

## Grant Proposal

# Low-Carbon Transportation Materials Program Inflation Reduction Act Section 60506

## Volume 1: Technical Application

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## **1. Introduction**

The Federal Highway Administration (FHWA) Low Carbon Transportation Materials (LCTM) grant program was created in the Inflation Reduction Act (IRA, Pub. L. 117-169, August 16, 2022) and included in Title 23, United States Code (U.S.C.), Section 179. The LCTM grant program provides funding for the use of construction materials that have substantially lower levels of greenhouse gas emissions (GHG). This application is in response to the FHWA Request for Applications (RFA). The goals of the program are to:

- 1) Increase the use of low-carbon transportation materials (LCTMs) and products in projects funded under 23 U.S.C.
- 2) Facilitate the use of LCTMs while ensuring appropriateness for use in projects funded under Title 23.
- 3) Support State highway agencies (SHAs) to develop LCTMs identification frameworks that include environmental product declarations (EPDs).
- 4) Provide technology transfer and workforce development for the agency personnel and the transportation construction workforce in general.
- 5) Support SHAs in updating or developing specifications to allow for use of LCTMs in eligible construction projects.

## **2. Administration Priorities**

The U.S. Department of Transportation (DOT) has a number of priorities that have been considered when developing the program proposed in this application.

### **2.1. Climate Change and Sustainability**

The Administration has undertaken a number of activities to reduce GHG emissions in all sectors of industry. Specific programs include the Federal Buy Clean Initiative and Executive Order (E.O.) 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability (86 FR 70935). The program proposed in this application will adhere to the tenets of these programs and others. A central component of this proposed program is to comply with the U.S. Environmental Protection Agency (EPA) Interim Determination (ID) on selecting materials and products that meet the standards of the IRA Sections 60503 and 60506. The approach to compliance is presented in the Project Description.

KYTC has completed a Resilience Improvement Plan (RIP), approved in July 2023 by the Federal Highway Administration (FHWA). The RIP has also been incorporated into KYTC's Long Range Statewide Transportation Plan (LRSTP). The goal of the RIP is to identify strategies for Kentucky to prepare for, respond to and withstand future extreme weather and natural hazard events affecting the transportation system. The RIP has been developed and will be implemented in coordination with: (1) KYTC Transportation Asset Management Plan (TAMP), (2) KYTC Long Range Statewide Transportation Plan (LRSTP), (3) KYTC Freight Plan, (4) Commonwealth of Kentucky Enhanced Hazard Mitigation Plan (EHMP).

## **2.2. Safety**

Safety is an overarching priority of the DOT. The program proposed in this application will align with the National Roadway Safety Strategy (NRSS) and the Fiscal Years 2022-2026 DOT Strategic Plan with respect to advancing safe and efficient transportation. The program will also align with KYTC's mission: to provide a safe, efficient, environmentally sound and fiscally responsible transportation system that delivers economic opportunity and enhances the quality of life in Kentucky.

## **2.3. Equity and Environmental Justice**

To the extent permitted by other constraints, this program seeks to fund activities and projects that will create proportional impacts to all populations in a project area, remove transportation-related disparities to all populations in a project area, and increase equitable access to project benefits, consistent with E.O. 13985, Advancing Racial Equity and Support for Underserved Communities Through the Federal Government (86 FR 7009). KYTC utilizes the Climate and Economic Justice Screening (CEJST) as well as the Grant Project Location tools to identify disadvantaged areas within the state where transportation burdens exist.

## **2.4. Workforce Development, Job Quality, and Wealth Creation**

The program proposed will incorporate the components of E.O. 14052, Implementation of the Infrastructure Investment and Jobs Act (86 FR 64335) that apply, and will, where possible and applicable, include the participation of Disadvantaged Business Enterprises, Minority-owned Businesses, Women-owned Businesses, and/or 8(a) firms. This program also intends to support Made in America goals consistent with E.O. 14005, Ensuring the Future Is Made in All of America by All of America's Workers (86 FR 7475).

