

# **Borough of State College**

## **Traffic Calming Guidebook**

**January 2008**

## **Traffic Mitigation Policy Statement**

It is the policy of the Borough of State College to consider traffic calming mitigation measures whenever volume or vehicle speeds exceed established thresholds or when temporary road closures or restrictions will likely cause adverse impacts in neighborhoods. Successful traffic calming mitigation will bring vehicle speeds and volumes within the ranges of the street classifications presented herein without shifting the traffic to another street of the same or lower classification. To the greatest extent possible, local streets should remain open for use by Borough residents. Therefore, any mitigation measures implemented should be the least intrusive of the options that corrects the problem.

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# **Chapter 1 – The Purpose of Traffic Calming**

## **Introduction**

Since 1995, the Borough of State College has had a traffic calming policy. While the initial adoption was to address “cut-through” traffic in one neighborhood in the Borough, it has been recognized that excessive traffic volume, regardless of its origin or destination, is a detriment to neighborhood life. More recently, concerns have also been raised regarding the speed of vehicles. Residents believe that speeding vehicles threaten the safety, peace and character of their neighborhoods.

Balancing an efficient multi-modal transportation system, while maintaining the safety of Borough streets and respecting the tranquility of its neighborhoods, creates a constant challenge. This document has been created to address this challenge.

## **PURPOSE OF TRAFFIC CALMING**

Traffic calming is the management of inappropriate vehicular traffic speeds and volumes through educational, enforcement, and/or engineering measures so that minimize their negative impacts on residents, pedestrians, bicyclists, and schools. The purpose of traffic calming is to reduce the speed and/or volume of traffic to acceptable levels. In doing so, traffic safety and active street life are improved by the reduction of accidents, excessive speeding, inappropriate traffic and noise, vibration and air pollution.

## **GOALS AND POLICIES**

The goal of this policy is to:

- Improve driver attention, awareness and behavior;
- Promote safe and pleasant conditions for residents, motorists, pedestrians, and bicyclists on neighborhood streets;
- Preserve and enhance pedestrian and bicycle access to neighborhood destinations;
- Encourage citizens to be directly involved in neighborhood traffic management activities; and
- Provide a process that will equitably address requests for action by neighborhood residents and will balance resident’s needs with all users of the Borough’s streets.

In pursuing these goals, the Borough supports the following policies:

- To the extent feasible, traffic flowing from one arterial that is contiguous to another should not make use of local or collector streets as a bypass;
- Emergency vehicle access should be preserved at levels that meet response standards;

- The Borough will work cooperatively with its citizens to employ a variety of measures that help reduce traffic speed and/or volumes on local and collector streets;
- Permanent traffic calming measures will be designed in conformance with sound engineering and planning practices and should complement the residential character of the neighborhood;
- Traffic calming measures employed along particular street corridors should not create substandard traffic conditions on other streets; and
- Traffic calming measures will be developed while being cognizant of their impacts on others who have no reasonable alternative routes.

### **EDUCATION, ENFORCEMENT AND ENGINEERING**

Education, enforcement and engineering are commonly accepted elements needed for the successful implementation of a traffic calming program.

#### Education

Providing information through a variety of outlets will help residents make informed decisions about neighborhood traffic concerns and influence driving behavior. Due to budgetary and staffing limitations, educational efforts are often the most readily implementable means of modifying driver behavior.

#### Enforcement

By enlisting the help of the police department, focused enforcement efforts serve to increase community awareness of speeding. While enforcement requires significant staffing, and budgetary resources, one of its key benefits is responsiveness. The police department utilizes its available resources to respond to areas experiencing traffic problems as identified by collision analysis, resident's complaints, and conditions observed by enforcement officers.

#### Engineering

Through a partnership of neighborhood, Transportation Commission, Borough Council and Borough staff, traffic calming strategies involving physical features may be developed recognizing sound engineering principles, community input and financial constraints. A variety of engineering options helps to ensure that the cumulative negative impacts associated with one traffic calming feature do not multiply and/or result in large scale, Borough-wide problems.

# Chapter 2 – Street Classifications, Speed Limits and Designated Routes

## Introduction

Streets are classified by the function they serve in providing mobility and access. Figure 1 depicts the classic relationship between access and mobility of streets. Local roads provide very little access control over adjacent land uses and it is generally desirable for local roads to contain low percentages of through traffic. Neighborhood traffic management is an attempt to control streets to meet real accessibility needs, yet keep the traffic service function of these streets to preserve the quality of life of the residents surrounding them (1).

The acceptable levels of traffic and operations (speed) depend on the resident's needs, values and expectations. It has been identified elsewhere (2) that what people may want from a residential street environment may be security, peace and quiet, comfort, cleanliness, attractive appearance, privacy, territorial control, convenience, good parking, street life, neighborliness and other amenities. In addition, expectations can significantly affect perceptions and satisfaction. Perceptions are not necessarily accurate or correct, given the selective nature of perception and its ability to screen out some precepts and sharpen others (2). A street classification policy can enable engineering and planning decisions to be made from some objective criteria, rather than strictly public perceptions.

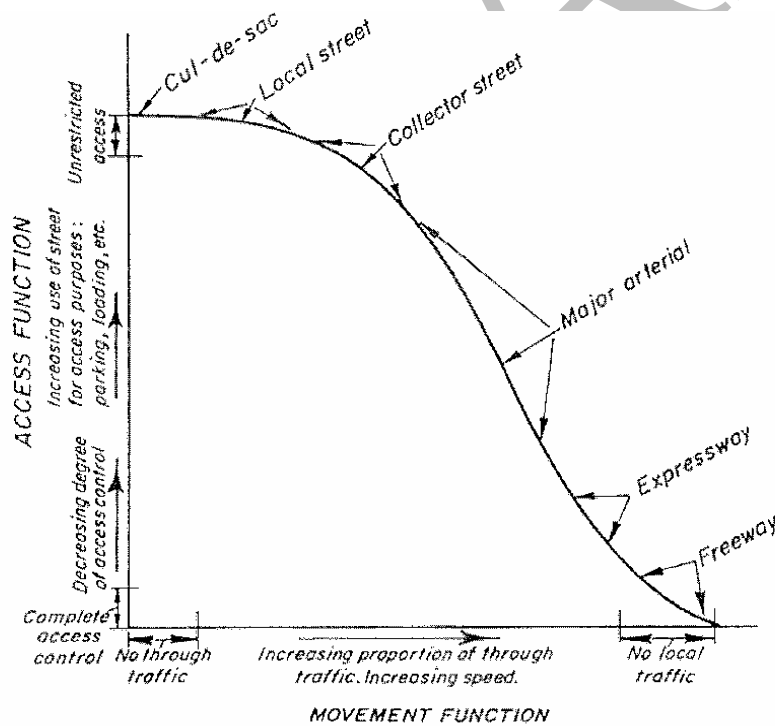


FIGURE 1 Schematic relationship between access and movement function of streets. [Source: *Fundamentals of Traffic Engineering*, 15th ed. ]

## **STREET CLASSIFICATION STRUCTURE**

Higher-type roadway functional classifications are generally easy to identify from the existing roadway network. They are characterized by higher traffic volumes, larger cross sections, turning lanes, traffic signals and other factors. The street classification structure uses a framework to correlate the observed traffic patterns with logical street classifications for the local residential roads.

