

Traffic Operations

Low Cost Enhancement 2013-15 Biennium Interim Report

And

2011-13 Low Cost Enhancement Final Report

September 2014



**Washington State
Department of Transportation**

INTRODUCTION

This report reflects the in-progress status of the 2013-15 Biennium Low Cost Enhancement projects, through the first half of the biennium, ending June 30, 2014.

Low Cost Enhancements (LCE) are low cost projects that can be quickly implemented to improve operational safety or reduce congestion on state highways. The Washington State Department of Transportation's (WSDOT) six regions use LCEs strategically to improve the operational safety and efficiency of the highway system, and to respond quickly to emergent roadway safety issues. LCE projects are implemented through WSDOT's Traffic Operations Program.

For the 2013-15 biennium, the legislature provided WSDOT with \$6 million in proviso funding from the Motor Vehicle Account to implement prioritized Low Cost Enhancement projects. LCE funding promotes efficiency by allowing regions to use state forces and small maintenance contracts, which tend to reduce labor costs in design, inspection, and contract administration. LCE's also help regions leverage funding by partnering with a variety of internal and external partners. This results in shared benefits, and gives regions flexibility by allowing them to make quick decisions when windows of opportunity are short.

LCE's generally come in two categories:

1. Major: Projects ranging in cost in the range of \$50,000 to over \$100,000.
2. Minor: Projects ranging in cost from \$5,000 to \$50,000. When projects costs are under \$5,000 they are frequently bundled together as one project, such as a series of related directional signs.

LCE Project Types:

- Traffic control signing improvements
- Roadway striping, rumble strip installation or other road marking improvements
- Installation or improvement of traffic signals or other electronic traffic monitoring devices
- Roadway access control through channelization or lane reconfiguration

LCE Benefits:

- Provide near term solutions that effectively address existing operational challenges
- Typically cost less to design and construct and can be completed fairly quickly without a lengthy review and approval process
- By their nature, LCEs foster open communication with local agencies and the public, making their implementation faster and more efficient
- Build public confidence by providing interim relief to critical issues.

The need for improvements is often identified by concerned citizens or communities. Target problem areas are also identified in the priority programming and internal review processes, requested by elected officials or address concerns raised by local agencies. Traffic Operations staff evaluates all requests for operational improvements and identifies and implements appropriate, operational solutions to address the issues (as funding allows).

2014 Mid Biennium Report

In the first half of the 2013-15 Biennium, Regional Traffic Operations moved over 150 small projects forward by controlling project scopes and balancing implementation with other functions and responsibilities of Traffic Operations. The following table summarizes expenditures of Low Cost Enhancement funds in the first half of the 2013-15 Biennium.

Summary of Regional LCE Projects as of June 30, 2014

Region	# of Projects	Total Expenditures
Northwest	33	\$1,509,544
Olympic	36	\$540,906
Southwest	27	\$222,607
South Central	25	\$121,139
North Central	23	\$222,286
Eastern	9	\$104,882
Grand Total	152	\$2,721,364

The following tables list Low Cost Enhancement projects underway in each region by project name and projected budget, and total expenditures as of June 30, 2014:

Northwest Region Examples of Low Cost Enhancement Projects

Project Description	Allocation	Expenditure to June 30, 2014
Emerging Projects	\$775,881	75,241
Project Support	775,000	451,242
Central Operations Low Cost Actions	90,000	48,053
Freeway Operations Low Cost Actions	30,000	5,663
ITS Operations Low Cost Actions	15,000	2,202
Mt. Baker Area Low Cost Actions	130,000	51,370
Snohomish Area Low Cost Actions	280,000	129,415
King Area Low Cost Actions	290,000	145,230
Wrong Way Traffic Control Actions	77,000	76,548
Curve Warning Signs 11-13	90,000	4,035
Curve Warning Signs 13-15	80,000	79,159
SR 526 – Boeing Access AWS	39,000	30,485
Region wide: Camera Replacement 13-15 Phase 1	28,000	7,866
Region wide: Camera Replacement 13-15 Phase 2	28,000	6,607
SR 18 – Median Restripe	4,816	4,816
I5 SB – Install Exit Signing to Northgate	6,857	6,857
SR 518 EB – Drop Lane to I-5 NB	34,494	34,494
SR 2 Vic. MP 46 – Money Creek Signing & Illumination	5,000	906
I-5 SB Federal Way – Cabinet Access Safety Improvement	30,876	30,876
Pooled Fund Study Contribution – HOV/MAL & TMC	45,000	23,171
SR 522 – Adaptive Signal Control	130,000	91,818
Region wide: Install 10 Gig Network Phase 3	89,937	89,937
SR 20 – Install Elk Warning Signs	24,645	24,645
I-5 @ Iowa Street – Replace Signal Cabinet	14,586	14,586
I-5 NB – Install MLK Exit Signing	10,000	2,562
SR 518 – Install Signing to SR 99	14,000	5,005
I-5 @ SR 530 – Lateral Fiber Distribution	34,973	34,973
SR 518 @ 51 st EB – Off Ramp I/S Modification	15,000	5,942
Region wide: Update VMS Equipment	14,000	13,241
SR 9 @ MP 66 – Install Curve Warning Signs	6,000	1,524
I-5 SB @ Southcenter – Replace Overhead Sign	25,000	11,075
TOTAL		\$1,509,544