Kentucky's Career Center is focused on providing workforce development for underemployed and untrained citizens and provides tax incentives and robust training and apprenticeship programs. Incentives include the Federal Work Opportunity Tax Credit (WOTC), a state administered federal program awarded to companies that hire people facing significant barriers to employment. Additionally, the Kentucky Unemployment Tax Credit (KUTC) program provides employers a credit of \$100 per eligible hire against Kentucky income taxes owed when they hire residents who have been unemployed for at least 60 days and remain employed full time for 180 consecutive calendar days in the tax year in which the credit is claimed. KYTC has created training courses which provide crucial training and support for Disadvantaged Business Enterprises (DBEs) crafted by contractors and designed to help individuals start companies, enhance their existing practices, and/or empower them with the knowledge and skills needed for success in the construction industry. KYTC will also include DBE goals when advertising for consultants and when letting construction projects implementing LCTMs.

### 3. Project Description

#### 3.1. Overview

The Kentucky Transportation Cabinet (KYTC) shall undertake a comprehensive program to use construction materials and products that have “substantially lower<sup>1</sup>” levels of embodied GHG emissions associated with the production stage compared to the estimated industry averages of similar materials or products. KYTC will develop specification language and conduct identification activities needed to demonstrate these LCTMs are appropriate for use on construction projects eligible for Federal-aid funding. Additionally, KYTC will specify in construction projects the use of LCTMs and will establish procedures to monitor and report the performance of those projects after construction. **KYTC’s program will be requesting LCTM funding for development activities and use of the following eligible material categories: asphalt mixtures, concrete and cement.** KYTC’s program will be implemented through a number of Tasks presented in Section 3.2 and the processes associated with each Task will be documented using Implementation Progress Reports (IPRs). These IPRs will be submitted to the FHWA for approval before KYTC obligates any funding for construction projects, as established in the RFA requirements.

#### 3.2. Technical Description

The KYTC LCTM program will focus on asphalt mixtures, concrete and cement. For each material type, the program will involve a number of Tasks that in turn encompass subtasks or “activities” to accomplish the program goals presented in Section 1. The initial step in the LCTM program is developing a series of Implementation Process Reports (IPRs) that will provide specific details on each Task and its activities. After receiving notification of award for this grant, and receiving a notice to proceed, KYTC will engage consultants and university partners, as needed, to assist with developing the IPRs to launch the program. The consultants and university partners will be engaged starting at the earliest stages of the program to achieve the schedule and expedite the program. Additional IPRs will be developed, if needed, as the program evolves. KYTC will work diligently to send IPRs for approval to FHWA in a timely manner and will be responsive in addressing comments to obtain the required approval. Additionally, KYTC acknowledges that approval of the IPRs is needed before construction projects can be obligated using LCTM funds and that all funds requested (including those for use on construction projects) will be obligated before September 30, 2026. Other than developing the IPRs, the other Tasks envisioned at this time are summarized in the following sections for each material type. Activities in common with all materials are presented and activities unique to specific eligible

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<sup>1</sup> The Environmental Protection Agency (EPA) interim determination (ID) has established that “substantially lower” embodied carbon is interpreted as meaning a material having a global warming potential (GWP) in the best performing 20 percent when compared to similar materials or products. The best performing, or “top 20 percent”, means the material has a GWP in the lowest 20 percent when compared to similar materials or products. If no materials or products in the top 20 percent are available in a project’s location, a material or product qualifies for funding under IRA Section 60506 per this ID if its GWP is in the top 40 percent (i.e., lowest 40 percent in embodied GHG emissions). If materials or products in the top 40 percent are not available in a project’s location, a material or product qualifies for funding under IRA section 60503 or 60506 per this ID if its GWP is better than the estimated industry average.

materials are identified. For each Task, a table is included identifying the specific activities anticipated for each eligible material.

### **3.2.1. Task 1 - Process for Substantially Lower Embodied Carbon**

This Task sets the foundation for future Tasks and includes identifying eligible LCTMs; assessing training needs and establishing what training materials are required; assessing the available data and databases, including life cycle assessment (LCA) data for construction materials in Kentucky and in the region; engaging in stakeholder outreach including contractors, material providers, environmental advocates, and trade organizations such as the Kentucky Association of Highway Contractors (KAHC), Plant Asphalt Institute of Kentucky (PAIKY) and the Kentucky Concrete Association (KCA), to seek cooperation on obtaining materials and necessary LCA data and discussing their questions or concerns; developing a process for gathering and storing environmental product declarations (EPDs); and launching training activities for KYTC personnel, contractors, and materials providers. This work will be conducted primarily by consultants and university partners and will be funded through the incremental funding process described in the RFA.

