sums Calculations

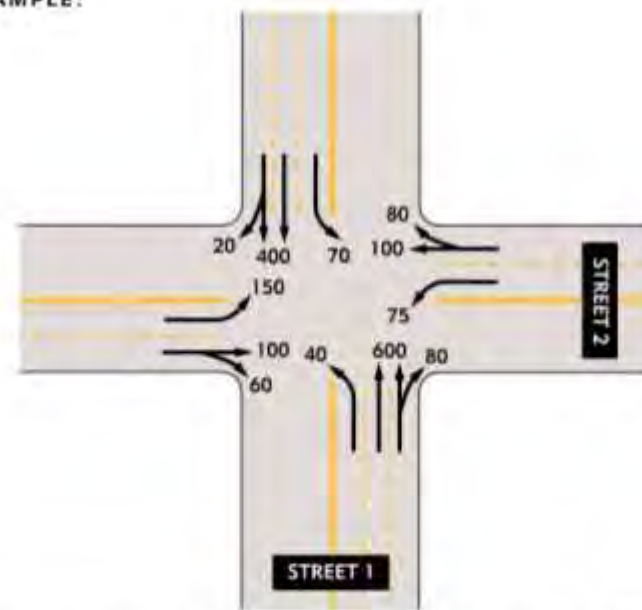


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Critical Sum = Result of Street 1 + Street 2

EXAMPLE:

