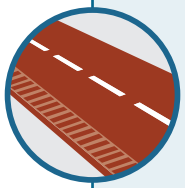
APPENDIX D. SAFETY COUNTERMEASURE TOOLBOX AND COST ESTIMATE ASSUMPTIONS

ROADWAY SEGMENT COUNTERMEASURES

Install 6-in. Edge Line (Both Sides of Roadway) - Increases visibility, especially at night and in poor weather. 6 inch edge lines provide clearer guidance, helping drivers maintain their lane position. Improved lane adherence reduces the risk of roadway departure crashes.

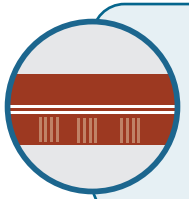
Install 4-in. Centerline and Edge Line Striping (Paint) - Improves Lane visibility and delineation. These markings help drivers maintain proper lane positioning, especially in low-light conditions. Better lane guidance reduces the potential for head-on and run-off-road crashes.

Install 4-in. Retroreflective Centerline and Edge Lines - Improves nighttime visibility and lane delineation. The enhanced reflectivity provides better guidance, reducing driver confusion and lane departures. Clearer lane markings help prevent crashes, especially in low-light conditions.

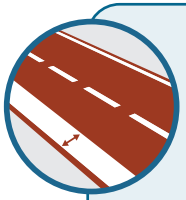


Install Edge Line Rumble Strips - Create audible and vibratory warnings when vehicles drift toward the shoulder. These strips alert distracted or drowsy drivers, preventing lane departures. Keeping vehicles in their lanes reduces the risk of run-off-road crashes.

Install Centerline Rumble Strips - Provide tactile and auditory alerts to drivers who cross into opposing lanes. They help prevent head-on and opposite-direction sideswipe collisions by encouraging lane compliance



Install Transverse Rumble Strips Prior to Curve - Provides tactile and auditory warnings to approaching drivers. These strips alert drivers to reduce speed and prepare for a curve. Slowing vehicles before curves decreases the likelihood of curve-related crashes.



Extend Unpaved Shoulder 2 ft (Both Sides of Roadway) - Provides additional recovery space for vehicles that leave the roadway. This extra space allows drivers to regain control, reducing the likelihood of run-off-road crashes.

Install 4 ft Paved Shoulder (Both Sides of Roadway) - Provides additional recovery space for vehicles, reducing the risk of run-off-road crashes. Paved shoulders can also enhance safety by accommodating multiple road users including pedestrians and bicyclists.

Install Medians (Back-to-Back Curb) - Provides a physical barrier that separates opposing traffic, reducing head-on and left-turn crashes. These medians limit dangerous crossing movements.

Install Medians and Pedestrian Refuge Islands - Provide safe stopping points for pedestrians crossing multi-lane roads. They allow pedestrians to cross one direction of traffic at a time, reducing exposure to traffic. This enhances pedestrian safety and reduces conflict points with turning vehicles.

Lane Narrowing - Reduces the width of vehicle travel lanes, often through restriping or adding buffers for bicyclists or pedestrians. Narrower lanes naturally encourage slower driving speeds and increase driver focus.

Widen Roadway and Install Two-Way Left-Turn Lane - Reduces conflicts by providing a dedicated space for turning vehicles. This minimizes rear-end and sideswipe crashes by keeping turning vehicles out of travel lanes. Safer left-turn movements reduce the risk of crashes.

Install or Upgrade Curve Signage to Enhanced Delineations - Uses bright, retroreflective materials and larger signs to increase curve visibility. These signs alert drivers to approaching curves, encouraging appropriate speed adjustments.

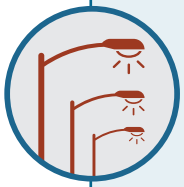
Install Speed Activated Flashers on Chevron Signs - Illuminate chevron signs when vehicles approach at excessive speeds, providing an immediate visual warning. These flashers alert drivers to reduce speed before entering dangerous curves.

Install In-Lane Curve Warning Pavement Markings - Provide visual cues directly on the pavement, alerting drivers to upcoming curves. This enhances curve awareness and encourages speed reduction. Increased driver attention reduces the risk of curve-related crashes.

Install High Friction Surface Treatment (HFST) on Curve - Increases pavement friction at critical curve locations, improving vehicle traction and reducing skidding. HFST helps vehicles maintain control on curves, especially in wet or slippery conditions.

Install 6 ft Sidewalk (Both Sides of Roadway) - Provide a designated space for pedestrians, separated from vehicle traffic. Installing sidewalks on both sides of a roadway increases pedestrian safety by reducing the likelihood of pedestrian-vehicle interactions.

Install A Separated 12 ft. Shared-Use Path - Accommodates pedestrians, bicyclists, and other non-motorized users, separated from the roadway. The separation significantly reduces conflicts between vulnerable users and vehicles.



Install Highway Lighting - Improves nighttime visibility for drivers, pedestrians, and bicyclists. Properly lit roadways enhance driver reaction times and reduce the likelihood of crashes in low-visibility conditions. Enhanced lighting reduces nighttime crash severity and frequency.

Driver Feedback Speed Limit Signs - Display vehicle speeds to approaching drivers, encouraging them to slow down when exceeding the posted speed limit. These signs use radar to detect speeds and provide real-time feedback, raising driver awareness.

Driver Feedback Speed Limit Signs on Rural Curves - Alert drivers to their speed as they approach potentially hazardous curves, encouraging speed reduction. These signs are strategically placed before curves to give drivers time to adjust their speed.

Install Guardrail - Provides a protective barrier that prevents vehicles from leaving the roadway, especially on curves or embankments. They redirect errant vehicles and minimize the severity of crashes. Properly placed guardrails reduce the potential for fatal off-road crashes.

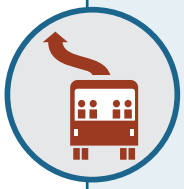
Install Post-Mounted Delineators - Increases edge of travel way visibility and guides drivers through curves, intersections, and other road features. Provides visual cues, especially in low-light conditions, enhancing driver awareness. Improved guidance reduces run-off-road and curve-related crashes.

Install Concrete Barrier - Provides a rigid, protective barrier that prevents vehicle crossovers and errant vehicle departures. They are effective at containing high-speed vehicles and reducing crash severity. Barriers prevent head-on collisions and protect vulnerable roadside areas.

Install Bicycle Lanes - Designate space exclusively for bicyclists, typically with pavement markings and signage. They provide a safer, dedicated area for bicyclists, separating them from motor vehicle traffic and reducing conflicts between bicyclists and vehicles.

Install Buffered Bicycle Lanes (Curb Separated) - Adds a physical separation between bicyclists and vehicles using curbs or raised elements. This increased separation protects bicyclists from encroaching vehicles and further reduces conflicts with traffic.

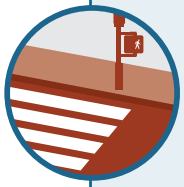
Convert Traditional/Buffered Bike Lanes to Separated Lane with Flexible Delineator Posts - Provides a physical buffer between bicyclists and vehicles. Delineator posts increase driver awareness and prevent vehicle encroachment into bicycle lanes.



Install Paved Bus Pullout - Provide a designated area for buses to stop outside the travel lane. This prevents buses from blocking traffic and reduces the likelihood of rear-end collisions. Pullouts enhance safety for both passengers and passing vehicles.

Conduct A Road Safety Audit (RSA) - A formal evaluation by a multidisciplinary team to identify safety concerns and recommend improvements. RSAs assess potential hazards and suggest mitigation measures. Addressing identified issues helps prevent crashes.

INTERSECTION COUNTERMEASURES



Install High-Visibility Crosswalk (Including Lighting) - Uses bold markings (e.g., continental or ladder styles) with enhanced lighting to improve pedestrian visibility. The increased visibility helps drivers detect crossing pedestrians earlier, especially at night.

