Legislation Text

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CONTRACT K-1819-111: A PROJECT AGREEMENT BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, AND THE OKLAHOMA DEPARTMENT OF TRANSPORTATION (ODOT) FOR FEDERAL-AID PROJECT STPG-214C(003)AG, J/P 28889(04)) FOR THE TRAFFIC SIGNAL UPGRADE PROJECT, EMERGENCY VEHICLE PRE-EMPTION SYSTEM (PHASE 1) AND ADOPTION OF RESOLUTION R-1819-82.

BACKGROUND: The 2015 - Fixing America's Surface Transportation (FAST) federal transportation funding bill allocates approximately $21 Million in Federal funds per year for the implementation of eligible transportation improvements in the Oklahoma City metropolitan area. Traffic signal upgrades that provide emergency vehicle pre-emption systems along federal functionally classified roads are eligible for 100% federal funding.

Traffic Signal Preemption is the process of allowing emergency vehicles to manipulate traffic signals in their path, halting conflicting traffic and allowing the emergency vehicle the right-of-way. This has been proven effective in reducing response times, while simultaneously enhancing traffic safety by dramatically reducing collisions with innocent motorists who may enter the intersection on a green light, but do not hear or see the approaching emergency vehicle.

Traffic signals in Norman are equipped with antiquated pre-emption systems that use an infrared (IR) signal transmitted from the emergency vehicle to a detection unit that is mounted on the traffic signal mast arm. This technology was first introduced in 1968 and has been providing reliable service for over 45 years. The technology was revolutionary when launched and remains the most widely deployed emergency vehicle detection technology in the world, supporting thousands of emergency calls every day. Over the years, the infrared product has been the subject of numerous federal and customer studies that attest to the significant benefits it provides, from both a safety and response time perspective. Infrared does however have limitations, which is why a GPS system was introduced in 2002 to overcome these limitations.

Because an infrared system uses a flashing beam of infrared light to communicate from the vehicle to the intersection, the system relies on the intensity of that light received by the intersection to estimate the distance (weaker light assumes greater distance) of the emergency vehicle from the intersection. When this estimated distance from the intersection (actually, light intensity) is reached, the emergency vehicle pre-emption sequence is initiated. Although the ability of the infrared system to detect infrared light up to ½ a mile from the intersection requires precision technology, it is not precise enough to track subtle changes in vehicle speed; nor can it determine exact vehicle location.

Unfortunately, there are many factors that can reduce the intensity of the infrared light being received by the intersection at a given distance. These factors can include:

- Aging infrared light sources (emitters) on the vehicle, particularly older strobe-based emitters
- Dirty or misaligned optical receivers (detectors) at the intersection
- Obstacles in the line of site between the vehicle and intersection (e.g., signs, buildings, etc.); seasonal obstacles (e.g., leaves on trees) can be especially problematic
- Certain climatic conditions, especially heavy fog or smoke i very rare cases sunlight, if especially intense and at the right angle, can drown out a detector
- Curves in the road that affect the angle of approach, especially multi-lane roads where this angle may be inconsistent

In all of the cases, the light intensity will be reduced or in severe cases completely blocked. As a result, the vehicle must now be closer to the intersection before it is deemed to be at the threshold distance to activate emergency vehicle detection system. Unfortunately, it is very difficult for the infrared receiver to know when any of these conditions are present. As a result there is no way for the system to automatically compensate for these conditions.

Unlike IR systems, Global Positioning Systems (GPS) utilize satellite-derived GPS coordinates to determine precisely

where the emergency vehicle is located relative to the intersection. This is combined with a bi-directional purpose-built radio that communicates between the vehicle and the intersection. This bi-directional radio allows the vehicle to "handshake" constantly with the intersection to ensure the emergency vehicle pre-emption is only activated precisely when required, even during transient conditions such as rush hour traffic. Because the radio no longer requires a direct line-of-site to the intersection, it is not subject to aging or degradation and it does not need to be cleaned. Therefore, all of the factors impacting IR systems mentioned above are eliminated with GPS.

One key contributing factor to the improved performance of GPS systems compared to an IR system is the use of estimated time of arrival (ETA). The GPS system transmits its exact location to the intersection once per second. Rather than simply using the estimated location of the vehicle (based on light intensity) to activate emergency vehicle pre-emption system (as is necessary in an IR system), the GPS system is capable of activating it based on the estimated time the vehicle will arrive at the intersection (taking into account location and speed variations). This ensures that activation is performed early enough to clear both traffic ahead and the pedestrian crossing, while not leaving cross-traffic waiting any longer than necessary. ETA is especially important when vehicles traveling at different speeds will utilize the system (e.g., an ambulance versus a fully loaded pumper truck) to avoid faster vehicles outrunning the system.

Traffic signals in Norman installed over the last five years are equipped with emergency vehicle pre-emption systems that use GPS technology. There are however numerous traffic signals that have the old IR system that is quickly been phased out of the industry. In order to modernize older traffic signals, the IR systems will need to be replaced with the more reliable GPS system in a systematic way.

On November 22, 2011, City Council approved Resolution R-1112-75, which was later forwarded to both the Association of Central Oklahoma Governments (ACOG) and the Oklahoma Department of Transportation (ODOT), requesting federal funds to pay for 100% of the construction cost associated with the upgrade of fifty five traffic signals ($505,000). In the resolution the City agreed to the terms and conditions of a federally funded project by stating its willingness to assume the responsibility for the preparation of engineering plans, the purchase of any additional right-of-way, the relocation of public utilities and funding of the local share of the construction cost, which normally is 20% but for this safety project will be 0%. The project was submitted for consideration and is currently included in the Association of Central Oklahoma Governments' (ACOG) 2019 Regional Transportation Improvement Plan (TIP).

Final plans were developed by City staff and submitted to ODOT in January of 2019. The project is scheduled to be bid on April 18, 2019. Work is anticipated to begin in August of 2019 and be completed by the end of the year.

DISCUSSION: ODOT requires the City to execute a project agreement and to adopt it by resolution before letting the project to contract. The agreement addresses the responsibilities of the City and the Department during and after the construction of the project. The execution of three original documents is required. Both the resolution and agreement have been reviewed by staff and approved by the City Attorney.

RECOMMENDATION: Staff recommends approval of Contract K-1819-111 and Resolution R-1819-82 with ODOT for the Traffic Signal Upgrade - Emergency Vehicle Pre-Emption System Project (Phase 1).