

CHICAGO LOW-CARBON TRANSPORTATION MATERIALS PROGRAM

Low Carbon
Transportation Materials
Grant Application
Submitted November 2024





Table of Contents

Key Applicant Information..... 1

Program Narrative..... 3

 Relevant Agency History and Context 3

Project Description 4

 Overview 4

 Technical Description 4

 Task 1: Process for Substantially Lower Embodied Carbon 5

 Task 2: LCTM Quality Assurance (QA) and LCTM Specifications 6

 Task 3: Construction Project Identification 7

 Task 4: Use of LCTM on Projects 7

 Task 5: Substantially Lower Embodied Carbon 8

 Task 6: Quality Assurance and Acceptance..... 8

 Task 7: Use of LCTM on Construction Projects 9

List of Process Development Activities 10

List of Projects and Required Approvals 10

Merit Criteria 11

Schedule and Budget 11

Overall Readiness..... 11

Project Risks and Mitigation Strategies 12

Administration Priorities and Departmental Strategic Goals 12

 Safety 12

 Climate Change and Sustainability 12

 Equity and Environmental Justice 13

 Workforce Development, Job Quality, and Wealth Creation 13



List of Tables

Table 1. LCTM: Applicant Information1

Table 2. LCTM: Federal Funding Information.....1

Table 3. LCTM: Federal Funding Information – By Material.....1

Table 4. Additional NOFO Requirements1

Table 5. LCTM External Partnerships2

Table 6. List of Process Development Activities by Task.....10

Table 7. List of Potential LCTM Construction Projects10

Table 8. Summary of Where Merit Criteria are Addressed11

Table 9. Summary Program Schedule11

List of Appendices

- Appendix A: Chicago Department of Transportation LCTM Team
- Appendix B: List of Letters of Support
- Appendix C: List of Concrete/Cement and Asphalt LCTMs
- Appendix D: Potential LCTM Construction Projects
- Appendix E: ETC Explorer

Project Website:

ChicagoLowCarbonTransportationMaterials.cnectchicago.com



Key Applicant Information

Table 1. LCTM: Applicant Information

Organization Name	Chicago Department of Transportation
Entity Type	Unit of local government <input checked="" type="checkbox"/>
	Political subdivision of a State <input type="checkbox"/>
	Territory of the United States <input type="checkbox"/>
	Tribal Government or entity as described in 23 U.S.C. 207(m)(1) <input type="checkbox"/>
	Recipient of funds under 23 U.S.C. 203 <input type="checkbox"/>
	Metropolitan planning organization (MPO) (as defined in section 23 U.S.C.134(b)(2)) <input type="checkbox"/> add Special purpose district or public authority with a transportation function <input type="checkbox"/>
Unique Entity Identifier	NFECXMGA3MJ4
Application Description	The Chicago Department of Transportation (CDOT) plans to develop the new Chicago Low Carbon Transportation Material Program that will identify and provide a framework for eligible low greenhouse gas emissions for concrete/cement, and asphalt. The framework will include specifications and procedures for collecting and developing Environmental Product Declarations, training on the use and implementation of low carbon transportation materials, identifying suitable construction projects, and reporting.
Primary Contact	Mr. Sean Guzik, P.E. CDOT Assistant Chief Engineer Materials & Quality Assurance sean.guzik@cityofchicago.org (312) 744-1861
Secondary or Technical Contact	Grant Davis CDOT Director of Grants Management grant.davis@cityofchicago.org (312) 744-3528

Table 2. LCTM: Federal Funding Information (Detailed budget provided with "Volume 2" app template)

Total LCTM Federal Funding Requested	\$19,999,995	
Application includes an applicable State DOT as a pass-through entity (Refer to NOFO Section B.3)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Federal Funds for LCTM Process Development*		\$5,141,300
Federal Funds for LCTM Construction Projects*		\$14,858,695
Does Application include scalable options? See NOFO sec. D.6.i "Scalable Project Options"	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Scalable – minimum funding amount that will fund sufficient work to achieve objectives of program – Total LCTM Federal Funding Requested	Leave blank if not scalable	\$10,000,000
Scalable – minimum funding amount that will fund sufficient work to achieve objectives of program – Federal Funds for LCTM Process Development	Leave blank if not scalable	\$3,000,000
Scalable – minimum funding amount that will fund sufficient work to achieve objectives of program – Federal Funds for LCTM Construction Projects	Leave blank if not scalable	\$7,000,000

