



U.S. Department
of Transportation

**Federal Highway
Administration**

FHWA 2018 Exploratory Advanced Research Program

Broad Agency Announcement

693JJ3-18-BAA-0001

Version 2

FEDERAL HIGHWAY ADMINISTRATION**BROAD AGENCY ANNOUNCEMENT****No. 693JJ3-18-BAA-0001****FHWA 2018 EXPLORATORY ADVANCED RESEARCH PROGRAM****March 3, 2018****I. General Information**

Contracting Officer: Robin K. Hobbs, FHWA, (202) 366-4004, Primary
Robin.Hobbs@dot.gov

Technical POC: David Kuehn, FHWA, (202) 493-3414; David.Kuehn@dot.gov

SUMMARY OF IMPORTANT DATES

The Federal Highway Administration anticipates that the proposal, evaluation and award process for this Broad Agency Announcement will proceed generally in accordance with the following schedule:

BAA Opens (FBO publication) March 3, 2018

Question Period Closes March 27, 2018

Proposals Due 4:00 pm EST April 19, 2018

Anticipated Award Dates: **Beginning September 2018 through December 2018**

PROPOSAL SUBMISSION: Electronic transmissions of the proposal shall be sent to FHWAadvancedresearch@dot.gov and to the Contracting Officer, Robin.Hobbs@dot.gov no later than 4:00 p.m., EST, on April 19, 2018. Proposals received after this date and time will not be considered.

The proposal transmission shall be titled in the following sample format:

Topic #, XYZ University – FHWA 2018 EAR BAA

FUNDING NOTE: Funding is available in the total amount of \$7M for all awards under this Broad Agency Announcement. FHWA anticipates that a total of five (5) to eight (8) contracts or cooperative agreements may be awarded across the four topic areas.

II. Overview

INTRODUCTION: Legislation established the Exploratory Advanced Research (EAR) Program that addresses longer-term, higher risk research and strives to develop partnerships with public and private sector entities.

FHWA identifies and scopes topics through extensive initial-stage investigation and engages national and international experts to assure use of the most recent advances in science and engineering. FHWA is moving forward with four topics that have a strong scientific and technical basis and national importance through the issuance of this BAA.

Award Type

FHWA may award either contracts or assistance agreements as a result of this BAA. In consultation with the technical evaluators, the Contracting Officer (CO) will make the determination whether a contract or assistance agreement will be awarded. Three factors affect the decision to award a procurement contract or assistance award, and if an assistance award, a grant or cooperative agreement. The three factors are:

- Legislative authority
- Principal purpose
- Degree of federal involvement

The authority to enter into assistance agreements for this effort and the costs sharing requirements is found under 23 U.S.C. § 502 - Surface Transportation Research, Development, and Technology, paragraph (b)(3)(C), which states: “The Secretary may carry out research, development, and technology transfer activities related to transportation...by making grants to, or entering into contracts and cooperative agreements.”

Assistance agreements differ from contracts in several key ways:

The primary goal of a procurement contract is to procure goods or services for the use of or to directly benefit the federal awarding agency; the primary goal of an assistance agreement is to further a public purpose.

Procurement contracts allow for the vendor/supplier to make a profit, while assistance agreements are cost-reimbursable agreements in that the only permissible charges are actual costs that are directly related to the project and an amount of indirect costs based on an agreed-upon rate.

Procurement contracts require “deliverables” that the CO/Contracting Officer’s Representative must test and accept; assistance agreements do not include deliverables, but may require other submissions described in the award document.

Although the Government encourages cost sharing for both cooperative agreements and contracts, all applications submitted for cooperative agreement consideration shall include a 20 percent of the total award value or greater non-federal cost share.

PROGRAM SCOPE: This program is intended to spur innovation and focus on higher risk and higher pay-off research. Exploratory advanced research bridges basic and applied research. In contrast to basic research, EAR Program funded research projects have a mission-orientation. In contrast to applied research, EAR Program funded research does not pursue a narrowly-defined application or product. Incremental advances and demonstrations or evaluations of existing technologies are not within the scope of this program. In terms of Technology Readiness Levels (TRL), the EAR Program focuses on moving research from TRL 2 or 3 to TRL 5 or 6. More information about Technology Readiness Levels is located at http://www.fhwa.dot.gov/advancedresearch/trl_h.cfm.

Though the overall program scope is intentionally ambitious and broad to address the wide spectrum of topics and objectives that funded investigations will strategically support, this solicitation is intended to address specific technology and knowledge gaps, identified through scanning and convening activities, that will help the FHWA improve highway safety, reduce congestion on the nation's highways, reduce environmental and health impacts of the nation's highways and reduce the long term costs and improve the efficiency of the nation's highways.

OBJECTIVES AND DESCRIPTION: FHWA is soliciting for proposals under its EAR Program for research projects that could lead to transformational changes and truly revolutionary advances in highway engineering and intermodal surface transportation in the United States. This program shall support scientific investigations and studies to advance the current knowledge and state-of-the-art in the sciences and technologies employed in the planning, design, construction, operation, maintenance and management of the nation's highways. Strategically, this research will enable and expedite the development of revolutionary approaches, methodologies, and breakthroughs required to drive innovation and greatly improve the efficiency of highway transportation.

The research topics described below are intended to guide potential offerors and are based upon the authorizing legislation, stakeholder input, initial stage investigations and the strategic needs of FHWA. Through scanning and convening activities over the past year, FHWA engaged a large number of stakeholders from within and outside the traditional highway research community to identify topics of research that promise transformation and possible breakthroughs in highway technology, processes and policies. Topics found to have strong merit in advancing different fields including engineering, hard sciences, as well as social sciences to support national strategic objectives are included in this solicitation.

Given the exploratory and high risk focus of this program, FHWA anticipates that the results of these investigations will not be methods or technologies that will be

immediately implementable and will most likely result in highway industry access to new knowledge and concepts that while proven, will require further development before they would be ready for full implementation. FHWA envisions that these results will undergo further development via the other applied research and development programs of FHWA and others.

