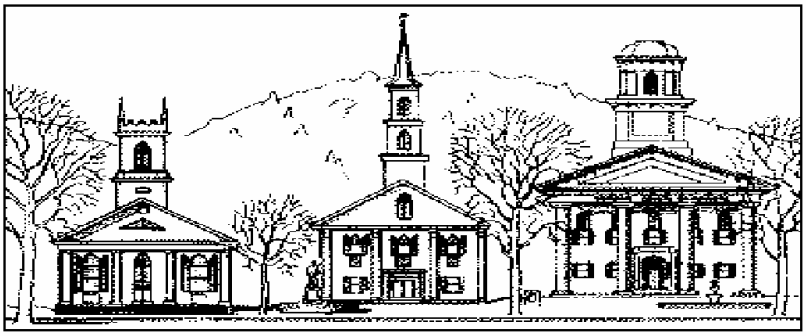
THE VERMONT AGENCY OF TRANSPORTATION



TRAFFIC CALMING STUDY
AND APPROVAL PROCESS
FOR STATE HIGHWAYS

September 2003

WITH THE

WINDHAM REGIONAL COMMISSION

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in association with Stevens & Associates, P.C.

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1.0 INTRODUCTION AND PURPOSE

In response to growing public interest statewide, this document was developed to provide information about the process for planning, evaluating and implementing traffic calming projects on state highways in Vermont. Municipalities, Regional Planning Commissions (RPCs) and the Metropolitan Planning Organization (MPO) are required to follow this process when considering traffic calming projects on state highways and when using federal or state funds for such projects. Municipal officials considering traffic calming on local roads without the use of federal or state funds may find it useful to adapt this process to their needs.

This document is a companion to the Traffic Calming Standard Drawings being adopted by the Vermont Agency of Transportation (VTrans). These standards include construction details, typical dimensions, signage and markings for various traffic calming devices. A Traffic Calming Matrix also shows the applicability of each device for specific highway settings and traffic volumes.

The traffic calming process for state highways is intended to strengthen the State's assets located along the highways, particularly in historic settlements and villages. Traffic calming projects and programs should be designed to optimize the intrinsic value of Vermont villages by enhancing the overall sense of place, appearance, and safety for walking, biking and vehicle travel.

The process described here will assist in determining:

- Whether traffic calming is appropriate;
- Where it may be appropriately used; and
- How to implement a project.

Traffic calming methods involve both volume and speed control measures to improve safety. Volume control measures include full and partial closures, diverters, median barriers and forced turn islands. Speed control measures include active measures to slow traffic by creating physical deflections or constrictions such as raised crosswalks, raised intersections, roundabouts, chicanes, alternate side parking, median islands, curb extensions, neckdowns, gateways and pedestrian refuge islands. Passive measures include on-street parking, bicycle lanes, narrowed traffic lanes, rumble strips, textured or colored pavement, textured markings, and signage. Traffic calming may also be designed to improve town or village aesthetics. Vermont villages have historically been designed at a smaller, pedestrian-oriented scale, consistant with goals of traffic calming.

TRAFFIC CALMING: the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users. The major advantage of traffic calming devices over more traditional speed reduction measures such as police enforcement is that traffic calming measures are "self-enforcing". Because traffic calming devices *physically force* drivers to slow down, they can be much more effective than measures that rely on consistent enforcement.
Source: Institute of Transportation Engineers

Roads and streets exist to move traffic safely and efficiently. State highways are designed for the purpose of carrying through traffic in a safe and expedient manner incorporating shoulders, turning lanes, passing opportunities and good sight distances to satisfy mobility and safety needs. Our state highways are owned by the Vermont Agency of Transportation (VTrans), and VTrans has final approval over any changes to the state highway system. State highways in

particular are typically designed to carry higher volumes of traffic and at higher speeds than local roads. Higher volumes and travel speeds for through traffic on arterial highways may cause conflicts when they intersect in residential villages and hamlets.

More and more residents are concerned that the quality of life is diminished in their communities as a result of speeding traffic, unsafe conditions for pedestrians, and noise pollution. Concerned citizens may begin to identify problems and seek solutions through Traffic Calming:

- High traffic volumes have a negative impact on the perceived quality of life, and the community character valued by residents of Vermont villages;
- Speeding vehicles put pedestrians and cyclists in greater danger;
- Delays in traffic movement cause motorists to seek routes on nearby roads and streets; and
- Traffic congestion may have a negative effect on the local economy.

Successful traffic calming projects may reduce the speed of traffic and other negative impacts of motorized traffic on particular sections of highway. Certain traffic calming measures can actually move larger volumes of traffic more safely than conventional methods. Projects include both physical measures to reduce the speed of traffic, and more subtle, passive measures to induce drivers to change their behavior such as on-street parking and street tree planting.

TRAFFIC CALMING GOALS AND OBJECTIVES:

- Reduce speeds for motor vehicles in pedestrian areas, and reduce collision frequency and severity.
- Increase the safety and the perception of safety for non-motorized users of the street(s).
- Incorporate local residents' preferences and needs for working, and living along public streets and at intersections.
- Create safe and attractive streets while enhancing the street environment (e.g., historic villages, streetscapes.)
- Help to reduce the negative effects of motor vehicles on the environment such as pollution, sprawl and water runoff on impervious surfaces.
- Promote pedestrian, cycle and transit use increasing access for all modes of transportation.
- Reduce the need for police enforcement.
- Reduce cut-through motor vehicle traffic.

This document assists the reader in implementing traffic calming measures while maintaining the safe and efficient movement of motorized traffic. Well-designed and properly constructed projects aim to improve all modes of travel including vehicles, pedestrians, cyclists and transit. The process balances the mobility needs of all users in pedestrian-oriented village settings. Decision-makers need to consider many issues including public support and long term maintenance to increase the chances for long-term traffic calming success.

EXAMPLES OF TRAFFIC CALMING DEVICES

(References to the VTrans Traffic Calming Standard Drawings are noted in parentheses)



Mid-Block Median with Cross Walk Portland, OR
(TC-8)



Textured Cross Walk (slightly raised)
Source: ITE



Pedestrian Crossing with Curb Extension Portland, OR
(TC-7)



Dynamic Striping with Raised Crosswalk Portland, OR
(Partial TC-1)

Note: Crosswalks in themselves are not traffic-calming devices.