*The lines for Process Development and Construction should sum to the Total LCTM Federal Funding Requested line

Table 3. LCTM: Federal Funding Information - By Material

EPA Interim Determination Material Purchase Category	Select if Yes	Federal Funds for LCTM Process Development	Federal Funds for LCTM Construction
Concrete	<input checked="" type="checkbox"/>	\$2,570,650	\$7,429,347
Asphalt Mix	<input checked="" type="checkbox"/>	\$2,570,650	\$7,429,347
Steel	<input type="checkbox"/>	\$	\$
Glass	<input type="checkbox"/>	\$	\$

Table 4. Additional NOFO Requirements

Applicant confirms that none of the range of potential construction projects to receive funds from the LCTM program will result in additional travel through lanes for single occupancy vehicles.	Yes <input checked="" type="checkbox"/>
Applicant confirms that they will submit an Implementation Process Report per guidance in Section F, Subsection (3) (iii) of the NOFO prior to any construction activity.	Yes <input checked="" type="checkbox"/>



Table 5. LCTM External Partnerships

Partner Organization	Role	Details
Gannett Fleming / Transystems (GFT)	Consultant	GFT is the prime consultant and Program Manager for the Quality Program Management Consultant (QPMC). The firm specializes in program management, Quality Control/Quality Assurance, material testing oversight, drafting of design specifications, and managing CDOT’s Construction Materials Quality Assurance (CMQA) website. GFT will be responsible for overall management of tracking and activities in Tasks 1 – 7, engineering design, bid items, specification, and cost and schedule estimating. GFT leadership is provided by Mr. Greg Duntz, P.E., Program Manager.
S.T.A.T.E. Testing, LLC (STATE)	Consultant	STATE is a professional engineering firm specializing in consultation and testing of construction materials, specifically concrete and HMA mix designs, mixture performance testing, forensic investigations, and asphalt binder testing. STATE has material laboratories that are AASHTO Materials Reference Laboratory (AMRL) & Cement and Concrete Reference Laboratory (CCRL) accredited. STATE has extensive experience and an in-depth knowledge of the City of Chicago’s transportation network, materials technology and state and federal engineering material requirements. STATE leadership will be provided by Mr. Steve Worsfold, P.E., Senior Materials Engineer.
Illinois Department of Transportation – Central Office & District 1 Bureau of Materials	Agency Partner	In Illinois, IDOT has statutory responsibility for the planning, construction, operation and maintenance of Illinois' extensive transportation network, which encompasses highways and bridges, airports, public transit, rail freight and rail passenger systems. This vast transportation system supports the fifth largest state in the nation. IDOT is divided geographically into nine Districts – Chicago is situated in District 1. Central Office in Springfield, Illinois and District 1 in Schaumburg, Illinois will both be key partners in the Chicago LCTM Program.
Illinois Road and Transportation Builders Association (IRTBA)	Industry Associations	IRTBA has served as the leading transportation industry trade association in Illinois since 1938. IRTBA member firms design, build, and maintain the state highways, transit systems, railways, and aviation systems in Illinois. The core purpose of IRTBA is to advance and promote the transportation design and construction industry in Illinois. The IRTBA Sustainability Council was established in 2008 to develop an environmental conscience while designing and building sustainable infrastructure. The objectives for the Council are: 1) to build public awareness and education; 2) to research technical and regulatory aspects of projects; 3) to research and define a sustainability metric as it applies to design and construction in the transportation industry; 4) to form partnerships with a variety of both public and private agencies.
Illinois Ready Mix Concrete Association (IRMCA)	Industry Associations	IRMCA is a non-profit trade organization that represents Illinois ready mix producers, suppliers and contractors. As an organization, their purpose is to achieve common goals such as education & training, promotion and advocacy that cannot be met individually. IRMCA strives to be the voice of the ready-mix industry in Illinois and ceaselessly promote the increased use of high quality, durable, and sustainable concrete.
Illinois Asphalt Pavement Association (IAPA)	Industry Associations	IAPA is a nonprofit trade association composed of Hot Mix Asphalt producers serving the Illinois market and affiliated companies. IAPA’s mission objectives are: 1) promote the improvement and advancement of quality asphalt pavement construction in Illinois; 2) provide assistance to members in the areas of research, technical specifications, environmental issues, education, promotion, government relations, and other related areas; 3) educate potential owners and designers of asphalt pavements as to the pavement's characteristics and benefits.
Ozinga Ready Mix Concrete (PCC) Prairie Materials / VCNA (PCC) Ogden Avenue Materials (HMA)	Material Supplier	Local Portland cement concrete and Hot-mix asphalt material producers and suppliers that are actively engaged in the Industry Associations listed above, engaged in Agency (IDOT & CDOT) coordination and open to innovative and emerging technology trials and pilot projects to advance the state-of-the-art industry knowledge and experience in the Chicagoland area.