The Borough's initial street classifications were based on traffic volumes generated by the number of dwelling units (DU) which use the streets for access. This is a logical assumption for traditional residential land uses, however, in certain districts of the Borough, zoning regulations have allowed land uses which generate more traffic than traditional residential land uses. The streets encompassing and bordering these land uses are expected to carry more traffic than a typical residential local road. Therefore, there are two classifications of local roads for the Borough of State College, major and minor local roads.

**Major local roads** are located within and border the downtown area of the Borough, and provide access to a mix of land uses including commercial, office, multi-family and institutional land uses. This classification has an anticipated volume threshold of 1,500 vehicles per day. **Minor local roads** are all those not classified as arterials, collectors, or major local roads, and primarily provide access to single family residential land uses and have an anticipated volume threshold of 750 vehicles per day.

Street classification is only meaningful in the context of policy decisions that are based upon it. The primary purpose of street classifications in the Borough of State College is in regard to this policy. With limited resources available for planning, analysis, design and evaluation of traffic calming measures, criteria must be presented that is fair and equitable to all Borough residents.

In terms of criteria for the justification for traffic calming strategies, all local roads should be expected to carry 1,500 vehicles per day or less for Major Local Roads, and 750 vehicles per day or less for Minor Local Roads. Diversion-type traffic calming is generally not cost-effective when traffic volumes are less than 1,500 vehicles per day.

A 1,500 ADT volume threshold delineates 84.2% of the streets as local roads. The remaining 15.8% of the streets in the Borough are classified as collectors and arterials. The percentage of streets by functional classification is consistent with the definition of functional classification of roadways, where there are generally more local access streets than higher-type collectors and arterials.

Although limited studies exist, it has been shown that residents can be unhappy even with very low volumes. However, when they rise above 2,000 vehicles per day on streets with children, they become un-acceptable to the vast majority of residents (2). The 1,500 vehicles per day threshold is a compromise between the maximum (socially) acceptable

volume level on minor residential roads and the current observed traffic volume levels on the Borough's minor residential roads.

**Minor Collectors** are to accommodate 3000 VPD and are generally streets used as primary and emergency access to neighborhoods.

**Major Collectors** have less than 6,000 ADT. Most collectors are already identified by ordinance (Chapter XI, Section 206, "Through Highways Established") and supported by the existing traffic patterns within the Borough. The ordinance should be consistent with this policy.

**Arterials** will have an ADT greater than 6,000 vehicles per day and be exempt from volume or speed traffic calming strategies. This category also includes all state routes.

### **RECLASSIFICATION OF STREETS**

From time-to-time, the Transportation Commission may recommend that Borough Council reclassify streets. The reclassification to a higher or lower level may be based on changes in use or zoning. If the routine traffic volume measurement over a period of 5 or more years is consistently 40% of the street's classification maximum rating, the Transportation Commission may request Borough Council to reclassify the street to the next lower level.

### **STREET CLASSIFICATIONS**

All streets within the Borough shall be classified into one of five classifications:

Arterials	(ADT > 6000 VPD)
Major Collector	(ADT < 6000 VPD)
Minor Collector	(ADT < 3000 VPD)
Major Local	(ADT < 1500 VPD)
Minor Local	(ADT < 750 VPD)

#### **Arterial Streets (ADT > 6000 VPD)**

- Atherton Street
- College Avenue
- Easterly Parkway
- Westerly Parkway
- O'Bryan Lane
- Waupelani Drive
- University Drive
- Blue Course Drive
- Plaza Drive
- Park Avenue – Atherton Street to University Drive



Beaver Avenue – Buckhout Street to High Street  
High Street – College Avenue to Beaver Avenue  
Buckhout Street – College Avenue to Beaver Avenue  
Whitehall Road – Campbell Road to Ferguson Township Line

Major Collectors (ADT < 6000 VPD)

All Streets bounded by College Avenue, Beaver Avenue, High Street and Atherton Street (downtown 100 blocks).  
South Allen Street – Beaver Avenue to Waupelani Drive  
South Pugh Street – Entire length  
South Garner Street – Beaver Avenue to Hamilton Avenue

Minor Collectors (ADT < 3000 VPD)

Bellaire Avenue – Entire length  
Garner Street – Hamilton Avenue to Bradley Avenue  
Nimitz Avenue – Pugh Street to University Drive  
Science Street – Entire length  
Norma Street – Entire length  
East Marylyn Avenue – Norma Street to University Drive Extension  
South Allen Street – Waupelani Drive to Waypoint Circle  
Plaza Drive – Entire length  
Stratford Drive – Entire length  
Southgate Drive – Entire length  
Bayberry Drive – Entire length  
Corl Street – Entire length  
Hedgerow Drive – Entire length  
Saxton Drive – Westerly Parkway to Bayberry Drive  
Fairmount Avenue – Westerly Parkway to Garner Street  
Hamilton Avenue – Atherton Street to Pugh Street  
Nittany Avenue – Atherton Street to Pugh Street  
Foster Avenue – Allen Street to Garner Street  
Highland Avenue – Entire length  
Buckhout Street – Beaver Avenue to Fairmount Avenue  
Sparks Street – College Avenue to Westerly Parkway  
Barnard Street – PSU to Beaver Avenue  
Burrowes Street – Beaver Avenue to Fairmount Avenue  
Fraser Street – Beaver Avenue to Fairmount Avenue  
Hillcrest Avenue – Atherton Street to cul-de-sac  
Whitehall Road – Atherton Street to College Township line

Major Local(ADT < 1500 VPD)

All streets not listed as Arterials or Collectors in the area bounded by Atherton Street, University Drive, Beaver Avenue and Hamilton Avenue; and in the area bounded by College Avenue, Buckhout Street, Atherton Street and PSU (West End Village).

Minor Local(ADT < 750 VPD)

All streets not listed as Arterials, Collectors, or Major Locals.

**SPEED LIMITS**

The maximum speed limit for all streets in the Borough shall be 25 MPH with the exception of the following streets, which shall be 35 MPH, or as approved by PENNDOT (for streets under PENNDOT's jurisdiction):

Whitehall Road – Campbell Road to Ferguson Township line  
Blue Course Drive  
Park Avenue – Atherton Street to University Drive  
University Drive and University Drive Extension  
Atherton Street  
College Avenue – University Drive Ramp A east to the Borough line

**ON- STREET BIKE ROUTES**

The following streets shall be designated as share-the-road bike routes:

Waupelani Drive – Entire length  
South Allen Street – Foster Avenue to Waypoint Circle  
Easterly Parkway – Entire length  
Westerly Parkway – Entire length  
South Garner Street – Foster Avenue to Bradley Avenue  
Foster Avenue – Sparks Street to Garner Street  
McKee Street – Entire length  
Sparks Street – PSU to Prospect or Hamilton?  
South Gill Street – SCASD land to Prospect or Hamilton?  
Hamilton Avenue – Sparks Street to Gill Street?  
Prospect Avenue – Sparks Street to Gill Street?