Median Island with Crosswalk
Manchester Village, VT
(TC-8)



Gateway with Crosswalk
Brattleboro, VT



Chicane with Median
Montgomery County, MD
(TC-3)



Chicane with Median
(TC-3)

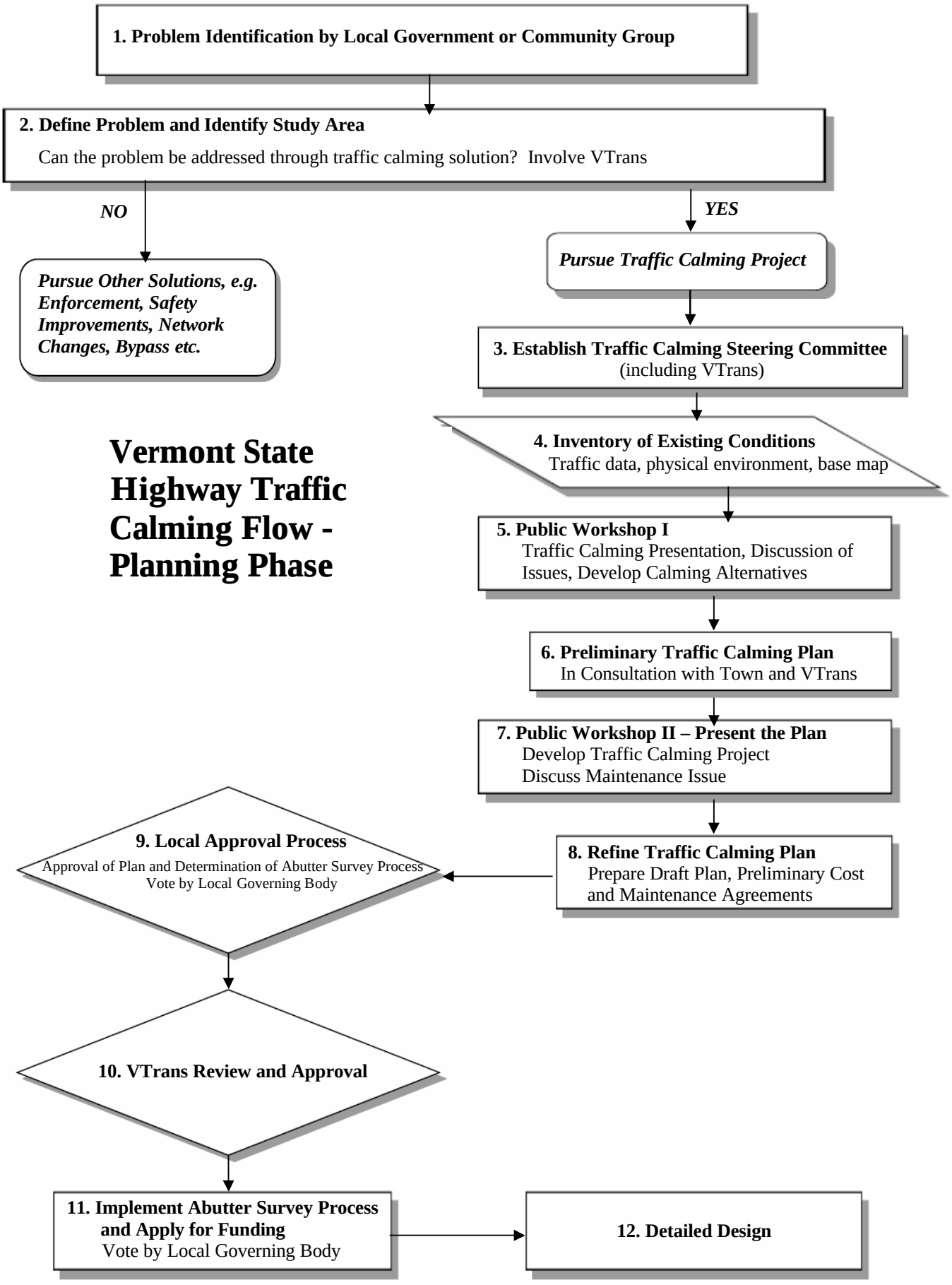


Roundabout - Manchester, VT
(TC-9)

