Kentucky's

# HSIP

(Highway Safety Improvement Program)

# Investment Plan


KENTUCKY TRANSPORTATION CABINET

**2022 Update**

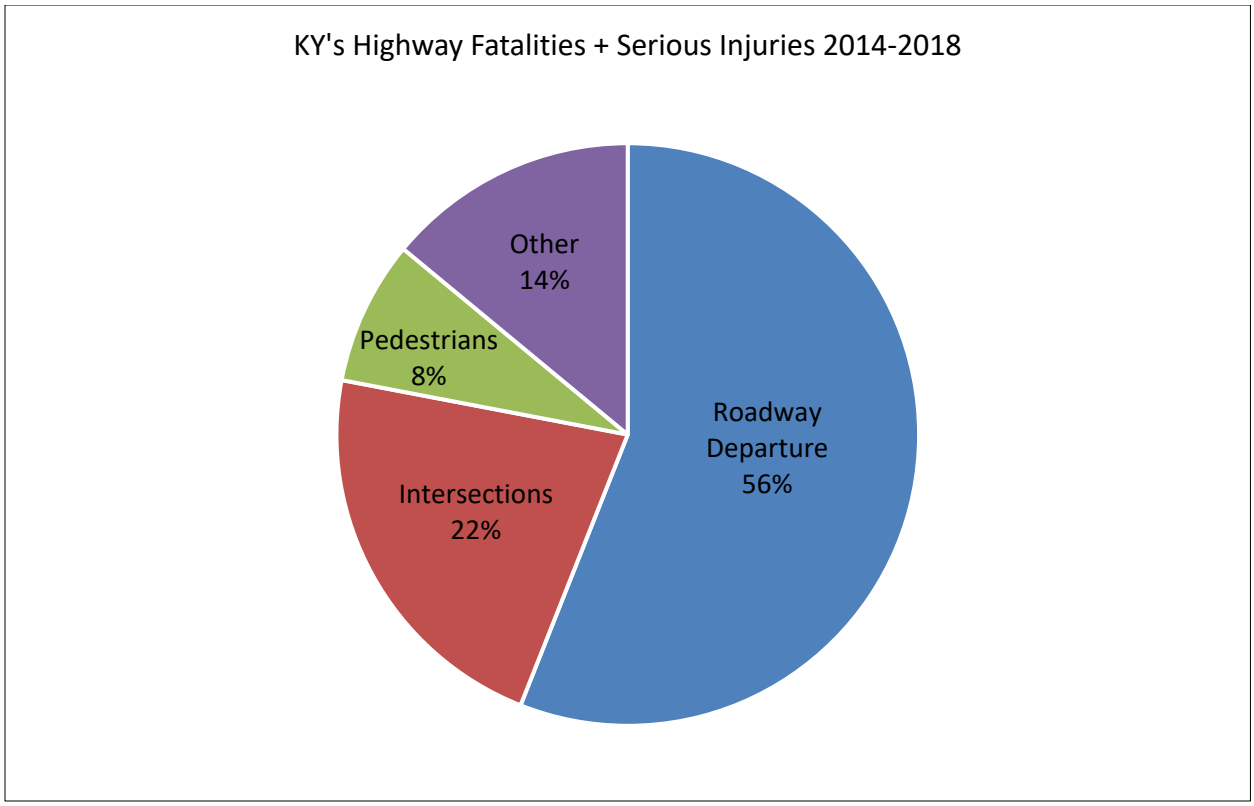
# Kentucky's Highway Safety Improvement Program Investment Plan

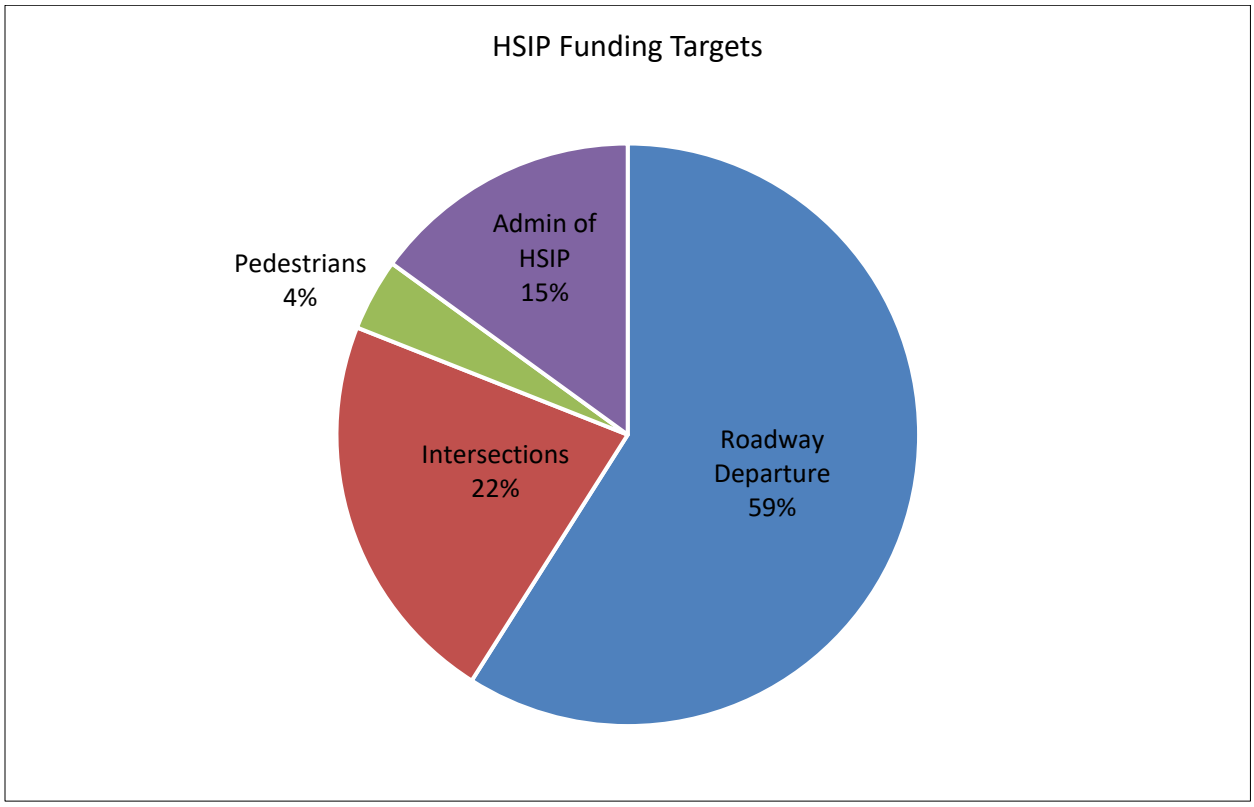
**Vision** – Kentucky's Highway Safety Improvement Program is committed to preventing traffic fatalities and serious injuries on all public roadways in Kentucky.

**Mission** – To help people reach their transportation destinations safely by developing and delivering a data-informed, strategic approach to improving highway safety with a focus on performance.

**Goal** – To invest in safety improvement opportunities aimed at preventing serious crashes to help achieve Kentucky's goal of having the number of highway deaths at or below 500 by the year 2024.