**EMERGENCY ROUTES**

The following streets shall be designated as primary neighborhood access routes for emergency response:

Atherton Street  
College Avenue  
Easterly Parkway  
Westerly Parkway  
O'Bryan Lane  
Waupelani Drive

University Drive  
Blue Course Drive  
Plaza Drive  
South Allen Street  
South Garner Street  
Sowers Street  
South Pugh Street  
Heister Street  
McAllister Street  
Bellaire Avenue  
Science Street  
Norma Street  
Stratford Drive  
Southgate Drive  
Bayberry Drive  
Corl Street  
Hedgerow Drive  
Whitehall Road  
Highland Avenue  
Park Avenue – Atherton Street to University Drive  
Beaver Avenue – Buckhout Street to High Street  
High Street – College Avenue to Beaver Avenue  
Locust Lane – College Avenue to Beaver Avenue  
Hetzel Street – College Avenue to Beaver Avenue  
Nimitz Avenue – Pugh Street to University Drive  
East Marylyn Avenue – Norma Street to University Drive Extension  
Saxton Drive – Westerly Parkway to Bayberry Drive  
Fairmount Avenue – Westerly Parkway to Garner Street  
Hamilton Avenue – Atherton Street to Pugh Street  
Nittany Avenue – Atherton Street to Pugh Street  
Foster Avenue – Allen Street to Garner Street  
Buckhout Street – College Avenue to Fairmount Avenue  
Sparks Street – College Avenue to Westerly Parkway  
Barnard Street – PSU to Beaver Avenue  
Burrowes Street – College Avenue to Fairmount Avenue  
Fraser Street – College Avenue to Fairmount Avenue  
Hillcrest Avenue – Atherton Street west to cul-de-sac

## REFERENCES

- (1) Smith, D.T., Appleyard, D. et. al. *State of the Art Report: Residential Traffic Mangement*. Federal Highway Administration, Washington, D.C., Report FHWA-RD-80-092, 1980.
- (2) Appleyard, D. (1981) *Livable Streets, Protected Neighborhoods*. Berkeley, CA: University of California Press.

# **Chapter 3 - Traffic Calming Study and Approval Process**

## **INTRODUCTION**

The traffic calming program begins with an “initiation” step, which all requests undertake, then follows one of the four levels of implementation, depending on the level of traffic calming requested. The Levels are those devices listed in the Chapter 4 of this document - Traffic Calming Toolbox.

Most Level 1 and 2 traffic calming devices can be implemented by the neighborhood or Borough at little or no cost. If more than one traffic calming project (consisting of Level 3 or 4 devices) is being proposed, a ranking system will be used to prioritize projects that meet the criteria established in the study and approval process. Sufficient funding may not be available to complete all of the traffic calming projects identified. Therefore, the ranking system will establish the order in which projects will be completed. The ranking system can be found at the end of this chapter.

This chapter is to be used in conjunction with Pennsylvania’s Traffic Calming Handbook, Publication No. 383, dated January 2001 as prepared by the Pennsylvania Department of Transportation (PENNDOT). Specifically, this document supercedes Chapter 4 of PENNDOT’s handbook.

For local roads not subject to State, Federal, or Liquid Fuels funding, PENNDOT approval/involvement is not necessary but may be requested by the local municipality. If deemed necessary, the Borough Engineer will make a recommendation to Borough Council requesting PENNDOT’s involvement.

### **STEP 1 - NEIGHBORHOOD EDUCATION AND ENFORCEMENT (LEVEL 1 & 2)**

The Level 1 process begins when the Borough’s Transportation Commission (TC) receives a request from a group of concerned residents. The request shall include a discussion of the current traffic problem and identify a potential neighborhood coordinator. The request must be signed by fifteen (15) owners or tenants of separate affected properties, who support the request.

The Borough will assist neighborhood organizations to take the initiative in responding to local traffic issues. The Level 1 techniques and tools provided can be deployed almost immediately and most may be implemented by the neighborhood itself without Borough action. However, prior to the initiation of a formal Engineering Traffic Study, a Level 1 program must be implemented by a neighborhood as part of a Level 3 or 4 Traffic Calming Study.

Some requests may be able to be addressed immediately, without the need for traffic calming. These include issues related to safety, e.g., trimming of shrubs that obstruct driver sight distance, replacement of worn or missing signs, re-striping lane lines, etc. The Borough Engineer will determine whether a concern should be addressed

immediately or qualifies as a potential traffic calming project and follow the process herein discussed. The Borough Engineer and/or the TC, based on an Engineering Traffic Study, may also determine that a Level 2 solution will resolve the problem, and can proceed immediately.

## **STEP 2 - ENGINEERING TRAFFIC STUDIES FOR TRAFFIC CALMING** **(LEVELS 3 & 4)**

Prior to considering the need for traffic calming, an Engineering Traffic Study will be completed.

### **A. BOROUGH CONDUCTS ROUTINE STUDY**

From time-to-time, the Borough will conduct traffic counts and speed studies to determine if traffic calming mitigation is warranted. If criteria are met, the information will be presented to the TC to determine if further action is desired. If in the opinion of the TC that action is desired, staff will notify the neighborhood via U.S. Mail, and will begin Level 1 or 2 actions, without the need for a petition. Level 3 or 4 actions require a Citizen's Request prior to any initiation of a Traffic Calming Project.

### **B. CITIZENS REQUEST FOR STUDY**

**Step 1- Request for Study:** A request must be submitted in the form of a petition with at least 25 signatures of owners or tenants of separate affected properties, who support the request for a traffic calming study for a particular street within the Borough of State College. The request shall detail steps taken as part of the Level 1 program and the affect of those steps.

**Step 2- Collection of Speed and Volume Data:** Staff will collect speed and volume data for the particular street noted in the petition. This data will be compared against the existing Street Classification Policy to determine if thresholds for mitigation have been exceeded and to what level of magnitude.

**Step 3- Level of Magnitude Established:** If the volume of the particular street exceeds the ADT rating of the Street Classification by 10% or if the 85<sup>th</sup> percentile speed exceeds the posted speed limit of the street by at least 10 mph, then the petition along with the speed and volume data will be taken to the next available meeting of the TC. If the thresholds have not been met on the particular street, then staff will send a letter to those who submitted the petition indicating that a study is not warranted based upon the collected data. It will be noted that the decision may be appealed to the TC.

### **Step 3 - ESTABLISHING A TRAFFIC CALMING PROJECT**

Upon a recommendation by the TC and approval by Borough Council, a traffic calming project for a particular street or area will be established.

#### **A. DEFINING THE PROJECT AND MITIGATION AREAS:**

The TC and Borough staff will determine the project area and mitigation area.

1. The **project area** will be used to designate the area from which community support must be sought throughout the study and approval process. The area will be determined by the streets that are to be included in the supporting data collection, but as a minimum will be defined as the area around the particular street bounded by arterial streets. The area should include the study street, cross streets on either side of the measure(s), any street which relies on the study street for access, and the two parallel local service streets. Other local streets that may be affected by the implementation of the traffic calming measures may also be included. For all affected arterial streets, it is necessary to identify any traffic related problems before implementing traffic calming measures on the study street.

{Generally, land owners along arterial streets should not be included for community approval purposes since arterial streets are designed to accommodate the higher speeds and volumes which are undesirable on local streets. Arterial streets, however, can be included if they serve a downtown district.}

2. The **mitigation area** will be defined as the streets on which some form of mitigation is proposed.

#### **B. SUPPORTING DATA:**

Once the project proceeds beyond the initial review, the following information may be gathered (under the supervision of qualified technical personnel) to provide evidence that a traffic problem exists.