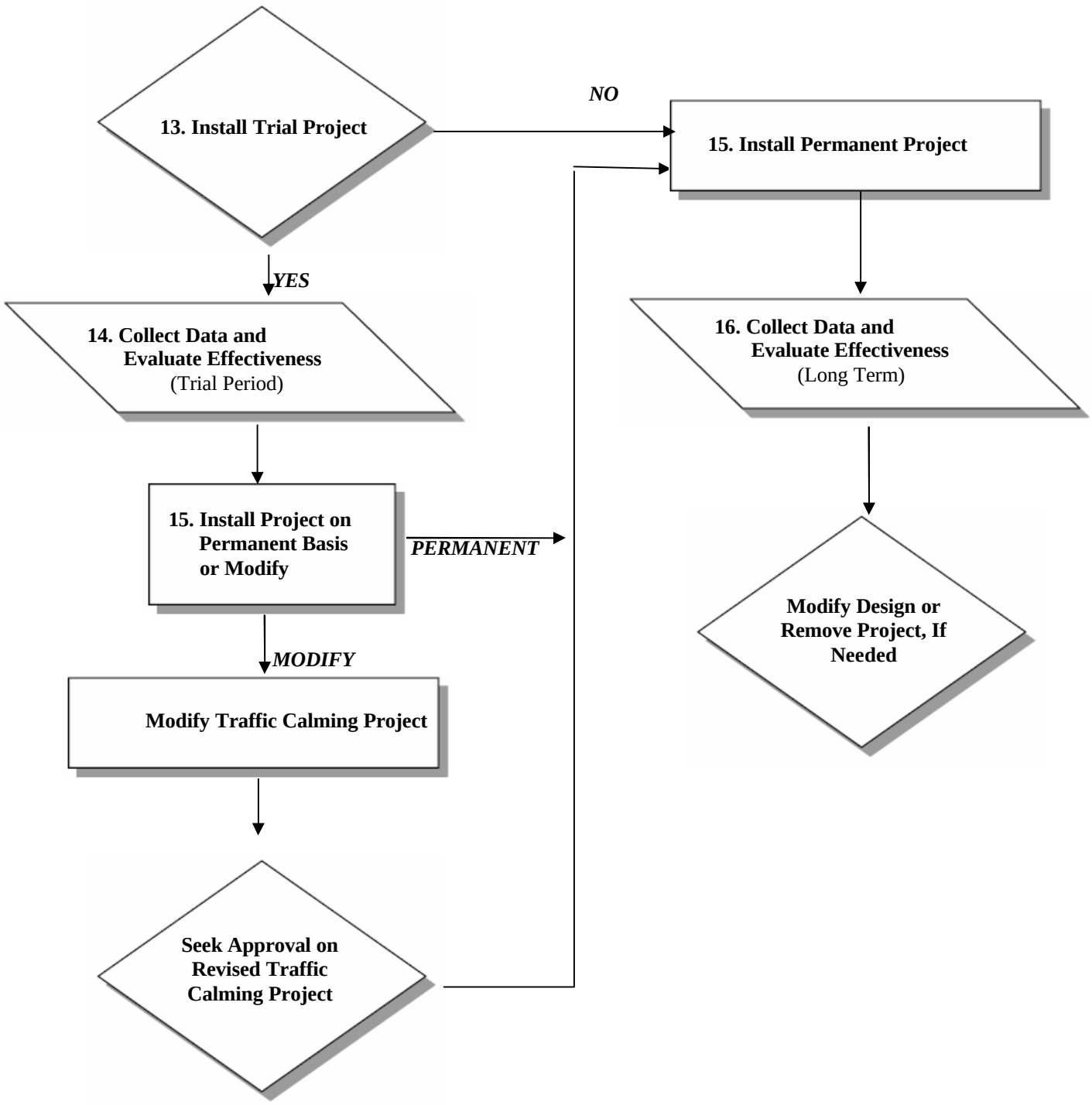


Roundabout - Beaverton, OR
(TC-9)

Vermont State Highway Traffic Calming Flow - Planning Phase



Vermont State Highway Traffic Calming Flow - Installation and Evaluation Phase



2.0 PLANNING PHASE OF TRAFFIC-CALMING PROJECT

Planning and implementing traffic-calming devices on a state highway requires stakeholder involvement to balance local and regional interests and to gain the support of municipalities and VTrans. This partnership is an essential component of a successful traffic calming program. By itself, this process will not ensure completion of the traffic calming program or project since traffic calming may be ruled out as inappropriate or not supported by one or more stakeholders.

Step 1: Problem Identification by Local Government or Community Group

Concern by local citizens about speeding and safety issues is the first step in problem identification and the beginning of the planning process for traffic calming. The group must bring the problem to the attention of the local governing body to obtain their endorsement and to pursue it with their RPC or their MPO. Either the local government (or the community group with their endorsement) needs to contact the appropriate RPC/MPO to discuss the issues and to obtain preliminary comments and guidance. The local RPC/MPO will be familiar with the process, have the ability to bring together the appropriate participants, and determine where the potential project fits within other transportation improvements and regional traffic calming priorities in the region. The RPC/MPO can contact the VTrans Planning Coordinator assigned to their area to see how the potential project may fit into the State's overall plans.

Step 2: Define Problem and Identify Study Area

This task clearly defines the problem and determines if the problem can be addressed through traffic calming solutions. The local community group who identified the traffic or speeding problem should work with the RPC/MPO's transportation planner to define the problem by reviewing actual conditions and examining available data. The data may include speed measurements, volume counts for the state route, volume counts on parallel roads, and crash statistics. It is important at this step to analyze the land use, context or setting and other environmental characteristics of the surrounding area (i.e. village setting, school zone, etc.) and pedestrian and bicycle use. The proportion of vehicles driving over the speed limit, the length of the section of highway for traffic calming and right-of-way limits and ownership of the highway should also be determined.

- ✓ Define problem
- ✓ Review data
- ✓ Define study area
- ✓ Contact VTrans

Upon completion, the limits of the preliminary study area should be defined including the locations where the speeding problem has been identified. Other routes may be identified for potential impact by diverted traffic, noise or air pollutant emissions if calming devices are installed. Both the VTrans Planning Coordinator and the VTrans District Transportation Administrator (DTA) for the respective region must be contacted for information and feedback and to coordinate with the appropriate VTrans Divisions.

The following questions should be asked:

1) Is there a conflict between traffic speeds and the use associated with the built environment along the road? For example, residential use versus through traffic.

2) Would traffic-calming devices reduce traffic speeds without negatively affecting the general safety, mobility and character of the region?

3) Is the problem occurring in a village or downtown setting?[1]

Positive answers to all questions indicate a traffic calming study and approval process should be pursued. If they are negative, other solutions should be investigated such as safety improvements, network changes, increasing capacity, or bypass road.

For the purposes of traffic calming, a village setting is defined by examining the characteristics of an area. At least two of the following characteristics need to exist in order to qualify as a "Village Setting"[2] including #5.

Criteria for Village Setting:

1) Speed limit of 40 mph or less;

2) Sidewalks exist in the proposed study area;

3) Residences, commercial and civic buildings such as town halls, post offices, and churches are so located that walking and bicycling are convenient modes of travel within the proposed study area;

4) The density of buildings gives the proposed study area the appearance of a connected settlement; and

5) The proposed study area must be designated as a village in the town or regional plan.

Traditional Town Centers:
"Village center" means a traditional center of the community, typically comprised of a cohesive core of residential, civic, religious, and commercial buildings, arranged along a main street and intersecting streets. Industrial uses may be found within or immediately adjacent to these centers.

Source: 24 V.S.A. Section 2791(10)

The traffic calming project being discussed may be in competition with other traffic calming projects in the region or there may be several problems concentrated in one town. The group undertaking the initial investigation may want to evaluate the need of the various projects by using the traffic calming ranking tool in Appendix B.

Step 3: Establish Traffic Calming Steering Committee

Identify local, regional, and state stakeholders to establish a Traffic Calming Steering Committee. The role of the committee is to:

- Advance the traffic calming process;

1 There may be unique situations where high levels of tourist-oriented pedestrian traffic outside Village settings may indicate that traffic calming may be an appropriate tool.
2 Adapted from the definition of "Village Setting" proposed for the Study of Guardrail Selection Criteria for Vermont Highways (VTrans Guardrail Study Committee, March 2000.) See also footnote #1.

- Assign work tasks to committee members;
- Direct traffic calming consultants (if they are retained for design work);
- Share information and act as the main contact group responsible for public outreach; and
- Coordinate with other local, regional and state organizations.