Olympic Region Examples of Low Cost Enhancements

Project Description	Allocation	Expenditures to June 30, 2014
LCE's Under \$5,000	250,000	210,682
Region wide Signing	200,000	72,119
QE Project Documentation	100,000	46,024
WSP Aerial surveillance	6,000	4,065
Region wide Low Clearance Signs	20,000	24,073
SR 16 @ Olympic Dr. Onramps to MP 10.74 – replace skip lines	4,000	3,300
SR 101 – Lavender Festival Signing	5,000	1,215
I-5 – Tacoma Dome Detour Signs	8,200	9,310
SR 3 @ Imperial Way SW I/S to MP 30.52 – Striping	15,000	8,709
SR 99 @ 54 th St. – Channelization Project	3,500	1,409
Crosby Blvd. – Lighting Installation	10,000	10,356
Region wide: Crosswalk & Signage	4,200	2,390
SR 117 – Install POW/MIA Signs	5,000	2,995
Region wide: Pavement Markings	20,000	50,152
SR 161 @ Edgewood – Install Speed Change Signs	9,500	6,728
SR 161 @ Jovita Blvd. – Install Signage	5,800	1,629
SR 12 – Replace Right Lane Pavement Markings	4,900	2,556
SR 410 in Bonnie Lake – Install Speed Revision Signing	11,000	10,053
SR 12 @ Denmark & Pecan I/S – Install Warning Signs	19,500	12,656
SR 162 @ Pioneer/Bowman–Signal Improvements	6,000	5,439
SR 162 @ Military Rd-Signal Ops Improvements	6,000	4,822
SR 162 @ 136 th - Safety Improvements to Signal	4,000	2,486
SR 162 @ Cardinal Lane Signal Ops Improvements	7,000	7,258
SR 162 @ Calistoga – Signal Ops Improvements	7,000	5,665
SR 507 @ Vancil Road- Signal Ops Improvements	7,000	7,861
US 101 @ River Road –Signal Ops Improvements	7,000	2,270
SR 3 @ Pickering Rd. –Update I/S Sign & install in-lane rumble Strips	6,000	3,095
SR 705 to SR 509 – Install Advisory Speed Signs	3,050	2,212
US 101 @ Blyn – Install Speed Zone Change Sign	500	552
SR 16 – Install Cross Hatching	2,500	1,020
SR 117 – Signing & Pavement Marking Improvements	4,400	3,806
SR 3 @ North Ally Loop – Enhanced signing & safety striping	4,500	2,235
US 12 @ Pecan St. I/S – Restripe for Left Turn Channelization	85,000	2,223
SR 8 – Install Speed Reduction Signing	45,000	5,830
SR 7 @ 66 th Ave. – Install Stop Sign	2,100	679
SR 3 Gorst Area – Install Traffic Arrows	2,400	3,032
TOTAL		540,906

Southwest Region Examples of Low Cost Enhancement Projects

Project Description	Allocation	Expenditures to July 1, 2014
Project Support	40,000	27,979
CAL/CAC/LAL/LCE Development	40,000	16,296
LCE Projects Costing Less Than \$5,000	120,000	51,387
TMC Equipment	10,000	3,823
Flashing Yellow Arrow Signal Upgrades	25,000	20,801
SR 14 @ 15 th St. – Install “Prepare to Stop When Flashing” signs	20,000	17,388
SR 14 Tunnels # 1 & 5 – Install Bike Pads	6,000	5,129
I-5 @ SR 502 NB Off Ramp – Signing & Striping Revisions	8,000	906
SR 503 @ Goerig St. – Enhanced Signing & Lighting	5,000	6,222
US 97 @ SR14 – Install Right Turn Lane	75,000	7,951
SR 14 Tunnels – Safety Enhancements	75,000	2,836
US 101 Tunnel – Safety Enhancements	25,000	816
SR 508 – Install All Way Stop Signing	10,000	7,033
ITS Expenditures	10,000	3,046
SR 508 @ SD03676 – Service at Cinebar Rd	390	390
SR 508 @ SD3677 – Service at Centralia Alpha Rd	350	350
Incident Response Program Support	10,000	2,639
I-5 @ Woodland – Install Traffic Camera	5,000	8,326
SR 503 - MP 53.70 @ SD03681 – Install LED Warning Light	679	679
US 12 EB @ Mossyrock – Install Right Hand Turn Lane	70,000	2,340
GCB 1413 –State Match for 78 th St Vast Project	10,000	10,000
Region wide – Low Clearance Project	30,000	6,064
WSP Aerial Marks	8,000	10,036
Region wide – Merge Arrows	20,000	530
SR 500 @ 54 th – Install Camera	15,000	7,117
SR 14 @ I-5 – Ramp Meter Enhancement	7,000	2,523
TOTAL		222,607

South Central Region Examples of Low Cost Enhancement Projects

Project Description	Allocation	Expenditures to June 30, 2014
Minor Signing Modification		2,049
PWS Communication Upgrade	10,000	8,178
Sky Meadows Microwave Upgrade	2,500	2,220
16th Ave Bike Path Widening	6,000	4,929
I-82, Emergency Call Box Install	3,000	5,001
Us-12, Interstate Bridge Clearance Signs	6,000	3,401
Us 12, MP 154 Chevrons	7,000	2,649
I82 Nob Hill On-Ramp - Install Merge Arrows	3,500	2,770
Us395, Serial Servers For Radar Units	1,500	1,405
I-90 Organized Chain Up Signing	10,000	3,835
I-90 Gold Creek Chain-Ups	3,000	7,325
Us97 Dry Creek Temp Rumble Strip Test	1,000	870
I-90 -PWS Maintenance And Upgrade	10,000	9,299
SR 240 - Install Steptoe Roundabout Arrows	2,000	1,016
SR 906 - Install Radar Speed Signs	9,000	7,837
SR 395 - Lane Ends Signing At Columbia Drive	2,000	2,242
Install RW Timemark Traffic Counters	4,600	4,311
Install RW Microwave Backbone Redundancy	4,000	8,627
SR 395 - Install Kartchner Right Turn Pocket	4,000	3,460
SR 124 - Sign Estes Memorial Overpass	2,500	4,766
I-90, Vantage Bridge Lds	14,000	10,549
RW PCMS Modems	5,000	4,865
SR 125 - Install Curve Warning Beacon	3,800	566
SR 12 - Dayton Lane Drop Arrows	3,000	891
Install Tri-Cities Flow Map Radar Units	18,000	18,078
TOTAL		121,139