In submitting proposals, offerors are reminded that the intent of this program is to fund applied research that, while high risk and perhaps longer term, is undertaken with a specific problem or need in mind. Basic research is not within the scope of this program.

FHWA may make multiple awards for each of the topics described below.

Topic 1: Mobil Ad Hoc Networks (MANETs)

Mobile ad hoc networks are fluid wireless moving networks that can form independently on an ad hoc basis. The network is defined by mobile nodes (smart devices, vehicles, etc.) that receive and transmit data and require no fixed or dedicated infrastructure. This network paradigm lends itself well to fast moving, complex, and dynamic applications (e.g. Transportation System Management & Operations or wayfinding and navigation solutions). Nodes can move cognitively into and out of the network through physical movements or through devices turning on or off, thus re-defining the network's characteristics. The network can then re-configure itself to accommodate these changes. Mobile ad hoc network research and development generally has been for Defense Department and first responder communications system applications.

Why is this topic important to FHWA? There are applications where current dedicated short range communications and current or emerging cellular networks have the potential to fail or become oversaturated through a combination of high communications traffic volumes, limited signal penetration (e.g. indoors, canyons) or equipment failure. Mobile ad hoc networks could provide applications for these environments and situations. The following examples are for illustration. FHWA welcomes other applications that could have a significant positive impact on transportation safety or operations.

- MANETs may be applied on crowded and dangerous intersections to protect vulnerable users (e.g., pedestrians and cyclists), with the goal of increasing their safety and mobility substantially.
- MANETS may be applied for pedestrian wayfinding and tracking, crowd counting, routing, and information sharing in situations with a high density of people but limited radio signal access.
- MANETs may be applied to facilitate movement in high density, multi-modal freight facilities. Through communication between closely coupled nodes in small areas, nodes can route vehicles through these tight or crowded spaces to improve efficiency of freight operations.
- In National Parks or similar areas, MANETs could assist in the deployment of traditional or automated shuttles and provide important schedule, trip, and other related announcements to Parks users.

For additional discussion, please refer to the white paper located at <https://www.fhwa.dot.gov/advancedresearch/>.

Note: FHWA anticipates that proposals in this topic will include two phases – an initial phase with laboratory testing and development of a concept of operations and a subsequent phase that includes field testing or a pilot demonstration or deployment.

Special capabilities: FHWA expects that research on this topic will require a multi-disciplinary team experienced with both the cyber and physical elements of intelligent transportation systems. Researchers are encouraged to partner with State Departments of Transportation or other system owners or operators to enable experiments.

Topic 2: Video Analytics

Rapid advances in video analytics techniques are emerging in multiple domains such as national defense, law enforcement, robotics, and vehicle automation.

Why is this topic important to FHWA? Advances in video analytic techniques could aid in increasing the level of automation for behavioral studies based on naturalistic driving video and roadway video data. Current data reduction techniques are predominately manual, which in the past have been adequate when behavioral studies included limited amounts of video data from driving simulators or test track experiments. With the magnitude of video data now available – over two petabytes in the case of the SHRP 2 NDS data – it is often impractical for researchers to continue to rely on manual processes.

In the longer-term, techniques developed for behavioral research has the potential to improve safety through real time control such as for crash avoidance through the identification, tracking, and prediction of pedestrians.

Background: Starting in 2016, the EAR Program, working with the Office of Safety R&D, has conducted workshops and funded research to increase the level of automation available for data extraction and assessment of driver behavior from video, and to provide identity masking. In 2016, the EAR Program, working with the Volpe Center, the Office of Safety R&D, and Oak Ridge National Laboratory (ORNL) conducted technology maturity assessments, and transferred successful results to the Safety Training and Analysis Center (STAC), at the Turner-Fairbank Highway Research Center in McLean, Virginia.

More information on existing video image tools for naturalistic driving studies are located at https://www.fhwa.dot.gov/research/resources/computervision_breakthrough.cfm and at <https://www.fhwa.dot.gov/research/resources/stac/>.

The technology assessments highlighted where current and emerging video analytics methods are not yet mature enough to automatically assess behavior from video data, and suggested a continued need for exploratory advanced research. Examples of topics that could benefit from additional research include:

- a) Face recognition and tracking at extreme angles – Current tools work well when a person's head is facing the camera and poorly when the head is turned more than 60 degrees away from side to side or 45 degrees up or down.

Objective: Develop or refine methods from recent and current research on identification and tracking of profiles and transitions between forward-facing and oblique facing identification and tracking tools.

- b) Tools for de-identification or face-masking – Existing tools mask the face. There may be other elements in an image that could result in unintended identification such as hair, ears, jewelry, tattoos, or clothing with names or symbols.

Objective: Develop or refine methods from recent and current research on computer vision methods for identifying potentially identifiable features, and approaches for masking them without markedly reducing access to behavioral or contextual information, such as facial expressions.

- c) Higher level behaviors – Existing machine learning tools can identify lower level behaviors such as talking or holding a hand near the head. Human reviewers still are needed to ascribe a higher-level behavior to the individuals visible in the video, perhaps to combine several lower level behaviors into a single identified action.

Objective: Develop machine learning approaches that can group higher level with or without identification or specific lower level behaviors.

- d) Multi-image reconstruction – Fuse diverse image data to recreate contextual scenes, for example, combining low fidelity dash camera image and higher fidelity photometry data to recreate context for driver behavior. This topic would require image data, for example, from infrastructure-based cameras and vehicle mounted cameras.

Note: FHWA anticipates that proposals in this topic will use image data collected for SHRP2. Information on the data is located at <https://insight.shrp2nds.us>. Proposals should anticipate the need for Institutional Review Board (IRB) approval and data use licensing.

Note: FHWA is partnering with the Department of Energy Oak Ridge National Laboratory to benchmark capabilities of tools developed under this topic.