The membership should reflect the complexity and scope of the traffic calming issues. Flexibility is needed to accommodate volunteers as follows:

1) The RPC/MPO should act as a technical resource and coordinator of the Steering Committee.

2) The Chair of the Committee should be a member of the local government or a member of the Planning Commission.

3) Ideally, the following stakeholders should be included in some way:
   a. A representative of each group listed in *italics* below;
   b. Include representatives of other groups not in italics as appropriate; and
   c. Participants may represent more than one stakeholder group.

Local Interests	**Regional Interests**	**State Interests**
-Residents, abutters (property owners and tenants *-Merchants* *-Planning Commission* *-Local Governing Body* *-Police, Emergency, Fire Departments* *-Town Maintenance* -Historical/Preservation Society -Bicycle/Pedestrian Groups -Schools	*-Regional Planning Commission/Metropolitan Planning Organization* -Commercial Transportation Interests -Resort/Ski Areas/Regional Businesses -Existing Committees working on Transportation Projects -Adjacent Towns -Commuter Groups	*-VTrans Planning Coordinator* *-VTrans District Transportation Administrator (DTA)*

The Steering Committee has a significant role in reviewing and refining the traffic calming project as it evolves throughout this process and in keeping the lines of communication open between the Steering Committee and other stakeholders.

Step 4: Inventory of Existing Conditions

The Steering Committee usually with the assistance of a consultant and/or the RPC/MPO, assembles all available data and information for the study area and collects any

additional data that may be relevant to the traffic calming study and process. Data collected in Step 2 can be used as part of the comprehensive database needed in Step 4. Much of these data are available from the VTrans web site (http://www.aot.state.vt.us/) or from the RPC/MPO. VTrans Traffic Research Unit should be contacted for coordination and assistance with data gathering. The most important data relevant to the traffic calming program are:

- Traffic volume counts (average daily traffic volumes, hourly volumes);
- Crash statistics for the last three years (by location and type, injuries, fatalities);
- Speed measurements; and
- Pedestrian and bicycle counts as appropriate, preferably during peak hours.

- ✓ Assemble comprehensive database
- ✓ Develop base maps

Data may be collected during the appropriate peak periods not only for the highway to be calmed, but possibly for parallel roadways that could be affected by the traffic calming project. Speed measurements should include locations that are the most sensitive from the point of view of pedestrian access, circulation and crossings.

Base maps for the study area are essential and need to be developed at this phase with enough detail to show the physical elements and to adequately assess the feasibility of traffic calming devices. Highway geometry and physical characteristics, right-of-way lines, topographical information, and building locations for example should be identified on the maps. In addition, grades, drainage conditions and sight distances along the highway section to be calmed should be reviewed.

Step 5: Public Workshop I

Public workshops work two ways: to inform the public as to potential benefits of traffic calming and to involve the community in decision-making process. Participation is expanded beyond the Steering Committee and the immediate stakeholders. All stakeholders including abutters of the project roadway area are invited to participate in the discussion and in the decision-making process regarding traffic calming.

Public Workshop I steps are as follows:

1) Send invitations to abutters, stakeholders and other interested parties. Include notices in local newspapers at town hall, post office, library, general store and other gathering places.

2) Define goals or objectives for the project.

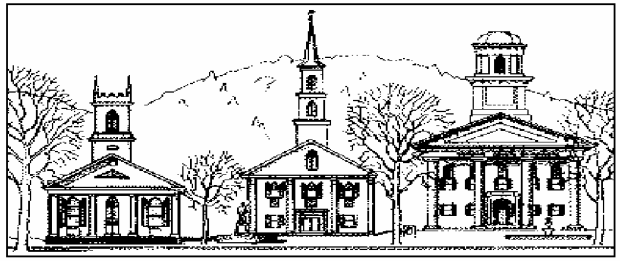
3) Define traffic calming and present successful traffic calming examples to the public.

4) Present and discuss information on existing traffic conditions if possible (volumes, speeds, and crashes).

5) Identify transition zones and the village setting located in the study area. See the ***Traffic Calming Prototype for State Highways*** diagram on page 12. Delay the selection of specific traffic calming devices until Public Workshop II.

TRAFFIC CALMING PROTOTYPE FOR STATE HIGHWAYS

Examples of Possible Signs and Devices



Setting:	RURAL/OPEN	TRANSITION	VILLAGE	TRANSITION	RURAL/OPEN	:Setting
Desired Speeds:	50 MPH	40 - 45 MPH	25 - 35 MPH	40 - 45 MPH	50 MPH	:Desired Speeds
Traffic Calming Devices:	NONE		(No Sections with Higher Speed)		NONE	Traffic Calming :Devices

Signs
Approaching Village of Newfane
Speed Limit



Entry / Gateway Device

As Appropriate

Median Island
Neckdown
Roundabout

Signs
Village of Newfane
Speed Limit





Additional Devices As Appropriate

Examples:

Neckdowns
Crosswalks
On-Street Parking
Landscaping
Curb Extensions
Roundabouts







Entry / Gateway Device

As Appropriate

Median Island
Neckdown
Roundabout

Signs
Village of Newfane
Speed Limit





Signs
Approaching Village of Newfane
Speed Limit



Note: Calming Devices and Signs must follow VTrans standards, regulations, and State laws related to State highways.

BJF September 2001

6) Discuss and identify traffic calming needs and specific locations where speeding and safety is a concern. Brainstorm conceptual ideas.

Step 6: Preliminary Traffic Calming Plan

Based on the input received from the first workshop, the Steering Committee or the consultants will prepare a preliminary traffic calming plan. Additional data collection may be needed since some of the initial assumptions regarding the issues, objectives and study area itself may need revision. Alternative traffic calming options could also be prepared and later evaluated at the Public Workshop II. VTrans (as the owner of the highway) represented by the Planning Coordinator and the DTA must actively participate in the process. The VTrans Planning Coordinator will contact other Agency divisions to address particular issues impacted by the traffic calming project. This preliminary work with VTrans is necessary to facilitate subsequent tasks in Step 10 (*VTrans Review and Approval*) increasing the chances of success. Support from the local governing body for the concepts in this preliminary plan is required prior to Public Workshop II.

The following steps apply:

1) Follow specific design guidelines in the VTrans Traffic Calming Standard Drawings and all other State laws related to State highways.

