Pedestrian Crossing Improvements: Before and After Study

Everett Street (SR 500) at 19th Avenue

Prepared for the City of Camas
And
Washington State Department of Transportation

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Background

In the City of Camas, Washington, students from local neighborhoods must cross Everett Street (SR 500) when traveling to and from school (Figure 1). Existing average daily traffic (ADT) along Everett Street is 7,400 vehicles per day with an 85th percentile speed of 32 to 34 mph. One of the main pedestrian routes crossing Everett Street is at 19th Avenue which has 82 pedestrians per day crossing Everett Street when school is in session. Most of the pedestrian crossings take place the hour prior to the start and the hour after release of students from school. At the project outset the intersection included a marked (striped) school crossing with advance "School Crossing" warning signs. Traffic on 19th Avenue was stop sign controlled and Everett Street traffic was uncontrolled. To help increase the visibility and safety of this crossing, local agencies wanted a crossing treatment, such as a traffic signal or the use of other traffic calming techniques, to assist pedestrians cross Everett Street. Gap studies along Everett Street showed that traffic control was warranted only during the time children were traveling home from school in the afternoons[1].

The City of Camas undertook an exhaustive public involvement process to insure that needs of all stakeholders affected by the crossing treatment would be addressed. The stakeholders involved included the City of Camas, Washington State Department of Transportation, local police and fire departments, the local school district, City Council, and neighborhood citizens. Four options were developed to provide traffic/pedestrian control at the Everett Street (SR 500)/19th Avenue intersection. All four options included a marked (striped) school crossing across Everett Street. The four options consisted of:

1. A median island and flashing beacons with passive infrared detection (19th Avenue to remain stop sign controlled and Everett Street to remain uncontrolled).
2. Traffic signal control with the west leg of NE 19th Avenue serving westbound traffic only.
3. Traffic signal control on Everett Street with stop sign control on NE 19th Avenue.
4. Traffic signal control with complete closure of the west leg of NE 19th Avenue.

Through an evaluation of the four options and numerous meetings and work sessions with the stakeholders, option 1 was selected as the preferred option for implementation.

Option 1 uses passive infrared sensors to detect when pedestrians are present at the landing of the crossing (Figure 2). Once the pedestrian is detected, flashing beacons (located above the crossing) are activated to alert motorists that pedestrians are at the crossing. The pedestrian is

[1] A school traffic signal may be warranted at an established school crossing when a traffic engineering study (of pedestrian group size and available gaps in the vehicular traffic stream) indicates that the number of adequate gaps in the traffic stream during the period of the children are using the crossing, is less than the number of minutes in that same period. Based on criteria from the *ITE School Trip Safety Program Guidelines*, 1984 (p. 9) and calculation methods from the *ITE Traffic Engineering Handbook*, 4th Edition (p. 78).