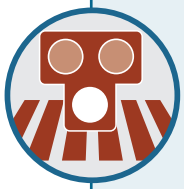
Install Extended Time Pushbutton - Allows pedestrians who need extra time to cross to extend the signal phase. These pushbuttons accommodate slower-moving pedestrians, ensuring they can safely clear the intersection.

Install Raised Crosswalk and Signage - Elevates pedestrian crossings, decreasing speeds and increasing pedestrian visibility. Accompanying signage alerts drivers to yield to crossing pedestrians. Slower speeds and increased driver awareness reduce pedestrian crash frequency and severity.

Install High Visibility Crosswalk Markings and Signage - Uses bold pavement markings and signage to alert drivers to pedestrian crossings. The increased visual cues improve driver awareness and compliance. Enhanced crosswalks reduce pedestrian crashes by improving visibility.

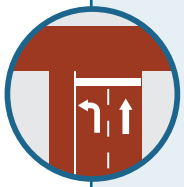
Install High-Visibility Crosswalk (Including RRFB) - Uses bold pavement markings, signage, and bright, flashing lights to alert drivers to pedestrian crossings. The flashing beacons activate when pedestrians approach, significantly increasing driver awareness.

Install Rectangular Rapid Flashing Beacons (RRFB) - Uses bright, flashing lights to warn drivers of pedestrians crossing the roadway. Activated by pedestrians, RRFBs draw driver attention and prompt yielding behavior.



Install Pedestrian Hybrid Beacons (PHB) or HAWK - Uses flashing and solid lights to control vehicle movements and allow pedestrians to cross safely. These signals create clear gaps in traffic for safe crossings. PHBs greatly reduce pedestrian crashes at midblock locations.

Install Pedestrian Refuge Island - Provides a safe space in the center of the roadway for pedestrians crossing multiple lanes. They allow pedestrians to cross one direction of traffic at a time, reducing exposure to traffic. Refuge islands can decrease the number of pedestrian related crashes



Install Left Turn Lanes - Provides space for slower, turning vehicles, removing them from the through traffic flow. This separation reduces rear-end and angle crashes by minimizing conflicts between turning and through vehicles.

Create Positive Offset of Existing Left-Turn Lanes (Pavement Markings and Curb Work, No Widening) - Realigns opposing left-turn lanes to improve driver visibility of oncoming traffic. This change reduces sightline obstructions and minimizes risky turning maneuvers.

Install Right Turn Lanes - Provides space for turning vehicles to exit the through traffic flow, reducing rear-end crashes. Separating right-turning vehicles improves intersection efficiency and reduces conflicts. Safer turning movements lead to fewer intersection involved crashes.

Realign Intersection Approach to Reduce or Eliminate Skew - Improves sightlines and reduces complex turning movements. Better alignment simplifies driver decision-making, reduces turning conflicts, and reduces. the risk of severe intersection crashes.

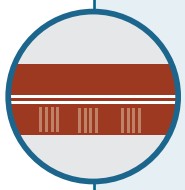
Implement Leading Pedestrian Interval (LPI) Signal Timing - Gives pedestrians a 3-7 second head start to enter the crosswalk before vehicles receive a green light. This early entry makes pedestrians more visible and reduces conflicts with turning vehicles.

Change Left-Turn Timing from Permissive Only to Flashing Yellow Arrow - Provides drivers more clarity by indicating when left turns are allowed but not protected. This reduces driver confusion and improves gap selection.

Change Left-Turn Timing from Permissive to Protected - Provides left-turning vehicles a dedicated green arrow and removes the need for drivers to judge gaps in opposing traffic, reducing conflicts.

Change 5-Section Doghouse to Flashing Yellow Arrow - Simplifies driver decision-making for left turns by clearly indicating when drivers must yield to oncoming traffic.

Install a Rural Intersection Control Warning System (RWIS) - Uses dynamic flashing beacons and signage to alert drivers of approaching traffic at rural intersections. These systems provide real-time warnings, improving driver awareness and reducing risky maneuvers.

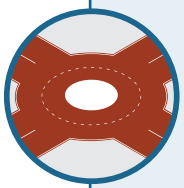


Install Transverse Rumble Strips on Minor Approach - Provides placed auditory and tactile warnings to drivers approaching intersections. These strips alert inattentive drivers, reducing the risk of failure-to-yield crashes.

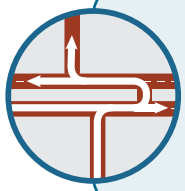
Clear and Grub - Removes vegetation and obstacles that obstruct sightlines at intersections. Improved sight distance allows drivers to detect and react to potential hazards more quickly. Better visibility reduces the likelihood of intersection crashes.

Install Pedestrian Refuge Island - Provides a safe space in the center of the roadway for pedestrians crossing multiple lanes. They allow pedestrians to cross one direction of traffic at a time, reducing exposure to traffic. Refuge islands can decrease the number of pedestrian related crashes.

Perform an Intersection Control Evaluation (ICE) and Implement - Assesses the best control type (signals, roundabouts, or stop signs) to improve safety and operations. Implementing the optimal control can reduce crash potential and improve traffic flow.



Convert Existing Intersection to Modern Roundabout (Single Lane) - Replaces traditional intersections with a circular layout where traffic flows counterclockwise. Roundabouts reduce conflict points, slow vehicle speeds, and minimize crash severity.



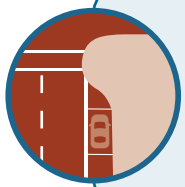
Right-In-Right-Out Access Treatment - Restricts left-turn movements at driveways or intersections, reducing conflict points. Vehicles enter and exit only via right turns, preventing risky crossing maneuvers. Limiting left-turns reduces the frequency of angle crashes.

Stop-Control Intersection Signage - Improves visibility and awareness at stop-controlled intersections. Larger, retroreflective signs or supplemental signs alert drivers earlier, reducing the likelihood of failure-to-yield crashes.

Install Second Stop Sign and Stop Ahead Sign - Reinforces the need for drivers to stop. This redundancy improves driver compliance and reduces the likelihood of failure-to-yield crashes.

Install Beacon on Stop Sign - Uses flashing lights to draw driver attention to the intersection. The increased visibility improves driver compliance to stop signs. Better compliance reduces intersection crashes, particularly at night or in low-visibility conditions.

Upgrade Signs and Pavement Markings (Paved Approach) - Enhances driver guidance and intersection visibility by providing, more visible signage and markings to reduce driver confusion.



Install Bulbouts - Bulbouts, or curb extensions, extend the sidewalk into the roadway, reducing crossing distance and slowing the speed of turning vehicles. Bulbouts improve pedestrian visibility and safety.

**The provided cost estimates represent planning-level estimates. The cost estimates were developed using the latest available unit material costs from Materials Masterworks Database, the UDOT Concept Cost Estimate Form, and project team input and experience.*

