STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
STANDARD WRITTEN AGREEMENT

Agreement No.	BE521
Financial Project I.D.	436328-1-82-01
F.E.I.D. No.:	F741070544-001

Appropriation Bill Number(s)/Line Item Number(s) for 1st year of contract, pursuant to s. 216.313, F.S.: _____

(required for contracts in excess of $5 million)

Procurement No.:	ITN-DOT-16-17-5004-ICMS
DMS Catalog Class No.:	80101507, 80101508

BY THIS AGREEMENT, made and entered into this day of $\underline{3/14/2018 \ | \ 10:16 \ AM \ EDT}$ by and between the STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION, hereinafter called the "Department" and Southwest Research Institute, Inc , of 6220 Culebra Road, San Antonio, TX 78238 duly authorized to conduct business in the State of Florida, hereinafter called "Vendor," hereby agree as follows:

1. SERVICES AND PERFORMANCE

A. In connection with Central Florida Regional Integrated Corridor Management System , the Department does hereby retain the Vendor to furnish certain services, information, and items as described in Exhibit "A," attached hereto and made a part hereof.

B. Before making any additions or deletions to the work described in this Agreement, and before undertaking any changes or revisions to such work, the parties shall negotiate any necessary cost changes and shall enter into an Amendment covering such work and compensation. Reference herein to this Agreement shall include any amendment(s).

C. All tracings, plans, specifications, maps, computer files, and reports prepared or obtained under this Agreement, as well as all data collected, together with summaries and charts derived therefrom, shall be the exclusive property of the Department without restriction or limitation on their use and shall be made available, upon request, to the Department at any time during the performance of such services and/or upon completion or termination of this Agreement. Upon delivery to the Department of said document(s), the Department shall become the custodian thereof in accordance with Chapter 119, Florida Statutes. The Vendor shall not copyright any material and products or patent any invention developed under this Agreement. The Department shall have the right to visit the site for inspection of the work and the products of the Vendor at any time.

D. All final plans, documents, reports, studies, and other data prepared by the Vendor shall bear the professional's seal/signature, in accordance with the applicable Florida Statutes, Administrative Rules promulgated by the Department of Business and Professional Regulation, and guidelines published by the Department, in effect at the time of execution of this Agreement. In the event that changes in the statutes or rules create a conflict with the requirements of published guidelines, requirements of the statutes and rules shall take precedence.

E. The Vendor agrees to provide project schedule progress reports in a format acceptable to the Department and at intervals established by the Department. The Department shall be entitled at all times to be advised, at its request, as to the status of work being done by the Vendor and of the details thereof. Coordination shall be maintained by the Vendor with representatives of the Department, or of other agencies interested in the project on behalf of the Department. Either party to this Agreement may request and be granted a conference.

F. All services shall be performed by the Vendor to the satisfaction of the Director who shall decide all questions, difficulties, and disputes of any nature whatsoever that may arise under or by reason of this Agreement, the prosecution and fulfillment of the services hereunder and the character, quality, amount of value thereof; and the decision upon all claims, questions, and disputes shall be final and binding upon the parties hereto. Adjustments of compensation and contract time because of any major changes in the work that may become necessary or desirable as the work progresses shall be subject to mutual agreement of the parties, and amendment(s) shall be entered into by the parties in accordance herewith.

Reference herein to the Director shall mean the
Director of Transportation Operations

2.   TERM

   A.   Initial Term. This Agreement shall begin on date of execution and shall remain in full force and effect through completion of all services required or 60 months after Notice to Proceed, whichever occurs first. Subsequent to the execution of this Agreement by both parties, the services to be rendered by the Vendor shall commence and be completed in accordance with the option selected below. (Select box and indicate date(s) as appropriate):

   ☐ Services shall commence _____ and shall be completed by _____ or date of termination, whichever occurs first.

   ☑ Services shall commence upon written notice from the Department's Contract Manager and shall be completed by 60 months after Notice to Proceed or date of termination, whichever occurs first.

   ☐ Other: See Exhibit "A"

   B.   RENEWALS (Select appropriate box):

   ☐ This Agreement may not be renewed.

   ☑ This Agreement may be renewed for a period that may not exceed three (3) years or the term of the original contract, whichever is longer. Renewals are contingent upon satisfactory performance evaluations by the Department and subject to the availability of funds. Costs for renewal may not be charged. Any renewal or extension must be in writing and is subject to the same terms and conditions set forth in this Agreement and any written amendments signed by the parties.

   C.   EXTENSIONS. In the event that circumstances arise which make performance by the Vendor impracticable or impossible within the time allowed or which prevent a new contract from being executed, the Department, in its discretion, may grant an extension of this Agreement. Extension of this Agreement must be in writing for a period not to exceed six (6) months and is subject to the same terms and conditions set forth in this Agreement and any written amendments signed by the parties; provided the Department may, in its discretion, grant a proportional increase in the total dollar amount based on the method and rate established herein. There may be only one extension of this Agreement unless the failure to meet the criteria set forth in this Agreement for completion of this Agreement is due to events beyond the control of the Vendor.

   It shall be the responsibility of the Vendor to ensure at all times that sufficient time remains in the Project Schedule within which to complete services on the project. In the event there have been delays which would affect the project completion date, the Vendor shall submit a written request to the Department which identifies the reason(s) for the delay and the amount of time related to each reason. The Department shall review the request and make a determination as to granting all or part of the requested extension.

3.   COMPENSATION AND PAYMENT

   A.   Payment shall be made only after receipt and approval of goods and services unless advance payments are authorized by the Chief Financial Officer of the State of Florida under Chapters 215 and 216, Florida Statutes. Deliverable(s) must be received and accepted in writing by the Contract Manager on the Department's invoice transmittal forms prior to payment. If the Department determines that the performance of the Vendor is unsatisfactory, the Department shall notify the Vendor of the deficiency to be corrected, which correction shall be made within a time-frame to be specified by the Department. The Vendor shall, within five days after notice from the Department, provide the Department with a corrective action plan describing how the Vendor will address all issues of contract non-performance, unacceptable performance, failure to meet the minimum performance levels, deliverable deficiencies, or contract non-compliance. If the corrective action plan is unacceptable to the Department, the Vendor shall be assessed a non-performance retainage equivalent to 10% of the total invoice amount. The retainage shall be applied to the invoice for the then-current billing period. The retainage shall be withheld until the vendor resolves the deficiency. If the deficiency is subsequently resolved, the Vendor

will bill the Department for the retained amount during the next billing period. If the Vendor is unable to resolve the deficiency, the funds retained will be forfeited at the end of the agreement period.

B. If this Agreement involves units of deliverables, then such units must be received and accepted in writing by the Contract Manager prior to payments.

C. Bills for fees or other compensation for services or expenses shall be submitted in detail sufficient for a proper preaudit and postaudit thereof.

D. The bills for any travel expenses, when authorized by terms of this Agreement and by the Department's Project Manager, shall be submitted in accordance with Section 112.061, Florida Statutes. In addition, if compensation for travel is authorized under this Agreement and by the Department's Project Manager, then the Department shall not compensate the Vendor for lodging/hotel expenses in excess of $150.00 per day (excluding taxes and fees). The Vendor may expend their own funds to the extent the lodging/ hotel expense exceeds $150.00 per day. The Department, in its sole discretion and pursuant to its internal policies and procedures, may approve compensation to the Vendor for lodging/hotel expenses in excess of $150.00 per day.

E. Vendors providing goods and services to the Department should be aware of the following time frames. Upon receipt, the Department has five (5) working days to inspect and approve the goods and services, unless otherwise specified herein. The Department has twenty (20) days to deliver a request for payment (voucher) to the Department of Financial Services. The twenty (20) days are measured from the latter of the date the invoice is received or the goods or services are received, inspected and approved.

F. If a payment is not available within forty (40) days, a separate interest penalty as established pursuant to Section 215.422, Florida Statutes, shall be due and payable, in addition to the invoice amount, to the Vendor. Interest penalties of less than one (1) dollar shall not be enforced unless the Vendor requests payment. Invoices which have to be returned to a Vendor because of Vendor preparation errors shall result in a delay in the payment. The invoice payment requirements do not start until a properly completed invoice is provided to the Department.

G. The State of Florida, through the Department of Management Services, has instituted MyFloridaMarketPlace, a statewide eProcurement system. Pursuant to Section 287.057(22), Florida Statutes, all payments shall be assessed a transaction fee of one percent (1%), which the Vendor shall pay to the State. For payments within the State accounting system (FLAIR or its successor), the transaction fee shall, when possible, be automatically deducted from payments to the Vendor. If automatic deduction is not possible, the Vendor shall pay the transaction fee pursuant to Rule 60A-1.031 (2), Florida Administrative Code. By submission of these reports and corresponding payments, Vendor certifies their correctness. All such reports and payments shall be subject to audit by the State or its designee. The Vendor shall receive a credit for any transaction fee paid by the Vendor for the purchase of any item(s) if such item(s) are returned to the Vendor through no fault, act, or omission of the Vendor. Notwithstanding the foregoing, a transaction fee is non-refundable when an item is rejected or returned, or declined, due to the Vendor's failure to perform or comply with specifications or requirements of the Agreement. Failure to comply with these requirements shall constitute grounds for declaring the Vendor in default and recovering reprocurement costs from the Vendor in addition to all outstanding fees. VENDORS DELINQUENT IN PAYING TRANSACTION FEES MAY BE EXCLUDED FROM CONDUCTING FUTURE BUSINESS WITH THE STATE.

H. A vendor ombudsman has been established within the Department of Financial Services. The duties of this individual include acting as an advocate for vendors who may be experiencing problems in obtaining timely payment(s) from a state agency. The Vendor Ombudsman may be contacted at (850) 413-5516.

I. Records of costs incurred under terms of this Agreement shall be maintained and made available upon request to the Department at all times during the period of this Agreement and for three (3) years after final payment for the work pursuant to this Agreement is made. Copies of these documents and records shall be furnished to the Department upon request. Records of costs incurred shall include the Vendor's general accounting records and the project records, together with supporting documents and records of the Vendor and all subcontractors performing work on the project, and all other records of the Vendor and subcontractors considered necessary by the Department for a proper audit of project costs.

J.   The Department, during any fiscal year, shall not expend money, incur any liability, or enter into any contract which, by its terms, involves the expenditure of money in excess of the amounts budgeted as available for expenditure during such fiscal year. Any contract, verbal or written, made in violation of this subsection is null and void, and no money may be paid on such contract. The Department shall require a statement from the comptroller of the Department that funds are available prior to entering into any such contract or other binding commitment of funds. Nothing herein contained shall prevent the making of contracts for periods exceeding one (1) year, but any contract so made shall be executory only for the value of the services to be rendered or agreed to be paid for in succeeding fiscal years. Accordingly, the Department's performance and obligation to pay under this Agreement is contingent upon an annual appropriation by the Legislature.

4.   <u>INDEMNITY AND PAYMENT FOR CLAIMS</u>

A.   INDEMNITY: To the extent permitted by Florida Law, the Vendor shall indemnify and hold harmless the Department, its officers and employees from liabilities, damages, losses, and costs, including, but not limited to, reasonable attorney's fees, to the extent caused by negligence, recklessness, or intentional wrongful misconduct of the Vendor and persons employed or utilized by the Vendor in the performance of this Agreement.

It is specifically agreed between the parties executing this Agreement that it is not intended by any of the provisions of any part of the Agreement to create in the public or any member thereof, a third party beneficiary hereunder, or to authorize anyone not a party to this Agreement to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Agreement.

PAYMENT FOR CLAIMS: The Vendor guaranties the payment of all just claims for materials, supplies, tools, or labor and other just claims against the Vendor or any subcontractor, in connection with the Agreement. The Department's final acceptance and payment does not release the Vendor's bond until all such claims are paid or released.

B.   LIABILITY INSURANCE. (Select and complete as appropriate):

☑ No general liability insurance is required.

☐ The Vendor shall carry and keep in force during the term of this Agreement, a general liability insurance policy or policies with a company or companies authorized to do business in Florida, affording public liability insurance with a combined bodily injury limits of at least $_____ per person and $_____ each occurrence, and property damage insurance of at least $_____ each occurrence, for the services to be rendered in accordance with this Agreement

☑ The Vendor shall have and maintain during the term of this Agreement, a professional liability insurance policy or policies or an irrevocable letter of credit established pursuant to Chapter 675 and Section 337.106, Florida Statutes, with a company or companies authorized to do business in the State of Florida, affording liability coverage for the professional services to be rendered in accordance with this Agreement in the amount of $<u>1,000,000.00</u>.

C.   WORKERS' COMPENSATION. The Vendor shall also carry and keep in force Workers' Compensation insurance as required for the State of Florida under the Workers' Compensation Law.

D.   PERFORMANCE AND PAYMENT BOND. (Select as appropriate):

☐ No Bond is required.

☑ Prior to commencement of any services pursuant to this Agreement and at all times during the term hereof, including renewals and extensions, the Vendor will supply to the Department and keep in force a bond provided by a surety authorized to do business in the State of Florida, payable to the Department and conditioned for the prompt, faithful, and efficient performance of this Agreement according to the terms and conditions hereof and within the time periods specified herein, and for the prompt payment of all persons furnishing labor, materials, equipment, and supplies therefor.

E.   CERTIFICATION.

With respect to any insurance policy required pursuant to this Agreement, all such policies shall be issued by companies licensed to do business in the State of Florida. The Vendor shall provide to the Department certificates showing the required coverage to be in effect and showing the Department to be an additional certificate holder. Such policies shall provide that the insurance is not cancelable except upon thirty (30) days prior to written notice to the Department.

5.   <u>COMPLIANCE WITH LAWS</u>

A.   The Vendor shall comply with Chapter 119, Florida Statutes. Specifically, the Vendor shall:

(1)   Keep and maintain public records required by the Department to perform the service.

(2)   Upon request from the Department's custodian of public records, provide the Department with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes, or as otherwise provided by law.

(3)   Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the Agreement term and following completion of the Agreement if the Vendor does not transfer the records to the Department.

(4)   Upon completion of the Agreement, transfer, at no cost, to the Department, all public records in possession of the Vendor or keep and maintain public records required by the Department to perform the service. If the Vendor transfers all public records to the Department upon completion of the Agreement, the Vendor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Vendor keeps and maintains public records upon completion of the Agreement, the Vendor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the Department, upon request from the Department's custodian of public records, in a format that is compatible with the information technology systems of the Department.

Failure by the Vendor to comply with Chapter 119, Florida Statutes, shall be grounds for immediate unilateral cancellation of this Agreement by the Department.

IF THE VENDOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE VENDOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS AGREEMENT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

District 5

386-943-5000
D5prcustodian@dot.state.fl.us
Florida Department of Transportation
District 5 - Office of General Counsel
719 South Woodland Boulevard
Deland, FL 32720

B. The Vendor agrees that it shall make no statements, press releases or publicity releases concerning this Agreement or its subject matter or otherwise discuss or permit to be disclosed or discussed any of the data or other information obtained or furnished in compliance with this Agreement, or any particulars thereof, during the period of the Agreement, without first notifying the Department's Contract Manager and securing prior written consent. The Vendor also agrees that it shall not publish, copyright, or patent any of the data developed under this Agreement, it being understood that such data or information are works made for hire and the property of the Department.

C. The Vendor shall comply with all federal, state, and local laws and ordinances applicable to the work or payment for work thereof, and will not discriminate on the grounds of race, color, religion, sex, national origin, age, or disability in the performance of work under this Agreement.

D. If the Vendor is licensed by the Department of Business and Professional Regulation to perform the services herein contracted, then Section 337.162, Florida Statutes, applies as follows:

 (1) If the Department has knowledge or reason to believe that any person has violated the provisions of state professional licensing laws or rules, it shall submit a complaint regarding the violations to the Department of Business and Professional Regulation. The complaint shall be confidential.

 (2) Any person who is employed by the Department and who is licensed by the Department of Business and Professional Regulation and who, through the course of the person's employment, has knowledge to believe that any person has violated the provisions of state professional licensing laws or rules shall submit a complaint regarding the violations to the Department of Business and Professional Regulation. Failure to submit a complaint about the violations may be grounds for disciplinary action pursuant to Chapter 455, Florida Statutes, and the state licensing law applicable to that licensee. The complaint shall be confidential.

 (3) Any complaints submitted to the Department of Business and Professional Regulation are confidential and exempt from Section 119.07(1), Florida Statutes, pursuant to Chapter 455, Florida Statutes, and applicable state law.

E. The Vendor covenants and agrees that it and its employees and agents shall be bound by the standards of conduct provided in applicable law and applicable rules of the Board of Business and Professional Regulation as they relate to work performed under this Agreement. The Vendor further covenants and agrees that when a former state employee is employed by the Vendor, the Vendor shall require that strict adherence by the former state employee to Sections 112.313 and 112.3185, Florida Statutes, is a condition of employment for said former state employee. These statutes will by reference be made a part of this Agreement as though set forth in full. The Vendor agrees to incorporate the provisions of this paragraph in any subcontract into which it might enter with reference to the work performed pursuant to this Agreement.

F. A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity, may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids, proposals, or replies on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, Florida Statutes, for CATEGORY TWO for a period of thirty-six (36) months following the date of being placed on the convicted vendor list.

G. An entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity, may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids, proposals, or replies on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with a public entity, and may not transact business with any public entity.

H. The Department shall consider the employment by any vendor of unauthorized aliens a violation of Section 274A(e) of the Immigration and Nationality Act. If the Vendor knowingly employs unauthorized aliens, such violation shall be cause for unilateral cancellation of this agreement.

I. The Vendor agrees to comply with the Title VI Nondiscrimination Contract Provisions, Appendices A and E, available at http://www.dot.state.fl.us/procurement/index.shtm, incorporated herein by reference and made a part of this Agreement.

J. Pursuant to Section 216.347, Florida Statutes, the vendor may not expend any State funds for the purpose of lobbying the Legislature, the judicial branch, or a state agency.

K. Any intellectual property developed as a result of this Agreement will belong to and be the sole property of the State. This provision will survive the termination or expiration of the Agreement.

L. The Vendor agrees to comply with s.20.055(5), Florida Statutes, and to incorporate in all subcontracts the obligation to comply with s.20.055(5), Florida Statutes.

6. TERMINATION AND DEFAULT

A. This Agreement may be canceled by the Department in whole or in part at any time the interest of the Department requires such termination. The Department reserves the right to terminate or cancel this Agreement in the event an assignment be made for the benefit of creditors.

B. If the Department determines that the performance of the Vendor is not satisfactory, the Department shall have the option of (a) immediately terminating the Agreement, or (b) notifying the Vendor of the deficiency with a requirement that the deficiency be corrected within a specified time, otherwise the Agreement will be terminated at the end of such time, or (c) taking whatever action is deemed appropriate by the Department.

C. If the Department requires termination of the Agreement for reasons other than unsatisfactory performance of the Vendor, the Department shall notify the Vendor of such termination, with instructions as to the effective date of termination or specify the stage of work at which the Agreement is to be terminated.

D. If the Agreement is terminated before performance is completed, the Vendor shall be paid only for that work satisfactorily performed for which costs can be substantiated. Such payment, however, may not exceed an amount which is the same percentage of the agreement price as the amount of work satisfactorily completed is a percentage of the total work called for by this Agreement. All work in progress shall become the property of the Department and shall be turned over promptly by the Vendor.

E. For Contracts $1,000,000 and greater, if the Department determines the Contractor submitted a false certification under Section 287.135(5) of the Florida Statutes, or if the Contractor has been placed on the Scrutinized Companies with Activities in the Sudan List, the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or the Scrutinized Companies that Boycott Israel List, the Department shall either terminate the Contract after it has given the Contractor notice and an opportunity to demonstrate the Department's determination of false certification was in error pursuant to Section 287.135(5)(a) of the Florida Statutes, or maintain the Contract if the conditions of Section 287.135(4) of the Florida Statutes are met.

7. ASSIGNMENT AND SUBCONTRACTS

A. The Vendor shall maintain an adequate and competent staff so as to enable the Vendor to timely perform under this Agreement and may associate with it such subcontractors, for the purpose of its services hereunder, without additional cost to the Department, other than those costs within the limits and terms of this Agreement. The Vendor is fully responsible for satisfactory completion of all subcontracted work. The Vendor, however, shall not sublet, assign, or transfer any work under this Agreement to other than subcontractors specified in the proposal, bid, and/or Agreement without the written consent of the Department.

B.   Select the appropriate box:

☑ The following provision is not applicable to this Agreement:

☐ The following provision is hereby incorporated in and made a part of this Agreement:

☐ It is expressly understood and agreed that any articles that are the subject of, or required to carry out this Agreement shall be purchased from a nonprofit agency for the blind or for the severely handicapped that is qualified pursuant to Chapter 413, Florida Statutes, in the same manner and under the same procedures set forth in Section 413.036(1) and (2), Florida Statutes; and for purposes of this Agreement the person, firm, or other business entity (Vendor) carrying out the provisions of this Agreement shall be deemed to be substituted for the state agency (Department) insofar as dealings with such qualified nonprofit agency are concerned. RESPECT of Florida provides governmental agencies within the State of Florida with quality products and services produced by persons with disabilities. Available pricing, products, and delivery schedules may be obtained by contacting:

RESPECT
2475 Apalachee Pkwy
Tallahassee, Florida 32301-4946
Phone: (850)487-1471

☐ The following provision is hereby incorporated in and made a part of this Agreement:
It is expressly understood and agreed that any articles which are the subject of, or required to carry out this Agreement shall be purchased from the corporation identified under Chapter 946, Florida Statutes, in the same manner and under the procedures set forth in Sections 946.515(2) and (4), Florida Statutes; and for purposes of this Agreement the person, firm, or other business entity (Vendor) carrying out the provisions of this Agreement shall be deemed to be substituted for this agency (Department) insofar as dealings with such corporation are concerned. The "corporation identified" is Prison Rehabilitative Industries and Diversified Enterprises, Inc. (PRIDE). Available pricing, products, and delivery schedules may be obtained by contacting:

PRIDE Enterprises
12425 - 28th Street, North
St. Petersburg, FL 33716-1826 (800)643-8459

☑ This Agreement involves the expenditure of federal funds and Section 946.515, Florida Statutes, as noted above, does not apply. However, Appendix I is applicable to all parties and is hereof made a part of this Agreement.

8.   MISCELLANEOUS

A.   The Vendor and its employees, agents, representatives, or subcontractors are not employees of the Department and are not entitled to the benefits of State of Florida employees. Except to the extent expressly authorized herein, Vendor and its employees, agents, representatives, or subcontractors are not agents of the Department or the State for any purpose or authority such as to bind or represent the interests thereof, and shall not represent that it is an agent or that it is acting on the behalf of the Department or the State. The Department shall not be bound by any unauthorized acts or conduct of the Vendor or its employees, agents, representatives, or subcontractors. Vendor agrees to include this provision in all its subcontracts under this Agreement.

B.   All words used herein in the singular form shall extend to and include the plural. All words used in the plural form shall extend to and include the singular. All words used in any gender shall extend to and include all genders.

C.   This Agreement embodies the whole agreement of the parties. There are no promises, terms, conditions, or obligations other than those contained herein, and this Agreement shall supersede all previous communications, representations, or agreements, either verbal or written, between the parties hereto. The State of Florida terms and conditions, whether general or specific, shall take precedence
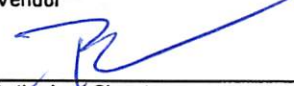
over and supersede any inconsistent or conflicting provision in any attached terms and conditions of the Vendor.

D.   It is understood and agreed by the parties hereto that if any part, term or provision of this Agreement is by the courts held to be illegal or in conflict with any law of the State of Florida, the validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the Agreement did not contain the particular part, term, or provision held to be invalid.

E.   This Agreement shall be governed by and construed in accordance with the laws of the State of Florida.

F.   In any legal action related to this Agreement, instituted by either party, the Vendor hereby waives any and all privileges and rights it may have under Chapter 47 and Section 337.19, Florida Statutes, relating to venue, as it now exists or may hereafter be amended, and any and all such privileges and rights it may have under any other statute, rule, or case law, including, but not limited to those grounded on convenience. Any such legal action may be brought in the appropriate Court in the county chosen by the Department and in the event that any such legal action is filed by the Vendor, the Vendor hereby consents to the transfer of venue to the county chosen by the Department upon the Department filing a motion requesting the same.

G.   If this Agreement involves the purchase or maintenance of information technology as defined in Section 282.0041, Florida Statutes, the selected provisions of the attached Appendix II are made a part of this Agreement.

H.   If this Agreement is the result of a formal solicitation (Invitation to Bid, Request for Proposal or Invitation to Negotiate), the Department of Management Services Forms PUR1000 and PUR1001, included in the solicitation, are incorporated herein by reference and made a part of this Agreement.

I.   The Department may grant the Vendor's employees or subconsultants access to the Department's secure networks as part of the project. In the event such employees' or subconsultants' participation in the project is terminated or will be terminated, the Vendor shall notify the Department's project manager no later than the employees' or subconsultants' separation date from participation in the project or immediately upon the Vendor acquiring knowledge of such termination of employees' or subconsultants' participation in the project, whichever occurs later.

J.   Vendor/Contractor:

   1.   shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the Vendor/Contractor during the term of the contract; and

   2.   shall expressly require any subcontractors performing work or providing services pursuant to the state contract to likewise utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor during the contract term.

K.   Time is of the essence as to each and every obligation under this Agreement.

L.   The following attachments are incorporated and made a part of this agreement:
Exhibit "A", Scope of Services including the PUR1000, Exhibit "B", Method of Compensation, Exhibit "C", Minimum Technical Requirements, Appendix 1, Appendix 2
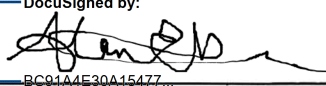
M.   Other Provisions:

IN WITNESS WHEREOF, the parties have executed this Agreement by their duly authorized officers on the day, month and year set forth above.

Southwest Research Institute Inc
Name of Vendor

BY: _____
Authorized Signature

R. B. Kalmbach
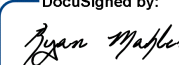(Print/Type)

Title: Executive Director, Contracts

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

BY: _____
Authorized Signature
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Alan E. Hyman, P.E.
(Print/Type)

Title: Director of Transportation Operations

FOR DEPARTMENT USE ONLY

APPROVED:
DocuSigned by:
Michelle Sloan
DBF10369F400432...

Procurement Office

DS
JF

LEGAL REVIEW
DocuSigned by:
Ryan Mahler
A5148250631D422...

ATTESTATION CHECKLIST

Authority: Department of Management Services State Purchasing Memorandum No. 01 (2013-2014)

Form Instructions:
The "Attestation Checklist" shall be completed for all contracts or purchase orders that meet all of the following criteria:
- Funded by the state or federal government.
- Results in anticipated expenditures of $1 million dollars or more during the term of the contract.
- Procured in accordance with Chapter 287, Florida Statutes.

Process for all Contracts/Purchase Orders with anticipated expenditures of $1 million and more:

1. Contract/Project Managers must ensure that the agreement includes provisions for statement of work, deliverables, performance measures, and financial consequences before project advertisement, since these provisions must be in the executed agreement. Immediately after the project is awarded/selected, at the time of obtaining the encumbrance, the Contract/Project Manager shall complete the Attestation Checklist Form No. 375-040-34 and forward to their Central or District Procurement Office, as applicable.
2. Procurement shall separately send the agreement to the vendor for signature, using the Department's approved electronic signature application. Procurement will separately submit to their respective Legal Office the following documents for their review: a) an unexecuted copy of the agreement, b) the Attestation Checklist, and c) the Contract Attestation Form.
3. Once Legal concurrence is obtained (review signature), an unexecuted copy of the agreement, the Attestation Checklist, and the Contract Attestation Form will be submitted to the District Secretary. The District Secretary's signature is required on the Contract Attestation Form. Execution of the attestation cannot be delegated to Director level. In the absence of the District Secretary, the Attestation Form will need to be routed to Central Office Procurement for signature by the Secretary, Chief of Staff, or an Assistant Secretary.
4. The Legal office and the District Secretary shall sign the Contract Attestation Form. The District Secretary's signature on the contract is not required. The process for contract signature routing should follow standard signature routing practices.
5. The District Secretary's Office shall return the signed Contract Attestation Form and the Attestation Checklist to the Procurement Office.

Final step if Contract/Purchase Order has anticipated expenditures of $1 million and more but less than $5 million:

1. Procurement shall distribute a copy of the Contract Attestation Form to the Contract/Project Manager. Procurement will also retain a copy of the Attestation Checklist Form and the signed Contract Attestation Form for the Procurement contract file.

Final steps if Contract/Purchase Order has anticipated expenditures of $5 million or More:

1. Once Legal concurrence and District Secretary concurrence is obtained (review signature), an unexecuted copy of the contract, the Attestation Checklist, and the Contract Attestation Form should be routed to Central Office Procurement, using the Department's approved electronic signature application. After Central Office Procurement Manager review, the Secretary of Transportation's signature will be required for the Contract Attestation Form.
2. Execution of the attestation may not be delegated or transferred for contracts or purchase orders of $5 million or more, except for instances of delegation of authority to executive agency staff in the absence of the agency head.
3. District Procurement will retain a copy of the Attestation Checklist Form and the signed Contract Attestation Form for the Procurement contract file.

ATTESTATION CHECKLIST REQUIREMENTS
CONTRACT #: BE521

I confirm to the best of my knowledge that this contract or purchase order contains or complies with all of the following requirements:

Check off to indicate compliance:

☒ A statement of work;

☒ Quantifiable and measurable deliverables;

☒ Performance measures;

☒ Financial consequences for non performance;

☒ Terms and conditions that protect the interests of the state;

☒ All requirements of law have been met regarding the contract;

☒ Documentation in the contract file that is sufficient to support the contract and the attestation;

☒ If the contract is established by way of a competitive solicitation as identified in s. 287.057(1), the cost of the contract is the most advantageous to the state or offers the best value, or if established by way of competitive solicitation as identified in s. 287.055 for acquisition of professional services contracts, the cost of the contract is fair, competitive, and reasonable.

SCOPE OF SERVICES:

The contract Scope of Services requirements are found on Page(s) 7-94_____ of Exhibit A_____.

CONTRACT DELIVERABLES:

A deliverable is a quantifiable, measurable, and verifiable unit of service that the vendor is required to satisfactorily perform in order for payment to be approved.

Deliverables should:
- Be used to measure the provider's progress;
- Be directly related to the scope of work;
- Be specific, quantifiable, measurable and verifiable;
- Be a necessary part of the provider's performance;
- Be identified in the agreement along with a description of what constitutes successful performance of the services;
- Include minimum performance standards.

Contract Deliverables Provide summary/rolled up contract deliverables (2- 3 sentences) explaining in plain language what the deliverables are for the contract. Also reference the section and page number where deliverables are detailed within the contract document. If you need assistance, please click here for deliverable guidance.

The Vendor shall develop, test, deploy, and support portions of the ICMS needed as part of the Integrated Corridor Management Project. The ICMS will consist of, but not be limited to; commercial off-the-shelf (COTS) modeling software (provided by the DEPARTMENT), a custom built decision support system (DSS), a custom built information exchange network (IEN) subsystem that includes dashboards and other user interfaces to the system, and a data fusion environment (DFE) to host data sources for both the ICMS and other external users and applications.

PERFORMANCE MEASURES:

Describe the required level of services with a description of what constitutes successful performance of the services;

List Contract Performance Measures on lines below or reference the section and page number where the information is found in the contract document: (If you need assistance, please click here for example performance measures.)

Payments shall be achieved and become eligible for payment in accordance with Table 1, Lump Sum Milestone and Monthly Operations, Maintenance, and Support Payments. The Vendor shall submit with each invoice certification that all requirements of each milestone have been completed and approved by the Department. Milestone requirements are detailed in Exhibit "A" Scope of Services. The Department shall verify that all deliverables meet the requirements of the Contract Documents.