Special capabilities: FHWA expects that research on sub-topic c. will require a multi-disciplinary team experienced with computer science topics such as machine vision and video analytics and with highway safety topics like human factors research.

Topic 3: Artificial Realistic Data

There are no accepted methods for developing a simulation test-bed for highway safety models. Advances in manipulating diverse data and creating simulated worlds with greater veracity and with increased automation could allow for development of an artificial database against which various highway safety models can be tested.

Artificial realistic data provides a synthesized model taken from idealized conditions found in real-world data sets. The data include important factors and traits influencing accident frequency and severity relevant to road sections and geometric features. In general, crashes are rare events difficult to generalize. Creating realistic, artificial data could allow for more testing of safety countermeasures by considering multiple variables across large number of examples.

Background: The EAR Program working with Safety R&D conducted reference scanning in 2014 and developed a proof of concept model for a limited set of crash types, roadway conditions, and environments in 2017. Information on the proof of concept is located at <http://www.trafficrecordsforum.org/program/sessions/TS6.html>.

There is a potential for expanding the range of crash, roadway, and environmental characteristics in the artificial world including to allow for study of connected vehicles. There also is a potential to apply to concept of artificial realistic data to other areas of the highway program where data are limited.

Note: FHWA anticipates applying the results from research on artificial realistic data for computational testing safety countermeasures. Researchers involved in the development of artificial realistic data likely would have a conflict in developing safety countermeasures for related scenarios. For example, a researcher involved in developing artificial realistic data for testing countermeasures on two-lane rural roads would have sensitive information that could exclude a researcher from testing a countermeasure against the same data. The research, however, likely would not have a conflict developing countermeasures for other scenarios such as for a four-lane urban intersection.

Special capabilities: FHWA expects that research for this topic will require a multi-disciplinary team experienced with data analytics, modeling and highway safety research experience.

Topic 4: Supplementary or Alternative Materials for Highway Pavements and Structures

In the last several years, new measurement techniques allow for characterization of heterogeneous materials used in highway pavements and structures and new computational methods allow for more accurate modeling of interactions at multiple scales and between material components.

Why **is this topic** important to FHWA? Results from this research could provide the starting point for laboratory and field testing of materials that provide improved cost or performance. Improved understanding of curing and aging mechanisms will provide for application of better performing, more durable, or lower cost materials in pavements and structures. The results also could prove effective for increasing the use of recycled or waste materials, as virgin materials may become more expensive and difficult to obtain.

FHWA anticipates research in this topic to include two or more phases, an initial phase for conducting experimental laboratory or computational simulation research and a subsequent phase where materials could be tested at larger than bench scales and in more realistic environments. FHWA anticipates having an expert panel review the first phase of work. Based on the expert review, availability of funding and continued needs, the research may continue through the final phase.

Initial applications from the results of this research may target niche uses where current materials have obvious limitations such as in marine environments, winter freezing and thawing, or in combination with recycled materials. In the longer-term, new materials may provide the highway industry with greater flexibility in the choice of materials for design and repair of pavements and structures.

Background: In FY 2012, the EAR Program solicitation included a topic on “Innovative Alternative Binders for Highway Structures and Pavements.” The EAR Program received 21 proposals that include over 50 institutions and funded three awards. Two of the three awards ended in FY 2017. A related materials project on cement hydration kinetics modeling also ended in FY 2017. Information about the funded projects is located at <https://www.fhwa.dot.gov/advancedresearch/pubs/17021/index.cfm#011>, <https://www.fhwa.dot.gov/advancedresearch/pubs/15084/index.cfm>, <http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1138.pdf>, and “Comprehension and Development of Nano-Additives to Judicially Improve the Interfacial

Region in Concrete and Asphalt” and “Use of Inorganic Coatings as Curing Compounds” located at <https://www.fhwa.dot.gov/advancedresearch/pubs/17023/index.cfm>.

Note: FHWA expects proposals to be clear about how responding to continued knowledge gaps will lead to advances in engineering practice in the design and use of supplementary and alternative materials.

Note: FHWA expects that proposals include industry or asset owners that would participate in the latter phase of the research when materials are tested in more realistic environments.

Special Capabilities: FHWA anticipates that that research team will be a multi-disciplinary team composed of experts from differing operating elements from one or multiple entities or institutions; include recognized experts in structural materials, chemistry, and highway engineering.

Note: Future Topic Areas

FHWA continues to investigate other research areas for potential breakthrough opportunities. FHWA welcomes questions or thoughts about opportunities and other areas of focus that could lead to transformation changes in highway research. At this time, however, FHWA has not identified other focus areas or topics for funding under the EAR Program. For further information about the EAR Program, please see <http://www.fhwa.dot.gov/advancedresearch/contacts.cfm>.

III. INSTRUCTIONS FOR SUBMISSION OF PROPOSALS:

ADMINISTRATIVE INFORMATION: Offerors are required to follow the guidance contained herein. The following sections provide information on proposal format, the submission process, evaluation and funding processes, and other general information. Proposals not meeting the format described in this BAA will not be reviewed.

All administrative correspondence or questions on this BAA should be directed to the Contracting Officer at the following email address: Robin.Hobbs@dot.gov.

FHWA will provide responses to questions received through the March 27, 2018 cut-off date. FHWA may not respond to questions received after the cut-off date.