NOT
TO SCALE

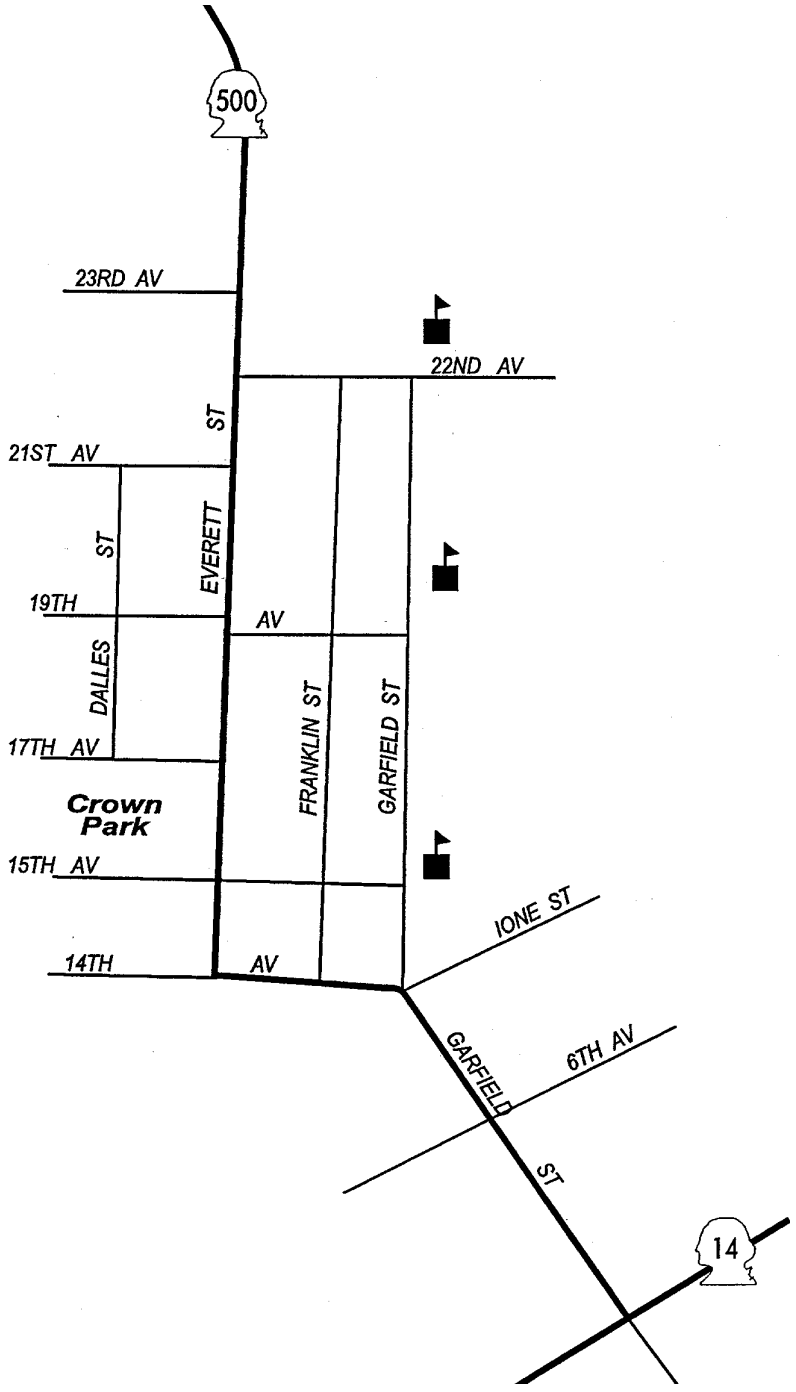

Figure 1
VICINITY MAP

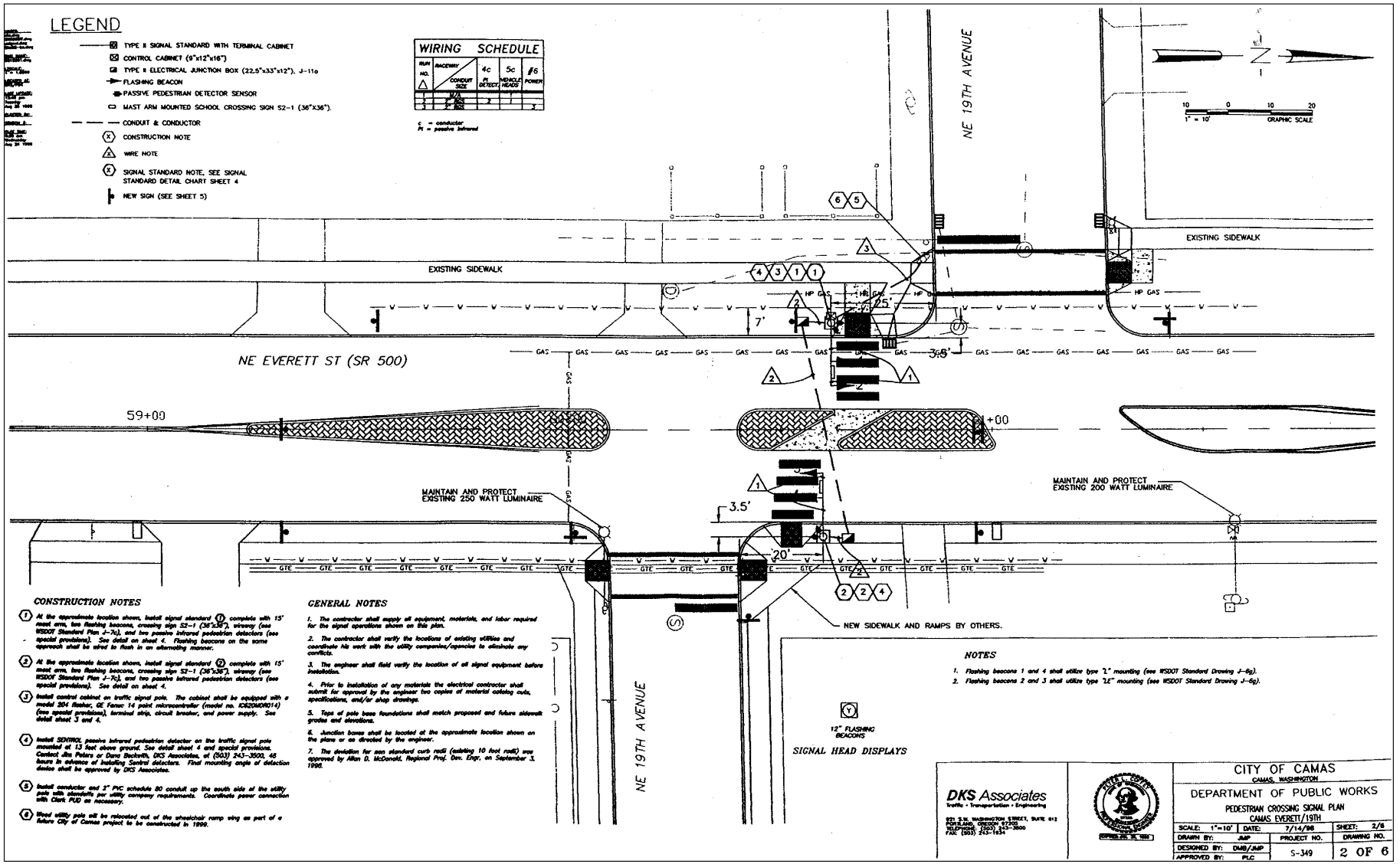

Figure 2
PEDESTRIAN CROSSING IMPROVEMENTS

then monitored as they are crossing the street by a second set of infrared sensors. Once the pedestrian has crossed the street and left the landing area, the beacons are deactivated by the use of a gap timer until another pedestrian comes up to the crossing landing.

In addition to the infrared detection, a raised island was constructed in the middle of NE Everett Street to provide a storage area for pedestrians as they cross and to constrict vehicle travel lanes to encourage lower speeds through the crossing area. Curb cuts were provided in the median to allow bicycle and wheelchair access across the street, and to direct pedestrians or bicyclists so they face in the direction of oncoming traffic before continuing across the street. Option 1 has the following advantages and disadvantages.

Advantages of Option 1

- Delay is minimized for vehicular traffic, bicyclists, and pedestrians.
- All approaches to the intersection remain open.
- Pedestrians only have to cross one lane of traffic at a time.
- Configuration of curb cut through raised median positions pedestrians and bicyclists to be facing in the direction of oncoming vehicular traffic.
- Construction, maintenance, and operation costs are less than for a signalized intersection.
- Passive control means beacons would be active only when pedestrians are present. This is believed to keep motorists from becoming conditioned to the warning devices and eventually ignoring them.
- Since there are no timers required to activate the beacons, supplementary warning of pedestrians and bicyclists would be available 24 hours a day.
- Lane restrictions due to islands are designed to slow traffic through crossing area.
- Since pedestrians cross only one lane of traffic at a time, the number of available gaps will increase.
- Aesthetics of the area would not be greatly changed. Mast arm poles would be kept to a minimum and there would be no large controller cabinets.
- Raised median is mountable to allow for emergency vehicle access into the neighborhood west of Everett Street.

Disadvantages of Option 1

- Left turns in and out would be restricted on the west leg of NE 19th Avenue.
- One driveway on the north leg and two driveways on the south leg of the intersection would be limited to right out movements only.
- School crossing guards may still be desired during school hours.

Evaluation Tests

The use of passive detection methods at pedestrian crossings to activate supplemental warning or traffic signal devices is a relatively new concept in the United States. With the addition of traffic calming elements and the use of passive detection to activate supplemental warning devices at this crossing, it is desirable to evaluate the crossing to determine if any of the treatments changed motorist or pedestrian behaviors within the crossing area. With approval of the Washington State Department of Transportation and the City of Camas Public Works, three different surveys were conducted before and after the addition of the crossing treatment to evaluate its effectiveness. The before and after survey results are described below.