FINANCIAL CONSEQUENCES:

Financial Consequences that must be applied in the event that the provider (vendor) fails to perform in accordance with the agreement (Section 287.058 (1)(h), F.S.).

Reference the section and page number where the financial consequences information is found in the contract document: (If you need assistance, please click here for example financial consequences).
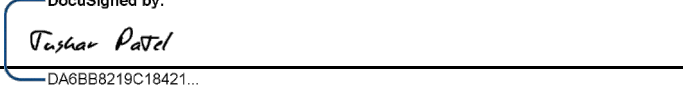
The Vendor acknowledges that failure to complete the services by the completion date designated on the contract document may cause the Department to incur damages that, at present are, and upon the occurrence of the failure to timely complete the services may be difficult to determine.

Contract, Purchase Order, or Solicitation Number:　　　BE521_____

☐　　Contract is $1M and more but less than $5M

☒　　Contract is $5M or more

Contract Manager/
Project Manager Name:　　　Tushar Patel_____

Signature of Contract Manager/
Project Manager:

Tushar Patel
DA6BB8219C18421...

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
CONTRACT ATTESTATION

375-040-35
PROCUREMENT
03/16

I confirm that this contract or purchase order contains or complies with all of the following requirements:
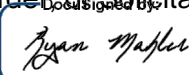
- A statement of work;
- Quantifiable and measurable deliverables;
- Performance measures;
- Financial consequences for non-performance;
- Terms and conditions which protect the interest of the state;
- All requirements of law have been met regarding the contract;
- Documentation in the contract file that is sufficient to support the contract and the attestation (examples: business case; directive to establish contract; subject research and analysis, etc.);
- If the contract is established by way of a competitive solicitation as identified in section 287.057(1), Florida Statutes, the costs of the contract are the most advantageous to the state or offer the best value.

Required for any contract or purchase order which meets all of the following criteria:

- Funded by the state or federal government.
- Results in anticipated expenditures of $1 million dollars or more during the term of the contract.
- Procured in accordance with Chapter 287, Florida Statutes.

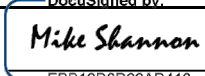Once executed, this attestation shall become part of the contract/procurement file.

Contract, Purchase Order, or Solicitation Number: BE521

Legal Review: *Ryan Mahler*
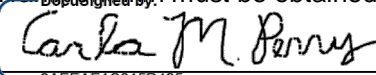A5148259631D422...

Date: 3/9/2018 | 1:36 PM EST

All contracts $1M and above require District Secretary or Assistant Secretary's signature.

District Secretary or Assistant Secretary: Michael Shannon, P.E.

Signature of District Secretary or Assistant Secretary: *Mike Shannon*
EBB16D0D66AD410...

Date: 3/9/2018 | 2:03 PM EST

Approval from the Secretary of the Department of Transportation must be obtained for contracts $5 million and above:

CO Procurement Manager Review Signature: *Carla M. Perry*
9AEEAE1C615D495...

Date: 3/11/2018 | 6:55 PM EDT

Agency Head Signature: *Mike Dew*
2345F99C7488431...

Date: 3/13/2018 | 2:29 PM EDT

Reference Document State Purchasing Memorandum No. 01 (2013-2014)

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

TERMS FOR FEDERAL AID CONTRACTS (APPENDIX I):
CONTRACT (Purchase Order) # <u>BE521</u>

During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "Contractor") agrees as follows:

A.   It is understood and agreed that all rights of the Department relating to inspection, review, approval, patents, copyrights, and audit of the work, tracing, plans, specifications, maps, data, and cost records relating to this Agreement shall also be reserved and held by authorized representatives of the United States of America.

B.   It is understood and agreed that, in order to permit federal participation, no supplemental agreement of any nature may be entered into by the parties hereto with regard to the work to be performed hereunder without the approval of U.S.D.O.T., anything to the contrary in this Agreement not withstanding.

C.   Compliance with Regulations: The Contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation (hereinafter, "USDOT") Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this Agreement.

D.   Nondiscrimination: The Contractor, with regard to the work performed during the contract, shall not discriminate on the basis of race, color, national origin, sex, age, disability, religion or family status in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

E.   Solicitations for Subcontractors, including Procurements of Materials and Equipment: In all solicitations made by the Contractor, either by competitive bidding or negotiation for work to be performed under a subcontract, including procurements of materials or leases of equipment; each potential subcontractor or supplier shall be notified by the Contractor of the Contractor's obligations under this contract and the Regulations relative to nondiscrimination on the basis of race, color, national origin, sex, age, disability, religion or family status.

F.   Information and Reports: The Contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Florida Department of Transportation, the Federal Highway Administration, Federal Transit Administration, Federal Aviation Administration, and/or the Federal Motor Carrier Safety Administration to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of a Contractor is in the exclusive possession of another who fails or refuses to furnish this information the Contractor shall so certify to the Florida Department of Transportation, the Federal Highway Administration, Federal Transit Administration, Federal Aviation Administration, and/or the Federal Motor Carrier Safety Administration as appropriate, and shall set forth what efforts it has made to obtain the information.

G.   Sanctions for Noncompliance: In the event of the Contractor's noncompliance with the nondiscrimination provisions of this contract, the Florida Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration, Federal Transit Administration, Federal Aviation Administration, and/or the Federal Motor Carrier Safety Administration may determine to be appropriate, including, but not limited to:

   a.   withholding of payments to the Contractor under the contract until the Contractor complies, and/or
   b.   cancellation, termination or suspension of the contract, in whole or in part.

H.   Incorporation of Provisions: The Contractor shall include the provisions of paragraphs (C) through (I) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The Contractor shall take such action with respect to any subcontract or procurement as the Florida Department of Transportation, the Federal Highway Administration, Federal Transit Administration, Federal Aviation Administration, and/or the Federal Motor Carrier Safety Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. In the event a Contractor becomes involved in, or is threatened with, litigation with a sub-contractor or supplier as a result of such direction, the Contractor may request the Florida Department of Transportation to enter into such litigation to protect the interests of the Florida Department of Transportation, and, in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

I.   **Compliance with Nondiscrimination Statutes and Authorities**: Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21; The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects); Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex); Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR Part 27; The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age); Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not); Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 -- 12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38; The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex); Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations; Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100); Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

J.   Interest of Members of Congress: No member of or delegate to the Congress of the United States shall be admitted to any share or part of this contract or to any benefit arising there from.

K.   Interest of Public Officials: No member, officer, or employee of the public body or of a local public body during his tenure or for one year thereafter shall have any interest, direct or indirect, in this contract or the proceeds thereof. For purposes of this provision, public body shall include municipalities and other political subdivisions of States; and public corporations, boards, and commissions established under the laws of any State.

L.   Participation by Disadvantaged Business Enterprises: The Contractor shall agree to abide by the following statement from 49 CFR 26.13(b). This statement shall be included in all subsequent agreements between the Contractor and any sub-Contractor or contractor.

The contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

M.   It is mutually understood and agreed that the willful falsification, distortion or misrepresentation with respect to any facts related to the project(s) described in this Agreement is a violation of the Federal Law. Accordingly, United States Code, Title 18, Section 1020, is hereby incorporated by reference and made a part of this Agreement.

N.   It is understood and agreed that if the Contractor at any time learns that the certification it provided the Department in compliance with 49 CFR, Section 26.51, was erroneous when submitted or has become erroneous by reason of changed circumstances, the Contractor shall provide immediate written notice to the Department. It is further agreed that the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction" as set forth in 49 CFR, Section 29.510, shall be included by the Contractor in all lower tier covered transactions and in all aforementioned federal regulation.

O.   The Department hereby certifies that neither the Contractor nor the Contractor's representative has been required by the Department, directly or indirectly as an express or implied condition in connection with obtaining or carrying out this contract, to

1.   employ or retain, or agree to employ or retain, any firm or person, or
2.   pay, or agree to pay, to any firm, person, or organization, any fee, contribution, donation, or consideration of any kind;

The Department further acknowledges that this agreement will be furnished to a federal agency, in connection with this contract involving participation of Federal-Aid funds, and is subject to applicable State and Federal Laws, both criminal and civil.

P.   The Contractor hereby certifies that it has not:

1.   employed or retained for a commission, percentage, brokerage, contingent fee, or other consideration, any firm or person (other than a bona fide employee working solely for me or the above contractor) to solicit or secure this contract;
2.   agreed, as an express or implied condition for obtaining this contract, to employ or retain the services of any firm or person in connection with carrying out this contract; or
3.   paid, or agreed to pay, to any firm, organization or person (other than a bona fide employee working solely for me or the above contractor) any fee contribution, donation, or consideration of any kind for, or in

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

connection with, procuring or carrying out the contract.

The Contractor further acknowledges that this agreement will be furnished to the State of Florida Department of Transportation and a federal agency in connection with this contract involving participation of Federal-Aid funds, and is subject to applicable State and Federal Laws, both criminal and civil.

Q.   Federal-aid projects for highway construction shall comply with the Buy America provisions of 23 CFR 635.410, as amended.

R.   Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of federally assisted construction contract" in 41 CFR Part 60-1.3 shall comply with the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
Appendix II
INFORMATION TECHNOLOGY RESOURCES

375-040-29
PROCUREMENT
06/16
Page 1 of 2

Contract (Purchase Order) #: **BE521**

☐ **PROJECT PLAN SCOPE LANGUAGE**

The Department requires that the Vendor create and submit a Project Plan that demonstrates how the creation and maintenance of the application will be carried out. The Project Plan template may be found at http://www.dot.state.fl.us/OIS/docs/dispFiles.shtm, and is the template which the Department requires the Vendor to follow. The Project Plan must be submitted to the Department within _____ business days after execution of Contract. Upon receipt of the Project Plan, the Department will have fourteen (14) business days to review and approve the Project Plan in its sole discretion. No other work may begin prior to the submission and approval of the Project Plan. After the Project Plan is approved, the Vendor shall keep the Project Plan updated as necessary or upon notification by the Department of a deficiency in the Project Plan. Any change to the Project Plan must be approved by the Department.

☐ **SECURITY PLAN SCOPE LANGUAGE**

The Department requires that the Vendor create and submit a Security Plan. The Security Plan template may be found at http://www.dot.state.fl.us/OIS/docs/dispFiles.shtm, and is the template which the Department requires the Vendor to follow. The Security Plan must be submitted to the Department by _____.   Upon receipt of the Security Plan, the Department will have fourteen (14) business days to review and approve the Security Plan in its sole discretion. After the Security Plan is approved, the Vendor shall keep the Security Plan updated as necessary or upon notification by the Department of a deficiency in the Security Plan. Any change to the Security Plan must be approved by the Department.

☐ **OWNERSHIP OF WORKS AND INVENTIONS**

The Department shall have full ownership of any works of authorship, inventions, improvements, ideas, data, processes, computer software programs, and discoveries (hereafter called intellectual property) conceived, created, or furnished under this Contract, with no rights of ownership in Vendor or any subcontractors. Vendor and subcontractors shall fully and promptly disclose to the Department all intellectual property conceived, created, or furnished under this Contract. Vendor or subcontractor hereby assigns to the Department the sole and exclusive right, title, and interest in and to all intellectual property conceived, created, or furnished under this Contract, without further consideration. This Contract shall operate as an irrevocable assignment by Vendor and subcontractors to the Department of the copyright in any intellectual property created, published, or furnished to the Department under this Contract, including all rights thereunder in perpetuity. Vendor and subcontractors shall not patent any intellectual property conceived, created, or furnished under this Contract. Vendor and subcontractors agree to execute and deliver all necessary documents requested by the Department to effect the assignment of intellectual property to the Department or the registration or confirmation of the Department's rights in or to intellectual property under the terms of this Contract. Vendor agrees to include this provision in all its subcontracts under this Contract.

☐ **ESCROW OF SOURCE CODE**

The Vendor shall maintain in escrow a copy of the source code for the licensed software. With each new release of the software provided to the Department, the Vendor shall maintain the updated source code in escrow. In the event the Vendor files for bankruptcy or ceases operations for any reason, the Department shall promptly be provided the current source code in escrow. The Department will only use the source code to support the licensed software subject to the same nondisclosure provisions of this Contract.

☒ **COPYRIGHT OR PATENT INFRINGEMENT**

To the extent permitted by Florida Law, the Vendor, without exception, shall save, defend and hold harmless the Department and its employees from liability of any nature or kind, including cost and expenses, for or on account of any copyrighted, patented or unpatented invention, process, or article manufactured or supplied by the Vendor. The Vendor has no liability when such claim is solely and exclusively due to the combination, operation or use of articles supplied hereunder with equipment or data not supplied by Vendor or is based solely and exclusively upon the Department's alteration of the article. The Department will provide prompt written notification of a claim of copyright or patent infringement. Further, if such claim is made or is pending, the Vendor may, at its option and expense, procure for the Department the right to continued use of, or replace or modify the article to render it non-infringing. If the Vendor uses any design, device, or materials covered by letters, patent or copyright, it is mutually agreed and understood that, without exception, the Contract price shall include all royalties or other costs arising from the use of such design, device, or materials in any way involved in the work.

☐ **COMPUTER HARDWARE/SOFTWARE**

In any Contract for the purchase or maintenance of machines or computer hardware/software or licensed programs, the Vendor's entire liability and the Department's exclusive remedy for damages to the Department related to the machine or computer hardware/software or

licensed program which is the subject of this Contract, or maintenance thereof shall be limited to, at the Department's discretion, 1) the correction by the Vendor of the relevant defect(s); or 2) actual damages up to the greater of $\_\_\_\_$ or an amount equal to __12__ months maintenance charges for said product or the purchase price of said product. Such maintenance charges will be those in effect for the specific product when the cause of action arose. The foregoing limitation of liability will not apply to (a) the payment of cost and damage awards resulting from liability in accordance with the Copyright and Patent Infringement paragraph above, or to (b) claims for reprocurement costs or the cost of cover pursuant to Rule 60A-1.006, Florida Administrative Code, or to (c) claims by the Department for personal injury or damage to real property or tangible personal property caused by the Vendor's negligence or tortious conduct.

☒ ACCOUNTING AND RIGHT TO AUDIT

ACCOUNTING DOCUMENTATION REQUIREMENTS

The Vendor shall maintain an accounting system which separately accumulates direct and indirect costs, and supports all billing to the Department. The system should include a set of records journals, ledgers, trial balances, and reports and policies and procedures used to process business transactions. A job-cost accounting system must contain each specific job. An acceptable job-costing accounting system should meet the following minimum requirements:

a. A general ledger in which direct and indirect costs are accumulated separately.
b. A payroll system, supported by time sheets, that clearly accounts for 10% of a person's work time and identifies all projects and account numbers charged for each person, including those costs charged to direct and indirect accounts.
c. Time sheets, hours recorded on labor distribution reports, and the hours and dollars summarized in the payroll register must agree.
d. A job-cost ledger or job-cost report in which costs related to all projects and account numbers are charged.
e. Direct costs in the job-cost ledger or job-cost report must support and agree with direct costs contained in the general ledger.
f. Periodic reconciliation of job-cost ledgers to the job-cost reports within the general ledger are conducted.

RIGHT TO AUDIT CLAUSE

The Vendor shall permit onsite visits by State and Department authorized employees, officers, and agents to conduct audits to ensure compliance with Section 20.055, Florida Statues. The Vendor shall grant access to all records pertaining to this Contract including access to all computers, communications devices, and any other equipment used to store, monitor, produce or transmit such records at any premises, whether onsite or offsite.

The Vendor shall maintain all records and other evidence of the Vendor, and any or all subcontractors, to support the costs incurred, and compensation received, directly or indirectly, by the Vendor. The Department, or its designated representatives, shall have the right to audit, copy, and inspect said records and accounts at all reasonable times during the performance of this contract and the retention period of three years after the cancellation, termination, or final payment, or until the conclusion of any claim, litigation, settlement, or appeal; or for such longer period, if any, required by applicable law or regulation, whichever date is latest.

At any time, the Department discovers any excess payments, payments not in conformity with this Contract, or any disallowable costs were paid to the Vendor under this Contract, the Vendor agrees that such amounts are due to the Department upon demand. Vendor agrees that the Department may deduct from any payment due to the Vendor under any other contract between the Department and the Vendor an amount to satisfy any amount due the Department by the Vendor under this Contract. Final payment to the Vendor may be adjusted for audit results.

☒ OPTIONAL CONTINUED SERVICES

The Vendor shall, at the Department's option, provide continued service to the Department for up to __5__ consecutive annual periods after the initial Contract, under all the terms and conditions of this Contract. The price of such annual maintenance shall not exceed the Vendor's then prevailing annual maintenance fee.

BE521

Exhibit A

Scope of Services

for

Central Florida Regional Integrated Corridor Management System

Version: *2.0*

Approval date: TBD

DOCUMENT CONTROL PANEL		
File Name:	CFR-ICMS Exhibit A - Scope of Services.docx	
File Location:	C:\temp\pdf\CFR-ICMS Exhibit A - Scope of Services.docx	
Version Number:	2.0	
Name		Date
Created by:	Kevin Miller/ Clay Packard/ Matt Juckes/ Joe Zingalli/ Carlton Urban/ Steve Corbin	11/30/2016
Reviewed by:	Karen England	12/07/2016
	Karen England	12/14/2016
	Jeremy Dilmore	12/28/2016
	Karen England	01/23/2017
	Karen England	01/25/2017
	Karen England	02/08/2017
	Clay Packard	10/19/2017
	Clay Packard	1/3/2018
Modified by:	Clay Packard	12/11/2016
	Kevin Miller/ Clay Packard/ Matt Juckes/ Joe Zingalli/ Carlton Urban/Soraya Saflicki	12/14/2016
	Clay Packard	1/25/2017
	Karen England	01/25/2017
	Philip Blaiklock	1/25/2017
	Kevin Miller	2/6/2017
	Clay Packard	2/7/2017
	Robert Heller	9/29/2017
	Robert Heller	12/28/2017, 1/16/2018
	Clay Packard	1/21/2018
Approved by:		

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List of Acronyms and Abbreviations

AAM .... Active Arterial Management
API .... Application Program Interface
ATMS .... Advanced Transportation Management System
ATR .... Automatic Traffic Recorders
CFX .... Central Florida Expressway Authority
COTS .... Commercial Off-the-Shelf
CDR .... Critical Design Review
D5 .... District 5
DEPARTMENT .... Florida Department of Transportation
DFE .... Data Fusion Environment
DI .... Data Interfaces
DSS .... Decision Support System
ERE .... Expert Rules Engine
EVE .... Evaluation Engine
FDOT .... Florida Department of Transportation
FTE .... Florida Turnpike Enterprise
GUI .... Graphical User Interfaces
HCS .... Highway Capacity Software
I-4 .... Interstate 4
ICM .... Integrated Corridor Management
ICMS .... Integrated Corridor Management System
IEN .... Information Exchange Network
ITS .... Intelligent Transportation Systems
ITSIQA .... Intelligent Transportation Systems Input Quality Assurance
KPI .... Key Performance Indicator
LD .... Liquidated Damage
LOS .... Level of Service
MOE .... Measure of Effectiveness
MPO .... Metropolitan Planning Organization
NMS .... Network Monitoring System
PDR .... Preliminary Design Review
PRE .... Predictive Engine
PSEMP .... Project Systems Engineering Management Plan
RTMC .... Regional Transportation Management Center
SAT .... System Acceptance Test
SDD .... System Design Document
SLA .... Service Level Agreement

1 Project Description

The Florida Department of Transportation (hereinafter DEPARTMENT or FDOT) District Five (herein after "D5") has identified a need for software development services to design, develop, test, deploy, and support the Central Florida Regional Integrated Corridor Management System (hereinafter "ICMS").

The DEPARTMENT is seeking to enter into a contract to procure works-for-hire design, develop, test, deploy, and support (hereinafter "CONTRACT") portions of the ICMS needed as part of the Integrated Corridor Management (ICM) PROJECT.

The term of the CONTRACT will be 4 years. The design/build portion of the PROJECT described in section 3.5 – with the exception of 3.5.1 – shall occur in the first 2 years of the CONTRACT. The operations, maintenance, and support of the system described in section 3.5.7 shall occur in the remaining 2 years of the CONTRACT. There will also be additional services, as described in section 3.6 that can occur at any time throughout the CONTRACT.

The ICMS will consist of, but not be limited to; commercial off-the-shelf (COTS) modeling software (provided by the DEPARTMENT), a custom built decision support system (DSS), a custom built information exchange network (IEN) subsystem that includes dashboards and other user interfaces to the system, and a data fusion environment (DFE) to host data sources for both the ICMS and other external users and applications.

Additional information about the system is covered in the DSS and ATMS Software Operational Concept document.

The successfully selected software development team (hereinafter "VENDOR") shall provide a qualified and experienced team. The VENDOR shall use an iterative software development approach described in this scope of services document.

1.1 Corridor Description and Boundaries

The ICMS is initially centered on the Interstate 4 (I-4) Corridor. The I-4 Corridor is a major east-west corridor (which travels cardinal northeast/southwest in the region). The I-4 Corridor and influence area contain a primary freeway, a commuter-rail line, transit bus service, park-and-ride lots, major regional arterial streets, toll roads, bike trails, and significant intelligent transportation systems (ITS) infrastructure. Figure 1 shows the I-4 Corridor in yellow, with the influence area shown by the dark line around the metropolitan area. However, this project will develop a modular approach to ICMS that is initially focused on the Orlando region, but will be scalable to FDOT District 5 (D5) entirely.
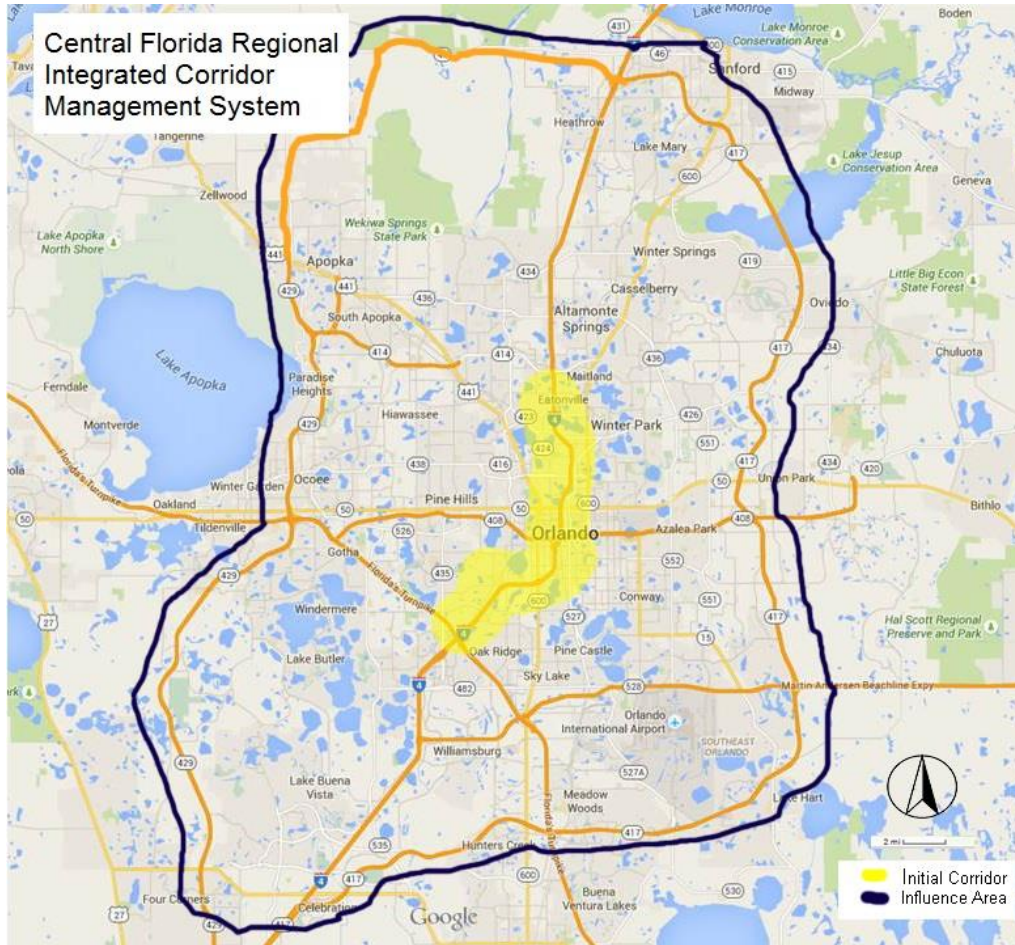
Figure 1: Central Florida ICMS

1.2 Corridor Networks

This section describes the networks contained within the corridor. A network is defined for the purposes of this PROJECT as a system of transportation infrastructure that is independent of agency or jurisdictional boundary. Table 1 provides a summary of the transportation facilities in the metropolitan area.

Table 1: Central Florida Regional Transportation Facilities

Transportation Facility (With Corresponding Agency(ies)) within the Orlando region	Summary Total
Transportation Management Centers (TMC)	8 TMCs (FDOT/Central Florida Expressway [CFX], City of Orlando, Orange County, Seminole County, Osceola County, LYNX, SunRail, Florida's Turnpike Enterprise [FTE])
Commuter Rail Transit System	61.5 miles (SunRail)
Bus Transit System	63 Routes (LYNX)
Computer Controlled Traffic Signal Systems	
Seminole County	380 signalized intersections
Orange County	600 signalized intersections
Osceola County	177 signalized intersections
City of Orlando	500 signalized intersections
Park and Ride Lots	12 SunRail Stations
I-4	~ 72 miles (FDOT), 21 miles of express lanes
Toll Roads	~ 55 miles (FTE) ~ 109 miles(CFX)

The Orlando region, and I-4 in particular, is a true multimodal corridor. It supports a transportation network that includes vehicular traffic on its highways, public transportation routes via bus and commuter rail, air passenger travel, and freight services creating linkages to major metropolitan population and employment and entertainment centers like International Drive, and major theme parks (e.g. Disney, Universal Studios, Sea World).

The maps showing these detour routes can be found at http://cflsmartroads.com/projects/future_projects.html.

1.2.1 Arterial Networks

The arterial network consists of several major east-west arterial streets. These major streets are typically spaced at one-mile intervals and serve as primary travel routes and potentially serve as alternate routes for traffic diverted from freeways and toll roads; however, they are also major traffic generators and need to be considered for response plan development. The key east-west arterials in the corridor are listed as follows:

- Colonial Drive (SR 50)
- Lake Mary Boulevard
- SR 536
- SR 434

- Lee Road (SR 423)

- Maitland Boulevard (SR 414)

- Aloma Avenue (SR 426)

- Sand Lake Road (SR 482)

There are also several key north-south arterials. While many of these carry significant traffic, these arterials are critical for moving traffic between the east west routes, including for diversion purposes. They are also major traffic generators and need to be considered for response plan development. The key north-south arterials are listed as follows:

- Orange Blossom Trail (US 441)

- Kirkman Road (SR 435)

- John Young Parkway (SR 423)

- Semoran Boulevard (SR 436)

- International Drive

- Apopka Vineland Road (SR 535)

- Orange Avenue (SR 527)

- Goldenrod Road (SR 551)

- US 17/92

- Alafaya Trail (SR 434)

As part of the active arterial management (AAM) project - the traffic signals and other key ITS devices along key corridors within the region will be used to actively manage these key roadways. The map in Figure **2** shows the roadways within the ICM corridor that are a part of the AAM project.
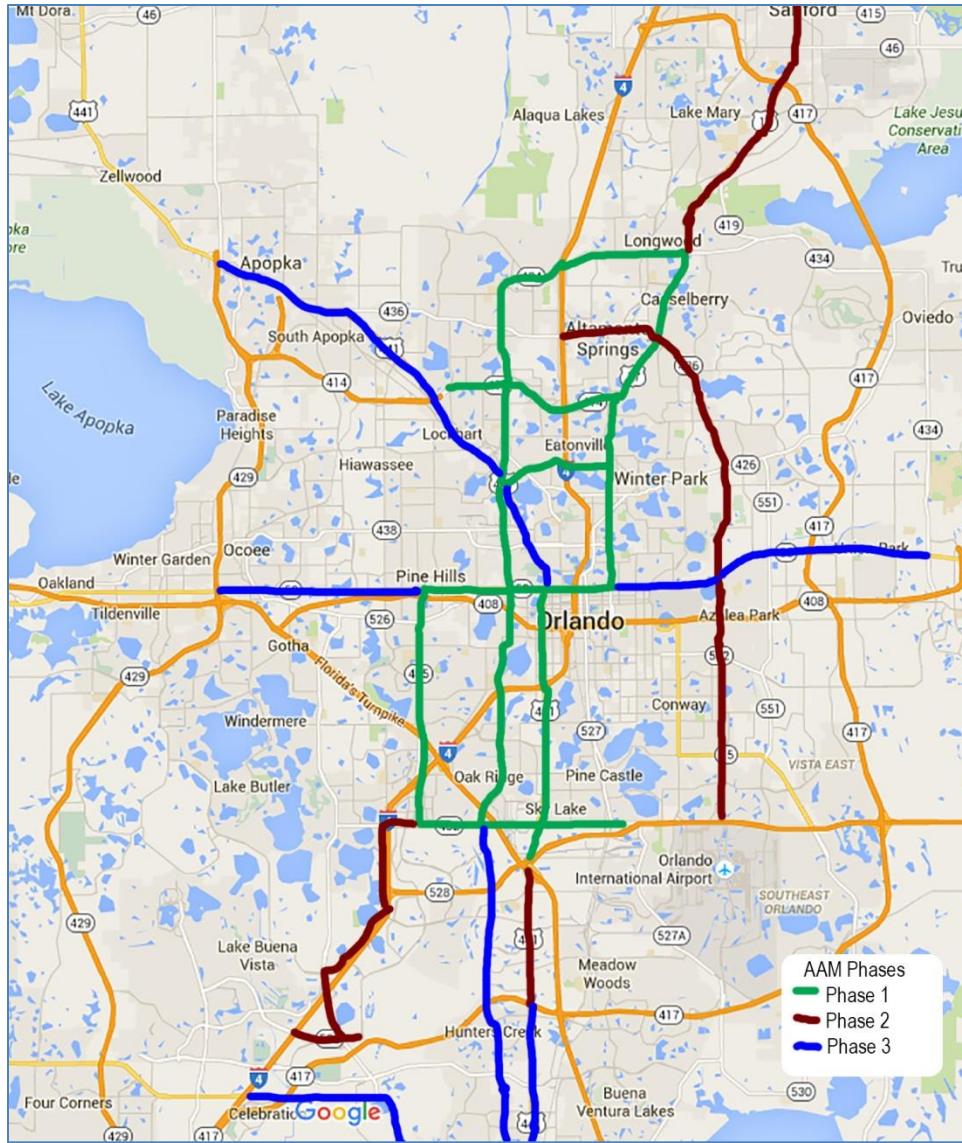
Figure 2: **AAM Project Phases within the Corridor**

As part of the I-4 Ultimate project, several detour routes were developed that include parts of the following east-west detour roads near I-4:

- Maitland Boulevard (SR 414)
- SR 46
- Semoran Boulevard (SR 436)
- Dirksen Drive
- SR 434
- US 17 - 92
- Lake Mary Boulevard

- Lee Road (SR 423)
- SR 46A (H.E. Thomas Blvd)
- Fairbanks Avenue (SR426)
- Princeton Street (SR 438)
- Colonial Drive (SR 50)
- Anderson Street
- W Kaley Street

- Michigan Street
- LB McLeod Road
- 33rd Street
- 35th Street
- 39th Street
- Beachline Expressway
- Millenia Boulevard
- Conroy Road

- Sand Lake Road (SR 482)
- Universal Boulevard
- SR 536
- Buena Vista Drive
- Ronald Reagan Parkway
- Osceola Polk Line Road
- US 192
- Epcot Center Road

There are also several north-south arterials involved with the detour of traffic when incidents occur on I-4. While many of these carry significant traffic, these arterials are critical for moving traffic between the east west routes, including for diversion purposes. They are also major traffic generators and need to be considered for response plan development. The key north-south arterials are listed as follows:

- Maitland Avenue
- Longwood-Lake Mary Boulevard
- Forest City Road (SR 434)
- Rinehart Road
- Montgomery Boulevard
- International Parkway
- Poinciana Boulevard
- US 17-92
- Markham Woods Road
- John Young Parkway (SR 423)
- Wymore Road
- Orange Avenue (SR 527)

- Magnolia Avenue
- Orange Blossom Trail (SR 441)
- Garland Avenue
- N Hughey Avenue
- Rio Grande Avenue
- Orlando-Vineland Road
- Kirkman Road (SR 435)
- Turkey Lake Road
- Universal Boulevard
- World Drive
- US 27
- Lake Wilson Road

There are other transportation networks (i.e. bus, commuter rail) within the region that are further discussed in the Concept of Operations document.