Safety Countermeasure	Description	Cost Estimate*
Install High-Visibility Crosswalk (including lighting)	Uses bold markings (e.g., continental or ladder styles) with enhanced lighting to improve pedestrian visibility. The increased visibility helps drivers detect crossing pedestrians earlier, especially at night. Enhanced crosswalks reduce pedestrian-related crashes by making pedestrians more noticeable.	$38,000 / Crossing
Install High-Visibility Crosswalk (including RRFB)	Uses bright, flashing lights to alert drivers to pedestrian crossings. The flashing beacons activate when pedestrians approach, significantly increasing driver awareness. This combination reduces pedestrian crashes by prompting drivers to yield.	$17,000 / Crossing
Implement Leading Pedestrian Interval (LPI) Signal Timing	Gives pedestrians a 3-7 second head start to enter the crosswalk before vehicles receive a green light. This early entry makes pedestrians more visible and reduces conflicts with turning vehicles. LPIs lower pedestrian-vehicle crash risk and increase pedestrian safety.	$3,000 / Intersection
Install a Extended Time Pushbutton	Allows pedestrians who need extra time to cross to extend the signal phase. These pushbuttons accommodate slower-moving pedestrians, ensuring they can safely clear the intersection. Longer crossing times reduce the likelihood of pedestrian crashes.	$500 / Each
Install Intersection Lighting	Enhances nighttime visibility for all road users, illuminating pedestrians, cyclists, and vehicles. Better lighting improves driver reaction time and reduces crash likelihood in low-visibility conditions. Properly lit intersections help prevent severe and fatal crashes.	$35,000 / Intersection
Install Left-Turn Lanes	Provides space for turning vehicles, removing them from the through traffic flow. This separation reduces rear-end and angle crashes by minimizing conflicts between turning and through vehicles. Left-turn lanes enhance safety by reducing intersection congestion.	$153,000 / Lane
Create Positive Off-Set of Existing Left-Turn Lanes (pavement markings and curb work, no widening)	Realigns opposing left-turn lanes to improve driver visibility of oncoming traffic. This change reduces sightline obstructions and minimizes risky turning maneuvers. Improved visibility lowers the risk of left-turn crashes.	$16,000 Intersection
Install Right-Turn Lanes	Provides space for turning vehicles to exit the through traffic flow, reducing rear-end crashes. Separating right-turning vehicles improves intersection efficiency and reduces conflicts. Safer turning movements lead to fewer intersection crashes.	$127,000 / Lane
Convert Existing Intersection to Modern Roundabout (Single Lane)	Replaces traditional intersections with a circular layout where traffic flows counterclockwise. Roundabouts reduce conflict points, slow vehicle speeds, and minimize crash severity. Their design significantly reduces fatal and serious injury crashes.	$1,900,000 / Intersection
Stop-Control Intersection Signage	Improves visibility and awareness at stop-controlled intersections. Larger, retroreflective signs or supplemental signs alert drivers earlier, reducing the likelihood of failure-to-yield crashes. Improved signage enhances driver compliance and intersection safety.	$4,000 / Intersection
Perform an Intersection Control Evaluation and Implement	Assesses the best control type (signals, roundabouts, or stop signs) to improve safety and operations. Implementing the optimal control reduces crash potential and improves traffic flow. Proper intersection control selection minimizes conflict points and crash severity.	$225,000 / Intersection

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Safety Countermeasure	Description	Cost Estimate*
Change Left-turn Timing from Permissive Only to Flashing Yellow Arrow	Gives drivers more clarity by indicating when left turns are allowed but not protected. This change reduces driver confusion and improves gap selection. Better decision-making lowers left-turn crash risks.	$8,000 / Intersection
Change Left-turn Timing from Permissive to Protected	Gives left-turning vehicles a dedicated green arrow. This removes the need for drivers to judge gaps in opposing traffic, reducing conflicts. Protected left-turns significantly reduce angle and left-turn crashes.	$8,000 / Intersection
Change a 5-section "Doghouse" to Flashing Yellow Arrow	Simplifies driver decision-making for left turns. The flashing yellow arrow clearly indicates when drivers must yield to oncoming traffic. This change improves understanding and reduces left-turn crashes.	$8,000 / Intersection
Right-in-Right-out Access Treatment	Restricts left-turn movements at driveways or intersections, reducing conflict points. Vehicles enter and exit only via right turns, preventing risky crossing maneuvers. Limiting left-turns reduces severe angle crashes.	$11,000 / Driveway
Install Raised Crosswalk and Signage	Elevates pedestrian crossings, slowing vehicle speeds and increasing pedestrian visibility. Accompanying signage alerts drivers to yield to crossing pedestrians. Slower speeds and increased driver awareness reduce pedestrian crash severity.	$41,000 / Each
Install Pedestrian Refuge Island	Provides a safe space in the center of the roadway for pedestrians crossing multiple lanes. They allow pedestrians to cross one direction of traffic at a time, reducing exposure. Refuge islands significantly lower pedestrian crash risk.	$75,000 / Each
Install High Visibility Crosswalk Markings and Signage	Uses bold pavement markings and signage to alert drivers to pedestrian crossings. The increased visual cues improve driver awareness and compliance. Enhanced crosswalks reduce pedestrian crashes by improving visibility.	$7,000 / Crossing
Install Pedestrian Hybrid Beacons (PHB) or HAWK	Uses flashing and solid lights to control vehicle movements and allow pedestrians to cross safely. Activated by pedestrians, these signals create clear gaps in traffic for safe crossings. PHBs greatly reduce pedestrian crashes at midblock locations.	$250,000 / Each
Install Bulbouts (2)	Extends the sidewalk into the roadway, reducing crossing distance and slowing turning vehicles. By shortening pedestrian exposure to traffic, they improve pedestrian safety. Bulbouts increase driver yielding and reduce pedestrian crashes.	$54,000 / Each
Install Rectangular Rapid Flashing Beacons (RRFB)	Warns drivers of pedestrians crossing the roadway. Activated by pedestrians, RRFBs draw driver attention and prompt yielding behavior. Increased driver awareness reduces pedestrian-vehicle conflicts.	$10,000 / Crossing
Clear and Grub	Removes vegetation and obstacles that obstruct sightlines at intersections. Improved sight distance allows drivers to detect and react to potential hazards more quickly. Better visibility reduces the likelihood of intersection crashes.	$1,000 / Leg

**The provided cost estimates represent planning-level estimates. The cost estimates were developed using the latest available unit material costs from Materials Masterworks Database, the UDOT Concept Cost Estimate Form, and project team input and experience.*

Safety Countermeasure	Description	Cost Estimate*
Install Transverse Rumble Strips on Minor Approach	Provides auditory and tactile warnings to drivers approaching intersections. These strips alert inattentive drivers, reducing the risk of failure-to-yield crashes. Better driver awareness lowers crash potential.	$1,000 / Leg
Upgrade Signs and Pavement Markings (Paved Approach)	Enhances driver guidance and intersection visibility. Clearer, more visible signage and markings reduce driver confusion. Improved guidance reduces crash frequency and severity.	$3,000 / Leg
Install Second Stop Sign and Stop Ahead Sign	Reinforces the need for drivers to stop. This redundancy improves driver compliance and reduces the likelihood of failure-to-stop crashes. Double signage enhances safety at stop-controlled intersections.	$1,500 / Leg
Install Beacon on Stop Sign	Uses flashing lights to draw driver attention to the intersection. The increased visibility improves driver compliance with stop signs. Better compliance reduces intersection crashes, particularly at night or in low-visibility conditions.	$5,000 / Each
Realign Intersection Approach to Reduce or Eliminate Skew	Improves sightlines and reduces complex turning movements. Better alignment simplifies driver decision-making and reduces turning conflicts. Correcting skewed approaches lowers the risk of severe intersection crashes.	$329,000 / Leg
Install a Rural Intersection Control Warning System (RICWS)	Uses dynamic flashing beacons and signage to alert drivers of approaching traffic at rural intersections. These systems provide real-time warnings, improving driver awareness and reducing risky maneuvers. Enhanced driver awareness lowers the likelihood of severe crashes at rural intersections.	$100,000 / Intersection

Install Intersection Lighting					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Underground service pedestal - power source	each	$ 660.00	1	$ 660.00	
40' Signal Pole Luminaire	each	$ 300.00	4	$ 1,200.00	
15' Mast Arm	each	$ 162.00	4	$ 648.00	
LED Luminaire	each	$ 312.00	4	$ 1,248.00	
Foundation	each	$ 3,137.00	4	$ 12,548.00	
Junction Box	each	$ 2,000.00	4	$ 8,000.00	
Items not Estimated	lump	$ 10,000.00	1	$ 10,000.00	
Total/Intersection				$	35,000

