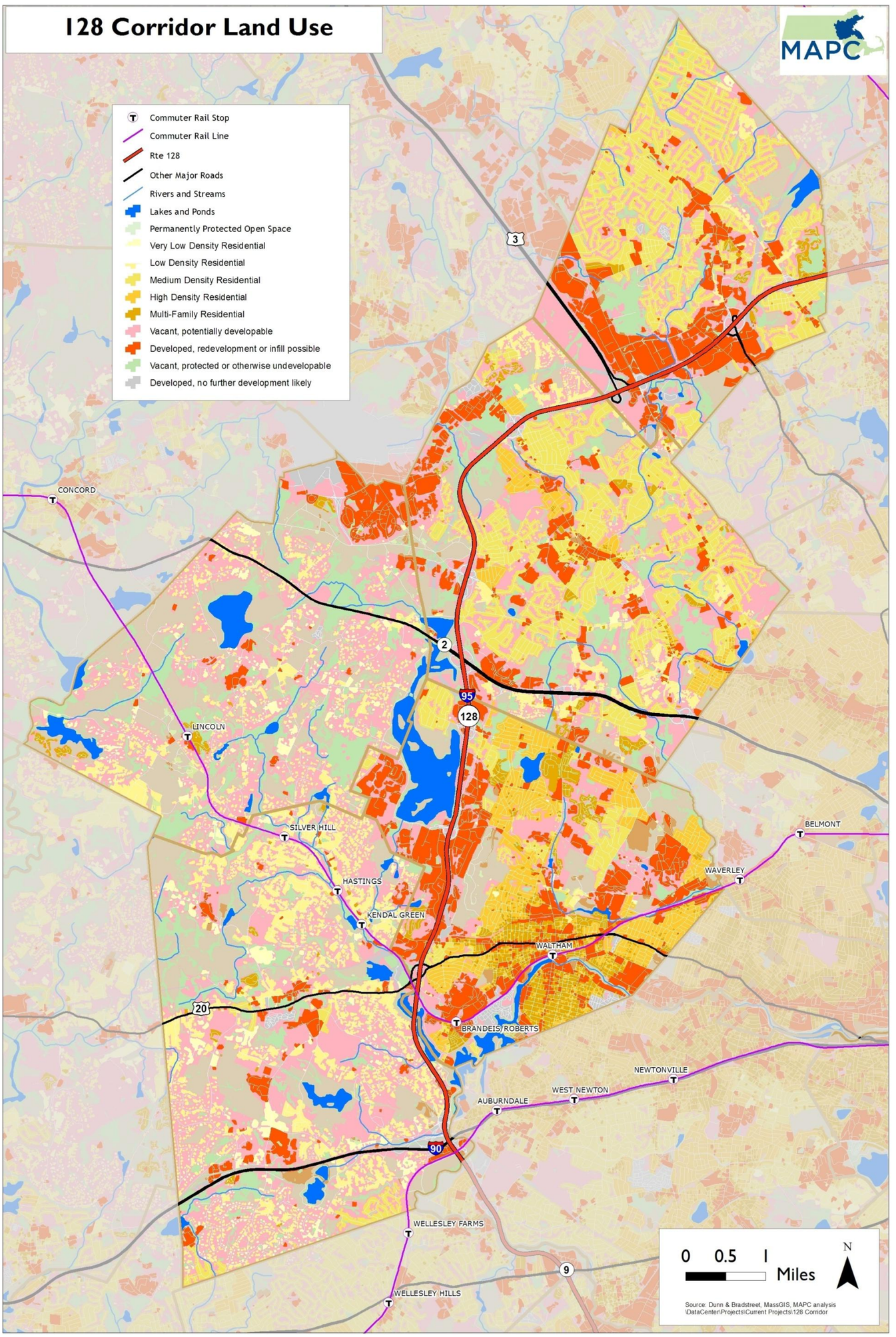
# Appendix F

# Land Use

# Appendix F


128 Corridor Land Use
MAPC
Commuter Rail Stop
Commuter Rail Line
Rte 128
Other Major Roads
Rivers and Streams
Lakes and Ponds
Permanently Protected Open Space
Very Low Density Residential
Low Density Residential
Medium Density Residential
High Density Residential
Multi-Family Residential
Vacant, potentially developable
Developed, redevelopment or infill possible
Vacant, protected or otherwise undevelopable
Developed, no further development likely
CONCORD
LINCOLN
SILVER HILL
HASTINGS
KENDAL GREEN
WALTHAM
BRANDEIS/ROBERTS
BELMONT
WAVERLEY
NEWTONVILLE
WEST NEWTON
AUBURNDALE
WELLESLEY FARMS
WELLESLEY HILLS
3
2
95
128
20
90
9
0 0.5 1 Miles
N
Source: Dunn & Bradstreet, MassGIS, MAPC analysis
\DataCenter\Projects\Current Projects\128 Corridor

# Appendix G

# Mitigation Concepts

# Appendix G Mitigation

## I. What is TDM

Transportation Demand Management, or TDM, are policies and programs that focus on reducing transportation demand and providing alternative means of travel to driving alone in a car. TDM policies and programs are intended to provide travel options and to reduce the demand for roadway improvements by reducing automobile travel, especially commuter trips during peak travel periods. TDM programs support and encourage ridesharing, transit use, walking, and bicycling.

There are many TDM strategies that influence travel behavior by mode, cost, time, or route in order to reduce single-occupancy vehicle (SOV) travel. TDM strategies are often applied to achieve public goals such as reduced traffic congestion, improved air quality, and decreased reliance on energy consumption. Employers often implement TDM strategies to reduce overhead costs and enhance productivity. The most effective financial incentives to reduce driving are employer-driven. Listed below are examples of TDM strategies that can be used as mitigation measures:

Bicycling
Provide bicycle storage, showers, and lockers and ensure the provision of bicycle parking facilities and bicycle lanes.

Carpooling
A group of two or more passengers sharing a ride in an employee's private vehicle to and from work, either using one car and/or sharing expenses.

Carsharing
A model of car rental where people rent cars for short periods of time, often by the hour.

Compressed Work Week
A scheduling program which consists of condensing the standard number of working hours into fewer than five days per week or fewer than 10 days per two week period.

Flexible Work Hours (Flextime)
A scheduling policy that gives employees the option of varying their starting and stopping times each work day (e.g. 10:00 am to 4:00 pm) when all employees are required to be present.

Guaranteed Ride Home Program
A free or subsidized ride provided to commuters who use alternative commute modes to accommodate their occasional unexpected trips, removing the concern of being stranded at work without an automobile.

Preferential Parking for Carpools/Vanpools
Assigning the most desirable parking spaces, such as those closest to building entrances, for the exclusive use of carpools and vanpools. In addition, parking charges may be partially reduced or eliminated.

Promotion of Bicycling, Walking and Public Transportation
Using bicycles and public transportation as well as walking reduces single occupancy vehicle use.

Ridesharing
Ridesharing includes carpools, vanpools, ride matching services, and shuttles, buses or vans intended to reduce commute trips. Ridesharing should be emphasized as a TDM measure in the Route 128 Corridor.

Staggered Work Hours
A scheduling policy in which the times that groups of employees begin and end work are staggered over a range from 15 minutes to two hours. The intent is to spread out commuting peaks.

Subsidizing Transit Pass Programs
Programs which employers use to provide their employees with free or subsidized transit passes.

Telework
A work arrangement in which an employee regularly works at an alternate worksite such as the employee's home.

Vanpool
A group of six or more passengers sharing a ride in a prearranged group.

**II. Community Mitigation Requirements**

In fall 2009, the Planners of Burlington, Lexington, Lincoln, Waltham and Weston were contacted by phone and asked a series of questions regarding their mitigation requirements as part of the review process for development projects. The following is a summary of the municipalities' responses:[10]

*Does your municipality have procedures in place that require mitigation for developments?*
With the exception of Lexington, the municipalities comprising the Route 128 Corridor do not have formal procedures in place to require mitigation from developments. Mitigation for developments is triggered by level of service (LOS) in Lexington. If an intersection or street segment reaches LOS E or F, two types of mitigation will be required - geometric changes to the roadway and incorporating TDM practices. In the past, mitigation primarily focused on geometric changes to the roadway, but this has been trending more recently to TDM practices. Lexington has a zoning-by-law that specifically addresses TDM measures.

Weston does not have zoning by-laws that specifically address mitigation. However, when two large developments were recently proposed (Office Park at Route 20 and Route 128 interchange and Liberty Mutual at the intersection of MassPike's Exit 14 and Orchard Avenue), mitigation was negotiated. A Special Permit from the Zoning Board of Appeals was issued and a Site Plan was approved by the Planning Board. Subsequently, a development agreement between the Town of Weston, the Board of Selectmen and the project proponent was prepared for both projects.