Program Narrative

Relevant Agency History and Context

The Chicago Department of Transportation (CDOT) intends to undertake a comprehensive program to use construction materials and products that have “substantially lower”¹ levels of embodied greenhouse gas (GHG) emissions associated with the production stage as compared to the estimated industry averages of similar materials or products. CDOT plans to implement the Chicago Low Carbon Transportation Materials (LCTM) Program which will focus on lowering the carbon footprint and improving durability of Portland Cement Concrete (PCC) and Hot-Mix Asphalt (HMA) incorporated into the City of Chicago’s transportation infrastructure.



This program will help the City of Chicago to reach its goal of reducing the City’s GHG emissions by 67% by 2040 as specified in the [2023 Chicago Climate Action Plan Addendum](#). CDOT uses approximately 300,000 cubic yards of concrete, and 500,000 tons of asphalt annually. For these materials, the use of low carbon alternatives over traditional sources can begin to make strides towards reducing the City’s transportation infrastructure carbon footprint. The framework developed as part of this program will increase the availability and use of LCTMs and provide a basis for environmental quantification techniques for their use.

CDOT’s goal is to meaningfully reduce its carbon emissions tied to construction materials, while simultaneously ensuring the performance of the modified mixes meet the City’s needs. Therefore, the Chicago LCTM Program will be incorporated into the current CDOT Materials and Quality Assurance Program, responsible for engineering services in support of CDOT’s quality program standards, including the inspection, physical testing, and documentation of construction materials used in City infrastructure projects. This program has been active in this role for the last 20+ years, incrementally increasing its scope and responsibilities to ensure innovative, sustainable, durable, and quality materials and construction infrastructure for the City of Chicago. The Chicago LCTM Program CDOT Team is included in *Appendix A*.

Within the Chicago LCTM Program, CDOT will establish a baseline of the City’s current innovative and sustainable low carbon PCC and HMA mixtures and compare them to existing national standards established by the FHWA, National Ready Mix Concrete Association, and National Asphalt Pavement Association; collaborate with partner agencies and industry to identify opportunities to lower carbon contents beyond current CDOT requirements; draft new

¹ 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.



specifications and procedures for collecting EPDs; and create agency-specific EPD thresholds for PCC and HMA mixtures used in the City. CDOT will then use the skills developed and information gathered from the first phase of the LCTM Initiative to revise material specifications; implement LCTM test strips to ensure mixture viability and durability; establish a Sustainability Team to monitor and guide the City's low carbon materials efforts; and to educate the engineering and industry partners who participate in the City's transportation program.

CDOT understands that the Illinois Department of Transportation (IDOT) is currently considering its own LCTM program and intends to create a similar program for Chicago that addresses Chicago-specific needs while fulfilling similar state-wide program LCTM activities. Collaboration with IDOT and the Illinois State Toll Highway Authority (Tollway) will ensure that CDOT's efforts align and progressively build on the contributions of each agency towards a lower carbon future, through participation in the Illinois State Transportation Innovation Leadership Team (IL STILT) and regular coordination meetings.

In addition to IDOT and the Tollway, CDOT currently partners with six county agencies within the Chicagoland area (Cook, DuPage, Kane, Lake, McHenry, and Will) and FHWA Illinois Division in the Construction and Materials Asset Management Committee to share ideas, and the results of innovative or emerging technologies for the benefit and efficiency of all agencies.