1.3 Corridor Stakeholders and Users

The operating agencies located in the I-4 Corridor, all of which were involved to some extent in the development of the Concept of Operations and System Requirements, are identified in Table 2. Each agency has a designated lead staff member along with technical staff in key areas of responsibility.

Scope of Services for Central Florida Integrated Corridor Management System

Table 2 shows the current responsibilities and infrastructure that each agency currently provides to the region.

Table 2: Traffic Related Responsibilities of the Orlando Region

Traffic-Related Roles	FDOT Central Office	FDOT D5	FTE	MetroPlan	CFX	SunRail	Orange County	Osceola County	Seminole County	City of Kissimmee	City of Maitland	City of Orlando	City of Winter Park	Florida Highway Patrol	LYNX	Universities
Police											X	X		X		
Fire							X	X	X	X	X	X	X			
Emergency Services							X	X	X	X	X	X	X	X		
Road Ranger/ Courtesy Patrol		X	X		X											
Traffic Signal System		X					X	X	X	X	X	X	X			
Detectors		X	X		X		X	X	X	X	X	X	X			
Dynamic Message Sign		X	X		X		X	X	X	X	X	X	X			
Public Works							X	X	X	X	X	X	X			
Closed-circuit Television		X	X		X		X	X	X	X	X	X	X			
Electronic Toll /Fare /Parking equipment			X		X	X						X			X	
Transit – Bus/ Commuter Rail						X									X	
Parking Management												X				
Maintenance/ Construction		X	X		X	X	X	X	X	X	X	X	X		X	
Data Warehouse/ Analytics	X	X		X												X
Modeling		X	X	X	X											
Internet Traveler Information	X	X	X		X	X									X	
Congestion Pricing		X	X													

Table 3 shows locality use of signal controllers and signal software.

Table 3 - Locality and Signal Software / Controller Use

	ATMS.Now	Econolite Centracs oftware	Siemens Tactics Software	Eagle Traffic Signal Controllers	Econolite Traffic Signal Controllers	Naztec controllers with
City of Kissimmee		X		X		
City of Maitland				X		
City of Orlando	X					X
City of Winter Park				X		
Orange County			X	X		
Osceola County		X			X	
Seminole	X					X

1.3.1 FDOT D5

FDOT D5 operates and maintains the interstates, US highways, and state highways within the region. The regional transportation management center (RTMC) serves as the command post that monitors and manages D5 technologies to provide motorists with reliable traveler information. The RTMC coordinates with incident responders in Brevard, Flagler, Lake, Marion, Orange, Osceola, Seminole, Sumter, and Volusia Counties to maintain the information flow throughout the District.

In addition, the RTMC is the home of FDOT D5's active arterial management project, which manages the traffic signals and other key ITS devices along key corridors within the region and will be used to actively manage the arterial corridors.

1.3.2 Florida's Turnpike Enterprise

FTE is a business unit of the DEPARTMENT, employing private sector business practices to operate its 483-mile system of limited-access toll highways across Florida. The FTE system includes the Mainline from Miami to Central Florida as well as the Homestead Extension, the Sawgrass Expressway, the Seminole Expressway, the Beachline Expressway, the Southern Connector Extension of the Central Florida GreeneWay, Veterans Expressway, the Suncoast Parkway, the Polk Parkway, the Western Beltway and the I-4 Connector. On average, 1.8 million motorists use Florida's Turnpike each day.

1.3.3 MetroPlan

Also known as the Orlando Urbanized Area Metropolitan Planning Organization (MPO), MetroPlan Orlando is one of 26 MPOs in the State of Florida, and it was one of the first multi-county MPOs in the state. MetroPlan Orlando is the MPO for Orange, Osceola, and Seminole counties, and the cities within those counties, including the City of Orlando, City of Winter Park, City of Maitland, and City of Kissimmee – which makes up the Orlando Urbanized Area. As a regional MPO, MetroPlan Orlando provides the forum for local elected officials, their staff, citizens, and industry experts to work together to improve transportation in Central Florida. A key responsibility under federal law is the development of a Long-Range Transportation Plan for the region.

1.3.4 Central Florida Expressway Authority

CFX is responsible for the construction, maintenance, and operation of a 109-mile limited-access expressway system. It may also acquire, construct, and equip rapid transit, trams, and fixed guideways within its rights-of-way. CFX's system includes SR 408 (Spessard Holland East-West Expressway), SR 528 (Martin Andersen Beachline Expressway), SR 417 (Central Florida GreeneWay), SR 429 (Daniel Webster Western Beltway), SR 414 (John Land Apopka Expressway), and State Road 451. CFX's jurisdiction includes Orange, Lake, Osceola, and Seminole Counties.

1.3.5 Orange County

Orange County has a population of 1,145,956 according to the 2010 United States Census, making it the fifth-most populous county in Florida. Located in Central Florida, Orange County includes the City of Orlando and a dozen other incorporated municipalities. Orange County uses Siemens Tactics Software and Eagle Traffic Signal Controllers for their signal system.

1.3.6 Osceola County

As of the 2010 census, the population of Osceola County was 268,685. Its county seat is Kissimmee. The Traffic Engineering Department is a part of the Public Works Division and conducts traffic studies, analyzes crash data, performs signal design reviews, manages the annual traffic count program, issues signal warrants, performs special event reviews, and participates in the development review process. The Traffic Operations Department installs and operates county signs, signals, roadway lighting, striping, and pavement markings. Osceola County uses Econolite Traffic Signal Controllers and Econolite Centracs software.

1.3.7 Seminole County

As of the 2010 census, the population of Seminole County was 422,718. It is the smallest county according to land size in the state. The county seat is Sanford. The transportation system of Seminole County brings people and goods into the county, accommodates

traffic passing through the county, and provides the mobility and accessibility that allows residents to participate in the community's social and economic activities. Historically, the county's transportation system was dominated by a single transportation mode – the private automobile. Public transit played a relatively minor role, and walking and biking played purely recreational roles. There are approximately 2,320 centerline miles of roadways in Seminole County. These roadways have been assigned to the State Highway System, the County Road System and the City Street Systems based on the functional classification of individual roadway segments as determined by FDOT. Seminole County uses Naztec controllers with ATMS.Now software.

1.3.8 City of Kissimmee

Kissimmee is a suburban city in Osceola County, Florida. As of the census, the population was 59,682. The City of Kissimmee Traffic Division is responsible for the maintenance of signalized intersections for the City of Kissimmee and Osceola County. The City of Kissimmee uses Econolite Traffic Signal Controllers and Econolite Centracs software.

1.3.9 City of Maitland

Maitland is a suburban city in Orange County, Florida, part of the Greater Metro Orlando area. The population was 15,751 at the 2010 census. The Maitland Transportation Engineer is responsible for transportation-related movements in the city with regard to automobiles, pedestrians, bicycles/bike paths, rail systems, and bus routes. The objective is to coordinate these facilities into an integrated system that best serves the citizens of Maitland. The City of Maitland uses Eagle Traffic Signal Controllers.

1.3.10   City of Orlando

In 2010, Orlando had a city-proper population of 238,300, making it the 77th largest city in the United States, the fifth largest city in Florida, and the state's largest inland city. Orlando is also known as "The Theme Park Capital of the World" and "City Beautiful." In 2014, tourist attractions and events drew more than 62 million visitors. The Orlando International Airport is the 13th busiest airport in the United States, and the 29th busiest in the world.

The City of Orlando Traffic Signal Maintenance is responsible for the maintenance of 500 signalized Intersections, 21 school zone flashers, and 21 warning flasher locations. The Operations Center services the traffic signals in the city 24 hours per day, 7 days per week. The City of Orlando uses Naztec controllers with ATMS.Now software.

1.3.11   City of Winter Park

Winter Park is a suburban city in Orange County, Florida. The population was 27,852 at the 2010 census. The Engineering Division within the Public Works Department manages all work in the city's rights-of-way including road design, parking and site improvements for city structures, traffic analysis and control, signal analysis and design, coordination

and implementation of streetlights, administration of the city's streetlight, brick street and sidewalk policies, survey and mapping, inspection of construction activities, permitting of right-of-way uses, and utility connections. The City of Winter Park uses Eagle Traffic Signal Controllers.

1.3.12   LYNX

The Central Florida Regional Transportation Authority, known as LYNX, provides bus transit service for Orange, Seminole, and Osceola Counties. This includes 63 local bus routes including the LYMMO downtown circulator, FastLink commuter service, Xpress service from Orlando to Volusia and Lake Counties, and ACCESS LYNX, which serves disabled customers. SunRail train service is a partner with LYNX.

The LYNX Operations Center is at 2500 Lynx Lane in Orlando near John Young Parkway and Princeton Street.

1.4 Scope of the System

The Central Florida Regional ICMS is an essential system for the operating agencies within the region to implement coordinated strategies to meet transportation performance measures and in response to recurring congestion and planned and unplanned traffic events causing congestion and/or delay. The ICMS will become the collective knowledge resource to select appropriate response plans either through an automated or human process and determine potential corridor benefits of proposed response plans. The ICMS is comprised of three main systems: 1) DFE, 2) IEN, and 3) DSS.

The DFE will host a variety of data sets used and produced by the ICMS and other external systems. Data interfaces (DI) will be developed to receive Central Florida transportation network data from various transportation data providers into the DFE. Application program interface (API) specifications will be provided for the majority of interfaces. If a new data source is found to be necessary, the VENDOR may be required to develop the data interface for that source and will include additional APIs as part of a Special Projects scope outside the base scope. The DFE will also serve other D5 transportation operations beyond the needs of the ICMS.

The IEN provides graphical user interfaces (GUI) for agencies to view the entire data set of transportation information on a single GUI and interact with the system including invoking response plans. The IEN also provides notifications through text, emails, and mobile applications to notify stakeholder agencies of events and response plan actions needed.

The DSS will be developed to provide a system to review and evaluate the current and predicted conditions of the Central Florida transportation network in order to help operators make smart decisions in managing both recurring and non-recurring congestion conditions. Components to the DSS will include an Expert Rules Engine (ERE), a Predictive Engine (PRE), a Signal Optimization Tool (SOT), and an Evaluation Engine (EVE). The DSS will build and select response plans to be evaluated, model the predicted outcomes of the selected response plans, evaluate and score the plans, coordinate with

operators and local agency maintainers through the IEN, and invoke the approved response plan actions through the SunGuide® software system (SunGuide). Once the system has deployed a response plan to SunGuide, the DSS will continue to monitor event status for changes and until the congestion has been alleviated so response plans can be modified or deactivated. The core responsibilities of the DSS are as follows:

- Monitor, evaluate, and respond to reoccurring congestion along the arterial network.

- Evaluate and respond to non-recurring congestion on I-4 within the identified network.

- Evaluate and respond to non-recurring congestion on arterial roadways within the identified network.

The main functionality of the ICMS is to:

- Receive live and historical data from traffic and transportation-related systems and operations in the region;

- Provide the current status of devices and performance of roadway and transit network within the region of interest;

- Analyze infrastructure status data to determine the availability of infrastructure components and/or systems to use in corridor improvement strategies and response plans in the region;

- Analyze collected data to determine transportation performance, potential corridor improvement strategies, and responses to traffic events and congestion. Strategies and responses will include, but are not limited to:

  - Coordinated timing plan for central traffic signal software;

  - Metering state and rates for ramp meters;

  - Hard shoulder running;

  - Dynamic messaging for diverting traffic;

  - Disable pricing on managed lanes;

  - Responder dispatch and coordination; and

  - Transit rerouting and bus bridging.

- Evaluate the potential benefit of implementing corridor improvement strategies and associated response plans through simulation in real-time and offline;

- Evaluate the impact of enacted corridor improvement strategies and associated response plans in real-time and offline;

- Provide stakeholders with the capability to provide and receive transportation-related data; and

- Present stakeholders with transportation-related analysis, and corridor improvement and response plan recommendations in an interactive real-time manner.

1.5 System Context

The system context diagram in Figure **3** shows a high-level conceptual framework of the FDOT D5 Operations, the DFE, and the integrated devices and data sources with D5 and partner agencies. The PROJECT consists of the ICMS Software Application, the IEN, and the supporting DFE. The ICMS is a data processing system integrated into other D5 transportation systems management and operations (TSM&O) operations as well as the DFE shown in Figure **3**. The DFE is integrated with data sets, data streams in motion, and user applications.
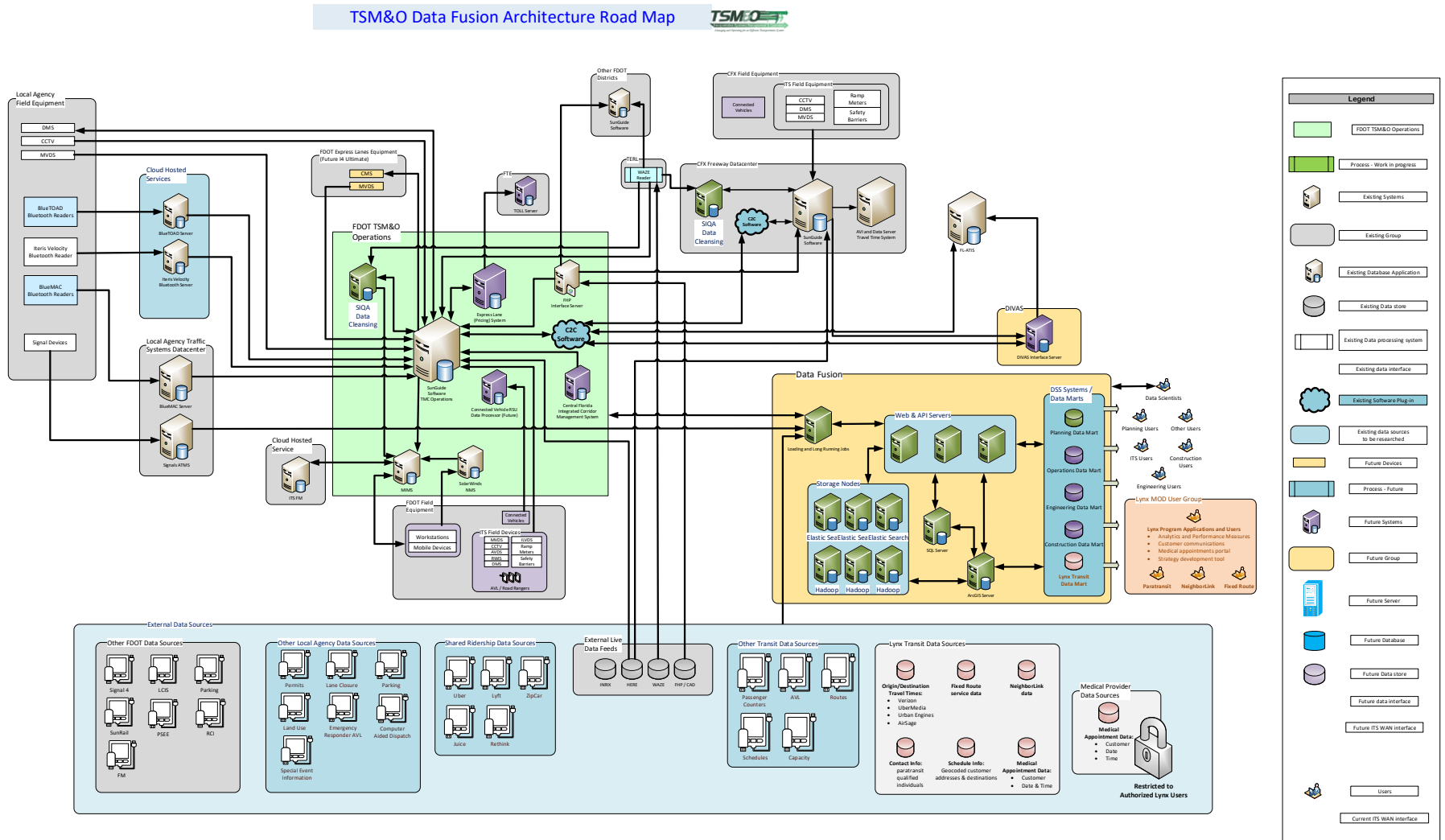
Figure 3: **System Context Diagram**

DI, as discussed in the sections below, interface with both data providers and data consumers. DIs can be implemented as data extractors to pull data into the DFE, or APIs to provide access to data in the DFE to other ICMS subsystems and components, and external users and applications.

This PROJECT is one of several that the DEPARTMENT existing, planned or legacy projects that support the D5 TSM&O Operations. The ICMS will be developed in a way that preserves this growing ecosystem of systems. Existing operations will not be interrupted. Early designs, prototypes, and implementations of systems to be implemented by this PROJECT will be provided to support this PROJECT's design and development, but not necessarily required to be used. There are other systems to be interfaced or integrated with the ICMS, but not developed by the ICMS PROJECT.

At the heart of the TSM&O data operations architecture is the group of systems performing real-time operations. This includes the following systems:

- Existing systems physically deployed in the D5 data center:
  - SunGuide, performing the primary command and control;
  - Maintenance and Inventory Module Subsystem (MIMS), providing ITS asset maintenance management;
  - SolarWinds network management system; and
  - Florida Highway Patrol Interface Server providing all of the state's SunGuide deployments with Florida Highway Patrol computer-aided dispatch data.
- Systems under development, to be deployed in the D5 data center:
  - Intelligent Systems Input Quality Assurance (ITSIQA) is a project that will perform transportation sensor data quality assurance and fusion onto a common base map.
  - Intersection Movement Counts is a project to retrieve turning movement counts for intersections from the traffic signal controllers.
  - Transit Signal Priority is a project where a bus behind schedule can invoke a priority to the traffic signal that the bus is approaching.
- Future systems to be developed including an express lanes pricing system, a connected vehicle roadside unit data processing system, a mixed mode routing engine, and this ICMS. These systems will all benefit from a centralized environment from which real-time and archived transportation related data can be obtained.
- Existing cloud-hosted systems used by TSM&O Data operations:
  - ITS Freeway Management system providing statewide inventory of ITS assets;
  - BlueMAC Server, BlueTOAD Server, and Iteris Velocity Server provide data collection and processing from Bluetooth readers; and

- Signal advanced transportation management system (ATMS) central software systems providing a central interface to an agency's network of traffic signal controllers.

The DSS will be another application in the operations systems group. Also hosted by D5's data center will be the DFE, which is, in a sense, also a D5 TSM&O system. However, it is separated in Figure 3 to show more details of the components in the DFE and to delineate it from an operations application to the paradigm shift of data storage and access. Data marts, or APIs, provide the users and applications with access to data stored within the storage components of the DFE. They provide a consistent interface to a cataloged set of data sources.

With the DFE in place, as more applications are created and enhanced, they will migrate to relying on the DFE as a central data hub. Applications will retrieve the data they need to process and provide processed data back into the DFE in three components, creating a pattern of separate DIs, data processors, and APIs as a design pattern.

More details of an initial documentation of the environment and plan for the future DFE-centric environment can be found in the supporting materials at http://cflsmartroads.com/projects/future_projects.html.

1.6 ICMS Operations

The TSM&O regional traffic optimization operations include a network of agencies working together to improve mobility of the transportation network. The ICMS operations supports the TSM&O operations, and includes the following concurrent processes:

- **Data Collection, Cleansing, Fusion, Archiving, and Interfacing** – this operational process supports ICMS as well as other users and applications with transportation information. Activities in this environment include retrieving data from real-time devices and systems, performance quality analysis and transformation of the data to a more usable state, providing the data streams in real-time to other applications, providing access to archive data, and supporting deep analytics to discover additional value, insights, and further decision-making and performance evaluation support.

- **Traffic Incident Response on Limited-Access Facilities** – this operational process monitors the Event Management Subsystem of the SunGuide software for incidents on limited-access facilities, determines an appropriate adjacent corridor flush strategy and other strategies pre-defined by FDOT as an incident response plan, determines the measure of effectiveness of the response plan using a mesoscopic simulation of a reduced network, coordinates with FDOT and/or local agency maintainers for approval, invokes the response plan through the SunGuide software, continues to monitor the incident and environment conditions, makes adjustments to the response plan, and finally deactivates the response plan.

- **Traffic Incident Response on Arterial Facilities** – this operational process monitors the turning movement counts, the signal performance measures data, and ITSIQA output for an increase in queue length and/or travel time over a

configurable percentage of historical value, determines a better optimized corridor signal timing plan set from existing plans, determines the measure of effectiveness of the signal timing plan set using a mesoscopic simulation of a reduced network, coordinates with FDOT and/or local agency maintainers for approval, invokes the response plan, continues to monitor the incident and environment conditions, makes adjustments to the response plan, and finally deactivates the response plan.

- **Periodic Signal Timing Optimization** – this offline process optimizes the network by considering all 5-minute interval's saturation rates for each movement of each intersection within a corridor or a signal in isolation, groups the intervals into contiguous intervals based on similarity of their saturation rates, clusters similar groups of contiguous intervals, calculates new optimal timing plans for the cluster of contiguous groups, calculates the percent improvement and applicability over the plans currently in use, presents optimal plans and metrics and related data to the signal timing engineer for review and timing plan implementation. The engineer can view the optimal plans and related data, make adjustments and new plans, request reduced mesoscopic simulations, and provide signed and sealed plans for approval and implementation.

The system context diagram in Figure 4 shows a high-level conceptual flow of the ICMS operations and process in meeting the core responsibilities of the DSS. The following are the detailed steps shown in the figure:

1. Data from external sources (traffic, events, signal timing) are collected, formatted if needed, and stored in the DFE.

2. The ERE polls the DFE continuously for the latest status and event information. The ERE analyzes the latest data to perform the following four subtasks:

   a. Check for any new or updated event data for SunGuide freeway related events;

   b. Check for any new or updated event data for arterial related events (Local Events;

   c. Analyze signals to check for level of service (LOS) triggers including the following:

      i. Deviation in queue length from expected value

      ii. Deviation in turning movement counts from expected values

   d. Perform periodic, offline optimization of traffic signals based on a demand clustering and clumping algorithm (This is not part of this control flow; it runs asynchronously and off-line. It is here only for completeness). .

3. Depending on the results of the previous step, the ERE can perform one or a combination of following functions:

   a. For freeway or arterial related events, the ERE will evaluate the severity and, based on the rules, determine the need for a response plan evaluation and if needed will select the most appropriate or applicable response plans from the

Response Plan Repository within the DFE for evaluation and send the request for the mesoscopic predictive simulation analysis; this function will repeat throughout the life of the event until the event has cleared and the mesoscopic predictive simulation analysis confirms that any event response plans related to that incident can be reverted back to normal operations.

b. For signal LOS, queue length, or travel time deviation alarms, or for periodic offline optimization, the ERE identifies the one or more response plans to be evaluated, and sends this selected group to the PRE for evaluation using the deterministic model and the predictive traffic simulation model. ICMS will allow the corridor to be configured prior to operation.

4. The deterministic model, when requested, builds a current corridor network for the requested intersections and optimizes the timing plans and offsets using the deterministic model to reduce the delays and improve the LOS. New timing plans may be sent to the mesoscopic simulation to be evaluated. Predictive traffic modeling, and procurement and configuration of the predictive traffic modeling engine/software are not part of this contract; the DEPARTMENT has responsibility for these tasks).

5. The mesoscopic traffic simulation model gets the request from the ERE and/or the deterministic model and builds each of the requested models, including the Do Nothing. The models are built using the status data from the DFE and the current date and time information. Simulations are run in parallel and the data is sent to the EVE and the DFE.

6. The EVE calculates the score for each Response Plan or the benefit for any suggested signal timing optimization changes by calculating the measures of effectiveness (MOE) and evaluating the recommended benefits of the response scenarios versus the Do Nothing scenario.

7. If the benefit or score of the best plan is sufficiently high enough, the EVE will send the recommendations through the IEN to the ICM operator/manager.

8. The manager reviews the plan and makes the final decision on its applicability to the current conditions. Upon approving the plan, the ICM operator/manager sends the requested controls through the IEN to the various implicated agencies.

9. Individual agencies approve or deny the requests and confirm that all actions were successful, providing necessary changes to reflect non-performed actions (assuming the initial request was approved).

10. After implementation or if no plan or change is recommended, the ERE will monitor the current conditions and, depending on said conditions, will determine if the event should be re-evaluated or terminated. Upon termination, response plan actions are cancelled and devices are returned to typical time of day operations. If re-evaluation is warranted ERE starts at step 2 again and goes through the steps to prepare the models for evaluations.
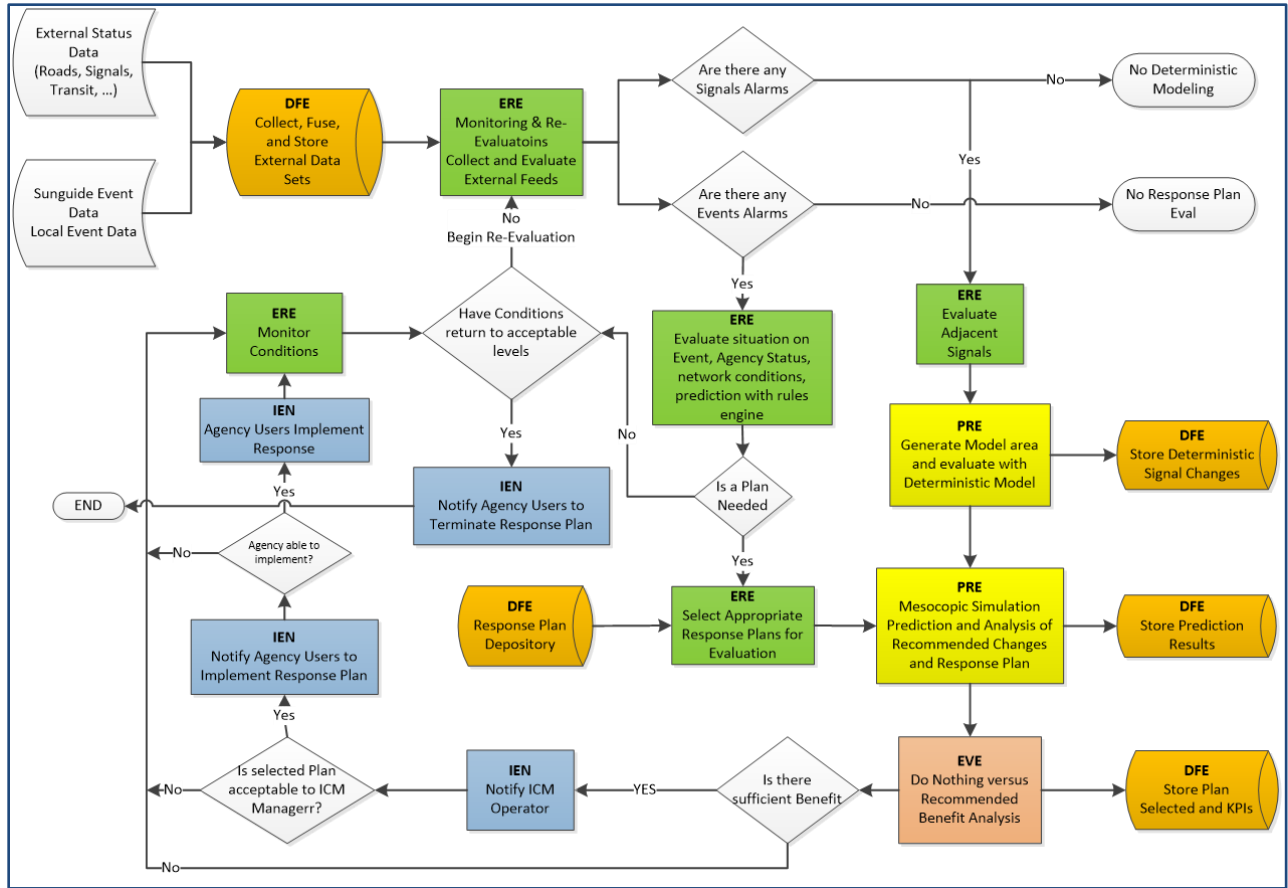
Figure 4: ICMS Response Plan Process Flow
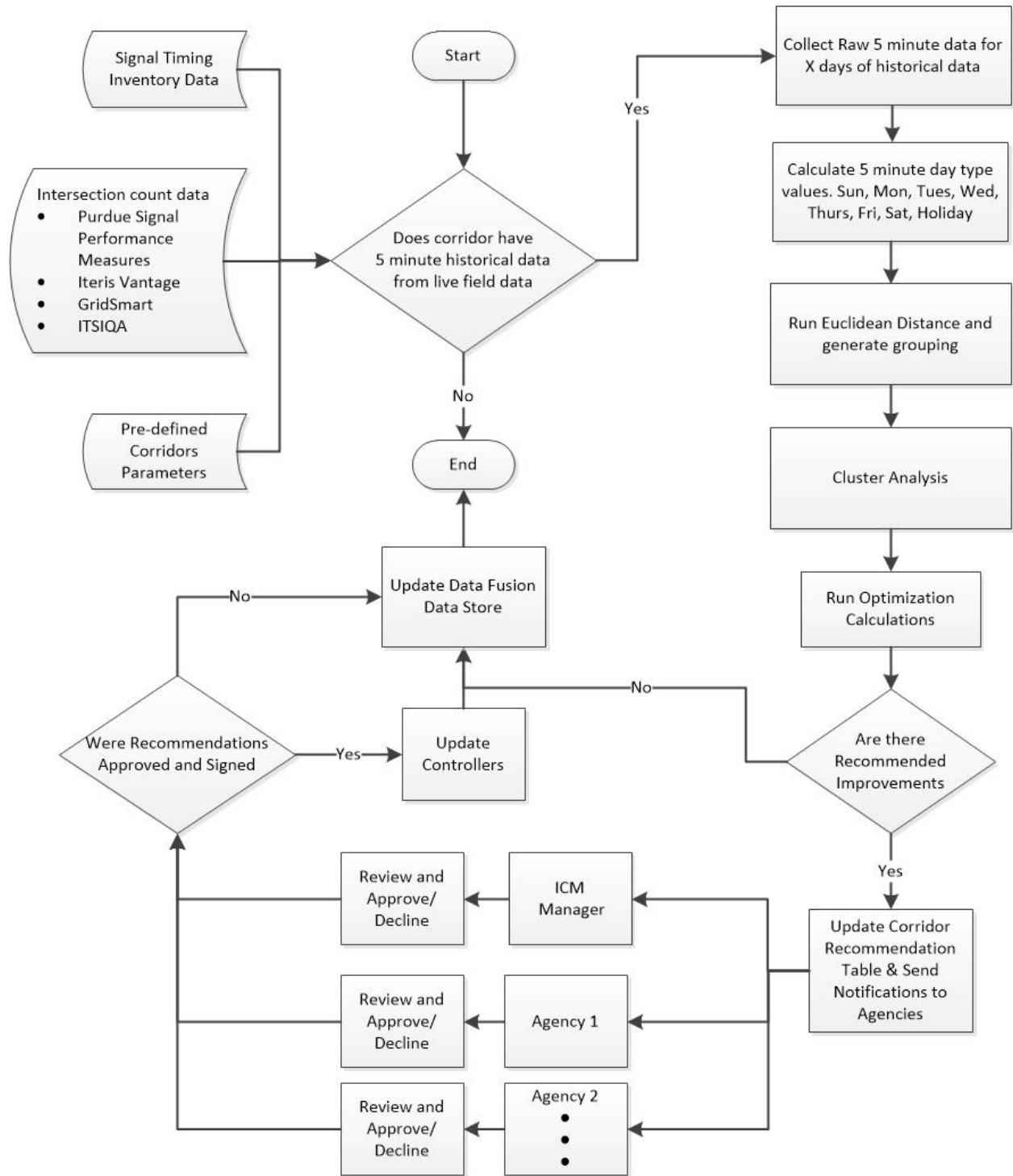
Figure 5: ICMS Periodic Corridor Optimization Process Flow

1.7 Subsystem Descriptions

The following sub-sections provide a high-level description of the ICMS subsystems.