In Waltham, mitigation can be requested if a project requires a special permit. If a project is 'as-of-right', or is compliant with all applicable zoning regulations, then mitigation cannot be requested. This has proven to be an issue. In some cases, a project that requires special permitting can have less of an impact compared to a project that is considered to be 'as-of-right.' For example, mitigation may be requested from a small drive-through restaurant that needs a special permit whereas mitigation cannot be required from a large big-box retail store that qualifies as 'as-of-right.'

[10] Phone conversations with Anthony Fields, Planning Director, Burlington on 9/25/09; Aaron Henry, Senior Planner, Lexington on 9/23/09; Mark Whitehead, Planner, Lincoln on 9/23/09; Frank Ching, Traffic Engineer, City of Waltham on 10/6/09; e-mail from Susan Haber, Town Planner, Weston on 9/21/09 and phone conversation on 9/25/09.

Projects are reviewed on a case by case basis in Lincoln and Burlington. In Burlington, only the Planning Board will negotiate with a developer regarding mitigation.

*Does your municipality require developers to implement physical improvements (ie: sidewalks, signals) for projects of a certain size?*
With the exception of Weston, requesting physical improvements is not driven by project size. In Weston, projects over a certain size require site plan approval from the Planning Board and a Special Permit from the Zoning Board of Appeals. The Boards will place conditions on a project that may include off-site improvements such as road improvements, sidewalks or signals.

The Towns of Lincoln and Weston commented that not many developers propose development projects in their municipalities. For example, only two large commercial projects have been proposed in Weston over the past 17 years, a community which is zoned nearly 98 percent residential.

In Lexington, implementing physical improvements is based on the project's forecasted traffic impact, not project size. Burlington, Lincoln and Waltham do not have specified criteria to request physical improvements.

*Does your municipality require businesses to be a TMA member? If so, does the business need to be a certain size or have a specific number of employees?*
The requirement of businesses to be TMA members varies among the five municipalities. Until about five years ago, Burlington requested business membership in the 128 Business Council. About a year into membership, the businesses felt the TMA was ineffective. As a result, requiring TMA membership has not continued. From Lexington's position, all business should ideally be TMA members, but recognizes that this is not always the case. In Lexington, development in the Hartwell Avenue area is as of right up to a FAR of .35. In other areas of town, a special permit is required for development of 10,000 square feet or greater. Lexington also has a unique re-zoning proves that provides for custom planned development zoning districts. In those cases, the TDM section of the by-law does not apply. Lexington's zoning enabling Transportation Management Overlay Districts can be found in the zoning code, section 135-43C: Transportation Management Overlay District.

(1) Purpose. The Town may create Transportation Management Overlay (TMO) Districts that allow greater opportunity for facilitating effective multimodal transportation networks that increase the quality of life in Lexington through improved traffic management and mitigation to that outlined in Article XI, Off-Street Parking and Loading, and Article XII, Traffic, of the Zoning Bylaw consistent with the following principles:

(a) Multimodal consideration. To ensure that the safety and mobility of all users of the circulation and transportation systems, including vehicles, public transit, pedestrians and cyclist, are considered equally;

(b) Context sensitive design. To incorporate, throughout project planning, design, and construction, the overarching principles of context sensitive design, including attention to scenic, aesthetic, historic, and environmental resources; and

(c) Clear process. To develop and implement plans adopted through a broad-based, clear and transparent process.

(2) District superimposed over other districts. A TMO District shall not supersede other zoning districts, but shall be deemed to be superimposed over these other zoning districts, except that if an applicant elects to comply with the requirements in this section as provided in § 135-43C(3) below, this § 135-43C shall supersede §§ 135-71 through 135-73. The boundaries of TMO Districts shall be indicated on the Town's official Zoning Map.

(3) Applicability. The provisions of this section shall apply to developments located within a TMO District that elect to comply with the requirements of this section, § 135-43C, instead of complying with §§ 135-71 through 135-73. Notwithstanding anything set forth herein to the contrary, an applicant may not make such an election until a plan for the TMO District has been adopted by the Planning Board as described below. A final certificate of occupancy shall not be issued unless or until all provisions of § 135-43C have been

satisfied, except for those conditions that by their terms are intended to be satisfied after occupancy of the structures for which the certificate of occupancy is sought.

(4) Transportation study required.

(a) The Planning Board, after consultation with the Board of Selectmen and an advertised public meeting, shall adopt a specific plan for each TMO District containing the following elements:

[1] Assessment of the impacts of reasonably anticipated future development in the TMO District considering current zoning bylaws and other legal and physical constraints;

[2] Analysis of existing capital improvement plans or the facilities element of a plan adopted under Massachusetts General Law, c. 41, § 81D;

[3] Cost projections for transportation infrastructure improvements required to address the impacts generated by the anticipated development in the TMO District, including the potential impact on nearby residential streets and neighborhoods;

[4] Analysis of other reasonably anticipated sources of funding;

[5] Required transportation mitigation fees in accordance with a methodology determined pursuant to this study;

[6] Off-street parking and loading requirements for the TMO District;

[7] Parking and transportation demand management techniques reasonably calculated to reduce the number of vehicle trips generated by developments in the TMO District and to ensure the long-term stability of the transportation system;

[8] An implementation program that defines and schedules the specific municipal actions necessary to achieve the objectives of the plan; and

[9] A plan to encourage voluntary participation in TDM programs by those not required to participate.

(b) The plan shall be updated periodically to reflect actual development activity, actual costs of infrastructure improvements completed or underway, plan changes, or amendments to the Zoning Bylaws.

(5) Transportation mitigation fee.

(a) The payment of a transportation mitigation fee is required when an applicant elects to proceed under this section. The imposition of a transportation mitigation fee shall not prevent the Town from imposing fees it may otherwise impose under local bylaws.

(b) Timing of payment. Payment of the transportation mitigation fee shall be in cash, under terms and conditions specified in the TMO District plan.

(c) Payment use. Any transportation mitigation fees paid to the Town are intended to be used to fund transportation infrastructure improvements that are necessitated by the proposed development of the applicant. Examples of appropriate uses include the costs related to the provision of equipment, infrastructure, facilities, services, or studies associated with the following: traffic mitigation; public transportation; bicycle and pedestrian accommodations or other transportation-related improvements. Except where deficiencies are exacerbated by the new development, in which case the fee may be assessed only in proportion to the deficiency so exacerbated, the fee shall not be expended for personnel costs, normal operation and maintenance costs, or to remedy deficiencies in existing facilities. The expenditure of the fees without Town Meeting appropriation is prohibited.

(d) Rough proportionality and reasonable benefit to fee payer. The transportation mitigation fee shall be determined by the TMO District plan described in § 135-43C(4). The fee shall be roughly proportionate to the impacts created by the development. The purposes for which the fee is expended shall reasonably benefit the proposed development.

(6) Parking and traffic demand management.

(a) Submission of a parking and transportation demand management (PTDM) plan which is consistent with the TMO District plan described in § 135-43C(4) above is required when an applicant elects to proceed under this section, § 135-43C. Compliance with the submitted PTDM plan shall be a condition of any permit approvals.

(b) Enforcement. Compliance with the PTDM plan submitted with an approved permit application may be enforced through § 135-9.

(7) Special permits. Where a development electing to proceed under this section also requires a special permit or special permit with site plan review, the SPGA shall not grant the special permit unless it imposes conditions, including transportation mitigation fees and parking and traffic demand management requirements, to meet the goals of the TMO District plan.

Waltham will require membership in the 128 Business Council only if the project needs a special permit. Membership in the 128 Business Council was required by the Town of Weston for its two large commercial projects. Lincoln does not require businesses to be TMA members.

*Does your municipality require developers to contribute funds for projects of a certain size? If so, how are these funds received and managed?*

With the exception of Lincoln, the municipalities do require developers to contribute funds for projects. Burlington encourages developers to make physical improvements rather than receiving funds. If funds are received for a project, the Planning Department allocates their use. Waltham will require a developer to contribute to the City's Traffic Safety and Infrastructure Maintenance Fund. The monetary contribution only applies for projects requiring a special permit and the amount is based on the project's FAR and square footage.

The receipt of funds is done on a case by case basis in Lexington and is required for large projects. Funds either go to a general fund or are applied to a specific use or uses (i.e., adopting a park). It is very rare if funds are applied for a single use. In Weston, the receipt of funds is also on a case by case basis. For example, the developer of the Office Park agreed to contribute $500,000 as part of the development agreement with the Town. Held as a separate agency account with the Board of Selectmen, the funds are slated to address the forecasted traffic increase along Summer Street, a residential road abutting the development.

*Does your municipality have any enforcement mechanisms in place requiring developers to implement agreed-upon mitigation?*

A Certificate of Occupancy will not be issued until mitigation has been implemented in Burlington and Weston. In Lexington, developer agreements for large projects are monitored by a traffic study after five years. A penalty will be incurred if traffic conditions are not met according to the study. Due to lack of funding and resources, neither Lincoln nor Waltham is in a position to monitor enforcement mechanisms.