In March 2020, the Kentucky Transportation Cabinet (KYTC) released Safe KY: Kentucky's 2020-2024 Strategic Highway Safety Plan (SHSP). Safe KY is Kentucky's roadmap to the future of transportation safety. This plan outlines clear goals, objectives, strategies, and opportunities to prevent transportation related deaths and injuries. A major goal of Safe KY is to prevent serious crashes on KY's highways such that the annual number of deaths falls at or below 500 by the year 2024. Kentucky's federally funded Highway Safety Improvement Program (HSIP) fully supports this goal. Two major ways the HSIP supports this goal is by continuing to seek ways to improve the development and delivery of highway safety projects and by continuing to increase the use of data to inform the investment of HSIP funds. This latter effort drives the development of the HSIP Investment Plan. On November 15, 2021, President Biden signed into law the Bipartisan Infrastructure Law (also known as the Infrastructure Investment and Jobs Act). The Bipartisan Infrastructure Law continues the highly successful HSIP, which provides Kentucky with an estimated average annual funding target of $58.5 million (this amount includes anticipated matching fund requirement) over the 5 years of the Bipartisan Infrastructure Law.


KY's Highway Fatalities + Serious Injuries 2014-2018
Other
14%
Pedestrians
8%
Roadway
Departure
56%
Intersections
22%


HSIP Funding Targets
Admin of
HSIP
15%
Pedestrians
4%
Intersections
22%
Roadway
Departure
59%

## Major Categories, their associated Need, and their annual Funding Goals

**Roadway Departure**: Roadway Departure is an Emphasis Area in Kentucky's 2020 – 2024 SHSP. From 2016 to 2018, roadway departure crashes accounted for 51% of fatal crashes nationally. However, in Kentucky from 2014 to 2018, roadway departure crashes accounted for approximately 64% of the roadway fatalities, 54% of serious injuries, and 56% of fatalities and serious injuries combined. The annual funding goal is to invest approximately 57% (~$33.3 million) of HSIP funding toward initiatives that will target Roadway Departure improvements.

**Intersections**: Kentucky's 2020 – 2024 SHSP includes a variety of Strategies to prevent intersection related crashes, which can likely improve many different SHSP Emphasis Areas, such as aggressive and distracted driving. From 2014 to 2018, intersection related crashes accounted for approximately 16% of roadway fatalities, 24% of serious injuries, and 22% of fatalities and serious injuries combined. The annual funding goal is to invest approximately 23% (~$13.2 million) of HSIP funding toward initiatives that will target Intersection improvements.

**Pedestrians**: Vulnerable Road Users, which includes pedestrians, is an Emphasis Area in Kentucky's 2020 – 2024 SHSP. From 2016 to 2018, pedestrian involved crashes accounted for 11% of roadway fatalities, 7% of serious injuries, and 8% of fatalities and serious injuries combined. The annual funding goal is to invest approximately 4% (~$2.6 million) of HSIP funding toward initiatives that will target pedestrian improvements. It is important to note that pedestrian safety challenges in Kentucky are typically more prevalent in specific, localized settings in Kentucky. As such, the HSIP is working toward Safety Plans for some of the larger urban areas in Kentucky. The KYTC also recently developed a Safe Transportation for Every Pedestrian (STEP) Action Plan in collaboration with FHWA through the Every Day Counts program.

**Other/HSIP Administration**: As with any program, a certain amount of funding is needed for administration of the program. The expected annual funding proportion for administration of the HSIP is 16% (~$9.4 million). These funds will help the HSIP be Informed, Involved, and Intentional by supporting the engineering and project development activities for the projects targeting Roadway Departure, Intersections, and Pedestrian improvements. These funds will also contribute to the continuous advancement of Kentucky's HSIP by supporting research and data collection aimed at improving the tools and data used to inform the investment of HSIP funds. These administrative costs also provide unique opportunities to partner with KYTC District personnel and other stakeholders to advance safety culture throughout Kentucky.

## HSIP Initiatives and the Major Categories supported

With the annual funding goals of the Major Categories in mind, the following HSIP Initiatives were developed. Some of these initiatives will support multiple Major Categories.

| HSIP Initiative | Major Category Supported by Investment in each HSIP Initiative | | | |
|---|---|---|---|---|
| | Roadway Departure | Intersections | Pedestrians | HSIP Admin |
| Roadway Departure Emphasis |  | | | |
| Statewide Competitive Intersections | |  |  | |
| Vision Zero Louisville |  |  |  | |
| Traffic Signal Enhancements | |  |  | |
| Cable Median Barrier |  | | | |
| Pavement Friction Treatments |  | | | |
| Pavement Friction Data Collection |  | | | |
| Pavement Markers |  | | | |
| Local Road Safety & STEP Action Plan |  |  |  |  |
| Roadway Reconfigurations | |  |  |  |
| Project Development Funds – HSIP Consultants | | | |  |
| Project Development Funds – KYTC In-House | | | |  |
| KTC Technical Assistance, LiDAR & HFST Evaluation |  | | |  |
| Safety Circuit Rider |  | | |  |

## Roadway Departure Emphasis (~$23,500,000 annually)

**Background:** Fatal and serious injury roadway departure crashes have been a continual safety challenge for Kentucky. Over the years, KY's HSIP has implemented a wide variety of initiatives to mitigate roadway departure crashes. Previous efforts have included initiatives such as: Roadway Departure Corridors, Lane Departure-Resurfacing, Paved Shoulder Widening, Horizontal Alignment Signing, NHS Guardrail End Treatments, and Edgeline-Only Striping. Most of these initiatives relied on Network Screening to produce Excess Expected Crash (EEC) values across the state. In short, a relatively high EEC indicates the potential opportunity for a safety improvement. As such, HSIP staff has been prioritizing locations and implementing roadway departure projects in each District based on these EEC values. Unfortunately, a relatively high EEC values does not indicate the effectiveness of any type(s) of safety improvement. Furthermore, over the years, some of the projects identified and selected due to a high EEC have proven to be very challenging to identify and/or implement a viable solution. Another previous initiative that typically targeted roadway departure crashes was the Localized Risk Mitigation Projects (LRMP) initiative. The LRMP initiative was unique in that it was based mostly on local knowledge (primarily District office staff) to identify safety challenges and potential safety improvement opportunities. Unfortunately, it is very difficult to evaluate such projects in a quantitatively manner when much of the local knowledge for these projects is qualitative in nature. And since the HSIP is required to use data-driven methods to prioritize, select, and evaluate projects, relying on qualitative information alone does not meet federal regulations. Summing up, a variety of HSIP initiatives have been implemented over the years. Some initiatives have relied on need to prioritize and select projects; other initiatives have taken a solutions-based approach to identify safety improvements. "Need" and "Solutions" are both important and both very positive aspects. However, there are drawbacks when "Need" and "Solutions" are used singularly. The Roadway Departure Emphasis initiative aims to incorporate both "Need" and "Solutions" into its methodology. In other words, this initiative takes the positives of the many previous initiatives to create a single, robust roadway departure initiative to drive toward implementation of safety improvement projects that are predicted to address areas of need with effective solutions that provide high benefit at low to moderate cost.

