

City of Sandy Neighborhood Traffic Management Program

**Prepared for:
City of Sandy**

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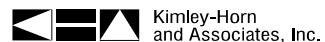


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INTRODUCTION

The City of Sandy Neighborhood Traffic Management Program was developed through a cooperative effort involving the City of Sandy, the Sandy and Boring Fire Departments, the Sandy Police Department, and neighborhood residents. The preparation of this document was funded in part with a Grant from the Oregon State Lottery through the Rural Investment Fund administered by the State of Oregon Economic Development Department. The program provides a process for identifying, prioritizing, and mitigating problems related to traffic speeds and volumes on local streets. Potential solutions to traffic problems include traffic calming measures, improvements to existing streets, enforcement, and education. Attachments to this document describe various traffic calming measures and evaluation criteria.

PROGRAM OBJECTIVES

The primary goal of the Neighborhood Traffic Management Program is to improve the livability and environment on neighborhood streets. With that goal in mind, the following program objectives were identified:

- a) Provide solutions that improve livability along publicly-owned neighborhood streets through the thoughtful implementation of a traffic management program, by properly controlling vehicular traffic and enhancing the safety and ability to walk and bicycle, while reducing accidents and maintaining emergency vehicle access;
- b) Provide a means for residents to work together to seek solutions to neighborhood traffic concerns;
- c) Provide a wide range of solutions to address neighborhood traffic management issues, including devices and street designs that accomplish the goals related to control of vehicular traffic, without creating adverse impacts to other key areas such as pedestrian and bicycle access, service provider activities, and maintenance;
- d) Provide an equitable and credible process to evaluate neighborhood traffic calming requests;
- e) Provide a process that incorporates the input of affected citizens, potentially affected citizens and service providers into the solution;
- g) Develop a process based on engineering and factual information;
- h) Develop solutions that are maintainable after implementation and that minimize maintenance costs

GUIDING PRINCIPLES

To ensure that traffic calming concerns are addressed in an equitable manner, several guiding principles were also identified:

- The purpose of local streets is to provide access to abutting properties and connect to higher order roads. New local streets should intersect collectors or, if necessary, minor arterials. The purpose of collectors is to connect local streets with major and minor arterials. Collectors distribute traffic between more principal traffic routes and local streets within the neighborhood. The purpose of residential minor arterial streets is to connect collectors with major and minor arterials within a predominantly residential area. Residential minor arterial streets provide some relief to the strained arterial system while ensuring a safe residential environment. All three street classifications are considered neighborhood streets eligible for treatment under the Neighborhood Traffic Management Program.
- Traffic volumes on local streets should be consistent with the density of residential development that is served by a particular street. According to data assembled by the Institute of Transportation Engineers, single family detached residences serve as origins or destinations for five to twenty trips on a typical work day. The following should be used as a general guideline for traffic volumes:

Local Streets: Less than 750 vehicles per day or 75 vehicles per hour

Traffic volumes near or in excess of these guidelines may benefit from a study to develop, implement, and evaluate possible remedial actions.

- Vehicle speeds (85th percentile speeds established by radar or equivalent methods) on neighborhood streets generally should be within five miles per hour of the posted speed limit. Traffic speeds in excess of these guidelines normally indicate the need for increased police enforcement and/or a study to develop, implement and evaluate remedial actions.
- Neighborhoods, areas, or residences experiencing "detrimental" traffic conditions on a local street may benefit from a study to develop, implement and evaluate remedial actions. "Detrimental" traffic conditions are defined as (a) traffic using a neighborhood street as a shortcut or detour, (b) an excessive volume of traffic on a neighborhood street that should normally be served by an arterial roadway, or (c) traffic operating at excessive speeds.
- An influence area should be defined for each project location. The influence area should be determined on a case-by-case basis. As a general guideline, the area within a one-quarter mile radius of the project location and any adjacent or parallel local streets that may be affected by improvements at the project location should be included in the influence area. Residents within the influence area should be notified of the study and invited to participate in the process.
- Traffic calming measures should not be installed if they create severe adverse impacts in

adjoining neighborhoods or to community service provider activities (i.e., fire department, police department, school bus access, garbage collection, roadway maintenance, etc.).