*How does your municipality distinguish by-right development, special permits and local permits?*

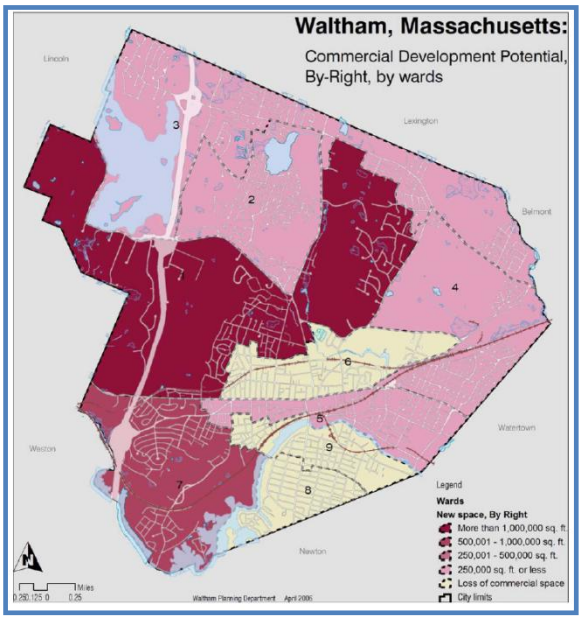
The distinction between by-right development, special permits and local permits varies among the municipalities. Below is a summary of each municipality:

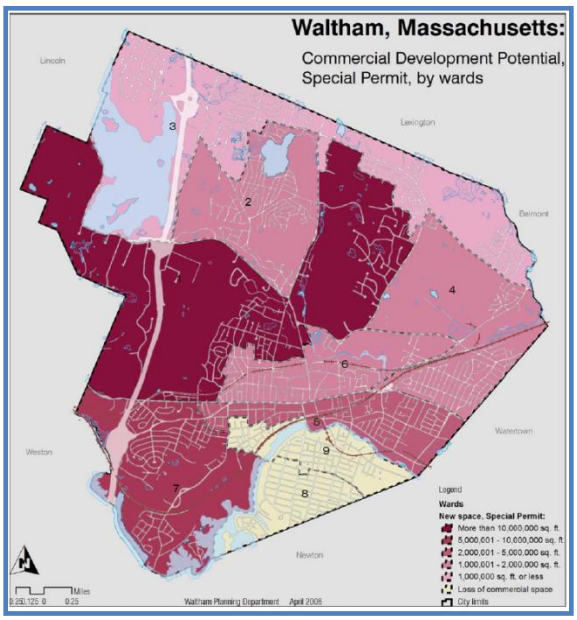
Burlington - The Planning Board approves all projects with the exception of single family houses. Projects with by-right development require a majority vote (minimum 4-3) and projects needing a special permit require a two-thirds vote (minimum 5-2).

Lexington - Generally speaking, developments of 10,000SF or greater require special permits. Lexington has a unique re-zoning process and does not have by-right development. For example, planned developments can be custom zoning districts. As a result, the TDM section of the by-law does not apply. There can be a lot of variation for local permits when compared to special permits on a case by case basis.

Lincoln - Most projects are single family homes which require a special permit. These projects undergo site plan review. Some projects are in PDD (Planned Development Districts). Projects in a PDD require Town Meeting approval and then go to the Planning Board for a special permit.

Waltham - Special permits require mitigation whereas by-right development does not. Figures from the Waltham Community Development Plan (June 2007) depict the square footage that can be developed by-right and by special permit.




Weston - If the project is in an Overlay District (i.e., Wetland and Floodplain Protection District) the Planning Board has Special Permit Granting Authority. The same is true for an AARD (Active Adult Residential Development, min lot size 40 acres). The Planning Board has site plan approval authority for commercial developments under 1,000SF. The Planning Board approves commercial developments in excess of 1,000SF but a Special Permit is also required by the ZBA.

## III. Communities' Existing Legislation or Documentation Pertaining to TDM and Mitigation

The following summarizes the existing legislation or documentation Burlington, Lexington, Lincoln, Waltham and Weston have with regard to TDM and mitigation:

**Lexington**

The Town of Lexington adheres to an extensive Transportation Demand Management (TDM) policy for existing and new businesses. Lexington has a TDM Bylaw which provides developers with the option of creating a TDM plan as mitigation for negative traffic impacts of a development. Many developers fulfill this condition by joining the 128 Business Council. Adopted in 1987, the Bylaw is Article XII of Chapter 135, Traffic, of the Zoning Bylaw of the Code of the Town of Lexington.

Article XII establishes minimum criteria for requiring traffic studies and mitigation of traffic impacts caused by a proposed development. For applicable developments, building permits shall not be granted until the SPGA (Special Permit Granting Authority – usually the Planning Board or Zoning Board of Appeals) has determined that there is adequate traffic capacity for the new development. Applicable developments include commercial establishments over 100,000 square feet, new housing developments with 25 units or more, and other activity that generates 50 or more new vehicle trips per day.

In March 1997, the Planning Board adopted a TDM Policy, which is much more detailed than Article XII. The thresholds for TDM are the same as those triggering traffic impact studies. Developers must

provide a written TDM plan, which includes measures selected from a variety of transportation services outlined in nine categories in the policy. These include site design, transportation information, and connections to transit. A reporting component is also detailed in the policy. Although the Transportation Element of Lexington's Comprehensive Plan recommends rigorously implementing, enforcing and monitoring Lexington's TDM Policy and Article XII, monitoring and enforcement has remained challenging[11].

Lexington also has LEXPRESS, a fixed route minibus service, which connects Lexington's neighborhoods with town services and shopping centers. Ridership has been growing by about eight percent annually, with approximately 70,000 riders in 2008. LEXPRESS is funded by the Town of Lexington and the MBTA and has been in operation since 1979.

LEXINGTON'S TRANSPORTATION DEMAND MANAGEMENT POLICY

Adopted by vote of the Planning Board, September 16, 1998

Originally adopted March 10, 1997

OBJECTIVES:

This Policy focuses on meeting the transportation needs of Lexington by a variety of measures that affect the demand for, and use of, various modes of travel rather than changes in the supply of transportation facilities, such as the construction of roadways and multi-level off-street parking facilities.

The Policy seeks to reduce the use of automobiles, particularly single occupant vehicles (SOV), in order to:

1. permit vehicular traffic on Lexington streets to move in an efficient manner without excessive delay or congestion,

2. reduce motor vehicle and pedestrian accidents on the town's streets,

3. permit emergency vehicles to reach homes and businesses with a minimum of delay,

4. reduce the awareness of and impact from vehicular traffic on a predominantly residential town,

5. promote safe and convenient routes for pedestrians and bicyclists,

6. promote cleaner air and reduce automotive exhaust emissions caused by vehicles standing and idling for an excessive time,

7. maintain a balance between the traffic generating capacity of businesses and residential development in the town and the traffic carrying capacity of streets and intersections.

The Policy also seeks to:

1. assure adequate opportunities for mobility for all Lexington residents, workers and visitors, and

[11] Composite Goals and Objectives from Vision 20/20 and Comprehensive Plan, Lexington 2020 Vision, January 2001, The Lexington We Want: Comprehensive Plan, First Four Elements, 2002 and The Lexington We Want: Comprehensive Plan, Transportation Element, 2003.

2. expand the Town's inventory of data about transportation needs and transportation utilization.

The Policy seeks to aid Lexington businesses and other establishments to:

3. reduce the cost of operations for Lexington companies and establishments caused by delays in vehicular traffic,

4. expand the pool of potential employees who can reach places of work in Lexington more easily and economically,

5. employ a more efficient and satisfied work force less concerned at the work place by the frustrations of transportation, particularly commuting,

6. permit potential customers and clients to reach places of business in Lexington more easily and economically,

7. provide transportation services more effectively in collaboration with other businesses and with the Town.

*(Traffic Executive Summary, Comprehensive Plan, 2003).*

Written Transportation Demand Management Plan Required

A developer or property owner:

a. constructing a more intensive commercial development or

b. constructing a higher density of residential development or

c. that proposes another activity that increases the number of vehicular trips by 50 or more trips per day, shall be responsible for preparing and administering a written Transportation Demand Management Plan. [This responsibility may be delegated to a company or other tenant of a building.]

The developer may also propose alternative transportation infrastructure improvements and alternative transportation services in the event that the principal proposed facilities and services cannot be successfully achieved.

It will usually be necessary to enter into a written agreement with the Town to insure that the provisions of the Transportation Demand Management Plan are carried out by the developer and subsequent occupants or owners.