{If there are insufficient funds and/or the scope of work exceeds the workload of staff, it will be necessary for Borough Council to authorize funds to hire a consultant. This approval is necessary prior to the collection of the supporting data.}

The traffic studies that are conducted for a traffic calming program should be conducted in accordance with the 67 PA Code, Chapter 201 (Publication 201 – Engineering and Traffic Studies), wherever applicable:

1. Average daily traffic (ADT) volume - As a minimum requirement, the ADT should exceed the thresholds as established in the Street Classification or the peak hour volume should exceed 100 vehicles for the roadway to be considered for traffic calming, or when the volume of the street's classification has been exceeded.
2. Speed - When speeding is the primary concern, the 85th percentile speed (or average speed) should exceed 10 mph over the posted speed limit before traffic calming is considered. The 85th percentile speed is the speed at or below which 85 percent of the motorists on a street are traveling. This speed is often used as a measure of the upper limit of reasonable speeds for prevailing conditions. The average speed should be used only when the number of vehicles necessary for determining the 85th percentile speed cannot reasonably be obtained.
3. Adjacent arterial roads – determine if problems on area streets are related to poor traffic conditions on adjacent arterial roads. In this case, deficiencies on the arterial streets should be identified first if they are the responsibility of the local municipality.
4. Crashes – crash data, by type, for the most recent three years.
5. Parking – location, capacity, and use.
6. Pedestrian and bicycle activity – identify vulnerable groups like children and the elderly.
7. Emergency service routes – identify primary routes.
8. Transit routes - identify any routes.
9. Locations of schools, parks, and other such facilities – note if any are within the project area.
10. Street Functional Classification and Land Use - The street for which mitigation has been requested must be evaluated based upon the land use of the properties along the street and its natural characteristic. Traffic calming measures may be considered on the following roadway types (local or State-owned) based on functional classification, land use patterns, and posted speed limits:
  - \* Local residential streets
  - \* Collector streets with predominantly residential land uses
  - \* Arterial roads within downtown districts or commercial areas (with posted speeds of 40 mph or less)

The Borough Engineer and Centre Region Transportation Planner shall provide assistance in identifying the functional classification of project

area roadways. State and U.S. routes where truck volumes are 5 percent or greater may indicate that goods movement is an important function of the highway and traffic calming measures may be undesirable.

**C. PROJECT AREA TRAFFIC CALMING SURVEY:**

Each residence and property owner within the project area will be surveyed for his/her opinion regarding potential traffic mitigation on the particular street in question. An additional benefit of the survey is to notify residents that the TC is evaluating the situation and is considering changes to the streetscape.

**D. PROJECT APPROVAL:**

After the supporting data and the survey responses have been gathered and evaluated, TC must decide if further consideration for traffic calming is warranted. If in the opinion of TC the supporting data and survey response does not warrant further consideration, then a letter will be sent to those who submitted the petition indicating that further study is not warranted based upon the collected data. The decision may be appealed to Council.

If TC agrees that further consideration is warranted, then the study shall be recommended to Borough Council for approval prior to continuation of the process. To demonstrate local government support for traffic calming projects on State roads, or for projects on local roads which are anticipated to have a major effect on State roads, the State College Borough Council must pass a resolution approving further study. If the traffic calming project is on a State road, this resolution must then be reviewed by PENNDOT to determine if the conditions warrant further study.



## **STEP 4 - TRAFFIC CALMING PLAN DEVELOPMENT**

Once Borough Council approves and supports the project, then the following procedure shall be used to develop a traffic calming plan:

### **A. INITIAL MEETING:**

The first step in the development of the traffic calming plan is to hold an initial “kickoff” meeting. This meeting should be conducted by the TC and staff. Registered owners of each tax parcel as well as residents within the project area that will be affected by the installation of the traffic calming measure(s) should be invited to this meeting. Representatives from the Borough’s emergency service departments (fire, police, and rescue), public works department, local schools, and the CATA should also be invited to attend. Finally, the traffic consultant retained to prepare the traffic calming plan (if applicable) should be included. It is important that all of these entities be included in the development of the traffic calming plan to ensure that the project addresses all the needs and concerns of the Borough.

### **B. NEIGHBORHOOD TRAFFIC CALMING COMMITTEE (NTCC):**

A NTCC should be developed from the residents that attended the initial meeting(s). This committee will help provide focus to the plan development process by providing a link between the neighborhood and the municipality. The NTCC will help assist the Borough Engineer and the TC in organizing future community events, reviewing preliminary traffic calming plans and reports, and other areas where neighborhood participation is needed.

### **C. Transportation Commission (TC):**

The TC should oversee the development of the traffic calming plan.

### **D. Plan Development:**

The Borough Engineer and staff, with assistance from the TC and the NTCC, should use the previously gathered to further define the traffic problem. In addition, the data may help identify appropriate solutions or define which traffic calming measures are appropriate for the particular application. Although TC and NTCC personnel can assist in this endeavor, traffic data analysis must be obtained under the supervision of appropriate traffic engineering or technical personnel.

1. **Analyze Data:** The Supporting Data listed in Step 3 of Establishing a Traffic Calming Project shall be analyzed.

2. **Identify Appropriate Traffic Calming Measures:** After the traffic data has been compiled, appropriate traffic calming measures can then be identified. Identifying appropriate measures includes the following:

- a. Identification of which traffic calming measures are designed to solve the documented problems.
- b. Appropriateness of a particular traffic calming measure to the location where it will be installed.

3. **Concur on Measure, Location, and Design:** At this point, the project engineer should present the findings of the data analysis to the NTCC and TC. Also, the engineer should describe which traffic calming measures are best able to address the problems identified, and discuss neighborhood opinions about traffic calming. Through this and subsequent meetings, Borough Council, Borough staff, the NTCC, and the TC should work toward a consensus on the most appropriate traffic calming measures, their design, and specific locations.

#### E. **Plan Documentation**

The project engineer shall develop a Traffic Plan Document that summarizes the plan developed under section D. This Document shall be used in the Approval Process defined in Step 5. This plan shall include as a minimum the following components:

1. **Overview.** A brief overview of the information discussed in paragraphs A, B, C, and D of this section, including: definition of problem, supporting data, and other analysis.
2. **Plan Definition.** A clear statement of the consensus plan shall be included as well as graphics and all plan components. Included with the plan shall be any options for specific locations.
3. **Rational and Justification.** A discussion that justifies the proposed plan based upon the information provided in the Overview.
4. **Impact Statement.** Included within the Traffic Plan Documentation shall be an Impact Statement section that at a minimum shall include.
  - a. A projection of traffic decrease on the project street(s). This must also include a projection of where the traffic will be rerouted.
  - b. A projection of the Plan impact on all non-project streets within the project area. This shall include identification of all non-project streets within project area that already exceed their

permissible maximum values of ADT as well as all non-project streets which are projected to exceed their maximum values as a result of the Plan implementation. The impact of the Plan on those streets must be specifically assessed.

c. An assessment of the expected impact to surrounding neighborhoods outside the project area shall be included. This shall include considerations of impact on the Downtown Business district, the inter-neighborhood traffic flow, and other neighborhood or borough-wide considerations.

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## **Step 5 - TRAFFIC CALMING PLAN APPROVAL PROCESS**

### **A. Open House or Public Meeting:**

Once consensus has been reached by the Borough Council and the traffic calming committees, the traffic calming plan should be presented at an open house or public meeting. Notices for these meetings may be distributed door-to-door, mailed, or announced via a press release. The community should typically be presented with a single plan, with options for specific locations. Then, if necessary, plans may be modified before they are submitted to the project area neighborhood for approval.