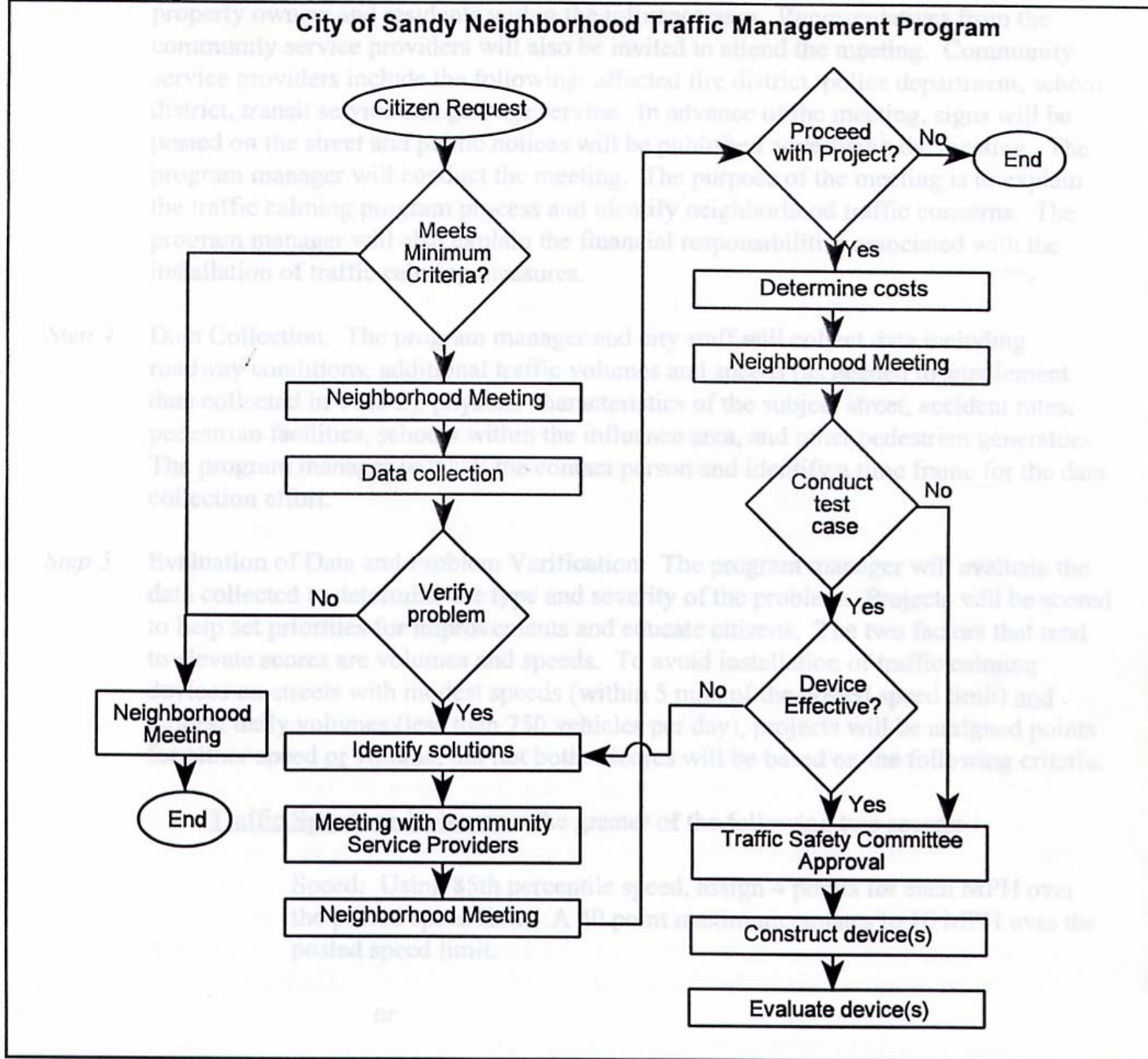
STEP-BY-STEP PROCEDURES

The following procedures outline the City of Sandy Neighborhood Traffic Management Program. Procedures were adapted from jurisdictions in the Pacific Northwest with three key factors in mind. First, the traffic calming program will guide staff through a process to address traffic concerns in an efficient and equitable manner. Second, the City is rural in nature with a sparse network of roads; therefore, connectivity to collectors and arterials must be maintained. Third, public funds to implement traffic calming devices are limited. Property owners may participate in funding the installation of devices and associated maintenance costs. In order for an appropriate traffic calming strategy to be selected, the citizens must clearly understand the problem and potential solutions to that problem. Consequently, the step-by-step process outlined below requires a high level of citizen participation and education. The program outline is illustrated in **Figure 1**.