CDOT will also collaborate with and rely upon the experience and resources of local industry contractors, material suppliers, and engineering and material consultants. The infrastructure and materials industry in the Chicagoland area is proactive and state-of-the-art, contributing to recent sustainable initiatives, including asphalt rejuvenators, concrete carbon sequestration and an upcoming commercial pilot to create micro-kilns for low-carbon modular cement production (a partnership between a local concrete supplier, Ozinga Ready Mix and Furno Materials).

Letters of Support for the Chicago LCTM Program are included in the *Appendix B*.

Project Description

Overview

CDOT intends to establish the Chicago LCTM Program for development activities and use of LCTM concrete/cement and asphalt mixtures. As part of the program, CDOT 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. If material costs increase in pursuit of sustainability, CDOT will perform robust life cycle cost analysis to ensure the mix changes are justified and warranted.

Additionally, CDOT will specify the use of LCTMs in construction projects and will establish procedures to monitor and report the performance of those projects after construction. CDOT's program will be implemented through a number of Tasks that in turn encompass subtasks or "activities," presented in the Technical Description below to accomplish the program goals outlined in the NOFO. 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 funds are obligated for construction projects, as established in the NOFO requirements.

Technical Description

After receiving notification of award for this grant, and receiving a notice to proceed, CDOT will engage with its Quality Program Management Consultant (QPMC) to assist the agency in



developing a series of IPRs to launch the program. The CDOT QPMC Team will be engaged in the earliest stages of the program to achieve the tightest possible schedule and expedite the program. Additional IPRs will be developed, if needed, as the program evolves. CDOT will send IPRs to FHWA for approval and be responsive in addressing comments such that approval is obtained. Furthermore, CDOT acknowledges that IPR approval is needed before LCTM fund can be obligated for various activities, including construction projects, and that funds will be obligated before September 30, 2026.

In addition to developing the IPRs, other Tasks envisioned at this time are summarized in the following sections. Specific activities to be conducted under each Task are described below and summarized in **Table 6**. Each activity will be conducted for both concrete/cement and asphalt. **Appendix C** provides a list of LCTMs being considered for use in the Chicago LCTM program.

Task 1: Process for Substantially Lower Embodied Carbon

Task 1 sets the foundation for future Tasks described below 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 the Chicagoland area; engaging in stakeholder outreach including contractors, material providers, environmental advocates, etc. 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); identification of local or regional embodied carbon thresholds; launching training activities for agency personnel, contractors, and materials providers. This work will be conducted primarily by consultants and will be funded through the incremental funding process described in the NOFO.

The collection of EPDs will require cooperation with material providers. The collection process will begin with investigating 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.

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). The NOFO provides two (2) options to establish thresholds for each eligible material. Those 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), asphalt mix, steel, and/or glass, following accepted International Organization for Standardization (ISO) standards to develop thresholds². As part of the IPR for Task 1, CDOT will establish thresholds for concrete/cement and asphalt using Option (2).

CDOT's ongoing efforts balance sustainability and performance to achieve concrete and asphalt mix designs with high recycled material content and performance characteristics fit for urban streets and traffic levels, northern climate, and significant underground utility cuts. These efforts and collaboration with material industry partners have resulted in concrete mix designs with high percentages of supplementary cementitious materials, hot-mix asphalt mix design with high asphalt binder replacement (ABR) utilizing reclaimed asphalt pavement. After local benchmarking efforts are realized as part of this grant initiative, CDOT looks forward to comparing current efforts

² When following Option 2 CDOT shall disclose the 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.



against established embodied carbon thresholds published by FHWA to highlight current advancements and identify future enhancements to determine new local Global Warming Potential (GWP) thresholds, and strategies to advance the goals of this grant initiative.

One area of opportunity regarding concrete/cement: CDOT is currently forced to use straight cement mixes for quicker set times in cold weather to thwart vandalism and impacts from traffic. Ideally, we learn how to develop low carbon mixes for these situations which are still set quickly enough to meet our unique needs. Utilizing LC3 and/or specialty blended performance cements, alternative SCMs, CSH seeding, aggregate optimization, novel accelerators/admixtures, or a combination of all, are needed to meet those challenging situations. In-situ strength monitoring using maturity meters may also be helpful to target exact opening times. One area of opportunity regarding HMA: CDOT routinely uses high asphalt binder replacement (ABR) mixes by incorporating large percentages of reclaimed asphalt pavement (RAP). We expect to place low carbon HMA mixtures by utilizing knowledge learned from a successful LCTM grant. These low carbon mixes could be used to assist the City with their massive In-House paving program (250k tons per year over thousands of miles of City streets) by lowering heat thresholds, yet still be able to adequately place and compact those mixes. Warm mix additives, cold-in-place recycling, bio-based asphalts, recycled oils - there are many opportunities for the City to lower our embodied carbon footprint and yet still build a long-lasting infrastructure.