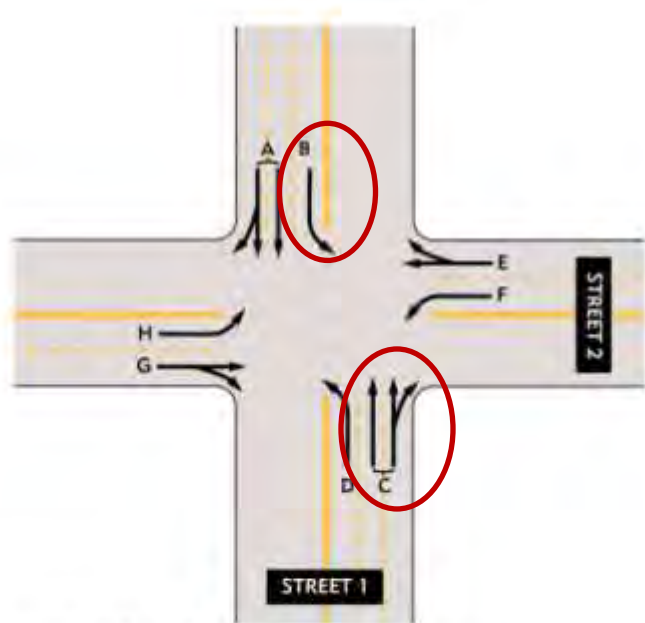


Street 1: $[(400 + 20)/2] + 40 = 250$ or $[(600 + 80)/2] + 70 = \boxed{410}$

Street 2: $(100 + 80) + 150 = \boxed{330}$ or $(100 + 60) + 75 = 235$

Critical Sum = $410 + 330 = 740$ vehicles

Critical Sums Calculations

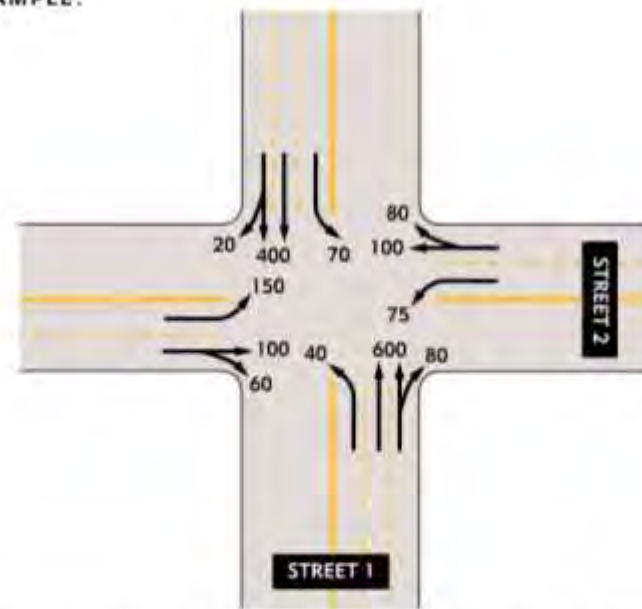


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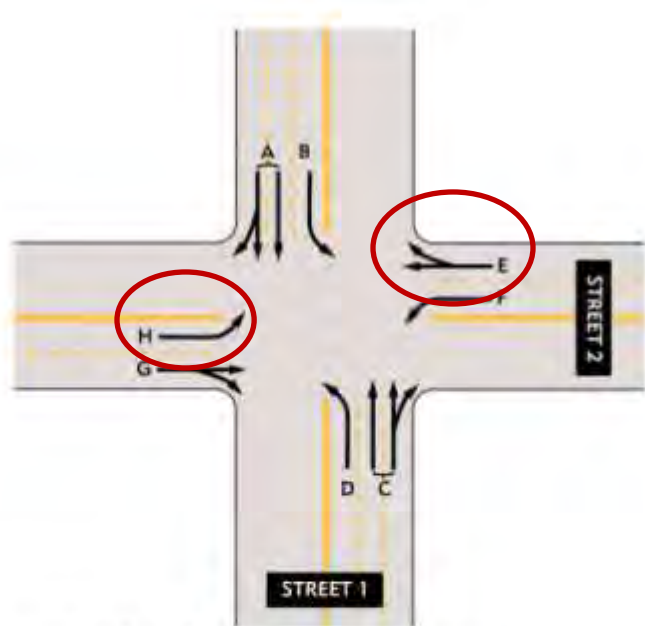


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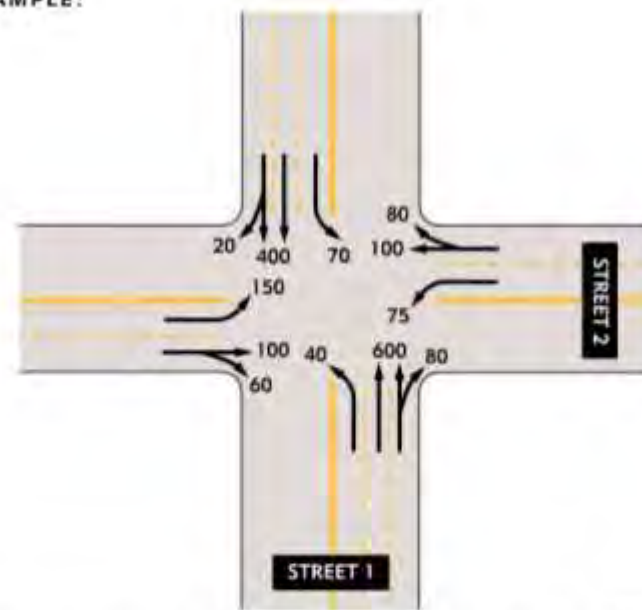


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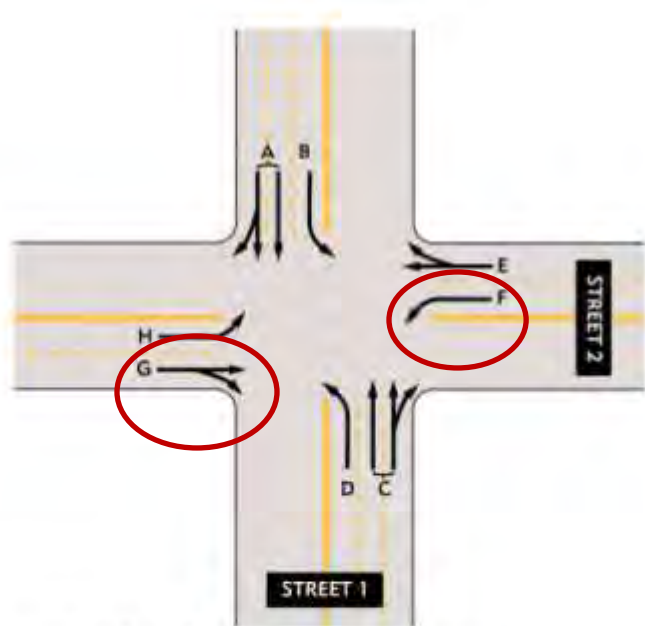