Step 1 Citizen Request: Neighborhood traffic calming projects must be requested in writing by a citizen. Citizen requests must be accompanied by a petition with signatures of at least 50% of the residents along the project street(s) or within 1000 feet of the project intersection(s). The petition will identify a neighborhood representative known as the contact person. A sample petition is illustrated in **Attachment A**. The request should identify the perceived problem, and the location(s). After the City receives a citizen request, the program manager should call the contact person and discuss a time frame for a preliminary evaluation of the problem and the first neighborhood meeting. The time frame will be based on the current number of citizen requests being evaluated by the program manager. The program manager should send the contact person a traffic calming brochure describing the Neighborhood Traffic Management Program. In general, requests received on or before December 31 should be ranked with other requests received in the same calendar year. By June of the following year, requests will be evaluated and ranked for allocation of funding.

Step 2 Preliminary Evaluation: The Program Manager will examine the request and conduct a preliminary evaluation of the project site. For local streets, the 85th percentile travel speed in either direction must be more than 5 MPH above the posted speed limit or the daily volumes must be greater than 750 vehicles. For collectors or residential minor arterials, the 85th percentile travel speed in either direction on the subject street must be more than 5 MPH above the posted speed limit. If the project does not meet the minimum criteria, the program manager will notify the neighborhood representative of the results of the analysis and close the project. The neighborhood must wait at least one year before submitting a request for an updated analysis unless a significant change in the transportation network has affected the project area. If the project site meets the minimum requirements, the project manager will determine an influence area. The influence area will be determined on a case-by-case basis. In general, the influence area should include all local streets that may be affected by the implementation of traffic calming devices or roadway improvements at the project location.

Figure 1. Program Outline



Volume: Number of vehicles in a 24 hour period divided by 50.

Maximum score of 30 points equates to 1,500 vehicles per day. A score of zero will be assigned for collectors and residential minor arterials since these streets are, by definition, intended to carry through traffic.

Accidents: For a single intersection, assign 5 points for each correctable accident in a consecutive three year period. Maximum score of 30 points. For a street

Step 3 Neighborhood Meeting #1: Property owners and residents within the boundary will be notified of the citizen request and invited to participate in the traffic calming program. The program manager will then organize a neighborhood meeting with the petitioners, property owners and residents within the influence area. Representatives from the community service providers will also be invited to attend the meeting. Community service providers include the following: affected fire district, police department, school district, transit service and garbage service. In advance of the meeting, signs will be posted on the street and public notices will be published advertising the meeting. The program manager will conduct the meeting. The purpose of the meeting is to explain the traffic calming program process and identify neighborhood traffic concerns. The program manager will also explain the financial responsibilities associated with the installation of traffic calming measures.

Step 4 Data Collection: The program manager and city staff will collect data including roadway conditions, additional traffic volumes and speeds (as needed to supplement data collected in Task 2), physical characteristics of the subject street, accident rates, pedestrian facilities, schools within the influence area, and other pedestrian generators. The program manager will call the contact person and identify a time frame for the data collection effort.

Step 5 Evaluation of Data and Problem Verification: The program manager will evaluate the data collected to determine the type and severity of the problem. Projects will be scored to help set priorities for improvements and educate citizens. The two factors that tend to elevate scores are volumes and speeds. To avoid installation of traffic calming devices on streets with modest speeds (within 5 mph of the posted speed limit) and modest daily volumes (less than 750 vehicles per day), projects will be assigned points for either speed or volume, but not both. Scores will be based on the following criteria:

Traffic Speeds or Volumes: The greater of the following two scores:

Speed: Using 85th percentile speed, assign 4 points for each MPH over the posted speed limit. A 40 point maximum equates to 10 MPH over the posted speed limit.

or

Volume: Number of vehicles in a 24 hour period divided by 50. Maximum score of 30 points equates to 1,500 vehicles per day. A score of zero will be assigned for collectors and residential minor arterials since these street are, by definition, intended to carry through traffic.

Accidents: For a single intersection, assign 5 points for each correctable accident in a consecutive three year period. Maximum score of 30 points. For a street segment, assign 5 points for each correctable accident in a consecutive three year period at the worst intersection or link. Maximum of 30 points.

Schools: Assign 5 points for each public or private (K-12 school only) on the subject street.

Pedestrian Facilities: Assign five points for each public facility (parks, community centers, elderly housing, etc.) on the project street.

Streets Without Sidewalks: Assign 5 points if there is no continuous sidewalk or suitable pedestrian facility on at least one side of the project street.

The final project score will be ranked in order of points with projects in other neighborhoods. The program manager will also evaluate (but not score) physical characteristics of the site such as topography, bridges, horizontal and vertical curves, and adjacent land uses. The program manager may also examine congestion on streets in the vicinity of the project location to determine whether problems on local streets are resulting from inefficiencies on the collector and arterial system.