1.7.1 Data Fusion Environment Subsystem

The ICMS will collect and share data sets and data streams in motion from a wide variety of data sources for use by other ICMS subsystems and other external users and stakeholders. Work has already been done to develop a prototype of this system. The ICMS will build upon this work to provide a robust production system that meets the requirements of other subsystem and other external users.

Data collected into the DFE subsystem will come from a variety of sources. Details of a sampling of these data sources can be found in the draft data dictionary documents, and the TSM&O Data and Systems Inventory. The DFE will be comprised of the following components:

- DIs that extract data from sources,

- Various data warehousing components to store the data,

- Processing components to process the data and perform data analytics, and

- APIs for users and other applications to access the data.

The DIs will extract data from these sources, validate it, transform it into a suitable format for retrieval and analysis, and store the data into one of the data warehousing components. The data warehousing components consist of traditional data warehousing technologies such as SQL Server relational database management system, an ArcGIS Data Store, and unstructured data storage components. The DEPARTMENT is piloting open source data warehousing components for the underlying unstructured data store, and including COTS components for other specialty data storage and processing functionality including an ArcGIS Data Store and an MS SQL Server transactional database management system.

The DFE represents a paradigm shift from silos of information and applications to a shared data environment that synergizes data streams and data sources not previously integrated to support data analytics of value not previously captured. The DFE shall support other ICMS subsystems as well as external analytics and applications by exposing APIs for access to DFE stored data.

The DFE will extract, transform, and load traditional structured and transactional data, unstructured data, and geographical and time-based data in a way to support efficient search, retrieval, and analysis. The DFE subsystem will provide APIs to the data sets, data streams, and derived data sets and data streams based on a processed output of other data sets and data streams. An administrative application will be used to manage the datasets including a catalog also accessible via an API, and implement a usage and access policy to secure the data. It will use the existing D5 environment Lightweight Directory Access Protocol environment to define users, groups, and permissions. The DFE will also support data science research by data scientists to discover new analytical insights from the data. The isolation of the data storage in the DFE from the operational systems should contribute to low or no impact to other operations and applications.

The DFE subsystem will be designed to label and store multiple versions of a data source to accommodate simulated data to facilitate simulation and testing for the integration, test,

maintenance, and training activities of this project while also maintaining live, production operations.

The current pilot for this utilizes MS SQL Server Enterprise, extensible set of servers running Hadoop on HDFS, and an extensible set of servers running Elastic Search. The VENDOR shall evaluate the current environment and consider including it in the proposed design and implementation for the production DFE subsystem as a part of this PROJECT in order to meet the PROJECT requirements.

The DEPARTMENT has developed an action plan for a pilot, or sandbox, of the DFE that can be used as a starting point of the production DFE subsystem. More information on the pilot DFE Sandbox and additional notes can be found online at http://cflsmartroads.com/projects/future_projects.html.

The data sources collected by the ICMS software will include several types of data, both static and dynamic. The static data includes data that will not change very often, if at all, during the development and deployment of this project and its on-going operation. These types of data include roadway links and nodes, SunRail routes and stations, LYNX bus routes and stations, location of existing infrastructure, and similar items. Dynamic data includes things that have an impact on the current operations, such as real-time traffic conditions, current location of bus and train vehicles, and items that change rapidly and will assist the operators of the network in making decisions. Both of these data types will be important to the operations of the region, and specifically the I-4 corridor, and will drive the response selection of the DSS.

Each stakeholder has information and data flows that will be needed during the operation of the PROJECT. As part of the requirements definition, the DEPARTMENT attempted to identify each data type and data source to ensure that the necessary data is available for the systems being developed and deployed.

These data elements include, but are not limited to the following: incidents, construction, special events information, performance data (speed, volume, occupancy, travel time, status, and weather), and request/response interaction for the DSS response plan distribution. Incidents, construction, and special events in the system will be entered through SunGuide, and made available to the DSS through the DFE subsystem. Performance data is provided by the various agencies and new field infrastructure systems, including existing DEPARTMENT SunGuide, CFX and FTE SunGuide, LYNX bus automatic vehicle location systems; and parking management and weather information systems. A list of data sets currently identified that shall at a minimum be included in the CONTRACT DFE, including known references to where the protocol or their interfaces can be found is in the Exhibit C, Minimum Technical Requirements. At the time of the development of this scope, not all data sets have been fully documented, but there is an ongoing effort to do so as part of the other existing TSM&O data initiatives projects, which can be expected to be provided.

1.7.2 Information Exchange Network Subsystem

The purpose of the IEN is to provide the GUI needed for a web-based information exchange tool for the stakeholder agencies to share information and manage incidents,

construction, and special event information. The IEN GUI is the presentation layer for the DSS in simplest terms. It is anticipated that the IEN will provide the agency users and stakeholders with a graphical tool to manage and monitor the status of their transportation networks, allowing full event management capability as well as allowing the users to make informed decisions regarding the management of their transportation infrastructure.

The main functionality of the IEN will include the following:

- View current status and performance of roadway and transit networks and devices within the corridor;

- Create and/or respond to traffic incidents, construction, special events, or planned events from detection to resolution;

- Monitor the status of recommended and implemented response plans from plan recommendation to incident resolution; and

- Review and respond to prioritized list of corridor improvement strategies including suggested timing plans to be implemented.

1.7.2.1 IEN GUI Overview

The IEN interface will allow stakeholders and users to view and interact with various data provided by the DFE and DSS appropriate for their role as a stakeholder or user. The following user roles will be supported:

- General Public

- Local Agency Signal Timing Engineer

- ICM Corridor Manager

The general public will be provided a high-level view of the system with the ability to drill down to more specific locations. The general public will not need user accounts, but cookies should be used to attempt to remember display preferences the user might have made e.g. area on the map the user zoomed and paned to, the layers on the map the user selected to be displayed.

D5 has already done work to develop a set of requirements and graphical mock-ups of a proposed prototype of a portion of this GUI as described and depicted in the following figures, and as detailed in the AAM Dashboard Description and Requirements, which contains the following two documents: Project Delivery Methodology of the FDOT District 5 AAM Dashboard, Version 1.0, Revision Date: 09/30/2016, Attachment A (Software Requirement Specifications) and Attachment B (System Requirements). The PROJECT will build upon this work to provide a robust production system that meets the requirements of the IEN. The above mentioned attachments can be found at the following link:
http://cflsmartroads.com/projects/design/tsp/Regional_integrated_corridor_mgmt/FDOT_D5_AAM_Dashboards_Description_and_Requirements_and_Mockups.pdf

The IEN will provide the user the ability to view various layers on a map that are geo-located, for instance Figure **6** provides the map with speed data (detectors), traffic signals,

dynamic message signs. The interface would allow the user to turn on and off the various layers and then select the icons to see additional information regarding that asset.
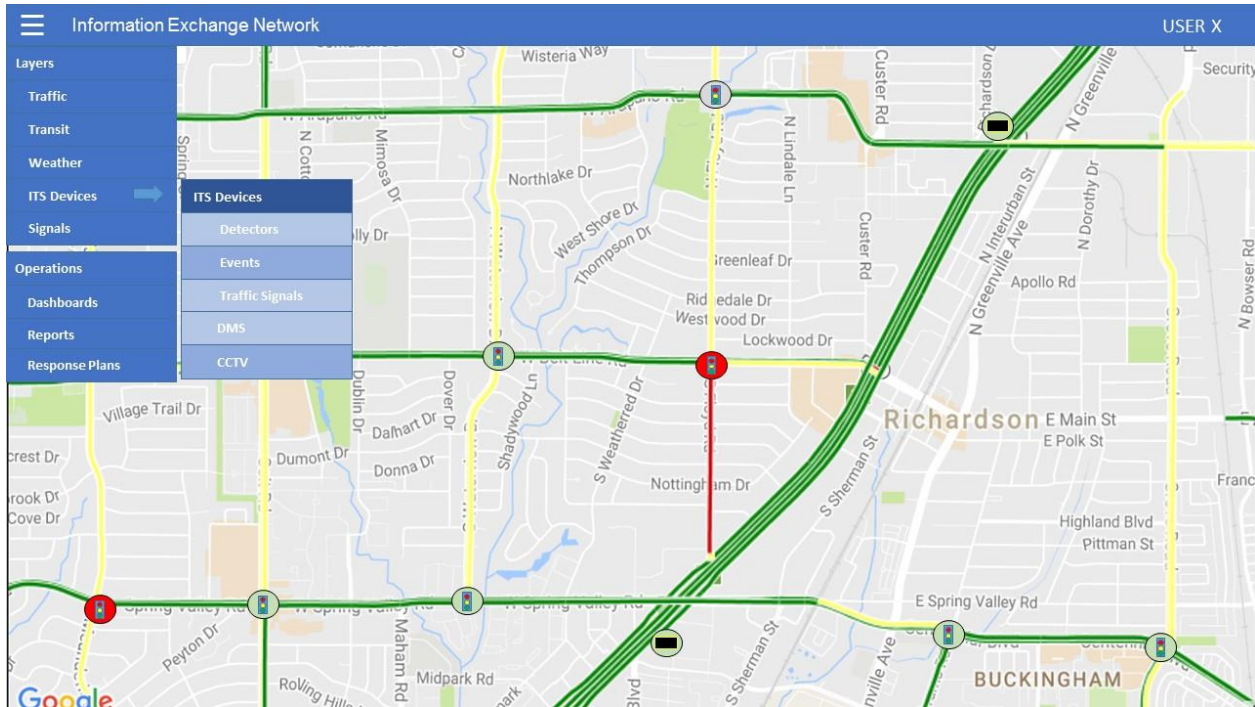
Figure 6**: IEN ITS Device Layers**

Figure **7** provides current events in the transportation network; each type of event has a color-coded icon for incidents (accidents), construction (current and planned), and special events (current and planned).
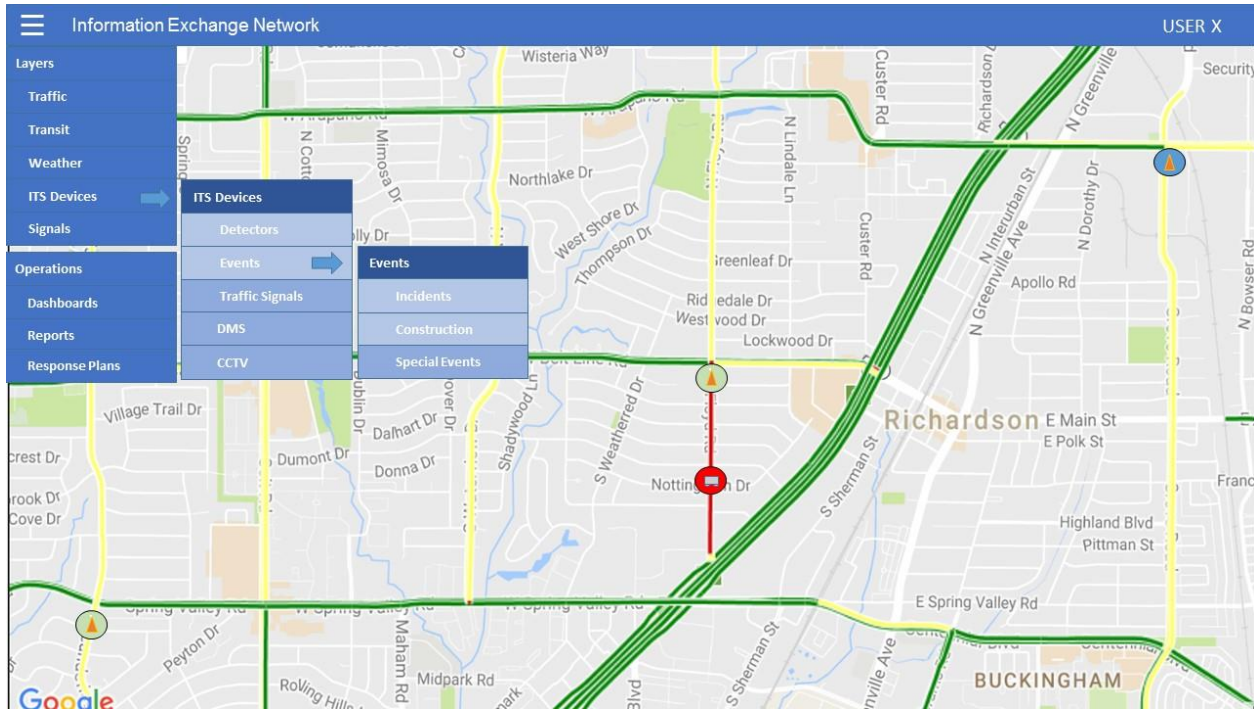
Figure 7: **IEN Event Locations**

For events within the DFE, the IEN will display a list of the events that are sortable by event type, event ID, location, etc. Figure **8** displays the event list and allows the user to select individual events, and view and update information (Figure **9**).

Figure 8: **IEN Event List**

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Figure 9**: Event Description Interface**

The IEN will also provide IEN operators with automated notifications for the response plans and DSS dialogs. Figure **10** provides an operator with a systems notification that the signals within a corridor are operating outside of the expected parameters, and an adjusted signal timing plan is recommended. Figure **11** provides an operator with a systems notification when an event within the network has reached a level where a pre-agreed response plan should be enacted. The operator can select which actions it is completing, and the ICMS will record all actions enacted by the operator.

Figure 10**: DSS Signal Timing Notification**
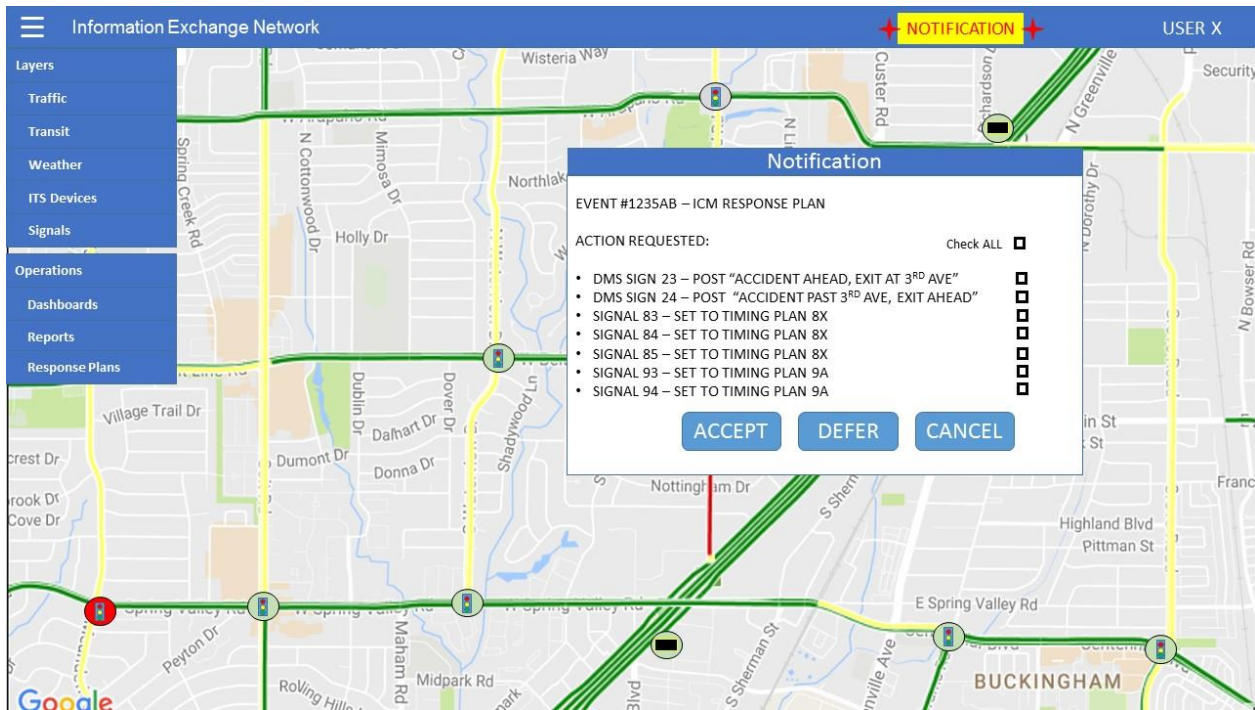
Figure 11**: ICM Response Plan Notification**

The IEN will extract detailed data from signal intersections from data sources such as the Signal Performance Measures system developed by Purdue, and other systems for detecting traffic signals about the intersections including the Intersection Movement Counts project and devices from Gridsmart, Iteris, and other projects and devices available. When the traffic signal timing engineer drills down into an intersection, the view

will assimilate available real-time status, study information including traffic counts, the geometry and design of the intersection itself, analytics and recommendations from the DSS. The IEN will present controls to allow the engineer to review, fine-tune, and accept the recommendation. The following mockups show an early example of how this might look, but the VENDOR will be responsible to work with the DEPARTMENT during the design phase to improve and finalize the design for all IEN GUIs.

The layout should facilitate viewing the information such that:

- The intersection can be quickly understood in terms of its geometry;

- The current status can be quickly understood;

- Its relationship within the corridor can be understood;

- Any recommendations for selecting different timing plans or creating new ones can be understood; and

- The predictions in terms of improvement of the intersection's performance can be understood.

1.7.2.2 DSS Operations GUI Screens

The GUI screens in the following figures show the user interaction that supports the DSS operations.
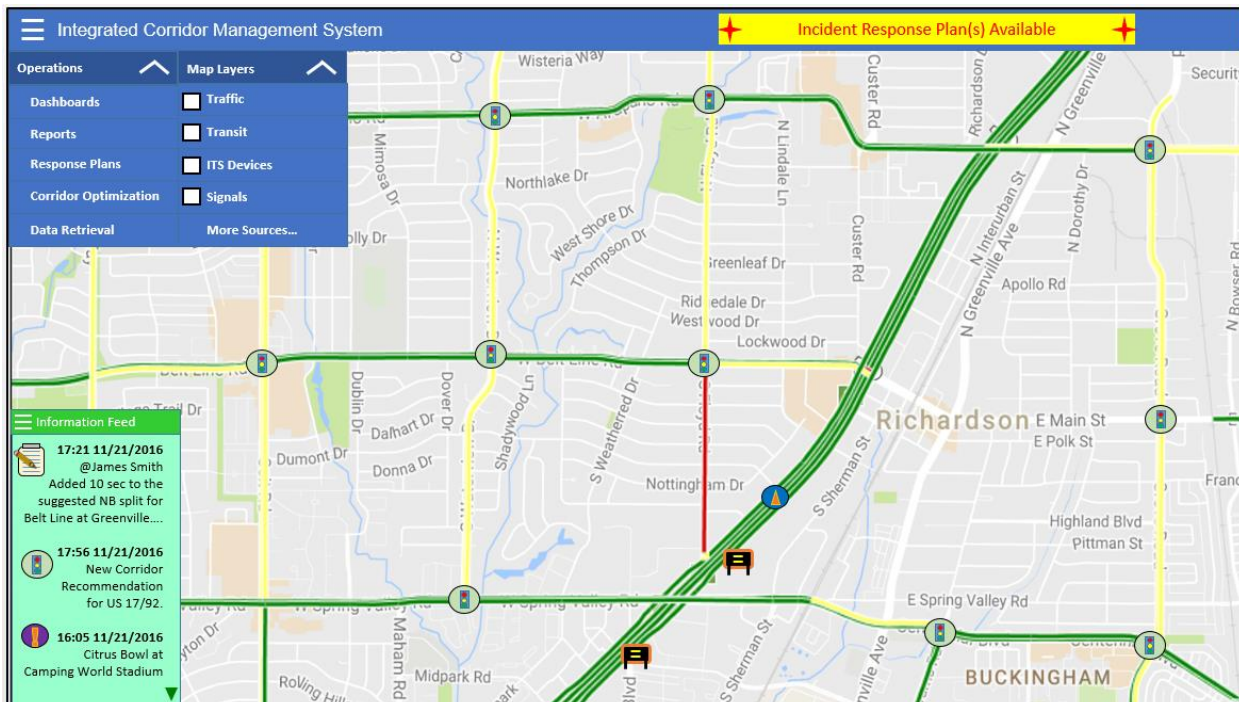
Figure 12: Operations Dashboard Home Screen

The operations dashboard contains the hub of status information, as described above, and as a starting point to access other operational information and interaction.

Map Layers can be enabled or disabled to populate the map with information from various data sources. The most popular sources will be displayed within the menu, and the many other data sources can be enabled through a separate pop-up (not shown) accessible from the menu item labelled "More Sources... ."
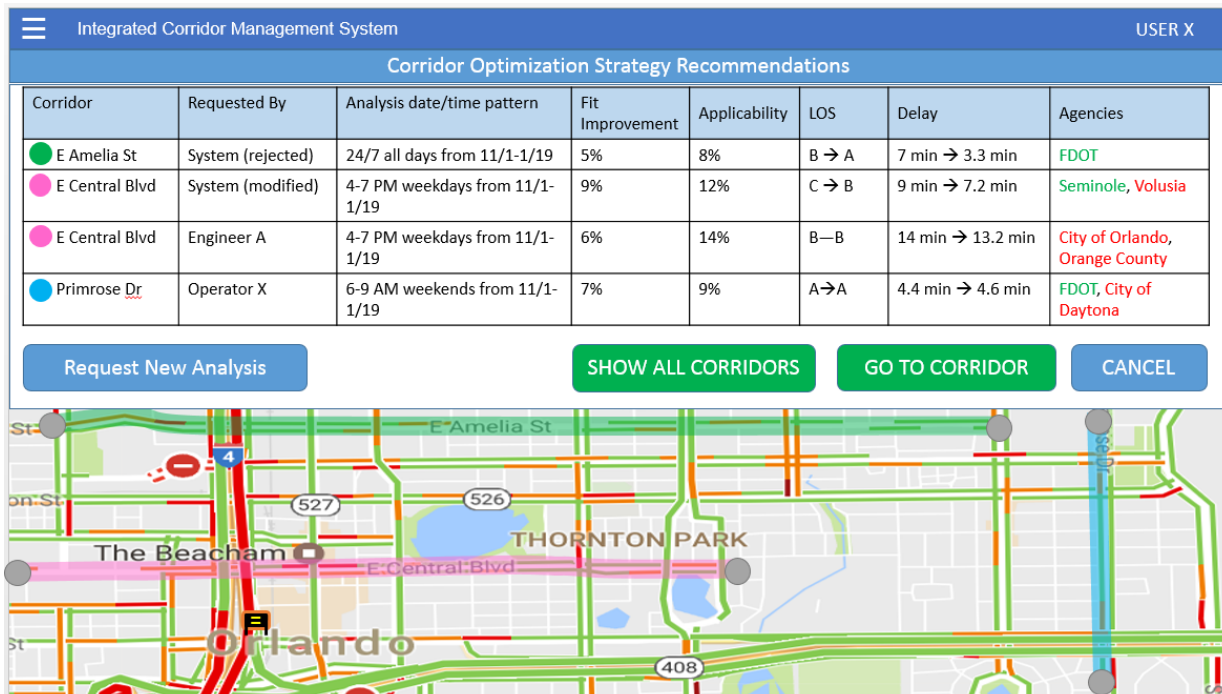
The information feed contains a wide variety of information relevant to the user. Incident response plans, corridor optimization recommendations, and other user's comments to recommendations are types of information that can be included as an item in the information feed.

Pre-defined corridors are automatically analyzed in the background. The System Administrator can adjust parameters that guide the automated process (date/time, etc.)

The user can request an analysis and specify the analysis parameters. A new screen and a menu item to access the new screen will need to be added for the user to request the analysis, but is not shown.

Once a periodic or manually requested corridor optimization analysis is complete and applicable to the user (permission-based), a note is added in the information feed to inform the user so that they are aware and can access the analysis as shown in the following figures.

When an incident response plan is available, an additional notification is presented at the top of the screen to indicate urgency and provide immediate access to the response plan recommendation screen.

Integrated Corridor Management System — USER X

Corridor Optimization Strategy Recommendations

Corridor	Requested By	Analysis date/time pattern	Fit Improvement	Applicability	LOS	Delay	Agencies
● E Amelia St	System (rejected)	24/7 all days from 11/1-1/19	5%	8%	B → A	7 min → 3.3 min	FDOT
● E Central Blvd	System (modified)	4-7 PM weekdays from 11/1-1/19	9%	12%	C → B	9 min → 7.2 min	Seminole, Volusia
● E Central Blvd	Engineer A	4-7 PM weekdays from 11/1-1/19	6%	14%	B—B	14 min → 13.2 min	City of Orlando, Orange County
● Primrose Dr	Operator X	6-9 AM weekends from 11/1-1/19	7%	9%	A→A	4.4 min → 4.6 min	FDOT, City of Daytona

Request New Analysis | SHOW ALL CORRIDORS | GO TO CORRIDOR | CANCEL

Figure 13**: Corridor Optimization Strategy Recommendations**

These corridor recommendations are the output of the algorithm used by the periodic corridor optimization process, or by manually requested analysis.

The System Administrator can tweak parameters that guide the automated process (date/time, etc.), while users are presented with a set of parameters for invoking the algorithm by request.

This Corridor Optimization Strategy Recommendations screen has a table of all corridor recommendations along with the analysis parameters and results, including: date/time pattern, FIT improvement, applicability, LOS, delay, and agencies who would need to be coordinated with to invoke the response plan. The values representing the agencies will be displayed with an indication of the status of the approval from that agency. Each recommendation in the table will also have the Requested By field, showing who requested the analysis. If the automated periodic optimization process requested it, System will be displayed. If a recommendation was modified or rejected, the modified recommendation will be added to the list and the original recommendation will remain, but with an indication that it was modified or rejected. Below the list of corridors, the map is zoomed and centered around all of the highlighted corridors having strategy recommendations. When the user clicks on a corridor, the GO TO CORRIDOR button is enabled and the map highlights only the selected corridor and zooms around the corridor selected. When the GO TO CORRIDOR button is pressed, the Intersection Recommendation screen appears. The SHOW ALL CORRIDORS button allows the user to zoom the map back out to show all corridors.
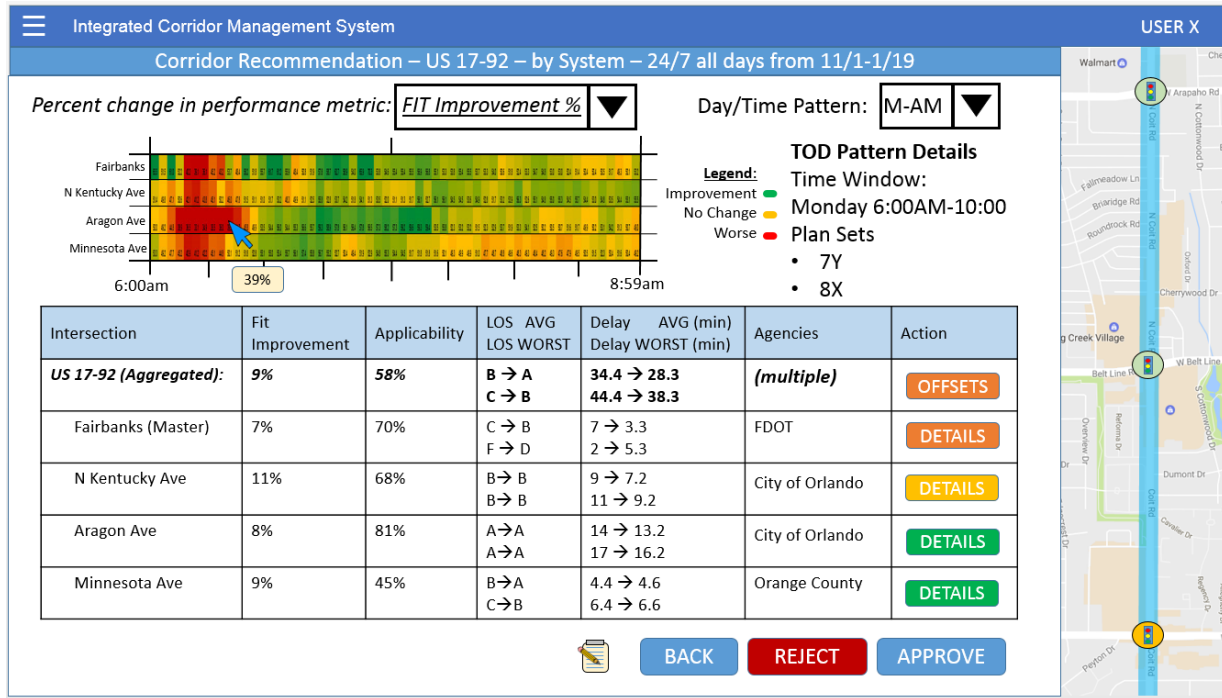
Figure 14**: Corridor Optimization Recommendation**

This screen shows the details and performance analysis of the recommendation for the corridor. The corridor, date range, and the date and time pattern are indicated in the screen title.

The heat map shows the selected color-coded performance metric for each intersection. Hovering over the heat map will show the numeric value represented by the color. The

performance metric for the corridor can be changed by the drop down at the top. Below the heat map, the table shows performance information for each intersection and for the aggregated corridor, including the FIT Improvement, Applicability, LOS for the average and the worst time interval, delay for the average and worst time interval, and the agency maintaining the intersection. The action buttons allow the user to adjust the offsets for the corridor or the splits for each intersection. The overall analysis has the date and time interval used in the recommendation, while the day/time pattern can be changed with the Day/Time Pattern drop down in order to view the performance information for specific date/time patterns in the graphs and tables on the screen.