IV. EVALUATION CRITERIA: Evaluations will be performed using the following criteria in descending order of relative importance:

- A. Scientific and Technical Merit:** Overall scientific and technical merit of the proposal, including the potential to result in increased understanding/knowledge in the field of highway research. Overall capabilities, including the qualifications, capabilities, and experience of the proposed principal investigator, team leader, and key personnel who are critical in achieving the proposal objective; the offeror's qualifications, capabilities, and experience in related technical areas; and the offeror's facilities and demonstrated ability for achieving the proposal objectives; overall capability to manage the effort, including plans to objectively measure the value and impact of the research and ensure value whether the inquiry leads or does not lead to anticipated results; and the offeror's demonstrated ability to transfer or hand-off results within and across scientific and engineering communities may be considered as part of scientific and technical merit.
- B. Importance to Agency Programs** in providing foundational research that would promote research investment in applying technology, process improvements or policy solutions that could lead to significant innovations in the highway system. Significant partnering is an essential aspect of the EAR program. Within the EAR Program, successful research teams often include entities or researchers who traditionally have not been involved in transportation research partnering with entities or researchers who have. The degree to which the proposal develops partnerships with public and private sector entities may be considered under importance to Agency programs.
- C. Fund Availability:** FHWA will consider the availability of funding for awards selected under the BAA. Cost realism and reasonableness will also be considered to the extent appropriate.
- D. Past Performance:** Past performance will be evaluated on a "Pass/Fail" basis for the purposes of making a determination of acceptable or unacceptable risk and responsibility on proposals/applications selected for award.

E. Small Business Subcontracting Plan: The Small Business Subcontracting Plan (required by all Offerors who are other than small business entities proposing contract awards) will be evaluated on a “Pass/Fail” basis.

NOTE: For each offer considered for award, a past performance or risk assessment will be conducted. For assistance agreements, a risk assessment will be conducted in accordance with 2 CFR 200.205.

NOTE: For contract awards only, the Small Business Subcontracting Plan is required for other than small businesses with proposals over \$700,000.

The number of awards, and their dollar value, will vary depending on the merit of proposals received.

V. GENERAL INFORMATION REGARDING THE PROPOSAL PROCESS

Proposals will be evaluated by FHWA against the evaluation criteria outlined above. The FHWA may make more than one award or no award for each of the topics listed in the BAA.

Offerors may submit more than one proposal; however, each one must be in response to a single topic on the BAA. The topic of the proposal must be clearly identified in the proposal title on the cover page.

It will be of added value for the proposing organization's management to demonstrate flexibility in support of this approach. Examples of support are strong internal backing with matching funds, innovative approaches in contracting and leveraging current and past technology development efforts that support this program.

Awards under this program may be subject to the requirements of Section 508 of the Rehabilitation Act, depending on the type of final products or reports to be delivered under each award. The Act requires that all electronic products prepared for the Federal Government be accessible to persons with disabilities, including those with vision, hearing, cognitive, and mobility impairments. Proposers can view [Section 508 of the Rehabilitation Act \(http://www.access-board.gov/508.htm\)](http://www.access-board.gov/508.htm) and the [Federal IT Accessibility Initiative \(Home Page\) \(http://section508.gov/\)](http://section508.gov/) for detailed information.

The Paperwork Reduction Act of 1995 (PRA): Offerors are advised that any activities involving information collection (i.e., surveys, questionnaires, etc.) from 10 or more non-Federal entities, including States, are subject to PRA requirements and may require the FHWA to coordinate an OMB Information Collection Clearance, a process that generally takes six months or more.

VI. PROPOSAL FORMAT AND CONTENT

Format

All proposals should be submitted in Microsoft® Word 2010 (compatible) or text searchable Adobe® Portable Document Format (PDF). Pricing data shall be submitted in Microsoft Excel 2010 (compatible).

The format of the proposal volumes discussed below shall be as follows:

- (a) Proposals shall be prepared on 8½ x 11-inch paper.
- (b) A page is defined as one side of an 8 ½ by 11-inch sheet of paper. Therefore, a sheet with printing on both sides is considered two pages.
- (c) Text shall be printed using a Times New Roman or Arial font, size no less than 12-point font.
- (d) Page margins (exclusive of headers and footers) shall be a minimum of 1 inch top, bottom and each side. Columns shall not be used as they are difficult to read electronically.
- (e) Footnotes, legends, or labels associated with tables or diagrams, and other information that is ancillary to the main text, may be presented in a font size smaller than 12-point font---provided that any such smaller font is fully legible.

Proposals shall consist of two separate volumes:

Volume I – Technical Proposal and Management Approach
Volume II – Cost Proposal and Business Information

Each Volume shall be titled per the sample format below:

Topic #, XYZ University – FHWA 2018 EAR BAA – VOLUME I

Topic #, XYZ University – FHWA 2018 EAR BAA – VOLUME II

The proposals shall be prepared in the following format: 8.5 x 11 inches, one and one-half line spacing or double spaced, in at least 12-point type.

Volume I

Volume I must be no longer than 30 pages in length. The contents of any appendices shall count against the 30-page limit and shall be limited to figures that directly support items discussed in the text of the proposal. If items are included in an appendix, which is not explicitly discussed, in the basic proposal, the proposal may not be reviewed.

Proposals with Volume I exceeding 30 pages, only the first 30 pages will be evaluated.

Proposals with less than the maximum number of allowed pages will not be penalized.

Offerors are encouraged to submit concise, but descriptive, proposals.

Volume I of the proposal shall include the following sections, each starting on a new page (an estimated page breakdown is included):

(a) *Cover Page*: This must include (1) the BAA number, (2) proposal title, (3) project duration, (4) type of business (large business, small disadvantaged business, other small business, HBCU or MI, other educational, or other nonprofit), (5) complete list of subcontractors, (6) technical and administrative points of contact including addresses, telephone numbers, electronic mail addresses, and facsimile machine numbers and (7) a project abstract of no more than 200 words. The cover page does not count against the page limit for Volume I.

(b) *Executive Summary*: The summary (approximately 4 pages) should include:

(1) a description of the proposed visionary technology or system and how the proposed effort will meet the objectives of the BAA,

(2) a description of the significant innovative ideas proposed for the nation's intermodal transportation systems,

(3) a comparison of these innovative ideas with current approaches and the current state of the art,

(4) the expected impact of the research, if successful, including the contribution and relevance of this proposed effort to related FHWA and highway programs,

(5) a brief description of the technical approach and the key technology and system development milestones for proof of concept

(6) the process and metrics recommended for measuring the impact of the developed technologies and system, and

(7) a summary of the anticipated program deliverables.