Projects must achieve a minimum score of 30 points to proceed to Step 6. If the project fails to score at least 30 points and the program manager determines that a problem does not exist, a meeting will be set up with the neighborhood property owners and residents to terminate the project. At the meeting, the program manager will explain the evaluation process and the results.

Step 6 **Identify Solutions:** Based on the evaluation results in Step 5, the program manager and a traffic engineer will identify potential solutions to address the traffic concerns. When considering potential solutions, consideration should be given to emergency vehicle access, connectivity to the transportation system, cost-effectiveness, maintenance impacts, and impacts to adjacent local streets. Solutions may include traffic calming measures as described in **Attachment B**. Guidelines and standard drawings for two common devices, speed humps and traffic circles, are provided in **Attachment C** and **Attachment D**, respectively. Solutions may also include roadway improvements to existing local street. Traffic calming measures which include traffic control devices (e.g., stop signs) must conform to the requirements in the Manual on Uniform Traffic

Control Devices and shall only be considered in keeping with sound engineering practices. Appropriate solutions should adhere to the following criteria:

- Reasonable automobile access should be maintained to the neighborhood.
- Solutions should encourage and enhance pedestrian, bicycle, and transit access to neighborhood destinations.

- Solutions should not significantly increase vehicle miles traveled (VMT) per capita as defined in the Statewide Land Use Planning Goal 12 Administrative Rule (OAR Chapter 600 Division 12).
- Traffic should not be rerouted from one local street to another if:
 - a) A traffic calming measure which does not directly reroute traffic will alleviate the problem;
 - b) The average daily traffic (ADT) on receiving streets with an ADT of 400 or fewer vehicles per day would increase by 100 vehicles per day or more than 50%, whichever is less, as a result of rerouting;
 - c) The ADT on receiving streets with an ADT of more than 400 vehicles per day would increase by more than 25% as a result of rerouting; or
 - d) The ADT on the receiving streets would exceed 1,000 per day on a local street.

Step 7 Service and Maintenance Providers Meeting: The program manager will meet with community service providers (as defined in Step 3) and City maintenance representatives to review the project evaluation and discuss the potential solutions. The purpose of the meeting is to gain consensus on which devices may be reasonably implemented without unduly increasing maintenance requirements or impeding service vehicle access or activities.

Step 8 Neighborhood Meeting #2: The program manager will conduct a second meeting with the property owners and residents to present the results of the data collection and evaluation process. Based on the findings, the program manager will describe various solutions to address traffic issues in the neighborhood. Generic costs for each alternative should be discussed. Neighborhood residents will then decide which, if any, alternative they are willing to help fund and implement. Service providers will be invited to attend the meeting to help residents assess the pros and cons of various devices.

Step 9 Determine Costs: The program manager will coordinate preparation of a cost estimate for installation of the preferred alternative in the neighborhood. The program manager may contact a consulting engineering firm or a local contractors for an estimate. The cost estimate should include design, construction, and maintenance. If matching funds are necessary, the program manager may contact the neighborhood to identify private funding sources, in-kind contributions (e.g., materials), or identify the boundaries of a local improvement district to fund implementation of the preferred alternative. City funds will be identified based on the project ranking (see Step 5), not first come/first serve. Funds will be allocated in June for project requests received in the prior calendar year.

- Step 10* Neighborhood Meeting #3: The program manager will conduct a third meeting with the property owners and residents to discuss the cost estimate for the preferred alternative. Service providers will be invited to attend the meeting. The program manager will explain the City and neighborhood financial responsibilities associated with installation of the device. The program manager will also describe the project ranking and timeline for obtaining City funds. The neighborhood must then approve the preferred alternatives with a two-thirds majority vote of property owners within the influence area. If a property assessment is not necessary, a petition may be circulated to obtain resident signatures. If a property assessment is necessary to fund the installation of a device, a mail-in ballot will be sent to property owners within the influence area. If appropriate, the program manager will also discuss opportunities to install temporary devices.
- Step 11* Test Case (Optional): Temporary devices such as traffic barrels or barricades may be installed to simulate the effects of permanent devices. If the program manager and the residents agree that installation of temporary devices is appropriate, a test case will be conducted. Traffic volumes and speeds will be measured one month after the temporary devices are installed. If the test device fails to address the problem, the program manager will return to Step 6 and identify other solutions.
- Step 12* Project Approval: The program manager recommends approval of the project to the Traffic Safety Committee in a public hearing. The neighborhood and service providers will be notified of the hearing date. The committee then determines whether the project will receive public funds. If matching funds are required from the neighborhood, the City will work with the citizens on a funding strategy. If approved, the project is implemented. The program manager will coordinate implementation with regularly planned maintenance or programmed roadway improvements as necessary.
- Step 13* Evaluate Device: A minimum of 6 months after implementation, data should be collected to evaluate the impacts of the traffic calming device on drivers' habits. For comparison purposes, the data should be collected at approximately the same time of year as the original data collection effort in Step 4. For example, if data was collected in September of 1997 for Step 4 and the device was installed in January 1997, the data collection effort for Step 12 should occur in the fall of 1998. Residents should also be surveyed by mail to determine if they prefer traffic conditions with or without the device. The purpose of the evaluation is to determine the effectiveness of the device. This information will be used for citizen inquires about specific projects and evaluation of devices for future applications. Documentation of the testing results should be kept on file for ten years.