On the screen shown in Figure **14**, and many others, users may also comment using the comment (notepad) icon. Comments may also appear in the information feed shown earlier.
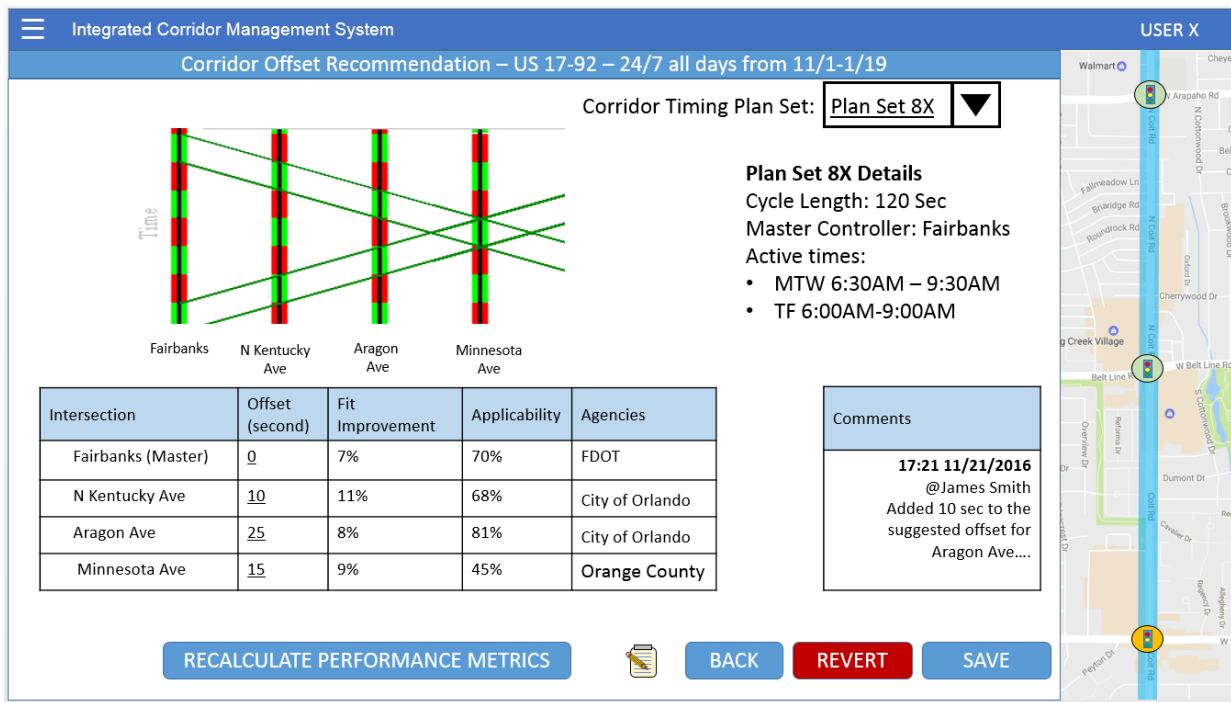
Figure 15: Corridor Offset Recommendation

The ICMS shall recommend offsets based on an algorithm, such as the Purdue system's link pivot algorithm, and display details about the recommended offset with performance or fitness information for the user to review and adjust. The corridor has recommended plan sets that include a plan for each intersection. The plan set can be selected using the drop down in the top to show details and performance information for the plan sets, and allow the user to adjust the offsets.

The RECALCULATE PERFORMANCE METRICS button will be enabled when one or more offset values are changed, and when clicked, will update the performance information using the modified offsets.

The COMMENTS button will allow the user to make a comment that will be shown to other users when they access this offset screen for this corridor recommendation. The comments can also appear in the information feed.

The SAVE button will be enabled when the user makes changes to the offsets and recalculates the performance metrics; when clicked, it will save the changes to the recommendation. Changes made to a recommendation by the same user will be saved into the current recommendation. Changes made to a recommendation requested by the system or a different user will be saved as a new recommendation and the original recommendation will be flagged as modified.

The REVERT button will be enabled when there are unsaved changes to return to the last saved state of the recommendation, or the original recommendation if no changes were saved.
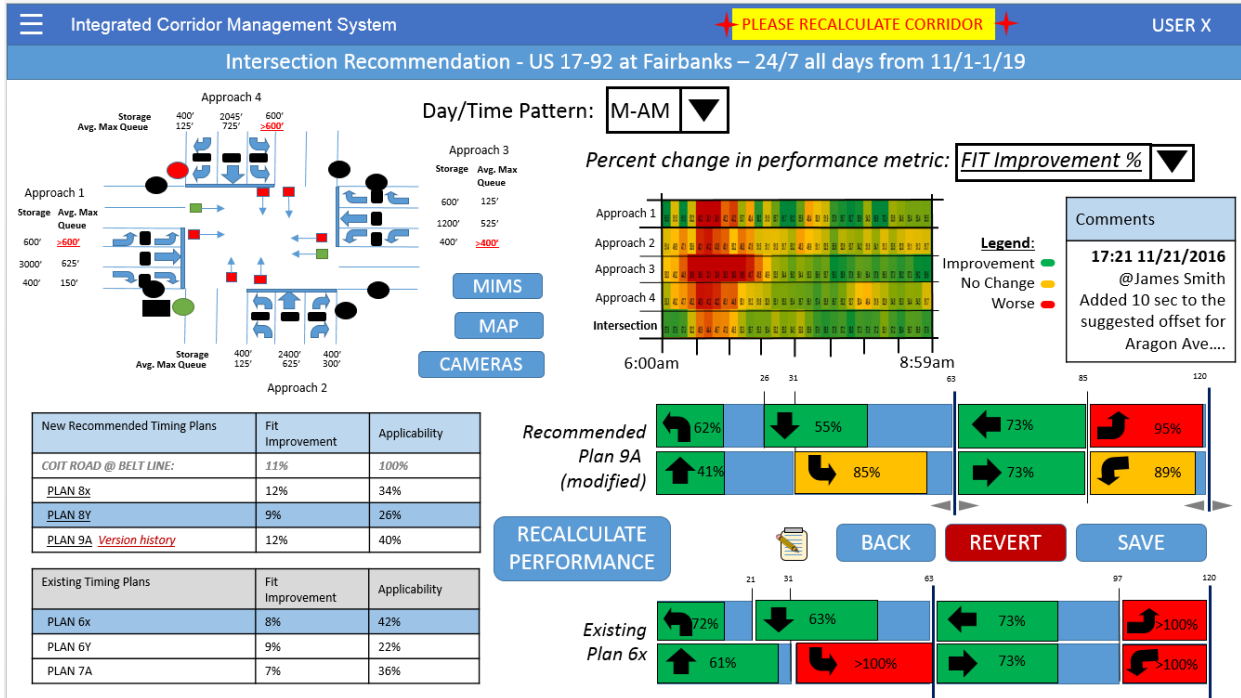

Figure 16: Intersection Plans Recommendation

The Intersection Plans Recommendations screen shows the details and performance analysis of the recommendation for the corridor. The intersection, date range, and the date/time pattern are indicated in the screen title. The overall analysis has the date and time interval used in the recommendation, while the day/time pattern can be changed with the Day/Time Pattern drop down in order to view the performance information for specific date/time patterns in the graphs and tables on the screen upon clicking the RECALCULATE PERFORMANCE button.

The intersection diagram in the upper left shows the basic geometry of the signal, including the storage and average max queue. The CAMERAS button allows the user to launch the camera videos at the intersection. The MAP button will launch a map of the intersection.

The heat map shows the value of the selected performance metric for the approaches and the aggregate for the intersection. The New Recommended Timing Plans table on the bottom left shows the new recommended plan IDs, the FIT improvement, and the applicability that shows the percent of time during the selected period that the plan

would be in effect. When the user clicks on a recommended plan, the table on the bottom left shows the existing plans that would be overridden by the selected new plan and the same performance information for the time during which the recommended plan will override the existing plan. Also, when a recommended plan is selected, the splits diagram is shown for that plan with controls for the user to make adjustments. The SAVE, REVERT, and BACK buttons work the same as with the offset screen, allowing a user with permission to save a new recommendation and then modify it, or revert to the last saved state of the recommendation, and go back to the corridor recommendation screen. When an existing plan is selected, the split diagram is shown for the selected existing plan at the bottom right. If a recommended plan is changed, the user will receive a notification depicted in Figure **17** to recalculate performance along its corridor.
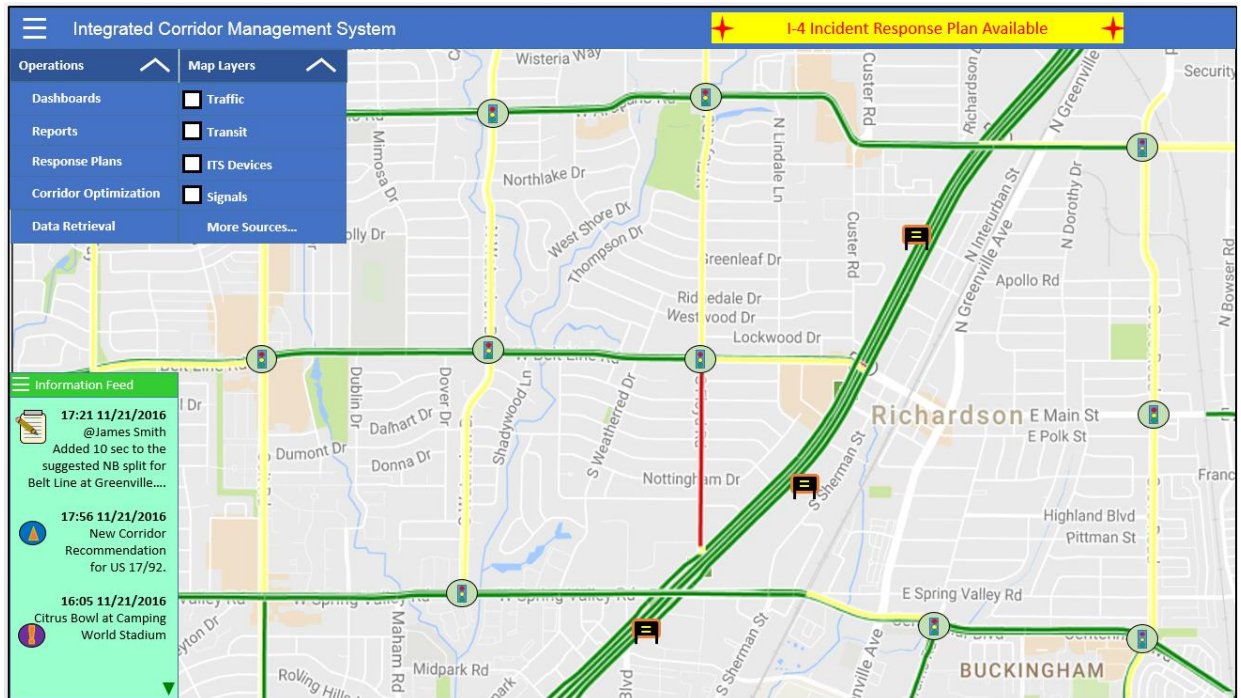
Figure 17**: Home Screen with Limited-Access Roadway Incident Response Plan Notification Banner**

Once the DSS identifies a limited-access roadway incident and a response plan to address the incident, the home screen will indicate that a response plan is available with a banner at the top of the screen and an entry to the Information Feed. The Information Feed can contain comments, traffic incidents, and planned events such as concerts and football games. The banner or the item in the feed can be clicked to launch a new screen with more focused details for that item.

Figure 18: Limited-Access Roadway Incident - Corridor Diversion Response Plan Details

The Limited-Access Roadway Incident - Corridor Diversion Response Plan provides information regarding the response plans available to respond to the incident. The response plans are shown in the top table along with their predicted performance metrics, number of signals affected, and the agencies needing approval to invoke the plan. The selected row is highlighted gray. The top plan is the one with the highest MOE improvement over current conditions and is initially selected; however, the user can select any plan available. The selected plan will have response plan items depicted on the map and shown in the bottom list along with the item's attributes, such as the current device or system status, the proposed change or invocation to the device/system, the agency whose approval is required for that invocation, and the ability to deselect items to be included in the plan. Filtering and sorting should be provided as controls in the table header, and a scroll bar will appear if needed in either table. Once the plan is reviewed, the user can approve it based on the agency the user represents. Clicking VIEW APPROVAL STATUS will display the details of the plan's approval status. The values representing the agencies for the response plan in the top table and the agency for each response plan item in the bottom table will be displayed with an indication of the status of the approval from that agency. Green represents approved, while red represents rejected. The RESPONSE PLAN SCHEMATIC will launch a detailed response plan schematic plan for review. Other types of response plan items not shown here include hard shoulder running, bus bridge, transit signal priority, express lanes pricing deactivation, and other items included in the response plan schematic. If the user clicks on the Flush Plan 6x link in the Item Detail column, the Diversion Route Corridor Flush Plan Details screen appears.
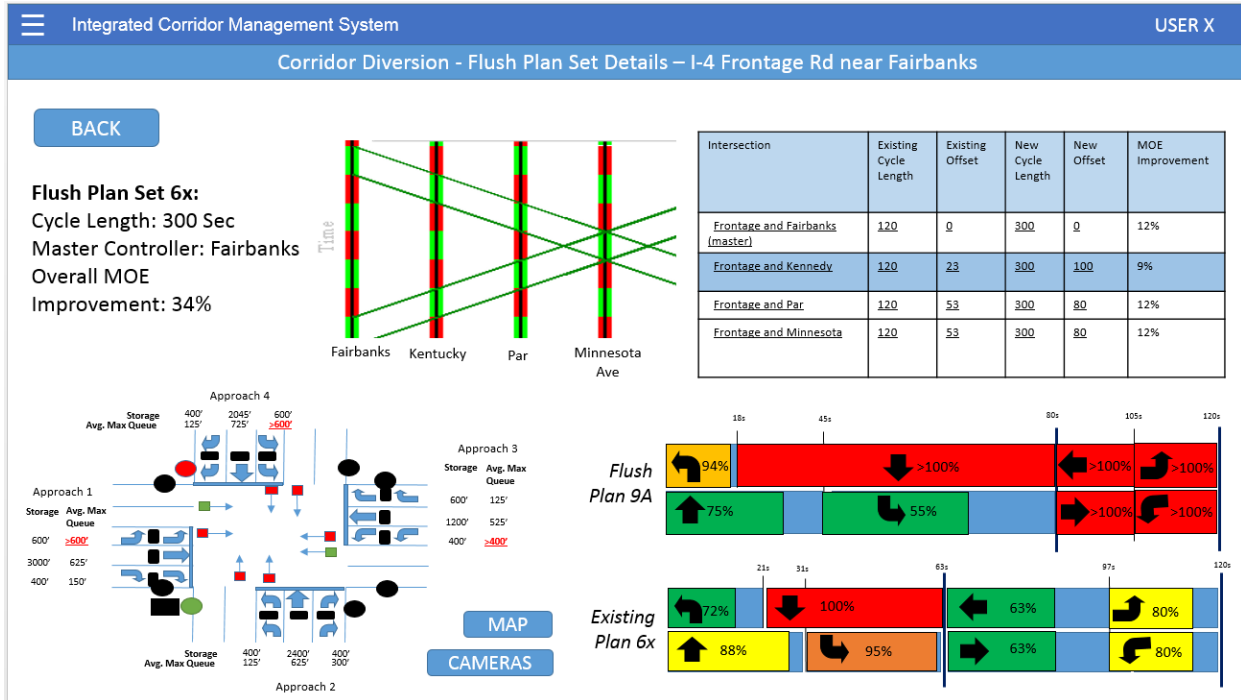
Figure 19: Corridor Diversion - Flush Plan Set Details

The Corridor Diversion - Flush Plan Set Details screen shows the details and the MOE performance analysis of the flush plan set. The table includes each intersection having a flush timing plan in the plan set, and includes the existing plan's and the new plan's cycle length and offset, and the intersection's MOE improvement. The time-space diagram in the top middle is displayed for the flush plan set and additional details including the new cycle length, master controller, and overall MOE improvement is presented to the far top left. The user can select an intersection from the table on the upper right to see details regarding the intersection's flush plan at the bottom of the screen. The intersection diagram is displayed with the storage and average max queue length for each approach, and the split diagram for the new plan and the existing plan is shown on the bottom right for the selected intersection.

Figure 20: Limited-Access Roadway Incident - Corridor Diversion Response Plan - Approval Status

The Limited Access Roadway Incident - Corridor Diversion Response Plan – Approval Status displays a table with each agency needing approval, along with the time they approved or rejected the item(s), the point(s) of contact and phone number, and three columns in which to place the approval status. The items are either pending approval, rejected, or approved. The selected row is highlighted.

Figure 21: Home Screen with Arterial Roadway Incident Response Plan Notification Banner

Once the DSS identifies an arterial roadway incident and a response plan to address the incident, a banner at the top of the home screen will indicate that a response plan is available, and also as an entry to the Information Feed. The Information Feed can contain comments, traffic incidents, and planned events such as concerts and football games. The banner or the item in the feed can be clicked to launch a new screen with more focused details.

Figure 22: Arterial Roadway Incident Response Plans

The Arterial Roadway Incident Response Plans screen shows the user a set of recommended response plans to respond to an arterial roadway incident. The table contains each response plan along with the performance metric improvements predicted and other attributes of the response plan. The user can select a response plan from the list; the selected item is highlighted. When a response plan is selected, it is depicted on the map. The user can then click the response plan name to view more details of the timing plan set in the Arterial Roadway Incident Response Plan Details screen, approve the response plan, and check the approval status of the response plan – much like the limited-access roadway incident response plans screen.
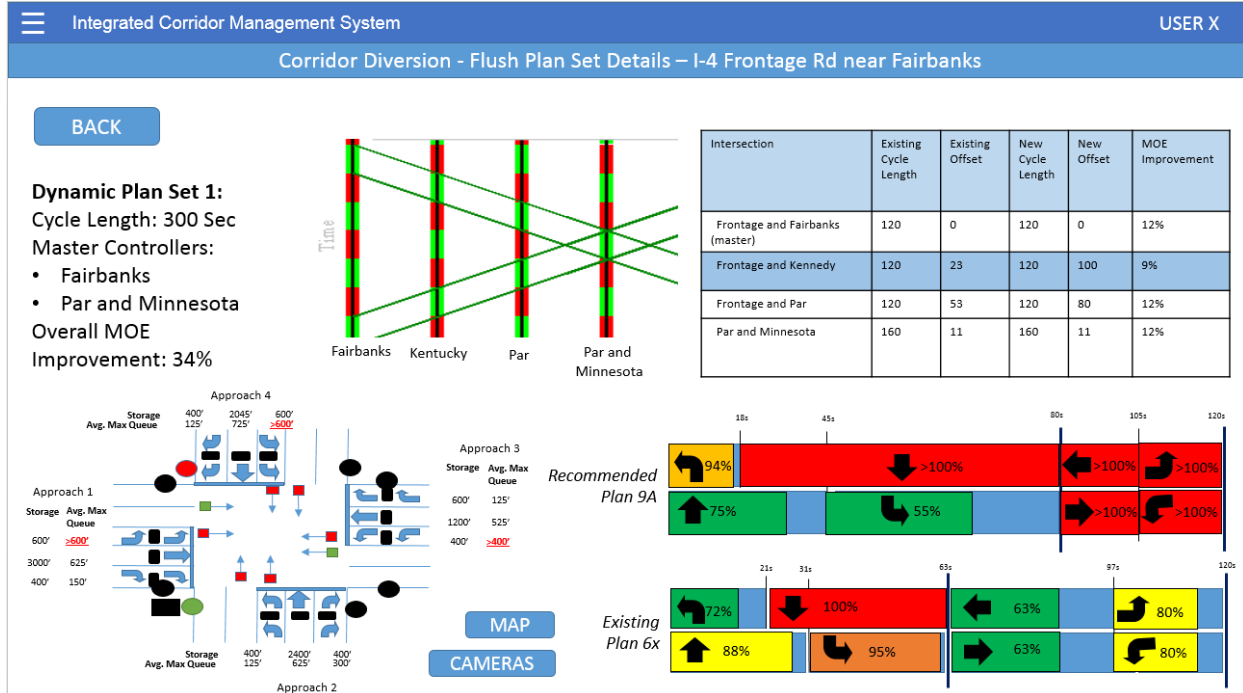
Figure 23: Arterial Roadway Incident Response Plan Details

The Arterial Roadway Incident Response Plan Details screen (Figure 23) shows the details and the MOE performance analysis of the arterial roadway incident response plan timing plan set. The table includes each intersection having a timing plan in the plan set, and includes the existing plan's and the new plan's cycle length and offset, and the intersection's MOE Improvement. The time-space diagram in the upper middle is displayed for the plan set and additional details including the new cycle length, master controllers, and overall MOE improvement is presented in the upper left. The user can select an intersection from the table to see details regarding the intersection's recommended timing plan at the bottom of the screen. The intersection diagram is displayed with the storage and average maximum queue length for each approach and the split diagram for the new plan; the existing plan is shown on the bottom right for the selected intersection.

1.7.2.3 Analytics & Dashboards

Performance Measures, obtained via analytics and dashboards can be used to provide important statistics that can help to detect and correct issues found within a transportation network. Under this CONTRACT, it is expected that the VENDOR shall provide analytics and graphical dashboards that will allow the DEPARTMENT to view archived, statistical data related to the DEPARTMENT'S transportation network. The data to be provided via the performance measures dashboards shall include the data as referenced in section 1.7.1 Data Fusion Environment Subsystem. VENDOR will propose the analytics and dashboards in the Preliminary Design, DEPARTMENT will approve a final set in the Detailed Design.

The dashboards will contain support for multiple profiles corresponding to the multiple views and roles in the system ranging from seeing high-level status, to corridor level performance, to very detailed status of intersection data.

The VENDOR can reuse specification information from the pilot project currently underway, detailed in the Project Delivery Methodology of the FDOT District 5 AAM Dashboard, Version 1.0, Revision Date: 09/30/2016, Attachment A (Software Requirement Specifications) and Attachment B (System Requirements). The document will provide guidance to the VENDOR when designing, specifying, and developing dashboard(s) for the ICMS. The core sections of the document include: Business Requirements, Data Management Requirements, Conceptual Data Model, and Reporting Requirements. These sections are briefly described hereinafter.

The VENDOR shall be responsible for developing the necessary requirements that will be used to develop the analytics and dashboards modules under this contract. The product will be used to present a variety of data to the DEPARTMENT. The product shall be approved by the DEPARTMENT.

The Business Requirements section includes definition of the business process model, and functional requirements (i.e. Use Cases). Secondly, the Data Management section will include archive/purge and auditing requirements. Moreover, the Conceptual Data Model will include Table Names and Descriptions and Integrity Constraints. Lastly, the Reporting Requirement will incorporate the report specificity, frequency, receiver of the report, sorting requirements, and/or notification that is to be sent.

1.7.2.4 SunGuide Integration

SunGuide is used for command and control of regional traffic operations. It is operated by traffic management center operators who use the SunGuide to view conditions in the transportation network, manage traffic events, and invoke response plans that control traffic in response to the incidents. The DSS and the IEN shall integrate with the SunGuide for implementation of response plans suggested by the DSS. The DSS shall suggest several traffic control strategies in response to a non-recurring incident, obtain the appropriate approvals via the IEN, and operate the SunGuide using the same underlying interface that the existing SunGuide GUI uses to manage events and response plans. During the design of the DSS, any needed modifications to the SunGuide shall be coordinated with FDOT D5, and detailed interactions with the SunGuide and TMC operators shall be part of the design of the DSS component of the ICMS.

There is a wealth of information about the SunGuide hosted on the http://sunguidesoftware.com website in the Document Library accessible from the Document main menu. Some details are described below. There are also concept of operations documents of several SunGuide modules and features referenced by the TSM&O Data and Systems Inventory.

The SunGuide system is architected in a modular fashion with subsystems responsible for business logic related to set of related functions typically corresponding to a type of device or operation. Examples include traffic sensor subsystem, and event management

subsystem. Each subsystem acts as a server with clients logging into the subsystem to request or subscribe to data and to request commands to be invoked by the subsystem. The clients are authenticated and authorized by another subsystem called the System Authentication and Authorization subsystem. The interfaces among all subsystems use an XML protocol whose structure is defined in the SunGuide XML Schemas available here:
http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ICD/6_2/6.2%20XML%20Schemas.zip

Connection to all subsystems is facilitated by the Databus subsystem.

The ICMS will interface with the SunGuide by connecting to database, logging in as a user, retrieving and subscribing to event management data, and requesting commands to be invoked by event management to modify and activate SunGuide's event management response plans, which are not to be confused with the DSS response plans and DSS response plan sets.

The VENDOR is responsible for implementing data retrieval from SunGuide. The SunGuide program office is responsible for modifications to SunGuide to accept response plans from the ICMS and implementation of additional interfaces to Signal Control Systems as noted in Table 3.

1.7.3 Decision Support System Subsystem

The DSS subsystem will exchange data with the DFE, interface with other users and systems through the IEN, and implement the computational elements of the ICMS operations described in section 1.6.

The DSS is comprised of three main components:

1. ERE component – The ERE contains the logic to make determinations based on pre-defined rules. This includes monitoring current conditions to determine when a response plan needs to be created, updated, or deactivated; selecting response plans from a set of rules applied to current conditions.

2. PRE component – The PRE contains the planning model and provides the function to other components for running a mesoscopic simulation of a reduced network in real-time to calculate the predicted conditions of the network for changes to signal timing plans or other response strategies that could be used in a response plan or optimization plan. The PRE component is envisioned to provide predictions of the network performance, 30 minutes into the future. These network performance measures will project how effective the ICMS response plan is expected to be and how well they enhance regional operations.

3. EVE component – The EVE contains the calculation logic to calculate overall measures of effectiveness from the output of the mesoscopic simulations, the FIT score of a signal timing plan for given saturation rates, and other evaluation metrics used by the DSS subsystem. The EVE component provides the analytics to be provided to the IEN's dashboards used by DEPARTMENT and stakeholder agencies within the region to quickly display pertinent information on the transportation infrastructure including current conditions, suggested

improvements for review and approval, and performance measures of invoked strategies.

The DSS performs the computational work of the ICMS operations, including transportation incident response and periodic signal timing optimization as described in the ICMS Operation section. These core responsibilities of the DSS are handled by the DSS components as follows:

a. **Monitor, Evaluate, and Respond to Traffic Incidents on Limited-Access Facilities.** The ERE will monitor information retrieved by the DFE of the limited-access roadway events within the corridor within the Event Management Subsystem of the SunGuide software. Each event will be evaluated by the ERE and, when triggered based on configurable parameters, the ERE will determine if an adjacent corridor flush, ramp metering adjustment, hard shoulder running, and/or managed lanes pricing deactivation response is needed for this event. The ERE will then select a set of response plans containing an appropriate combination of strategies to respond to the event. The ERE will send those response plans, along with the Do Nothing plan to the PRE to be simulated in the mesoscopic model. The results of the simulations will then be sent to the EVE to determine the overall measures of effectiveness for each plan. The EVE will rank the plans based on the system performance indexes produced by the PRE and EVE. Those plans that meet the threshold of improvement will then be sent to the IEN for selection, approval, and activation through the SunGuide software. The ERE will continue to monitor the event status and evaluate additional response plans.

   During the design phase, the event workflows and scenarios and interactions between systems will be defined.

b. **Monitor, Evaluate, and Respond to Traffic Incidents on Arterial Facilities.** The ERE will monitor the turning movement counts, the data from the signal performance measures system, and the ITSIQA output data stream. If the queue length or the travel time exceeds a configurable percentage of historical values, the ERE will generate an alarm condition of an arterial incident and build a response. The ERE will then select a set of response plans containing an appropriate combination of strategies to respond to the event. The ERE will send those response plans, along with the Do Nothing plan to the PRE to be simulated in the mesoscopic model. The results of the simulations will then be sent to the EVE to determine the overall measures of effectiveness for each plan. The EVE will rank the plans based on the system performance indexes produced by the PRE and EVE. Those plans that meet the threshold of improvement will then be sent to the IEN for selection, approval, and activation through the SunGuide software. The ERE will continue to monitor the event status and evaluate additional response plans.

c. **Periodically Optimize Signal Timing Plans for Arterial Facilities.** The ERE will periodically attempt to optimize the network in the following manner:

   - Definitions:

The ERE will consider corridors of signals as defined by the local agencies and their central signal software. Signals running in isolation will be treated as corridors of one intersection. The ERE will consider a historic period of time for which to run the optimization algorithm. The historic period of time will be split up into short time intervals having a volume and capacity for each movement. Each movement will have a saturation rate defined as the volume divided by the capacity. The Euclidean distance between two intervals is calculated by taking the square root of the sum of the difference of each of the movement's saturation rates as shown in the formula below:

$$I_d = \sqrt{\sum_{i=0}^{n} \left(\frac{v_{i,j}}{c_i} - \frac{v_{i,k}}{c_i}\right)^2},$$

Where I_d is the Euclidean distance between two intervals at times k and j, i represents each of the n movements in the corridor, v represents volume and c represents capacity. When two or more intervals are grouped, their saturation rates are averaged for each movement to produce the saturation rates for the centroid of the group, which will represent the saturation rates of the group for further comparison.

The optimal timing plan for an intersection is calculated by proportioning green time based on saturation rates of each movement.

Proportioning green time: for each movement m: take the ratio of that movement's saturation flow rate to the sum of all movement's saturation flow rate, then multiply that by the available green time to get the green time.

The FIT Score of a timing plan is calculated as the Euclidean distance between the timing plan under evaluation and the optimal timing plan for the applicable time period, either from historical volume data, real-time data, or predicted data.

The FIT Score improvement is calculated by the percentage increase or decrease of a proposed timing plan under evaluation and a control timing plan. The control timing plan is defined as the current timing plan for which a proposed timing plan is being recommended.

The FIT Score of a corridor or network of intersections is calculated as the volume weighted average of the FIT Scores of the comprising intersections.

Aggregating:

- Signal controllers have constraints to the number of plans they can store. Furthermore, scheduling timing plans requires the aggregation of time intervals within a scheduling model that can be understood by the controller. Thus, time intervals will be aggregated according to the day of the week they fall on, unless they fall into a special day such as a holiday. For example, Mondays from 6:00 PM – 6:05 PM, Mondays from 6:05 PM to 6:10 PM, and the Fourth of July from 4:00 PM to 4:05 PM.

- Each volume value within an interval defined by the day of week or special day and the 5-minute time interval within that day, will have their approach volumes averaged to define an aggregated set of volumes for all movements for all intersections in the corridor.

Grouping:

- Each aggregated interval must be in exactly one group, corresponding to the constraint that an intersection must have exactly one timing plan activated at that time.

- Each aggregated interval will initially be considered as a group of one.

- Each final group must have a minimum number of contiguous aggregated intervals, corresponding to the constraint to not change timing plans too frequently.

- Groups will be considered starting with the first group, in order, to the last group. Each group considered will be combined with the adjacent group having the smallest Euclidean centroid distance away (based on saturation flow rates) if either: 1. the group is less than the minimum group size threshold or 2. if the Euclidean distance between the groups is less than a configurable that defaults to one standard deviation of the distances from both group's members to their group's centroids. This step will repeat until no further grouping occurs.

- Clustering:

    Once contiguous groups are established, the groups will be clustered by their centroids into a configurable number of groups using a clustering algorithm based on the Euclidean distance of the saturation rates of the centroid of the contiguous groups. The purpose of this is to find a set of timing patterns that can be reused for multiple contiguous groups so that a few enough timing plans can be developed that will not exceed the signal controller storage with some reserved storage for abnormal condition timing plans.

- Analysis:

    - Each of the contiguous group of intervals has been assigned to the cluster with the least Euclidean distance away of the saturation flow rates. For each centroid of the cluster, the optimal timing plan will be calculated.

        1. For each available timing plan in the controller, the FIT score will be calculated for each interval. For each cluster, an available timing plan will be chosen to be used for the entire cluster who has the highest average FIT score for the entire cluster.

        2. For each interval, the FIT score will be calculated from the following:

            1. the optimal timing plan for the cluster to whom the interval belongs,

2. the actual timing plan in effect, and

3. the available timing plan in the controller that was selected for having the highest average FIT score for the entire cluster.

From these FIT scores, the percentage improvement of the new timing plan can be calculated for that interval of the actual and best available timing plan as the percent changed from the actual and best available timing plan's FIT score, respectively, and the number of intervals will be summed to get the applicability of the new timing plan.

- The new timing plans along with their percentage improvements over the actual used and best available plans will be sent to the IEN to be prioritized and presented to the signal timing engineer for further review as potential improvement strategies.

- Other relevant information and analysis output may be made available by the tools employed by this process and will be provided to the IEN to the user. For example, HCS provides corridor optimization that produces recommended cycle lengths and offsets.

1.7.3.1 Evaluation Engine Component

The evaluation engine component provides the DEPARTMENT with a critique of how a response plan performed for any given event. The evaluation engine component uses the corridor data from the DFE and the Planning Model to calculate corridor performance metrics. These performance measures will allow the DEPARTMENT to refine strategies and response plans in attempts to continually improve how the CFR-ICMS improves operations within the region.