2) Comply with the Manual on Uniform Traffic Control Devices (MUTCD). If any exceptions are to be made, or new devices are to be proposed, they should be clearly noted. For example, it should be noted that the signs "Approaching the Village of XXX" and the signs "Village of XXX" as shown in the *Traffic Calming Prototype* on the previous page need to go outside of State right-of-way (r.o.w.) since it may not be allowed by State law within the State r.o.w. If the sign is within the highway clear zone on the State r.o.w, it needs to follow the MUTCD as to size, colors and letters, and a breakaway design.

3) Discuss maintenance and funding issues with municipal officials. It is essential that the local governing body is aware that the Town or Village may be responsible for maintaining the traffic calming devices, (even if the actual maintenance is scheduled to be done by local participants such as a garden club). The local governing body should be consulted about their willingness to maintain the devices or the entire section of road.

4) Discuss converting the affected section of highway to a Class 1 Town Highway as an option for the municipality at this time.

Step 7: Public Workshop II – Present the Plan

The preliminary traffic calming plan is presented focusing on benefits of specific traffic calming devices for the highway sections identified in Public Workshop I. Maintenance of the traffic calming devices also needs to be a primary topic. Public II Workshop steps are as follows:

1) Encourage public participation and discussion as in Public Workshop I.

2) Prior to the workshop, the Steering Committee consults with the VTrans DTA and Planning Coordinator regarding the State's support and ability or willingness to maintain the devices.

3) The Steering Committee presents the constraints in maintaining certain devices identifying which ones the municipality is likely to maintain.

4) It may be helpful to provide general information regarding costs for traffic calming plans in other communities or a description of the VTrans current programs as construction cost estimates and funding opportunities may not be determined at this point.

Step 8: Refine Traffic Calming Plan, Prepare Draft Maintenance Agreement and Implementation Plan

The municipality, RPC/MPO, or consultant under the direction of the Steering Committee refines and adjusts the preliminary traffic calming plan to reflect the input received at the Public Workshop II.

The plan should include:

1) Preliminary cost estimates for final design and construction of the devices.

2) Draft agreements regarding maintenance of the various elements, including snow removal, cleaning, striping, and landscaping. If the municipality is considering the conversion of this section of highway to Class 1 Town Highway, it should be included in the agreement at this time.

3) Whether the traffic calming devices are to be installed on a permanent or on a trial basis. Subsequent steps in the approval process consider this decision and its consequences, as well as the necessary evaluation, especially for a trial installation.

4) An implementation and phasing plan showing the steps needed for the completion of the traffic calming project, especially if a project is broken down into several phases or combined with other work.

5) Identifying all federal, state and local permits required and all right-of-way issues and requirements.

6) Identifying funding sources for final design and construction costs. The Steering Committee or consultant may contact the VTrans Planning Division (telephone number 828-3960) or the Planning Coordinator assigned to the particular region regarding potential funding sources.

Step 9: Local Approval Process

The local governing body needs to approve the traffic calming plan, supporting and approving each phase of implementation as it proceeds. The traffic calming plan is more likely to suceed with strong community involvement in decision-making and support. This step can be used once or through individual phases of implementation.

The following process is recommended:

1) Plan Approval: The traffic-calming plan (Step 8) is presented to the local governing body for comment and conceptual approval with further refinements and detailed designs later on. At this stage, it is necessary for the local governing body to support the concept of the traffic calming plan to move forward toward implementing specific devices.

2) Determination of Abutter Survey Process: Next, the local governing body and Steering Committee representative agrees on the process to obtain support from those most directly impacted by each traffic calming device. All abutters will be informed about the traffic calming plan and will be surveyed regarding issues and concerns towards the proposed traffic calming devices adjacent to their property. Depending on the complexity of the traffic calming device, the survey may be delayed until more detailed designs are completed in Step 12.

   Abutters include all property owners along the section of highway to be calmed as well as adjacent roads or highways that may be affected by the project. The survey may also be distributed to people working or living along the affected highway(s), but not owning property. A 2/3 approval in the survey response is recommended for the successful implentation of the device. A simple and short survey is most effective. Typical questions could include:

   - "Do you support the traffic-calming project and the particular device proposed adjacent to your property?"
   - "Do you support it with reservations and what are your reservations?"
   - "Do you oppose the traffic-calming project or the device?"
   - "What are your concerns?"

   Additional questions may probe the respondents about their particular issues with the device.

3) Abutter Outreach and Project Information Handout: Abutters who did not participate in the planning process need to be informed prior to the survey. It is recommended to prepare a project information handout or newsletter to distribute with the survery door-to-door along the affected highway(s) and if possible, place the handout information in the local paper.

4) Plan Submittal: If approved, the local governing body submits the plan to VTrans for review. Any changes to the plan as a result of the survey implemented in Step 11 should be submitted to VTrans as well.

Step 10: VTrans Review and Approval

Divisions within VTrans review the traffic calming plan for compliance with the Agency's standards and policies as coordinated by the VTrans Planning Coordinator (Policy and Planning Division) and the DTA (Operations Division) assigned to the region. In addition, the following Division and Sections may be involved in the review depending on the details of the project:

Program Development Division:

- Sections of Roadway and Traffic Design
- Traffic Operations
- Local Transportation Facilities
- Pavement Management
- Environmental Section
- Utilities Unit.

Once the VTrans review is complete:

1) The Steering Committee and representatives of VTrans involved in the approval process meet to discuss any outstanding issues from the review (as arranged by the VTrans Planning Coordinator for the region.) This discussion may require revisions of the Traffic Calming Plan as in Step 8 with further adjustments to the plan. New local approval may be necessary if plan adjustments are significant.

2) Sign-off approval by the VTrans Director of the Program Development Division and the VTrans Director of the Operations Division occurs once VTrans support for the traffic calming plan is complete (including agreement that the basic function of the road is preserved.) Other VTrans requirements such as utility permits, a permit for use of the highway right-of-way, and maintenance agreements may be required as the project moves toward implementation and evaluation (Step 13).

Step 11: Implement Abutter Survey Process, Vote by Local Governing Body, and Apply for Funding

The Steering Committee implements the abutter survey discussed in Step 9 and present the survey results to the local governing body with the relevant comments and reservations. The local governing body votes on action to proceed with entire plan or to phase the plan if appropriate. The 2/3 approval rating of the abutters is to be used as a guide, but is not mandatory or binding.