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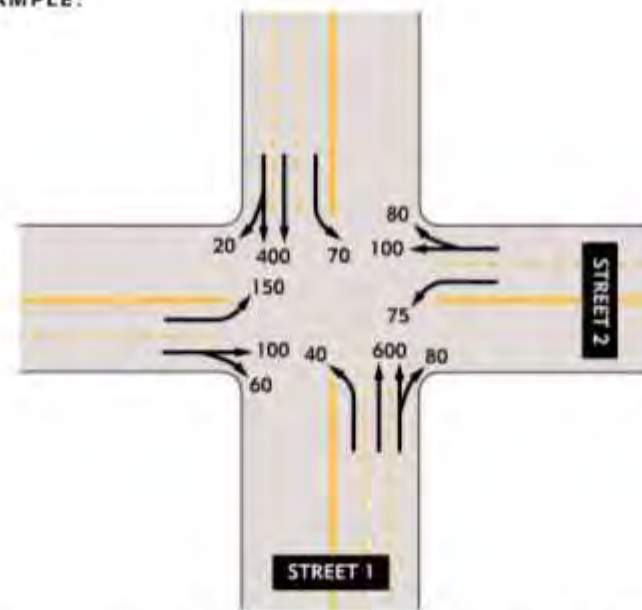


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Critical Sums by Intersection 2030 Existing Zoning

	2010		2030 Buildout	
	Existing Conditions		Existing Zoning	
	Total Volume	Critical Sum	Total Volume	Critical Sum
1. Broadway/Galilei	2292	768	2732	897
2. Broadway/Third	1964	1111	2437	1333
3. Main/Galilei/Vassar	1764	711	2183	986
4. Binney/Third	2007	742	2597	982
5. Binney/First	1311	590	1983	682
6. Binney/Land	2382	654	3019	917
7. Memorial Drive / Wadsworth	1361	680	1638	802
8. Mass. Ave/Albany	1850	807	2210	1026
9. Main/Mass./Columbia/Sidney(Lafayette Sq.)	1460	762	2053	1098
10. Mass/Prospect/River/Western(Central Sq.)	1912	825	2285	1017

- Total intersection volumes increase 19-51% (avg 27%)
- Broadway/Third closest to threshold

Critical Sums by Intersection 2030 K2C2 Proposal

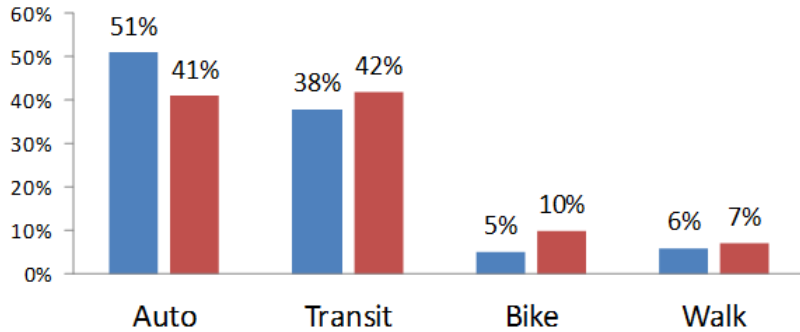
	2010		2030 Buildout		2030 Buildout	
	Existing Conditions		Existing Zoning		K2C2	
	Total Volume	Critical Sum	Total Volume	Critical Sum	Total Volume	Critical Sum
1. Broadway/Galilei	2292	768	2732	897	3022	1045
2. Broadway/Third	1964	1111	2437	1333	2787	1510
3. Main/Galilei/Vassar	1764	711	2183	986	2389	1069
4. Binney/Third	2007	742	2597	982	2929	1112
5. Binney/First	1311	590	1983	682	2182	749
6. Binney/Land	2382	654	3019	917	3162	967
7. Memorial Drive / Wadsworth	1361	680	1638	802	1677	812
8. Mass. Ave/Albany	1850	807	2210	1026	2159	1013
9. Main/Mass./Columbia/Sidney(Lafayette Sq.)	1460	762	2053	1098	2180	1145
10. Mass/Prospect/River/Western(Central Sq.)	1912	825	2285	1017	2385	1069