North Central Region Examples of Low Cost Enhancements

Project Description	Allocation	Expenditures to June 30, 2014
Maintenance Area #1 Signing Enhancements	25,000	28,466
Maintenance Area #2 Signing Enhancements	15,000	14,571
Maintenance Area #3 Signing Enhancements	20,000	19,358
Maintenance Area #4 Signing Enhancements	15,000	23,999
Region wide minor striping channel modifications	5,000	2,227
Region wide minor enhancements requested by WSP	2,000	9,738
SR 150 Bike Beacon @ MP 3.65	17,000	19,308
Region wide: LED Stop Sign Installation	10,000	3,875
US 97A – Chelan Truck signing	5,000	1,590
SR 155 @ MP 44.5 – Nespelem School Beacons	5,500	3,990
US 2/97 @ Old Monitor Rd MP 112.59 – Install Median Refuge	1,000	1,756
US 2 @ MP 140.5 – Modify Truck Escape Ramp	2,840	8,271
US 97 @ MP 240.3 – Hugo VMS Design	26,000	13,525
SR 150 @ MP 7.97 Columbia Signal – Install Flashing Yellow Arrows	15,000	695
SR 24 @ MP 78.45 Bench Road - Install LED Stop Signs	9,000	176
SR 17 @ MP 27.36 Bench Road - Install	4,500	176
US 97 @ MP 244 Vic. Pateros – Install Signing	6,000	2,454
US 2/97 MP 105-108 – Remove Rumble Strip on Bridges for Bikes	3,000	2,160
US 2/97 @ MP 115.22 Monitor – Signal Modifications	2,000	169
SR 28 @ MP 3.57 9 th Street – Install Camera	10,000	3,601
US 2@ MP 63.7 Stevens Pass West – Install Camera	10,000	3,601
SR 243 @ MP 13.94 Mattawa – Install Roundabout Camera	15,000	12,015
US 2 @ MP 90.1 – Install Drop Arm Gate	10,000	46,565
TOTAL		222,286

Eastern Region Examples of Low Cost Enhancement Projects

Project Description	Allocation	Expenditures to June 30, 2014
Maintenance Area #1 – Signing Enhancements	45,000	28,042
Maintenance Area #2 – Signing Enhancements	15,000	2,939
Maintenance Area #3 – Signing Enhancements	15,000	4,179
Maintenance Area #4 – Signing Enhancements	15,000	6,039
US 2 Hayford Road MP 279.23 to 279.48 – Install Channelization		1,789
I-90/Sullivan EB – Modify Off Ramp	68,000	40,237
Region wide: Signal Back plate Enhancement Materials	23,000	13,805
Tv32 Version Upgrade For Windows 7	7,700	7,621
SR 270 Install Signal Detection Modification	8,000	231
TOTAL		104,882

Traffic Operations Low Cost Enhancement 2011-13 Biennium

Final Report

September 1, 2013



**Washington State
Department of Transportation**

INTRODUCTION

Low Cost Enhancements (LCE) are small, low cost projects that can be quickly implemented to improve operational safety or reduce congestion on state highways. The Washington State Department of Transportation's (WSDOT) six regions use LCEs strategically to improve the operational safety and efficiency of the highway system, and to respond quickly to emergent roadway safety issues. Low Cost Enhancement projects are implemented by WSDOT's Traffic Operations Program.

LCE's generally come in two categories:

3. Major: Projects ranging in cost from \$50,000 to over \$100,000.
4. Minor: Projects ranging in cost from \$5,000 to \$50,000. When projects costs are under \$5,000 they are frequently bundled together as one project, such as a series of related directional signs.

LCE Project Types:

- Provide near term solutions that effectively address existing operational challenges
- Traffic control signing improvements
- Roadway striping, rumble strip installation or other road marking improvements
- Installation or improvement of traffic signals or other electronic traffic monitoring devices
- Roadway access control through channelization or lane reconfiguration

LCE Benefits:

- Typically cost less to design and construct and can be completed fairly quickly without a lengthy review and approval process
- By their very nature, LCEs initiate open communication with local agencies and the public, making their implementation faster and more efficient
- Build public confidence

The need for improvements is often identified by concerned citizens. However some target problem areas identified in the priority programming process, are requested by elected officials or address concerns raised by local agencies. Needs are also identified through the internal review process. Traffic Operations staff evaluates these needs and when appropriate, identify operational solutions to address the problem.

During the 2011-13 biennium Region Traffic Offices focused on Target Zero related safety projects, investing over \$1.7 million in safety related improvements in the three types of projects listed below:

- Overall, Traffic Operations spent about \$1,000,000 on intersection projects that improve safety, often solving the problem of delaying the need for larger capital improvements like traffic signals, roundabouts or interchanges can be funded. These interim intersection improvements included installing dynamic intersection warning systems, "Prepare to Stop When Flashing" systems, turn lanes, LED stop signs, flashing yellow arrow signal heads and audible pedestrian warning devices. Intersections are a Target Zero priority.
- Traffic Operations response to community concerns was reflected in over \$300,000 being spent on pedestrian and bicycle safety improvements, including crosswalk striping, signing, pedestrian islands, rectangular rapid flashing beacons (RRFB) and school zone beacons.

- Nearly \$400,000 was spent on projects that targeted run off the road or lane departure collisions. These improvements included curve warning signs, slope flattening, and rumble strip installation.
- Other Low Cost Enhancement funds funded installation of wrong way countermeasures, minor striping improvements, intelligent transportation system projects, illumination projects and minor traffic studies.

The wide variety of LCE projects listed in this report show the value and efficiency of LCE's in large and small ways. Following are highlights of significant projects from each WSDOT region followed by the regional lists of projects with their expenditures for the 2011-13 Biennium.

Summary of Regional Projects

Region	# of Projects	Total Expenditures
Northwest	87	\$3,554,598
Olympic	61	1,111,462
Southwest	34	\$657,745
South Central	27	\$430,717
North Central	46	\$622,816
Eastern	26	\$388,471
Grand Total	281	\$6,765,809

Northwest Region

A portion of LCE money in the Northwest Region (NWR) is dedicated to a package of Low Cost Enhancements in each of the three areas that comprise the Northwest Region; Mount Baker, King and Snohomish. Examples of typical small (less than \$5,000) projects in this category are: a sign or a series of signs; restriping worn pavement, adding traffic signal back plates, or signing improvement and replacement... Following are the expenditures for each of Northwest Region's three subareas.

