



## RESEARCH REQUEST FOR PROPOSAL (RRFP) #19-02

### UTILIZATION AND LIMITATIONS OF USING RECYCLED ASPHALT PAVEMENT (RAP) AS ROADWAY EMBANKMENT AND STRUCTURAL BACKFILL

**POSTED DATE: 07/18/2019; CLOSING DATE: 08/14/2019**

#### PROJECT INFORMATION

<b>Funds:</b>	\$150,000
<b>Estimated Contract Term:</b>	12 months
<b>Projected Start Date:</b>	January 1, 2020
<b>Deadline for Submitting Proposal:</b>	4:30:00 PM (local time) August 14, 2019
<b>Submit Proposal via Email to:</b>	<a href="mailto:research@getipass.com">research@getipass.com</a>

#### BACKGROUND

The Tollway has utilized recycled or reclaimed asphalt pavement (RAP) as roadway embankment and structural backfill. In isolated instances, excessive settlement has occurred, which may be attributed to the use of RAP. The excessive settlement is typically identified months after placement, primarily in situations where construction was performed late in the season (late fall/winter). While it is unknown what all the contributing factors were in these settlement locations, there is a belief that additional research is needed to develop a more rigorous material specification for the placement of RAP as roadway embankment and structural backfill which would address the following factors:

1. Lift thickness
2. Aggregate gradation
3. Temperature at placement
4. Water content
5. Use of RAP in conjunction with lifts of dissimilar material

## 6. Density / Compaction verification method

Additional background for this project can be found in a literature review previously performed by the Tollway. Relevant references that were identified included:

1. User Guidelines for Waste and Byproduct Materials in Pavement Construction (FHWA-RD-97-148)
2. Engineering Properties of Recycled Materials for Use as Embankment Fill, by Soleimanbeigi, A, Edil, T B & Benson, C H for the Geo-Congress 2014
3. Compressibility of Recycled Materials for Use As Highway Embankment Fill by Soleimanbeigi, Ali & Edil, Tuncer B for the Journal of Geotechnical and Geoenvironmental Engineering

Additional potential references for this effort include:

1. Tutumluer, E. et. al, *Practices for Unbound Aggregate Pavement Layers*, November 2013
2. Edil, T. B., J. M. Tinjum, and C H. Benson, *Recycled Unbound Materials*, Minnesota DOT, Report MN/RC 2012-35, November 2012.
3. Kim, W., and J. F. Labiz, *Resilient Modulus and Strength of Base Course with Recycled Bituminous Materials*, Minnesota DOT, Report MN/RC-2007-05, January 2007.
4. Alam, T.B., Abdelrahman, M., and Schram, S.A. (2010). "Laboratory Characterization of Recycled Asphalt Pavement as a Base Layer." *International Journal of Pavement Engineering*, No. 2, pp. 123-131.
5. Attia, M. and Abdelrahman, M. (2010). "Modeling the Effect of Moisture on Resilient Modulus of Untreated Reclaimed Asphalt Pavement." *Transportation Research Record: Journal of the Transportation Research Board*, No.2167, pp. 30-40.
6. Bozyurt, O., Tinjum, J.M., Son, Y.H., Edil, T.B. and Benson, C.H. (2012). "Resilient Modulus of Recycled Asphalt Pavement and Recycled Concrete Aggregate," *GeoCongress 2012*, American Society of Civil Engineers, GSP No. 225, Oakland, CA, pp. 3901-3910.
7. Guthrie, S.W., Cooley, D., and Eggett, D.L. (2007). "Effects of Reclaimed Asphalt Pavement on Mechanical Properties of Base Materials." *Journal of the Transportation Research Board*, No.2005, Washington, D.C., pp. 44-52.
8. Kim, W., and Labuz, J.F. (2007). "Resilient Modulus and Strength of Base Course with Recycled Bituminous Material." *Minnesota Department of Transportation Report No. MN/RC-2007-05*, pp. 1-270.
9. Molenaar, A.A .and Niekerk, A.A. (2002). "Effects of Gradation, Composition, and Degree of Compaction on the Mechanical Characteristics of Recycled Unbound Materials." *Transportation Research Record: Journal of the Transportation Research Board*, No.1787, Washington, D.C., pp. 73-82.
10. Saeed, A. (2008). "Performance-Related Tests of Recycled Aggregates for Use in Unbound Pavement Layers." *Transportation Research Board of the National Academies. Report 598*. Washington, D.C.
11. Taha, R., Ali, G., Basma, A. and Al-turk, O. (1999). "Evaluation of Reclaimed Asphalt Pavement Aggregate in Road Bases and Subbase." *Transportation Research Record:*

*Journal of the Transportation Research Board*, No.1652, Washington, D.C., pp. 264-269.