## Article XII of Chapter 135, Traffic, of the Zoning Bylaw of the Code of the Town of Lexington

**ARTICLE XII**
**[Added 5-6-1987 ATM by Art. 43]**

**§ 135-71. Objectives and applicability.**

A. The provisions of this article are intended to achieve the following purposes:

(1) To permit vehicular traffic on Lexington streets to move in an efficient manner without excessive delay or congestion;

(2) To permit emergency vehicles to reach homes and businesses with a minimum of delay;

(3) To reduce motor vehicle and pedestrian accidents on the town's streets;

(4) To consider and allow for safe and convenient routes for pedestrians and bicyclists;

(5) To promote cleaner air and to reduce automotive exhaust emissions caused by vehicles standing and idling for an excessive time;

(6) To promote the efficient use of the town's arterial and collector streets so that use of local and neighborhood streets as shortcuts can be discouraged;

(7) To avoid excessive traffic demand on Town streets that necessitates extraordinary Town expenditures to maintain adequate and safe traffic flow;

(8) To maintain a balance between the traffic-generating capacity of dwellings and businesses in the Town and the traffic-carrying capacity of streets and intersections;

(9) To encourage alternative methods of transporting people, through public transportation, car pools and van pools, bicycling and walking, rather than near exclusive reliance on single-occupant automobiles;

(10) To encourage the use of good traffic engineering principles and design standards consistent with a predominantly residential suburban town;

(11) To encourage the positive management of traffic flow consistent with the town's other stated objectives;

(12) To encourage private sector participation in dealing with the town's traffic problems;

(13) To expand the town's inventory of data about traffic conditions on Town streets.

B. No building permit shall be granted for the erection of a new building or the enlargement or renovation of an existing building with the result that there are 10,000 square feet or more of gross floor area on the lot, including any existing floor area, but not including any floor area devoted to residential use or to off-street parking, or there are 50 or more dwelling units, or their equivalent, in a development, including any existing dwelling units, the number of parking spaces is increased by 25 or more and there are 50 or more parking spaces, including any existing parking spaces, on the lot, unless a special permit with site plan review has been granted and the SPGA has made a determination that the streets and intersections affected by the proposed development have, or will have as a result of traffic improvements, adequate capacity, as set forth in § 135-73, to accommodate the increased traffic from the development. The requirement for a special permit with site plan review (SPS) does not apply to a religious or nonprofit educational use, as described in § 135-9E(1). **[Amended 4-6-1988 ATM by Art. 38; 3-27-1991 ATM by Art, 30; 3-30-1998ATM by Art. 38]**

**§ 135-72. Traffic study required.**

A. A traffic study shall be submitted with each application for a building permit, special permit or special permit with site plan review to which § 135-71B is applicable, or where required by any other provision of this By-Law.

B. The traffic study shall be conducted by a traffic engineer who will certify that he/she qualifies for the position of member of the Institute of Transportation Engineers (ITE).

C. For the purposes of this analysis, the terms below shall have the meaning indicated. The morning and evening "peak period" shall usually be the two hours between 7:00a.m. and 9:00a.m. and between 4:00 p.m. and 6:00p.m. respectively. The morning and evening "peak hour" shall be that consecutive sixty-minute segment within the peak period in which the highest traffic count occurs as determined by traffic counts of the peak period divided into fifteen-minute segments. For uses which have an exceptional hourly, daily or seasonal peak period, the SPGA may require that the analysis be conducted for that extraordinary peak period. A street or intersection "likely to be affected by the development" is one which has an average daily traffic (ADT) of 2,000 vehicles or more and either:
   (1) Carries 10% or more of the estimated trips generated by the development; or
   (2) In the case of an intersection only, traffic from the proposed development will add 5% or more to the approach volumes. **[Amended 4-6-1988 ATM by Art. 38]**

D. The traffic study shall include:

(1) An estimate of trip generation for the proposed development showing the projected inbound and outbound vehicular trips for the morning and evening peak periods and a typical one hour not in the peak period. Where there is existing development of the same type of use on the site, actual counts of trip generation shall be submitted. Trip generation rates may be based on:

(a) **[Amended 5-8-1996 ATM by Art. 29; 4-2-2003 ATM by Art. 17]** The most recent edition of "The Trip Generation Manual" prepared by the Institute of Transportation Engineers that is on file in Lexington Town Engineer's office; and, if applicable,

(b) Data about similar developments in Massachusetts; or

(c) Data from professional planning or transportation publications, provided the methodology and relevance of the data from Subsection D(l)(b) or (c) is documented.

(2) An estimate of the directional distribution of new trips by approach streets and an explanation of the basis of that estimate. Where there is existing development of the same type of use on the site, actual counts of trip directional distribution shall be submitted.

(3) An assignment of the new trips to be generated by the proposed development to the segments of the Town street network, which shall include state highways in Lexington, which are likely to be affected by the proposed development (see Subsection C).

(4) Average daily traffic (ADT) on the streets likely to be affected by the development (see Subsection C), counted for a twenty-four-hour period.

(5) Intersection turning movement counts of the morning and evening peak periods at the intersections likely to be affected by the proposed development (see Subsection C). In special circumstances where the peak traffic impacts are likely to occur at times other than the usual morning and evening peak periods, the SPGA may require counts for those other peak periods.

(6) An inventory of roadway characteristics of the principal approach streets adjacent to the development site and of the streets in the intersections at which turning movement counts are taken showing the width of the right-of-way and of the traveled way, traffic control devices, obstructions to adequate sight distance, the location of driveways or access drives within 500 feet of the entrance to the site for uses that are substantial trip generators, and the presence or absence of sidewalks and their condition.

(7) In the case of a development in an abutting city or Town which will have a traffic impact on a street or intersection in Lexington which is one that is likely to be affected by the proposed development for which the traffic study is being prepared, the traffic impact of the development in the abutting city or Town shall be included in the traffic study provided:

(a) That traffic impact is equal to or greater than that set forth in the test in Subsection C;

(b) The development has been approved by official action of that abutting city or Town but has not opened for use prior to the date that the traffic counts required by this section were taken; and

(c) Data on the traffic impact of that development, comparable to that required by this section, is available.

(8) An analysis of the effect on the capacity of those intersections in the Lexington street system likely to be affected by the development (see Subsection C) during peak periods of:

(a) The additional traffic generated by the development; and

(b) Additional traffic from other developments previously approved by the Town of Lexington for which a traffic study was required, or by an abutting city or Town as provided in Subsection D(7) above, which have not yet been opened far use prior to the date that the traffic counts required by this section were taken. Analysis of the capacity of intersections shall be based on traffic levels of service as described in the "Highway Capacity Manual, 1985 Edition" published by the Transportation Research Board. This analysis may include an intersection of an access drive serving a development and a segment of the Lexington street system.

(9) Where mitigating measures or trip reduction programs are proposed, they shall be proposed by the applicant and shall accompany the traffic study at the time of filing of the application. Where the proposed mitigating measure is the construction of a traffic engineering improvement, evidence, such as letters of support, or commitment, or approval, or the award of a contract, may be submitted to show that construction of the traffic improvement is likely to occur. **[Amended 4-6-1988 ATM by Art. 38]**

(10) An estimate of the time and amount of peak accumulation of off-street parking. The counts referred to above shall have been taken within the 12 months prior to the filing of the application. Upon request, the traffic engineer shall furnish an explanation of the methodology of the traffic study and additional data, as needed.

**§ 135-73. Adequate traffic capacity.**

A. Prior to granting a special permit or special permit with site plan review in those cases covered by § 135-71B or as may be required elsewhere in this By-Law, the SPGA shall determine that the streets and intersections likely to be affected by the proposed development currently have, or will have as a result of traffic improvements, adequate capacity, as defined in Subsection B. In making its determination of adequate capacity, the SPGA shall consider at least the cumulative effect on a street or intersection likely to be affected by the development, as provided in § 135-72C,of:

(1) Existing traffic conditions;

(2) Estimates of traffic from other proposed developments which have already been approved in part or in whole by the Town of Lexington for which a traffic study was required, or by official action of an abutting city or town, which have not yet been opened for use prior to the date that the traffic counts required by this article were taken; and

(3) Estimates of traffic from the proposed development.

B. Adequate capacity defined by level of service. Adequate capacity shall mean level of service "D" or better as described in the "Highway Capacity Manual, 1985 Edition" published by the Transportation Research Board. If the level of service that would result from the cumulative effect, referred to in Subsection A, is "E" or below, the SPGA shall determine there is not adequate capacity and shall deny the application.

C. Mitigating measures to improve capacity. **[Amended 4-11-1988ATM by Art. 38]**

(1) The SPGA shall consider that various traffic engineering improvements, or other method of positive traffic control, such as a traffic control officer, can improve the traffic-carrying capacity of an intersection or street and improve the level of service rating to a higher and acceptable value. The SPGA shall consider such improvements, or other method of traffic control, in its determination and may make a conditional determination that adequate capacity is dependent upon the construction of the traffic engineering improvement, or other method of traffic control.