- Mount Baker Area Low Cost Actions **Total: \$128,323**
- Snohomish Area Low Cost Actions **Total: \$275,888**
- King Area Low Cost Actions **Total: \$300,288**

Highlighted below are examples of the types of LCE projects implemented during this biennium in Northwest Region:

- **Dynamic Intersection Warning Systems \$152,539** – Dynamic Systems were installed at four locations: SR 542 at SR 9, SR 524 at Larch, SR 526 at Boeing Way and SR 530 at 59th Street. Dynamic intersection warning signs are designed to provide supplemental warning to drivers approaching an intersection and alert them to look for traffic that is either stopped or entering the roadway. The goal is for dynamic intersection warning systems to improve safety while delaying the need for a higher cost improvement at these locations well into the future.
- **“Prepare to Stop When Flashing” signs (PTSWF) \$287,373** – “Prepare to Stop When Flashing” signs were installed at five intersections located on high speed routes that had a history of rear end collisions. Adding PTSWFs give drivers concrete advance notice that the signal will turn red, giving them more time to react and decelerate at a safer rate of speed. PTSWF's are particularly useful to truck drivers who need more distance to stop.
- **Uninterrupted Power Supply – Battery back-up \$127,652** - During the 2011-13 biennium, the NW Region installed Uninterrupted Power Supply – Battery Back-up systems at approximately ten key intersections. Battery back-up is essential at intersections prone to power outages. Traffic can quickly gridlock or back-up onto freeway off-ramps when the power goes out. In dark conditions with the power out, all drivers are at risk of not knowing a signal exists and may fail to stop. Battery back-up also prevents staff from having to haul generators to sites needing back-up power and then having to monitor them constantly to prevent theft.
- **Pedestrian-Bicycle Enhancements** – Northwest Region has implemented its own pedestrian and bicycle enhancements, and where feasible, contracted with local agencies to add pedestrian enhancements. Examples of some pedestrian enhancements are:
 - Replacing standard pedestrian walk symbol signs with countdown timers that inform pedestrians of how much time they have to cross before light the changes
 - Installing Rectangular Rapid Flashing Beacons (RRFB) at crosswalks crossing free flowing freeway ramps
 - To inform decisions on the type of enhancements needed, engineers collected data on the number of pedestrians using the shoulder and crossing SR 164.
- **Olive Way Ramp Terminal Pad Enhancement – \$135,493** -The primary purpose of this project was to improve pedestrian safety at the I-5 northbound on-ramp from Olive Way. The crosswalk is a busy pedestrian crossing on a freeway onramp in downtown Seattle. The project improved the crosswalk

position across the ramp and landings, repositioned the lanes on Olive Way, and added pedestrian activated Rapid Rectangular Flashing Beacons. The City of Seattle provided the concrete work and state forces contributed the electrical, signing, and pavement marking work.



Olive Way Ramp Terminal Pad Enhancements – Before and After

- **Intersection Signal Integration - \$119,974**- This project added 60 signalized intersections to Northwest Region’s integrated traffic signal management system. NWR uses existing traffic surveillance cameras and software to monitor and adjust traffic signal operations by Signal Engineers in the field or at the Traffic Management Center (TMC). This allows traffic signal timing adjustments to be made quickly when changes caused by collisions, power outages, winter storms or other events suddenly impact traffic patterns.
- **Wrong Way Traffic Control – \$196,816** - This project enhanced DO NOT ENTER, and WRONG WAY signing and pavement markings at select freeway interchanges. These enhancements reduce the risk of drivers mistakenly entering off-ramps in the wrong direction.
- **Curve Warning Signs – \$102,248** - This project added chevrons to a number of severe curves. Due to proximity of some of some curves, and limited shoulder width for installation, there were locations where a mounting bracket was required and the sign was attached to a bridge or roadway barrier. This project addresses run off the road collisions, a Target Zero priority.

Northwest Region Low Cost Enhancement Projects 2011-13 Biennium

Northwest Region Project Description	Total Expenditures
Unobligated	19,072
Project Design	359,343
Materials Lab Investigations	14,001
Tort Claim Investigations	8,654
Active Traffic Management (ATM) Collision Data	5,309
Central Operations Low Cost Actions	88,539
Freeway Operations Low Cost Actions	24,336
ITS Operations Low Cost Actions	25,404
Mt. Baker Area Low Cost Actions	128,323
Snohomish Area Low Cost Actions	275,888
King Area Low Cost Actions	300,288
SR 99 Jct. with SR 599 Signing	16,269
I-5 & Olive Way Ramp Terminal Pedestrian Enhancement	135,493
I-90 EB On Ramp at Rainier Ave. - Install Rectangular Rapid Flashing Beacons (RRFB)	27,536