(c) *Innovative Claims (optional)*: Provide a summary of significant innovative technical claims (approximately 2 pages). Identify any innovative technologies and technical ideas to be pursued and the expected impact on the state of the art if the proposed efforts are successful.

(d) *Statement of Work (SOW)*: This section (approximately 6 pages) must detail the relevant background information, the objective(s) of the proposed effort, the overall planned scope of the effort, and the technical approach for accomplishing the proposed effort. A chart of the proposed Work Breakdown Schedule (WBS) must be provided to describe both the high-level tasks and the subtasks at a level of detail sufficient to ensure that individual subtasks are clearly identified and allocated to a single project group or functional group within the proposing organization or to a single clearly identified

subcontractor. For each task and subtask, provide a description of the proposed effort, significant timing constraints associated with the specific task and subtask to be performed (such as, "this task y can only be initiated after successful completion of task x"), the anticipated duration in both calendar time (weeks) and in resource time (person-hours and person-weeks), the planned specific utilization of personnel from specific project groups, functional groups and subcontractors, and also the anticipated results, products, or deliverables associated with the completion of each tasks and subtasks.

(e) *Schedule, Milestones, and Evaluation Metrics*: This section must provide a summary (approximately 3 pages) of the schedule, milestones, and associated evaluation metrics for the proposed effort. A Plan of Action and Milestones (POA&M) format will be utilized in which the technical tasks and subtasks from the SOW, described in section (d) above, will be listed along the vertical axis of the schedule chart and time, with planned program phases (in 12 month increments), calendar year and fiscal year identified along the horizontal axis of the schedule chart. All significant experiments, simulations, lab demonstrations and field demonstrations to be performed should be identified. Each milestone on the chart(s) will be numbered. There will be a separate table listing each of these milestones, the planned date of completion, the planned evaluation metrics, and the criteria for successful completion of the milestone. This table must be specific, with both goal and specific quantified performance criteria (or range of anticipated performance) described for each planned milestone.

This section must also provide a summary description of any Measures of Effectiveness expressions planned to be utilized in this development effort. A descriptor of the proposed approach to designing experiments, simulations and demonstrations to ensure consistent and effective software/system development and associated test planning should be provided if appropriate. Techniques or methodologies to facilitate repeatable, risk mitigation experimentation in all phases of the proposed development effort should be described.

This section also must describe the two or three most challenging technical areas and activities related to the proposed research or technology development and indicate approaches for mitigating technical and schedule risks should proposed technologies produce weaker than anticipated results. This section also may describe any parallel or alternative development approaches or technologies, and the rationale for their use. Please indicate the potential impact of these alternatives on the performance goals and objectives described for the topic in the BAA

(f) *Deliverables and Products*: This section (approximately 2 pages) shall consist of two subsections: Deliverables and Products. The deliverables subsection must describe and enumerate the anticipated deliverables for the proposed effort, both preliminary and final. The products subsection must describe and enumerate any additional anticipated results or products, including transferable technology expected for users on this program or for developers or users on related programs. This section should address specific innovative approaches the offeror will take to facilitate technology transition. This subsection should contain a clear description of how results will be made sharable to other funded highway

research programs and what use these results might be to these other activities. Any restrictions on software, other data, or hardware developed under proposals that would affect this practice should be clearly identified in this section. The government expects to obtain no less than Government Purpose License Rights to all software delivered as a part of these funded efforts. All software deliveries, preliminary and final, will include as a minimum, well-documented source code in electronic readable format, overall software architecture documentation, overall and individual module interface documentation, and a users' operations manual. All hardware deliveries will include all documentation necessary to reproduce (assemble) and operate the delivered hardware system(s).

Note: FHWA seeks research that encourages continued research and development by providing reasonable and broad access to products such as models, algorithms, software, or data. Information on data management plans is located at https://ntl.bts.gov/publicaccess/creatingaDMP_extramural.html.

(g) *Proprietary Claims:* This section (approximately 1 page) must provide a summary of any proprietary claims to results, software, hardware, prototypes, or systems supporting and/or necessary for the use of the research, results, software, hardware, prototype, or system proposed for development under this BAA. Any claims made in other parts of the proposal, such as in sections (c) and (f) above, which would impact the claims in this section must be identified in a cross-reference table in this section. As mentioned in section (f) above, the government expects to obtain no less than Government Purpose License Rights to all software delivered as a part of these funded efforts. If there are no proprietary claims, this section shall consist of a statement to that effect.

Note: Exploratory advanced research can lead to unexpected inventions and processes. Accordingly, FHWA may ask for disclosure of inventions and new processes that result from Program awards in order to discuss and advise the research team on how the results could continue through the research and development process and be taken up by the highway transportation industry or by other industries.

(h) *Management Plan:* This section (approximately 2 pages) must describe the overall approach to management of this effort, including a brief discussion of the proposed organization and the use of personnel and other resources. Provide a description of how the proposed effort, as described in the Work Breakdown Structure (WBS), will be executed. Refer to significant tasks and subtasks identified in the SOW (section (d) above) and to the Schedule, Milestones, and Evaluation Metrics (section (e) above) and provide a rationale for allocation of resources to proposed project groups, functional groups, and subcontractors. Indicate planned government research and facility interfaces, and planning, scheduling and control practices. This section should also describe the partnership structure between the entity proposing work and other public and private sector entities funding or otherwise substantially participating in the work, including State Departments of Transportation, Metropolitan Planning Organizations, Universities, Foundations, etc.

Note: The Management Plan and Technology Transfer plan (section (i), next) should provide discussion on how FHWA will know the work is successful. Project evaluations

will be conducted at key mid-point milestones or at completion to document accomplishments.