Install Right Turn Lane					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Concrete Sidewalk	sq ft	$ 15.00	1765	$ 26,473.11	
Remove Concrete Curb and Gutter	ft	$ 10.00	385	$ 3,854.70	
Pavement Marking Paint	ft	$ 0.50	300	$ 150.00	
Clearing and Grubbing	acre	$ 15,000.00	0.1	$ 1,222.74	
Concrete Curb and Gutter Type B1	ft	$ 50.00	357	$ 17,834.45	
Relocate Sign	Each	$ 250.00	5	$ 1,250.00	
UTBC (Plan Quantity)	cu yd	$ 80.00	88	$ 7,012.35	Assumes a 27" Pavement Section (7" HMA, 8" UTBC, 12" GB)
HMA 1/2 Inch	Ton	$ 160.00	153	$ 24,518.67	Assumes a 27" Pavement Section (7" HMA, 8" UTBC, 12" GB)
Granular Borrow	cu yd	$ 70.00	131	$ 9,203.70	Assumes a 27" Pavement Section (7" HMA, 8" UTBC, 12" GB)
Roadway Excavation	cu yd	$ 35.00	296	$ 10,354.17	Assumes 295' turn lane, 12' width
Items not estimated	lump	$ 25,000.00	1	$ 25,000.00	Signal Pole Relocate and new foundation. Doesn't account for ROW
Total/Lane				$	127,000

Install Left Turn Lane					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Concrete Sidewalk	sq ft	$ 15.00	1765	$ 26,473.11	
Remove Concrete Curb and Gutter	ft	$ 10.00	385	$ 3,854.70	
Clearing and Grubbing	acre	$ 15,000.00	0.1	$ 1,222.74	
Concrete Curb and Gutter Type B1	ft	$ 50.00	357	$ 17,834.45	
Relocate Sign	Each	$ 250.00	5	$ 1,250.00	
UTBC (Plan Quantity)	cu yd	$ 80.00	133	$ 10,666.67	Assumes a 29" Pavement Section (7" HMA, 8" UTBC, 12" GB)
HMA 1/2 Inch	Ton	$ 160.00	233	$ 37,296.00	Assumes a 29" Pavement Section (7" HMA, 8" UTBC, 12" GB)
Granular Borrow	cu yd	$ 70.00	200	$ 14,000.00	Assumes a 29" Pavement Section (7" HMA, 8" UTBC, 12" GB)
Roadway Excavation	cu yd	$ 35.00	318	$ 11,121.14	Assumes 450' x 12'
Remove Pavement Marking Paint	ft	$ 2.00	1350	$ 2,700.00	450', 2 centerline stripes, 1 edge line
Pavement Marking Paint	ft	$ 0.50	2100	$ 1,050.00	450', 2 centerline stripes, 1 edge line, 1 Lane
Items not estimated	lump	$ 25,000.00		$ -	Signal Pole Relocate and new foundation. Doesn't account for ROW
Total/Lane				$	128,000

Convert Existing Intersection to Modern Roundabout - 1 Lane					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Huntsville ICE Concept	Lump	$ 1,930,000.00	1	$ 1,930,000.00	
Cedar City ICE Concept	Lump	$ 1,620,000.00	1	$ 1,620,000.00	
Tremonton ICE Concept	Lump	$ 2,850,000.00	1	$ 2,850,000.00	
Spanish Fork ICE Concept	Lump	$ 2,126,500.00	1	$ 2,126,500.00	Roadway, pavement marking
Total/Intersection				$	2,132,000
Convert Existing Intersection to Modern Roundabout - 2 Lane					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Magna ICE Concept	Lump	$ 2,220,000.00	1	$ 2,220,000.00	Roadway, pavement marking and lighting costs
St. George Bluff Street ICE Concept	Lump	$ 2,404,900.00	1	$ 2,404,900.00	Roadway, pavement marking and lighting costs
Helper ICE Concept	Lump	$ 2,571,400.00	1	$ 2,571,400.00	Roadway, pavement marking and lighting costs
Total/Intersection				$	2,399,000

Install Bulbouts (Two)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Concrete Curb and Gutter Type B1	ft	$ 50.00	200	$ 10,000.00	Assumes 6 ft shoulder for parking, not for pedestrian crossings on both legs
Concrete Flatwork 6 Inch	sq ft	$ 15.00	2000	$ 30,000.00	Assumes 6 ft shoulder for parking, not for pedestrian crossings on both legs
Asphalt Tie-In	Ton	$ 200.00	40	$ 8,000.00	Assumes 6 ft shoulder for parking, not for pedestrian crossings on both legs
Roadway Excavation	cu yd	$ 35.00	93	$ 3,240.74	Assumes 6 ft shoulder for parking, not for pedestrian crossings on both legs
Remove Concrete Curb & Gutter	ft	$ 10.00	200	$ 2,000.00	Assumes 6 ft shoulder for parking, not for pedestrian crossings on both legs
Total/Pair of Bulbouts				$	54,000

Install Raised Crosswalk					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	Notes
Concrete Flatwork 8-11 Inch Thick	sq ft	$ 25.00	528	$ 13,200.00	2 lanes
Perpendicular/Parallel Pedestrian Access Ramp	Each	$ 7,500.00	2	$ 15,000.00	Assume 2 pedestrian access ramps for two-stage crossing
Concrete Curb and Gutter Type B1	ft	$ 50.00	60	$ 3,000.00	
Remove Curb and Gutter	ft	$ 10.00	60	$ 600.00	
Remove Pavement	Cu Yd	$ 25.00	18	$ 450.00	Assumes two 12-ft lanes, 30' long, 8 inches of pavement removal
Asphalt Tie-In	Ton	$ 200.00	10	$ 2,000.00	4' pave cut on either side of raised crosswalk
Pavement Message (Preformed Thermoplastic)	Each	$ 325.00	2	$ 650.00	3 markings, 2 lanes
Sign Assembly	Each	$ 850.00	4	$ 3,400.00	Assume one crosswalk sign for crossing as well as one crosswalk ahead sign for each direction (4 total)
Pavement Message (Preformed Thermoplastic)	Each	$ 325.00	6	$ 1,950.00	Assume six 1'x10' messages for crosswalk striping
Total/Crossing or Location				$	41,000

Change Left-Turn Timing from Permissive to Flashing Yellow Arrow					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Type Type IV Signal Head	Each	$ 1,760.00	4	$ 7,040.00	Includes removal of existing head
Total/Intersection				$	8,000

Change Left-Turn Timing from Permissive to Protected or Protected/Permissive					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Type Type IV Signal Head	Each	$ 1,760.00	4	$ 7,040.00	Includes removal of existing head
Total/Intersection				$	8,000

Change a 5-Section Doghouse Signal to Flashing Yellow Arrow					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Type Type IV Signal Head	Each	$ 1,760.00	4	$ 7,040.00	Includes removal of existing head
Total/Intersection				$	8,000

Install High-Visibility Crosswalk (Including RRFB)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Sign Type A-2	sq ft	$ 50.00	32	$ 1,600.00	Advanced Warning Sign (Oversized W3-1)
Sign Post P2	Each	$ 150.00	4	$ 600.00	Advanced Warning Sign
Small Sign Tubular Steel Post Base (B1)	Each	$ 400.00	4	$ 1,600.00	Advanced Warning Sign
Retroreflective strip	each	$ 50.00	4	$ 200.00	
Solar RRFB	Each	$ 5,000.00	2	$ 10,000.00	Assumes two solar sign assemblies (one on each side of road)
Pavement Message (Preformed Thermoplastic)	ft	$ 50.00	60	$ 3,000.00	Assumes 12-ft lanes (ladder style crosswalk). Item is quantified by 12" thermoplastic (ft)
Total/Crossing				$	17,000

Stop-Control Intersection Signage					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Sign Type A-2	sq ft	$ 50.00	32	$ 1,600.00	Advanced Warning Sign (Oversized W3-1)
Sign Post P2	Each	$ 150.00	4	$ 600.00	Advanced Warning Sign
Small Sign Tubular Steel Post Base (B1)	Each	$ 400.00	4	$ 1,600.00	Advanced Warning Sign
Retroreflective strip	each	$ 50.00	4	$ 200.00	
Total/Intersection				$	4,000