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 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 processes.

Activities under Task 2 include development of a QA plan as well as a plan for monitoring 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; existing material testing such as hardened air analysis, freeze/thaw durability, Hamburg Wheel performance, DCT/iFIT, etc. will be conducted on proposed LCTM's to ensure viability prior to use. 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 durability and resilience of LCTM concrete and asphalt mixtures. New technologies available for AI driven pavement condition ratings may be utilized to provide highly specific assessments of material performance in the short and long term. Updating existing specifications or developing special provisions for new materials will follow from developing preliminary mixture designs in the laboratory and limited field testing, including test strips to ensure constructability.

Other activities under Task 2 are 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 providers and may involve changes to processes and equipment used to batch and deliver construction materials to a job site. There are emerging technologies for ready-mix concrete trucks, for example, that provide EPD verification with batch tickets. Use of this type of



reporting and similar reporting for other LCTMs will require CDOT validation. The use of electronic ticketing will be investigated and expanded for identification of incorporated LCTMs.

The work in Task 2 will be conducted primarily by consultants and will be funded through the incremental funding process described in the NOFO. CDOT's QPMC will lead specification writing and the assessment of laboratory capabilities, with input and oversight from agency staff. And throughout this Task, there will be additional need for training of agency and consultant personnel, as well as training contractor and material producer's personnel.

Task 3: Construction Project Identification

Task 3 includes identifying eligible 23 U.S.C projects. Given the time span between grant initiation and project construction, it is difficult to predict which projects will be used. Potential projects are discussed below and presented in the Additional Supporting Documentation.

In addition to these potential projects, CDOT will work to identify additional construction projects throughout the City with the intent to represent its economic and geographic diversity.. The focus will be high-impact projects or locations, along with public outreach (e.g., informational signage) to inform the residents of the City's decarbonization and performance enhancement efforts. CDOT will also look to identify projects which are not schedule intense for opportunities to utilize concrete mixes which may require additional time to meet design strength. As part of Task 3, the preliminary lists of LCTMs developed in Task 1 will be aligned with opportunities 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 and industry partners, the best application for LCTM technologies will be identified, ensuring the best chance of success for each selected technology. CDOT intends to identify a wide range of applications for varied use of LCTM materials. Examples include identifying high SCM replacement concrete mixes for use in low water/cement applications such as curb and gutter; different LCTM technologies may be utilized for concrete mixes which will never endure freeze/thaw conditions such as drilled shafts; or, cold in place recycling with high ABR warm mix asphalt mixes may be considered for local street paving.

As part of this task, CDOT will work with industry stakeholders, to develop a plan for incorporation of LCTMs on construction projects. Plan elements will include material procurement, mixture design submittal processes, establishing contractor capabilities for construction and quality control, and acceptance criteria. This plan will then be integrated into a larger activity of developing project-specific construction contract language. Contract writing will be conducted primarily by CDOT and consultants and will be funded through the incremental funding process described in the NOFO.

Task 4: Use of LCTM on Projects

Task 4 activities include paring down the preliminary project list, developed under Task 3, and provided with this grant application, to select final projects for use of LCTMs. Additional activities will involve developing a methodology to determine the incremental costs associated with an LCTM project as well as evaluating other costs associated with using LCTMs. Though not a direct cost, one particular focus for the City is to identify and manage construction of concrete elements that impact construction schedule of incorporating specific LCTMs. That is, if a new LCTM mix is developed, will it slow the pace of construction and extend the overall time for construction, ultimately increasing the "user cost." This is an important consideration for any major metropolitan



area; however, Chicago is particularly vulnerable to condensed construction seasons given the northern climate.