### **B. Finalize Plan:**

Following public review, any necessary modifications are made to the traffic calming plan. Additional public meetings can be held if the changes are very substantial.

### **C. Project Area Survey:**

Once the traffic calming plan is completed, a second survey of the project area should be conducted. Each residence and property owner within the project area will be surveyed regarding the plan. The TC will evaluate the responses and determine if there is sufficient support for the plan to continue.

### **D. Borough Council and PENNDOT Approval:**

After approval from the project area neighborhood is obtained, the traffic calming plan must be officially approved by Borough Council. At this point, the funding source should be clearly identified and money set aside for implementation and maintenance. If the project involves a State road, or if State, Federal, or Liquid Fuels funds are requested, PENNDOT approval is also required.

## **STEP 6 - TRAFFIC CALMING PLAN INSTALLATION AND EVALUATION**

After the traffic calming plan is approved by the neighborhood, Borough Council, and PENNDOT (when State highways are involved), the traffic calming measure(s) can be installed on either a temporary or permanent basis.

### **A. Temporary Measure:**

Temporary measures should be considered if traffic flow might be severely affected by the installation of traffic calming measures. After installation, traffic patterns and community approval may not be as expected. Temporary measures provide an opportunity to review the design in the field without a major removal expense if the project does not satisfy the original goals. If traffic calming measures are installed on a temporary basis, the temporary measures should resemble the permanent measures as much as possible, and should be marked, signed, and lit as if they were permanent measures. In addition, they must be designed using crashworthy devices so that they do not impose a safety hazard if struck by an errant vehicle. Temporary installations provide a valuable means for the Borough Council to gauge the depth of neighborhood support for measures that citizens may be unfamiliar with.

### **B. Test Period:**

When temporary measures are installed, a three to twelve-month test period should be considered. In most cases, a three to six-month test is sufficient. Measures, such as diverters, that significantly alter traffic patterns may require a six to twelve-month test period. The test period should extend into the snow season whenever possible. This will provide the opportunity to detect any snow removal problems that may exist as a result of using the traffic calming measure. In addition, the test period must include part of the fall and spring semesters. After the measure has been in-place for the specified time period, engineers or technical personnel should gather appropriate speed, volume, and other data to determine whether the measure has had the desired effect. The test period also provides the neighbors with the opportunity to decide whether the advantages gained from slower vehicle speeds, lesser volumes, and, in many cases, safer streets are worth the extra braking, the noise that some measures produce, extra seconds added to an emergency response call, longer trips to and from home, and other associated effects. Adjacent streets should also be monitored to verify that traffic problems have not shifted elsewhere. Temporary installation period may also be used to test the impact on emergency service vehicles.

### **C. Install or Modify Measure:**

Following the temporary installation period, the NTCC, TC, Borough Council, and PENNDOT (when necessary) must decide whether to install the measure on a

permanent basis. At this point, they may also decide to modify the original traffic calming plan. (The modification need not take as long to develop as the original plan.)

**D. Conduct Follow-up Studies:**

Whether the measure is installed permanently at the onset or after a temporary installation, follow-up traffic studies should be conducted to determine the effectiveness of the calming measures and the level of community support. If initial opposition occurs, it should not be acted upon unless safety is a concern. Borough Council should consider removal of measures only 1) after they have been in place for six months to a year, 2) after a review and recommendation by the TC, and 3) with the same level of project area support for removal that was required to install the measure.

Depending on the particular traffic calming measure and project objective, staff may monitor crashes, traffic speeds, traffic flow, or diversion to other routes. The following parameters may be helpful in determining the benefits derived from the installation of traffic calming measures:

1. Before and after crash statistics for motor vehicle crashes, motor vehicle/bicycle crashes, and motor vehicle/pedestrian crashes. The crash studies should indicate how crash trends in the project area have been affected and should cover a length of time sufficient to identify long-term effects.
2. Before and after speed studies to determine the 85th percentile speed. Ideally, speed studies should be performed upstream of, at, and downstream of the traffic calming measure to identify its effect on vehicle speeds.
3. Before and after user volume, including peak hour volumes, the average daily traffic (ADT), and the directional design hourly volume (DDHV). Traffic counts should be made on the street where traffic calming will be installed and on the streets to which traffic is expected to divert. The “after” counts should be made when traffic patterns have stabilized.

**E. Modify Design or Remove Measure if Needed:**

As previously indicated, the removal of traffic calming measures should only be considered after they have been in-place and monitored for six months to a year, and then only with the support of the project area, unless a safety problem has developed. If a safety problem develops, the Borough will take steps to modify the traffic calming measure or remove it. PENNDOT may also remove a traffic calming measure installed on a State road if a safety problem has developed. If PENNDOT removes a measure from a State road due to safety concerns caused

by improper installation or maintenance, the cost for removal must be reimbursed by the Borough.

**PROJECT RANKING**

**A. Funding:**

Borough Council may designate funding for a traffic calming program and maintenance in its annual budget.

**B. Project Ranking System:**

If more than one project is being evaluated, the following ranking system will be used to prioritize projects that meet the criteria established in the study and approval process. Sufficient funding may not be available to complete all of the traffic calming projects identified. Therefore, the ranking system will establish the order in which projects will be completed.

<b>Criteria</b>	<b>Points</b>	<b>Basis for Point Assignment</b>
Speed	0 to 30	Extent by which 85 <sup>th</sup> percentile speeds exceed posted speed limit; 2 points assigned for every 1 mph
Volume	0 to 25	Average daily traffic volumes; 1 point assigned for every 120 vehicles
Crashes	0 to 10	1 point for every crash reported within past 3 years
Elementary or Middle Schools	0 to 10	5 points assigned for each school crossing on the study street
Pedestrian Generators	0 to 15	5 points assigned for each public facility such as parks, community centers and high schools or commercial use that generates a significant number of pedestrians within the project area
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.
<b>Total Points Possible</b>	100	

**C. Transportation Commission (TC)**

The TC is a standing committee which coordinates all traffic calming measures within the Borough of State College and makes recommendations to Borough Council on the implementation of traffic calming measures.

## Chapter 4 – The Traffic Calming Toolbox

### INTRODUCTION

In keeping with the Policy Statement, the toolbox has been designed with four levels of “tools” from subtle to aggressive. In all cases, it is necessary to begin with Level 1 tools before moving to Level 2, 3, or 4. **With no exceptions, all traffic calming measures must follow the PENNDOT Manual on Uniform Traffic Control Devices (MUTCD).**

### **Level 1 Tools**

Level 1 tools are neighborhood driven and allows a neighborhood to take immediate action to address concerns. Residents take the initiative in forming a speed watch group, taking neighborhood pledges, conducting neighborhood education workshops, and undertaking other measures. Additionally, neighborhoods can request the use of the Borough’s radar speed display unit and ask for targeted police enforcement. The need for an engineering traffic study is not needed for Level 1 measures. The following are Level 1 traffic calming measures:

#### 1.1 **Neighborhood Traffic Safety Campaign**

Neighborhood traffic safety campaigns include: personalized letters, flyers and newsletters as well as meetings, workshops, specific school programs, and neighborhood speed awareness signs or banners. Campaigns focus on subjects such as pedestrian safety, enforcement and speeding impacts in order to heighten community awareness both consciously and subconsciously.