1.7.3.1.1 Planning Model

The DEPARTMENT will develop a large scale mesoscopic simulation model for use by the PROJECT.

1.7.3.2 Predictive Engine Component

The DSS will include a DEPARTMENT furnished PRE component that will have two main functions. The maintenance function is internal but necessary for the PRE to maintain its calibration and readiness to provide the evaluation function to the ICMS operations.

1.7.3.2.1 Predictive Engine Maintenance Function

The maintenance function provides 30-minute horizon predictions every five minutes as well as provides a near real-time evaluation system to be used to evaluate potential event response plans and other strategies on-demand. The PRE component runs 24-hours a day / 7-days a week and is available for evaluations at any time.

The core network for the PRE component will be the planning model and represents the main corridors and parallel arterials of the Central Florida Transportation Network. As the planning model will be configured for typical day operations, the PRE component will need further refinement on the demands and operational parameters to be able to accurately represent any day of the year. The PRE component should be able to represent the following for any given day:

- Updated travel flows and demands;

- Accurate speeds and congestion;

- Correct implementation of ITS devices and systems;

- Any changes to travel patterns due to the change in demand; and

- Accurately predict queue propagation and dispersal.

The PRE component will also include a near real-time deterministic model that will work with the simulation model to evaluate and optimize the signalized intersection corridors within the network.

The PRE component will be integrated as part of the DSS subsystem and include access to several data connections that will allow the PRE to collect the status of all devices in real-time, including, but not limited to:

- Current traffic signal timing plans and operational model

- Ramp meter status and rate, if applicable.

- Detector status including flows and speeds.

- Dynamic message signs message status

- Transit automatic vehicle location and status data.

- Event and incident status messages, including start time, blockage pattern, and severity.

This maintenance function of the PRE component is to provide a rolling 30-minute horizon view of the traffic conditions on the roadway network, including a 10, 20, and 30-minute forecast. These predictions should be run in under 5 minutes using a mesoscopic simulation with enough fidelity allowing the system to calculate the benefits of changes to signals, ramps, and incorporation of strategies like transit signal priority. The rolling horizon will provide the demands and loaded network that will be the starting point for the evaluation models.

1.7.3.2.2   Predictive Engine Evaluation Function

The second function of the PRE component is to provide an evaluation tool that, upon request from the ERE, will run multiple simulations in parallel. These simulations will be triggered in response to an event in the system and would be used to run the Do Nothing scenario and the various response plan scenarios to provide the MOEs to evaluate the scenario that provides the highest benefit and best key performance indicator (KPI). Both

the rolling and evaluation predictions will need to produce all levels of MOEs; these need to include the following categories and details:

- Node MOEs:
  - Turning movement counts by vehicle type
  - Approach and turn delays
  - Highway capacity manual definition of LOS
- Link MOEs:
  - Flow by vehicle type and total flow
  - Average speed
- Average queue length and 95 percent queue length:
  - Number of stops
  - Average density
  - Volume/capacity
- Sub path MOEs:
  - Total route volume
  - Total route delay
  - Average delay
  - Average speed
  - Average travel time
- Transit MOEs:
  - Route travel time
  - Average delay
  - Average speed
- Emission MOEs
- Network Summary MOEs:
  - Vehicle miles traveled
  - Vehicle hours of delay
  - Total volume entering
  - Total volume exiting
  - Average delay

Upon completion of the simulations, the PRE component shall post the MOEs to the IEN and provide access of the MOEs to the ERE.

The VENDOR supplied Signal Optimization Tool (third role of the PRE component) will analyze signalized arterial corridors and, using a model based on the FHWA Highway Capacity Manual, optimize the signal timings to develop an improved corridor flow. SOT will have the capacity to request simulation of the optimized signal timings through a request of mesoscopic simulation runs. Following the request for and completion of simulation runs, the returned/collected MOEs will be summarized and evaluated by the PRE by comparing the results from the optimized signal timing to the MOEs of the current signal timing. These results will be included with the HCM results, and used to help define the improvement and percent change in performance metric graphics of the new timing plans, as demonstrated in the mockup dashboard shown in figure 16.

1.8 Assumptions and Dependencies

Since the practice and concepts of ICM are relatively new, several systems, technology, and institutional assumptions were made in the development of the requirements. These assumptions may be improved upon through the development of the PROJECT.

1.8.1 System Assumptions for the ICMS Project

- The DFE system will store live data streams, historical data, and transformed data sets and streams (also referred to as analytics);

- The standards deployed as part of the DFE system will be sufficient in most cases for the data needed for the DSS;

- Communication links between all stakeholders are complete, and on a high bandwidth fiber network;

- Current deployed infrastructure and systems will be utilized;

- The ICMS will utilize COTS solutions as much as possible, including SunGuide;

- Current and proposed infrastructure will be sufficient for the data requirements of the ICMS, and specifically the DSS within the ICMS; and

- Current TSM&O will be maintained throughout the design, implementation, testing, and deployment of the ICMS and components.

1.8.2 Technology Assumptions for the ICMS Project

- Industry best practices for user account management, authentication, and authorization practices will be used for data and application resources in the ICMS and TSM&O environment.

- Information technology standards required by the DPARTMENT will be used for this PROJECT. These standards can be found in the Business Systems Support Office's *Web Application Standards* document, and documents found at http://cflsmartroads.com/projects/future_projects.html.

1.8.3 Data Quality Assumptions for the DSS Subsystem

- Timestamps associated with data provided to the DSS will be accurate;

- Data provided to the DSS will be spatially accurate;

- Static data updates from external feeds will be provided on a periodic basis for inclusion in the DFE system and the DSS.

1.8.4 Statutory Project Management and Cyber Security Standards

- Chapter 74-1 F.A.C., Florida Information Technology Project Management and Oversight Standards

- Governed by the Agency for State Technology (AST), Chapter 74-1 F.A.C., Florida Information Technology Project Management and Oversight Standards, establishes project management principles that State Agencies are required to follow when implementing information technology projects. The Department must adhere to the State project management standards and ensure that all project documentation created by the Vendor, Department, or in collaboration, is developed and maintained in accordance with Chapter 74-1 F.A.C. The Vendor must be familiar with the State project management standards and be prepared to work with the Department to satisfy all requirements. It is important for the Vendor to recognize that documentation, monitoring, or reporting requirements could change mid-project, based on the project's AST Risk and Complexity Assessment, outlined in 74-1.002. The Vendor must be adaptable to changes required by Chapter 74-1 F.A.C., without increasing cost to the Department.

- Chapter 74-2 F.A.C., Information Technology Security

- Governed by the Agency for State Technology (AST), Chapter 74-2 F.A.C., Information Technology Security, also known as the Florida Cybersecurity Standards (FCS), establishes cybersecurity standards for information technology (IT) resources. State Agencies are required to follow these standards in the management and operations of state IT resources. The Department must adhere with the Florida Cybersecurity Standards for all Information Technology projects created by the Vendor, Department, or in collaboration. The Vendor must be familiar with the State cybersecurity standards and be prepared to work with the Department to satisfy all requirements.

  o Florida Cybersecurity Standards, 74-2 F.A.C. Section 74-2.002 (4) requires that agencies determine the potential security impact of all systems. If the system if found to have a categorization of moderate impact or higher, a system security plan (SSP) will be required. The SSP must address the security setup of the system, ensuring that required security controls are in place and listing the required information described in Section 74-2.003(5)(g)(4). The SSP must be submitted and approved by the FDOT Information Security Manager (ISM). An SSP template is available from the FDOT ISM.

1.9 Technical Requirements

Functional requirements that the system must meet are included in the attached *Minimum Technical Requirements Specification*. It will be the responsibility of the VENDOR to understand all requirements in the requirements specification and inferred in the descriptions within this Scope of Services document. The VENDOR shall be responsible for developing a FINAL Requirements Specification once the requirements walkthrough is completed with the DEPARTMENT.

The Requirements Specification has been developed by the DEPARTMENT and will be updated to include negotiation conclusions. Exhibit C of this document lists each requirement and identifies the responsible party.

DEPARTMENT will have responsibility for procuring all hardware and COTS software identified by the VENDOR as needed for deployment and operation and maintenance of the developed software. The VENDOR shall recommend minimum hardware and software requirements to support the PROJECT.

1.10 Software Ownership

The DEPARTMENT shall have full ownership of any works of authorship, inventions, improvements, ideas, data processes, computer software programs, source code, source code documentation, drawings, designs, specifications, documents, traffic models, and discoveries (hereafter called intellectual property) conceived, created, or furnished under this CONTRACT, with no rights of ownership to the VENDOR. The VENDOR shall fully and promptly disclose to the DEPARTMENT all intellectual property conceived, created, or furnished under this CONTRACT. The VENDOR hereby assigns to the DEPARTMENT the sole and exclusive right, title, and interest in and to all intellectual property conceived, created, or furnished under this CONTRACT, without further consideration. This CONTRACT shall operate as an irrevocable assignment by the VENDOR to the DEPARTMENT, including all rights therein in perpetuity. The VENDOR shall not copyright or patent any intellectual property conceived, created, or furnished under this CONTRACT without the express written consent of the DEPARTMENT. The VENDOR agrees to execute and deliver all documents requested by the DEPARTMENT to effect the assignment of intellectual property to the DEPARTMENT or the registration or confirmation of the DEPARTMENT's rights in or to intellectual property under the terms of this CONTRACT.

The foregoing shall not apply to any preexisting software, or other work of authorship used by the VENDOR, to create a deliverable, but which exists as a work independent of the deliverable, unless the preexisting software or work was developed by the VENDOR pursuant to a previous contract with the DEPARTMENT or a purchase of the intellectual property by the DEPARTMENT under the contract.

Any preexisting software, or other work of authorship used by the VENDOR, to create a deliverable, or integrated into the deliverable, shall require the written approval of the DEPARTMENT prior to use. Insofar as preexisting software is concerned, that intellectual property remains that of the commercial software publisher; however, all license to use that software, relative to this PROJECT will be irrevocably and perpetually conferred to

the DEPARTMENT. Furthermore, the preexisting software owned by the VENDOR and licensed to the DEPARTMENT shall be placed in escrow. The Vendor shall maintain in escrow a copy of the source code for the preexisting software. With each new release of the software provided to the Department, the Vendor shall maintain the updated source code in escrow. In the event the Vendor files for bankruptcy or ceases operations for any reason, the Department shall promptly be provided the current source code in escrow. The Department will only use the source code to support the licensed software subject to the same nondisclosure provisions of this Contract.

At all times, the DEPARTMENT shall have access to the intellectual property owned by the DEPARTMENT and developed pursuant to this CONTRACT or a previous contract with the DEPARTMENT including source code and its documentation for the purpose of modification, enhancement, or distribution. The DEPARTMENT shall distribute the software to state agencies as required and may distribute the software to other states.

The VENDOR also agrees to execute all papers necessary for the DEPARTMENT to protect their ownership of the rights in the work products.

The VENDOR shall be responsible for the preservation of any and all such work products prior to transmittal to DEPARTMENT, and shall replace any such work products that are lost, destroyed, or damaged while in its possession without additional cost to the DEPARTMENT.

2 Applicable Documents

Most documents named throughout this Scope of Services are located and viewable on one central page at http://cflsmartroads.com/projects/future_projects.html. These include, but are not limited to:

- Detour Maps – Orange County, Osceola County, and Seminole County

- TSM&O Data and Systems Inventory

- ICM Action Plan

- Business Systems Support Office's Web Application Standards

- Installation and Deployment Guide Template

- Project Delivery Methodology of the FDOT District 5 AAM Dashboard, Version 1.0, Revision Date: 09/30/2016

- AAM Dashboard Description and Requirements:

  o Comprised of the following two documents: Project Delivery Methodology of the FDOT District 5 AAM Dashboard, Version 1.0, Revision Date: 09/30/2016, Attachment A (Software Requirement Specifications) and Attachment B (System Requirements). The PROJECT will build upon this work to provide a robust production system that meets the requirements of the IEN. The above mentioned attachments can be found at the following link:

    http://cflsmartroads.com/projects/design/tsp/Regional_integrated_corridor_mgmt/FDOT_D5_AAM_Dashboards_Description_and_Requirements_and_Mockups.pdf

Other documents named include, but are not limited to:

- FDOT Systems Engineering Management Plan templates (http://www.fdot.gov/traffic/its/projects_deploy/semp.shtm), including:

  o Project Systems Engineering Management Plan Template

  o Software Development Plan Template

  o System Test Template

  o Test Procedures Template

  o Test Report Template

- USDOT's Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software (http://ops.fhwa.dot.gov/trafficanalysistools/tat_vol3/vol3_guidelines.pdf)

In the event of a conflict between the documents referenced herein and the contents of this Scope of Services, this document shall be considered the superseding requirement.

3 Scope of Work

The VENDOR is responsible for providing a detailed scope of work in a project work plan document that meets the requirements for managing the project contained in this section of the scope of services.

The scope of work described in this section is a general guide and is not intended to be a complete list of all the work necessary to complete the project. One of the early deliverables by the VENDOR will be a detailed work plan. The scope of work contains work tasks that are necessary to meet the DEPARTMENT's project requirements.

The selected VENDOR shall implement a comprehensive, fully integrated suite of software systems covering the general functional areas and specific requirements detailed in the Requirements Specification.

3.1 DEPARTMENT Responsibilities

The DEPARTMENT will be responsible to:

- Designate a project manager

- Form a project steering committee

- Provide all existing documentation in the DEPARTMENT's possession on the equipment and systems required to interface with ICSM

- Coordinate the documentation for an interface with other projects. Acquire an Interface Control Document from other projects, if required

- Review, Comment, and Approve the documentation and other deliverables

- Monitor the project's implementation progress and schedule

- Provide facility access and staff support

- Participate in requirements reviews, integration testing, acceptance testing, implementation, training, and status meetings

- Acquire all off-the-shelf hardware and software required to implement the functional capabilities of the PROJECT

- Provide hardware, commercial software, and communication infrastructure

- Provide all data interface APIs and Static Data required for the ICMS

- Create and maintain a project SharePoint site during the contract period to:
  - o Update project progress
  - o Post documentation
  - o Post meeting agendas, minutes, and action items

- Provide an integration testbed environment for testing all software functions. Performance, security, and other system functions will be tested in a controlled

pre-production environment during the system test phase which will mirror the production environment.

- Provide test systems and simulators to support the unit and system testing of the ICMS.

- Provide the COTS modeling engine

- Develop and maintain the necessary traffic models (macroscopic, mesoscopic, microscopic)

- Develop, maintain, and configure response plans, rules for triggering response plans and rules for selecting response plans to be evaluated

3.2 VENDOR's General Obligations

The VENDOR and its subcontractors will be responsible to:

- Designate a project manager and key project team members

- Provide a resource loaded Microsoft Project Schedule

- Provide detailed software design and integration with complete software system design documentation

- Identify the hardware requirements for system implementation, so the DEPARTMENT can furnish the computer-related equipment and networks for system integration and testing for the TMC

- Schedule and Coordinate with the DEPARTMENT's project manager to ensure that adequate network infrastructure and data links are provided by the DEPARTMENT

- Integrate software into an operational system

- Test functional capabilities of the system

- Provide network and workstation security

- Pack, ship, insure, and deliver all parts; training and maintenance materials; submittals; and documentation to the DEPARTMENT, as directed

- Implement a rigorous, structured integration methodology

- Implement a rigorous configuration management system

- Implement and executing a formal software development process

- Complete documentation for all hardware (as applicable) and software training, including a complete operator/administrator manual; user and service documentation; and the drawings

- Train DEPARTMENT-designated personnel

- Project management and control, including attending periodic progress meetings with and reporting to, the DEPARTMENT staff

- Maintenance and support of the system for the duration of the contract

- Standard warranty services for the duration of the contract

- Post implementation maintenance support for delivered software within the contract period, renewable in one year increments

- Provide a list of licenses for public domain software used in the CONTRACT before the project award. The VENDOR shall provide the DEPARTMENT with related licenses

- Provide a means to bulk-load response plans, response plan confirmation authorities, and decision plan rules.

3.3 Other Participants' Obligations

Other agencies and contractors shall participate in the ICMS Project in the following manner:

- Contractors implementing TSM&O related systems shall work with the VENDOR to provide existing system design documents and implementations in support of the ICMS Production System and environment.

- FDOT Offices and other Agencies providing data streams and data sets shall make these data resources and associated metadata and documentation available to the VENDOR.

- ICMS Stakeholders and Users shall provide input to their needs and preferences to support the design and implementation of the ICMS system to meet their needs

3.4 Overview of the Project Steps

This project will follow an iterative development process based on the Systems Development Process, shown in Figure 24, and described in Section 3.5. The VENDOR shall complete four iterative cycles corresponding to one design validation thread and three functional threads prior to final integration and systems acceptance as described below.
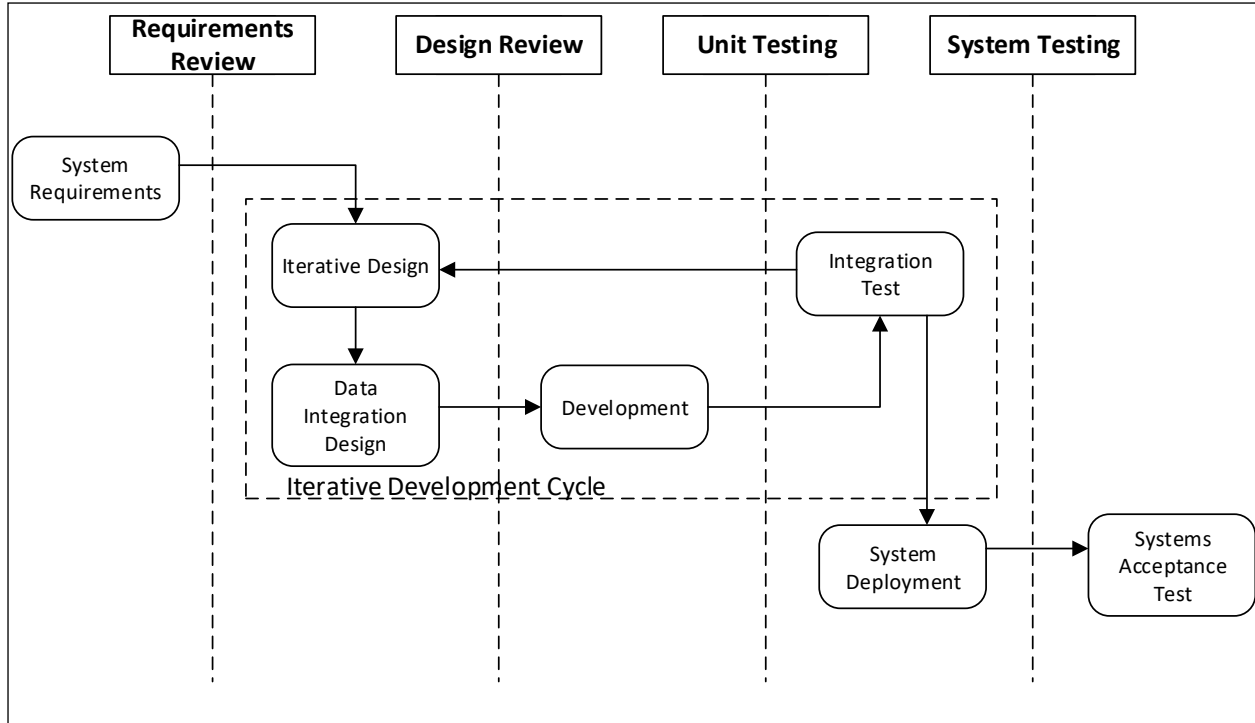
Figure 24: System Development Process

3.4.1 Thread Concept

For each thread the VENDOR will:

    a. Select a subset of the DFE data sources and provide the selection to the Department for approval before implementation.

    b. Implement the Extraction, Transformation and Load (ETL) processes necessary to store the data into the DFE data warehouse.

    c. Implement the approved APIs to expose the data stored in the data warehouse to approved consumers.

    d. Implement approved IEN web pages to display the data to approved users.

    e. Implement related DSS processing and actions based on the data being stored in the data warehouse.

3.4.2 Thread Content Descriptions

The VENDOR will implement the ICMS in a series of threads from Design Validation to final delivery of the software. The sections that follow describe the content of each thread. During the design phase, the VENDOR will provide the finalized content of each thread for DEPARTMENT approval.

3.4.2.1 Design / Development / Deployment / Test Design Validation Thread 0

In thread 0, The VENDOR will implement the following ICM functionality to verify the underlying design methods, software tools and COTS software deployment configurations. The functionality to be implemented during the Design Validation include components and capabilities that are architecturally significant or that illustrate the use of the selected tools. Validation capabilities to be prototyped for the validation phase are:

> DFE Design Validation

>> Definition: DFE will receive static data for Transit sources, Intersection data, RCI data and schools related data, store that data, and make the data available via a defined API. The DFE will also receive a single dynamic data source, store that data, and make that data and its current stream available via a defined API.

>> Demonstrate: Show the receipt of data through data logs, the storing of the data in the logs and the availability of the data through the API accessed by a test jig.

>> Deliverable: The code that implements the ETL and the API, the test jig, the API definition (ICD) and the data storage schema.

> IEN Validation

>> Definition: The IEN will display the static data listed in the DFE milestone above on a GUI.

>> Demonstrate: Display of the static data.

>> Deliverable: The display code and rudimentary user manual pages describing the use of the IEN to display static data.

> DSS Validation

>> Definition: The Highway Capacity Software (HCS) backend for the SOT will be encapsulated and programmatically used to produce a set of optimum signal timing plans for a single-intersection corridor.

>> Demonstrate: The production of a file containing an optimized set of signal timing plans for the demonstration intersection.

>> *Deliverable: The code that encapsulates the HCS backend, a rudimentary user manual for the manual initiation case for optimization of a single-intersection corridor.*

3.4.2.2 Design/Development/Deployment/Test Thread 1

Thread 1 concentrates on the retrieval, storage and display of traffic data from ITSIQA and other sources.

DFE Milestone

Definition: DFE will received traffic data from the ITSIQA, store that data, and make the data available via a defined API.

Demonstrate: Show the receipt of data through data logs, the storing of the data in the logs and the availability of the data through the API accessed by a test jig.

Deliverable: The code that implements the ETL and the API, the test jig, the API definition (ICD) and the data storage schema.

IEN Milestone

Definition: The IEN will display the traffic data on a GUI and implement other traffic oriented displays per the Scope of Services. Implement the user management interface.

Demonstrate: Display of the traffic data. Show add / modify / delete of users from the system and configuration of user privileges.

Deliverable: The display code and rudimentary user manual pages describing the use of the IEN to display traffic data and manage users.

DSS Milestone

Definition: Bulk load rules into the DSS rules engine, bulk load response plan elements and response plans; develop method for wrapping HCL for use in SOT.

Demonstrate: Demonstrate ability to load rules, response plan elements and response plans through simple stub that dumps the rules, etc.

Deliverable: Bulk rule loader code, ICD for bulk rule loaders, schema for rules and response plans.

3.4.2.3 Design/Development/Deployment/Test Thread 2

Thread 2 concentrates on the retrieval, storage and display of event data from SunGuide and other sources.

DFE Milestone

Definition: Data is being extracted from Event sources and is available from the DFE through the API.

Demonstrate: None.

Deliverable: ETL, "database" schema, API definition, API implementation.

IEN Milestone

Definition: Event data In the DFE can be displayed by the IEN and an ICMS user can enter data into the DFE from the IEN.

Demonstrate: This is demonstrated by dumping data from the data store, looking at logs generated by the DFE

Demonstrate: The IEN can display data from SunGuide, the ICMS user can enter their own events into the IEN that get stored in the DFE.

Deliverable: The display code and rudimentary user manual pages describing the use of the updated IEN.

DSS Milestone,

Definition: DSS will detect events, using rules to select response plans and invoking PRE (modeling engine or its stub). Manual SOT including signing of optimized signal timing plans.

Demonstrate: The rules engine invoking the modelling engine to process / model / predict.

Deliverable: Code; Modeling Engine ICD; Initial SOT manual pages

3.4.2.4 Design/Development/Deployment/Test Thread 3

Thread 3 completes the DFE, IEN and DSS and concentrates on the retrieval, storage and display of planned events and signal optimization.

DFE Milestone

Definition: DFE will incorporate data from all remaining data sources.

Demonstrate: None.

Deliverable: ETL, API and associated source code and applicable documentation.

IEN Milestone

Definition: IEN will include screens for remaining functionality. Notably, these include support for planned events, response plan (tracking, evaluation and analysis), event workflow, SOT configuration UI, sending response plan elements to SunGuide, etc.

Demonstrate: None.

Deliverable: Final pre-testing source code drop and associated documentation.

DSS Milestone

Definition: SOT will be fully automated.

Demonstrate: Demonstrate the ability of SOT to make signal timing modifications running in an automated manner.

Deliverable: DSS source code drop including SOT final code delivery.

3.5 Project Tasks

This section describes all the work tasks to be performed. The VENDOR is expected to follow this structure in developing a detailed work plan. Figure 25 shows the tasks in a Gantt chart, and the sections below provide more detailed description of the tasks.

Task Name	Start	Finish	
Notice To Proceed (NTP)	Thu 3/1/18	Thu 3/1/18	3/1/18
Kick-off Meeting	Thu 3/8/18	Thu 3/8/18	
⊿ Project Management	Thu 3/1/18	Thu 1/26/23	
▷ System Engineering Management Plan	Thu 3/1/18	Mon 4/16/18	
▷ Manage Project	Thu 3/1/18	Thu 1/26/23	
⊿ Design	Thu 3/1/18	Wed 9/12/18	
▷ Requirements Analysis	Thu 3/1/18	Tue 5/22/18	
▷ Preliminary Design	Wed 5/2/18	Tue 6/5/18	
▷ Detailed Design	Fri 6/1/18	Wed 9/12/18	
▷ Software Coding Guidelines	Thu 3/29/18	Fri 5/11/18	
⊿ System Build	Fri 8/24/18	Thu 1/9/20	
▷ Thread 1 - Traffic	Fri 8/24/18	Thu 1/31/19	
▷ Thread 2 - Event	Fri 1/4/19	Thu 7/4/19	
▷ Thread 3 - Planned Events	Fri 5/31/19	Thu 12/12/19	
System Build Complete	Thu 12/12/19	Thu 12/12/19	12/12/19
▷ System Testing	Fri 8/2/19	Thu 1/9/20	
▷ Deployment	Fri 6/1/18	Tue 1/28/20	
▷ System Training	Wed 7/24/19	Tue 1/28/20	
▷ Operations, Maintenance and Support (Years 3-4)	Mon 1/6/20	Wed 3/2/22	

Figure 25: Notational Project Gantt Chart

3.5.1 Task 1 – Project Management (VENDOR)

At a minimum, the VENDOR's project manager will be responsible for:

- Organizing a project team, and identifying key team members and their specialties

- Providing periodic updates to the work plan and schedules. Changes to the work plan and schedules that exceed 10 percent of the baseline require approval by the DEPARTMENT.

- Submitting monthly project status reports detailing the following:

  o Progress towards fulfilling the objectives in the work plan and its project schedule;

  o Critical path with highlighted items;

  o Status of risk mitigation efforts; and

  o VENDOR performance assessment and supporting details for determining liquidated damages as described in section 4.

3.5.1.1 Administrative Reports

The DEPARTMENT requires the deliverables indicated below from the VENDOR in order to monitor progress and ensure compliance.

- Project Systems Engineering Management Plan
- Software Development Plan

3.5.1.2 Project Systems Engineering Management Plan

The VENDOR shall develop a Project Systems Engineering Management Plan (PSEMP) document using the Project Systems Engineering Management Plan Template (http://www.fdot.gov/traffic/its/projects_deploy/semp.shtm) as a starting point in accordance with section 3.5.1.3.1 - Developed Document Deliverables.

The VENDOR shall use the PSEMP template to include the following additional sections, at a minimum. Some of these items should also be provided as stand-alone deliverables as described below.

a) Detailed Work Plan Section – The VENDOR shall develop a detailed work plan listing all the tasks the VENDOR will perform to fulfill the requirements of the ICMS. At a minimum, the work plan shall contain a detailed work breakdown structure (WBS) that is keyed to the level of cost and schedule reporting. A list of all deliverables provided under this contract. The work plan may incorporate the staffing plan and schedule, or it may reference them.

b) Risk Management Plan Section – The VENDOR shall develop a risk management plan that identifies initial project risks and possible ways to mitigate those risks. The VENDOR shall report on the status of each identified risk in the monthly progress report until that risk is fully mitigated. Risks shall be classified as: 1) cost, 2) schedule, and/or 3) technical. Even though the contract is limited to a maximum budget that may be adjusted through an amendment process, it is critical that the VENDOR keep the DEPARTMENT informed of any potential impacts to cost and what steps the VENDOR is taking to mitigate the cost impact. It is in the DEPARTMENT's best interest for the VENDOR to meet their cost and schedule commitments, and the DEPARTMENT will actively support the VENDOR in achieving those commitments. When new risks are identified, revisions to the risk management plan section shall be issued.

    (1) The VENDOR shall, at a minimum, address the following potential risk areas:

    (2) Development of new software modules

    (3) Platforms for integration and testing

    (4) Adequate technology transfers of the system

    (5) Stability of hardware suppliers

    (6) System security

c) Staffing Plan Section – The VENDOR will identify the key individuals to be involved in the project during negotiations and indicate in the staffing plan the number of personnel assigned to each element of the WBS. A key individual is defined as a person who is a task leader or individual contributor with specialized

knowledge applicable to the project. No key individual may be removed or substituted on the project without approval by the DEPARTMENT.

d) Detailed Schedule Section – The VENDOR shall develop a detailed schedule in Microsoft Project based on the WBS and work plan that. This will be described in and referenced by the Detailed Schedule Section. The Project Schedule will be delivered as a separate deliverable as described below.

e) Communication Management Plan – The VENDOR shall develop a Communications Management Plan, as defined in section 3.5.1.2.7.

f) Deliverable Approval Process – The VENDOR shall document the Deliverable Approval Process, as defined in section 3.5.1.3.

g) Change Management Procedures – The VENDOR shall document the Change Management Procedures within its PSEMP as defined in Section 3.5.1.2.1,.

h) Cost Management Plan – The VENDOR shall document the processes for managing and reporting costs in its PSEMP as defined in Section 3.5.1.2.3.

i) Requirements Traceability Verification Matrix Section – The VENDOR shall develop a Requirements Traceability Verification Matrix in accordance with section 3.5.1.3.1.

3.5.1.2.1   *Change Management Procedures*

The VENDOR shall follow a change management procedure for making changes to the ICMS after requirements have been finalized.

a) The VENDOR shall submit a change request to the DEPARTMENT for consideration. The change request shall include a description of the change, the requirement changes needed for the change, justification for the change, and the impact to the budget and schedule. The description of the change shall address the changes to the system and the changes to the operation of the system, and may be referred to as a "mini-conops."

b) The DEPARTMENT will coordinate with stakeholders to consider the change and make a decision to accept or reject the change request.

c) If accepted, the VENDOR shall propose contractual changes (contract updates or contract amendments) necessary to implement the change.

3.5.1.2.2   **Project Risk Register**

The Risk Management Plan section in the PSEMP describes how risks are managed; the project risk register contains identified risks and is updated through the project. The Project Risk Register will be maintained online with a tool such as a SharePoint list so the project team and the management team can work with this register collaboratively.

3.5.1.2.3 *Cost Management*

Project cost control searches out the causes of positive and negative variances, and is part of the Change Management process. Project Cost Management during the controlling phase includes the processes used to control costs so that the project can be completed within the approved budget. Project cost controls include:

- Influencing the factors that create changes to the cost baseline;

- Ensuring requested changes are agreed upon;

- Managing the actual changes when and as they occur;

- Assuring that potential cost overruns do not exceed the authorized funding periodically and in total for the project;

- Monitoring cost performance to detect and understand variances from the cost baseline;

- Recording all appropriate changes accurately against the cost baseline;

- Preventing incorrect, inappropriate, or unapproved changes from being included in the reported cost or resource usage;

- Informing appropriate stakeholders of approved changes;

- Acting to bring expected cost overruns within acceptable limits.