The collection of EPDs will require cooperation from material providers. The starting point will be to investigate how available LCTMs in the eligible categories fit into existing product category rules (PCRs). It will be necessary to ensure that for eligible materials, a facility-specific material/product-specific EPD, developed using ISO procedures, can be delivered at the time of construction. KYTC has partnered with HaulHub to implement a single statewide e-ticketing portal. KYTC will investigate the use of this e-ticketing platform to facilitate the collection of EPDs from contractors and materials suppliers. If needed KYTC will engage consultants to upgrade the e-ticketing system to accommodate the collection of EPDs. Having the e-ticket and EPDs collected, managed, and stored in a single system will increase effectiveness and efficiency for KYTC in the ultimate review and reporting of the data.

Specific activities to be conducted under this Task are shown in Table 1, grouped by eligible material. Exhibit A in the Additional Supporting Documents provides a list of LCTMs being considered for use in the KYTC LCTM program. The list includes asphalt and cement/concrete with references to concepts KYTC plans to review and investigate to substantiate and document their reduction in GHG per the requirements of this program. An important component of Task 1 is to establish substantially lower embodied carbon thresholds meeting the Environmental Protection Agency (EPA) interim determination (ID) (see footnote 1, pg. 3). The RFA provides two (2) options to establish thresholds for each eligible material. These are: Option (1): An agency may reference the established thresholds as published on the FHWA Website; Option (2): An agency may determine local or regional thresholds for concrete (and cement) and asphalt mix, following accepted International Organization for Standardization (ISO) standards to

develop thresholds<sup>2</sup>. KYTC will examine both options and select the option most suitable for the eligible material at the time the applicable IPR is developed for this task. As part of the IPR for this Task, KYTC will detail the process to be used for determining the Global Warming Potential (GWP) threshold to be used. It is expected that within Task 1, KYTC will develop a process for collecting and storing EPD data. This process could be conducted by including a line item for EPD development and collection at the time of project bidding. Once EPD data is submitted and compiled, it will be analyzed to “benchmark” the current GWP with existing mixtures. KYTC will also explore development of EPDs for all, or nearly all, unique mixtures accepted annually in the state. KYTC will monitor the availability of EPDs in the region and based on that information, select an appropriate timeline to shift from Option 1, the FHWA provided national benchmark, to Option 2, a state or regional specific GWP threshold.

**Table 1. Task 1 Activities Anticipated for All Eligible Materials.**

Process for Substantially Lower Embodied Carbon	Eligible Material for Activity			
	Concrete (Cement)	Asphalt	Steel	Glass
1.1 Development of Task 1 Implementation Process Reports	X	X		
1.2 University or consultant support to identify eligible materials, training needs, additional data, and specification review	X	X		
1.3 Task 1 Stakeholder outreach	X	X		
1.4 Development of a process to collect and store EPDs	X	X		
1.5 Identification of local or regional "substantially lower" embodied carbon thresholds that meet ISO acceptable practices	X	X		
1.6 Conduct Task 1 LCTM training	X	X		

### 3.2.2. Task 2 - LCTM Quality Assurance (QA) and LCTM Specifications

An important step in transitioning to LCTMs will be developing a quality assurance (QA) program suitable for use with LCTMs and products. For concrete/cement and asphalt, designers will also need to determine if any changes in design processes or project development details will be required for using LCTMs. Design changes can be modeled and examined before construction and post-construction performance monitoring will provide data to further improve design and project development processes.

Activities under this Task include development of this QA plan as well as a plan for monitoring LCTM performance post-construction. Development of both plans will require limited testing to establish measures of performance appropriate for new materials or to demonstrate existing testing and specifications are applicable. For concrete and asphalt, existing mixture designs will need to be evaluated and may require adjustment to ensure performance. An additional need is to establish constructability and, to the extent possible over the duration of the grant, establish the

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<sup>2</sup> When following Option 2 KYTC shall disclose the Global Warming Potential (GWP), the methodology for determining the percentiles and averages, the source(s) used for each material/product, and the parameters (including performance specification) used to set the GWP.

durability and resilience of LCTM concrete and asphalt mixtures. Updating existing specifications or developing special provisions for new materials, will occur following the development of preliminary mixture designs in the laboratory and limited field testing, including test strips to ensure constructability.

In many cases, new test methods will be required to establish material properties to be included in new specifications. It is expected that existing KYTC testing facilities will need augmented capabilities to adequately assess and accept LCTMs. Therefore, a major activity under this Task will be to assess the need for additional testing equipment for KYTC laboratories and undertake procurement of that equipment, installing the additional equipment, training key laboratory personnel on use, and then integrating the new testing capabilities into the LCTM QA program. Additional stakeholder outreach to socialize new QA protocols and specification requirements will involve industry partners, including PAIKY, KCA and KHAC.