ATTACHMENT A
SAMPLE PETITION

The following is a sample petition to initiate the Neighborhood Traffic Management Program process.

Subject: Neighborhood Traffic Management Program
To: City of Sandy Program Manager

Neighborhood Contact: _____

Address: _____

Phone Number: _____

Date: _____

Project Location: _____

Problem Description: _____

We, the undersigned property owners and residents, request the initiation of a traffic management program for our neighborhood.

	NAME	ADDRESS	SIGNATURE	DATE
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

ATTACHMENT B

TRAFFIC CALMING DEVICES

This section provides a brief description of typical traffic calming measures. This list should be considered as a resource once the problem has been identified.

K, Summary of Traffic Calming Devices

Device	Impact					Approximate Unit Cost
	Safety	Speed Reduction	Traffic Diversion	Fuel Consumption, Pollution	Emergency Services	
Chicanes	Possible Improvement	Possible	Possible	Small Increase	Possible Problems	Varies
Curb Extensions	Improved Ped Crossing	Possible	No Effect	No Change	Possible Problems	\$10-20K
Diverter	Possible Improvement	Mixed Results	Yes	No Change	Possible Problems	\$10-40K
Entrance Treatments	Possible Improvement	Unlikely	Mixed Results	No Change	Possible Problems	\$10K
Forced Turn Channelization	Possible Improvement	No	Yes	Small Increase	Possible Problems	\$6-10K
Median Barriers	Possible Improvement	No	Possible	No Change	Possible Problems	\$10-20K
Rumble Strips	Possible Improvement	Possible	No Effect	No Change	No Effect	\$300-500
Speed Humps	Unknown	Yes	Possible	Small Increase	Possible Problems	\$1.2-2K
Traffic Circles	Improved	Yes	Possible	No Change	Possible Problems	\$10-20K

ATTACHMENT C

GUIDELINES AND STANDARD DRAWINGS FOR SPEED HUMP INSTALLATION

This attachment provides guidelines for the application of speed humps in public right-of-way on streets classified as local streets, collectors, and residential minor arterials. Speed humps are traffic management devices used for lowering the speed of motor vehicles along specific street sections. Speed humps should only be used when justified by field studies.

Given the proximity of the City of the Sandy to the Portland metropolitan area, the guidelines and standards for installation of speed humps have been adapted from the City of Portland's Bureau of Traffic Management. This will facilitate driver recognition of the speed humps and require the same action on the part of driver regardless of where it is encountered. There are two types of speed humps for use in the City of Sandy: the 14-foot speed hump and the 22-foot speed hump. The 14-foot speed hump is intended to maintain traffic speeds at 25 mph. The 22-foot speed hump is intended to maintain traffic speeds at 30 mph. Generalized guidelines for both types of speed humps are provided below. Specific guidelines for each type of speed hump are addressed on pages 30 through 33.

Generalized Guidelines

The following are general standards and guidelines that apply to all speed hump applications. There may be situations which do not meet all the criteria.

- A. **GRADE** - Speed humps may be installed on street sections with a grade equal to or less than 5 percent. The installation of speed humps on street sections with a grade greater than 5 percent must be based on engineering evaluation to assure that the installation will not create inappropriate risks to traffic safety. Speed humps may not be installed on street sections with grades greater than 8 percent¹.

- B. **PROXIMITY TO CURVE** - Prior to placing speed humps along horizontal roadway curvature, an engineering evaluation should be conducted to assure that the speed hump installation in conjunction with the design speed of the curve(s) will accommodate safe vehicle passage. In addition, speed humps and/or speed hump warning signs should be placed in such a manner as to be clearly visible by approaching motorists according to MUTCD guidelines for visibility and reaction times.