Advantages:

- Allows residents to discuss views
- Information targeted to a specific audience
- Can be applied quickly without a formal review process

Disadvantages:

- May not be very effective
- Often requires additional measures
- Potentially time consuming
- Enforcement still likely required

#### 1.2 **Neighborhood Pledge Program**

This program promotes safe and courteous driving through the use of two elements: a pledge and a bumper sticker. Residents are asked to sign a pledge and implement it into their own driving habits and lifestyles. A bumper sticker promotes courteous driving and identifies the person as a “pace” car driver. By setting the example for proper driving, the vehicle sets the pace or speed for other vehicles on the road by requiring cars behind the



pace car to also drive within the speed limit. The intended benefit of a neighborhood pledge program is to get residents to recognize that their driving behavior impacts the livability of other residents' streets.

Advantages:

- Heightens awareness of vehicle travel speeds
- Residents set the "pace" for drivers behind them
- Demonstrates neighborhood support for courteous driving habits
- Involves community

Disadvantages:

- Effectiveness may be limited
- May not appreciate stickers on their vehicles
- Might create ill will or tension among neighbors

### 1.3 **Neighborhood Sign Program**

The Borough loans yard signs to a neighborhood on a short-term basis to encourage motorists to respect the neighborhood and to drive responsibly. Every few days, residents move the signs around the neighborhood to different yards so drivers and pedestrians notice the newly placed signs.

Advantages:

- Requires large group of supporters
- Novelty of new signs draws attention to message
- Short duration of sign placement helps keep the message fresh

Disadvantages:

- Signs could be vandalized
- Effectiveness will diminish with repeat usage

### 1.4 **Speed Display Signs**

The most common form of radar speed display units is a portable sign equipped with a radar unit that detects the speed of passing vehicles and displays it on a reader board, often with a speed limit sign next to the display. The primary benefit of speed display units is to discourage speeding along neighborhood streets.

Advantages:

- Effective educational tool and good public relations tool
- Encourages speed compliance and can reduce speeds temporarily
- Provides immediate feedback to drivers on their driving speed
- Allows residents to see how fast vehicles are traveling

Disadvantages:

- Does not enforce
- Less effective on high volume streets
- Subject to vandalism

- Require Borough staff to set-up and remove

### 1.5 **Moveable “Slow Down” Signs**

Permanent signs often lose their effectiveness, yet the novelty of a new sign may draw a motorist's attention. As appropriate, the Borough could install on existing sign posts, on a short-term basis, signs to heighten driver awareness to a particular concern. These short-term, specialized signs may draw attention to the need to observe pedestrian laws, drive more slowly, or some other desired behavior.

Advantages:

- Novelty of new signs attracts the attention of motorists
- Avoids long-term sign clutter

Disadvantages:

- Long-term benefit may be negligible
- Existing sign posts may not accommodate added signage or be located in proper location
- More sign clutter in residential area
- Requires Borough staff to install and remove

### 1.6 **Speed Watch and Warning Letters**

Residents deliver brochures to their neighbors to raise awareness of how safety and quality of life are affected by speeding. Several trained residents then borrow a radar gun from the Borough to conduct their own speed study and, if available, the Borough will set up a speed display unit. License plate numbers of speeding vehicles and time of day can be recorded and given to Borough staff. The Borough sends the owners of the most egregious speeding vehicles a letter stating when, where and by how much their vehicle was observed speeding. The owners also receive educational information about the problems generated by speeding.

Advantages:

- High-speed vehicles identified and owners receive educational information
- Letter from local law enforcement may increase driver awareness and compliance
- May allow parents to become aware of a child's driving habits

Disadvantages:

- Registered vehicle owner who receives letter may not be the high-speed driver
- Program requires monitoring by staff to avoid potential abuse or harassment
- Requires accurate notation of vehicle license number

## 1.7 Targeted Police Enforcement

The Police Department deploys officers to perform targeted enforcement on residential streets. The intended benefit of targeted police enforcement is to make drivers aware of local speed limits and to reduce speeds. Experience has shown that residents as well as non-residents receive citations.

### Advantages:

- Warns drivers and increases awareness
- Visible enforcement very effective, especially when combined with other actions
- Can be used on short notice
- Can reduce speeds temporarily
- May influence the behavior of other drivers by seeing a citation being issued

### Disadvantages:

- Only temporary
- Requires officers availability
- May disrupt traffic
- Requires repeated use to be effective
- Is a cost to the Borough

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## **Level 2 Tools**

These measures focus on easily implemented and still relatively low-cost features. All Level 2 measures require an engineering traffic study, but do not require following the Traffic Calming Approval Process.

### **2.1 Crosswalk Improvements**

These can consist of new crosswalks or providing higher visibility crosswalks. Higher visibility crosswalks can be created by painting "zebra" stripes in lieu of or between the crosswalk's outer boundary stripes. New crosswalks, when warranted, designate pedestrian crossing areas. The primary benefit of higher visibility crosswalks is to increase crosswalk visibility to drivers.

Advantages:

- Indicates preferred crossing location
- When pedestrians are present, may slow travel speeds
- High visibility crosswalks are more visible than traditional crosswalks
- Focuses crossing pedestrians at a single location

Disadvantages:

- Pedestrians may assume they are always safe to cross
- Requires a high level of maintenance

### **2.2 Street Lighting**

While most Borough street intersections have streetlights, it may be advantageous to improve brightness, change location, or install supplemental fixtures.

Advantages:

- Increased night-time visibility of both pedestrians and drivers

Disadvantages:

- Requires maintenance
- May have on-going maintenance and energy costs associated
- May be costly to install
- May be disruptive to adjacent property owners

### **2.3 Lane Striping**

For this measure, striping is usually used to create narrow lanes -- often about 10 feet wide. This may be accomplished by striping white "fog" lines or edgelines and/or yellow centerlines. A centerline stripe helps drivers stay on the "right" side of the road and not use the entire roadway width as a travel

lane. On wide roadways, the "unused" pavement created by striping can sometimes be used to stripe a bicycle lane, a parking lane, or a pedestrian shoulder. The primary benefit of narrowing lanes through striping is to delineate lanes and to slow vehicle speeds.

Advantages:

- May slow vehicle speeds
- Visibly defines travel lanes

Disadvantages:

- Not always perceived as effective
- May not be visibly appealing in small neighborhoods
- High maintenance costs

## 2.4 Supplemental Signs and Pavement Markings

On some streets, additional sign age or pavement markings could assist in drawing motorist's attention to particular roadway conditions. Advance warning signs (e.g., Bicycle Crossing Ahead, Watch Children), supplemental regulatory signs (e.g., an added speed limit sign), and pavement markings (e.g., "Keep Clear", "Bike Xing") can be used, when warranted based on engineering studies.

Advantages:

- Increases awareness
- Draws attention

Disadvantages:

- May be slippery for bicyclists
- Not aesthetically appealing

## 2.5 New Regulatory Signing

New regulatory signs such as stop signs and speed limit signs can be installed when warranted based on engineering studies. In other words, traffic engineering analysis must be conducted by the Borough and the installation of a certain regulatory sign must be based on applicable implementation standards. It should be noted that this category does not include restricted movement signing (see Level 3 measures).