SR 169 at I-405 Bus Lane Removal	9,929
US 2 – Complete Installation of VMS at Monroe	12,923
US 2 – Complete Installation of VMS at Skykomish	12,802
SR 18 – Install camera at Issaquah-Hobart Roads	45,341
I-90 – Install EB Variable Message Sign (VMS)	91,110
I-90 – Complete Installation of WB VMS	51,588
I-405 Jct. with SR 522 – Relocate Roadway Weather Information Station (RWIS)	66,865
SR 9 Jct. at Sumas - Relocate Roadway Weather Information Station (RWIS)	27,466
Upgrade RWIS at Multiple Locations	17,399
Install Camera on SR 529	17,084
Retrofit Tunnel Control	5,986
SR 9 Jct. SR 542 – Install Active Warning System	81,037
Install I-5 SB Signing to SR 104	12,706
I-405 SB to I-5 NB – Install HOV Ramp Sign Beacons	14,656
SR 9 Jct. 152 nd St. SE – Improve Access	14,773
I-5 Jct. SR 524 – Install Sign	6,278
I-90 Jct. Preston Rd. – Install Camera	22,101
I-5 Jct. SR 539 – Replace Cabinet	28,813
SR 18 Jct. “C” St. – Install Signing	17,518
I-90 W Jct. 4 th St. – Replace Sign	2,955
US 2 Jct. 5 th St. – Improve Warning Sign	8,069
Street Tree In-Service Evaluation Agreement	1,640
Integrate Multiple Intersection Signals	119,974
I-5 NB at Northgate Mall – Perform Puck Test	5,518
US 2 Trestle – Install Traffic Control Signing	7,014
I-90 WB – Install HOV Signing	22,142
SR 18 EB Exit to SE 256 th St. – Install Sign	9,359
SR 543 – Nexus Shift	15,774
SR 164 – Upgrade Signing	33,453
SR 536 – Install Centerline Rumble Strip	50,961
I-5 Jct. S 188 th to I-405 – Install Fiber Distribution Network	33,975
Implement Wrong Way Traffic Control at Multiple sites	196,816
SR 18 Jct SR 516 – Replace 2 Cabinets	6,812
Install Connection to Marysville WSP	12,222
SR 164 – Conduct Pedestrian Study	6,281
I-5 at Federal Way – Retrofit 48VDC	7,202
I-5 Jct. 272 nd St. – Add Signal Controller	72,903
I-5 Jct. Main St. Ferndale – Re-channelize Roadway	10,112
SR 522 – Multiple Uninterruptible Power Supply (UPS) Installations	29,592
Traffic Management Center Equipment	10,000
SR 169 at 161 st Ave SE & 17 th Ave SE – Restripe	8,520
US 2 East Trestle – Install CCTV	6,628
SR 99 at 148 th SW SB – Install advance detection	18,203
SR 900 at Boeing Access Rd EB & WB - Detection	15,873
I-5 to NB Southcenter Blvd – Install Rectangular Rapid Flashing Beacons (RRFB)	9,893
I-5 & I-405 – Camera Replacement Phase 1	21,101
I-5 & I-405 – Camera Replacement Phase 2	34,522
I-5 at NE 45 th – Raise Terminal Cans	7,560
I-90 at 77 th – Upgrade Neon to LED Lighting	27,692
SR 9 at 204 th – Install Protected Left Signal Phasing	19,216

Region wide – Curve Warning Signs	102,218
SR 522 WB at SR 104 – Install Signing	7,188
“Prepare To Stop When Flashing Signs” at 5 intersections	287,373
SR 532 at 72 nd – Accessible Pedestrian Station (APS)	5,254
SR 9 at Bunk Foss – Install Signal Heads	6,371
I-90 - Bellevue College Signing	4,178
SR 167 SB at S 212 th – Battery Back-up	18,987
SR 20 at Sharpes Corner - Battery Back-up	11,435
SR 202 at Sahalee Way NE - Battery Back-up	12,676
I-5 SB at 196 th St SW/36 th Ave W - Battery Back-up	5,726
SR 20 at La Conner/Whitney Rd - Battery Back-up	12,302
SR 548 at Portal Way/Grandview Rd - Battery Back-up	3,646
I-5 SB at S 320 th - Battery Back-up	9,188
I-5 NB at S 320 th - Battery Back-up	8,468
SR 169 at SR 516 - Battery Back-up	30,944
SR 509 at SW Normandy Rd - Battery Back-up	2,344
SR 20 – Bicycle Detection Test	16,089
Region wide - Low Clearance Signs	9,940
SR 524 at Larch – Install Active Warning Signs	20,872
SR 526 at Boeing Access Rd – Install Active Warning Signs	25,790
SR 530 at 59th – Install Active Warning Signs	24,840
Upgrade Fiber Communications Transition Systems	99,159
SR 9 vic. 168 th Street SW – Intersection Channelization	27,875
DUI Overruns	2,579
TOTAL EXPENDITURES	\$3,554,598

Olympic Region

Olympic Region Traffic uses LCE projects to enhance safety and mobility for area transportation system users. The following list provides an overview of Olympic Region projects:

- **SR 109 in Hoquiam – Install School Crossing Sign – \$1,564** - This portion of SR 109 traverses through the City of Hoquiam as a one-way couplet. The region was initially contacted by the Hoquiam School District in response to a child that was hit in a crosswalk near Central Elementary School. To improve visibility and pedestrian safety, the Region combined LCE funding with Highways and Local Programs Safe Routes to Schools funding and installed beacons, a stop bar and STOP HERE FOR PEDESTRIAN signing in advance of the crosswalk.
- **LCE Projects Costing Under \$5,000 - \$454,176** – This category combines funding for small projects that may be related, and generally cost under \$5,000 each. An individual or series of single post signs, minor striping revisions, and investigating and resolving citizen requests all are administered in this category. For the biennium, this funding provided for over 50 single post signs, 20 minor striping revisions and addressed 750 citizen requests.
- **SR 16 at the Burnham Roundabout - \$23,013** – This project paid for design modifications to a City of Gig Harbor roundabout project on eastbound SR 16 to Burnham Drive. The modifications improved the flow by reducing traffic back-ups on eastbound SR 16, changing lane turning movements, and increasing capacity. The design modification also included a lane reduction within the roundabout that improved safety and reduced accidents. The City also contributed funding to the project.
- **SR 109 at Moclips - Install Northbound and Southbound Speed Zone Signing - \$1,278** – The community of Moclips and WSDOT Maintenance requested that a 50 MPH speed zone sign be moved north approximately 3/10 of a mile, to a location just outside a series of a series of curves. Traffic engineers investigated lane and shoulder width, back to back curves, and multiple driveways along this section in determining the safest solution.

Olympic Region Low Cost Enhancement Projects 2011-13 Biennium

Olympic Region Project Description	Total Expenditures
LCE Projects Costing Under \$5,000	454,778
Region wide sign crew Activity	137,402
LCE Project documentation	107,493
I-5 S1/S2 MP 104.89 – reduce gore point	4,929
I-5 @ MP 127.16 – Install Overhead Sign	5,202
SR 109 in Hoquiam – Install school crossing sign	1,564
UW Signing	2,083
I-5 – Install Tow-away Zone Signing corridor wide	14,294
US 101 – Speed reduction	9,486
SR 16 – Install state law move over signs corridor wide	3,726
SR 16 – Burnham Roundabout – Design modifications	23,013
SR 410 – Install Median Signing	2,816
SR 109 at Moclips – Install NB & SB Speed Zone Signing	1,278
I-5 at Tumwater – Add signing at Trosper Road	2,489