¹Based on ITE Draft Speed Hump Guidelines.

- C. **STREET CONDITIONS** - The Public Works Department should inspect all streets prior to any proposed hump construction. The Public Works Department will determine if the existing street pavement conditions are adequate to support the impact loads caused by the humps and if any pavement maintenance is required. If it is determined that improvements or maintenance is required, that work should be completed before humps are constructed.
- D. **CURBS** - Speed humps may be installed on streets without curbs. However, in order to avoid potential circumnavigation around humps at locations without curbs, precautions, such as the installation of road side delineators, may need to be taken.
- E. **DRIVEWAYS** - Construction of speed humps at a driveway location should be avoided where possible to reduce potential vehicle conflict.
- F. **PARKING** - No special parking removal is required on or near speed humps.
- G. **DIVERSION POTENTIAL** - Adjacent streets, identified by the engineer, as having potential for being impacted by vehicle diversion from the street being treated with speed humps should be monitored.
- H. **BUS STOPS/ZONES** - Where possible, speed humps should not be installed in street sections where transit vehicles must transition between travel lane and curb stop. To the extent possible, speed humps should be located in such a way as to ensure that transit vehicles can traverse the hump perpendicularly.
- I. **SPACING** - Speed humps installed in series should be spaced according to an engineering evaluation of the physical street section as well as traffic operation data. Typically, speed humps are spaced at between 300 and 600 feet apart.
- J. **NUMBER OF HUMPS** - Speed humps should be installed in series of two or more. When only one speed hump is installed, it tends to reduce speeds only in the vicinity of the speed hump. Travel speeds may not be affected in areas that are more than 300 feet away from the speed hump. Therefore, a series of two or more speed humps is recommended to provide a uniform reduction of travel speeds along the roadway.
- K. **UTILITIES** - Speed humps should be located in such as way as to avoid conflict with underground utility access to boxes, vaults, sewers, and roadway drainage.

Construction and Maintenance of Speed Humps

- A. **CONSTRUCTION** - Speed humps may be constructed by a public agency or a private contractor per the appropriate Standard Plan as attached.
- B. **CONSTRUCTION TOLERANCES** - Speed humps must be constructed per the appropriate Standard Plan within a tolerance of +/- 0.5 inches in height.
- C. **ROAD/UTILITY WORK** - After a speed hump has been installed, any damage by road or utility work to the speed hump, including any associated pavement markings or signage, shall be repaired to the original condition by the utility agency responsible for the damage.
- D. **MAINTENANCE** - Speed humps and associated signing and markings shall be monitored and maintained by the City of Sandy.

14-FOOT SPEED HUMPS

Application of 14-Foot Speed Hump

- A. STREET CLASSIFICATION - 14-foot speed humps are limited for use on streets in residential areas with a posted speed limit of 25 mph.
- B. PREVAILING SPEED - 14-foot speed humps are intended to maintain traffic speeds at 25 mph. 14-foot humps should not be used on street sections with an 85th percentile speed of less than 25 mph². For street sections with 85th percentile speeds in excess of 35 mph, 14-foot speed humps may be inappropriate. The provision of 14-foot humps on street sections with 85th percentile speeds greater than 35 mph should be based on careful evaluation of the street section, land use, traffic-type, traffic volumes, etc³. Note that 14-foot speed humps should not be used on street sections with an 85th percentile speed of 40 mph or greater.

Design of 14-foot Speed Humps

- A. SHAPE - The 14-foot long vertical cross section of the 14-foot speed hump, measured in the direction of traffic flow, shall be a parabolic curve with a maximum height of 3-inches at the mid-point, and be 14 feet in length as detailed in Standard Plan C-1.
- B. SIGNING AND PAVEMENT MARKINGS - 14-foot speed humps shall be accompanied by appropriate signing and pavement markings as detailed in Standard Plan C-1.

Placement of 14-foot Speed Humps

²Residential speed limit under statutory law.

³Eighty-fifth percentile speed is an excellent indicator of street character. The application of a speed reduction device, which lowers the 85th percentile speed at device locations, more than 15 miles per hour will tend to create a pronounced "sine wave" type velocity profile. For many higher volume streets, such a velocity profile may be inappropriate both with regards to traffic safety and/or the noise of acceleration and deceleration. Since research has indicated that 14-foot speed humps reduce 85th percentile speeds to approximate 20 mph, the use of 14-foot speed humps on streets with 85th percentile speed in excess of 35 mph may be inappropriate.