- Total intersection volumes increase 17-60% (avg 36%)
- Broadway/Third at threshold (1,510)

Central Square Mode Shares – Enhanced TDM

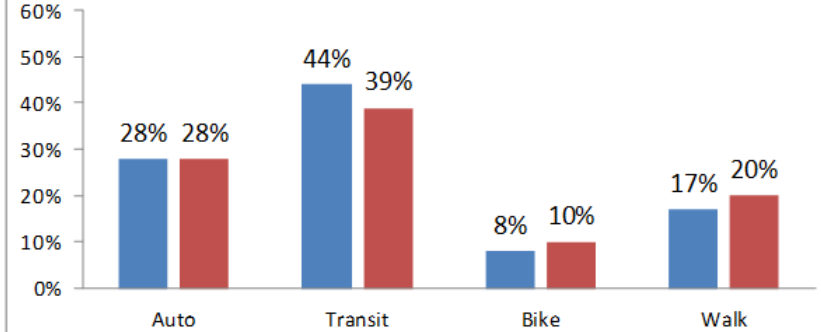
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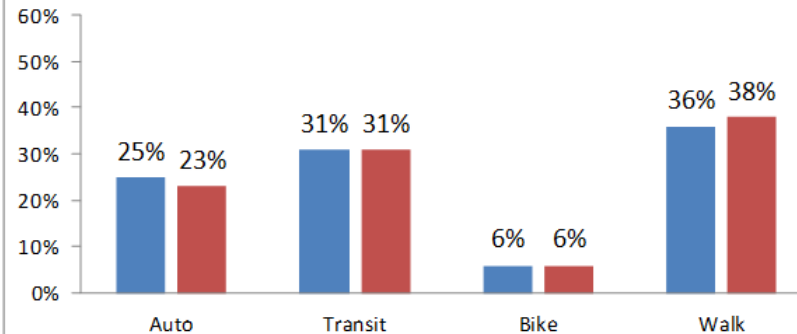
Residential

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Retail

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2030 Net New Trips by Car with Enhanced TDM

Person-Trips

Residential	1,496
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TOTAL	9,993

**25-51% of
Trips in Cars**

Vehicle occupancy
of 1.08-1.09

Car Trips

Residential	474
Employee	3,280
Retail	459
TOTAL	4,213

**10% Fewer
Car Trips**

(-736 cars)

Car Trips (enhanced TDM)

Residential	430
Employee	2,636
Retail	411
TOTAL	3,477



	2010		2030 Buildout		2030 Buildout		2030 Buildout	
	Existing Conditions		Existing Zoning		K2C2		K2C2 w/TDM	
	Total Volume	Critical Sum	Total Volume	Critical Sum	Total Volume	Critical Sum	Total Volume	Critical Sum
1. Broadway/Galilei	2292	768	2732	897	3022	1045	2906	999
2. Broadway/Third	1964	1111	2437	1333	2787	1510	2641	1440
3. Main/Galilei/Vassar	1764	711	2183	986	2389	1069	2285	1007
4. Binney/Third	2007	742	2597	982	2929	1112	2768	1044
5. Binney/First	1311	590	1983	682	2182	749	2024	722
6. Binney/Land	2382	654	3019	917	3162	967	3018	903
7. Memorial Drive / Wadsworth	1361	680	1638	802	1677	812	1615	785
8. Mass. Ave/Albany	1850	807	2210	1026	2159	1013	2110	978
9. Main/Mass./Columbia/Sidney(Lafayette Sq.)	1460	762	2053	1098	2180	1145	2063	1082
10. Mass/Prospect/River/Western(Central Sq.)	1912	825	2285	1017	2385	1069	2309	1027



	2010		2030 Buildout		2030 Buildout		2030 Buildout	
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10. Mass/Prospect/River/Western(Central Sq.)	1912	825	2285	1017	2385	1069	2309	1027

Preferred Scenario



Conclusion

- Critical sums is a planning tool
- Used to compare future build-out scenarios
- Future development projects subject to:
 - Traffic study/traffic mitigation requirements in Zoning Ordinance
 - Parking and Transportation Demand Management (PTDM) Ordinance