I-5 at Tacoma - Install Overhead Guide Signing	3,245
SR 510 at Pacific Ave – RAB Restripe	19,847
SR 109 –Breckenridge Vicinity – Install speed zone signing	2,251
SR 16 – Resign Speed Zone	12,675
SR 161 MP 21.84 – Install mid-block crosswalk	2,369
No Parking Tow Away Zone	2,406
SR 7 @ 304 St. E – Replace sign on signal arm	1,562
I-5 – Install signs at weigh stations corridor wide	9,784
SR 162 @ City of Orting – Install crosswalk signs	5,064
SR 302 – Install speed zone	2,239
US 101 in Olympia – Evergreen Parkway Signing	1,196
VMS Software Upgrade	10,184
I-5 – Off ramp regulatory signing corridor wide	44,274
SR 305 – Install edge line inlay	4,048
SR 101 MP 340.6 – Install hill sign with beacon	3,289
Region wide Wrong Way Signing	31,582
SR 8 – Corridor wide - Install Test Rumble Striping	2,065
US 101 E of Deer Park – Install U-Turn Signing	2,366
SR 167 – Install Barrier	1,951
Region wide CATV Modulators	3,778
SR 3 @ Sam Christopherson Wye – Striping Project	3,667
SR 304 MP .20-.3 – Install signing and beacons	7,518
SR 305 MP 6.85-MP 7.05 – Install Agate Pass Centerline	4,256
SR 16 at Burnham – Post Replacement	4,774
SR 512 at 94 th Ave Off Ramp – Install Right Turn Lane	5,376
Region wide Dotted Restriping Extension Projects	19,317
SR 121 at Pilot Truck Vic.	5,007
SR 304 – Drop Lane & Wide Line	7,744
SR 410 at SR 167 – Install striping rumble strips	6,351
I-5 - Install Lane Reduction Traffic Arrow	1,156
I-705 at SR 509 – Install CCTV Camera	9,376
SR 101 – Install Mud Bay HAR Sign	11,609
Region TMC Equipment Funding	16,021
SR 104 at Center Rd. – Install Signing	2,768
SR I-5 at 38 th St - Off Ramp Modifications	28,545
US 101 at MP 87.27 – Add Striping Improvements	635
I-5 – Striping Improvements	11,269
SR 101 – Install Forks Visitor Signing	220
US 12 – Remove Stain Pole Remove & Install Sign	3,581
IR/WSP – Portable Radios	4,986
SR 160 – Install Low Clearance Signing	6,499
SR 8 – Misc. Safety Improvements	1,790
SR 112- Physt River Guardrail Extension	2,826
Misc. Safety Sign Work	1,051
SR 303 – Alter Gore Line	240
SR 101 – No Pass Strip Removal	4,960
DUI Over Runs	3,192
TOTAL EXPENDITURES	\$1,111,462

Southwest Region

Southwest Region Traffic uses LCE projects to enhance safety and predictability for the area's transportation system users. The following list provides an overview of Southwest Region projects:

- **I-5 SB Exit 2- Wrong Way Enhancement – \$11,335** - LCE funds paid for implementing a pavement marking and signing project located at the I-5 SB Exit 2 off-ramp. Traffic Operations established the need for this project after conducting a traffic field investigation after a wrong way collision occurred at this location. The project included upgrading signing and pavement markings and installing a Wrong Way sign with flashing LED lights.
- **SR 14 Cape Horn Camera Lighting – \$7,086** - This project funded an illumination, modem, and camera to provide better nighttime weather information to the traveling public. The project was initiated in response to many constituent complaints of poor nighttime visibility at this site.
- **SR 14 Tunnel 1 Safety Enhancement – \$57,699** - This project installed an active speed advisory warning system for motor vehicles traveling too fast. Motor vehicles traveling above a threshold speed are flashed a SLOW DOWN message. The project also upgraded the system for warning motorists that bicyclists were passing through the tunnel, and updated low vertical clearance signs with brighter sign sheeting.

Southwest Region Low Cost Enhancement Projects 2011-13 Biennium

Southwest Region Project Description	Total Expenditures
Traffic Staff Labor Costs on LCE Projects	72,875
Portable Traffic Video Recorder	21,202
Install Multiple Low Cost Warning Signs	32,081
Install Multiple Low Cost Regulatory Signs	18,445
Install Multiple Low Cost Heritage/Recreation Signs	2,184
Install Multiple Low Cost Guide Signs	55,438
Install Multiple Low Cost Miscellaneous Signs	7,824
Multiple Misc. Projects costing less than \$5,000	19,721
Traffic Management Center Equipment	9,320
Incident Response Equipment	6,401
Collision Analysis Locations & Corridor Studies	161
ITS Expenditures	18,242
Pavement Marking Enhancements	6,823
Traffic Analysis & Counts	12,839
I-5 SB Exit 2 – Wrong Way Movement Enhancements	11,335
Region wide SR View Ramp Filming	6,443
SR 14 at Cape Horn Vista – Install Camera Lighting	7,086
Regional Transportation Council (RTC) Pilot Project Match	23,333
SR 14 Tunnel #1 – Safety Enhancements	57,699
Automated Turning Movement Camera for Region Wide Use in Signal Timing	3,576
SR 500 at 19th Street – Install Lighting – Reimbursed County	1,033
I-5 – Install Warning System for Flood Control	35,115

SR 501 – Developed End-of-Route Sign Plan	8,063
I-5 – Install Traffic Camera at Woodland Interchange	32,231
Region wide - Flashing Yellow Arrow Signal Upgrades	23,013
Region wide Wrong Way Enhancements	13,010
SR 500 – Install Audible Pedestrian Signal System	9,976
SR 14 MP 45.80-75.69 – Install Centerline Rumble Strip	74,262
US 97 at Goldendale – Relocate VMS Sign	789
SR 4 – Slope Flattening Project	\$26,878
SR 500 at 15 th Street – Signal Modifications	14,168
I-5 – Install Blinking Wrong Way Signing	5,340
Install ITS Trenching System	11,632
Region wide Centerline Rumble Strips	10,239
TOTAL EXPENDITURES	\$657,745