Other important activities under this Task include the development of processes for verifying EPDs for LCTM materials and for ensuring materials delivered to the construction site are the LCTM materials covered by those EPDs. Obtaining EPD verification will involve cooperation and participation of the material suppliers and use of the HaulHub e-ticketing/EPD database platform. This automatic tracking of each unique material supplier will ensure accurate data collection for review and auditing of program goals.

The work in this Task will be conducted primarily by KYTC staff, consultants and/or university partners and will be funded through the incremental funding process described in the RFA. KYTC personnel will lead specification writing and the assessment of laboratory capabilities, with guidance from consultants and university partners. And throughout this Task, there will be additional need for training of KYTC personnel as well as training for contractor and material producer’s personnel. Specific activities to be conducted under this Task are shown in Table 2, grouped by eligible material.

**Table 2. Task 2 Activities Anticipated for All Eligible Materials.**

LCTM Quality Assurance (QA) and Specifications	Eligible Material for Activity			
	Concrete (Cement)	Asphalt	Steel	Glass
2.1 Development of Task 2 Implementation Process Reports	X	X		
2.2 Development of QA plans and/or performance monitoring plan for the LCTM	X	X		
2.3 Task 2 Stakeholder Outreach	X	X		
2.4 Update of existing material specifications or development of new special provision to facilitate use on projects	X	X		
2.5 Preliminary mixture design and testing to evaluate materials	X	X		
2.6 Testing equipment to accept and verify LCTM	X	X		
2.7 Construction of Task 2 LCTM test strips	X	X		
2.8 Development of a verification process for LCTM using EPDs	X	X		
2.9 Task 2 training	X	X		



### 3.2.3. Task 3 - Construction Project Identification

Tasks 1 and 2 will set in place the foundation to move towards construction using LCTMs. For the purpose of this program, the next step is identifying eligible 23 U.S.C. projects. Given the time span between the grant initiation and construction, it is not possible to predict with absolute certainty which eligible 23 U.S.C. projects will be used. However, KYTC has identified potential programs from which projects can be selected for each eligible material. These programs are presented in Exhibit B for concrete/cement and in Exhibit C for asphalt and these are included in the Additional Supporting Documentation as part of SF-424, Item 15. As part of this Task, KYTC will work with consultants, university partners and contractors to identify the most suitable projects for applicable LCTMs.

As part of this task, KYTC will identify eligible 23 U.S.C. projects for LCTM funding that are part of Kentucky's 2024 Enacted Six Year Highway Plan (SYP). The SYP is divided into three distinct focus areas including Asset Management and Performance, Capacity Improvements, and a "Various" category. Asset Management and Performance represents the Kentucky Transportation Cabinet's (KYTC's) investment in bridges and pavements. To maintain its assets, KYTC has made a strong commitment to its Transportation Asset Management Plan (TAMP). **KYTC's Performance-Based Approach** to managing its pavements and bridges is data-driven and relies on performance measures to monitor system performance, identify needs, and develop investment priorities. The FY24-FY30 Enacted Highway Plan lists 554 bridge and pavement type projects that total \$3,355,962,970. Projects may also be selected for 23 U.S.C. roadways that have been identified through KYTC's pavement prioritization process that would not be included the highway plan. KYTC will not use LCTM funds on projects that add lane miles or capacity to the existing highway system.

The list will be aligned with opportunities to use LCTMs on specific projects. For example, an alternative cement may be available only in small quantities, or a particular asphalt mixture using LCTMs may not meet the engineering requirements dictated by the traffic on a specific Federal-aid route. Working with consultants, university, and industry partners, the best application for LCTM technologies will be identified and matched with particular projects, ensuring the best chance of success for each selected technology.

Working with industry stakeholders, an activity under this Task is to develop a plan for incorporation of LCTMs on construction projects. KYTC will work with industry partners to communicate how LCTM's will be incorporated on construction projects. Industry organizations such as PAIKY, KCA and KAHC will be engaged for this effort. Elements of the plan will include material procurement, mixture design submittal processes, establishing contractor capabilities for construction and quality control (QC), and acceptance criteria. This will roll up into a larger activity of developing project-specific construction contract language. The contract writing will be conducted primarily by KYTC personnel and consultants and will be funded through the incremental funding process described in the RFA. Specific activities to be conducted under this Task are shown in Table 3, grouped by eligible material.