(2) The SPGA may make a condition of its approval of the special permit or special permit with site plan review that the start, or any stage, of the construction of the development, or the occupancy

thereof, is dependent upon the start or completion of the traffic engineering improvement or of the start of another method of positive traffic control, such as a traffic control officer, on a permanent basis. A conditional approval shall be dependent upon at least a start of the physical construction of the traffic engineering improvement or the execution of an agreement with the Town of Lexington for another method of traffic control. Letters of support, or commitment, or approval, or the award of a contract are not considered as a start of construction. However, as the basis for making a conditional determination of adequacy, the SPGA may consider as evidence that the traffic-carrying capacity will be improved to a higher level of service, such letters of support, or commitment, or approval, or the award of a contract for construction of the traffic engineering improvement, or a proposed agreement with the Town of Lexington for another method of traffic control.

D. Trip reduction requirements. **[Amended 4-4-1990 ATM by Art. 36]**

(1) As a condition of its approval of a special permit or a special permit with site plan review, the SPGA may require actions and programs by the owner and/or manager of a development to reduce the number of single-occupant automobile trips made to a development, particularly during peak traffic hours. Such actions and programs may include:

(a) Providing a pass to employees for use on a public transportation system that serves the development site;

(b) Use of car pools and van pools;

(c) Scheduling of hours of operation such as flex-time, staggered work hours, and spread scheduling that reduces trips during peak traffic hours;

(d) Preferential parking locations and arrangements for vehicles other than single-occupant automobiles;

(e) Restrictions on access to, or egress from, off-street parking areas during peak traffic hours; or

(f) Bicycle parking facilities and other measures such as locker and shower facilities to encourage bicycle commuting.

(2) Where such conditions are included, they shall include a reporting system which monitors the effectiveness of the trip reduction program. The SPGA may make a condition of the granting of the special permit or special permit with site plan review that:

(a) Such monitor be directly responsible to and report to the Building Commissioner or designee; and

(b) The applicant be responsible for the cost of providing such monitoring system.

(3) If the Building Commissioner or designee determines that the conditions of the special permit or special permit with site plan review are not being met, he/she shall order the applicant to bring the development into compliance or shall take such other corrective enforcement action as may be needed to ensure compliance.

**Waltham**

The City of Waltham's Traffic Safety and Infrastructure Maintenance Fund

The General Ordinances of the City of Waltham, Massachusetts, v11, Updated 4-2009, Part III Zoning Code, Article III. Establishment of Districts, Sec. 3.5. Special Permits

3.539. Traffic Safety and Infrastructure Maintenance Fund.

(1) Except as otherwise provided in Sections 8 354, 8 433 and 8.435 and all other relevant provisions of the Riverfront Overlay District and Planned Unit Development sections of this chapter and Section 9 16 of this chapter, the City Council shall, upon the granting of a special permit for an increase in intensity of use, require the applicant to make a contribution into the Traffic Safety and Infrastructure Maintenance Fund ("fund") only for that portion of the new structure or structures which is in excess of the FAR allowed by right or in excess of the FAR which is in existence on the subject lot at the time of the filing of the application for the special permit, whichever is less The rate of contribution shall be $3 per square foot of gross floor area of a building whose primary use shall be for office or retail space, and the rate of contribution shall be $1 per square foot of gross floor area of a building whose primary use will be for multifamily dwelling units in any residential development of 10 or more units or as a research laboratory or structure or for industrial, manufacturing, warehousing, product and material distribution or similar purposes. The primary use of a building or buildings, for the purpose of this section, shall be deemed to be office or retail use where the total square foot floor area used for office or retail purposes, considered ether individually or where both uses are added together, constitute more than 20% of the entire gross square foot floor area of the building or buildings in question Otherwise, the primary use of the building or buildings shall be deemed to be for use other than office or retail, and the rate of contribution shall be $1 per square foot of gross floor area. [Amended 6-10.1991 by Ord. No. 27154; 9-25-1991 by Ord. No. 272241

(2) Said Traffic Safety and Infrastructure Maintenance Fund shall be established in the city treasury and shall be kept separate and apart from other moneys by the City Treasurer Any moneys in said "fund" shall be expended only at the direction of the City Council, for the purposes mentioned below without further appropriation. All moneys which are collected as a result of any contribution to this "fiend" shall be transferred to the principal of said "find", and the City Treasurer shall be custodian of the "find" and may deposit the proceeds in a bank or invest the same in such securities as are legal for the investment of funds of savings banks under the laws of the commonwealth or in federal savings and loan associations situated in the commonwealth. Any interest earned thereon shall be credited to and become part of such "fund". The "fund" shall be administered by the Traffic Engineer of the city In matters not exclusively involving traffic regulations and controls, the Traffic Engineer shall consult with and obtain recommendations and cost estimates from the appropriate department heads.

(3) Any moneys in the "fund" may be expended only by a majority vote of the entire membership of the City Council and shall be appropriated only for the purpose of maintaining and improving traffic safety and for the purpose of maintaining and improving the traffic safety infrastructure in the city, which shall include traffic regulation and control, road improvements (including widening), street lighting, sidewalks and other public services related to the maintenance of traffic safety and safe public utilities, including new construction where needed The cost of land takings necessary to accomplish any of the purposes listed herein shall also be considered a proper purpose for the expenditure of moneys from this "fund" No moneys in this "fund" shall be used for any purpose not included or directly related to the purposes listed above Further, moneys contributed by a certain applicant for a special permit for an increase in intensity of use shall be spent on city services related to said development.

(4) The payment of the required contribution shall be made in accordance with the following schedule- An initial payment of 25% of the required amount, and an irrevocable letter of credit for the balance shall be made within 30 days after the issuance of the building permit.

Thereafter, the Traffic Engineer may, at any time after the city has awarded any contract for work to be performed pursuant to the terms of the special permit, requisition against the letter of credit an amount of money equal to the full amount of said contract; and thereafter he may requisition, but not more frequently than once every 60 days, up to 25% of the original amount of the entire impact fee, until the entire amount of the impact fee has been paid In the event that no contract for the performance of such work has been awarded within 90 days after the issuance of said building permit, the Traffic Engineer may, at any time thereafter but not more frequently than once every 60 days, requisition up to 25% of the original amount of the entire impact fee, until the entire amount of the impact fee has been paid. The balance of the entire amount of the impact fee shall be paid no later than one year from the date of the issuance of the building permit or before the issuance of the final permanent occupancy permit, whichever occurs first. All payments received by the city under the provisions of this subsection shall be placed into the "fund", and no moneys in the "fund" shall be expended without the specific approval of the City Council [Amended 6-10-1991 by Ord. No. 27154]

(5) (Reserved)

(6) Said moneys shall be paid by applicants seeking a special permit for increased intensity of use, and provided further that all contributions must be paid into the "fund" before a permanent occupancy permit will be issued.

3.5391 Order by City Council Any final action by the City Council shall be in the form of an order which shall include findings of compliance with the matters in Sections 3 53 through 3.539 Such order shall clearly relate to the plans as submitted and shall identify any additional conditions or limitations determined by the City Council to be appropriate.

**Weston**

The Town of Weston's Filing Procedures for Site Plan Approval

Filing Procedures for Site Plan Approval, Section 4.14 – Traffic Study

The Traffic Study Area will be defined by the Planning Board to include all Intersections and roads within 500' of the development site, as well as all intersections and roads potentially impacted by the proposed development. A detailed traffic study will evaluate the traffic before development, during development (including any phased development stages), and post development. The traffic study shall include: present and projected number of vehicle trips by vehicle type; i.e. passenger car, delivery truck, employee vehicle, public transit, etc. estimated daily A.M. and P.M. peak hour traffic levels; accident records for five years in the traffic study area including nature of accident and time of day; the proposed traffic flow pattern including vehicular movements at all intersections likely to be affected by the proposed use of the site; the impact of this traffic upon existing abutting public ways in relation to existing road capacities before, during, and after development; the adequacy of vehicular queuing storage at the site entrance; and transportation management system plans and traffic mitigation measures that are consonant with Town character and acceptable to the Planning Board. The traffic study area shall be defined by the Planning Board. The traffic study should take into account any proposed projects or road improvements that are being considered by local, state, or other agencies that may affect the proposed traffic projections.

*(Rules and Regulations for Site Plan Approval, 1991)*

**Lincoln**

Depending on a project's size, the Town of Lincoln either encourages or requires future commercial development projects to prepare and adhere to a Transportation Demand Management (TDM) plan for employees[12].

[12] Lincoln Comprehensive Plan, Version 6, July 11, 2009.

**Burlington**
According to the Town of Burlington's Zoning By-Law (amended through January 2009), projects with Special Permit Requirements require a traffic analysis that also includes 'proposed mitigating measures' to 'maintain an acceptable traffic level of service.'

**IV. Establish Standard Development Impact Fees**
Impact fees are one-time payments made by an applicant to a government entity as a condition of approval on a proposed development. Impact fees offset the extra municipal capital costs of infrastructure necessary to service the proposed development. These funds must be used for governmental services or infrastructure improvements that are affected by the proposed development (i.e., streets, sewers, water supplies, or other capital facilities). The developer is charged based on a formula (i.e., the number of bedrooms, or the square feet of a building permit). Nationwide, impact fees are becoming the mitigation tool of choice.