Install High-Visibility Crosswalk Markings and Signage					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Sign Assembly	Each	$ 850.00	4	$ 3,400.00	Assume one crosswalk sign for crossing as well as one crosswalk ahead sign for each direction (4 total)
Pavement Message (Preformed Thermoplastic)	ft	$ 50.00	60	$ 3,000.00	Assumes 12-ft lanes (ladder style crosswalk). Item is quantified by 12" thermoplastic (ft)
Total/Crossing				$	7,000

Install Pedestrian Refuge Island					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Concrete Flatwork 6 Inch thick	Sq ft	$ 15.00	1400	$ 21,000.00	Assume 50'x14' median on either side of crossing
Perpendicular/Parallel Pedestrian Access Ramp	Each	$ 7,500.00	4	$ 30,000.00	Assume 4 pedestrian access ramps for two-stage crossing
Curb Type B5	ft	$ 35.00	200	$ 7,000.00	Assume 100' median on either side of crossing
Sign Assembly	Each	$ 850.00	6	$ 5,100.00	Assume 2 crosswalk signs (each direction) for crossings as well as one object marker sign each direction
Pavement Message (Preformed Thermoplastic)	Each	$ 325.00	20	$ 6,500.00	Assume high-vis crosswalk for two twelve-foot lanes (20 messages)
Plowable end section	Each	$ 2,500.00	2	$ 5,000.00	
Total/Crossing				$	75,000
Clear and Grub					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Clearing & Grubbing	LEG	$ 573.92	1	$ 573.92	Assumes clearing 10-ft wide both sides of the road for 250-ft
Total/Leg				$	1,000

Install Transverse Rumble Strips on Intersection Approach					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Ground-in Rumble Strip	LEG	$ 2.00	240	$ 480.00	Assumes each leg has 4 12-ft wide lanes each direction, with 5 sets of strips on each let
Total/Leg				$	1,000

Upgrade Signs and Pavement Markings (Paved Approach)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Remove/Replace Sign	Each	$ 650.00	2	$ 1,300.00	Assumes 2 signs per leg, re-use sign posts
Remove/Replace Striping	LEG	$ 1.00	2500	$ 2,500.00	Assumes 4-lane roadway, refreshing 500-ft of striping
Total/Leg				$	3,000

Install Second Stop Sign and Stop Ahead Sign					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Sign Type A-1	Sq ft	$ 42.00	6	$ 252.00	Assumes two signs
Sign Post P2	Each	$ 144.00	2	$ 288.00	Assumes two signs
Small Sign Tubular Steel Post Base (B1)	Each	$ 400.00	2	$ 800.00	Assumes two signs
Total/Leg				$	1,500

Install Beacon on Stop Sign					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Stop Sign Beacon Installation	Each	$ 5,000.00	1	$ 5,000.00	
Total/Leg				$	5,000

Realign Intersection Approaches to Reduce or Eliminate Skew					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Remove Pavement	Cu Yd	$ 25.00	1185	$ 29,625.00	Assumes two 12-ft lanes, 4 legs for 500' each direction. 8 inches of pavement removal
Replace Pavement	Ton	$ 250.00	1184	$ 296,000.00	Assumes two 12-ft lanes, 4 legs for 500' each direction. 8 inches of pavement (ssphalt) replacement
Sign Type A-1	Sq ft	$ 42.00	6	$ 252.00	Assumes two signs
Sign Post P2	Each	$ 144.00	2	$ 288.00	Assumes two signs
Small Sign Tubular Steel Post Base (B1)	Each	$ 400.00	2	$ 800.00	Assumes two signs
Pavement Marking Paint	gal	$ 85.00	21	$ 1,789.47	assume 4 inch white lines (2 edgeline, 2 center, 2 legs), 190 ft/gal
Total/Leg				$	329,000

Create Positive Off-Set of Existing Left-Turn Lanes at an Intersection					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Remove Pavement Marking	ft	$ 3.00	1345	$ 4,035.00	Assumes 2' offset and no new pavement required
Pavement Marking Paint	Gal	$ 85.00	28	$ 2,387.16	Assumes paint, two coats, 8" striping
Pavement Message (Preformed Thermoplastic)	Each	$ 325.00	2	$ 650.00	
Remove Pavement Message	Each	$ 120.00	2	$ 240.00	
Remove Concrete Curb	ft	$ 10.00	190	$ 1,900.00	
Concrete Curb Type M2	ft	$ 45.00	185	$ 8,325.00	
Total/Intersection				$	18,000

Install Rectangular Rapid Flashing Beacons (RRFB)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Solar RRFB	Each	$ 5,000.00	2	$ 10,000.00	Assumes two solar sign assemblies (one on each side of road)
Total/Location				$	10,000

Install Pedestrian Hybrid Beacon (PHB) or HAWK					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
PHB	Lump	$ 250,000.00	1	$ 250,000.00	
Total/Location				$	250,000

Install Right-in Right-out Only Access Driveway					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Curb Type B5	ft	$ 35.00	100	$ 3,500.00	Assuming porkchop can be mounted on existing asphalt and no removal/widening of existing asphalt is necessary
Concrete Flatwork 6 Inch thick	Sq ft	$ 15.00	250	$ 3,750.00	
Pavement Marking Paint	ft	$ 0.50	300	$ 150.00	
Sign Assembly	Each	$ 850.00	4	$ 3,400.00	
Total/Location				$	11,000

**The provided cost estimates represent planning-level estimates. The cost estimates were developed using the latest available unit material costs from Materials Masterworks Database, the UDOT Concept Cost Estimate Form, and project team input and experience.*

Safety Countermeasure	Description	Cost Estimate*
Install Driver Feedback Speed Limit Signs	Displays vehicle speeds to approaching drivers, encouraging them to slow down when exceeding the posted speed limit. These signs use radar to detect speeds and provide real-time feedback, raising driver awareness. By promoting lower speeds, they help reduce the likelihood and severity of crashes.	$11,000 / Each
Install Driver Feedback Speed Limit Signs on Rural Curves	Alerts drivers to their speed as they approach potentially hazardous curves, encouraging speed reduction. These signs are strategically placed before curves to give drivers time to adjust their speed. Slowing vehicles before curves reduces the risk of lane departure crashes and rollover incidents.	$11,000 / Each
Lane Narrowing	Reduces the width of vehicle travel lanes, often through restriping or adding buffers for bikes or pedestrians. Narrower lanes naturally encourage slower driving speeds and increase driver focus. Lower speeds reduce the severity of crashes and create a safer environment for all road users.	$37,000 / Each
Install Medians (Back-To-Back Curb)	Provides a physical barrier that separates opposing traffic, reducing head-on and left-turn crashes. These medians limit dangerous crossing movements and provide a refuge for pedestrians. By restricting risky maneuvers, they enhance safety and reduce severe crash rates.	$654,000 / Mile
Install Bicycle Lanes	Designates space exclusively for cyclists, typically with pavement markings and signage. They provide a safer, dedicated area for bicyclists, separating them from motor vehicle traffic. Bicycle lanes reduce conflicts between cyclists and motorists, lowering the risk of serious crashes.	$44,000 / Mile
Install Buffered Bicycle Lanes (Curb Separated)	Adds a physical separation, often using curbs or raised elements, between cyclists and vehicle lanes. This increased separation protects cyclists from encroaching vehicles. By enhancing safety and reducing cyclist exposure to motor traffic, the likelihood of serious crashes is minimized.	$651,000 / Mile
Install a Separated 12 ft. Shared-use Path	Accommodates pedestrians, cyclists, and other non-motorized users, separated from the roadway. The separation significantly reduces conflicts between vulnerable users and vehicles. Providing a safe, off-road option minimizes the potential for fatal and serious injury crashes.	$627,000 / Mile
Convert Traditional/Buffered Bike Lanes to Separated Lane with Flexible Delineator Posts	Provides a physical buffer between cyclists and motor vehicles. These posts increase driver awareness and prevent vehicle encroachment into bike lanes. The added protection significantly reduces collision risk for cyclists.	$106,000 / Mile
Install Medians and Pedestrian Refuge Islands	Provides safe stopping points for pedestrians crossing multi-lane roads. They allow pedestrians to cross one direction of traffic at a time, reducing exposure. This improvement enhances pedestrian safety and reduces the chance of fatal crashes.	$871,000 / Mile
Install 6 ft. Sidewalk (both sides of roadway)	Provides a designated space for pedestrians, separated from vehicle traffic. Installing sidewalks on both sides of a roadway increases pedestrian safety by reducing the likelihood of pedestrian-vehicle interactions. This separation helps lower pedestrian fatalities and serious injuries.	$761,000 / Mile

