

***THIS ENTIRE SCOPE OF WORK FALLS UNDER SOURCE TYPE 9025***

**PROJECT OVERVIEW**

Increasing bridge maintenance and inspection costs are a concern for existing bridges in Minnesota. These additional costs can be minimized and the quality of inspections can be improved by utilizing Unmanned Aerial Systems (UAS). In the summer of 2015, State performed a Phase I study to evaluate the use of UAS' for bridge inspections and the resulting study was published by State's Research Services. Based on the conclusions and recommendations of the first study, the overall goal of this Phase II contract is to further evaluate the effectiveness of UAS' as they applies to Bridge Safety Inspections. This project will involve utilizing UAS' to evaluate three structures to determine their effectiveness in as a tool for bridge safety inspections. The structure types include a steel box girder, a steel culvert and through arch bridge. The Sensefly eXom, an inspection specific UAS, will be utilized to conduct the fieldwork. The study will culminate in a report detailing newer technology that is specific to inspection, a cost comparison to traditional access methods, and advantages and disadvantages of using the UAS during an actual inspection. The project will also include the development of a UAS best practices document based on the results of the study.

**STANDARDS AND GUIDELINES**

Contractor's inspections will be performed in accordance with the following:

- "Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges", Federal Highway Administration (FHWA) Report No. FHWA-PD-96-001 (1995), including 2003/2004 errata.
- Bridge Inspector's Reference Manual (BIRM), dated February 2012, FHWA National Highway Institute (NHI) 12-049
- Code of Federal Regulations, 23 CFR Part 650, Subpart C, National Bridge Inspection Standards.
- "MnDOT Bridge Inspection Program Manual", 2014.

**PROJECT TASKS**

**Task 1: Finalize Work Plan (2 Months)**

Prior to any field inspections, Contractor will:

- 1.1 Review current Federal Aviation (FAA) rules, technical literature, owners and industry experiences, and ongoing UAS research.
- 1.2 Develop a field work plan for three bridges, including the following:
  - Bridge 27201 Steel Box Girder
  - Bridge 62513 Steel Culvert
  - Bridge 9030 Blatnik Bridge Steel Through Arch

These bridges were selected to evaluate areas of inspection that could not be part of the Phase I Study. If approvals for these bridges cannot be obtained, suitable alternatives will be chosen. This field work plan will address safety concerns and FAA and other agency requirements. Any traffic control required will be coordinated with and provided by State.

- 1.3 Establish a work schedule and deliverable submission schedule.
- 1.4 Establish methods of access and schedule equipment.
- 1.5 Manage the UAS subconsultant.

**Task 2: Field Work and Evaluation (2 months)**

Under this task, Contractor will:

- 2.1 Perform field work at the selected bridges to collect imagery and evaluate the technology to accomplish the project goals.
- 2.2 Inspect known deficiencies identified during previous inspections with the use of the UAS to evaluate the ability to identify deficiencies using photos and video. The Blatnik Bridge fieldwork will be performed in conjunction and scheduled with State's fracture critical inspection of the bridge.

### ***Safety***

Contractor will develop a safety plan to ensure safety during the performance of the inspection, by strictly adhering to all applicable pertinent sections of State, FAA and Occupational Safety and Health Administration (OSHA) Standards, including abiding by relevant Section 333 exemptions and Certificates of Authorization (COA) or waivers issued by the FAA. Failure to comply with all Federal, State, and OSHA safety requirements will result in immediate cessation of inspection activities until safety requirements are met.

In addition to developing a safety plan, Contractor must also coordinate with State's Communications Office, per the "MnDOT Drone Policy" to develop a communications plan. See the complete "MnDOT Drone Policy" at the following website: <http://www.dot.state.mn.us/policy/operations/op006.html>.

### ***Bridge Safety Inspection Certification***

Contractor will ensure that personnel performing inspections meet the requirements of State's Bridge Safety Inspection Certification Policy prior to the execution of inspections. A State certified Bridge Inspection Team Leader must oversee the bridge inspection effort. For information on State's Bridge Safety Inspection Certification Policy see <http://www.dot.state.mn.us/bridge/pdf/insp/bridgeinspcertinfo.pdf>. Contractor's State Certified Bridge Inspection Team Leader must have successfully completed a FHWA approved comprehensive bridge inspection training course, and passed a field proficiency test (administered by State) and either (A) be a registered professional engineer in Minnesota; or (b) have 5- years of bridge inspection experience.

### ***State Personnel***

During the performance of the inspections, State's personnel will be encouraged to accompany field teams and participate in the research for the purposes of review, oversight and quality assurance.

### ***Restrictions during Physical Inspection***

During performance of the physical inspection of the structure, Contractor will adhere to the following restrictions:

- If required, State will be responsible for providing all traffic control. Traffic control efforts will be coordinated with the appropriate State's District level contacts to determine if a traffic control plan will be required. If needed a traffic control plan meeting the requirements of the Federal and the State's Manual of Uniform Traffic Control Devices (MUTCD) and other State requirements will be prepared and submitted for approval prior to commencing any work.
- Contractor will notify State's Project Manager of any proposed lane closures at least 72 hours in advance. State will notify law enforcement, agency staff, and local media as necessary of any lane closures and restrictions.

### **Task 3: Documentation/Final Study Report (4 Months)**

Under this task, Contractor will prepare a final UAS Bridge Inspection Study report, outlining the results of the Phase II study. The report will include the following:

- An Executive Summary
- An Introduction and the Research Approach
- A Review of Current Technology
- An analysis of the inspection specific UAS technology
- The Field Work Parameter and Methods
- The Field Work Results
- A Cost Comparison of Bridge Safety Inspection Efforts and Data Collection for the Blatnik Bridge
- Hyper Linked and Electronic Copies of Inspection Video and Still Photos
- Advantages and Challenges Identified During Field Work
- Conclusions and Recommendations

Also included in this task will be the development of a set of best practices and safety guidelines that could be added to State's Bridge and Structure Inspection Program Manual. The document will be added as a separate chapter or added to the current chapter titled "MnDOT Inspection Vehicle Policy Manual". The best practices will include a decision tree as to when the use of a UAV for bridge safety inspection is more safe and/or cost effective dependent on the type of structure and location.

**ITEMS FURNISHED BY STATE**

For the accomplishment of the work, State will provide Contractor access to the three bridges and all available: contract drawings, as-built drawings, and shop drawings on file, upon request. State will provide Contractor a copy or electronic access of the most recent Fracture Critical, Routine, and Bridge Inventory Reports.

**COORDINATION**

The points of contact for State, for technical aspects of the project, will be State's Project Coordinator and Technical Liaison, or their designees. All questions, submissions, and other correspondence must be directed to State's Project Coordinator and Technical Liaison. Contractor and State will exchange contact information for local coordination.

**PROJECT SCHEDULE**

Based on a November 1, 2015 start date, Contractor will complete all physical inspections by December 31, 2015. Contractor must submit the final study report to State by April 30, 2016. Should notice to proceed not be received by November 1, 2015, the project schedule will be adjusted accordingly.

**PROGRESS REPORTS**

Contractor will provide bi-weekly progress reports to State's Project Coordinator and Technical Liaison, describing work performed during the previous two weeks.

**PROJECT MANAGEMENT**

Contractor will be responsible for the effective communication and coordination of the project to ensure all the project tasks are completed on time, within budget, and in accordance with State and Federal laws, rules, and regulation. As part of their project management duties, Contractor will hold a kick off meeting and a mid-point meeting in Oakdale, Minnesota. Contractor will prepare and provide meeting minutes and correspondence and maintain the project schedule, providing periodic updates to State.