Impact fees can be based on projected/expected traffic, or on monitored volumes. In either case, the fee for new auto trips should be greater than the cost to the developer of providing alternative modes – walking, biking, transit, ridesharing. If the fee is based on projected auto trips there is still a need to monitor performance unless the fee is simply for all trips, although this is not recommended since it doesn't encourage the "right kind" of trips. The fee schedule should depend on the cost of planned improvements.

A joint mitigation bank would collect the fees from new projects in all corridor communities, or all new developments in the designated corridor overlay districts in all communities. An impact fee structure would have to be consistent among the five communities and would ideally be structured to tie in with smart growth principles. Funds would be used to support any of the projects identified in the Corridor Plan. A five community oversight committee will need to be established to prioritize the spending of the fees. The joint mitigation bank would be held and administered by a public agency, such as MAPC. The joint mitigation bank could support three levels of mitigation improvements:

- Public projects on which federal, state or local funds would be 'matched' by the mitigation fund. These types of projects would include state highway improvements, street and sidewalk improvements, or transit services.

- Mitigation measures required by MEPA.

- More generic mitigation improvements.

MetroFuture, MAPC's plan for the greater Boston region, supports the application of impact fees. One of MetroFuture's recommendations is to "enable the widespread application of impact fees." According to MetroFuture, an impact fee is a:

> Calculated and consistent charge on new development that is used by municipalities and other public entities to offset the cost of providing new services. For example, a municipality can collect impact fees from developers to pay for a turn lane that will be needed once the traffic volume increases due to several developments, but each of the developments has paid "its fair share" of the cost into a mitigation bank so that the dollars are available once the lane is needed. This process allows the municipality to meet the cumulative impact of multiple developments, which currently burdens the municipal infrastructure.

Impact fees have been used in some Massachusetts communities as part of the development approval process, but there is no specific authorization in the Massachusetts General Laws. For example, the State Legislature empowered the Cape Cod Commission to implement impact fees in Barnstable County in 1989. Under the Cape Cod Commission Act, towns within Barnstable County may impose impact fees upon certification of their local comprehensive plans by the Cape Cod Commission. The municipality in which the development would occur would hold and allocate the impact fees collected.

Any imposed impact fees must meet the following criteria: have a rational nexus to the impact created by the development; reasonably benefit the proposed development; be used for the development/improvement of capital facilities in accordance with the Commission or municipalities' capital facilities planning element; and be expended within a reasonable period of time.

To be legally defensible, an impact fee must be reasonably related to the infrastructure needs created by the development to which it applies. The fee payer must receive some benefit from the additional facility, and the fee must be proportional to the impact of the development.

The Massachusetts courts have established a three-pronged test to distinguish an impact fee from a tax. In order to meet this test, impact fees must be:

- Charged in exchange for a particular governmental service which benefits the party paying the fee in a manner "not shared by other members of society;"

- Paid by choice in that the party paying the fee has the option of not utilizing the governmental service and thereby avoiding the charge; and

- Collected not to raise revenues, but to compensate the governmental entity providing the services or shouldering the impact.

The three-pronged test was developed in 1983 in *Emerson College v. City of Boston*, and most recently applied in *Greater Franklin Developers Ass'n v. Town of Franklin* in 2000. Applying the three-pronged test, the courts in *Greater Franklin* and *Emerson College* held that fees assessed by the cities were invalid taxes despite their description as impact fees.

Formerly called the Massachusetts Land Use Reform Act (MLURA), the Community Planning Act (CPA-2) is a new statute which is currently under legislative review. One of the components of CPA-2 is a provision for adoption of impact fees. CPA-2 also establishes requirements and limitations for the use of such fees. It is expected that the use of impact fees is likely to lessen local resistance to new development projects. In considering the establishment of impact fees, communities should also ensure that their bylaws/ordinances are applied in an equitable manner to new projects.

**V. Local and Multi-Community Mitigation Banks**

Local

The City of Woburn has an ordinance which is intended to ensure that the City's infrastructure is upgraded and maintained in a responsible manner consistent with State and Municipal laws and is designed to ensure that major developments bear a proportionate share of capital facilities costs. The ordinance contains a Traffic Safes and Infrastructure Fund which enables a project proponent to make a

contribution equal to three percent of the total costs of a development project. The proponent is also required to participate in the regional TMA and implement TDM programs.

The Town of Holliston requires a Traffic Impact Assessment Report for any non-residential subdivision or any residential subdivision proposing fifteen or more homes. A Roadway Mitigative Measures component describing all proposed mitigation measures is required. Holliston requires a cash payment towards the implementation of traffic calming for development projects as well as a tonnage fee for roadway improvements.

Multi-Community

South Shore Tri-Town Development Corporation
Located in Weymouth, Abington, and Rockland, South Weymouth Naval Air Station was an operational United States Navy airfield from 1942 to 1997. The base features a mixed-use complex called "SouthField" in which there are currently plans to put movie studios, housing, retail and office space as well as a golf course at the site of the former air station. Construction is expected to begin in the Fall of 2009. Long-term plans call for development through 2017. SouthField is being transformed into a mixed-use "community within the communities" of Abington, Rockland and Weymouth and is the largest Smart Growth-style project in New England.

The SSTTDC was created by the state legislature to develop the base to the benefit of the three towns that share its footprint. Approximately a decade later, the SSTTDC is fulfilling an obligation to the three towns it represents by beginning the flow of revenues (an estimated $4.3 million) from base development directly to the treasuries of the surrounding towns. At the end of SSTTDC's legislated lifetime, the SouthField land will seamlessly transfer back to the three respective towns for the first time since the Navy bought the land in the early 1940s.

Mitigation Programs in other States

Colorado – Land Banking

Land banking is the practice of purchasing land with the intent to hold on to it until such a time as it is profitable to sell it to others for more than was initially paid. Municipalities can use land banking to retain some control over the future development of a particular area.

Florida and Washington - Concurrency
Concurrency is a growth management concept intended to ensure that necessary public facilities and services are available concurrent with the impacts of development.

Florida
In Florida, a Growth Management Act was adopted in 1985 which requires all of the state's counties and municipalities to adopt Local Government Comprehensive Plans that guide future growth and development. A key component of the Act is its "concurrency" provision.

Washington
Passed in 1995, Washington's Growth Management Act gives special attention to concurrency for transportation.

New Jersey – Transportation Development Districts (TDDs)

Transportation development districts (TDDs) are regional districts created voluntarily by municipal and/or county governments to manage growth and coordinate and finance transportation infrastructure improvements in a regional growth area. Costs of infrastructure improvements are borne by the public sector and private developers under a predetermined cost-sharing formula based upon traffic generation or other criteria associated with the development.

## VI. Recommendations where MEPA can Apply Standard and Consistent Mitigation Requirements

Mitigation currently takes place through the Massachusetts Environmental Policy Act (MEPA). MEPA is a uniform system of environmental impact review to reduce the potential for harm to the environment from certain development, construction or other projects. MEPA was established as a state law in the late 1970s (MEPA Regulations, 301 CMR 11.00).

The intent of MEPA review is to inform project proponents and state agencies of potential adverse environmental impacts while a proposal is still in the planning stages. MEPA requires studying alternatives to the proposed project and developing enforceable mitigation commitments, which will become permit conditions for the project.

According to MEPA Regulations Section 11.03: Review Thresholds, a MEPA review is required when one or more review thresholds are met or exceeded and the subject matter of at least one review threshold is within MEPA jurisdiction. Review thresholds identify categories of projects that are likely to cause "Damage to the Environment." There are two tiers of MEPA thresholds:

1. ENF (Environmental Notification Form) and an EIR (Environmental Impact Report)

2. ENF and other MEPA review

The review thresholds fall into twelve categories, of which Transportation is one. For example, an ENF and EIR is required if a project proposes the construction of 1,000 or more new parking spaces at a single location. An ENF and other MEPA review are required if a project proposes the construction of 300 or more new parking spaces at a single location. The twelve categories of review thresholds and the specific thresholds within each category can be viewed on-line at: http://www.mass.gov/envir/mepa/thirdlevelpages/meparegulations/301cmr1103.htm.

Section 61 Findings require state agencies and authorities to review, evaluate and determine the impacts on the natural environment of all projects or activities requiring permits issued by the state. Findings are issued describing the environmental impacts, if any. All feasible measures that have been taken by the project proponent to avoid or minimize these impacts are certified. Section 61 is a requirement of Massachusetts General Laws (Chapter 30, Section 61. M.G.L. c.30, s.61).

Although Section 61 Findings provide a "template" for permit conditions, MEPA is not responsible for issuing permits. Participating state agencies are responsible for issuing permits (i.e., MassDOT issues Highway Access Permits). To enforce mitigation requirements, a municipality can link their permit requirements with that of state agencies.