**Table 3. Task 3 Activities Anticipated for All Eligible Materials.**

Construction Project Identification	Eligible Material for Activity			
	Concrete (Cement)	Asphalt	Steel	Glass
3.1 Development of Task 3 Implementation Process Reports	X	X		
3.2 Identify construction projects	X	X		
3.3 Develop a plan for incorporation of LCTM on construction projects	X	X		
3.4 Development of project-specific construction contract language	X	X		
3.5 Task 3 industry outreach and coordination	X	X		
3.6 Task 3 training	X	X		

**3.2.4. Task 4 - Use of LCTM on Projects**

Activities under this Task include the final selection of eligible 23 U.S.C. projects for use of LCTMs from the potential project list, discussed under Task 3. Additional activities will involve developing a methodology to determine the incremental costs associated with an LCTM project. Along with material costs, a methodology for evaluating other costs associated with the use of LCTMs needs to be developed for those costs to be included. KYTC staff, consultants, and university partners will explore the best methodology to include costs on existing projects or new construction and applicable Federal cost principles will be followed. This may include costs for a contractor to mobilize for the project (e.g., temporary materials silo) or additional workforce training or certification. This work will be conducted primarily by KYTC staff and consultants, with some assistance from university partners, and will be funded through the incremental funding process described in the RFA, or the incentive amount process described in the RFA, or both. Specific activities to be conducted under this Task are shown in Table 4, grouped by eligible material.

**Table 4. Task 4 Activities Anticipated for All Eligible Materials.**

Use of LCTM on Projects	Eligible Material for Activity			
	Concrete (Cement)	Asphalt	Steel	Glass
4.1 Development of Task 4 Implementation Process Reports	X	X		
4.2 Identification of eligible Federal-aid projects	X	X		
4.3 Estimation of costs of LCTM	X	X		
4.4 Comparison of LCTM costs and traditional material costs	X	X		
4.5 LCTM bid items (added solely to facilitate use of LCTM)	X	X		

**3.2.5. Task 5 - Substantially Lower Embodied Carbon**

Activities under this Task include collecting EPDs and verifying compliance with the EPA ID. KYTC will, as necessary, add a pay item to construction contracts for EPD collection. Additionally, as applicable, KYTC will request and gather Energy Star Performance Scores from upstream material producers. Another important activity will be establishment of appropriate and necessary quality incentives as part of the developed special provisions or by other means within the construction contracting process. Any other additional KYTC costs incurred in the use of the LCTM in the specific project will be identified and reimbursement will be requested using the appropriate IPR process. All reimbursements will be in accordance with federal regulations and

cost control provisions. This work will be conducted primarily by KYTC personnel and consultants, with some assistance from university partners, and will be funded through the incremental funding process described in the RFA, or the incentive amount process described in the RFA, or both. Specific activities to be conducted under this Task are shown in Table 5, grouped by eligible material.

**Table 5. Task 5 Activities Anticipated for All Eligible Materials.**

Substantially Lower Embodied Carbon	Eligible Material for Activity			
	Concrete (Cement)	Asphalt	Steel	Glass
5.1 Development of Task 5 Implementation Process Reports	X	X		
5.2 EPD bid item	X	X		
5.3 Collection of Energy Star Performance score	X	X		
5.4 Quality incentives for environmental performance	X	X		
5.5 Other costs for the use of substantially lower carbon materials	X	X		

### 3.2.6. Task 6 - Quality Assurance and Acceptance

Accomplishing the activities under this Task requires close coordination between material providers, contractors, and KYTC personnel. The QA plan developed in Task 2 will be implemented with the understanding that changes may be required as it is rolled out. Pre-construction test strips can be placed to evaluate the testing included in the QA plan but also to ensure constructability and performance. Contractor engagement will be key and pre-construction test strips or mock-ups will provide opportunities to train contractor personnel on placement, finishing, and/or installation of the LCTM material in the field. It is possible that pre-construction evaluation will identify additional QA testing requirements and in turn, that may lead to the need for additional testing equipment and training. The QA plan will verify as-placed material meets both the developed GWP thresholds and the necessary engineering requirements. In some cases, this validation will require inspections at material production facilities to observe LCTM production, followed by testing to validate EPD compliance and to ensure key engineering properties are met. An important part of the QA plan will be the sampling process, which needs to be thorough without being onerous. Access to materials for sampling, and delays in construction due to testing, shall be minimized through cooperation and communication with all stakeholders. It may be necessary to provide quality incentives to achieve all desired properties for the LCTM construction.

