STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

# PROPRIETARY PRODUCT CERTIFICATION

630-020-07
PROGRAM MANAGEMENT
08/14

To: Annette K. Brennan, P.E
Design Engineer

Date: 12/7/2015

Financial Project ID: 426904-3-52-01 New Const. ☒ RRR ☐
Federal Aid Number: 0953 134 I
Project Name: I-95 New Interchange at St. Johns Heritage Parkway SE, Brevard County
State Road Number: 9 (I-95) Co. / Sec. / Sub.:
Begin Project MP: 5.830 End Project MP: 5.830
Full Federal Oversight: No ☒ Yes ☐ Note: If Yes, submit to FHWA Director.

A justification and all supporting documents must be attached to this document.
*Mark the appropriate certification:*

*"I, Arturo Espinosa (Print Name of Initiator), District 5- ITS consultant (Position Title), of the BCC Engineering, Inc (Name of Agency),*

*do hereby certify that in accordance with the requirements of 23 CFR 635.411(a)(2),*
*Mark appropriately (choose only one option):*

☐ *that this patented or proprietary item is essential for synchronization with existing highway facilities.*
☒ *that no equally suitable alternative exists for this patented or proprietary item."*

*Signature* , 12/7/2015 *Date*

For Department Use Only

*"I,* RICHARD MORROW *Print Name*, DTOE *Position Title*,

*of the Florida Department of Transportation, do hereby approve this certification request made in accordance with the requirements of 23 CFR 635.411(a)(2),*
*Mark appropriately (choose only one option):*

☐ *that this patented or proprietary item is essential for synchronization with existing highway facilities.*
☒ *that no equally suitable alternative exists for this patented or proprietary item."*
*Identify any conditions and limitations:*

SEE ATTACHED

*Signature* , 12/10/15 *Date*

Date: December 7th of 2015.

From: Arturo Espinosa, CCNP. /BCC Engineering, Inc.

To: Annette K. Brennan, P.E/ District 5 Design Engineer

RE: Financial Project ID- 426904-3-52-01. Wavetronix High Definition Microwave Vehicle Detector (MVDS), models SS125 &SS-126. Proprietary Product Certification, Justification Memo.

Road-side mounted microwave vehicle detectors, also known as MVDS, provide traffic data such as: a vehicle's speed, volume, classification and occupancy in a non-intrusive way. MVDS operate in the licensed microwave radio frequency bands. Their basic operating algorithm is based on sending a low power microwave beam to the vehicle's side panels. Once the microwave signals hit the side of the vehicle it gets reflected back to the MVDS unit's antenna. Each vehicle, in different traffic lanes, reflect the microwave energy back to the MVDS unit with a distinctive time delay and signal strength. This microwave beam reflection will be delayed based on the distance from the vehicle to the MVDS unit antenna and the strength of such reflection. The MVDS unit is then able to detect the lane from where the signal was reflected, based on the delay between transmission and receipt of the microwave signal. Reflected signal strength is used for the vehicle classification.

Since the introduction of the MVDS technology to Intelligent Transportation Systems (ITS), the manufacturer's ultimate goal is to make the microwave detectors as accurate as the inductive road-embedded dual-loops. Microwave vehicle detectors can be classified in two different categories, single antenna and dual antenna units. Single antenna MVDS have the limitation of assuming a vehicle length in order to obtain vehicle speed, and their inability to detect vehicle heading direction. Whereas dual antenna, also known as dual-radar, do not have to assume a vehicle length in order to determine vehicle's speed. Dual-radar MVDS use two embedded radio antennas operating at different microwave frequencies. This configuration is very close to the true operating behavior of the dual inductive road loops. By measuring the fraction of a millisecond that it takes a vehicle to pass the two microwave beams, the dual-radar MVDS can accurately determine the vehicle speed. The order in which the antennas received their signal is used to determine vehicle heading direction. This later feature allows for the dual-radar detector to determine the vehicle travel direction.

Single-radar MVDS units are not suitable for detection of reverse travel direction due to the technology's inability to determine if the vehicle entered the detection zone in positive or negative direction.

FDOT District 5, ITS is seeking to integrate the Vehicle Travel Direction detection feature into their ITS system. The advantages of building up a MVDS infrastructure that is capable of automatically detecting wrong way travel direction are numerous. Foremost is public welfare. Wrong way travel direction detection can be used to accurately and timely detect vehicles traveling in the wrong direction and act accordingly to prevent a vehicle collision. The dual-radar technology is not restricted to a "per-lane" vehicle detection. The technology provides for accurate detection of individual vehicles, including those changing lanes or driving on the shoulders. This subtle difference is important because vehicles traveling in the reverse direction are most likely driving erratically and not abiding by the constraints of the delineated lane's lines.

FDOT District 5 will seek integrating the reverse driving direction capability into the SunGuide software, as an enhancement to the TSS subsystem (the MVDS driver within SunGuide), in which the TSS graphical map's links are updated with a distinctive color, indicating that a lane or a segment of a roadway is operating in reverse mode. This feature will be instrumental during evacuation and road closure conditions that cause vehicles to travel in the reverse direction under the guidance of a proper temporary traffic diversion

maintenance of traffic (MOT). Furthermore, being able to log in SunGuide Software database, vehicles traveling the wrong way, will allow the Department to correlate this data with accident data logged into the system. Wrong way driving accidents are commonly associated with people driving in reverse on an off-ramp after realizing that they took the wrong exit, or drivers driving in the wrong direction in the mainline shoulder after realizing that they missed a highway exit. The implementation of a system capable of detecting and log these events will improve road safety, by identifying problematic areas.

There are two MVDS products currently listed in the FDOT Approved Product List (APL), classified under the Vehicle Detector – Radar – Multizone category. The manufacturers with MVDS products in this category are Image Sensing Systems® and Wavetronix®. Both vendors have single antenna units (also known as single radio). Of the two, Wavetronix® has one MVDS product series that offers the dual-radar configuration. The Wavetronix® model series with dual-radar capabilities is the Smart Sensor (SS) High-Definition (HD) series – model number SS125 and SS126, which are already listed in the APL. Image Sensing Systems® MVDS modelsG4, RTMS, Sx300 and Wavetronix® MVDS model SS105V do not offer dual-radar functionality.

The FDOT District 5 has therefore concluded, as a strategic safety measure to be built into their ITS network, the need to implement the unique dual-radar MVDS. Based on the capabilities and availability of the Wavetronix SS125 and SS126 in providing reverse traveling direction detection, District 5 would like to process these MVDS models as a proprietary and unique product with no equivalent suitable alternative. District 5 seeks to introduce this dual-radar technology in all future ITS deployments in order to synchronize the ITS infrastructure which will allow for the future implementation of reverse/wrong traveling direction in highways and arterial ITS deployments. District 5 seeks to deploy the hardware-based dual-radar MVDS infrastructure before issuing a change request to the SunGuide Software Change Management Board, for the inclusion of a software driver enhancement that alerts and logs vehicles driving in the wrong direction.

This proprietary product certification shall stay active until a similar dual-radar MVDS model is approved by the FDOT Traffic Engineering Research Laboratory (TERL) and certified in their Approved Product List. The scope extend of this certification request is Districtwide, for new or technology replacement ITS jobs.