Test Results

Speed Surveys

Speed surveys were conducted to evaluate if lane width restrictions and the addition of overhead pedestrian crossing signs with supplemental warning beacons activated only when pedestrians are in the vicinity of the crossing changed motorist behavior within the crossing area. Speed surveys were conducted at two locations for both southbound and northbound vehicles (100 feet and 500 feet north and south of the crossing). The results of the surveys are shown in Table 1[2].

Table 1: Speed Survey Results

Survey Location	85%* Speed Before (mph)	85%* Speed After (mph)	Percent Change
Northbound			
100' South of Crossing	29.0	29.6	+2%
500' South of Crossing	28.0	28	0%
Southbound			
100' North of Crossing	32.0	29.4	-8%
500' North of Crossing	33.0	30.6	-7%

* The 85th percentile speed is the speed at which 85% of the driver population exists and is often used as a measure of the upper limit of reasonable speeds for the prevailing conditions.

[2] Surveys conducted by Traffic Smithy. Before surveys conducted Wednesday, June 10, 1998 on a wet day. After surveys conducted Wednesday, May 26, 1999 on a dry day.

Pedestrian Crossing Counts Survey

Pedestrian counts were conducted at the intersection of Everett Street/19th Avenue, mid-block locations north and south of the Everett Street/19th Avenue intersection, and adjacent intersections (17th Avenue and 21st Avenue) before and after the pedestrian crossing improvements. Before counts show where pedestrians were crossing Everett Street prior to the pedestrian crossing improvements. After counts make it possible to determine if modifications to the existing crossing encouraged pedestrians to use the crossing, cross at other locations, or if pedestrian behaviors remain unchanged.

The results of the before and after surveys indicate that with crossing improvements in place, 83 percent of the pedestrians (4 percent more than before improvements were made) crossing Everett Street between 17th Avenue and 21st Avenue crossed at the improved 19th Avenue crossing. Survey results also show a reduction in mid-block crossings and crossings at 19th Avenue outside of the crosswalks. Table 2 summarizes the pedestrian crossing counts surveys.

Table 2 : Pedestrian Crossing Count Results

Crossing Location	**Percent of Pedestrians Crossing Everett St**	
	Before	**After**
19th Ave/Everett St (within crosswalk)	78%	83%
19th Ave/Everett St (outside of crosswalk)	9%	7%
Everett St: Mid-block (17th to 19th and 19th to 21st)	9%	3%
Everett St: Adjacent Intersections (17th and 21st)	4%	7%

Video Tape Survey

Video tape surveys were conducted on both approaches of Everett Street at its intersection with 19th Avenue. Cameras were placed in advance of the crossing (approximately 200 to 300 feet in inconspicuous locations) at a position that allows for the monitoring of the deceleration and braking of vehicles which can indicate the drivers reaction to pedestrians at the crossing.

The results from the video tape surveys provide the most obvious affect of the pedestrian crossing improvement on motorists behavior. Three categories of motorists behavior were analyzed. These included motorists that showed no apparent slowing when pedestrians were present at the crossing, those that slowed for pedestrians, and those that stopped for pedestrians at the crossing. Table 3 summarizes the before and after analysis.

Table 3: Video Taping Survey

Motorist Behavior	NB		SB	
	Before	After	Before	After
No Apparent Slowing for Pedestrian	49%	10%	58%	20%
Slowed for Pedestrian	25%	33%	19%	43%
Stopped for Pedestrian	26%	57%	23%	37%

Conclusion

The pedestrian crossing improvement at the intersection of Everett Street/19th Avenue, which includes the use of passive infrared pedestrian detection methods, has had a positive affect on motorist behavior when pedestrians are present at the crossing. Analysis of the before and after surveys identify a decrease in the 85th percentile speed near the crossing, increases in the number of motorists that stop or slow down for pedestrians at the crossing, and a decrease in the number of motorists that show no apparent slowing when pedestrians are present at the crossing. This increase in motorist recognition and slowing for pedestrians attempting to cross Everett Street at 19th Avenue should increase crossing safety at the crossing for both motorists and pedestrians.

References

5. Beckwith D., and K. Hunter-Zaworski. Passive Pedestrian Detection at unsignalized Crossings. *Transportation Research Board Preprint*, National Research Council, Washington, D. C., 1998.