CDOT QPMC consultants will explore the best methodology to include costs and schedule impacts on existing projects or new construction, following applicable Federal cost principles. This may include costs for a contractor to mobilize for the project (e.g., temporary materials silo) or additional workforce training or certification. Consultants will also explore the best methodology to include costs and schedule impacts on existing projects or new construction. CDOT will evaluate potential options to provide incentives to contractors to propose and use LCTMs meeting the program requirements. This work will be funded through the incremental funding process described in the NOFO, or the incentive amount process described in the NOFO, or both.

Task 5: Substantially Lower Embodied Carbon

Activities under Task 5 include collecting EPDs and verifying compliance with the EPA ID. CDOT, as necessary, will add a pay item to construction contracts for EPD collection. As applicable, the agency will request and gather Energy Star Performance Scores from upstream material producers. Another important activity will be the 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 agency 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 agency personnel and consultants and will be funded through the incremental funding process described in the NOFO, or the incentive amount process described in the NOFO, or both.

Task 6: Quality Assurance and Acceptance

Accomplishing the activities under Task 6 requires close coordination between material providers, contractors, CDOT personnel and agency consultants. 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 will 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 and consultants. However, the program will follow Stewardship and Oversight requirements outlined by the FHWA division office. Overall, Task 6 will be largely conducted by consultants and will be funded through the incremental funding process or the incentive amount process described in the NOFO, or both.

Task 7: Use of LCTM on Construction Projects

Task 7 is associated with construction and post construction activities. CDOT will examine construction documents and identify measures to minimize impacts that may stem from use of 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. As another example, in-situ asphalt binder grading of HMA pavements may be needed to ensure long-term resilience and flexibility of the mix. 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 consultant partners. As part of the long-term monitoring plan, reporting mechanisms will need to be established for providing data to CDOT and for public dissemination through conferences and technical publications. CDOT will play a role in publishing results of their project experiences but inter-agency cooperation with IDOT and the Tollway to present regional results will also play an important role. Publications and presentations at venues such as the Illinois Transportation and Highway Engineering Conference, and 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 NOFO, or both.





List of Process Development Activities

Table 6 lists the process development activities accomplished under each task.

Table 6. List of Process Development Activities by Task

Task	Activities	Description
1	Process for Substantially Lower Embodied Carbon	Development of Implementation Process Reports; Consultant support to identify eligible materials, training needs, additional data, and special provision development; Stakeholder outreach; Development of a process to collect and store EPDs; Identification of local or regional "substantially lower" embodied carbon thresholds that meet ISO acceptable practices; LCTM Training
2	LCTM Quality Assurance (QA) and LCTM Specifications	Development of Implementation Process Reports; Development of QA Plans and/or Performance Monitoring Plan for the LCTM; Stakeholder outreach; Update of existing material specifications or development of new special provision to facilitate use on projects; Preliminary mixture design and testing to evaluate materials; LCTM Test Strips; Development of a verification process for LCTM and EPDs, including electronic ticketing/documentation; Training
3	Construction Project Identification	Development of Implementation Process Reports; Identify construction projects; Develop a plan for incorporation of LCTM on construction projects; Development of project-specific construction contract language; Industry outreach and coordination; Training
4	Use of LCTM on Projects	Identification of eligible Federal-aid projects; Estimation of costs and schedule impacts of LCTM; Comparison of LCTM costs and traditional material cost; LCTM Bid Items (added solely to facilitate use of LCTM), Evaluate potential incentive specifications
5	Substantially Lower Embodied Carbon	EPD bid item; Collection of Energy Star Performance score; Quality incentives for environmental performance; Other costs for substantially lower carbon materials use
6	Quality Assurance and Acceptance	LCTM test strip; Additional testing equipment and/or testing required to accept low carbon materials; Verification that material placed meets thresholds for substantially lower carbon; Verification of engineering properties of the LCTM; Quality incentives for engineering performance
7	Use of LCTM on Construction Projects	Develop project-specific performance monitoring plan; Reporting results from long-term performance monitoring plan

List of Projects and Required Approvals

Table 7 below lists projects with appropriate construction timelines that could incorporate and benefit from LCTM materials. The Arterial Street Resurfacing Program is ongoing. Information regarding project description, schedule, required approvals, and public outreach is included in the **Appendix D**.