**Major Categories Supported:**

100% ($23.5 million) of the Roadway Departure Emphasis initiative's annual funding target will support the Roadway Departure category

**Methodology and Implementation:**

- This initiative will be implemented over a <u>two-year cycle</u> at the District level
- Perform a District level study to identify candidate safety projects by investigating both the safety needs and safety opportunities across the District. A Consultant from the Statewide HSIP Contract will perform the study. Below is the general process of the study:
    - Pull together a wide variety of data, such as:
        - Input from District staff and other locals (this will include locations of potential opportunity, as well as potential solutions)
        - Crash data
        - EEC results from Network Screening
        - Roadway element data from HIS (e.g., lane & shoulder widths, curve data, etc.)
        - Curve Advisory Speeds (from Rieker's CARS system)
        - Friction data (from WDM's SCRIM truck)
        - FD05 & Preventative Maintenance resurfacing lists
        - Projected Rural Secondary resurfacing projects
        - Any other data that can inform the process
    - Study and diagnosis the data to identify the underlying risk factors and crash hotspot
    - Investigate the roadway attributes correlated with severe crash types to determine a variety of safety improvement solutions, including low-cost, systemic improvements and low to moderate/high-cost traditional improvements (this may include virtual and/or field reviews of certain routes and spots)
        - Typical low-cost, systemic improvements:
            - Signing, Striping, & Other Delineation Treatments
            - Guardrail
            - Paved Shoulder Widening
            - Removal of Roadside Hazards
        - Typical low to moderate/high-cost traditional improvements:
            - Curve Widening
            - Curve Realignment
            - New Guardrail (using the Division of Maintenance's G/R Database)
            - Friction Treatments
            - Paved Shoulder Widening
            - Roadside Improvements (spot or corridor)
    - Calculate the predicted effectiveness of the various improvement options. This will generally be accomplished by determining each solution's approximate Return on Investment after a 5-year period; however, longer-term Return on Investment calculations may also be appropriate, depending on the proposed solution
- Hold a Preliminary Review meeting with the Project Team to review the study results and determine the candidate safety projects to move forward, based on the funding targets
- **<u>OBJECTIVE</u>**: Balance safety project selection by investing approximately 50% of the funding on systemic improvements and approximately 50% of the funding on traditional improvements
- As part of the decision-making process, determine the timing, schedule, and budget of the selected projects. Generally, this will be accomplished as follows:

- Low-cost, systemic improvements generally have a shorter project development timeline; therefore, the projects selected in this category will be scheduled for letting during the first year of the two-year cycle
- Low to moderate/high-cost traditional improvements have a longer project development timeline; therefore, the projects selected in this category will be scheduled for letting during the second year of the two-year cycle

- To provide flexibility, projects will not be required to be selected solely on predicted Return on Investment. Any project that has a 5-year Return on Investment of approximately 2:1 or better can be selected and implemented. In certain situations, a project with a 5-year Return on Investment of less than 2:1 may be selected in unique circumstances (e.g., 20-year B/C of 4:1 or better), if approved by the District's Central Office HSIP liaison.
- District funding targets are based on each District's proportion of fatal roadway departure crashes relative to statewide totals. The current crash data yields the following District funding targets:

| District | Systemic Projects Target | Traditional Projects Target | Total 2 Year R, U, & C Investment Target |
|---|---|---|---|
| **1** | $2,100,000 | $2,100,000 | **$4,200,000** |
| **2** | $2,050,000 | $2,050,000 | **$4,100,000** |
| **3** | $2,000,000 | $2,000,000 | **$4,000,000** |
| **4** | $2,750,000 | $2,750,000 | **$5,500,000** |
| **5*** | $1,400,000 | $1,400,000 | **$2,800,000** |
| **6** | $1,850,000 | $1,850,000 | **$3,700,000** |
| **7** | $3,100,000 | $3,100,000 | **$6,200,000** |
| **8** | $1,800,000 | $1,800,000 | **$3,600,000** |
| **9** | $1,300,000 | $1,300,000 | **$2,600,000** |
| **10** | $1,600,000 | $1,600,000 | **$3,200,000** |
| **11** | $1,900,000 | $1,900,000 | **$3,800,000** |
| **12** | $1,650,000 | $1,650,000 | **$3,300,000** |
| **Total** | **$23,500,000** | **$23,500,000** | **$47,000,000** |

*NOTES: The 2 Year Funding Targets for each District are based on the percentage of Roadway Departure fatalities in each District. District 5 values do not include Jefferson County, since HSIP projects in Jefferson County will be implemented through the Vision Zero Louisville initiative.*

**Benefits and how this initiative relates back to the SHSP:**

- Roadway Departure is an Emphasis Area in KY's 2020-2024 SHSP
- Opportunity to collaborate with District staff and local communities to promote Data-Driven Safety Analysis (DDSA) culture by implementing DDSA in more stages of the HSIP process
- Gives Districts more options for and influence on the HSIP-funded projects selected and prioritized through a data-driven process
- Be responsive to the projects that local staff sees as the needs
- Several improvement types fall under federal guidelines that allow for 100% reimbursement
- Supports preservation and renewal of our transportation system infrastructure

## Statewide Competitive Intersections (~$8,000,000 annually)

**Background:** The HSIP recognizes the importance of various intersection improvements, many of which were implemented under the previous Intersection Emphasis List initiative. These improvements included, but were not limited to turn lane additions, offset turn lanes, Intersection Conflict Warning Systems (ICWS), Advance Warning Flashers (AWFs), basic signing upgrades, Reduced Conflict U-Turns (RCUTs), right-sized roundabouts, and other innovative intersection types. The HSIP also understands the immense importance of implementing effective solutions that provide high benefit at low to moderate cost. The Statewide Competitive Intersections initiative seeks to make strategic safety investments through the implementation of a wide variety of intersection improvements by allowing districts to submit projects for consideration based primarily on a calculated Return on Investment.

**Major Categories Supported:**

The HSIP anticipates the Statewide Competitive Intersections initiative's annual funding will primarily support safety benefits for the Intersections category but will provide safety benefits for the Pedestrian category. The anticipated breakdown is as follows:

- 95% ($7.6 million) will support the Intersections category
- 5% ($0.4 million) will support the Pedestrians category

**Methodology and Implementation:**

- Use HSM methodologies to calculate Excess Expected Crash (EEC) values for all intersections across KY – performed by the Kentucky Transportation Center (KTC) & Central Office HSIP
- Use the EEC results to identify intersections to consider for low to moderate/high-cost traditional solutions – performed by Districts
- Districts are encouraged to work closely with HSIP staff to identify potential candidate projects
- Use the EEC results and systemic methodologies to identify a list of intersection attributes correlated with severe crash types (e.g., intersections that appear to be potential candidates for RCUTs would be identified) – performed by KTC & Central Office HSIP
- Study identified intersections to determine underlying crash risk factors, potential countermeasures to mitigate crash risks, and measures of effectiveness of the potential improvements. Return on investment must be included as a measure of effectiveness. Proposed projects must align with an identified strategy in the SHSP. Example project improvements are:
    - Positive Offset Turn Lanes
    - New Turn Lanes
    - RCUTs
    - Roundabouts
    - Intersection Conflict Warning System
    - Advance Warning Flashers
- Project submissions must include the source for the CMF (or other indication of the anticipated safety improvement) and why the District believes the CMF is appropriate
- Districts are encouraged to submit a variety of low-cost (<$200,000), medium-cost ($200,000-$500,000), and larger-cost (>$500,0000) intersection projects
- The submission should indicate the expected project development timeline
- Central Office HSIP staff and District HSIP Coordinators will review project submissions and select and program projects, based primarily on return on investment calculations, but other considerations will be taken into account, such as the last time a District was granted a competitive intersection project
- NOTE: Central Office HSIP will review the selection process after the first couple of iterations to ensure there is a sense of fairness as we move forward