As part of the PSEMP, VENDOR shall document how each subproject's budget will be tracked to measure the Actual Cost, Earned Value, Estimate to Complete, and Estimate at Completion. These measurements will be reported as part of the monthly project status meeting. VENDOR is responsible for tracking the subproject budgets and the overall program's budget.

3.5.1.2.4 *Project Schedule*

The VENDOR shall develop and maintain a detailed schedule in Microsoft Project based on the WBS and work plan that, at a minimum, identifies:

1. Earliest start dates for a tasks

2. Latest start dates for tasks

3. Earliest finish dates for tasks

4. Latest finish dates for tasks

5. Schedule float time in days

6. Duration of tasks in days, where the minimum increment is one day

7. Task names and task numbers

8. Resource loading

9. Critical path information

3.5.1.2.5   Monthly Progress Reports

The VENDOR shall prepare a progress report each month to be provided to the DEPARTMENT by the fifth day of the next month. The progress report shall include the following items at a minimum:

1   Work completed

2   Work planned

3   Risks and issues

4   Schedule deviations

3.5.1.2.6   Administrative Meetings

List the administrative meetings that the VENDOR is expected to attend. If possible, list where the meetings will be held and the duration of each meeting.

The VENDOR shall attend the following administrative meetings. In-person meetings will be held at FDOT D5 Headquarters, 719 S Woodland Blvd., DeLand, FL 32720.

- Kickoff Meeting

    - The kickoff meeting shall last for 2 hours. It shall be in person.

- Monthly Status Meetings

    - Monthly status meetings will last 1 hour in duration. Six meetings will be person and 18 meetings will be held via screen share teleconference such as GoToMeeting or Skype Meeting.

- Project Closeout and Post-Mortem Meeting

- Towards the end of the project, an in-person meeting with the project manager and key technical staff.

Note: Other meetings are not listed here because they are part of the other tasks.

Meeting agenda shall be provided 5 business days prior to meetings.

Meeting minutes shall be provided within 5 business days after meetings.

3.5.1.2.7   Communication Management Plan

The overall objective of a Communications Management Plan is to promote the success of a project by meeting the information needs of project stakeholders. The Communications Management Plan defines the project's structure and methods of information collection, screening, formatting, and distribution and outline understanding among project teams regarding the actions and processes necessary to facilitate the critical links among people, ideas, and information that are necessary for project success.

The intended audience of the Communications Management Plan is the project manager, project team, project sponsor and any senior leaders whose support is needed to carry out communication plans. The Communications Management Plan defines the following:

- What information will be communicated—to include the level of detail and format

- How the information will be communicated—in meetings, email, telephone, web portal, etc.

- When information will be distributed—the frequency of project communications both formal and informal

- Who is responsible for communicating project information

- An escalation process for resolving any communication-based conflicts or issues

3.5.1.3 Transmittal of Deliverables

3.5.1.3.1   Developed Document Deliverables

Document deliverables are an important tool to contain work plans, products, and important decisions made between the DEPARTMENT and the VENDOR and shall conform to the following process for consistent, timely development. Where document templates are available on the DEPARTMENT's Systems Engineering website, the template shall be used and may be tailored by the VENDOR in developing the document unless an alternative is agreed to by the DEPARTMENT. Where a specific document template is not available, the VENDOR shall use the DEPARTMENT's non-specific technical memorandum document template and include the sections and information specified in the scope item at a minimum.

Document Deliverable Planning:

1. The VENDOR and the DEPARTMENT agree on deadlines for the document deliverable submittal activities (described below) that fit within the project schedule.

2. VENDOR submits a document shell or outline for the DEPARTMENT's review and approval following the submittal procedure below. The document shell shall contain the outline of the document and may contain notes to guide the development of the document content.

3. The DEPARTMENT shall email the VENDOR that the outline has been accepted.

4. VENDOR submits the completed document according to the submittal procedure below.

5. The VENDOR shall provide a finalized document after comments have been addressed by the deliverable final due date. A final document shall have the DRAFT watermark removed and the version number of the document incremented to the next whole number.

6. The DEPARTMENT shall mark the document as final in the document library and email the VENDOR that the final document has been accepted.

Document Deliverable Submittal and Review Procedure:

1. VENDOR delivers draft deliverable to the DEPARTMENT by the draft deliverable due date.

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2. DEPARTMENT reviews the deliverable and provides comments to the VENDOR by the deliverable review due date. Comments will be provided as comment balloons and tracked changes if using Microsoft Word; else, a comments table will be provided that will track each comment's text, reference location within the deliverable, and a place for the VENDOR's response, and a status of the comment.

3. VENDOR addresses comments by modifying the submittal and answering questions by the revision due date. Changes to the deliverable shall be tracked using the tracked changes feature of Microsoft Word if the deliverable is in that format, else, a list of changes made to the deliverable shall be provided with the comments responses.

4. DEPARTMENT reviews the VENDOR's comment responses and deliverable changes by the revision review due date. All comments shall be marked as completed using the "Mark as Completed" function of the comment balloon if using Microsoft Word, else by indicating in a comments table.

5. Steps 3 and 4 will repeat until the DEPARTMENT marks all comments as completed.

3.5.1.3.2   Other Deliverables

Other deliverables that are not formatted as a Microsoft Office document shall be submitted in a fashion described in the other plan documents.

3.5.2 Task 2 – System Design

The VENDOR shall develop and finalize the preliminary, critical, and final system design for the ICMS and for the new external systems that interface to the ICMS. Project files shall be set up and overall coordination of staff and all agencies involved will be maintained. The system design development tasks include:

3.5.2.1 System Requirements Specification

The VENDOR shall conduct a one-week, in-person requirements walkthrough with the DEPARTMENT and its representatives to ensure common understanding of what will be built and what capabilities the system will include. The DEPARTMENT has sole discretion of the acceptance of any changes to the requirements.

After this walkthrough is completed, the VENDOR shall update the System Requirements Specification with agreed changes and clarifications made during the requirements walkthrough in accordance with section 3.5.1.3.1 - Developed Document Deliverables.

Once the System Requirements Specification is finalized, the Software Requirements Specification should be produced for the individual new software development tasks. Software requirements are derived from the System Requirements Specification by allocating functional requirements to specific software modules or subsystems and further decomposing these requirements to the software level. These documents will be controlled in a manner consistent with the configuration management plan.

3.5.2.2 Preliminary Design

The VENDOR shall coordinate to develop the 40% Design deliverable for the DEPARTMENT review, and build upon the work done by the DEPARTMENT during the Systems Requirements. The 40% Design phase shall include the following at a minimum:

1. Description of subsystems and components;

2. Architecture of subsystems and components;

3. Identification of data sets used by and transferred between all subsystems and components;

4. Identification of interfaces between subsystems and components and users;

5. Dependencies and modules to be used to build or support subsystems and components, including COTS API modules, configuration data, and mechanisms;

6. Design Methodology and Design Document Templates; and

7. Other high-level design artifacts.

Preliminary Design Review - At the completion of the 40% Design phase the VENDOR shall perform a Preliminary Design Review (PDR) to obtain verification / approval of the system architecture design. The goals of the PDR are to:

1. Verify the technical content of the architectural design document and its interfaces are complete and traceable to requirements;

2. Ensure the selected design methodology has been followed in producing the architectural design; and

3. Obtain approval from the DEPARTMENT Project Manager to proceed into detailed design.

3.5.2.3 Critical Design

VENDOR shall coordinate to develop the 90% Design deliverable for the DEPARTMENT. The 90% detailed design shall include the following at a minimum:

1. Structure of subsystems and components and shared libraries

2. Behaviors of subsystems and components

3. Mockups of user interfaces

4. Database model diagrams of databases used to support ICMS subsystems and components.

Critical Design Review - After completion of approximately 90% of the detailed design and prior to system build, a Critical Design Review (CDR) shall be conducted by the VENDOR to ensure the design fulfills the requirements. The CDR will serve as a baseline for all deliverables, and there will be no deviation from the final CDR without change requests being approved by the DEPARTMENT. The goals of the CDR are to:

1. Verify the technical content of the System Design Document are complete and its functions are traceable to requirements.

2. Ensure the selected design methodology has been followed in producing the detailed design.

3. Obtain approval from the DEPARTMENT Project Manager; the team will proceed into the implementation phase.

3.5.2.4 Software Coding Guidelines

At the time of the critical design review, the software coding guidelines shall be established and submitted in accordance with section 3.5.1.3.1 - Developed Document Deliverables. The DEPARTMENT has provided some example coding standards that would be acceptable to use, but the VENDOR may propose changes or other standards to be used. This document will govern how the software source code will be developed to ensure the source code products can be understood and maintained by an entire team of developers, not just the original author. It will also provide a familiar style that will make reading code in differing parts of the system understandable without having to learn new conventions or documentation styles. The VENDOR shall follow coding guidelines that include general guidelines for all code and specific standards for code that is anticipated to comprise of at least 10 percent of the system.

3.5.2.5 System Design Document

The final deliverable in the design phase will be the System Design Document (SDD). At the conclusion of the CDR and final design, the SDD is baselined and placed under configuration management control. The resulting SDD will identify the system design and how it will be implemented. The software object models, data models, and dynamic models will be fully specified, including all data inputs and outputs, and software algorithms. The VENDOR shall submit a Final System Design document in accordance with section 3.5.1.3.1 - Developed Document Deliverables.

Task 2 Approach

1. Develop Design Methodology and Design Document Templates

2. System Requirements Walkthrough

3. Develop Final System Requirements Document

4. Work with Project Stakeholders, DEPARTMENT, and other vendors (suppliers) to develop a Preliminary Design

5. Provide Preliminary Design Document to the DEPARTMENT and project stakeholders for review and comment

6. Present Preliminary Design as part of PDR

7. Work with PROJECT stakeholders, DEPARTMENT, and other VENDORS (suppliers) to develop update Preliminary Design and develop Critical Design

8. Provide Critical Design Document to DEPARTMENT and project Stakeholders for review and comment

9. Present Critical Design as part of CDR

10. Submit CDR results and 90% Design to DEPARTMENT approval and Notice to Proceed to Build Phase

11. Work with PROJECT stakeholders, DEPARTMENT, and other VENDORS (suppliers) to develop update Critical Design and complete Final Design

12. Provide 100% Design to DEPARTMENT and PROJECT stakeholders for review and comment

13. Update Final Systems Design Document and submit to DEPARTMENT approval

3.5.3 Task 3 – Model Development Plan

Task 3 is deleted from the VENDOR's responsibility under this contract.

3.5.4 Task 4 – System Build

The VENDOR will build the ICMS in functional threads as described in Section 3.4. The functional thread approach has the advantage over a subsystem by subsystem approach by incrementally providing usable functionality. The VENDOR shall prepare a software development plan to detail the plan for building and integrating the prototype system that will be used for system testing. The VENDOR shall use test driven development (TDD) to facilitate efficient and effective verification of the system, sub-systems, and components. This will require using simulators and test systems provided by the DEPARTMENT. This will also require tagging or identification of system components, data sets, and data streams as to which mode or purpose it belongs. Ultimately, there will be production subsystems, components, and data sets and data streams, but there may be several non-production sets of these artifacts used through the build, test, demonstration, and training phases of the PROJECT.

The VENDOR shall develop a **Software Development Plan** using the Software Development Plan Template (http://www.fdot.gov/traffic/its/projects_deploy/semp.shtm) as a starting point in accordance with section 3.5.1.3.1 - Developed Document Deliverables.

3.5.4.1 System Build Subsystem Constraints

The VENDOR shall design and build the ICM subsystems as described in Section 3.4, in phases subject to the following paragraphs.

Each phase delivery of the system; threads 0, 1, 2, and 3; shall include a Version Description Document that describes the integrated system or integrated partial system being delivered, and changes from prior threads or versions. The VDD will contain instructions for installation, configuration, operation, maintenance, and development. The VDD may reference content in external companion documents, such as a System User's Manual or System Developer Guide, so long as the content is covered.

3.5.4.1.1 System Build – Data Fusion Environment

The VENDOR shall design and deploy a DFE based on the requirements and the approved design. The VENDOR may use the prototype provided in earlier FDOT D5 efforts, but will design and deploy a solution to meet the requirements of this PROJECT. The prototype DFE will have its components and the data stored by the components labeled with prototype as its purpose.

The components will be built in the following manner:

- Data sources from the data dictionary will be identified from which the data extraction component can extract data without impacting operations.

- Simulators will be provided by the DEPARTMENT to produce data to be used by the data ingestion component when production data is not available in a manner to be extracted without impacting TSM&O.

- The data warehousing components will be built to accommodate storing of the types of data needed by the ICMS. This will include the SQL Server relational database management system, the unstructured data store, and the ArcGIS Data Store.

- The data interfaces components will be built to extract, transform, and load data from the data sources into the data warehousing components.

- API components will be built to provide access to data in the DFE.

3.5.4.1.2 System Build - IEN

The VENDOR shall develop the IEN subsystem based on the requirements and the approved design.

3.5.4.1.3 System Build – DSS

The VENDOR and the DEPARTMENT share responsibility for the DSS in the following manner.

The VENDOR has responsibility for the following functionality of the DSS.

- The VENDOR shall design, develop and deploy DFE APIs which the PRE shall utilize to retrieve data from the DFE.

- The VENDOR shall design, develop and deploy the DSS ERE including a GUI used by the operators to enter the rules, possible response plans to be simulated by the PRE to rank the outcomes of the possible response plans, and allow an operator to select a possible response plan for implementation.

- The VENDOR shall design, develop and deploy as part of the IEN a mechanism and GUI to manage the approval of the selected response plans from the affected stakeholders.

- The VENDOR shall design, develop and deploy an interface to the PRE to evaluate the effectiveness of the selected and deployed response plan.
- The VENDOR shall design, develop and deploy the DSS Signal Optimization Tool.

The DEPARTMENT shall deploy, configure, and calibrate the DSS Predictive Model and Planning Model. The DSS Predictive Model and Planning Model build sub-task will, integrate all necessary static and dynamic data, and calibrate the model. The DSS Predictive Model and Planning Model build task consists of the following steps:

- Identify all data sources and data feeds from the DFE APIs,

- Develop all necessary data interfaces (DI),

- Integrate all necessary static and dynamic data,

- Calibrate the model, and

- Deploy a COTS modeling system

3.5.4.2 System Build Thread Model

The VENDOR shall build the ICM in functional threads as described in in Section 3.4.

- Each thread will be composed of sub-threads, one for each of the DFE, IEN and DSS. Completed and successful system testing and acceptance of each sub-thread will constitute a project milestone.

- Each thread shall be built on the results of the earlier threads. The source code, documentation, test procedures shall be written in a manner that they are an integrated deliverable.

- The VENDOR shall perform the System Integration and the System Testing and Acceptance described in sections 3.5.4.3 and 3.5.4.4 on the partial ICMS as development of each thread is completed.

3.5.4.3 System Integration

The VENDOR shall perform the System Integration and System Testing and System Acceptance described in sections 3.5.4.3 and 3.5.4.4 as each thread is completed. This testing assures the incremental functionality of DFE, IEN and DSS are integrated together and the later threads build upon the earlier threads.

Following completion of the third thread, the VENDOR shall integrate all systems into a fully functional ICMS. Initially, simulated systems and test systems shall be used for the integration to build up towards full system testing. SunGuide test systems, ITS device simulators, ITS devices not used in production, and replicated data feeds from the DFE, and other resources shall be included during the system integration task.

Each external system will need to be considered as to how it can be used or cloned and deployed in a way to not disrupt operations while allowing the ICMS components to be

tested. The following test systems will be provided by the DEPARTMENT as required resources for testing:

- A test instance of SunGuide labeled as the "D5 ICMS Test SunGuide" will be provided with simulated data inputs and simulated data outputs for testing.

- A test instance of the central traffic signal ATMS software (herein signal software) will be deployed and connected to the D5 ICMS Test SunGuide system. Currently, the TrafficWare ATMS.Now is the only signal software planned to be interfaced with SunGuide, but other signal software products should be considered for later inclusion, possibly including Econolite Centracs, Siemens Tactics, and Transcore TransSuite. However, SunGuide will be interfacing directly with the signal software products, encapsulating their specific interface protocols, and providing a single interface to the DSS through the SunGuide system.

- Other test systems needed to interface with the ICMS will be deployed and provided by the DEPARTMENT.

3.5.4.4 System Testing and Acceptance

The VENDOR shall perform system testing of the partial or complete prototype ICMS after each of the three subsystems are built and integrated into a partial or complete ICMS. The system testing tasks are described in the following paragraphs.

3.5.4.4.1   Software Unit Testing

The VENDOR will use Test Driven Development (TDD), which relies on allocating requirements to units or modules, performing development and then testing to assure the resulting intermediate product satisfies the requirements. When all the requirements allocated to the unit or module are satisfied, then by definition the Unit Test is complete.

The unit testing will be documented and conducted without a formal event, but the unit testing procedures, scripts, simulators, and results will be provided to the DEPARTMENT so that the unit tests can be repeated by the DEPARTMENT.

3.5.4.4.2   Software Integration Testing

The software integration testing process is invoked for a given group of software configuration items upon completion of the software unit testing process for all software units of that group. The software integration testing process activities include:

1. Re-affirming integration test environment
2. Establishing integration test strategy
3. Developing simulation software, drivers, and stubs
4. Developing software integration procedures
5. Conducting peer review of the test procedures

6. Coordinating effort with other teams

7. Conducting the software integration testing

The integration testing will be documented and conducted without a formal event, but the unit testing procedures, scripts, simulators, and results will be provided to the DEPARTMENT so that the unit tests can be repeated by the DEPARTMENT.

3.5.4.5 System Test Plan

The VENDOR shall develop a System Test Plan document using the System Test Plan Template as a starting point in accordance with section 3.5.1.3.1 - Developed Document Deliverables.

3.5.4.6 Test Procedures

The VENDOR shall develop a Test Procedures document using the Test Procedures Template as a starting point in accordance with section 3.5.1.3.1 - Developed Document Deliverables.

3.5.4.7 System Acceptance Testing

The VENDOR shall conduct System Acceptance Testing in accordance with the System Test Plan and System Test Procedures. System Acceptance Testing will consist of a multi-step process including Test Readiness Reviews, Test Execution and Hot Wash-up Meeting.

Test Readiness Reviews – The VENDOR shall hold a two-hour, in-person, Test Readiness Review meeting prior to each major testing event. The purpose of the Test Readiness Review is to provide the DEPARTMENT with the assurance that the software has undergone a thorough test process and is ready for turnover to the next test phase. The scope of the Test Readiness Review is to inspect the test products and test results from the completed test phase for completeness and accuracy, and to verify that the test cases, test scenarios, test scripts, environment, and test data have been prepared for the next test phase. Each of the subsystems contributing to the overall ICMS will hold Test Readiness Reviews for their subsystem.

Test Execution – The VENDOR shall execute the test in accordance with the test plan

Hot Wash-up Meeting – The VENDOR shall attend a hot wash-up meeting in person at the conclusion of the test execution. Unverified requirements will be discussed to facilitate the development of the Corrective Action Plan.

3.5.4.8 Corrective Action Plan

The VENDOR shall address all unverified requirements with a Corrective Action Plan. This plan will become part of the Test Report. The Corrective Action Plan will include a list of each unverified requirement, and each item in the list will contain the following information:

1. Requirement identification number, requirement text, and other attributes of the requirement

2. Test Procedure identification number

3. Symptoms or observations of the behavior or evidence that the requirement was not verified

4. Proposed resolution of one of the following options:

   i. **Correction –** The VENDOR describes a solution to resolve the unmet requirement and retest the system at no additional cost to the DEPARTMENT. The VENDOR shall record the planned corrections in the issue tracking tool described in the Operations, Maintenance, and Support task.

   ii. **Deviation –** The VENDOR may request a deviation from a stated requirement if the system can be shown to provide an equivalent functionality. The DEPARTMENT has the discretion to accept or reject a deviation request. The VENDOR shall revise the requirement(s) and documentation to reflect the accepted deviation.

   iii. **Waiver –** The VENDOR may request a waiver for a requirement that is not verified. The DEPARTMENT may grant the waiver to accept the system as-is with regards to the unverified requirement if the requirement was unable to be tested or whose results are unable to be interpreted. If the requirement was unverified due to an error in the design or implementation, the DEPARTMENT may grant the requested waiver with the proviso that the problem will be fixed in accordance with the VENDOR-furnished, DEPARTMENT-approved correction within the approved schedule. If a fix for the problem proves impractical for the VENDOR, the DEPARTMENT may grant the waiver to accept the system as-is if the VENDOR provides commensurate consideration for the lack of specified functionality and there is an acceptable work-around procedure for the DEPARTMENT and an acceptable payment adjustment. The DEPARTMENT may also reject the waiver request and require that the VENDOR meet its obligations under the contract scope and system requirements.

   iv. **Temporary Waiver** – The VENDOR may request a temporary waiver for a requirement that is not verified. The DEPARTMENT may grant the waiver to accept the system as-is at that time if the unmet requirement is included in the work plan and project schedule to be implemented and go through system testing and acceptance at a later time, and if the cost schedule is adjusted to move commiserate payment of the work involved in the unmet requirement to when the system having the requirement implemented has gone through system testing and acceptance.

3.5.4.9 Test Report Document

The VENDOR shall develop a test report document using the Test Report Template as a starting point in accordance with section 3.5.1.3.1 - Developed Document Deliverables to

record the results of the testing. This shall include the pass/fail results of each requirement to be verified, any deviations or waivers approved by the DEPARTMENT, and planned corrections.

System Acceptance – After the test report is finalized and accepted, and after all unverified requirements are resolved, the subsystem or system under test shall be accepted by the DEPARTMENT formalizing the completion of a major milestone of the PROJECT.

3.5.5 Task 5 – Deployment

The VENDOR shall assist the DEPARTMENT with deployment of the ICMS into the production environment, once systems are accepted. The VENDOR shall develop a Deployment Plan using the Installation and Deployment Guide Template found online at http://cflsmartroads.com/projects/future_projects.html) as a starting point and in accordance with section 3.5.1.3.1 - Developed Document Deliverables to list the activities involved in deploying the software into operations. The Deployment Plan shall include at a minimum information:

- Deployment Diagram - Provide and describe a figure that depicts where all system products will reside within the operational site.

- Site Preparation - Describe the preparation required for the site on which the system product will operate. Define any changes that must occur to the operational site and specify features and items that should be modified to adapt to the new product.

- Checklist of Implementation Tasks - Checklist will include the task, person responsible, and schedule of events.

- Server Configuration - For all required servers (database, web server, etc.) provide configuration, including operating system version and any required software packages that must be installed.

- Installation Steps - Includes any prerequisites, installation steps, scripts, and all required configured values.

- Software Configuration - Include a list of prerequisites, roles, features, and packages that are required for deployment.

- Verification of Installation – Perform an installation verification test designed to demonstrate installation was successful.

The VENDOR shall attend a two-hour deployment readiness meeting prior to deployment of the software.

Upon DEPARTMENT approval of the plan and schedule, the VENDOR shall deploy the ICMS into the operational environment for operational use.

3.5.6 Task 6 – System Training

The VENDOR shall develop training plans, perform training, and provide training materials for operations and maintenance of the ICMS. Project files shall be set up and overall coordination of staff and all agencies involved will be maintained. The VENDOR shall provide training as early as it can be scheduled after the implementation milestone is reached. Training materials will be provided to trainees to include an updated description of system functions, application procedures, and error troubleshooting guides including contingencies and/or alternative modes of operations (backup plan). This will include providing Updated End User Training Materials, and Updated Technical User Manuals. Each major subsystem shall include training. The training tasks include:

3.5.6.1 Training Plan

VENDOR shall develop a Draft Training Plan in accordance with section 3.5.1.3.1 - Developed Document Deliverables, which will describe how the system operators and users will be trained prior to operation of the system. The draft plan will be provided to the DEPARTMENT for review and comment. Once comments are addressed, a Final Training Plan will be developed.

3.5.6.2 Training Schedule

As part of the project schedule, a high-level training schedule shall be included.

3.5.6.3 Training Manuals

VENDOR shall develop the System Training Manuals in accordance with section 3.5.1.3.1 - Developed Document Deliverables.

The VENDOR shall provide the Training Plan, Training Schedule, and Training Manuals corresponding to the subsystems being built, prior to System Testing and Acceptance.

3.5.6.4 Training Workshop

The VENDOR shall provide an onsite training workshop for each subsystem being built.

3.5.7 Task 7 – Operations and Maintenance, and Support

Technical support shall be provided via phone and/or email. The VENDOR shall provide the appropriate staff to respond and support the ICMS with the following operations, maintenance, and support:

- Hardware activity shall be monitored by the VENDOR. If a hardware failure occurs, the VENDOR shall notify the DEPARTMENT of the issue and provide a plan of resolution. All hardware upgrades and maintenance shall be completed afterhours and sufficient notice will be given to the DEPARTMENT.

- Software support will include, but will not be limited to, resolving software issues, database issues as they relate to the application, and providing regular maintenance to systems to ensure continuity of the system. Routine maintenance to the system shall be communicated to the DEPARTMENT one week prior to the scheduled maintenance. If emergency maintenance is required, this shall be communicated to the DEPARTMENT as soon as it is deemed necessary. All work to the production system shall be done afterhours to reduce any impact on the system and to the client.

- An on-call support phone number shall be made available to the DEPARTMENT for support calls. Support staff will be available, as needed, 24-hours per day, seven-days per week, year-round. Support calls will have a 30-minute response time. Calls made to the support number shall be routed to the appropriate staff as described below.

- Issues reported to the on-call support phone number will be entered as new issues into the tracking system by the support staff so that the issue and its resolution can be tracked. The support staff will provide the caller with insight as to how long it will take to resolve the issue. The VENDOR will estimate the time required to address the issue in its response.

- The following tiered support staff shall be available and respond to issues:

  1) Tier 1 Support Staff – System administrator:

     a) Available eight-hours per day, 8:00 AM to 5:00 PM Eastern Time with a one-hour break between 11:00 AM and 2:00 PM.

     b) Available Monday through Friday, except holidays recognized by the DEPARTMENT, including New Year's Day, MLKJ Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

     c) Will perform tasks in the following general priority:

        i) Respond to issues reported by users or detected by the system

           (1) Record all support requests in an issue tracking system.

           (2) Respond to and acknowledge issues within 60 minutes of being reported and recorded in the issue tracker.

           (3) If cause and resolution is not identified, escalate issues to the appropriate staff within 120 minutes of being acknowledged.

           (4) Notify appropriate DEPARTMENT staff of issues that will require emergency system downtime.

        ii) Perform routine maintenance tasks as required

  2) Other tasks as assigned by the DEPARTMENTTier 2 Support Staff – Product developer:

     a) Acknowledge support requests entered in the issue tracking tool.

    b) Respond to issues escalated by the system administrator within four hours of escalation in order to support identifying the cause and provide a resolution of the issue. If a tier 1 support staff is able to resolve the issue after discussion with the computer programmer, it can be reassigned to the tier 1 support staff for resolution.

    c) Respond to enhancement requests made by the DEPARTMENT project manager and provide the appropriate cost estimate for the enhancement.

    d) Review issues closed by other support staff within one business day to confirm the issue was properly resolved. This may include soliciting confirmation from the user reporting the issue.

    e) Escalate issues that require expertise beyond the product developer to the tier 3 product specialist

3) Tier 3 Support Staff – Product specialists

    a) Respond to deeper issues escalated from tier 2 that require larger effort for resolution and require specialized knowledge dealing with the DFE or any other highly specialized components of the ICMS.

- Provide a schedule of staff covering tier 1 support for a minimum of two weeks out into the future, including the support staff names, phone numbers, and email addresses.

- Provide a web-based issue tracking tool for users to collaborate with support staff with the following functions and constraints:

    1. Users will be able to report defects, issues, and enhancement requests

    2. This system shall be available 24-hours a day / 7-days a week

    3. Administrators and support staff will be able to respond to users, update issues with additional information, and log maintenance activities

    4. Issue tracking tool will track issue status, the staff that worked/is working on the issue, any comments recorded by the support staff, how the issue was resolved, and other issue information agreed upon between the DEPARTMENT and VENDOR

    5. Issue tracking tool shall be an open-source tool, such as Mantis

    6. Information collected by the issue tracking tool shall be the property of the DEPARTMENT

    7. Issue tracking tool shall be delivered to the DEPARTMENT upon request and at the end of the contract term such that the DEPARTMENT can take over operation of the tool in its current state.

- The VENDOR shall suggest and request any needed software related licensing renewals and support for COTS packages used by the PROJECT over the same period.

- The VENDOR shall attend weekly operational review meetings for the first two months after deployment, followed by monthly operational review meetings for the remainder of the CONTRACT.

- The VENDOR shall update all manually updated data sets within one week of when new data becomes available unless otherwise directed by the DEPARTMENT.

- The VENDOR shall perform preventative maintenance activities that include, but are not limited do:

  1. Enter logs of maintenance performed to an issue tracking tool

  2. Perform daily, weekly, and monthly server maintenance and sub-system monitoring activities

  3. Perform monthly database and data store maintenance activities including optimization and backup

3.5.7.1 Service Level Agreements with Non-performance Liquidated Damages

The VENDOR shall use all reasonable commercial efforts, being no less than accepted industrial standards in this regard, to ensure that the ICMS is available 99.9% of the time in any calendar month. If it is not, the DEPARTMENT will be eligible to receive the Service Credits as shown in Table 4.

Definitions. The following definitions shall apply to the Uptime Service Level Agreement (SLA).

"**Downtime**" means, for a server, if there is more than a five percent user error rate. User error is calculated using server monitoring software, based on results from ping tests, web server tests, TCP port tests, and website tests. Downtime is measured based on server side error rate.

"**Emergency Downtime**" means those times where the VENDOR becomes aware of a vulnerability that, based on a risk assessment of the vulnerability, the VENDOR deems to require immediate remediation and, as a result, the ICMS is made temporarily unavailable in order for the VENDOR to address the vulnerability. Emergency Downtime is not considered Downtime for purposes of this ICMS Uptime SLA, and will not be counted towards any Downtime Periods

"**Monthly Uptime Percentage**" means the total number of minutes in the calendar month minus the number of minutes of Downtime suffered from all Downtime Periods in the calendar month, divided by the total number of minutes in the calendar month.

"**Scheduled Downtime**" means those times where the VENDOR notifies the DEPARTMENT of periods of Downtime five days prior to the commencement of

such Downtime. There will be no more than 12 hours of Scheduled Downtime per calendar year. Scheduled Downtime is not considered Downtime for purposes of this Uptime SLA, and will not be counted towards any Downtime Periods.

"Services" means the services provided to the DEPARTMENT by the ICMS Service including source control, project management, ticketing collaboration, and other services in accordance with the Contract or, alternatively, on terms as expressly agreed between the DEPARTMENT and VENDOR.

"Service Credit" may be provided according to the following schedule:

Payment Adjustments. The following payment adjustments apply to the SLAs.

- **Maximum Service Credit.** The aggregate maximum number of Service Credits VENDOR can claim for any Downtime Periods that occurs in a single calendar month shall not exceed 30 days of services added to the end of your billing cycle. Service Credits may not be exchanged for, or converted to, monetary compensation.

- **Uptime SLA Exclusions.** The Uptime SLA does not apply to any performance issues: (i) caused by factors outside of the VENDOR's reasonable control; (ii) that resulted from any actions or inactions of the DEPARTMENT or any third parties; or (iii) that resulted from the DEPARTMENT's equipment and/or third-party equipment (not within the primary control of the VENDOR).