South Central Region

In South Central Region, many projects address reducing potential conflicts at high speed intersections. LCEs are also widely used to improve traveler information in this region. The following highlights represent significant projects implemented in the region during this biennium:

- **US 97 Lateral A - Prepare to Stop When Flashing (PTSWF) System - \$50,228** - The purpose of the project was to increase roadway safety by installing a PTSWF sign at the intersection of US 97 and Lateral A. This intersection has a slight curve on the north side that can be a contributor to drivers missing a traffic signal phase change. Adding the PTSWF will improve driver awareness by providing advance notice that the signal will turn red, giving them more time to react and slow down at a comfortable rate of deceleration. PTSWF's are particularly useful to truck drivers who need more distance to stop.
- **US 395 Blue Bridge LED Light Replacement - \$22,904** – This project replaced the existing high pressure sodium lights with LED lights on the Blue Bridge over the Columbia River between Kennewick and Pasco. The LCE funds purchased the LED fixtures and Maintenance funded the installation. LED lights were installed for two reasons: the vibration in the bridge was shortening the life of the high pressure sodium lights and the LEDs are more energy efficient, reducing the cost of bridge operations.
- **I-90 at Exit 109 – Signal and Signing Improvements - \$6,643** - This project implemented a solution to one of WSDOT intersection collision locations. The project installed a flashing yellow arrow and improved directional signing to Seattle. The signal was changed from a permissive left turn on a green ball to a flashing yellow arrow.

South Central Low Cost Enhancement Projects 2011-13 Biennium

South Central Region Project Description	Expenditures
Traffic Staff Labor Costs on LCE Projects	580
Region wide Minor Signing Modifications	12,459
SR 241 vic. Sunnyside – Install Flashing Beacons	16,102
US 395 – Install 911 Memorial Signs	2,428
US 12 – Install Pomeroy School Beacon	5,469
I-82 at Parker - Replace Camera	10,464
I-90 – Install Warning Beacon at Beaver Pond	15,368
US 97 at Jct. SR 22 – Install Pedestrian Enhancements	4,913
US 97 at Lateral A – Install “Prepare to Stop When Flashing” System	50,228
US 395 at Kennewick & Clearwater– Install Flashing Yellow Arrow	37,387
Region wide-Microwave Hot Standby	30,986
US 12 at Bridge Street - Signal Interconnect	10,113
I-90 at Exit 109 – Install Sign to Seattle	6,643

ITS Testing Equipment for Microwave Infrastructure	624
Partial Cloverleaf Wrong Way Signing & Striping	24,442
I-90 – Snoqualmie Pass - Install GPS unit for HAR	5,850
I-90 - Snoqualmie Pass -Install Culvert for Radio Repeater Access Pad	477
SR 221 at Prosser Hill – Add Flashing Beacons to Curve Sign	5,841
Purchase Telecom Radio Spare	1,943
I 82 – Install Sign for Port of Grandview	2,084
US 395 at Blue Bridge – Replace Lights with LED Bulbs	22,904
Purchase ITS Equipment for Traveler Information Equipment	14,825
Region wide – Install 2070 Controllers	105,312
I 82 – at Fred Redmon Bridge - Install Emergency Call Boxes-	10,123
US 12 at MP 159.6 – Replace VMS Sign	16,871
Region wide – Upgrade VMS Controllers	14,364
DUI Over Runs	1,917
TOTAL EXPENDITURES	\$430,717

North Central Region

North Central Region used LCE funding to address issues on many rural high speed two lane and multi-lane highways. Winters frequently bring snow and ice which can adversely affect travel on state highways.

- **US 2 - Tumwater Canyon Gate - \$49,689** - This Low Cost Enhancement project funded the installation of a drop arm gate and illumination in the town of Leavenworth at the south end of Tumwater Canyon. Previously, whenever the highway through the canyon was closed due to rock slides, avalanche, fire or flood, WSDOT or WSP personnel had to be stationed at this location for the duration of the closure. The drop arm gate will allow the road to be closed while freeing up personnel for other critical work. An identical gate will be installed at the north end of Tumwater Canyon during the 13-15 Biennium.
- **SR 28 - Ephrata to Soap Lake Restripe - \$66,563** - This stretch of four lane highway had a 60 MPH speed limit and no median. The collision history at this location led the Region Traffic office to investigate this site.

The Traffic Office decided to install a Two Way Left Turn Lane (TWLTL) after engineering studies indicated it would be a more effective solution than reducing speed limits. The project involved removing portions of the existing striping and converting the previous four lane configuration to three through lanes and a two way left turn lane. The TWLTL is continuous throughout the length of the project with two lanes eastbound and one lane westbound for half the project, and one lane eastbound and two westbound for the other half. This provides passing opportunities in both directions.

- **US 97 - MP 226 to 235 Centerline Rumble Strip - \$45,861** - Installed centerline rumble strips on US 97 south of Beebe Bridge for a distance of 8 ½ miles. Centerline rumble strips have been shown to reduce head-on and collisions by as much 45% and fatal and serious injury head-on collisions by 49%.
- **Intelligent Transportation Systems \$73,122** – ITS projects in the NCR help WSDOT Maintenance and Operations make important information accessible quickly and easily. The traveling public also relies on this information to make travel decisions. NCR at used LCE funding during the 11-13 biennium; purchase and install ITS radio equipment; a 900 MHz communication network; new traffic cameras on US 2 at Pine Canyon, Waterville and Coulee City; on SR 20 at Mazama, and on SR 26 at Othello. The region also purchased and installed equipment for a camera ITS link at the junction of SR 285 and SR 28 in East Wenatchee. The camera at Othello was installed because of parent requests for better information to help the Washington State University make travel decision during poor weather.