**Benefits and how this initiative relates back to the SHSP:**

- HSIP will be able to implement various intersection projects that directly align with the identified intersection strategies in KY's 2020-2024 SHSP.
- Prevent intersection related fatalities and serious injuries
- Compared to previous initiatives, a focus on competitive projects with relatively high returns on investments is expected to provide KYTC with greater opportunity to achieve safety goals
- Opportunity to partner with KYTC District personnel to deliver data-driven safety solutions and advance the safety culture toward considering a solutions-based approach

## Vision Zero Louisville (~$4,300,000 annually)

**Background:** From 2014-2018, fatal crashes in Jefferson County accounted for 12.3% of all fatal crashes and 18.7% of all serious injury crashes statewide. As such, there is a safety improvement opportunity by strategically focusing efforts in Jefferson County, Kentucky's largest metro area. To seize this opportunity, KYTC partnered with Louisville Metro to develop a Vision Zero Louisville (VZL) Safety Report. Similar to how Kentucky's Strategic Highway Safety Plan serves as a guide for the implementation of statewide safety improvements, the VZL Safety Report helps the Louisville Metro–KYTC team work together to identify and prioritize the implementation of safety improvements across the Louisville Metro area. Based on historical crash trends and systemic crash analysis, the VZL Safety Report identifies both proactive and reactive countermeasures, along with candidate locations for improvement, with the overall goal of increasing the safety for the roadway users of the Louisville Metro area.

| Jefferson County | Roadway Departure | Intersections | Pedestrian |
|---|---|---|---|
| % of K Crashes | 20% | 55% | 26% |
| % of A Crashes | 12% | 65% | 12% |
| % of K + A Crashes | 13% | 64% | 14% |

**Major Categories Supported:**

The HSIP anticipates the Vision Zero Louisville initiative's annual funding will be cross-cutting and support safety benefits for the Roadway Departure, Intersections, and Pedestrian categories. The anticipated breakdown is as follows:

- 20% ($0.86 million) will support the Roadway Departure category
- 50% ($2.15 million) will support the Intersections category
- 30% ($1.29 million) will support the Pedestrians category

**Methodology and Implementation:**

- The VZL Safety Report was developed through the following tasks:
  - Data Collection & Integration
  - Analyze Crash, Roadway, & Traffic Volume Data
  - Identify & Recommend Countermeasures
  - Identify & Prioritize Potential Projects

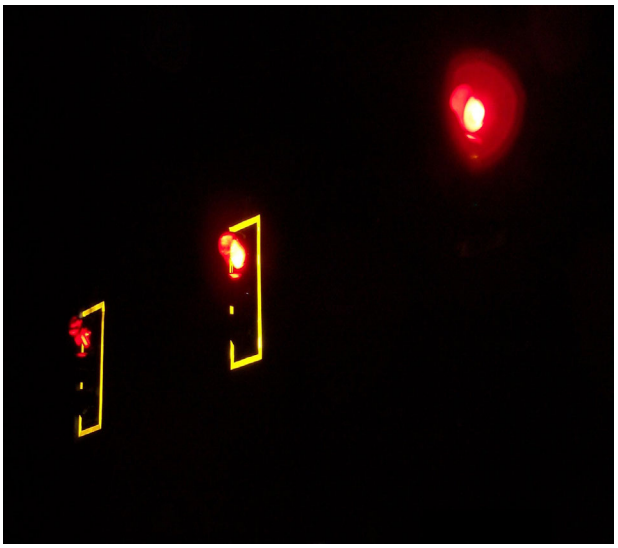
- The VZL Safety Report consists of the following Emphasis Areas & Area of Opportunities:
    - Design & Operations
        - Intersections
        - Four-Lane Divided Highways
        - Roadway Departures
    - Vulnerable Roadway Users (VRUs)
        - Non-motorized Users
        - Motorcycles
        - High Risk Drivers
    - Behavior Modifications
        - Aggressive Driving
        - Distracted Driving
        - Impaired Driving
        - Occupant Protection
    - Urban Considerations
        - Environmental Justice
        - Lighting
- Each Area of Opportunity has potential projects that can be implemented using HSIP funds
- Staff from Louisville Metro, KYTC District 5, and HSIP will collaborate to determine which safety improvement projects identified within the Vision Zero Louisville Safety Report
- The funding categories, each category's targeted funding proportion, and the types of projects that will be considered for HSIP funding are as follows:
    - Intersection-related projects **45%**
        - Systemic Intersections (Signalized & Unsignalized)
        - Reactive Intersections (Signalized & Unsignalized)
        - Restricted Crossing U-Turns (RCUTs)
        - Address Previously Warranted Signals
        - Lighting at Intersections (Signalized & Unsignalized)
    - VRU-related projects **30%**
        - Roadway Reconfigurations
        - Pedestrian Systemic Intersections (Signalized & Unsignalized)
        - Pedestrian Reactive Intersections (Signalized)
        - Bicycle Reactive Intersections
    - RD-related projects **20%**
        - RD Corridors
    - Other projects **5%**
        - Intersection Monitoring & Data Collection

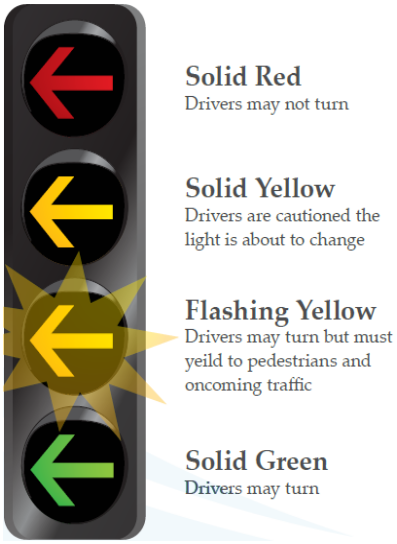
**Benefits and how this initiative relates back to the SHSP:**

- The VZL Safety Report supports all Emphasis Area and many strategies in KY's 2020-2024 SHSP
- Opportunity to partner and collaborate with staff at Louisville Metro and District 5 to determine targeted, unique safety improvements for KY's largest metro area
- Be responsive to the projects that local staff sees as the needs
- Several improvement types fall under federal guidelines that allow for 100% reimbursement

## Traffic Signal Enhancements (~$3,000,000 annually)

**Background:** For the past few years, HSIP has utilized HSM methodologies to prioritize intersections statewide for safety projects under the Intersection Emphasis List initiative. Safety improvements were determined from a list of countermeasures studied by consultants to target identified crash patterns. One of the most common countermeasures implemented was retroreflective backplates. This is primarily because retroreflective backplates are a proven safety countermeasure that have a crash modification factor of 0.85 (indicating a 15% crash decrease) for all crash types. The expectation of mitigating 15% of intersection crashes coupled with the relatively low cost for installation indicates that retroreflective backplates have a very significant return on investment. Installation of other low-cost traffic signal enhancements, such as flashing yellow arrow, supplemental signal heads, and pedestrian countdown heads also present an opportunity to increase the safety at signalized intersections. Therefore, the HSIP seeks to install more low-cost traffic signal enhancements, with a focus on installing them along corridors to increase consistency.