Table 7. List of Potential LCTM Construction Projects

Project Type	Project Name	TIP ID	Construction Year	Programmed Funding Amount
Roadway Resurfacing	Arterial Street Resurfacing 2027	01-22-0037	2027	\$40M
	Arterial Street Resurfacing 2028	01-22-0038	2028	\$40M
	Arterial Street Resurfacing 2029	01-24-0011	2029	\$40M
Streetscape / Complete Streets	ISW Humboldt Park Streetscape – North Ave from Kostner Ave to Kedzie Ave	01-23-0005	2027	\$25M
Bridge / Viaduct	California Ave Bridge over Sanitary and Ship Canal	01-23-0004	2027	\$33M
Street Improvement / Reconstruction	OPC Mobility Improvements to Support the Update to the South Lakefront Framework Plan – Package #3	01-17-0025	2028	\$60M



Merit Criteria

Table 8 summarizes where throughout this document the merit criteria are addressed.

Table 8. Summary of Where Merit Criteria are Addressed

Merit Criterion	Application Subfactor	Task(s) Addressing
Substantially Lower Embodied Carbon Identification	Identification of eligible construction materials	Task 1
	Energy Star Performance Score	Task 5
	EPD Process	Task 1
	Substantially Lower Embodied Carbon Threshold	Task 1
Quality Assurance and Materials Acceptance	Material Specification	Task 2
	Verification Process	Task 6
	Engineering performance monitoring	Tasks 6, 7
Use of Materials and Products on Construction Projects	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
Schedule and Budget	Schedule and Budget	Volume 2

Schedule and Budget

The program schedule in **Table 9** below identifies key milestones, including federal funding milestones, and ensures that all eligible activities will be completed before the expiration of funds on 9/30/2031. A detailed schedule and budget is provided in **Volume 2**.

Table 9. Summary Program Schedule

Start Date	Completion Date	Funds Appropriated	Task - Milestone
Upon Grant Award	1/1/2026	TBD	EPD Training, Evaluation of Current Mixes, and Target Specification
	9/30/2031	TBD	Secure Additional Consulting Firm Contract(s)
	9/1/2031	TBD	Inter-Agency Collaboration and Industry Outreach
3/1/2025	9/30/2026	TBD	Generation of IPRs for Each Task Identified in the Application
5/1/2025	5/1/2026	TBD	Develop QA Plan and New LCTM Specifications
9/1/2025	1/1/2027	TBD	Develop new LCTM mixes, Evaluate Performance (Lab and Field)
9/1/2025	5/1/2026	TBD	Identification of Construction Projects for LCTM usage
1/1/2027	9/1/2031	TBD	Implementation of LCTMs in Construction Projects
6/1/2031	9/1/2031	TBD	Final Evaluation of LCTM Performance and Reporting of Results

Overall Readiness

The CDOT QA/QPMC team is currently engaged and ready to implement the LCTM program as soon as approved. The CDOT QA Section is a well-established group within the Department, and the LCTM Program will fit right into current CDOT QA objectives and priorities. **Appendix C** list of LCTMs being considered for use in the CDOT LCTM program. The lists for PCC and HMA were developed by the CDOT QPMC team in the Summer 2024 to catalogue current achievements and future enhancements for sustainable and performance-based material decisions. The CDOT



QA and QPMC team regularly meet with sister agencies and material suppliers in industry to review new technologies and test emerging and innovative material products. The LCTM Grant will assist in prioritizing and accelerating a part of the CDOT Materials and Quality Program that is of core importance to the CDOT QA leadership team.

Project Risks and Mitigation Strategies

The most significant risk to success is not having clearly identified goals, timelines, and a leadership team to implement the necessary steps at the right time. The skills, experience, and diversity of the team is vital to the successful completion of the work outlined in this application. CDOT is confident that its proven track record of productive collaboration with other agencies, engineering consultant teams, and industry partners will help ensure mis-steps or setbacks in implementation will be minimized. CDOT will also look to other state and non-state highway agencies to learn from them and their best practices. Because of the vast size and number of participants in this unique funding opportunity, CDOT will actively pursue working relationships with other LCTM grant awardees.