12. Wen, H., Mengqi, W., and Uhlmeyer, J. (2011). "Evaluation of The Effects of Climatic Conditions on Modulus of Base Materials with Recycled Asphalt Pavement." *Journal of ASTM International*, Vol. 8, No. 10, pp. 1-13.

One recently completed research project to be reviewed as part of this project would be:

1. Wisconsin Highway Research Program - Evaluation of Recycled Base Aggregates. Final brief due to be published 08/2019

## **OBJECTIVE**

The primary objective of this proposed research effort is to determine the limits for using RAP as roadway embankment and structural backfill. The work will result in the development of a draft specification on the required material and placement specifications.

## **RESEARCH TASKS AND REQUIRED DELIVERABLES**

The research shall be divided into tasks, as described below:

- A. Conduct literature review regarding the relevant parameters for ensuring optimum performance of RAP used as a roadway embankment and structural backfill.

*Task deliverables: Report containing a summary of literature reviewed and findings gleaned from the experiences of other agencies utilizing RAP as roadway embankment and structural backfill.*

- B. Review Tollway data associated with RAP roadway embankment and structure settlement locations along the Tollway to determine what information is and is not available to help in identifying potential cause of the settlement.

*Task deliverables: Summary of information reviewed and any patterns or lessons that can be taken from that information.*

- C. Using the information and data from the previous tasks, develop and conduct a materials evaluation program to validate the material properties that are critical to the performance of RAP when used as embankment and structural backfill.

*Task deliverables: Summary and conclusions of materials evaluation program.*

- D. Develop a draft specification for the Tollway to apply to RAP when used as a roadway embankment and structural backfill material.

*Task deliverables: Draft specification on how best to use RAP as a roadway embankment and structural backfill material for Tollway projects.*

Deliverables that will be required throughout this project will include:

- Quarterly progress reports, in electronic format, containing a summary of effort performed during the quarter and expected progress for the following quarter.
- Final report, in electronic format, summarizing the results and recommendations developed as a result of this research effort. A draft final report shall be submitted 45 days prior to the end date of the research contract. The Tollway will review and provide comments and feedback within 15 days of receipt of the draft final report. Then, the researcher shall have 30 days to address the comments and questions, make revisions, and resubmit the final report.
- Two hard copies and one electronic copy (pdf) of the final report shall be submitted.

## **INSTRUCTIONS FOR SUBMITTING A PROPOSAL**

The proposal shall be prepared in accordance with the guidelines presented in Appendix A. The contact name/email and due date are presented on the first page. All potential Principal Investigators (PIs) should read and understand the responsibilities of Illinois Tollway Principal Investigators, which are presented in Appendix B.

Technical questions regarding the research project or questions regarding the RFP procedures should be submitted to [research@getipass.com](mailto:research@getipass.com) by 2:00:00 p.m. (local time) on August 7, 2019. Technical questions that are received by 2:00:00 p.m. (local time) on August 7, 2019 will have the question and answers posted on the Tollway's website at least 3 days before the proposal due date.

## **SPECIAL CONDITIONS FOR REVIEWING PROPOSALS AND AWARDING ILLINOIS TOLLWAY FUNDS**

Please note that the following two conditions will be applied in reviewing all proposals received and in awarding Tollway funds:

- 1) The award of this project is contingent upon the availability of funds at the time of award.
- 2) Tollway research projects are entered into through an Intergovernmental Agreement. Therefore, the lead institution in a successful proposal is required to meet the definition of a "public agency" pursuant to Illinois' Intergovernmental Cooperation Act (5 Ill. Comp. Stat. 220) in order to enter into an Intergovernmental Agreement to complete the project.

## **APPENDIX A: GUIDELINES FOR PREPARING A PROPOSAL FOR THE ILLINOIS TOLLWAY**

Please use the following format for submitting a Tollway proposal for consideration. Please limit your total proposal to 5 pages in length (not including the Cover/Summary Page or optional Appendices), ensure file size is less than 5 MB, and use a font size no smaller than 10. We suggest Arial font with 1.5 spacing between lines.

### **1. Cover/Summary Page**

Use the cover page included in Appendix C.

### **2. Research Plan**

The research plan should describe in a specific and straightforward manner the proposed approach for solving the problem described in the problem statement. The research plan should be subdivided into the following sections:

#### **(a) Introduction, including Research Idea Statement**

Provide an introduction to the proposal and a concise overview of the research approach. Outline the objectives of the research project and explain the questions that will be answered by the research.