Where possible, 14-foot speed humps should be located at least 60 feet from the closest perpendicular extension of an intersecting street curb or pavement edge line⁴. Speed humps should be installed in series of two or more to provide a uniform reduction in speed along the roadway segment. Speed humps are generally installed with a spacing of 300 to 600 feet.

Insert 14-foot Speed Hump Standard Plan

⁴The placement of 14-foot speed humps at a minimum of 60 feet from the closest intersecting curb or pavement line will assure that all bump related pavement markings remain outside the intersection and ensure that vehicles turning from the side street will engage the hump in a perpendicular fashion.

22-FOOT SPEED HUMPS

Application of 22-Foot Speed Hump

- A. **STREET CLASSIFICATION** - 22-foot speed humps are limited for use on streets in residential areas with a posted speed limit of 30 mph.
- B. **PREVAILING SPEED** - 22-foot speed humps are most appropriate for street sections with an 85th percentile speed between 35 and 45 mph. 22-foot humps should not be used on street sections with an 85th percentile speed of less than 30 mph⁵. The provision of 22-foot humps on street sections with 85th percentile speeds greater than 40 mph should be based on careful evaluation of the street section, land use, traffic-type, traffic volumes, etc⁶. Note that 22-foot speed humps should not be used on street sections with an 85th percentile speed of 45 mph or greater.

Design of 22-foot Speed Humps

- A. **SHAPE** - The 22-foot long vertical cross section of the 22-foot speed hump, measured in the direction of traffic flow, shall consist of a 10 foot horizontal platform, 3-inches in height which transitions at both ends to existing pavement level by way of 6-foot parabolic curves, as detailed in Standard Plan C-2.
- B. **SIGNING AND PAVEMENT MARKINGS** - 22-foot speed humps shall be accompanied by appropriate signing and pavement markings as detailed in Standard Plan C-2.

⁵ Research has indicated that the 22-foot hump is effective in reducing 85th percentile speeds to approximately 30 mph. The use of 22-foot speed humps on street sections with 85th percentile speeds less than 30 mph would be ineffective.

⁶ Eighty-fifth percentile speed is an excellent indicator of street character. The application of a speed reduction device, which lowers the 85th percentile speed at device locations, more than 15 miles per hour will tend to create a pronounced "sine wave" type velocity profile. For many higher volume streets, such a velocity profile may be inappropriate both with regards to traffic safety and/or the noise of acceleration and deceleration. Since research has indicated that 22-foot speed humps reduce 85th percentile speeds to approximate 30 mph, the use of 22-foot speed humps on streets with 85th percentile speed in excess of 40 mph may be inappropriate.

Placement of 22-foot Speed Humps

Where possible, 22-foot speed humps should be located at least 100 feet from the closet perpendicular extension of an intersecting street curb or pavement edge line⁷. Speed humps should be installed in series of two or more to provide a uniform reduction in speed along the roadway segment. Speed humps are generally installed with a spacing of 300 to 600 feet.

Insert 22-foot Speed Hump Standard Plan

⁷The placement of 22-foot speed humps at a minimum of 100 feet from the closest intersecting curb or pavement line will assure that all bump related pavement markings remain outside the intersection and ensure that vehicles turning from the side street will engage the hump in a perpendicular fashion.

ATTACHMENT D

GUIDELINES AND STANDARD DRAWINGS FOR TRAFFIC CIRCLE INSTALLATION

The purpose of the design criteria is to provide a traffic circle that will reduce traffic speeds and accidents while allowing for the movement of large trucks through the intersection. This design criteria will also provide the largest possible traffic circle, and thereby allow maximum landscaping and beautification, and to visually warn the driver of the obstruction.

There will be cases where this design cannot be totally followed and/or where one or more curb returns will have to be reconstructed. Some of these cases are, where intersecting streets are of different widths, and where one or more of the intersecting streets are off-set or skewed. There will also be situations requiring special attention be given to landscaping and aesthetic considerations. In these cases, engineering judgement should be used in following the design criteria as closely as possible, with traffic safety and operation of prime concern.