- ✓ Implement survey
- ✓ Present results to local government
- ✓ Local government votes
- ✓ Apply for funding

The RPC/MPO will have to include the traffic calming project in the regular funding process for transportation improvements in the region unless the local government decides to fund the project. The funding sources identified in Step 8 are then assessed to identify the most appropriate sources for the project. In some instances special funding sources may become available that could be pursued by the Steering

Committee. If more than one traffic calming project is being evaluated in a region, the Project Ranking System in Appendix A can be used to evaluate or rank priorities.

Step 12: Detailed Design

Depending on the traffic-calming devices being considered, additional topographical survey work may be needed to prepare a more detailed design and to develop final construction costs. The local governing body needs to consult with VTrans to determine the lead agency for design. At this stage, it is necessary for all permits including environmental permits, right-of-way certificate, and necessary utility clearance to be obtained. The municipal engineer, consulting engineer or a VTrans engineer can undertake the necessary design and permitting work. Construction specifications need to be developed before the project can be bid. Depending on the level of designs, there will be additional review phases by VTrans.

3.0 INSTALLATION AND EVALUATION PHASE

Step 13: Decide on Trial or Permanent Installation

The final decision is made at this step to install the traffic calming devices on a trial or a permanent basis. The trial installation may be a condition of approval by the local government or by VTrans as an evaluation or demonstration step. Considerations for trial installation include:

- If significant traffic flow changes are expected from the traffic-calming devices; trial installations allow everyone to evaluate the design and the impacts in the field without major expenses.

- Trial measures should be installed to resemble the final design as much as possible: adequately illuminated, marked, signed and well constructed so that the full safety and aesthetic effects can be gauged.

Step 14: Collect Data and Evaluate Effectiveness of Trial Project

The RPC/MPO, coordinates with VTrans Traffic Research Unit to collect data during the trial period of the traffic calming project. The review should lead the Steering Committee to determine if the goal and objectives were met and if not, what changes may be made to achieve success.

- Data includes traffic counts, crash data, and speed measurements on the main road and possibly on parallel roads.

- Traffic operations from beginning to end of the calming devices should be reviewed, pedestrian and bicycle counts should be taken as appropriate, adjacent streets should be monitored to assess if problems have shifted.

- All measurements are to be compared to the same data before the installation. The review compares average speeds before and after (often they change very little –indicating that the average person may not be affected to a significant degree), but also to the 85th percentile and the 95th percentile speeds (measuring the effects on speeders).

- Traffic volume evaluations should also take into consideration traffic forecasts beyond existing conditions.

Ideally, a trial period runs twelve months and includes winter conditions. In some cases, shorter periods, (6 months) may be sufficient. Resident and merchant surveys may help to evaluate the effects on users and on the persons living and working close to the calming devices, and to determine an approval rating.

At the end of the trial period, the Steering Committee decides and recommends to the local governing body whether to install the calming project on a permanent basis, to modify it, or to discontinue it. The local governing body votes to select one of these three options. VTrans then reviews the evaluation study and decides on the installation, taking into consideration the local recommendation and vote. If substantial modifications are made, the project may need approval again at the local and state levels.

Step 15: Install Permanent Traffic-Calming Project

The construction of the permanent traffic calming project may occur as the result of the decision to install the project permanently from the beginning or after a successful trial installation.

Step 16: Collect Data and Evaluate Effectiveness (Long Term)

Evaluation studies are important to guage or determine the long-term effectiveness of the traffic calming measures especially permanent installations. Evaluation studies can be used to adjust future installations of traffic calming devices, and potentially to adjust the State Traffic Calming Standard Drawings. Evaluation studies should include before and after comparisons of traffic volumes, speeds and crashes as described in Step 14 –*Collect Data and Evaluate Effectiveness of Trial Project.* These studies will be especially important in the first few years of the traffic calming projects state-wide in order to gain experience on the various measures. Unlike Step 14, Step 16 may involve longer evaluation studies to assess the long-term effectiveness of the traffic calming measures.

Short-term evaluation studies under Step 16 would be undertaken under the direction of the Steering Committee assisted by the RPC/MPO (similar to Step 14). Longer-term studies would be the responsibility of VTrans.

There may be further changes to the traffic calming project after the study period has ended, including the possible removal of the traffic calming devices.

APPENDICES

APPENDIX A:

Traffic Calming Project Ranking System

It may be desirable to establish a ranking system to prioritize projects or to evaluate their needs. Sufficient funding may not be available to complete all of the traffic calming projects in a town or in a region. Therefore, the ranking system will help establish the order in which projects may be completed. Figure 1 is an example of a "Project Ranking or Need Evaluation System". Local municipalities and the Regional Planning Commissions may amend this system to address particular needs of the region.

Figure 1

PROJECT RANKING SYSTEM

Criteria	Points	Basis for Point Assignment
Speed	0 to 30	Extent by which 85 percentile speeds exceed posted speed limit; 2 points assigned for every 1 mph.
Volume	0 to 20	Average daily traffic volumes (1 point assigned for every 250 vehicles.
Crashes	0 to 20	1 point for every crash reported within past 3 years, 5 points for every injury.
Elementary or Middle Schools	0 to 10	5 points assigned for each school in the study area
Pedestrian or Bicycle Generators	0 to 10	5 points assigned for each facility (such as parks, community centers, high schools, shared paths or bike lanes) or commercial use that generates a significant number of pedestrians or bicycles.
Pedestrian Facility	0 to 10	5 points assigned if there is no continuous sidewalk on one side of the street; 10 points if missing on both sides.

There may be existing conditions, other than those included on the project ranking system, that warrant the need for traffic calming. Establishing the ranking for these traffic calming projects will require the use of engineering judgment.