CDOT has extensive experience in managing federal-aid highway program funds. In a typical year, CDOT manages a federal program valued at approximately \$100 million but which can exceed \$300 million. These programs include STP, CMAQ, TAP, Major Bridge, HPP, NHFP, and TIGER. Projects range from resurfacing arterial streets to reconstructing major structures such as the 43rd St Pedestrian/Bike Bridge over Lake Shore Drive, the Navy Pier Flyover, and the 606 Trail. CDOT also manages a state funded program of over \$100 million per year and a local program in excess of \$200 million. CDOT works closely with its partners at IDOT, Cook County Department of Transportation and Highways, and the FHWA to ensure projects are delivered on time and within budget.

Administration Priorities and Departmental Strategic Goals

Safety

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. Additionally, all Chicago transportation projects implement Complete Streets policy and prioritize safety improvements in accordance with CDOT's 2021 [Strategic Plan](#) and the [Vision Zero Plan](#), and outlined in the 2024 [Guidelines for the Evaluation of Complete Streets Design Elements](#). The projects selected to be part of the LCTM Program are important infrastructure improvements that advance Chicago's safety goals.

Climate Change and Sustainability

USDOT has undertaken 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 Chicago LCTM Program will adhere to the tenets of these programs and others. A central component of this program is to comply with the EPA 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.



Currently the CDOT Materials and Quality Assurance Program works to ensure innovative, sustainable, durable, and quality materials and construction infrastructure. However, there are knowledge gaps and limited processes that allow for leveraging low carbon materials efficiently and systematically throughout the City. The Chicago LCTM Program will develop tools for CDOT to deploy and will also develop benchmarks and realistic goals for carbon emissions reductions across CDOT's construction projects.

Equity and Environmental Justice

CDOT's proposal for low-carbon asphalt and concrete falls in line with the goals of the [City of Chicago 2023 Environmental Justice Action Plan](#), as directly addresses environmental justice by reducing the pollution burden on communities already facing high environmental risks. The city's main asphalt and concrete suppliers are located near or within an environmental justice community—a neighborhood disproportionately affected by industrial pollution and its associated health impacts (*See SF-424, Item 14, Appendix E*). Implementing LCTM not only aligns with the city's climate goals but also supports fair environmental practices by reducing toxic exposure for residents in these underserved areas. In turn, this could improve community health, enhance local air quality, and signal a commitment to equitable environmental solutions.

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). CDOT has carefully selected the project that will participate in the LCTM Program and maximize its impact. As described in CDOT's [Strategic Plan](#), the City utilizes equity-based tools to prioritize projects, and will continue to use these tools to deploy the LCTM equitably. The projects listed in the *Appendix D* are geographically diverse and will bring innovative construction practices to many neighborhoods in the City, including Historically Disadvantaged Communities.

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) and will, where possible and applicable, include the participation of Disadvantaged Business Enterprises, Minority-owned Businesses, Women-owned Businesses, or 8(a) firms as dictated by national and local policies. 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).

The City of Chicago is proud of its long heritage of utilizing local, highly skilled union labor to meet the infrastructure needs of Chicago. The Chicago Residency Ordinance requires construction contractors to utilize at least 50% of all labor hours by Chicago residents, and at least 7.5% of all labor hours by residents in the project area. The City encourages contractors that 15% of their workforce is female and 70% are minority workers. The City provides monetary incentives, ranging from 0.5 – 6% of the contract value, to hire City residents, people from socio-economically disadvantaged areas, women, minorities, and ex-offenders, and apprentices. Not only are the men and women that physically build the infrastructure proud union members, the majority of the engineering technicians who design, create, test, and inspect the mixes are also union members (IUOE Local 150). These technicians will play an integral role in the development and



implementation of the City's LCTM goals. The Chicago LCTM Program will leverage grant funds to incorporate trainings and provide Chicago workers an opportunity to develop their skills and knowledge on burgeoning construction materials and local and federal initiatives such as the IDOT LCTM program and the Made in America efforts.

It is a goal of the City to determine ways to utilize locally available, and Made in America, resources for the City's materials needs. As one example, the City's ready-mix concrete producers are currently forced to import cements from overseas to meet the producers' needs. This detracts from CDOT's goal to reduce GHG emissions. CDOT intends to use these grant funds to develop concrete mixtures made of locally available materials.

Chicago's Minority and Women-owned Business (M/WBE) Procurement Program demonstrates the City's continued commitment to the success of minority- and women-owned businesses. Promoting contracting opportunities to M/WBEs enhances the City's growth and economic stability.