Design Criteria

1. The outside 1.5 feet of the traffic circle will be constructed with a mountable monolithic cement concrete curb. Raised pavement markers will be placed 4.5 inches from the outside edge as shown in Standard Plan D-1.
2. The distance between a traffic circle and the street curb projection (off-set distance) shall be a maximum of 5.5 feet as shown in Standard Plan D-2.
3. The width between a traffic circle and a curb return (opening width) shall be a minimum of 16 feet and a maximum of 20 feet as shown in Standard Plan D-2.
4. As the off-set distance decreases from the maximum 5.5 feet, the opening width shall increase from the minimum of 16 feet. Refer to Standard Plans D-2 and D-3.
5. Traffic circles will be landscaped with low level shrubs and canopy tree(s) that in no way obstruct driver's vision of pedestrians and other vehicles at the intersection.
6. Traffic circles will be maintained by the City of Sandy.
7. A typical sign for a traffic circle at a four-way intersection is shown in Standard Plan D-4. Signs and traffic circle shapes shall be modified to fit other intersection configurations.

Insert Standard Plan D-1, Traffic Circle

Insert Standard Plan D-2, Intersection Diagram

Insert Standard Plan D-3, Dimension Chart

Insert Standard Plan D-4, Typical sign for traffic circle at four-way intersection

ATTACHMENT E

GLOSSARY

The following are brief descriptions of techniques and terms commonly used to describe and measure traffic conditions.

Accident History: Accident history is used to determine safety problems at a given location. Accidents, particularly at low volume intersections, are often random. For the purposes of the Neighborhood Traffic Management Program, only correctable accidents are considered in the scoring criteria. Correctable accidents are those accidents that could have been prevented through geometric improvements to the roadway or intersection. For example, an accident caused by lack of adequate sight distance at an intersection would be considered correctable. On the other hand, an accident caused by a drunk driver's illegal maneuver would not be considered a correctable accident. An average of one or less correctable accidents per year on a local street usually does not indicate a safety hazard. An average of two or more correctable accidents per year can be significant, particularly if there is a pattern of several similar accidents having occurred. When a pattern is apparent, the problem can be identified and appropriate solutions developed.

Roadway Classifications: All roadways in Sandy are classified in the City of Sandy Transportation System Plan. Those classifications designate a hierarchy of roadways to serve different kinds of trips.

- **Local Streets:** Local streets provide access to abutting properties and connections to higher order streets. Local streets should also serve bicycle and pedestrian needs. Local should serve traffic with an origin or destination within one neighborhood.
- **Collectors:** Connectors of local streets to major arterials, minor arterials, and side streets of the Central Business District. Collectors are the principle carriers within neighborhoods or single land use areas. Collectors link neighborhoods with major activity centers and arterials. Generally, collectors are not intended for through traffic.
- **Residential Minor Arterials:** A hybrid between minor arterial and collector streets which allow moderate to high traffic volumes on streets where over 90 percent of the fronting lots are residential. Residential minor arterials are intended to provide some relief to the strained arterial system while ensuring a safe residential environment.
- **Minor Arterials:** High volume, intra-city street, providing connectivity and

parallel features, and limited access control. Minor arterials provide connections in urban areas to major arterials. Minor arterials may bisect neighborhoods in areas of low density having insufficient collectors.

- **Major Arterials:** Major arterials carry local and through traffic to and from destinations outside the local community such as other cities and rural centers. Major arterials do not bisect neighborhoods, parks or commercial districts.

Community Service Providers: Community service providers are those organizations which provide a service to citizens within a community. Community service providers involved in the Neighborhood Traffic Management Program include the following: Sandy Fire District, Boring Fire District, Sandy Police Department, transit service, and sanitary service.

Detrimental Traffic Conditions: Detrimental traffic conditions occur on neighborhood streets when (a) drivers are using a neighborhood street as a shortcut or detour, (b) there is an excessive volume of traffic on the neighborhood street that should normally be served by an arterial roadway, or (c) traffic is operating at excessive speeds.

Speed: Speed may be the most often noted and discussed of neighborhood traffic problems. Speed is usually quantified in miles per hour (MPH). The 85th percentile speed is a statistical term indicating the speed below which 85 percent of the vehicles travel and above which 15 percent of the vehicles travel.

Traffic Calming Measures: Traffic calming measures are techniques employed to slow traffic and/or shift traffic to more appropriate routes. Techniques may include either traffic management devices or traffic control devices. Traffic management devices include traffic circles, speed humps, diverters, medians, and curb extensions. Traffic management devices do not include traffic control devices regulated by the Manual on Uniform Traffic Control Devices (MUTCD). Traffic control devices include stop signs, speed limit signs, one-way streets, and turn prohibitions.

Volume: Volume is another of the most commonly reported local traffic problems. Volume refers to the number of vehicles that cross a given section of roadway during a specified time period. Volumes are normally measured on mid-week days, on an hourly basis, for 24 hours. For streets near schools, volumes should be measured on mid-week days when school is in session.