**VII. Identify Ways to Address Impacts of Developments that are below the MEPA threshold**

One way Burlington, Lexington, Lincoln, Waltham and Weston can address impacts of developments that are below the MEPA threshold is to develop a 'Standard Mitigation Procedures and Requirements Manual.'

What is the Standard Mitigation Procedures and Requirements Manual?

The Standard Mitigation Procedures and Requirements Manual will assist municipal planners, local officials, developers, citizen board members and advocates to understand the transportation impacts of proposed development projects and to identify potential solutions.

This Manual will be used as a guideline to help establish standards and to provide a framework for evaluating the transportation impacts of development projects. Impact assessment methodologies are provided and potential mitigation measures are described, including support for Transportation Demand Management (TDM) approaches.

Using the Manual will help answer the following development mitigation issues and questions:

- How can a municipality measure the impact of a development?
- How can a municipality interpret a developer's traffic study?
- How can development impacts outside a municipality's limits be addressed?
- Are a municipality's mitigation requests legal?
- How can a municipality finance mitigation?

What is Standard Mitigation?

Standard mitigation is determined off-site improvements for which a development is responsible to offset the impacts on the transportation system. The project's overall impact on traffic, municipal services, the environment, the local economy, and the community are taken into consideration. When requesting mitigation, it is important to be explicit in what to ask for, when to ask for it and how to enforce it. Some mitigation tools can be used individually, while others require mutually supportive actions implemented cooperatively by public and private sector groups.

How is Standard Mitigation Identified?

When the scale or nature of the project results in significant traffic impacts to the surrounding streets and intersections, the impacts need to be mitigated. There is a wide variety of mitigation measures that can be implemented. First and foremost, it is important to apply transportation demand management (TDM) measures, strategies and policies that reduce automobile travel demand.

Other mitigation measures include improvements to roadway geometry, traffic signal equipment, and traffic monitoring. Developers should be responsible for the cost, implementation and maintenance of identified improvements that mitigate the traffic impact of their proposed development. It is critical that communities be clearly explicit about their desired mitigation. This requires building relationships, multi-community coordination, and partnerships.

There are legal considerations involved in the design of development mitigation. First, a "rational nexus" must be demonstrated between the impacts caused by a development and the nature of the

mitigation required. Second, there must be a “rough proportionality” between the extent of the impacts generated and the extent of the mitigation required. It must be shown that new development creates the need for mitigation.

# Appendix H

# Projected Average Daily Traffic based on Developments

# Appendix H Projected Average Daily Traffic based on Developments

| Development Name | Development Type | Square Footage | Projected Average Daily Traffic[1] | Development Status[2] |
|---|---|---|---|---|
| **Burlington** | | | **71,753** | |
| Arborpoint | Housing | 425 units | 2,705 | Completed 2010 |
| 36 Muller Road | Housing | 75,000 | 601 | Conceptual |
| 78 Blanchard Road | Office | 120,000 | 1,527 | Permitted |
| 400 Wheeler Road | Office and Retail | 250,000 | 5,394 | Permitted |
| Oracle - 8 Van de Graaff Drive | Office | 420,000 | 3,995 | Completed 2010 |
| 5 Wall Street | Office | 170,000 | 1,995 | Completed 2008 |
| Palomar – Network Drive at Northwest Park | Office/R&D | 180,000 | 2,166 | Completed 2010 |
| NorthWest Park Redevelopment - Middlesex Turnpike and Second Avenue | Hotel/Retail/Office | 200 hotel rooms, 600,000 sf retail, 2,160,000 sf office | 26,057 | Conceptual |
| South Avenue Planned Development District | R&D/Restaurant | 545,000 | 7,252 | Permitted |
| Burlington Mall Expansion | Retail/Restaurant | 246,000 | 8,520 | Completed 2008 |
| Lahey Clinic Expansion | Hospital | 331,000 | 5,523 | Completed 2007 |
| 10 Corporate Drive | Office | 100,000 | 1,327 | Completed 2009 |
| Winn Street Commons – 265 Winn Street | Housing | 18,000 | 259 | Under Construction |
| Hillview-129 Cambridge Street | Housing | 12,000 | 222 | Under Construction |
| The Village at Burlington Commons – 141 Cambridge Street | Housing | 11,000 | 216 | Under Construction |
| Burlington Heights 235-245 Cambridge Street | Housing | 37 units | 373 | Under Construction |
| Oakridge – Murray Ave | Housing | 14 units | 234 | Under Construction |
| Dave and Busters | Restaurant/Entertainment | 35,000 | 3,319 | Conceptual |
| Scott Avenue Townhouses | Residential | 7 units | 67 | Conceptual |
| George J. Kostas Research Institute for Homeland Security | Graduate School | 70,000 | 238 | Under Construction |
| **Lexington** | | | **12,859** | |
| Avalon at Lexington Square | Housing | 387 units | 2,476 | Completed 2008 |
| Lexington Technology Park | R&D, Office, Manufacturing | 672,000 | 5,310 | Permitted |
| Cubist Pharmaceuticals | R&D | 110,000 | 1,111 | Permitted |
| Ledgemont III | Office / R&D | 129,000 | 1,663 | Conceptual |
| Starwood Hotels | Hotel | 260 hotel rooms | 1,954 | Completed 2008 |
| Battle Green Inn | Condominiums | 30 units | 231 | Completed 2009 |
| Jefferson Union | Condominiums/Townhouses | 13 units | 113 | Completed 2009 |
| **Lincoln** | | | **5,080** | |
| Deaconess "The Groves" | Senior Living Community | 173 units | 386 | Under Construction |
| Minuteman Commons | Senior Living Community | 32 units | 150 | Completed 2007 |
| Airport Road Housing | Air Force Base Housing | 731 units | 4,544 | Under Construction |
| **Waltham[3]** | | | **61,653** | |
| 850 Winter Street - Reservoir Woods | Office | 160,000 | 1,904 | Completed 2008 |
| 40 Sylvan Road | Office, Hotel, and Retail | 697,000 sf office, 152 hotel rooms, 20,000 sf retail | 8,043 | Completed 2008 |
| 40 Green Street | Office and Restaurant | 556,000 sf office and 14,000 sf restaurant | 6,236 | Conceptual |
| 21 Hickory Drive - Overlook Center (Adobe) | Office | 110,000 | 1,428 | Completed 2008 |
| 504 Totten Pond Road - Boston Properties | Retail/Restaurant and Office | 75,000 sf retail/restaurant, 355,000 sf office | 8,652 | Permitted |
| 1006 & 1022 Main Street - Waltham Ford and Bickford's | Mixed (Office and Retail) | 45,000 sf | 1,232 | Conceptual |
| 1265 Main Street - Polaroid | Office | 1,200,000 sf office | 8,948 | Permitted |
| One Moody Street - Moody & Main on the Common | Mixed | 73,988 sf commercial, 231 apartments | 4,255 | Permitted |
| BJ's Wholesale Club | Retail | 118,000 | 3,679 | Completed 2010 |
| 66 Seyon Street - Former Raytheon Site | Retail | 100,000 | 3,303 | Completed 2010 |
| 175 Wyman Street | Office | 318,000 | 3,227 | Completed 2009 |
| 77 Fourth Avenue - 77 City Point | Office | 197,000 | 2,234 | Completed 2008 |
| 1560 Trapelo Road | Office | 62,000 | 919 | Completed 2009 |
| 35 Gatehouse Drive Astra Research Center | R&D and Office | 434,000 | 4,351 | Completed 2009 |
| 920 Winter Street - Reservoir Woods, Phase II | Office | 320,000 | 3,242 | Completed 2008 |
| **Weston** | | | **3,704** | |
| Boston Properties (Route 20/Route 128) | Office | 350,000 | 3,473 | Completed 2010 |
| Highland Meadows | Senior Living Community | 69 units | 231 | Under Construction |
| | | **Total** | **155,049** | |