#### **(b) Research Approach/Work Plan**

Include the details of how the investigator will carry out the project and accomplish the project objectives. Itemize the tasks to be completed, explaining each in sufficient detail so the reviewers understand what will be done for each task and what will be produced or completed with each task.

#### **(c) Anticipated Research Results**

Specifically state the anticipated research results and deliverables.

#### **(d) Applicability of Results to Illinois Tollway Practice**

Describe how the anticipated research results can be used to improve Tollway practices.

### **3. Qualifications and Accomplishments of the Research Team**

Identify who will perform the research and provide a brief explanation of each researcher's qualifications to perform the research. Please provide examples of similar research that the proposed individuals have performed.

**4. Other Commitments of the Research Team**

Briefly outline the other commitments of the proposed principal and co-principal investigators to demonstrate that both will be able to fulfill the commitments of the proposal.

**5. Equipment and Facilities**

Describe the facilities and equipment available to undertake the research proposal.

**6. Time Requirements**

Describe the time that will be required to complete the research proposal, including final report preparation, Tollway editing, review of the report by the Technical Review Panel (TRP), and final review/publishing of the report. Include a timeline for each task. Please plan on submitting the draft final report to the Tollway for initial editing at least three months before the end date for the project.

**7. Itemized Budget**

Provide an itemized budget for each of the Phases of the project and for the entire project, including the cost of personnel, consultants, subcontracts, equipment, materials, travel, overhead/indirect costs and cost share (match). The Illinois Tollway believes that an overhead/indirect rate of 20% is reasonable and competitive. Justification shall be provided if an indirect cost rate in excess of 20% is used. Please itemize equipment and travel requests, especially any requested out-of- state travel or planned attendance at conferences.

**8. Cooperative Features (if appropriate)**

If assistance or cooperation is required from other sectors, public or private, to complete this proposed research, describe the plans for securing this assistance.

**9. Appendices (if appropriate)**

You may include such things as statements regarding previous work on the problem or related problems, abstracts of related projects, a bibliography or list of references, or materials describing the submitting organization.

## **APPENDIX B: RESPONSIBILITIES OF ILLINOIS TOLLWAY PRINCIPAL INVESTIGATORS**

1. Prepare and submit a project work plan and multi-year line-item budget, consistent with the Tollway RRF for the newly-approved research project.
2. Meet with the Technical Review Panel (TRP) and revise the project work plan and multi-year budget, as agreed with the TRP.
3. Assist the TRP chair in preparing an Implementation Planning Worksheet and work throughout the project to identify the expected benefits of the research, e.g., construction savings, operation and maintenance savings, increased lifecycle, safety, etc.
4. Carry out the project as agreed with the TRP, or notify the TRP if any problem develops regarding the project.
5. Provide online quarterly progress reports to the TRP chair for review and approval.
6. Attend quarterly meetings of the TRP to provide project updates and answer TRP members' questions about the project.
7. Provide the TRP a synopsis of the project's implementation potential as well as implementation strategies. In conjunction with the TRP, develop Implementation activities/ tools such as draft specifications, policy guidelines, software, and training on new test/ practice/ equipment/ software and develop an implementation cost estimate, if applicable.
8. Near the completion of the research project, draft a final research report in accordance with the Tollway report format. (The timeline for the work plan must allow adequate time to prepare the report, typically three months.)
9. At least three months before the end date for the project, submit the draft final report to the Tollway for preliminary editing (prior to submission to the TRP).
10. After the Tollway returns the edited draft final report, submit the report to the TRP chair for review and work with the TRP chair to finalize the content of the report.
11. Re-submit the final report to the Tollway for publication. The Tollway will post the final report to the Tollway website and will arrange to publish the final report.
12. The publication or release of all work products, any information that is deemed confidential by the Tollway, or information which includes patentable results may not be published/ released without the Tollway's approval.



13. Include the Illinois Tollway acknowledgement statement and disclaimer statement (available on the Tollway website) in all publications and presentations regarding research sponsored partially or fully by the Tollway.



**APPENDIX C:  
PROPOSAL COVER SHEET FOR  
SOLICITATION #19-02**

**UTILIZATION AND LIMITATIONS OF USING RECYCLED  
ASPHALT PAVEMENT (RAP) AS ROADWAY EMBANKMENT  
AND STRUCTURAL BACKFILL**

**DUE: AUGUST 14, 2019**  
**TO: [research@getipass.com](mailto:research@getipass.com)**

<b>Submitted by: (Include Name and Address of Organization)</b>	
<b>Proposed Investigator(s):</b>	
<b>Corresponding Investigator Name:</b>	
<b>Corresponding Investigator Phone:</b>	
<b>Corresponding Investigator Fax:</b>	
<b>Corresponding Investigator Email:</b>	
<b>Submission Date:</b>	