This QA process may require testing utilizing third-party laboratories, consultants and university partners. These facilities will be accredited by appropriate standards organizations for the respective testing. Overall, this Task will be largely conducted by KYTC staff, with some consultant inspection and testing, and will be funded through the incremental funding process or the incentive amount process described in the RFA, or both. Specific activities to be conducted under this Task are shown in Table 6, grouped by eligible material.

**Table 6. Task 6 Activities Anticipated for All Eligible Materials.**

Quality Assurance and Acceptance	Eligible Material for Activity			
	Concrete (Cement)	Asphalt	Steel	Glass
6.1 Development of Task 6 Implementation Process Reports	X	X		
6.2 Construction of Task 6 LCTM test strip	X	X		
6.3 Additional testing equipment and/or testing required to accept low carbon materials	X	X		
6.4 Verification that material placed meets thresholds for substantially lower carbon	X	X		
6.5 Verification of engineering properties of the LCTM	X	X		
6.6 Quality incentives for engineering performance	X	X		

**3.2.7. Task 7 - Use of LCTM on Construction Projects**

Task 7 is associated with construction and post construction activities. KYTC will examine the construction documents and identify measures to minimize impacts that may stem from use of the LCTMs. As an example, maturity or in-situ strength measurement techniques may be employed to identify the time for opening a concrete placement to traffic. This will require a performance monitoring plan for each project to assess post-construction and long-term performance of LCTMs in actual construction. This work will largely involve university partners, but consultants may also have a role. As part of the long-term monitoring plan, reporting mechanisms will need to be established for providing data to KYTC and also for public dissemination through conferences and technical publications. KYTC will play a role in publishing results through research reports, but industry publications and academic journals will also play an important role. Publications and presentations at venues such as the Transportation Research Board will be critical to public dissemination. The activities will be funded through the incremental funding process, or the incentive amount process described in the RFA, or both. Specific activities to be conducted under this Task are shown in Table 7, grouped by eligible material.

**Table 7. Task 7 Activities Anticipated for All Eligible Materials.**

Use of LCTMs on Construction Projects	Eligible Material for Activity			
	Concrete (Cement)	Asphalt	Steel	Glass
7.1 Development of Task 7 Implementation Process Reports	X	X		
7.2 Develop project-specific performance monitoring plan	X	X		
7.3 Construction & placement costs of using eligible materials	X	X		
7.4 Results from long-term performance monitoring plan	X	X		
7.5 Incentives for using LCTM on project	X	X		

**3.3. Team Information****3.3.1. KYTC Personnel**

For this program, KYTC intends to work across many divisions within the agency. All work activities will be closely coordinated and communications across the agency will ensure the effective and efficient use of these LCTM funds. The administrative lead for the grant will be Greg Garner in the Division of Maintenance. Greg will be supported by the personnel listed below.

**A. State Highway Engineer's Office**

1. John Moore, P.E. – Deputy State Highway Engineer
2. Tracy Nowaczyk, P.E. - Assistant State Highway Engineer

**B. Division of Program Management**

1. Susan Oatman, P.E. – Grants Program Branch Manager
2. Beth Niemann, P.E. – Transportation Engineering Specialist

**C. Division of Materials**

1. Allen Myers, P.E. – Director
2. Robert Semones, P.E. – Asphalt Branch Manager
3. Michael Black, P.E. – Structural Materials Branch Manager
4. Wesley Glass, P.E. – Concrete and Cement Section Supervisor

**D. Division of Construction**

1. Matt Simpson, P.E. – Director
2. Mark Walls, P.E. – Contract Support Branch Manager

**E. Division of Maintenance**

1. Josh Rogers, P.E. - Director
2. Chad Shive, P.E. – Operations and Pavement Management Branch Manager

**3.3.2. Anticipated Partners**

**3.3.2.1. Consultants**

KYTC will advertise for consultant services to assist with managing the LCTM program, performing field testing and inspection during construction and performing laboratory testing. Firms will need to be prequalified in the area of Construction Engineering and have access to an AASHTO certified laboratory. Consultant Firms pre-qualified to perform work for KYTC can be found at the following link: [Professional Services | KYTC](#)

KYTC uses a Quality Based Selection process to select the firm best qualified to perform the work on a project based on demonstrated competence and qualification for the required type of professional services. As regulated by the Federal Brooks Act of 1972, 23 CFR § 172.7, the Kentucky Model Procurement Code (KRS 45A), and Title 600 KAR Chapter 6, the fee for the service is negotiated independently of the selection and should not be a criterion for choosing the most qualified firm.