**Major Categories Supported:**

The HSIP anticipates the Traffic Signal Enhancements initiative's annual funding will primarily support safety benefits for the Intersections category but will provide safety benefits for the Pedestrian category. The anticipated breakdown is as follows:

- 92% ($2.77 million) will support the Intersections category
- 8% ($2.30 million) will support the Pedestrians category

**Methodology and Implementation:**

- Utilize HSM methodologies to prioritize intersections statewide based on safety performance
- For each District, HSIP staff will review the safety performance of the signalized intersections, create a prioritized list of potential signalized intersection corridors, and select approximately 1-3 signalized corridors

- For the selected signalized corridors, HSIP Consultants and/or District staff will:
    - Perform field reviews to document existing conditions and look for opportunities to install:
        - Retroreflective backplates
        - Flashing yellow arrow
        - Supplemental signal heads
        - Pedestrian countdown heads
    - When appropriate, Central Office HSIP staff will use the field data/measurements to perform SALSA analysis to ensure existing traffic signals have adequate structural capacity to carry the additional wind load of the retroreflective backplates and/or other improvements
    - Develop and deliver projects to implement the identified safety improvements within available funding
- Funding targets are based on each District's proportion of signalized intersections relative to statewide totals. The current inventory of signals yields the following District funding targets:

| District | % Signals | Signal Enhancement Investment Target |
|---|---|---|
| **1** | 6.3% | **$190,000** |
| **2** | 10.1% | **$310,000** |
| **3** | 8.0% | **$240,000** |
| **4** | 6.5% | **$190,000** |
| **5*** | 5.9% | **$180,000** |
| **6** | 17.8% | **$530,000** |
| **7** | 25.6% | **$770,000** |
| **8** | 3.8% | **$120,000** |
| **9** | 6.0% | **$180,000** |
| **10** | 2.4% | **$70,000** |
| **11** | 4.4% | **$130,000** |
| **12** | 3.0% | **$90,000** |
| **STWD** | **100%** | **$3,000,000** |

*NOTE: District 5 values do not include Jefferson County, since HSIP projects in Jefferson County will be prioritized and selected through the Vision Zero Louisville initiative.*

**Benefits and how this initiative relates back to the SHSP:**

- Retroreflective backplates are an identified strategy in KY's 2020-2024 SHSP.
- Supports prevention of intersection related fatalities and serious injuries
- Opportunity to partner with KYTC District personnel to deliver data-driven safety solutions and advance safety culture
- Streamlines project development and delivery by placing focus on a specific countermeasure
- Supports preservation and renewal of our transportation system infrastructure

## Cable Median Barrier (~$2,000,000 annually)

**Background:** Median crossover crashes often result in fatalities or serious injuries. Systemic installation of cable median barrier provides an excellent opportunity to mitigate the severity of these relatively low frequency, high severity crashes. Beginning in 2006, the Division of Highway Design prioritized cable median barrier projects based on safety evaluations. Since 2010, the HSIP has been the primary analysis and funding source for cable median barrier implementation. Annual evaluations of this long-term initiative continue to show a significant return-on-investment as presented in the HSIP Annual Reports submitted to FHWA. The current objective is to obtain complete coverage of positive separation along Kentucky's Interstate system, and then continue with investment in Cable Median Barrier on lower volume, divided highways that are conducive to installation.

**Major Categories Supported:**

100% ($2.0 million) of the Cable Median Barrier initiative's annual funding target will support the Roadway Departure category

**Methodology and Implementation:**

- Use HSM methodologies to calculate Excess Expected Crash (EEC) values for median crossover crashes occurring along Interstates across KY – performed by KTC & Central Office HSIP
- Review the EEC values for the sections of the Interstate System where longitudinal barrier does not exist
- Select projects based on EEC values with consideration given to the schedule of upcoming Interstate pavement rehab projects to ensure effective project coordination
- Projects are developed and delivered by the Central Office Division of Highway Design

**Benefits and how this initiative relates back to the SHSP:**

- Installation of median barriers is a strategy in KY's 2020-2024 SHSP
- Supports prevention of high severity median crossover collisions
- Supports a safe systems approach
- Improves the reliability of the Interstate system by decreasing the likelihood of crash reconstruction scenes
- Highly visible symbol of KYTC's investment in safety, which creates positive public relations

## Pavement Friction Data Collection (~$1,850,000 annually)

**Background:** In late 2019, the Kentucky Transportation Cabinet (KYTC) began discussing the idea of creating a Pavement Friction Management Program (PFMP) based on the collection of continuous pavement friction data. The KYTC believes integrating continuous pavement friction with roadway geometric data will provide the information necessary to develop a PFMP that can better inform various processes within the HSIP such as, network screening, crash analysis and diagnosis, and ultimately project prioritization & selection. In early 2020, an RFP was issued for the collection of continuous pavement friction and roadway geometric data, and in July 2020, a multi-year partnership for this data collection contract was established with WDM USA.

**Major Categories Supported:**

100% ($1.85 million) of the Pavement Friction Data Collection initiative's annual funding target will support the Roadway Departure category

**Methodology and Implementation:**

- WDM performs the following annual tasks through this initiative:
    - Collect GPS linked continuous pavement friction and roadway geometric data on approximately 15,000 lane miles along the Interstate, Parkway, State Primary, and State Secondary roadway systems
    - Process and deliver the data in a format that can be integrated with KYTC's Linear Reference System (LRS)
    - Provide technical assistance and support for the analysis of the continuous pavement friction and roadway geometric data
- The HSIP, through support from WDM and the Kentucky Transportation Center (via the KTC Technical Assistance contract), will use the collected data to improve safety, such as:
    - Categorize the 15,000 miles of roadway into Event types (e.g., curves, intersections, tangents, etc.)
    - Review historical crash data for each Event type to determine the friction levels that correlate to an increased risk of crashes
    - Identify Friction Demand Levels for each Event type

    - Compare the actual, collected friction values to the Friction Demand Levels
    - Prioritize sites and determine potential friction improvement options (e.g., HFST, microsurface, chip seal, asphalt resurface, diamond grinding, skidabrator, etc.)
- Over time, HSIP & KTC will incorporate friction values into KY's Safety Performance Functions to refine the network screening analysis performed for the various HSIP initiatives

**Benefits and how this initiative relates back to the SHSP:**

- Roadway Departure is an Emphasis Area and improving skid resistance is a strategy in KY's 2020-2024 SHSP
- Opportunity to collaborate with the Divisions of Maintenance, Materials, Highway Design, and Construction on a wide variety of KYTC business practices that may have widespread influence on safety performance
- Increased information and understanding about pavement friction will better inform KYTC decisions such as material specifications and pavement mix design policy and procedures
- Provides direct data support for the Friction Treatment initiative, as well as the network screening and safety analysis methods used to prioritize & select HSIP funded projects

## Friction Treatments (~$2,000,000 annually)

**Background:** KY's HSIP has been implementing High Friction Surface Treatment (HFST) since 2009. For many years, this has been the only HSIP funded treatment for the improvement of friction. KY's HSIP has had tremendous success with HFST but believes there is an opportunity to identify a variety of friction treatments that could be more efficient solutions to meeting the friction demand of individual locations. In early 2020, to better understand the friction supply on KY's roadways, the HSIP established a multi-year partnership with WDM USA for the annual collection of continuous pavement friction measurement and roadway geometric data on approximately 15,000 lane miles along the Interstate, Parkway, State Primary, and State Secondary roadway systems. This initiative seeks to utilize this data to select the most cost-effective treatment options for the locations that have friction improvement opportunities.