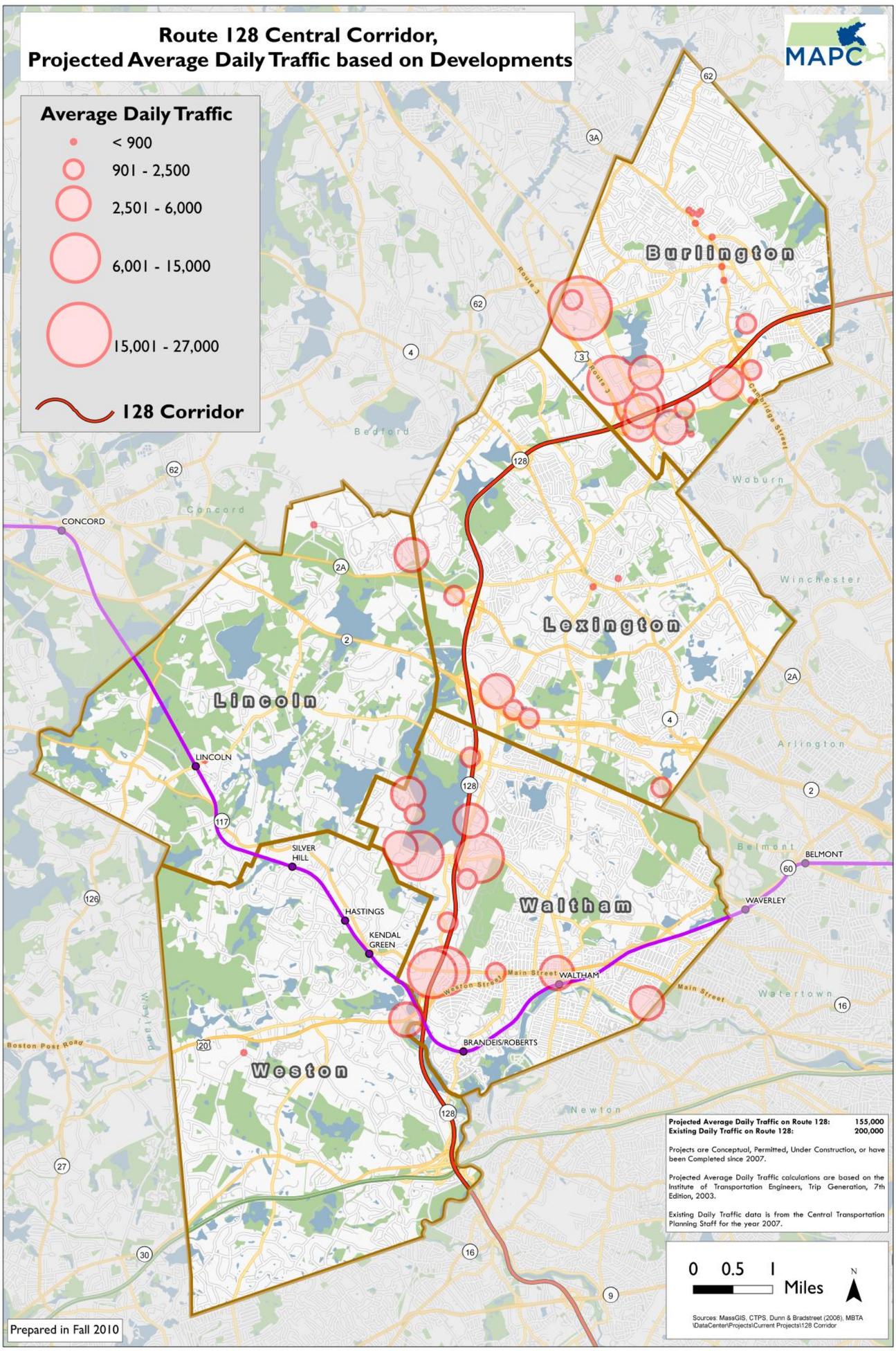
[1] Projected Average Daily Traffic calculations are based on the Institue of Transportation Engineers, Trip Generation, 7th Edition, 2003.

[2] Conceptual, Permitted, Under Construction, or Completed.

[3] Projects were submitted from either the City's Traffic Commission or Planning Department.

Table prepared fall 2010.

# Appendix H


Route 128 Central Corridor,
Projected Average Daily Traffic based on Developments
MAPC
Average Daily Traffic
< 900
901 - 2,500
2,501 - 6,000
6,001 - 15,000
15,001 - 27,000
128 Corridor
Burlington
Lexington
Lincoln
Waltham
Weston
Bedford
Concord
Woburn
Winchester
Arlington
Belmont
Watertown
Newton
CONCORD
LINCOLN
SILVER HILL
HASTINGS
KENDAL GREEN
WALTHAM
WAVERLEY
BELMONT
BRANDEIS/ROBERTS
Main Street
Boston Post Road
Projected Average Daily Traffic on Route 128: 155,000
Existing Daily Traffic on Route 128: 200,000
Projects are Conceptual, Permitted, Under Construction, or have been Completed since 2007.
Projected Average Daily Traffic calculations are based on the Institute of Transportation Engineers, Trip Generation, 7th Edition, 2003.
Existing Daily Traffic data is from the Central Transportation Planning Staff for the year 2007.
0 0.5 1
Miles
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Sources: MassGIS, CTPS, Dunn & Bradstreet (2008), MBTA
\DataCenter\Projects\Current Projects\128 Corridor
Prepared in Fall 2010

# Appendix I

# The Benefits of Ramp Metering

# Appendix I -The Benefits of Ramp Metering

Ramp meters are an inexpensive tool to improve traffic flow on freeways. Ramp meters allow traffic to enter the freeway at a rate dependent on the conditions of the freeway traffic. While a typical driver might be delayed at the meter, overall travel and freeway speeds are improved.

**Safety**

Studies of traffic management centers using ramp meters show that freeway management systems reduce accidents by 15% to 50%. When ramp metering was in operation on the Superstition Freeway project in Arizona, rear-end and sideswipe accidents were reduced by 10%. During the periods when ramp metering was not in use, accidents increased by 33% comparing to the cases when ramp metering was in effect. Washington State ramp metering system experienced reduction in rear-end and sideswipe collisions by over 30%. In Denver, Colorado, ramp metering helped cut freeway crashes in half.

**Mobility**

Washington State ramp metering system provided reduction in freeway mainline congestion of 8.2%. In Madison, WI, ramp metering project improved speed variability which was reduced by 5.5 to9.2 km/h (3.4 to 5.7 mi/h) with ramp meters. In 1995 FHWA study of ramp metering in North America found that implementing ramp management strategies in Detroit increased average speeds and volumes by 8% and 14%, respectively.

**Productivity**

The benefits for the Houston TranStar ramp metering project within the Greater Houston Area provided an estimated travel time savings of 2,875 vehicle-hours daily, or $37,030 per day. Due to inclement weather, incidents, and other events, these savings could be expected for about 150 days each year, for a yearly user delay savings of $5,554,500.

**Efficiency**

After ramp meters were experimentally turned off in the Twin Cities of Minnesota, freeway volume declined by 9% and peak period throughput decreased by 14%. The analysis conducted for the Salt Lake Valley of Utah ramp metering project, found a decrease in mainline (freeway) delay with an increase in ramp metering cycle length. For a peak-hour mainline traffic volume of 8,350 vehicles/hour and no metering, the average mainline delay was 151.2 seconds/vehicle. The greatest delay reduction, 125.3 vehicle-hours over a period of one hour, was found with an eight second metering cycle and an average mainline delay of 97.2 seconds/vehicle.

**Energy and Environment**

Ramp metering system in the Twin Cities of Minnesota reduced the number of acceleration-deceleration cycles and smoothed traffic flow. Fuel savings at each ramp meter ranged from 2% to 55% depending on ramp roadway geometry.


*http://ops.fhwa.dot.gov/freewaymgmt/publications/fmt/2008/issue1ap*

# Appendix J

# A Walk along Trapelo Road

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A walk along Trapelo Road, across its interchanges with Route 128 and on the bridge across Route 128, illustrate the challenges and potential opportunities for walking and biking in the corridor. New sidewalks, crosswalks, and pedestrian signals have been recently built at the Trapelo Road off ramps from Route 128 southbound. They appear to have been privately funded, connecting two new office developments on either side of Trapelo to the west of Route 128.

There are even detectors to activate the signals for bicyclists riding on Trapelo Road. Experienced bicyclists may feel comfortable sharing Trapelo Road with cars in this area, but there are no special accommodations for bicyclists who would rather have some separation. But most of the sidewalks don't connect to anything.

The new sidewalks and crosswalks do connect to the existing sidewalk on the bridge over Route 128, and the sidewalk itself is in good condition (unusual for many of the existing sidewalks on bridges over Route 128. The design does a good job protecting trees and bushes from cars the leave the roadway, but pedestrians have no such protection. All future bridge designs in the corridor should include an ADA compliant sidewalk, with protection between the sidewalk and the roadway.

And once a pedestrian walks from either of the new office developments across the bridge, there is no place to go. The sidewalk ends – there is no way to safely continue along Trapelo Road or to cross the ramps to/from Route 128. Since the on/off ramps are under MassDOT jurisdiction, any changes to the sidewalks will require state approval. The worn path is evidence that people will still try to walk, and when they do, they encounter another frequent danger to pedestrians in Massachusetts, overgrown poison ivy along the side of the road. Even the best pedestrian accommodations still require maintenance, removing snow/ice in the winter, hazards and obstructions year round.

Even if infrastructure is not built for pedestrians, they will still access sites. They may not have a car, or maybe it's being repaired. Or they just got off the bus. Or they just like to walk, and think they should be able to walk to someplace a few hundred feet away.

Observe any interchange like this for a few hours on a fair weather day and you will see someone trying to cross it. Many more would want to if they could do it safely. Allowing people to make short trips in good weather by walking or biking can make a significant reduction in the number of auto trips that are now necessary.