**3.3.2.2. Universities**

KYTC currently has Memorandums of Understanding for Engineering and Technical services in place with the University of Kentucky, the University of Louisville and Western Kentucky University. KYTC also participates in research efforts at the National Center for Asphalt Technology at Auburn University. This research is conducted via the FHWA Transportation Pooled Fund Program.

### **3.3.2.3. Other Entities**

KYTC plans on engaging regional industry organizations as part of the stakeholder outreach and to assist with research efforts. These organizations include the following:

- Plant Asphalt Institute of Kentucky (PAIKY)
- Kentucky Concrete Association (KCA)
- Kentucky Association of Highway Contractors (KAHC)

KYTC will also engage national organizations such as the National Asphalt Pavement Association (NAPA) and the National Ready Mix Concrete Association (NRMCA) to provide a national perspective to activities occurring across the country.

### **3.4. Overall Readiness**

The management of the Low Carbon Transportation Material (LCTM) grant program will be under the oversight of Greg Garner, P.E. from the Operations and Pavement Branch within the Division of Maintenance at KYTC. Greg will work in close collaboration with several key divisions within KYTC. KYTC has limited experience with LCTM programs, however in his current role, Greg has experience in managing specialized pavement programs and has led the KYTC asphalt pavement micro surfacing program, including developing a Microsurfacing guide for KYTC and selecting appropriate projects. This effort included the development of specifications and testing protocols for this application. Key milestones and metrics have been identified to ensure adequate progress tracking and project management. These include procurement timelines for contracting with university resources and consultants, as well as staffing allocation and workload management to mitigate potential hurdles. The recently initiated e-ticketing process utilizing HaulHub will provide KYTC with the ability to streamline their approach to collecting and storing EPD information.

The cost estimate presented in this application is based on a review of current KYTC projects and assumptions made based on industry research. Contingency levels have been identified to address any scope, schedule, or budget risks, with appropriate risk-mitigation measures in place. Resources required for a successful program are included in this grant submission, along with contingency resources as needed. These contingencies include coordination of multiple resources through the use of KYTC, consultant and university personnel to assist in the development of the program. KYTC has support from the Cabinet leadership to coordinate work across all divisions to make this program a success.

### **3.4.1. Schedule**

The expected program schedule is shown in Figure 1 and is based on an award announcement in September 2024. It is anticipated that approval of the request for proposals will occur within the 3<sup>rd</sup> quarter of calendar year (CY) 2024. The project team anticipates that the procurement authorization will occur during the 3<sup>rd</sup> quarter or 4<sup>th</sup> quarter of CY 2024. Partnership agreements and contracts will be completed by the end of CY 2024. Highlights of the expected program schedule are briefly discussed below. Key milestones shown in Figure 1 include the approval of

the request for proposals, procurement authorization, and project partnership agreements and contracts.

The project team expects that Task 1 will commence immediately after a consultant is selected and continue for the first year of the program. Major efforts within Task 1 include needs assessments, outreach, training, EPD database efforts, and threshold identification. Task 2 will begin shortly after approval and include development of IPRs, QA and performance monitoring plans, outreach and training, specification development, preliminary mixture testing, identification and purchase of required equipment, test sections, LCTM and EPD verification, and training. The emphasis of Task 3 includes project identification and incorporation plans, contract language development, and outreach and training. This task is expected to continue through the construction seasons of the first two years of the program. Task 4 includes work associated with using LCTMs on actual construction projects and cost estimation. This task is expected to continue through the construction seasons of the first four years of the program. Tasks 5 and 6 are expected to occur at approximately the same time; highlights include the development and use of an EPD line item during project bidding, incentives for environmental performance, test section construction, equipment purchase, threshold and engineering property verification, and incentives for engineering performance. It is expected that these two tasks will occur over multiple construction seasons during the middle to later years of the program. Task 7 focuses on development of a monitoring plan, construction and placement costs, and reporting of monitoring results. This task will occur during the last phases of the study given the performance reporting components. Details not shown on the schedule (but expected to occur) include the submission of IPRs for each task, other reporting activities for local agency and industry stakeholders, and participation in any FHWA-sponsored technical dissemination activities.