**Major Categories Supported:**

100% ($2.0 million) of the Friction Treatments initiative's annual funding target will support the Roadway Departure category

**Methodology and Implementation:**

- Using the prioritized site lists developed from the Pavement Friction Data Collection initiative, HSIP and/or District staff will:
    - Perform field reviews to determine existing pavement conditions and suitability of various friction improvement options (e.g., HFST, microsurface, chip seal, asphalt resurface, diamond grinding, skidabrator, etc.)
    - Evaluate cost estimates and potential lifespan of suitable friction improvement options to determine a recommended option
    - Develop and deliver projects based on recommended options and available funding
- Implement projects annually where reinstallation is desired or where new installations provide the best opportunity to prevent fatalities and serious injuries

**Benefits and how this initiative relates back to the SHSP:**

- Roadway Departure is an Emphasis Area and improving skid resistance is a strategy in KY's 2020-2024 SHSP
- Opportunity to bundle HSIP funded projects with Division of Maintenance funded projects
- Statewide implementation based on data-driven methods
- Positive public relations for KYTC

## Pavement Markers (~$1,500,000 annually)

**Background:** Over time, KYTC has facilitated the installation and maintenance of pavement markers through a variety of methods. Since 2015, the HSIP has been the primary funding source for the installation and maintenance of pavement markers to systemically enhance nighttime delineation along eligible roadways.

**Major Categories Supported:**

100% ($1.5 million) of the Pavement Markers initiative's annual funding target will support the Roadway Departure category

**Methodology and Implementation:**

- Pavement marker projects are eligible for newly resurfaced routes that are on the KYTC Pavement Marker System
- Eligible routes are determined by facility type, typical section, and AADT, with Interstates, Parkways, divided and undivided multilane highways, and 3 lane and 5 lane roadways with center left turn lanes being the predominate facility types
- Pavement marker projects may also facilitate replacement of lens in existing pavement markers that have been identified by District staff as deficient
- Projects will be determined annually through coordination between Central Office HSIP and District staff
- Projects will be developed and delivered by Central Office HSIP

**Benefits and how this initiative relates back to the SHSP:**

- Enhanced pavement markings is an identified strategy in KY's 2020-2024 SHSP
- Increases nighttime delineation and aids drivers in lane positioning, especially during wet nighttime situations
- Systemic application of Pavement Markers provides consistent delineation to the Kentucky's higher traffic volume highways, which should decrease variability and positively contribute to safety
- Highly visible symbol of KYTC's investment in safety, which creates positive public relations

## Local Road Safety & STEP Action Plan (~$1,800,000 annually)

**Background:** From 2014-2018, fatal crashes on the locally owned roadway network in Kentucky accounted for approximately 13% of the statewide fatal crashes. In the past KY's HSIP has primarily addressed local road safety through the Safety Circuit Rider Program. In recent years, the network screening performed by the HSIP has included locally owned roadways that are functionally classified as Minor Collector or higher, since KYTC has roadway and traffic volume data for these roadway functional classes, regardless of ownership. Unfortunately, most locally owned roadways in KY are functionally classified as Local Road, and the roadway and traffic volume data needed to support network screening typically does not exist. To address the lack of data on locally owned roadways, foster partnerships with local communities, and support safety on all public roadways within Kentucky, the HSIP has recently worked with the Kentucky Local Technical Assistance Program (LTAP) at the University of Kentucky to establish methods for the development of Local Road Safety Plans (LRSPs). These LRSPs help identify locally owned roadways with opportunities to improve safety through safety analysis and local input. Once identified, local governments can submit project applications for HSIP funding to implement safety improvements identified through the plans.


Safe Transportation for Every Pedestrian (STEP) is an Every Day Counts (EDC) 5 initiative that guides states into applying systemic safety countermeasures for pedestrians at both uncontrolled and signalized

crossing locations. Kentucky, along with FHWA assistance, recently developed a STEP Action Plan. This plan identifies areas of safety analysis needs. KY's HSIP plans to help assist through either the Kentucky Transportation Center or one of our on-call consultants.

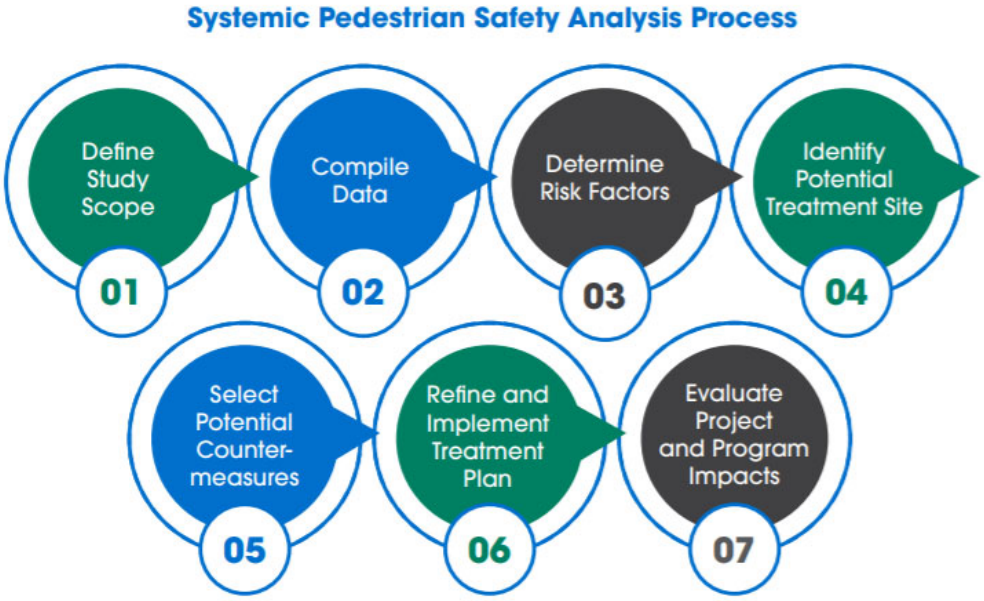
**Major Categories Supported:**

The HSIP anticipates the Local Road Safety & STEP Action Plan initiative's annual funding will be cross-cutting and support safety benefits in all categories. The anticipated breakdown is as follows:

- 75% ($1.35 million) will support the Roadway Departure category
- 10% ($0.18 million) will support the Intersections category
- 10% ($0.18 million) will support the Pedestrians category
- 5% ($0.09 million) will support the Other/HSIP Administration category

**Methodology and Implementation:**

- Continue to develop Local Road Safety Plans with the Kentucky LTAP center with the goal of 3-6 counties each year. Depending on the complexity of the local network, some Local Road Safety Plans may be developed by an HSIP Consultant from the Statewide HSIP Contract.
- Potential project candidates may be submitted throughout the year. Submissions will require a return on investment calculation (or other indication of the anticipated safety improvement) to determine the safety benefit for the project.
- Local governments are recommended to submit projects that are 100% federally reimbursable, such as signing, striping, and guardrail, since these projects will not require a local match. The full list can be found in 23 U.S.C 120(c)(1). Projects outside of the 100% federal reimbursable category will require local governments to provide a MOU stating they will provide a 10% match.
- HSIP staff will look to assist KYTC's development and implementation of the STEP Action Plan through safety analysis and project funding.