Source: Pennsylvania's Traffic Calming Handbook, adjusted for Vermont State Highways

APPENDIX B EVALUATION FOR TRAFFIC CALMING DEVICES

TRAFFIC CALMING DEVICE	ADVANTAGES	DISADVANTAGES
Speed Hump (TC-1) **Speed Table** (TC-2)	• Appropriate for low-traffic local, streets. • Relatively inexpensive to install and maintain.	• Local, residential streets only. • May increase noise and pollution from vehicles accelerating and decelerating for hump. • Requires special plow settings or slower operations. • May be unpopular. These require strong local support to succeed. • Special design needed for cyclists, disabled and for storm drainage. • Should not be used on critical emergency response routes or bus routes. May affect emergency service response times.
Chicane (TC-3)	• May reduce traffic volumes • Traffic noise may be reduced due to lower speeds and volume. • Landscaped chicanes may improve street appearance. • May be effective in reducing the number of collisions.[1]	• With two-lane chicanes, motorists may attempt to increase travel speeds by crossing the centerline to maintain a straight line of travel. • Will require loss of on-street parking spaces. • Useful only for low volume, neighborhood streets.
Neckdown (TC-4)	• Improves visibility of pedestrians. • Shortens the crossing distance for pedestrians. • May reduce vehicle-pedestrian conflicts. • Landscaping and special pavement may enhance village area.	• May lose on-street parking spaces. • May make it difficult to accommodate full bicycle lanes. • May impact drainage. • Requires provisions for maintenance and snow removal.
Mini-Roundabout (TC-9B) **Traffic Circle** (TC-5M)	• See Roundabout comments below. • May act as gateways on neighborhood streets with low speeds and low volume. • May be enhanced with landscaping.	• See Roundabout comments below. • For local, neighborhood streets only. • Not be used on critical emergency response routes.
Raised Intersection (TC-6)	• May reduce travel speed. • May slow right-turning vehicles. • Prevents illegal parking close to intersection. • May improve appearance with landscaping and/or textured treatments.	• Expensive to construct and maintain. • May create a minor increase in delay for emergency vehicles. • For use in special situations with high levels of pedestrian activity. • Recommended only with very low percentage of long wheel-base vehicles.

1 Insurance Corporation of British Columbia, summarizing 43 international studies concluded that chicanes were effective in reducing the number of collisions.

TRAFFIC CALMING DEVICE	ADVANTAGES	DISADVANTAGES
Curb Extension (TC-7)	• May reduce vehicle-pedestrian conflicts. • May visually enhance the street, especially if landscaped. • Vehicle speeds may decrease. • Shortens the crossing distance for pedestrians. • Improve visibility of pedestrians.	• May make it difficult to accommodate full bicycle lanes. • May impact drainage. • Requires provisions for maintenance and snow removal.
Raised Median Island (TC-8)	• May help to form a visual "gateway" at the edge of community. • Separate opposing vehicle travel lanes and prevent passing movements. • Can be designed with breaks for pedestrian refuges to allow pedestrians to cross half of the street at a time. • May reduce vehicle-pedestrian conflicts. • May visually enhance the street through landscaping.	• May require removal of on-street parking to create room for median. • May need to restrict access to driveways from one direction. • Requires provisions for maintenance and snow removal. • May make it difficult to accommodate full bicycle lanes. • May impact drainage.
Roundabout (TC-9A)	• Reduce more serious motor vehicle collisions, particularly right angle conflicts. • Reduces the number of potential conflict points at an intersection. • Enhances intersection appearance when properly landscaped. • Allows for easy u-turns and access control. • Deflection reduces vehicle speed on approach.	• Adequate turning radii must be provided to insure access for emergency vehicles, buses and trucks to turn left. • May be inappropriate on major emergency response routes. • May require removal of some on-street parking at approaches. • Requires provisions for snow and ice removal. • May require additional ROW at intersection. • Requires attention for pedestrians and bicycles including pedestrian crossings since no signal is provided. • Requires attention to assist vision impaired pedestrians w/ detectable warnings and clearly defined edges.
Gateway Sign	• Identifies change in character to more densely settled area. • Helps to orient the driver. • May help to reduce travel speeds.	• Amount of speed reduction uncertain. • Must comply with MUTCD if located within the State Highway right-of-way. Currently not allowed within the State Highway right-of-way under State law.
Pavement Marking	• Inexpensive	• Effectiveness not yet measured. • Needs maintenance and not highly visible in winter months.

TRAFFIC CALMING DEVICE	ADVANTAGES	DISADVANTAGES
Delineation	• Inexpensive	• Effectiveness not yet measured. • If paint, it may be expensive.
On-Street Parking	• May reduce travel speeds depending on extent of use. • Parked vehicles provide a buffer between traffic and pedestrians on sidewalks. This provides a comfort level for pedestrians that can be particularly important in commercial or village areas.	• On-street parking can reduce the visibility of pedestrians and vehicles to each other. • Increased risk of suddenly opened doors hitting cyclists or vehicles where the adjacent travel lane is narrow. • May require parking ban during snow periods.
Speed Reader (Permanent)	• Raises awareness of speeding problem. • Encourages driver to slow to speed limit.	• Only reduce speeds temporarily.

Source: Pennsylvania's Traffic Calming Handbook with changes and additions.

Source: Chicanes- Insurance Corporation of British Columbia summarized 43 international reports: chicanes may be effective in reducing the number of collisions.

APPENDIX C: TRAFFIC CALMING RESOURCES

Institute of Transportation Engineers, Traffic Calming State-of-the-Art, and Transportation: www.ite.org/traffic/index.html

Association of Canada/Canadian ITE's Canadian Guide to Neighbourhood Traffic Calming: www.tac-atc.ca

Bucknell University Students Traffic Calming Project.: www.students.bucknell.edu/projects/trafficcalming/index.html

Public Technology, Inc, Slow Down, You're Going To Fast, The Community Guide To Traffic Calming. http://pti.nw.dc.us/task_forces/transportation/docs/trafcalm/TRAFCAGL.HTM

Pennsylvania's Traffic Calming Handbook, Pennsylvania Department of Transportation, Bureau of Highway Safety and Traffic Engineering. Publication No. 383. PA Traffic Calming Handbook on the Web: http://www.dot.state.pa.us

City of Portland, Oregon - Office of Transportation: http://www.trans.ci.portland.or.us/trafficcalming/default.htm