North Central Region Low Cost Enhancements 2011-13 Biennium

North Central Region Project Description	Expenditures
Maintenance Area #1 Signing	31,083
Maintenance Area #2 Signing	5,846

Maintenance Area #3 Signing	39,700
Maintenance Area #4 Signing	14,738
Region wide minor striping channel modifications	9,526
Region wide minor enhancements requested by WSP	5,714
US 2 EB @ Tunnel Creek Bridge - Install durable markings	2,500
US 97Alt. in Chelan - Install solar powered school zone beacons	6,926
SR 150 - corridor wide modifications	9,207
SR 28 at Jct. SR 285 Sellar Bridge - Install Camera ITS Link	21,416
Region Basin Area - Install ITS radio equipment	9,693
Region wide - Install 900MHZ network for ITS & signals	21,743
SR 2 at Pine Canyon/Waterville/Coulee Install Cameras	17,430
SR 172 @ Mansfield - Install School Zone Beacons	4,869
SR 283 MP 9.93-10.16 - Complete slope flattening project	9,797
SR 2 at MP 90.1 - Install Drop Arm Gate Utilities	7,799
Region wide - Review & update wrong-way signing	16,387
SR 28 at MP 33.79 (Adams Rd) Install LED Stop Sign	2,624
SR 97 at MP 184.95 (Big Y) - Install LED Stop Sign	2,054
SR 7 at MP 134.4 - Sight Dist. Improve Partner	2,842
SR 26 from MP 40.7-42.6 (Othello) - Install Cameras	32,575
SR 2 at MP 70.5 - Install Camera	6,944
SR 150 from MP 7-10 - Flashing Yellow Arrow at 2 Signals	6,853
SR 282 at Dodson Rd - Install Radius Improvements	8,048
SR 28 at SR 17 - Closed graveled portion of Canna St impeding ramp	2,681
SR 20 at Mazama - Install Camera	3,657
SR 17 at Moore Rd - Radius Improvements	6,600
SR at 19 th St - Signal Modifications	1,668
US 97 at SR 20 (Tonasket) - Design Radius Improvements	2,645
SR 28 - MP 47.3 to 47.7 - Installed ADA compliant Pedestrian Pushbutton	19,711
SR 20 at MP 277-278 - Partnered to Flatten Slope and Prevent Erosion	15,687
SR 243 at MP 13.94 (Mattawa) - Install LED Signs	11,375
SR 155 at Colville Reservation - Install Signage	4,515
SR 285 at MP 4.49 - Enhance Flagging for Traffic Control	654
Region wide - Purchased Remote Controls for Augers on Sign Trucks	15,000
Frenchman Hill - Lease on Radio Site	15,000
SR 97 at MP 226-235 - Install Centerline Rumble Strips	34,313
SR 2 from MP 90-99 - Install Gates in Tumwater Canyon	9,880
US 2 at Bridge Db00179 MP 99.01 - Install Drop Arm Gates	32,010
SR 17 at I-90 I/C - Restore Worn Pavement Markings	7,579
SR 150 - Corridor wide Curve Warning Sign Update	18,810
SR 28 from Ephrata to Soap Lake - Restripe Two-way Left Turn Lanes	66,563
Db00204 Striping	35,994
VMA For Traveler Information	19,354
LCE Projects under \$5,000	279
DUI Over runs	2,527
TOTAL EXPENDITURES	\$622,816

Eastern Region

Eastern Region Traffic uses LCE projects to enhance safety and mobility for the area transportation system users. The following list provides an overview of the Eastern Region projects:

- US 2 Traffic Signal Back Plate Enhancements - \$10,557** - Based on guidance from the Federal Highway Administration's (FHWA) "Proven Safety Countermeasures" website, the region installed back plates with retro-reflective borders on a select number of signals. Studies show the use of back plates with retro-reflective borders can result in a 15 percent reduction in all crashes at urban signalized intersections. The enhancement makes the signal more conspicuous in all conditions, which reduces the possibility of unintentional red-light running crashes. Another reason to use retro-reflective borders is that in the event of a nighttime power outage the yellow tape helps indicate the presence of an intersection. Adding retro-reflective borders is also advantageous during periods of power outages when signals would otherwise be dark. The retro-reflective sheeting continues to provide a visible cue for travelers to take note of the dark signal and adjust their actions accordingly.

Other traffic signal back plate enhancement installations on US 2 include:

- US2 at SR 41
 - US2 at Day Mt Spokane
 - US2 at SR 206 (selected because it is in a Collision Analysis Location)
 - US2 at Farwell
 - US2 at Nevada
- US 2 at Flynt Road Intersection Design - \$106,570** - Eastern Region Traffic partnered with the City of Spokane to fund a traffic signal and intersection design project. The intersection had a growing left turn issue that had developed over the last several years. The design work has been completed and the project is scheduled for award in the fall of 2013.

Eastern Region Low Cost Enhancement Projects 2011-13 Biennium

Eastern Region Project Description	Expenditures
Maintenance Area #1 – Customer response Signing	44,477
Maintenance Area #2 – Customer response Signing	11,312
Maintenance Area #3 – Customer Response Signing	11,113
Maintenance Area #4 Customer Response Signing	16,124
US 2 at Creston - Install School Flashers	9,950
US 395 NB - Interconnect Signals	15,976
US 395 Columbia River Bridge – Install Navigation Lights	21,305
I-90 Tokio Exit - Install Open/Close Sign	4,562
US 2 at Hayford Rd. – Upgrade Controller	3,758
US 395 – Install switch in VMS Sign	8,364
US 395 at Farwell West – Install Sign Head to Control Right Turn	1,719
US 2 at MP 294 - Enhance Signal Back plates	10,557
Region wide -Install Multiple School Signs	1,178
SR 21 NB - Update Warning Signs corridor wide	8,230

I-90 at Sullivan WB Off Ramp – Upgrade Guide Signs	17,540
I-90 at Sullivan EB – Off Ramp	11,315
I-90 at Division EB Off Ramp – Congestion Management	109
US 2 at Flint Rd City of Spokane – Intersection Design	106,409
Pedestrian Countdown Timers	9,715
US 395 at Hawthorne – Controller Upgrade	6,956
SR 26 at Hatton Coulee SRA – Install CCTV	26,538
SR 21 – North Warning Signs Update	8,230
Inland Power & Light – Power Installation	1,018
US 2 at Wood/Espanola Rd – Sign Installation	5,302
Spokane Area – Highway Advisory Radio Synchronization	23,909
DUI Over runs	2,805
TOTAL EXPENDITURES	\$388,471