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Safety Countermeasure	Description	Cost Estimate*
Install Highway Lighting	Improves nighttime visibility for drivers, pedestrians, and cyclists. Properly lit roadways enhance driver reaction times and reduce the likelihood of crashes in low-visibility conditions. Enhanced lighting reduces nighttime crash severity and frequency.	$300,000 / Mile
Conduct a Road Safety Audit	A Road Safety Audit (RSA) is a formal evaluation by a multidisciplinary team to identify safety concerns and recommend improvements. RSAs proactively assess potential hazards and suggest mitigation measures. Addressing identified issues helps prevent crashes and reduce injury severity.	$25,000 / Location
Install 6” Edge Line (Both Sides of Road)	Increases visibility, especially at night and in poor weather. These edge lines provide clearer guidance, helping drivers maintain their lane position. Improved lane adherence reduces the risk of roadway departure crashes.	$8,000 / Mile
Install Edge Line Rumble Strips	Creates audible and vibratory warnings when vehicles drift toward the shoulder. These strips alert distracted or drowsy drivers, preventing lane departures. Keeping vehicles in their lanes reduces the risk of run-off-road crashes.	$5,000 / Mile
Install Centerline Rumble Strips	Provides tactile and auditory alerts to drivers who cross into opposing lanes. They help prevent head-on and opposite-direction sideswipe collisions by encouraging lane discipline. This reduces the likelihood of severe and fatal crashes.	$5,000 / Mile
Install Post-Mounted Delineators	Increases visibility and guide drivers through curves, intersections, and other road features. They provide visual cues, especially in low-light conditions, enhancing driver awareness. Improved guidance reduces off-road and curve-related crashes.	$4,000 / Mile
Install and/or Upgrade Curve Signage to Enhanced Delineations	Uses bright, retroreflective materials and larger signs to increase curve visibility. These signs alert drivers to approaching curves, encouraging appropriate speed adjustments. Improved warning systems reduce curve-related crashes.	$3,000 / Curve
Install In-Lane Curve Warning Pavement Markings	Provides visual cues directly on the pavement, alerting drivers to upcoming curves. These markings enhance curve awareness and encourage speed reduction. Increased driver attention reduces the risk of curve-related crashes.	$3,000 / Curve
Install High Friction Surface Treatment (HFST) on Curve	Increases pavement friction at critical curve locations, improving vehicle traction and reducing skidding. It helps vehicles maintain control on curves, especially in wet or slippery conditions. Enhanced grip reduces run-off-road crashes and curve-related fatalities.	$53,000 / Curve
Extend Unpaved Shoulder 2 ft. (both sides of roadway)	Provides additional recovery space for vehicles that leave the roadway. This extra space allows drivers to regain control, reducing the likelihood of run-off-road crashes. Wider shoulders also reduce conflicts with pedestrians and cyclists.	$27,000 / Mile
Install 4" Retroreflective Centerline and Edge Lines	Improves nighttime visibility and lane delineation. The enhanced reflectivity provides better guidance, reducing driver confusion and lane departures. Clearer lane markings help prevent crashes, especially in low-light conditions.	$96,000 / Mile

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Safety Countermeasure	Description	Cost Estimate*
Install Speed Activated Flashers on Chevron Signs	Illuminates chevron signs when vehicles approach at excessive speeds, providing an immediate visual warning. These flashers alert drivers to reduce speed before entering dangerous curves. Early warnings decrease the risk of curve-related crashes.	$6,000 / Each
Install Transverse Rumble Strips Prior to Curve	Provides tactile and auditory warnings to approaching drivers. These strips alert drivers to reduce speed and prepare for the curve. Slowing vehicles before curves decreases the likelihood of curve-related crashes.	$1,000 / Curve
Install Guardrail	Provides a protective barrier that prevents vehicles from leaving the roadway, especially on dangerous curves or embankments. They redirect errant vehicles and minimize the severity of crashes. Properly placed guardrails reduce the potential for fatal off-road crashes.	$188,000 / Mile
Widen Roadway and Install Two-Way Left-Turn Lane	Reduces conflicts by providing a dedicated space for turning vehicles. This minimizes rear-end and sideswipe crashes by keeping turning vehicles out of the travel lanes. Safer left-turn movements reduce the risk of severe collisions.	$1,526,000 / Mile
Install Paved Bus Pullout	Provides a designated area for buses to stop outside the travel lane. This prevents buses from blocking traffic and reduces the likelihood of rear-end collisions. Pullouts enhance safety for both passengers and passing vehicles.	$20,000 / Each
Install 4-ft Paved Shoulder (both sides of roadway)	Provides additional space for errant vehicles, cyclists, and pedestrians. It offers a recovery area for vehicles, reducing the risk of run-off-road crashes. Paved shoulders enhance safety by accommodating multiple road users.	$709,000 / Mile
Install 4" Centerline and Edge Line Striping (Paint)	Improves lane visibility and delineation. These markings help drivers maintain proper lane positioning, especially in low-light conditions. Better lane guidance reduces the potential for head-on and run-off-road crashes.	$73,000 / Mile
Install Concrete Barrier	Provides a rigid, protective barrier that prevents vehicle crossovers and errant vehicle departures. They are effective at containing high-speed vehicles and reducing crash severity. Barriers prevent head-on collisions and protect vulnerable roadside areas.	$915,000 / Mile

Install Driver Feedback Speed Limit Signs					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Driver Feedback Speed Limit Sign	Each	$ 5,500.00	2	$ 11,000.00	Assumes 1 sign each direction, Sign material cost is around 4.5k, 1k for install
Total/Each				$	11,000

Install Medians (Back-to-back Curb)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Type B5 Curb	ft	$ 35.00	10560	$ 369,600.00	Assumes center median with back to back B5 and no sidestreets
Remove Pavement For Curb Installation	sq yd	$ 14.00	2933		Assumes removing width of curbs (1') plus 2' on either side to account for curb installation (5' wide total)
UTBC (Plan Quantity)	cu yd	$ 80.00	521		Assumes a 27" Pavement Section (7" HMA, 8" UTBC, 12" GB)
HMA 1/2 Inch	Ton	$ 160.00	912		Assumes a 27" Pavement Section (7" HMA, 8" UTBC, 12" GB)
Granular Borrow	cu yd	$ 70.00	782		Replacement of 2' on either side of curb for curb installation (4' wide total) Assumes a 27" Pavement Section (7" HMA, 8" UTBC, 12" GB)
Total/Mile				$	370,000

Install Bicycle Lanes					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Pavement Message (Preformed Thermoplastic)	Each	$ 325.00	42	$ 13,728.00	Assumes no additional pavement needed. Bike rider/ arrow assumed every 500'
Sign Type A-1	Sq ft	$ 50.00	30	$ 1,500.00	Assumes signs every 1000' on both sides. Bike lane sign (3 sq ft each)
Sign Type A-2	sq ft	$ 60.00	40	$ 2,400.00	Assumes signs every 1000' on both sides. No parking sign
Sign Post P2	Each	$ 200.00	10	$ 2,000.00	Assumes signs every 1000' on both sides.
Small Sign Tubular Steel Post Base (	Each	$ 400.00	10	$ 4,000.00	Assumes signs every 1000' on both sides.
Remove Pavement Marking Paint	ft	$ 2.00	5280	$ 10,560.00	
Pavement Marking Paint	gal	$ 85.00	111	$ 9,448.42	assume 4 inch white lines (2 each side), 190 ft/gal
Total/Mile				$	44,000