**Benefits and how this initiative relates back to the SHSP:**

- Local Road Safety Plans and STEP are identified strategies in KY's 2020-2024 SHSP
- Opportunity to partner with local officials and develop data to promote safety culture for local roadways
- Be responsive to local/regional needs and partner with local communities to improve safety
- Determine Pedestrian safety needs through systemic safety analysis

## Roadway Reconfigurations (~$1,750,000 annually)

**Background:** Roadway Reconfiguration, oftentimes referred to as a Road Diet, is an FHWA Every Day Counts-3 Initiative. Roadway Reconfiguration projects typically involve converting an existing four-lane undivided roadway into a three-lane roadway consisting of two through lanes, a two-way left turn lane (TWLTL), along with bicycle lanes or a relatively narrow paved shoulder.

*Before Road Reconfiguration*

*After Road Reconfiguration*

For many years maintaining a high level of capacity along most roadways was the primary focus; however, many communities are beginning to focus on "complete street" environments to improve the comfort level of all users by incorporating pedestrian, bicycle, and transit facilities, while better managing vehicle speeds and improving safety performance.

Because resurfacing contracts are developed and delivered to letting quickly, past efforts to incorporating Roadway Reconfigurations into resurfacing contracts has been difficult, resulting in missed opportunities. Quite simply, there is usually not enough time to identify the opportunity, analyze the capacity and safety effects, develop restriping plans, present the roadway reconfiguration options to the local transportation leaders for community buy-in, and include the restriping plans in the resurfacing contract proposals.

These challenges lead to a great opportunity for the HSIP to collaborate with District staff and the Division of Maintenance when four-lane undivided roadways are scheduled for resurfacing. For the cost of studying the traffic capacity and developing a restriping plan, the HSIP can identify locations where Roadway Reconfiguration will improve safety and not substantially impact traffic operations, develop plans for restriping, and keep a list of all viable roadway segments. This way, once the roadway segments become scheduled for resurfacing, the Roadway Reconfiguration plans are immediately ready and available to present to local transportation leadership for buy-in, and ultimately included in the resurfacing contract proposals.

**Major Categories Supported:**

A major effort of this initiative is to identify, evaluate, and develop Roadway Reconfiguration opportunities. As such, the HSIP anticipates a relatively large portion of the Roadway Reconfigurations initiative's annual funding will support safety benefits for the Other/HSIP Administration category. This

initiative will also provide significant safety benefits for the Intersections and Pedestrian category. The anticipated breakdown is as follows:

- 28.5% ($0.5 million) will support the Intersections category
- 28.5% ($0.5 million) will support the Pedestrians category
- 43% ($0.75 million) will support the Other/HSIP Administration category

**Methodology and Implementation:**

- HSIP will identify potential Roadway Reconfiguration locations through a contract with KTC.
- An HSIP Consultant and/or District staff will:
    - Perform a study to determine the feasibility of potential Roadway Reconfiguration projects. Priority will be given to potential projects that are relatively high on KYTC's annual resurfacing, preventive maintenance, and pavement rehab lists.
    - Develop restriping plans to incorporate into the resurfacing proposal.
- HSIP staff, District staff, and Division of Maintenance staff will remain in communication at the beginning of each FD05 resurfacing cycle to identify the resurfacing projects that have been identified for a Roadway Reconfiguration. At this point, District staff will begin communications with local officials and possibly perform a Public Meeting.
- Roadway Reconfiguration restriping plans will be designed in accordance with FHWA Road Diet Guidance and must conform to KYTC policies and guidelines

**Benefits and how this initiative relates back to the SHSP:**

- Roadway Reconfigurations are an Engineering Strategy in Kentucky's 2020-2024 SHSP
- Supports FHWA's EDC-3 initiatives and local communities' "complete streets" initiatives
- Responsive to local and regional needs
- Roadway Reconfigurations typically decrease overall crashes between 19 and 47 percent, by reducing speed differentials and vehicle interactions, and by providing separation of left-turning vehicles from through vehicles
- Roadway Reconfigurations improve traffic operations by:
    - Reducing delays at signalized intersections by separating left-turning traffic
    - Improving driver comfort from side-street traffic entering the mainline roadway and reducing side-street delay
    - Reducing speed differential and providing more consistent traffic flow
    - Reducing speeds to improve the comfort level of all users
- Roadway Reconfigurations can improve mobility and safety for pedestrians and bicyclists by:
    - Utilizing the resulting paved shoulders as bike lanes
    - Reducing the number of lanes being crossed, and by providing space in the TWLTL for construction of pedestrian refuge islands (when a route has relatively high pedestrian activity)

## Project Development Funding for on-call HSIP Consultants (~$7,000,000 annually)

**Background:** In the past, Planning and Design funds for each consultant led HSIP project were tied to the specific projects. The process of requesting and authorizing Design funds for the numerous individual HSIP projects requires significant effort and adds additional time and effort to the project development process. The purpose of this initiative is to provide a ready source of Planning and Design funding for a wide variety of project development activities to be performed by the on-call HSIP Consultants. Currently, the workload of KYTC's HSIP team and many District teams exceeds the capacity of these teams to develop and deliver HSIP projects to letting efficiently. To address this, KYTC has been utilizing on-call contracting to select a group of consultants with specific expertise to assist with HSIP-related project development activities. Selected consultants are responsible for providing engineering and other project development services on an "as-needed" basis.

**Major Categories Supported:**

100% ($7.0 million) of the Project Development Funding for on-call HSIP Consultants initiative's annual funding target will support the Other/HSIP Administration category

**Activities supported by this funding:**

- Screening the network to identify potential safety improvement projects
- Performing District-wide analyses to identify and prioritize high value safety improvement projects to better target and optimize HSIP investments
- Informing District and Central Office Planning staff when higher-cost safety improvement projects are identified so such projects can be considered for inclusion in the CHAF database
- Performing project level safety analysis to identify potential countermeasures
- Performing studies to evaluate environmental, right of way, utility, and operational impacts, as well as determine potential returns on investment
- Recommending project programming, phasing, and bundling
- Developing and delivering the plans, specifications, and estimates for programmed projects
- Evaluating past projects

**Benefits and how this initiative relates back to the SHSP:**

- Supports EDC efforts to streamline HSIP processes
- Provides a ready, immediate source of funds that will allow development activities to proceed immediately after the identification, selection, and programming of projects (the HSIP anticipates this streamlining will shorten the project development process by 4 to 8 weeks)
- Reduces the complication of bundling similar projects after projects have been programmed, since potential projects being studied and developed using these funds would be programmed after study and development, and therefore all improvements can be identified and included under a single Item Number
- Reduces the number of STIP and TIP modifications during the Design phase, which in turn will reduce the number of funding authorizations processed by the Division of Program Management

## Project Development Funding for KYTC Personnel (~$1,250,000 annually)

**Background:** In the past, Design funds for each HSIP project were tied to the specific projects. The process of requesting and authorizing Design funds for the numerous individual HSIP projects requires significant effort and adds additional time and effort to the project development process. The purpose of this initiative is to provide a ready source of Design funding for a wide variety of project development activities performed by KYTC personnel for HSIP projects and for the administration of the HSIP.