(i) *Technology Transition Plan:* The technology transition plan (approximately 2 pages) should describe the plans and capabilities to accomplish technology transition. It should describe the anticipated stage of development of the technology at the completion of the proposed effort, describing how the research is anticipated to result in an increased understanding/expansion of the knowledge base for the topic, and the anticipated overall approach to advancing the technology further, either through further applied research, commercialization, or other mechanisms.

The transition plan should include a discussion of long-term use of and access to data or software developed as part of the research and approaches for exploiting the use of intellectual property developed through licensing or other means.

Note: For Proposals that result in awards, FHWA intends the transition plan to be a living document during the conduct of research.

(j) *Facilities:* This section should include a description (approximately 2 pages) of the facilities that would be used for the proposed effort.

(k) *Experience:* This section should include a description (approximately 2 pages) of relevant capabilities, work, and significant accomplishments in areas associated with the proposed research area or in closely related areas. Associate the described relevant experience to the specific project group or functional group in the proposing organization or to the specific proposed subcontractor(s).

(l) *Key Personnel:* This section should include a list of key personnel (approximately 1 page), with title and identification of association to a specific project or functional group within the proposing organization or to a specific proposed subcontractor. Indicate the proposed amount of effort (person-hours) to be expended by each person during the proposed program (by both calendar year and by fiscal year). Resumes shall be provided for all key personnel. Resumes shall not exceed one page, and are not included in the total page limitation for this part of the proposal.

(m) *Qualifications:* This section should include a concise summary of the relevant qualifications of all key personnel proposed along with other major sources of support for them (limited to no more than one page per key person). If necessary, the government will request additional resume and qualification related information. **Note: This section is not included in the page limit.**

(n) *Other Proposals:* This section must include a summary list of all current and pending proposals (approximately 2 pages) being executed or proposed to be executed with the support of personnel proposed in this effort. This list should be ordered by the size of the effort and should include start and end dates, total project cost, and the average amount of time (person-hours per month) planned or currently being expended on each effort. The

list should be organized by names of the key personnel and other significant senior personnel. If the summary list is greater than 2 pages long, indicate at the bottom of the second page the number of additional current and pending proposals and the total project cost associated with these remaining efforts. If required, a request for the complete list will be made.

(o) *Bibliography*: This section should include a bibliography (approximately 1 page) of relevant technical papers and research notes which support the technical concepts and innovative ideas described in this proposal.

Volume II

There is no page limit on Volume II of the proposal. If necessary, the government will request additional cost back-up information, as appropriate.

Volume II information shall include annual and total costs with a baseline period of performance up to 12 months, and if needed, with one or more options, each with a 12-month period of performance.

FHWA anticipates that proposals funded would have an approximate award date beginning in September 2018 through December 2018.

A. Cost/Price Information

A fully detailed cost break-down showing costs by each major cost category, including (as applicable) direct labor, fringe benefits, subcontract costs, other direct costs (travel, equipment, etc.), and indirect costs for the initial phase of the proposed effort.

Provide a *separate* and fully detailed cost break-down for *each* optional future phase proposed.

NOTE: Some topics anticipate successful results in an initial phase before moving into one or more subsequent phases. In these cases, proposals shall include a fully detailed cost break-down for the initial phase. Where the approach of subsequent phases is dependent on the work of the initial phase, proposers should use their best judgment regarding the levels of direct and indirect costs and categories of personnel.

The cost detail shall include:

Direct Labor:

- Personnel by name or labor category
- Number of hours proposed (commercial organizations) or percent of effort (organizations subject to OMB Circulars)
- Hourly unburdened labor rate (commercial organizations) or salary rate and basis (9- or 12-month basis) (organizations subject to OMB Circulars)
- Fringe Benefits Rates applied

Other Direct Costs. Other Direct Costs shall be supported by explanation of estimating factors and other relevant supporting details. For example, travel costs shall be supported by detail on the estimated trips, number of travelers, and associated costs for airfare, per diem, other transportation, etc. A similar level of detail shall be provided for any meeting costs, equipment, duplication/printing charges, and other direct costs.

Indirect Costs. Discuss your proposed rates for all years. Identify the various specific indirect rates and what they are based on (e.g., labor overhead based on direct labor dollars) and how they are applied/calculated. State any differing rate applications (for example if there is a different proposed rate when applied to travel or material purchases than when applied to subcontractor costs). Offerors must provide dollar values as well as percentages.

Subcontractor costs should be fully detailed, and the information used by the proposer to analyze the price of the subcontract shall be provided. An SF1411 is not required for this submission of your proposal.

Details of any cost sharing to be undertaken by the offeror shall also be included in the cost section. Describe the type of funds (cash, in-kind, etc.) and its contribution and relationship in enhancing the proposed effort.

Volume II must also include a separate breakdown of costs by major task area. Use the same task or subtask numbers as described in the SOW submitted as part of your Technical proposal in Volume I.

If necessary, the government will request additional cost back-up information, as appropriate.

B. Other Business Information:

IMPORTANT NOTE: The FHWA may award either contracts or cooperative agreements as a result of this BAA. Due to the requirements of **FAST Act § 6002(c)(1)**, the FHWA can offer cooperative agreements **only** if the proposer can offer a cost share of at least twenty (20) percent from non-federal sources of funding. Proposals selected for funding that offer LESS than 20 percent cost sharing may be awarded as contracts.

The requirements outlined below will vary depending on whether a contract or cooperative agreement is anticipated.

Proposals for CONTRACT awards that are received from other than small businesses and that exceed \$700,000 must include a Small Business Subcontracting Plan in accordance with the Federal Acquisition Regulation Part 19.7.