Install Buffered Bicycle Lanes (Striping Only, No Barrier)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Pavement Marking Paint	gal	$ 85.00	167	$ 14,172.63	Assumes no sidestreets, 3' buffer both sides. Assumes no additional pavement needed. Assume 4 inch white lines (4 each side), 190 ft/gal, no cross hatching in buffer
Pavement Message	Each	$ 325.00	42	$ 13,728.00	Assumes bike rider/arrow assumed every 500'
Sign Type A-1	Sq ft	$ 50.00	30	$ 1,500.00	Assumes signs every 1000' on both sides. Bike lane sign
Sign Type A-2	sq ft	$ 60.00	40	$ 2,400.00	Assumes signs every 1000' on both sides. No parking sign
Sign Post P2	Each	$ 200.00	10	$ 2,000.00	Assumes signs every 1000' on both sides.
Small Sign Tubular Steel Post Base (	Each	$ 400.00	10	$ 4,000.00	Assumes signs every 1000' on both sides.
Remove Pavement Marking Paint	ft	$ 2.00	5280	$ 10,560.00	
Total/Mile				$	49,000

Install Buffered Bicycle Lanes (Curb Separated)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Pavement Marking Paint	gal	$ 85.00	167	$ 14,172.63	Assumes no sidestreets, 3' buffer both sides. Assumes no additional pavement needed. Assume 4 inch white lines (4 each side), 190 ft/gal, no cross hatching in buffer
Pavement Message	Each	$ 325.00	42	$ 13,728.00	Assumes bike rider/arrow assumed every 500'
Sign Type A-1	Sq ft	$ 50.00	30	$ 1,500.00	Assumes signs every 1000' on both sides. Bike lane sign
Sign Type A-2	sq ft	$ 60.00	40	$ 2,400.00	Assumes signs every 1000' on both sides. No parking sign
Sign Post P2	Each	$ 200.00	10	$ 2,000.00	Assumes signs every 1000' on both sides.
Small Sign Tubular Steel Post Base (B1)	Each	$ 400.00	10	$ 4,000.00	Assumes signs every 1000' on both sides.
Remove Pavement Marking Paint	ft	$ 2.00	5280	$ 10,560.00	
Type B5 Curb	ft	$ 28.50	21120	$ 601,920.00	Assumes median with back to back B5 and no sidestreets. Both sides of road
Total/Mile				$	651,000

Convert Traditional Bicycle Lanes to Separated Bicycle Lanes with Flexible Delineators					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Flexible Delineator Post	Each	$ 200.00	528	$ 105,600.00	Assumes delineators every 20' (<45 mph, otherwise 40') on both sides, no sidestreets.
Total/Mile				$	106,000

New High-Visibility Crosswalk at Midblock locations					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Lighting	Lump	$ 10,200.00	2	$ 20,400.00	Inlcudes 40' Highway Luminaire Pole (Slip Base), 15' Luminaire Arm, LED Luminaire B, Type III, MV, PC
Underground service pedestal - power source	each	$ 1,500.00	1	$ 1,500.00	Lighting
Foundation	each	$ 3,137.00	2	$ 6,274.00	Lighting
Junction Box	each	$ 2,000.00	2	$ 4,000.00	Lighting
Pavement Message (Preformed Thermoplastic)	ft	$ 15.00	144	$ 2,160.00	Assumes 4 12-ft lanes and 2 4-ft shoulders (ladder style crosswalk). Item is quantified by 12" thermoplastic (ft)
Sign Type A-1	Sq ft	$ 50.00	5	$ 250.00	
Sign Post P2	Each	$ 200.00	5	$ 1,000.00	
Small Sign Tubular Steel Post Base (	Each	$ 400.00	5	$ 2,000.00	
Total/Crossing				$	38,000

Install Medians and Pedestrian Refuge Islands					
Item	Unit	Unit Cost	Quantity	Total Cost	Notes
Concrete Curb Type B5	ft	$ 28.50	9840	$ 280,440.00	Assumes 100' intersection every 1320' and 10' crosswalks
Remove Pavement For Median Insta	sq ft	$ 14.00	39360		Assumes removing width of median
Replace Pavement	sq ft	$ 16.00	19680		Replacement on either side of median for curb installation
Concrete Flatwork 6 Inch Thick	sq ft	$ 15.00	39360	$ 590,400.00	Assumes existing 14' TWLTL and Crosswalks
Total/Mile				$	871,000

Install Raised Medians on Roads with TWLTL					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Concrete Curb Type B5	ft	$ 28.50	9120	$ 259,920.00	Assumes 100' intersection every 750' and 10' crosswalks
Roadway Excavation (Plan Quantity)	cu yd	$ 50.00	3133	$ 156,635.80	Assumes 29" cross-section, 12" pavement section
Replace Pavement	sq ft	$ 16.00	18240	$ 291,840.00	Replacement on either side of median for curb installation
Concrete Flatwork 6 Inch Thick	sq ft	$ 15.00	35000	$ 525,000.00	Assumes existing 12' TWLTL and Crosswalks
Total/Mile				$	1,234,000

Install 6-ft. Sidewalk (Both Sides of Roadway)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Concrete Sidewalk	sq ft	$ 12.00	63360	$ 760,320.00	Assumes 6' sidewalk, no sidestreets both sides
Total/Mile				$	761,000

Median Barriers on Divided Highways (Concrete Barrier)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Cast-In-Place Concrete Constant Sl	ft	$ 160.00	10456	$ 1,672,960.00	Assumes no sidestreets both sides
Crash Cushion Type D (MASH)	Each	$ 35,000.00	4	$ 140,000.00	Assumes end sections on both sides
Total/Mile				$	1,813,000

Install 6" Edgeline Striping (Both Sides of Roadway)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Pavement Marking Paint	gal	$ 85.00	83	$ 7,086.32	Assumes both sides of road, qty is in 4" equiv
Total/Mile				$	8,000

Install Edgeline Rumblestrips					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Longitudinal Rumble Strip - Asphalt	ft	$ 0.50	8448	$ 4,224.00	Assumes no sidestreets, both sides
Total/Mile				$	5,000

Install Centerline Rumblestrips					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Longitudinal Rumble Strip - Asphalt	ft	$ 0.50	8448	$ 4,224.00	Assumes no sidestreets, both sides
Total/Mile				$	5,000

Install Post-Mounted Delineators					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Delineator Type 1	Each	$ 100.00	20	$ 2,000.00	Assumes no sidestreets, no curves, delineators on both sides of road
Flexible Delineator Post - Type 1	Each	$ 85.00	20	$ 1,700.00	
Total/Mile				$	4,000

Install or Upgrade Curve Signage					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Sign Type A-1	sq ft	$ 50.00	11	$ 562.50	Includes W1-2 warnings signs and W13-1 Speed Advisory Plaque
Sign Post P2	Each	$ 200.00	1	$ 200.00	For above signs
Small Sign Tubular Steel Post Base (B1)	Each	$ 400.00	1	$ 400.00	For above signs
Sign Type A-1	sq ft	$ 50.00	5	$ 250.00	Added cost per W1-8 Chevron
Sign Post P2	Each	$ 200.00	1	$ 200.00	Added cost per W1-8 Chevron
Small Sign Tubular Steel Post Base (B1)	Each	$ 400.00	1	$ 400.00	Added cost per W1-8 Chevron
Total/Curve				$	3,000

Install In-Lane Curve Warning Pavement Markings					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Pavement Message (Preformed Thermoplastic)	Each	$ 300.00	7	$ 2,100.00	Two bars, four letters (SLOW) and an arrow
Total/Curve				$	3,000

Install Safety Edge					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
HMA 1/2 Inch	Ton	$ 140.00	117.487	$ 16,448	Assumes 5" HMA safety edge section, assumes both sides of road, no sidestreets - 1 mile length
UTBC (Plan Quantity)	cu yd	$ 80.00	971	$ 77,711.60	Assumes a 4 ft x 7 inch UTBC section behind the safety edge, assumes both sides of the road
Total/Mile				$	95,000