**Major Categories Supported:**

100% ($1.25 million) of the Project Development Funding for KYTC Personnel initiative's annual funding target will support the Other/HSIP Administration category

**Activities supported by this funding:**

- Screening the network to identify potential safety improvement projects
- Data analyses performed by the Safety Data person in the Kentucky Office of Highway Safety
- Performing Road Safety Assessments (RSAs) and project level safety analysis to identify potential countermeasures
- Performing studies to evaluate environmental, right of way, utility, and operational impacts, as well as determine potential returns on investment
- Recommending project programming, phasing, and bundling
- Developing and delivering the plans, specifications, and estimates for programmed projects
- Evaluating past projects

**Benefits and how this initiative relates back to the SHSP:**

- Supports EDC efforts to streamline HSIP processes
- Provides a ready, immediate source of funds that will allow development activities to proceed immediately after the identification, selection, and programming of projects (the HSIP anticipates this streamlining will shorten the project development process by 4 to 8 weeks)
- Reduces the complication of bundling similar projects after projects have been programmed, since potential projects being studied and developed using these funds would be programmed after study and development, and therefore all improvements can be identified and included under a single Item Number
- Reduces the number of STIP and TIP modifications during the Design phase, which in turn will reduce the number of funding authorizations processed by the Division of Program Management

## KTC Technical Assistance, Mobile LiDAR & HFST Evaluation Contracts (~$375,000 annually)

**Background:** A wide range of technical expertise is required in order to support the activities associated with the management and implementation of the HSIP. This funding will be used to fund two contracts with the Kentucky Transportation Center (KTC) at the University of Kentucky: the Technical Assistance contract and the LiDAR & HFST Evaluation contract. This assistance includes data analysis, evaluation of project effectiveness, evaluation of project completion, HSIP Annual Report assistance and other technical activities that support the Division of Traffic Operations in the administration of the HSIP in Kentucky.

**Major Categories Supported:**

The technical assistance portion of this initiative will support the Other/HSIP Administration category, while the Mobile LiDAR & HFST Evaluation portion of this initiative will support the Roadway Departure category. The anticipated breakdown is as follows:

- 53% ($0.20 million) will support the Roadway Departure category
- 47% ($0.175 million) will support the Other/HSIP Administration category

**Activities supported by this funding:**

- Data analysis, including a wide variety of network screening analyses and development/refinement of Kentucky specific Safety Performance Functions (SPFs).
- Evaluating the effectiveness of various countermeasures, completed projects, and Initiatives
- Assisting with compilation of the HSIP Annual Report.
- Providing Mobile LiDAR point cloud data along with processed DTM's for pavement cross slope and water flow analysis. Locations will be determined by HSIP staff and will generally be roadway sections experiencing a higher-than-expected frequency of roadway departure crashes potentially related to existing pavement geometrics. Collected and processed information will be made accessible utilizing an ArcGIS platform for easy viewing and retrieval of data.
- Evaluation of high friction surface (HFS) installations to evaluate long-term performance. All sites are inspected every other year, with Districts 1-6 inspected one year and Districts 7-12 inspected the other year.
- Other technical activities that support the Division of Traffic Operations in the administration of the HSIP in Kentucky

**Benefits and how this initiative relates back to the SHSP:**

- Support a data-informed process which is emphasized by KY's 2020-2024 SHSP
- Provides state of the art technical expertise not currently available within KYTC
- Opportunity to learn from leading experts about the latest DDSA methods, which can be shared to advance the highway safety culture throughout all of Kentucky's transportation agencies
- Supports EDC efforts to streamline HSIP processes

## Safety Circuit Rider ($175,000 annually)

**Background:** In 2005, FHWA Office of Safety piloted the Safety Circuit Rider (SCR) program with three LTAP centers (Florida, Kentucky, and West Virginia) with the purpose of determining feasibility and usefulness of a SCR program. Currently there are more than 20 SCR programs in the United States including Kentucky. This funding will be used to further the SCR program in Kentucky through the University of Kentucky Technology Transfer Program.


**Major Categories Supported:**

A major effort of this initiative is providing technical assistance to local officials, so this initiative will primarily support the Other/HSIP Administration category but will provide safety benefits for the Roadway Departure category. The anticipated breakdown is as follows:

- 77% ($0.135 million) will support the Roadway Departure category
- 23% ($0.04 million) will support the Other/HSIP Administration category

**Methodology and Implementation:**

- The Kentucky SCR program uses crash data to identify six focus counties each year to receive training to local governments on low-cost safety improvements.
- After the training session, a road safety audit, led by a professional Civil Engineer, is performed on two roads within each focus county.
- Up to $5,000 in signing is provided for the two roads the safety audit was performed on.
- In addition to the six focus counties, the SCR Engineer provides free technical assistance to all local county governments within Kentucky.

**Benefits and how this initiative relates back to the SHSP:**

- The Safety Circuit Rider program is an identified strategy in KY's 2020-2024 SHSP
- Assists local governments with technical issues
- Opportunity for local government employees to learn about highway safety and DDSA, which will advance the highway safety culture throughout Kentucky
- Supports preventing rural roadway departures, an FHWA EDC-5 initiative

## Funding Breakdown Summary

The following table provides a summary of the anticipated breakdown of how each initiative's annual funding target will support the major categories.

| HSIP Initiative | Roadway Departure | Intersections | Pedestrians | HSIP Admin |
|---|---|---|---|---|
| Roadway Departure Emphasis | $23.5 million | | | |
| Statewide Competitive Intersections | | $7.6 million | $0.4 million | |
| Vision Zero Louisville | $0.86 million | $2.15 million | $1.29 million | |
| Traffic Signal Enhancements | | $2.77 million | $0.23 million | |
| Cable Median Barrier | $2.0 million | | | |
| Pavement Friction Treatments | $2.0 million | | | |
| Pavement Friction Data Collection | $1.85 million | | | |
| Pavement Markers | $1.5 million | | | |
| Local Road Safety & STEP Action Plan | $1.35 million | $0.18 million | $0.18 million | $0.09 million |
| Roadway Reconfigurations | | $0.5 million | $0.5 million | $0.75 million |
| Project Development Funds – HSIP Consultants | | | | $7.0 million |
| Project Development Funds – KYTC In-House | | | | $1.25 million |
| KTC Technical Assistance, LiDAR & HFST Evaluation | $0.2 million | | | $0.175 million |
| Safety Circuit Rider | $0.04 million | | | $0.135 million |
| **TOTALS** | **$33.3 million** | **$13.2 million** | **$2.6 million** | **$9.4 million** |
| **Total HSIP annual funding target: $58.5 million** | **57%** | **23%** | **4%** | **16%** |