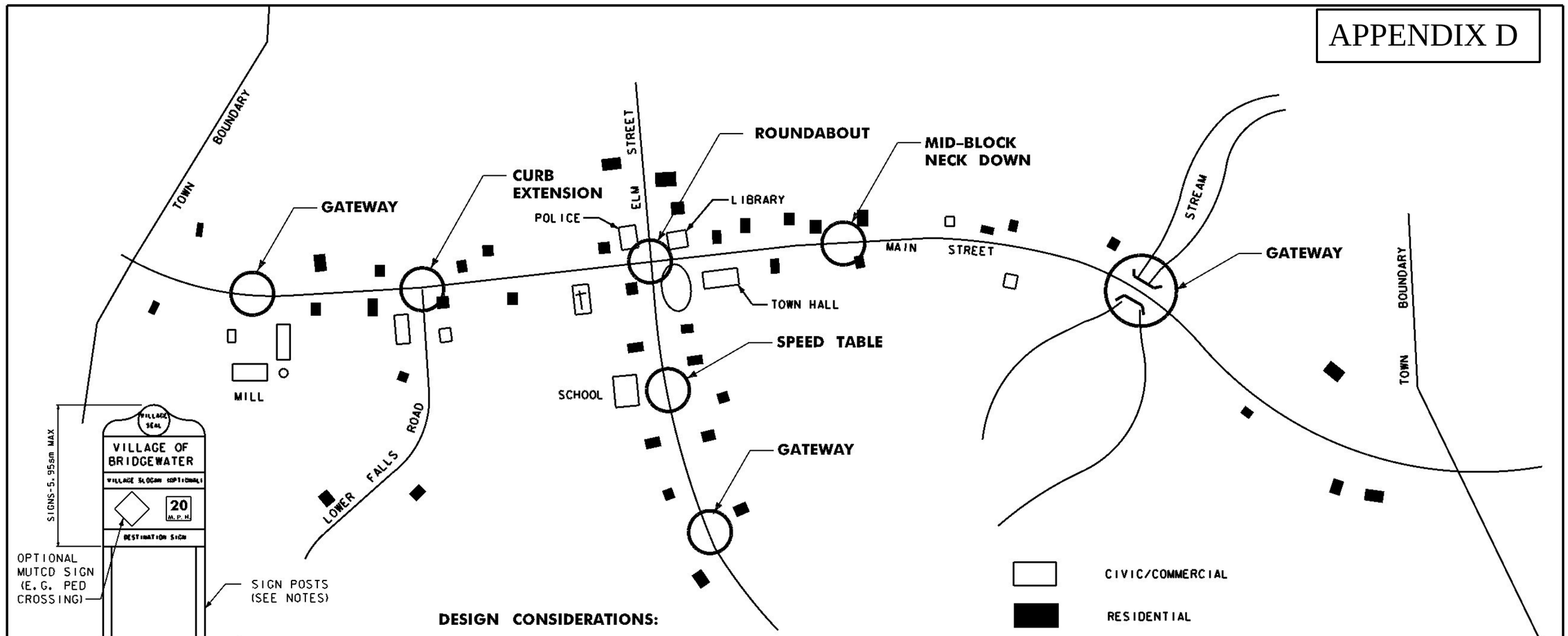
City of Houston, Texas - Department of Public Works and Engineering: www.ci.houston.tx.us/departme/works/humps.htm

City of Berkeley, California - Department of Public Works: www.ci.berkeley.ca.us/transportation/TrafficCalming/TrafficCalming.html

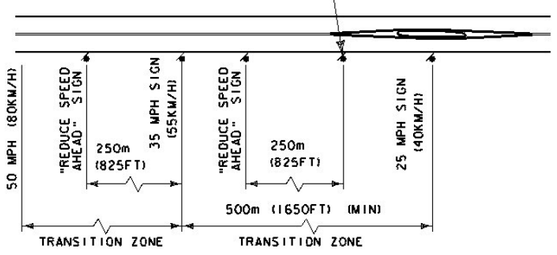
Collier County, Florida: www.co.collier.fl.us/transportation

City of Seattle, Washington http://www.seattle.gov/transportation/trafficcircles.htm

APPENDIX D



EXAMPLE GATEWAY VILLAGE SIGN



EXAMPLE GATEWAY (MEDIAN NOT REQUIRED)

DESIGN CONSIDERATIONS:

USE:
-ENTERING AND WITHIN VILLAGE OR TOWN CENTER

GOAL:
-WELCOMING, VISUAL ENHANCEMENT, AESTHETICS AND SPEED CONTROL

DESIGN PHILOSOPHY:
-TRAFFIC CALMING IS A COORDINATED SERIES OF DEVICES IMPLEMENTED TO CHANGE DRIVER BEHAVIOR AND IMPROVE SAFETY
-TRAFFIC CALMING WITHIN VILLAGE WILL BE DESIGNED TO ACHIEVE THE PROJECT GOAL:

- -SPEED REDUCTION
- -PEDESTRIAN AND MOTORIST SAFETY

-GATEWAYS MAY OR MAY NOT BEGIN AT TOWN BOUNDARIES
-GATEWAYS SHOULD BE LOCATED 150m (500 ft) IN ADVANCE OF VILLAGE
-GATEWAYS MAY BEGIN AT AN EXISTING STRUCTURE, BRIDGE, HISTORIC BUILDING AS WELL AS A CREATED LOCATION.
-SEE STANDARDS FOR TRANSITION SPEED ZONES
-FORM FOR MATERIAL SELECTION AND OVERALL SITE DESIGN TAKE CUES FROM SURROUNDING ARCHITECTURE AS WELL AS THE HISTORICAL AND SOCIAL CONTEXT OF THE AREA

ELEMENTS:
-POTENTIAL ELEMENTS INCLUDE:

- -INFORMATION: VEHICULAR AND PEDESTRIAN
- -LIGHTING: VEHICULAR, PEDESTRIAN AND FEATURE/DECORATIVE
- -TRAFFIC CONTROL & PROTECTION: BOLLARDS, CURBS AND RAMPS, RAILINGS AND FENCING AND PLANTS
- -SPECIAL FEATURES: HISTORIC ELEMENTS, FOUNTAINS AND SCULPTURE

OTHER:
-POSTS FOR GATEWAY VILLAGE SIGN SHOULD BE BREAKAWAY IF SIGN IS WITHIN CLEAR ZONE OF ROAD. WOOD POSTS MAY BE USED IF SIGN IS OUTSIDE THE CLEAR ZONE OR IS PROTECTED BY GUARDRAIL WITHIN THE CLEAR ZONE.

NOTE:
SEE INDIVIDUAL TRAFFIC CALMING DEVICE SHEETS FOR DIMENSIONS AND SIGNAGE.

OTHER STDS. REQUIRED: NONE

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT WHERE NOTED.

VERMONT AGENCY OF TRANSPORTATION

VTrans Metric DETAIL TC-13M

VILLAGE CONCEPT WITH GATEWAYS