Install High Friction Surface Treatment (HFST) on Curve					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
High Friction Pavement	Ton	$ 250.00	172	$ 43,094	Assumes 2-lane highway with 2' shoulders. Assumes 1000' curve with 1000' radius. Assumes 150 lb/cu ft
Rotomilling - 1 Inch	sq yd	$ 3.00	3064	$ 9,193.33	Assumes 2-lane highway with 2' shoulders. Assumes 1000' curve with 1000' radius
Total/Mile				$	53,000

Extend Unpaved Shoulder (2-ft., Both Sides of the Roadway)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
UTBC (Plan Quantity)	cu yd	$ 80.00	326	$ 26,074.07	Assumes a 2 ft x 10 inch UTBC shoulder, assumes no sidestreets
Total/Mile				$	27,000

Install 2-ft. Paved Shoulder (Both Sides of the Roadway)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
UTBC (Plan Quantity)	cu yd	$ 80.00	521	$ 41,718.52	Assumes 8" section, both sides of road. Assumes no sidestreets
HMA 1/2 Inch	Ton	$ 140.00	912	$ 127,635.20	Assumes 7" section, both sides of road. Assumes no sidestreets
Granular Borrow	cu yd	$ 70.00	782	$ 54,755.56	Assumes 12" section, both sides of road. Assumes no sidestreets
Remove Pavement	sq yd	$ 14.00	391	$ 5,475.56	Assumes removal of 1-ft existing shoulder on each sides
Total/Mile				$	230,000

Install Lighting					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Highway Lighting	Lump	$ 300,000.00	1	$ 300,000.00	Assumes 20 poles each side of road, junction box wiring, and power source
Total/Mile				$	300,000

Install 4" Retroreflective Centerline and Edge Lines					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Remove Existing Striping	ft	$ 1.00	21120	$ 21,120.00	Assumes 2 lines of stripe (2 edge lines, 2 centerline)
Retroreflective Thermoplastic Striping	ft	$ 3.50	21120	$ 73,920.00	Assumes 2 lines of stripe (2 edge lines, 2 centerline)
Total/Mile				$	96,000

Clear and Grub					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Clearing & Grubbing	Mile	$ 48,484.85	1	$ 48,484.85	Assumes clearing 10-ft on both sides of the road
Total/Mile				$	49,000

Install Speed Activated Flashers on Chevron Signs					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Speed-Activated Flasher Sign	EACH	$ 5,500.00	1	$ 5,500.00	Assumed similar cost to driver speed feedback sign
Total/Mile				$	6,000

Install Transverse Rumble Strips Prior to Curve					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Ground-In Rumble Strips	EACH	$ 2.00	480	$ 960.00	assumes 2 12-ft lanes each direction, 5 sets of strips on each side of curve
Total/Mile				$	1,000

Install Guardrail					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
W-Beam Guardrail	FT	$ 35.00	5280	$ 184,800.00	Assumes 6-ft wood post
W-Beam Guardrail Anchor Type I	EACH	$ 1,600.00	2	$ 3,200.00	Assumes End Sections
Total/Mile				$	188,000

Install Concrete Barrier					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Cast in Place Concrete constant slope barrier - 42 inch	FT	$ 160.00	5280	$ 844,800.00	CIP Concrete Constrant Slope Barrier - 42 inch
Crash Cushion Type D (MASH)	Each	$ 35,000.00	2	$ 70,000.00	Assumes end sections on both sides
Total/Mile				$	915,000

Install a Separated 12-ft. Shared-use Path					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Roadway Excavation (Plan Quantity)	cu yd	$ 50.00	2347	$ 117,333.33	Assumes 12" section, 12' wide
UTBC (Plan Quantity)	cu yd	$ 80.00	782	$ 62,577.78	Assumes 4" section, 12' wide
HMA 1/2 Inch	Ton	$ 140.00	3126	$ 437,606.40	Assumes 8" section, both sides of road. Assumes no sidestreets
Pavement Marking Paint	gal	$ 85.00	28	$ 2,362.11	1 4" stripe 190 ft/gallon
Pavement Message	Each	$ 325.00	11	$ 3,432.00	Assumes bike rider/walker every 500' or messages at crossings
Sign Type A-1	Sq ft	$ 50.00	5	$ 250.00	Assumes signs every 1000'
Sign Post P2	Each	$ 200.00	5	$ 1,000.00	Assumes signs every 1000'
Small Sign Tubular Steel Post Base (B1)	Each	$ 400.00	5	$ 2,000.00	Assumes signs every 1000'
Total/Mile				$	627,000

Widen Roadway to Install Two-Way Left-Turn Lane					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Roadway Excavation (Plan Quantity)	cu yd	$ 50.00	6160	$ 308,000.00	Assumes 27" section, 14' TWLTL
UTBC (Plan Quantity)	cu yd	$ 80.00	1825	$ 146,014.81	Assumes 8" section, 14' TWLTL
HMA 1/2 Inch	Ton	$ 140.00	4103	$ 574,358.40	Assumes 7" section, 14' TWLTL, 4' sawcut existing pavement
Granular Borrow	cu yd	$ 70.00	2738	$ 191,644.44	Assumes 12" section, 14' TWLTL
Pavement Marking Paint	gal	$ 85.00	139	$ 11,810.53	Assumes 4-inch lines (2 white on sides, 2 solid yellow + 1 broken yellow eq) - 190 gallon/ft.
Type B1 Curb & Gutter	ft	$ 50.00	5280	$ 264,000.00	Assumes curb and gutter one side of road
Remove Concrete Curb & Gutter	ft	$ 10.00	5280	$ 52,800.00	Assumes removing curb and gutter on one side of road
Remove Pavement	sq yd	$ 14.00	782	$ 10,951.11	4' wide
Total/Mile				$	1,560,000

Install Paved Bus Pullout					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Roadway Excavation (Plan Quantity)	cu yd	$ 50.00	119	$ 5,925.93	Assumes 27" section, 80' x 16' asphalt pad
UTBC (Plan Quantity)	cu yd	$ 80.00	32	$ 2,528.40	Assumes 8" section, 80' x 16' asphalt pad
HMA 1/2 Inch	Ton	$ 140.00	58	$ 8,122.24	Assumes 7" section, 84' x 16' asphalt pad
Granular Borrow	cu yd	$ 70.00	47	$ 3,318.52	Assumes 12" section, 80' x 16' asphalt pad
Total/Pullout				$	20,000

Install 4-ft. Paved Shoulder (Both Sides of the Roadway)					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
UTBC (Plan Quantity)	cu yd	$ 80.00	1043	$ 83,437.04	Assumes 8" section, 4' wide
HMA 1/2 Inch	Ton	$ 140.00	3647	$ 510,540.80	Assumes 7" section, 8' wide
Granular Borrow	cu yd	$ 70.00	1564	$ 109,511.11	Assumes 12" section, 4' wide, both sides of road. Assumes no sidestreets
Remove Pavement	sq yd	$ 14.00	391	$ 5,475.56	Assumes removal of 1-ft existing shoulder on each sides
Total/Mile				$	709,000

Install 4" Paint Centerline and Edge Lines					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	*Notes*
Remove Pavement Marking	ft	$ 3.00	21120	$ 63,360.00	Assumes 2 lines of stripe (2 edge lines, 2 centerline)
Pavement Marking Paint	gal	$ 85.00	111	$ 9,448.42	Assumes 2 lines of 4" stripe (2 edge lines, 2 centerline), 190 ft/gal
Total/Mile				$	73,000

Lane Narrowing					
Item	*Unit*	*Unit Cost*	*Quantity*	*Total Cost*	Notes
Remove Pavement Marking	ft	$ 3.00	10560	$ 31,680.00	Striping on Both Sides of Road. Assumes no sidestreets. Assumes 2 lanes
Pavement Marking Paint	gal	$ 85.00	56	$ 4,724.21	2 lines of 4" stripe (2 edge lines), 190 ft/gal
Total/Mile				$	37,000.00