All proposers shall include in the cost proposal the following mandatory business information regarding your business or institution:

- a. Business Size
- b. Federal Tax Identification Number (TIN)
- c. Dun & Bradstreet Number
- d. Name and contact information (mail address, telephone, and email address)

of your authorized business representative/point of contact

B.1 Other Financial / Organizational Information:

Provide the following information:

- (1) Standard Form LLL - Submit a completed Standard Form LLL, Disclosure of Lobbying Activities, included as Attachment 1.
- (2) Terminated Contracts - List any contract that was terminated for convenience of the Government within the past 3 years, and any contract that was terminated for default within the past 5 years. Briefly explain the circumstances in each instance.
- (3) A completed copy of the offeror's representations and certification from the System for Award Management site (www.SAM.gov).
- (4) Conflicts of Interest - Offerors shall provide a brief statement in their proposals that describe in a concise manner all past, present or planned organizational, contractual or other interest(s), which may affect the Offerors' ability to perform the proposed contract in an impartial and objective manner. The Contracting Officer will review the statement and may require additional relevant information from the Offeror(s). In accordance with FAR Subpart 9.5, all such information, and any other relevant information known to DOT, will be used to determine whether an award to an Offeror may create an actual or potential conflict of interest. If any such conflict of interest is found to exist, the Contracting Officer may (a) disqualify the Offeror(s), or (b) determine that it is otherwise in the best interest of the United States to contract with the Offerors and include appropriate provisions to mitigate or avoid such conflict in the contract awarded.
- (5) If a proposal is selected for a contract award, a formal contract document that includes all terms and conditions for award will be forwarded to the offeror for review and signature.
- (6) The original proposal must be signed by an official authorized to bind your organization and must stipulate that it is predicated upon all the terms and conditions of this BAA. Proposals shall be submitted in the number of copies, to the address and marked as indicated on Page 2. Proposals shall be reproduced on letter-sized paper, and legible in all required copies.
- (7) If subcontractors and/or individual consultants will be used in carrying out the requirements of this project, the following minimum information concerning the subcontractor shall be furnished:
 - (a) Name and address of the subcontractor or consultant.

C - Subcontracting Plan

Subcontracting Plan:

Proposals submitted for CONTRACT award consideration from other than small businesses and that exceed \$700,000 in total value must include a Small Business Subcontracting Plan in accordance with the Federal Acquisition Regulation Part 19.7. The Subcontracting Plan does not count against the page limit for Volume II.

Each prime offeror who is other than a small business shall include within its proposal a complete copy of the prime offeror's Master Subcontracting Plan, satisfactorily addressing all the administrative requirements set forth in FAR section 52.219-9.

The offeror shall also submit a subcontracting plan in accordance with the instructions/format Attachment 2 to this BAA. If the Offeror has no such plan, the form shall be submitted with "no plan identified" indicated on the form as applicable and the offeror shall submit a statement of circumstances supporting that determination.

D - Past Performance

The offeror shall submit in its proposal past performance references for no more than two relevant contracts or subcontracts performed by the offeror, its predecessor companies, its key personnel who have relevant experience, or its performance as a subcontractor performing major or critical aspects of the requirement, relevant contracts/subcontractors are those similar in nature to the requirements of the solicitation and performed within the last three years. Each past performance reference shall not exceed two pages for a total maximum page count of four pages. Each past performance reference must contain contact information (name, agency or business, title, telephone number, and email address) for the CO and COR if a federal contract or subcontract, or equivalent positions if non-federal, as well as the contract number with agency or business name, total potential value, value of work completed, description of the work performed by the offeror, and the period of performance. Each reference must indicate clearly whether the work was performed by the offeror as a prime or a subcontractor, by a predecessor company, or by key personnel.

E - Special Instructions for Assistance Agreement Applicants

IMPORTANT NOTE: FHWA may award either contracts or assistance agreements as a result of this BAA. Due to the requirements of Public Law 114-94, Section 6002(a), the FHWA requires a cost share of at least 20 percent from non-federal sources of funding.

In addition to the information above, proposals eligible for cooperative agreement awards shall also complete and submit the following forms (available at www.grants.gov or <http://grants.nih.gov/grants/funding/424/index.htm>).

Volume 2 – Budget Application as described below - no page limit

OPTIONAL: An Applicant may include, at their option, to facilitate displaying the organization of their application, a one-page cover page, and a second page to include both a Table of Contents and/or a Listing of Tables/Figures. These pages are for orienting evaluators to the contents of the application package and will not be evaluated and are not included in the Volume I page limitation.

a. Part I - APPLICATION FORMS

1. SF424

Note: Applicants may leave fields 5a, 5b, 6, 7, and 13 blank on the form.

2. SF424A

Note: Section A:

- Block 1(a): Print opportunity title listed on page 1;
- Block 1(b): Print CFDA number (20.200) on page 1;
- Block 1(c): Print Total Federal Funds Requested in dollars; and,
- Block 1(d): Print Total Cost Share in dollars, and leave columns (e), (f), and (g) and rows 2, 3, and 4 blank.

3. SF424B

4. SFLLL

Note: The form must be completed and submitted even if no lobbying to report. If no lobbying to report insert none or N/A in the relevant blocks.

b. Part II – COST INFORMATION AND OTHER FINANCIAL INFORMATION

Provide a separate detailed budget plan for each year and summarize the information for all years for all activities. Spreadsheets can be formatted similarly to the format in DOT Form 4220.44, located at:

https://www.fhwa.dot.gov/cfo/pdf/frm4220_44.pdf, or see Attachment 3.

The detailed budget plan must include each of the following items/sub-items:

1. Detailed excel (or compatible) workbook containing spreadsheets/tabs (formatted to be printed out) and supporting information clearly delineating and supporting all estimated costs: with columns for Federal Share, Cost Share (if applicable) and Total Costs (per year and in summary form) as follows:
 - a. Labor Rates- Direct labor-by-labor categories to include hours, rates and escalation. Anticipated promotions for any personnel must be included with the escalation calculation. The annual direct labor escalations rate and its basis should be clearly stated with the proposal. Discuss your proposed rate as compared to historical experience and include when and how escalation will be calculated/implemented.
 - b. Indirect Rates- Discuss your proposed rates for all years. Identify all the various specific indirect rates including what they are (pool and base), and what they are based on (e.g.; labor overhead based on direct labor dollars) and how they are applied/calculated. Provide dollar values as well as percentages. Please also provide any audit information to support these rates (for example, a copy of signed Department of Health of Human Services rate agreement).