Advantages:

- Can be effective if warranted
- Can increase safety and reduce speeds

Disadvantages:

- Must be warranted
- Involves traffic analysis

## **Level 3 Tools**

Level 3 treatments require the Traffic Calming Approval Process be followed. These treatments are generally more costly, require engineering, and require substantial citizen input. Level 3 measures proposed on Arterials, Collectors, Designated On-Street Bike Routes, and Designated as Emergency Routes shall be limited to horizontal changes in the roadway only (that is, vertical roadway deflections, ie, speed humps, raised crosswalks, etc, are not acceptable). Additionally, barriers restricting access by emergency vehicles on streets designated as Emergency Routes are not permitted. Level 3 treatments include:

### **3.1 Center Median Islands**

Median islands are raised islands in the center of a street that can be used to narrow lanes for speed control and/or to create a barrier to prohibit left-turns into or from a side street. They can also be used as a pedestrian refuge in the middle of a crosswalk.

Advantages:

- Reduces speeds and may reduce noise
- Can be implemented on any street, regardless of classification
- Visually appealing
- May reduce accidents

Disadvantages:

- May require parking removal
- Could impact emergency vehicles
- May divert traffic volumes, if turning movements are restricted

### **3.2 Intersection Neck-Down or Chokers**

Curb extensions narrow the street by extending the curbs toward the center of the roadway or by building detached raised islands to allow for drainage and bike lane passage. They are used to narrow the roadway and to create shorter pedestrian crossings. Curb extensions also improve sight distance and influence driver behavior by changing the appearance of the street.

Advantages:

- Better pedestrian visibility
- Shorter pedestrian crossing distance
- Can decrease vehicle speeds
- Opportunity for landscaping and entrance feature
- Can be used on any street regardless of classification

Disadvantages:

- Can require removal of parking
- May create hazard for bicyclists
- Can create drainage issues
- Difficult for trucks turning right

### 3.3 Chicanes and Chokers

A chicane is a series of two or more staggered curb extensions on alternating sides of a roadway. Horizontal deflection influences motorists to reduce speed through the serpentine roadway. The primary benefit of chicanes is speed control without a significant impact to emergency vehicle mobility.

Chokers and slow points are intersection or mid-block curb extensions that narrow a street by extending the sidewalk or widening the planting strip. The remaining cross-section can consist of one lane or two narrow lanes. Chokers and slow points are intended to reduce traffic volumes and speeds by making the roadway narrow so vehicles slow down. Chokers reduce the roadway width so that only one car at a time can pass through it, while slow points allow two cars to pass very slowly in opposite directions.

Chicanes and chokers are generally placed on streets with speed limits that are lower than 35mph.

Advantages:

- Effectively reduces vehicle speeds
- Low impact on emergency vehicles
- Does not restrict resident access
- Opportunity for landscaping

Disadvantages:

- Can require removal of parking
- May create hazard for bicyclists
- Can create drainage issues
- Increased maintenance
- May require additional sign age

### 3.4 Changes In On-Street Parking Configuration

Adding parking to a street, on one side or both sides, or creating alternate side parking on a street, may be an effective tool in reducing vehicle speeds.

Advantages:

- Adding parking may reduce speeds
- Can be used to create a chicane effect
- Increased effectiveness when combined with other measures
- Buffers pedestrians from traffic

Disadvantages:

- Reduced visibility
- Impedes bicycles
- Parking on high volume streets may increase collisions
- Opening doors on parked cars into travel lane can be hazardous

### 3.5 **Bike Lanes**

Streets designated as Bike Routes, may be candidates for striping of bike lanes. Striping usually creates narrow vehicle lanes -- often about 10 feet wide. A centerline stripe also helps.

Advantages:

- Space is provided for both vehicles and bicycles
- Improves safety of bicyclists
- May slow vehicle speeds
- Visibly defines travel lanes

Disadvantages:

- May complicate intersections
- Drivers may not be used to bicycles on the road
- Not always perceived as effective

### 3.6 **Traffic Circles**

Traffic circles are raised circular islands in a residential intersection. They are modest in size, unlike a rotary or modern roundabout, and are appropriately scaled for the intersection of neighborhood streets. Traffic circles require drivers to slow down to a speed that allows them to comfortably maneuver around the circle in a counterclockwise direction. The primary benefit of traffic circles is speed control and reduction in angle and turning collisions. Traffic circles cannot be located on collector streets.

Advantages:

- Effectively reduces vehicle speeds
- Can reduce collision potential
- May reduce collision severity
- Provides better side-street access
- Opportunity for landscaping
- May alleviate need for stop signs
- Provides visual interruption on long, straight streets

Disadvantages:

- Parking removal may be required
- Can increase bike/ auto conflicts
- Can impede emergency vehicles
- Can restrict large vehicle access



- Crosswalk location may need to be modified
- Does not reduce noise

### 3.7 Turn Restrictions

Turn prohibition signs involve the use of standard "No Left Turn", "No Right Turn", or "Do Not Enter" signs to prevent undesired turning movements onto residential streets. They may include peak period limitations. The primary benefit of restricted movement signing is to reduce traffic volumes along residential streets.

Advantages:

- Reduces traffic volume
- Reduces traffic volume at peak periods of the day
- Inexpensive

Disadvantages:

- May re-direct traffic to other streets
- Requires enforcement
- Usually not effective all day
- Limits neighborhood access

### 3.8 Speed Humps

Speed humps are typically asphalt mounds constructed on residential streets. They are usually placed in a series and spaced 300 to 600 feet apart. Speed humps are typically 14 feet long and 3 inches high and extend across the entire width of the street. Their vertical deflection encourages motorists to reduce speed.

Speed humps require good approach sight distance -- therefore they cannot be used on winding streets or on streets with steep grades so as not to create additional safety concerns. Streets considered for speed humps typically have speed limits of 25 mph and have low traffic volumes. Speed humps cannot be used on collector streets due to the need to accommodate emergency vehicles.

Advantages:

- Does not require parking removal
- Impact on bicyclists may be minimized through design
- Effective in slowing traffic
- May reduce traffic volumes

Disadvantages:

- Impacts all drivers, even those driving appropriately
- Increases noise near speed humps
- May divert traffic to parallel streets

- Not esthetically pleasing
- Adds more signs to neighborhood
- Impacts emergency vehicle response time
- Effects people with certain disabilities
- Impacts school buses and transit

### 3.9 Roundabouts

Roundabouts are much like traffic circles, but can be used in place of a traditional STOP intersection or traffic signal. For an effective roundabout, there must be adequate right-of-way to construct a 100' diameter outside radius (minimum) of the travel way. Roundabouts are more effective on higher volume roadways.

Advantages:

- Reduces speeds and safety
- Reduces energy consumption of motorists
- Visibly appealing

Disadvantages:

- Requires maintenance
- Construction may interfere with utilities
- Very costly to construct
- Generally requires acquisition of additional right-of-way
- Can be viewed as challenging to bicyclists and pedestrians

### 3.10 Transverse Pavement Markings

Transverse pavement markings are created using a double thick thermoplastic marking, thereby creating a “rumble strip” effect to the motorist. They have been successful in slowing traffic in diverse areas such as school zones, hospitals, approaches to severe curves, etc.