**Table 8. Anticipated Program Schedule.**

Task	CY 2024		CY 2025				CY 2026				CY 2027				CY 2028				CY 2029				CY 2030				CY 2031				
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
1 - Process for Substantially Lower Embodied Carbon		X	X	X	X	X	X	X	X																						
2 - LCTM QA and Specifications		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									
3 - Construction Project Identification		X	X	X	X	X	X	X	X	X	X	X																			
4 - Use of LCTMs on Projects		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X															
5 - Substantially Lower Embodied Carbon		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
6 - Quality Assurance		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X													
7 - Use on Materials on Construction Projects		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

### 3.4.2. Project Risks and Mitigation Strategies

KYTC has a proven track record of responsibly and effectively utilizing federal funds towards eligible projects in Kentucky. KYTC has established processes in place to ensure federal funding is spent in a manner that respects project funding eligibility and maintains compliance with all related federal laws and regulations.

Due to the innovative programs funded through this grant, outreach to other state DOTs will be an effective tool to share experiences and mitigate program risks. KYTC will also work closely with Kentucky’s FHWA Division office to keep them apprised of all activities associated with the grant and discuss any concerns as they arise.

While KYTC is confident that this program will be successful, there are outside factors that can affect different aspects of project delivery. For example, legislative actions, materials cost escalation and availability of qualified labor among others. The KYTC team is a cross agency group with experience in many aspects of project delivery and is confident that the LCTM program can be delivered successfully.

### 3.5. Eligible Application Factors

The LCTM program RFA identifies key factors to be reviewed in the application process. Table 9 identifies where each of these items are addressed in the application.

**Table 9. Summary of Where Application Review Factors are Addressed.**

Application Factor	Application Subfactor	Task(s) Addressing
Factor #1	Identification of eligible construction materials	Task 1
	Energy Star Performance Score	Task 5
	EPD Process	Task 1
	Substantially Lower Embodied Carbon Threshold	Task 1
Factor #2	Material Specification	Task 2
	Verification Process	Task 6
	Engineering performance monitoring	Tasks 6, 7
Factor #3	General Approach to incorporate LCTMs on construction projects	Task 3
	Industry Outreach	Tasks 1, 2, 3
	Calculating Incentive or Reimbursement for Materials with “Substantially Lower GWP” on Construction Projects	Task 4
	Identify specific construction projects and materials	Tasks 1, 3
Factor #4	Schedule and Budget	Volume 2



#### **4. References**

##### **Additional Supporting Documentation**

###### **Exhibit A**

This exhibit contains a list of potential LCTMs being considered for use by KYTC during the LCTM program.

###### **Asphalt:**

- 1) Warm mix asphalt (WMA)
- 2) Use of higher Reclaimed Asphalt Pavement (RAP) contents including RAP management processes and fractionation techniques
- 3) Asphalt rejuvenators
- 4) Non-pavement recycled content such as plastics, ground tire rubber, etc.
- 5) Pavement recycling techniques such as Cold In-Place Recycling (CIR) and Full Depth Recycling (FDR)
- 6) Recycled materials use in preservation treatments
- 7) Asphalt binder modification such as polymer modified binders and bio-based binders
- 8) Modified plant practices such as covered stockpiles and energy efficiency

###### **Concrete/Cement:**

- 6) Optimized normal and lightweight concrete mixtures with low total cementitious content for applications such as overlays and mass concrete
- 1) Low carbon cements such as: Portland limestone cements (Type 1L), blended cements (e.g., ternary cement blends, LC3/LC2 systems)
- 2) Conventional and alternative supplementary cementitious materials (SCMs) such as: coal ashes, reclaimed coal ashes, calcined clay, ground glass, microsilica and slag
- 3) Alternative cementitious materials
- 4) Carbon-negative additives (e.g., biochar, carbon black)
- 5) Additives such as: nano additives and chemical admixtures

###### **Exhibit B**

The project team will review KYTC's 2024 Enacted Six Year Highway Plan and KYTC's pavement prioritization list for 23 U.S.C. eligible projects and select applicable concrete/cement projects from this list based on the outcomes of Tasks 3 and 4.

###### **Exhibit C**

The project team will review KYTC's 2024 Enacted Six Year Highway Plan and KYTC's pavement prioritization list for 23 U.S.C. eligible projects and select applicable asphalt projects from this list based on the outcomes of Tasks 3 and 4.