Note: Per 2 CFR 200.414(f), Indirect (F&A) Costs, an Applicant may elect to propose a de minimis indirect rate of 10% of modified total direct costs.
 - c. Other Direct Costs- Applicants must provide a breakout and justification of Other Direct Costs by Category (travel, equipment, etc.)
 - d. If subcontractors/sub-recipients (lower-tiered organizations and/or individual consultants) will be used in carrying out this project, the following minimum information concerning such, must be furnished:
 - i. Name and address of the organization or consultant.
 - ii. Description of the portion of work to be conducted by the organization or consultant.
 - iii. Cost details for that portion of work.
 - iv. Applicant's cost/price analysis of each sub-recipient/contractor(s) showing how their price is fair and reasonable (this includes any sub-recipient/contractor(s) that will be included in the Federal share or the non-Federal share); and

- v. Letter of commitment from each sub-recipient/contractor(s) (this includes any sub-recipient/contractor(s) that will be included in the Federal share, the non-Federal share or in a non-paid (volunteer) capacity).
 - e. Provide detail and support for cost share as part of overall project budget.
 - f. Clearly delineate cost share match versus Federal share.
- 2. Identify any preexisting intellectual property that you anticipate using during award performance, and your position on its data rights during and after the award period of performance.
- 3. The use of a Dun and Bradstreet (D&B) Data Universal Numbering System (DUNS) number is required on all applications for Federal grants or cooperative agreements. Please provide your organization's DUNS number in your budget application.
- 4. A statement to indicate whether your organization has previously completed an A-133 Single Audit and, if so, the date that the last A-133 Single Audit was completed.
- 5. A statement regarding Conflicts of Interest. The Applicant must disclose in writing any actual or potential personal or organizational conflict of interest in its application that describes in a concise manner all past, present or planned organizational, contractual or other interest(s), which may affect the Applicants' ability to perform the proposed contract in an impartial and objective manner. Actual or potential conflicts of interest may include but are not limited to any past, present or planned contractual, financial, or other relationships, obligations, commitments or responsibilities, which may bias the Applicant or affect the Applicant's ability to perform the agreement in an impartial and objective manner. The AO will review the statement(s) and may require additional relevant information from the Applicant. All such information, and any other relevant information known to DOT, will be used to determine whether an award to the Applicant may create an actual or potential conflict of interest. If any such conflict of interest is found to exist, the AO may (a) disqualify the Applicant, or (b) determine that it is otherwise in the best interest of the United States to contract with the Applicant and include appropriate provisions to mitigate or avoid such conflict in the agreement pursuant to 2 CFR 200.112.
- 6. A statement to indicate whether a Federal or State organization has

audited or reviewed the Applicant's accounting system, purchasing system, and/or property control system. If such systems have been reviewed, provide summary information of the audit/review results to include as applicable summary letter or agreement, date of audit/review, Federal or State point of contact for such review.

Terminated Contracts - List any contract/agreement that was terminated for convenience of the Government within the past 3 years, and any contract/agreement that was terminated for default within the past 5 years. Briefly explain the circumstances in each instance.

7. Describe how your organization will obtain the necessary resources to fund and fulfill the proposed cost share, as applicable.
8. The Applicant is directed to review Title 2 CFR §170 (http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title02/2cfr170_main_02.tpl) dated September 14, 2010, and Appendix A thereto, and acknowledge in its application that it understands the requirement, has the necessary processes and systems in place, and is prepared to fully comply with the reporting described in the term if it receives funding resulting from this Notice.
9. Disclose any violations of Federal criminal law involving fraud, bribery, or gratuity violations. Failure to make required disclosures can result in any of the remedies described in 2 CFR 200.338 entitled Remedies for Noncompliance, including suspension or debarment. (See also 2 CFR Part 180 and 31 U.S.C. 3321).
10. If a nonprofit or not-for-profit status, please provide evidence of this status preferably from the Internal Revenue Service

VII. OTHER ADMINISTRATIVE INFORMATION: It is the policy of the FHWA to treat all proposals as competitive information and to disclose the contents only for the purposes of evaluation. The Government may use selected support contractor personnel as special resources to assist in administering the evaluation of the proposals. These persons are restricted by their contracts from disclosing the proposal information or using it for other than performing the administrative task. Contractor personnel are required to sign non-disclosure statements. By submission of your proposal, you agree that your proposal information may be disclosed to those selected contractors for the limited purpose stated above.

This announcement constitutes the Broad Agency Announcement as contemplated by FAR 6.102(d)(2). A formal Request for Proposals or other solicitation regarding this announcement will not be issued. Requests for same will be disregarded.

The Government reserves the right to select for award any, all, part, or none of the proposals received in response to this announcement. In addition, the Government reserves the right to award either contracts, grants, or other instruments determined to be of benefit to the government in achieving the goals of this program.

This BAA is an expression of interest only and does not commit the Government to pay any proposal preparation costs. All responsible sources capable of satisfying the Government's needs may submit proposals, which will be evaluated. Historically Black Colleges and Universities (HBCU) and Minority Institutions (MI) are encouraged to submit proposals and join others in submitting proposals. However, no portion of this BAA will be set aside for HBCU and MI participation due to the desire to solicit ideas as broadly as possible.

LIST OF DOCUMENT, EXHIBITS, AND OTHER ATTACHMENTS

1. **STANDARD FORM LLL, DISCLOSURE OF LOBBYING ACTIVITIES** (also available at <https://www.whitehouse.gov/sites/default/files/omb/grants/sflllin.pdf>)
2. **FORMAT FOR SMALL BUSINESS SUBCONTRACTING PLAN**
3. **DOT Form 4220.44**