Advantages

- Low cost
- Effective when used with other measures
- Catches attention of driver

Disadvantages

- High maintenance
- Perceived as not very effective
- Drivers become accustomed to them, and they lose their effectiveness
- Creates noise which can be detrimental to nearby residents

### 3.11 Raised Mid-Block Crosswalks

Raised mid-block crosswalks are crosswalks constructed 3 to 4 inches above the elevation of the street. They are usually about 22 feet long in the

direction of travel, with a flat section in the middle (approximately 10 feet long) and ramps on the ends. Sometimes the flat portion is constructed with brick or other textured materials. Raised crosswalks are intended to reduce vehicle speeds specifically where there are a high number of pedestrians that cross the street. Raised crosswalks are typically placed in high visibility locations on streets without steep grades, moderate vehicle volumes and speed limits less than 35 mph.

Advantages:

- Effectively reduces vehicle speeds
- Good pedestrian safety treatment
- Improves pedestrian visibility
- May ease street crossings for disabled
- Does not affect access
- Flat portion can be textured

Disadvantage:

- May generate increased noise
- Can require drainage modifications
- Often require signage and markings
- Impacts emergency vehicle response time
- Affects people with certain disabilities

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## **Level 4 Tools**

Level 4 measures consist of traffic diversion measures to reduce vehicle volumes on selected streets. Level 4 measures should only be used as a last resort. In general, Level 4 measures require significant public input, are generally very costly, and require significant planning due to changes in traffic flow. Level 4 tools include:

### **4.1 Diverters**

Diagonal diverters are physical barriers placed diagonally across a four-way intersection to create two unconnected intersections. They are not appropriate for collector or arterial classified streets. They are effective in reducing traffic volumes, but do not affect vehicle speed.

Advantages:

- Reduces traffic volume
- Can be aesthetically pleasing
- Improves pedestrian safety

Disadvantages:

- Limited access
- Very costly to install
- May require right-of-way acquisition
- May shift collisions to arterial or collector streets
- Restrictive for emergency vehicles
- Are not bicycle friendly
- May shift traffic to adjacent streets

### **4.2 Semi-diverters**

Semi-diverters prevent travel in one direction on a street by blocking half the street with a physical barrier. The semi-diverter creates a one-way roadway at the point of construction while two-way traffic is maintained on the remaining portion of the roadway. Semi-diverters can only be used on major and minor local streets.

Advantages:

- Reduces traffic volume
- Reduces cut-through traffic
- May reduce travel speeds
- Permits emergency vehicle access
- Can be visually appealing

Disadvantages:

- Requires maintenance

- May require loss of on-street parking
- May be costly to install
- Limits neighborhood access
- Can be easily violated

#### 4.3 **Right Turn Diverters**

Right-in/right-out islands form an intersection channelization that prevents left turns and through movements to and from a side street. These devices are appropriate for major and minor local streets only.

Advantages:

- Reduces traffic volume
- Reduces cut-through traffic
- Used in conjunction with regulatory sign restrictions
- Improves pedestrian safety
- Reduce traffic speed
- Can be traversed by emergency vehicles

Disadvantages:

- Traffic may not circulate smoothly
- Can be easily violated
- Limits access to neighborhoods

#### 4.4 **Cul-de-sacs and Street Closures**

Cul-de-sacs and street closures form a barrier extending the entire width of a street, obstructing all traffic movements. These treatments can only be used on major and minor local streets, and should be used as a last resort.

Advantages:

- Reduces cut-through traffic
- Reduces vehicle noise
- May be visually appealing
- May reduce speeds

Disadvantages:

- Limits access to neighborhood
- May redirect traffic on other streets
- Obstructs access to transit/emergency vehicles
- May be legally challenged
- May result in loss of on-street parking

#### 4.5 **One-Way Streets**

While turn restrictions are only spot controls and can be violated, creating a one-way street may be more effective. One-way streets are usually implemented in parallel pairs to ensure good circulation.

Advantages:

- Reduces traffic volume
- Reduces cut-through traffic
- Used in conjunction with regulatory sign restrictions
- Improves pedestrian safety

Disadvantages:

- Traffic may not circulate smoothly
- May increase vehicle speed
- Limits access to neighborhoods
- May affect emergency vehicle response time

#### 4.6 **Raised Intersections**

A raised intersection is a flat, raised area covering an entire intersection. There are ramps on all approaches. The plateau is usually about 4" high. Often, the raised intersection is finished in brick or other textured materials. Raised intersections are used to reduce through movement speeds and provide safer street crossings for pedestrians. Raised intersections are generally not placed on streets with speed limits greater than 35 mph, streets with steep grades or high volume streets.

Advantages:

- Effectively reduces vehicle speeds
- Creates a level crossing for pedestrians
- Can be aesthetically pleasing
- Does not affect access

Disadvantages:

- Expensive to construct and maintain
- Requires drainage modifications
- Affects emergency vehicle response time
- May require bollards to define corners
- Affects people with certain disabilities

#### 4.7 **Raised Median through Intersection**

A raised median through an intersection is a barrier which prevents left turns and through movements to and from a local street at an intersection with a collector or arterial.

Advantages:

- Reduces speed
- Reduces pedestrian crossing distance
- Improves pedestrian safety
- Improves intersection safety by removing conflicting movements

Disadvantages:

- May reduce parking
- May affect emergency vehicle response time
- May shift traffic to other locations

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## Appendix A

### Transportation Policy Borough of State College

Adopted by the State College Borough Council on February 20, 2001

#### **Vision:**

The transportation system of the Borough of State College is planned, operated and maintained to support residential neighborhoods that are good places to live; a downtown that is diverse, lively and economically viable; and an overall community that is accessible, safe, clean, and attractive.

#### **The Transportation Policy:**

##### The Premise

- Supports and encourages alternatives to the single occupant automobile (pedestrian, bicycle, transit, and carpool, as well as transportation demand management strategies).
- Accepts that the private auto is, and will continue to be, the transportation mode of choice for most residents of the Centre Region.

##### Traffic Management

- Gives highest priority to the safety of pedestrians, the protection of neighborhood streets, and the smooth flow of traffic onto the campus and into the downtown.
- Fosters the use of environmentally sustainable and economical means of transport to reduce traffic congestion and parking demand, as well as the speed and volume of traffic on neighborhood streets.
- Encourages bicycling by providing safe, connected, and well-maintained bike paths in the downtown and throughout the Borough.
- Minimizes the environmental aspects of transportation (noise, air and water pollution, consumption of land, traffic congestion) that impact quality of life in the Borough.
- Supports diverting through traffic routes from downtown streets.
- Provides for traffic mitigation solutions when traffic levels on neighborhood streets exceed their classification limits.

##### Relationship Issues

- Requires a partnerships approach (with surrounding municipalities, neighborhood associations, the downtown business community, Penn State and PaDOT) to addressing traffic and parking issues.
- Recognizes that land use decisions, within the Borough and in outlying municipalities, directly impact the viability of the Borough's transportation system.
- Acknowledges that transportation issues, in the downtown and elsewhere in the Borough, should be addressed cooperatively with the Pennsylvania State University, whenever possible.
- Recognizes that transportation issues must be viewed holistically as comprising automobile issues, pedestrian issues, alternative transportation issues and planning issues.
- Ensures that downtown parking fairly balances the amount sought by the business community, pricing conducive to a healthy downtown, the necessity of being economically self-supporting, the impact of associated traffic, and the application of sound principles of urban design.