Table 4: Response and Repair Time Service Level Agreement Parameters and Liquidated Damages

Definition	KPI	System Acceptance Test Measurement Requirement	Operations Measurement Period/Sample	Liquidated Damages*
Priority 1 issue is defined as any failure that will result in: loss of ability to create response plans; inability to accurately create response plans; inability to send response plans to requested agencies; inability to collect data that would result in missing data in the archived data. Maintenance response time shall be measured from the time when the VENDOR receives notification of the maintenance event or failure, and ending when the VENDOR staff acknowledge the notification of the problem or acknowledge the associated alarm or alert in the network monitoring system (NMS) application.	Maximum response time of 15 minutes during normal operating hours of 6 AM – 7PM on weekdays. Maximum response time of 1 hour outside of normal operating hours.	NMS application will be utilized to report all events for this category during the test time period.	All events submitted monthly. Liquidate damage (LD) applies to individual events.	For every hour over the KPI, the VENDOR shall be subject to liquidated damages of 1%, with a maximum of 6% per day of the monthly support payment.
Repair time shall be measured from the time when the VENDOR receives notification of the maintenance event or failure and ending when the failure condition is corrected and the system is returned to normal operation.	Maximum repair time of 1 hour during normal operating hours of 6 AM – 7PM on weekdays. Maximum repair time of 4 hours outside of normal operating hours.	NMS application will be utilized to report all events for this category during the test time period.	All events submitted Monthly. LD applies to individual events.	For every hour over the KPI, the VENDOR shall be subject to liquidated damages of 1%, with a maximum of 6% per day of the monthly support payment.

Measurement Method:
1. System acceptance testing can be used to verify successful resolution
2. System report to be provided by the VENDOR to indicate performance

Notes:
1. Provide a report and detail log of all Priority 1 events including:
   a. Loss of response plan generations is related to the loss of any system and/or hardware
   b. Exclusions include DEPARTMENT-directed postponements
   c. Report indicates Maintenance event, failure detection, notification time, and repair times for each event, and make clear those events that exceed the SLA
   d. Repair time is measured for each event
   e. Time duration between the event notification and repair for each ticket.
   f. Events will be tracked on an individual basis, and summarized by the VENDOR for monthly reporting
2. The report will indicate all repair times and those that exceed the SLA increments, examples below:
   a. Event notification and response and repair occurs during normal business hours and at 3 hrs. and 30 mins. after event notification.
      (i) SLA LD will be 3% for response, and
      (ii) SLA LD will be 2% for repair
      (iii) SLA LD will be 5% for both response and repair

3.6 Special Services

Upon mutual agreement between the DEPARTMENT and the VENDOR, the VENDOR may be required to perform work outside the milestone-based negotiated scope of the ICMS "Works for Hire" detailed in the above sections. This work will be related to the support, engineering, maintenance (including emergency maintenance), modifications, growth, and enhancement of ICMS-owned and operated by the DEPARTMENT or other authorized agencies. This work shall be considered Special Services and may include, but not be limited to, design, software development, infrastructure engineering, engineering analysis, recommendations and testing, fabrication, prototype programs, data collection activities, training, installation, reporting and documentation. Examples of future work items are, but not limited to:

1. DIs created for new agency partners not identified in original build of the ICMS

2. Database administration and maintenance

3. Software applications enhancements using SunGuide and/or interfacing with SunGuide

4. Web-based software applications

5. Customized queries and reports

6. System migration to future changes in hardware and operating systems

7. Configuration management

8. Documentation, user manuals, and training

9. Development of Incident Response Scenario Building

10. Other tasks and/or Special Services as assigned or requested by the Department's Contract Manager will be assigned by task work order

All task assignments not included in section 3.5 will be negotiated by hour classification units based on following job classification categories. All work products will fall under the same "Work for Hire" solely owned by the DEPARTMENT as outlined in Section 1.10. The below job classification hourly rate shall be negotiated during the Invitation to Negotiate selection process and the VENDOR will be required to fill our Exhibit C – Hourly Rate by Job Classification. If the VENDOR does not fill in Exhibit C, the VENDOR will be deemed non-compliant and be disqualified from the selection process.

Table 4: Labor Categories and Descriptions

Labor Category Name	Labor Category Description
Project Manager	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 5+ years of managing software development projects including projects greater than $2M in size.

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Labor Category Name	Labor Category Description
Senior Computer Programmer	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 10+ years of programming experience and experience in software development
Computer Programmer	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 5+ years of programming experience and experience in software development
Junior Computer Programmer	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 1+ years of programming experience and experience in software development
Senior Database Administrator	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 10+ years of database administration experience and experience in software development
Database Administrator	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 5+ years of database administration experience and experience in software development
Junior Database Administrator	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 1+ years of database administration experience and experience in software development
Senior Network Architect	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 10+ years of network architecture experience and experience in software development
Network Architect	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 5+ years of network architecture experience and experience in software development
Junior Network Architect	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 1+ years of network architecture experience and experience in software development
Senior Web Developer	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 10+ years of web developer experience and experience in software development

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Labor Category Name	Labor Category Description
Web Developer	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 5+ years of web developer experience and experience in software development
Junior Web Developer	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 1+ years of web developer experience and experience in software development
Quality Assurance / Quality Control Manager	Computer Engineering, Electrical Engineering, or Computer Science Bachelor's degree with 5+ years of experience.

4 VENDOR Performance

In the event the VENDOR fails to achieve project milestones and schedule according to the method of compensation, the VENDOR shall make payment adjustments to the DEPARTMENT in the form of a reduction of the amount billed the DEPARTMENT in the next invoice. The reduction amount will be $2,000 per day. LDs for different tasks are not to be additive if multiple tasks are behind schedule simultaneously.

The VENDOR shall make payment adjustments for each missed support call response or repair deadline as defined in section 3.5.7.1 and below. This reduction is considered liquidated damages and may not be recovered as retainage.

In the event the VENDOR causes harm to the DEPARTMENT or other DEPARTMENT systems, the VENDOR shall provide liquidated damages to the DEPARTMENT commensurate with the impact to the DEPARTMENT for restitution of the damage.

Table 5: Service Level Key Performance Indicators and Liquidated Damages

Service Level KPIs	Definition	KPI	Liquidated Damages*
Availability of Applications, including; DSS, IEN, DFE	An application will be considered unavailable if it is not functioning to a reasonable level of usability and ability to accomplish the ICMS operations described in section 1.6.	Maximum of 1% of downtime each month after deployment	For every hour over the KPI, the VENDOR shall be subject to liquidated damages of 1%, with a maximum of 6% per day of the monthly support payment.

	Measurement method: (Host Hardware and Applications)
	Host Availability (specific to each Host Hardware and Application) % = 1 – (total Host Hardware/Application downtime / (Expected time of operations – exclusions])
	1. SAT and Operations methods to be the same
	2. System report to be provided by the VENDOR to indicate performance
	Notes:
	1. Exclusions include all time when the system is not operating during preventative maintenance activities pre-approved by the DEPARTMENT, or due to damage beyond the VENDOR's control
	2. DSS measurement excludes the PRE, and the EVE when the PRE is unavailable.
	3. DFE measurement is related to entire system excluding components/software included
	4. This addresses software applications that fail and are not available
	5. Interfaces are included based in VENDOR interface availability only
	6. SLA applies to each application independently, and excludes hardware availability
	7. Need to identify the processes and hardware that impact the Host Hardware and Application and make sure failure of each will create an alarm message via automated Solar Winds monitoring with supporting system-generated availability reports being provided to the VENDOR
	8. Identify if there are failures that cannot be identified through software failures alone
	9. Identify the problems (such as external interfaces) where the VENDOR is not responsible; such alarms should be identified with explanation
	10. SLA damages example: for a month (24hr x 30 days' x (100%-99%) = 8.2 hours of allowable down time, so for downtime in excess of SLA, LD are being calculated as:
	    a. From 8.2 hr. to 9.2 hr. is 2% of monthly maintenance fee; and
	    b. From 9.2 hr. to 10.2 hr. is 3% of monthly maintenance fee.		

Service Level KPIs	Definition	KPI	Liquidated Damages*

TC1
System Response Plan Creation and Dissemination Performance
	For traffic conditions that might cause a response plan activation, the following simplified flow occurs:
	  a) ERE rule triggers, ERE selects response plan set
	  b) ERE sends response plan set to PRE
	  c) PRE sends modelling task to the modelling software
	  d) Modelling software sends results back to the ICMS
	  e) PRE evaluates results, calculates MOEs, and sends results to DFE
	  f) IEN displays results of simulation to ICM manager
	  g) ICM manager selects plan
	  h) IEN sends plan to affected agencies for approval
	  i) Last approval received
	  j) GO issued by ICM manager
	  k) IEN sends implementation to SunGuide
	Delay is computed by summing the delays a to b, b to c, d to e, e to f, j to k.
	
	For those steps that require connection to external systems (e.g. SunGuide, SMTP server, modeling engine), the step is considered complete when the attempted connection is initiated.
		Minor: 2 minutes,
		Moderate: 4 minutes, and
		Major: 6 minutes
			For every day that contains one or more occurrences of the ICMS exceeding the minor, moderate, or major KPIs, the VENDOR shall be subject to liquidated damages of 1%, 2%, or 3%, respectively, of the monthly support payment.

5 Contract Deliverable Requirements List

Provide a tabular list of all documents that are required. Provide a unique numerical identification code for each deliverable for tracking purposes. It is suggested that a draft and final be indicated by a decimal value, for example, a preliminary draft work plan might initially be version 0.1, a subsequent draft might be identified as version 0.2 and the final document accepted by the DEPARTMENT would then be identified as version 1.0.

Table 6: Contract Deliverable Requirements List

Task	Scope Reference	Deliverable Number	Title	Due Date
1	3.5.1.2.2	ICMS-PRR	Project Risk Register	30 days after NTP
1	3.5.1.2.4	ICMS-SCHED	Project Schedule	30 days after NTP
1	3.5.1.2	ICMS-PSEMP	Project Systems Engineering Management Plan	30 days after NTP
1	3.5.1.2.5	ICMS-Report-MMYY	Monthly Progress Reports	Monthly on 5th of each month for the previous month
1	3.5.1.2.6	ICMS-MTG-AGENDA-<topic>-<YYYY-MM-DD>	Meeting Agendas	5 business days prior to all meetings
1	3.5.1.2.6	ICMS-MTG-NOTES-<topic>-<YYYY-MM-DD>	Meeting Minutes	5 business days after all meetings
2	3.5.2.2	ICMS-PD	Preliminary Design	90 days after NTP
2	3.5.2.1	ICMS-REQ	System Requirements Specification	60 days after NTP
2	3.5.2.3	ICMS-CD	Critical Design	180 days after NTP
2	3.5.2.4	ICMS-CG	Software Coding Guidelines	90 days after NTP
2	3.5.2.5	ICMS-SD	System Design Document	180 days after NTP
3	3.5.3	ICMS-MDP	Model Development Plan	TBD by Work Plan
4	3.5.4	ICMS-SDP	Software Development Plan	TBD by Work Plan
4	3.5.4	ICMS-VDD	Version Description Document	TBD by Work Plan

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Task	Scope Reference	Deliverable Number	Title	Due Date
4	3.5.4.1.1	ICMS-DFE	Data Fusion Environment	TBD by Work Plan
4	3.5.4.1.2	ICMS-IEN	Information Exchange Network Software	TBD by Work Plan
4	3.5.4.1.3	ICMS-ERE	ERE Software	TBD by Work Plan
4	3.5.4.5	ICMS-STP	System Test Plan	TBD by Work Plan
4	3.5.4.6	ICMS-TP	Test Procedures	TBD by Work Plan
4	3.5.4.8	ICMS-CAP	Corrective Action Plan	TBD by Work Plan
4	3.5.4.9	ICMS-TR	Test Report Document	TBD by Work Plan
5	3.5.5	ICMS-DP	Deployment Plan	TBD by Work Plan
6	3.5.7	n/a	Plan of Resolution for hardware failure	TBD by Work Plan
6	3.5.7	n/a	Schedule of Staff	TBD by Work Plan
6	3.5.7	n/a	Web-based Issue Tracking Tool	TBD by Work Plan
6	3.5.6.1	ICMS-TRP	Training Plan	TBD by Work Plan
6	3.5.6.2	ICMS-TRS	Training Schedule	TBD by Work Plan
6	3.5.6.3	ICMS-TRM	Training Manuals	TBD by Work Plan
6	3.5.6.4	ICMS-TRW	Training Workshop	TBD by Work Plan

STANDARD CONTRACT TERMS AND CONDITIONS

The following form PUR 1000 is a standard contract terms form that the Department includes in all procurements, except that paragraphs 5, 11, 19, 20, 22, 23, 25, 26, 27, 29, 31, 35, 40, 41, and 42 do not apply to this Request for Proposal. Deletion of these paragraphs shall not be deemed to be deletion of content contained elsewhere and the substance of these excepted paragraphs may be addressed in other locations in the procurement documents. That substance located elsewhere continues to apply regardless of this exception paragraph.

State of Florida
PUR 1000

Contents

1. Definitions. The definitions contained in s. 60A-1.001, F.A.C. shall apply to this agreement. The following additional terms are also defined:

(a) "Contract" means the legally enforceable agreement that results from a successful solicitation. The parties to the Contract will be the Customer and Contractor.

(b) "Customer" means the State agency or other entity identified in a contract as the party to receive commodities or contractual services pursuant to a contract or that orders commodities or contractual services via purchase order or other contractual instrument from the Contractor under the Contract. The "Customer" may also be the "Buyer" as defined in the PUR 1001 if it meets the definition of both terms.

(c) "Product" means any deliverable under the Contract, which may include commodities, services, technology or software.

(d) "Purchase order" means the form or format a Customer uses to make a purchase under the Contract (e.g., a formal written purchase order, electronic purchase order, procurement card, contract or other authorized means).

2. Purchase Orders. In contracts where commodities or services are ordered by the Customer via purchase order, Contractor shall not deliver or furnish products until a Customer transmits a purchase order. All purchase orders shall bear the Contract or solicitation number, shall be placed by the Customer directly with the Contractor, and shall be deemed to incorporate by reference the Contract and solicitation terms and conditions. Any discrepancy between the Contract terms and the terms stated on the Contractor's order form, confirmation, or acknowledgement shall be resolved in favor of terms most favorable to the Customer. A purchase order for services within the ambit of section 287.058(1) of the Florida Statutes shall be deemed to incorporate by reference the requirements of subparagraphs (a) through (f) thereof. Customers shall designate a contract manager and a contract administrator as required by subsections 287.057(14) and (15) of the Florida Statutes.

3. Product Version. Purchase orders shall be deemed to reference a manufacturer's most recently release model or version of the product at the time of the order, unless the Customer specifically requests in writing an earlier model or version and the contractor is willing to provide such model or version.

4. Price Changes Applicable only to Term Contracts. If this is a term contract for commodities or services, the following provisions apply.

(a) Quantity Discounts. Contractors are urged to offer additional discounts for one time delivery of large single orders. Customers should seek to negotiate additional price concessions on quantity purchases of any products offered under the Contract. State Customers shall document their files accordingly.

(b) Best Pricing Offer. During the Contract term, if the Customer becomes aware of better pricing offered by the Contractor for substantially the same or a smaller quantity of a product outside the Contract, but upon the same or similar terms of the Contract, then at the discretion of the Customer the price under the Contract shall be immediately reduced to the lower price.

(c) Sales Promotions. In addition to decreasing prices for the balance of the Contract term due to a change in market conditions, a Contractor may conduct sales promotions involving price reductions for a specified lesser period. A Contractor shall submit to the Contract Specialist documentation identifying the proposed (1) starting and ending dates of the promotion, (2) products involved, and (3) promotional prices compared to then-authorized prices. Promotional

prices shall be available to all Customers. Upon approval, the Contractor shall provide conspicuous notice of the promotion.

(d) <u>Trade-In.</u> Customers may trade-in equipment when making purchases from the Contract. A trade-in shall be negotiated between the Customer and the Contractor. Customers are obligated to actively seek current fair market value when trading equipment, and to keep accurate records of the process. For State agencies, it may be necessary to provide documentation to the Department of Financial Services and to the agency property custodian pursuant to Chapter 273, F.S.

(e) <u>Equitable Adjustment.</u> The Customer may, in its sole discretion, make an equitable adjustment in the Contract terms or pricing if pricing or availability of supply is affected by extreme and unforeseen volatility in the marketplace, that is, by circumstances that satisfy all the following criteria: (1) the volatility is due to causes wholly beyond the Contractor's control, (2) the volatility affects the marketplace or industry, not just the particular Contract source of supply, (3) the effect on pricing or availability of supply is substantial, and (4) the volatility so affects the Contractor that continued performance of the Contract would result in a substantial loss.

5. Additional Quantities. ~~For a period not exceeding ninety (90) days from the date of solicitation award, the Customer reserves the right to acquire additional quantities up to the amount shown on the solicitation but not to exceed the threshold for Category Two at the prices submitted in the response to the solicitation.~~

6. Packaging. Tangible product shall be securely and properly packed for shipment, storage, and stocking in appropriate, clearly labeled, shipping containers and according to accepted commercial practice, without extra charge for packing materials, cases, or other types of containers. All containers and packaging shall become and remain Customer's property.

7. Inspection at Contractor's Site. The Customer reserves the right to inspect, at any reasonable time with prior notice, the equipment or product or plant or other facilities of a Contractor to assess conformity with Contract requirements and to determine whether they are adequate and suitable for proper and effective Contract performance.

8. Safety Standards. All manufactured items and fabricated assemblies subject to operation under pressure, operation by connection to an electric source, or operation involving connection to a manufactured, natural, or LP gas source shall be constructed and approved in a manner acceptable to the appropriate State inspector. Acceptability customarily requires, at a minimum, identification marking of the appropriate safety standard organization, where such approvals of listings have been established for the type of device offered and furnished, for example: the American Society of Mechanical Engineers for pressure vessels; the Underwriters Laboratories and/or National Electrical Manufacturers' Association for electrically operated assemblies; and the American Gas Association for gas-operated assemblies. In addition, all items furnished shall meet all applicable requirements of the Occupational Safety and Health Act and state and federal requirements relating to clean air and water pollution.

9. Americans with Disabilities Act. Contractors should identify any products that may be used or adapted for use by visually, hearing, or other physically impaired individuals.

10. Literature. Upon request, the Contractor shall furnish literature reasonably related to the product offered, for example, user manuals, price schedules, catalogs, descriptive brochures, etc.

11. Transportation and Delivery. ~~Prices shall include all charges for packing, handling, freight, distribution, and inside delivery. Transportation of goods shall be FOB Destination to any point within thirty (30) days after the Customer places an Order. A Contractor, within five (5) days after receiving a purchase order, shall notify the Customer of any potential delivery delays. Evidence of inability or intentional delays shall be cause for Contract cancellation and Contractor~~

~~suspension.~~

12. Installation. Where installation is required, Contractor shall be responsible for placing and installing the product in the required locations at no additional charge, unless otherwise designated on the Contract or purchase order. Contractor's authorized product and price list shall clearly and separately identify any additional installation charges. All materials used in the installation shall be of good quality and shall be free of defects that would diminish the appearance of the product or render it structurally or operationally unsound. Installation includes the furnishing of any equipment, rigging, and materials required to install or replace the product in the proper location. Contractor shall protect the site from damage and shall repair damages or injury caused during installation by Contractor or its employees or agents. If any alteration, dismantling, excavation, etc., is required to achieve installation, the Contractor shall promptly restore the structure or site to its original condition. Contractor shall perform installation work so as to cause the least inconvenience and interference with Customers and with proper consideration of others on site. Upon completion of the installation, the location and surrounding area of work shall be left clean and in a neat and unobstructed condition, with everything in satisfactory repair and order.

13. Risk of Loss. Matters of inspection and acceptance are addressed in s. 215.422, F.S. Until acceptance, risk of loss or damage shall remain with the Contractor. The Contractor shall be responsible for filing, processing, and collecting all damage claims. To assist the Contractor with damage claims, the Customer shall: record any evidence of visible damage on all copies of the delivering carrier's Bill of Lading; report damages to the carrier and the Contractor; and provide the Contractor with a copy of the carrier's Bill of Lading and damage inspection report. When a Customer rejects a product, Contractor shall remove it from the premises within ten days after notification or rejection. Upon rejection notification, the risk of loss of rejected or non-conforming product shall remain with the Contractor. Rejected product not removed by the Contractor within ten days shall be deemed abandoned by the Contractor, and the Customer shall have the right to dispose of it as its own property. Contractor shall reimburse the Customer for costs and expenses incurred in storing or effecting removal or disposition of rejected product.

14. Transaction Fee. The State of Florida has instituted MyFloridaMarketPlace, a statewide eProcurement System ("System"). Pursuant to section 287.057(22), Florida Statutes, all payments shall be assessed a Transaction Fee of one percent (1.0%), which the Contractor shall pay to the State, unless exempt pursuant to 60A-1.032, F.A.C.

For payments within the State accounting system (FLAIR or its successor), the Transaction Fee shall, when possible, be automatically deducted from payments to the Contractor. If automatic deduction is not possible, the Contractor shall pay the Transaction Fee pursuant to Rule 60A-1.031(2), F.A.C. By submission of these reports and corresponding payments, Contractor certifies their correctness. All such reports and payments shall be subject to audit by the State or its designee.

Contractor shall receive a credit for any Transaction Fee paid by the Contractor for the purchase of any item(s) if such item(s) are returned to the Contractor through no fault, act, or omission of the Contractor. Notwithstanding the foregoing, a Transaction Fee is non-refundable when an item is rejected or returned, or declined, due to the Contractor's failure to perform or comply with specifications or requirements of the agreement.
Failure to comply with these requirements shall constitute grounds for declaring the Contractor in default and recovering reprocurement costs from the Contractor in addition to all outstanding fees.
CONTRACTORS DELINQUENT IN PAYING TRANSACTION FEES MAY BE SUBJECT TO BEING REMOVED FROM THE DEPARTMENT OF MANAGEMENT SERVICES' VENDOR LIST AS PROVIDED IN RULE 60A-1.006, F.A.C.

15. Invoicing and Payment. Invoices shall contain the Contract number, purchase order number if applicable, and the appropriate vendor identification number. The State may require any other information from the Contractor that the State deems necessary to verify any purchase order placed under the Contract.

At the State's option, Contractors may be required to invoice electronically pursuant to guidelines of the Department of Management Services. Current guidelines require that Contractor supply electronic invoices in lieu of paper-based invoices for those transactions processed through the system. Electronic invoices shall be submitted to the Customer through the Ariba Supplier Network (ASN) in one of the following mechanisms – EDI 810, cXML, or web-based invoice entry within the ASN.

Payment shall be made in accordance with sections 215.422 and 287.0585 of the Florida Statutes, which govern time limits for payment of invoices. Invoices that must be returned to a Contractor due to preparation errors will result in a delay in payment. The Customer is responsible for all payments under the Contract. A Customer's failure to pay, or delay in payment, shall not constitute a breach of the Contract and shall not relieve the Contractor of its obligations to the Department or to other Customers. A vendor ombudsman has been established within the Department of Financial Services. The duties of this individual include acting as an advocate for vendors who may be experiencing problems in obtaining timely payment(s) from a state agency. The Vendor Ombudsman may be contacted at (850) 413-5516 or by calling the Division of Consumer Services at 1-877-693-5236.

16. Taxes. The State does not pay Federal excise or sales taxes on direct purchases of tangible personal property. The State will not pay for any personal property taxes levied on the Contractor or for any taxes levied on employees' wages. Any exceptions to this paragraph shall be explicitly noted by the Customer in the special contract conditions section of the solicitation or in the Contract or purchase order.

17. Governmental Restrictions. If the Contractor believes that any governmental restrictions have been imposed that require alteration of the material, quality, workmanship or performance of the products offered under the Contract, the Contractor shall immediately notify the Customer in writing, indicating the specific restriction. The Customer reserves the right and the complete discretion to accept any such alteration or to cancel the Contract at no further expense to the Customer.

18. Lobbying and Integrity. Customers shall ensure compliance with Section 11.062, FS and Section 216.347, FS.The Contractor shall not, in connection with this or any other agreement with the State, directly or indirectly (1) offer, confer, or agree to confer any pecuniary benefit on anyone as consideration for any State officer or employee's decision, opinion, recommendation, vote, other exercise of discretion, or violation of a known legal duty, or (2) offer, give, or agree to give to anyone any gratuity for the benefit of, or at the direction or request of, any State officer or employee. For purposes of clause (2), "gratuity" means any payment of more than nominal monetary value in the form of cash, travel, entertainment, gifts, meals, lodging, loans, subscriptions, advances, deposits of money, services, employment, or contracts of any kind. Upon request of the Customer's Inspector General, or other authorized State official, the Contractor shall provide any type of information the Inspector General deems relevant to the Contractor's integrity or responsibility. Such information may include, but shall not be limited to, the Contractor's business or financial records, documents, or files of any type or form that refer to or relate to the Contract. The Contractor shall retain such records for the longer of (1) three years after the expiration of the Contract or (2) the period required by the General Records Schedules maintained by the Florida Department of State (available at: http://dlis.dos.state.fl.us/barm/genschedules/gensched.htm). The Contractor agrees to reimburse the State for the reasonable costs of investigation incurred by the Inspector General or other authorized State official for investigations of the Contractor's compliance with the terms of this or any other agreement between the Contractor and the State which results in the suspension or debarment of the Contractor. Such costs shall include, but shall not be limited to: salaries of investigators, including overtime; travel and lodging expenses; and expert witness and documentary fees. The Contractor shall not be responsible for any costs of investigations that do not result in the Contractor's suspension or debarment.

~~**19. Indemnification.** The Contractor shall be fully liable for the actions of its agents, employees,~~

partners, or subcontractors and shall fully indemnify, defend, and hold harmless the State and Customers, and their officers, agents, and employees, from suits, actions, damages, and costs of every name and description, including attorneys' fees, arising from or relating to personal injury and damage to real or personal tangible property alleged to be caused in whole or in part by Contractor, its agents, employees, partners, or subcontractors, provided, however, that the Contractor shall not indemnify for that portion of any loss or damages proximately caused by the negligent act or omission of the State or a Customer.

Further, the Contractor shall fully indemnify, defend, and hold harmless the State and Customers from any suits, actions, damages, and costs of every name and description, including attorneys' fees, arising from or relating to violation or infringement of a trademark, copyright, patent, trade secret or intellectual property right, provided, however, that the foregoing obligation shall not apply to a Customer's misuse or modification of Contractor's products or a Customer's operation or use of Contractor's products in a manner not contemplated by the Contract or the purchase order. If any product is the subject of an infringement suit, or in the Contractor's opinion is likely to become the subject of such a suit, the Contractor may at its sole expense procure for the Customer the right to continue using the product or to modify it to become non-infringing. If the Contractor is not reasonably able to modify or otherwise secure the Customer the right to continue using the product, the Contractor shall remove the product and refund the Customer the amounts paid in excess of a reasonable rental for past use. The customer shall not be liable for any royalties.

The Contractor's obligations under the preceding two paragraphs with respect to any legal action are contingent upon the State or Customer giving the Contractor (1) written notice of any action or threatened action, (2) the opportunity to take over and settle or defend any such action at Contractor's sole expense, and (3) assistance in defending the action at Contractor's sole expense. The Contractor shall not be liable for any cost, expense, or compromise incurred or made by the State or Customer in any legal action without the Contractor's prior written consent, which shall not be unreasonably withheld.

20. Limitation of Liability. For all claims against the Contractor under any contract or purchase order, and regardless of the basis on which the claim is made, the Contractor's liability under a contract or purchase order for direct damages shall be limited to the greater of $100,000, the dollar amount of the contract or purchase order, or two times the charges rendered by the Contractor under the purchase order. This limitation shall not apply to claims arising under the Indemnity paragraph contain in this agreement.

Unless otherwise specifically enumerated in the Contract or in the purchase order, no party shall be liable to another for special, indirect, punitive, or consequential damages, including lost data or records (unless the contract or purchase order requires the Contractor to back-up data or records), even if the party has been advised that such damages are possible. No party shall be liable for lost profits, lost revenue, or lost institutional operating savings. The State and Customer may, in addition to other remedies available to them at law or equity and upon notice to the Contractor, retain such monies from amounts due Contractor as may be necessary to satisfy any claim for damages, penalties, costs and the like asserted by or against them. The State may set off any liability or other obligation of the Contractor or its affiliates to the State against any payments due the Contractor under any contract with the State.

21. Suspension of Work. The Customer may in its sole discretion suspend any or all activities under the Contract or purchase order, at any time, when in the best interests of the State to do so. The Customer shall provide the Contractor written notice outlining the particulars of suspension. Examples of the reason for suspension include, but are not limited to, budgetary constraints, declaration of emergency, or other such circumstances. After receiving a suspension notice, the Contractor shall comply with the notice and shall not accept any purchase orders. Within ninety days, or any longer period agreed to by the Contractor, the Customer shall either (1) issue a notice authorizing resumption of work, at which time activity shall resume, or (2) terminate the Contract or purchase order. Suspension of work shall not entitle the Contractor to

any additional compensation.

22. Termination for Convenience. ~~The Customer, by written notice to the Contractor, may terminate the Contract in whole or in part when the Customer determines in its sole discretion that it is in the State's interest to do so. The Contractor shall not furnish any product after it receives the notice of termination, except as necessary to complete the continued portion of the Contract, if any. The Contractor shall not be entitled to recover any cancellation charges or lost profits.~~

23. Termination for Cause. ~~The Customer may terminate the Contract if the Contractor fails to (1) deliver the product within the time specified in the Contract or any extension, (2) maintain adequate progress, thus endangering performance of the Contract, (3) honor any term of the Contract, or (4) abide by any statutory, regulatory, or licensing requirement. Rule 60A-1.006(3), F.A.C., governs the procedure and consequences of default. The Contractor shall continue work on any work not terminated. Except for defaults of subcontractors at any tier, the Contractor shall not be liable for any excess costs if the failure to perform the Contract arises from events completely beyond the control, and without the fault or negligence, of the Contractor. If the failure to perform is caused by the default of a subcontractor at any tier, and if the cause of the default is completely beyond the control of both the Contractor and the subcontractor, and without the fault or negligence of either, the Contractor shall not be liable for any excess costs for failure to perform, unless the subcontracted products were obtainable from other sources in sufficient time for the Contractor to meet the required delivery schedule. If, after termination, it is determined that the Contractor was not in default, or that the default was excusable, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the Customer. The rights and remedies of the Customer in this clause are in addition to any other rights and remedies provided by law or under the Contract.~~

24. Force Majeure, Notice of Delay, and No Damages for Delay. The Contractor shall not be responsible for delay resulting from its failure to perform if neither the fault nor the negligence of the Contractor or its employees or agents contributed to the delay and the delay is due directly to acts of God, wars, acts of public enemies, strikes, fires, floods, or other similar cause wholly beyond the Contractor's control, or for any of the foregoing that affect subcontractors or suppliers if no alternate source of supply is available to the Contractor. In case of any delay the Contractor believes is excusable, the Contractor shall notify the Customer in writing of the delay or potential delay and describe the cause of the delay either (1) within ten (10) days after the cause that creates or will create the delay first arose, if the Contractor could reasonably foresee that a delay could occur as a result, or (2) if delay is not reasonably foreseeable, within five (5) days after the date the Contractor first had reason to believe that a delay could result. **THE FOREGOING SHALL CONSTITUTE THE CONTRACTOR'S SOLE REMEDY OR EXCUSE WITH RESPECT TO DELAY.** Providing notice in strict accordance with this paragraph is a condition precedent to such remedy. No claim for damages, other than for an extension of time, shall be asserted against the Customer. The Contractor shall not be entitled to an increase in the Contract price or payment of any kind from the Customer for direct, indirect, consequential, impact or other costs, expenses or damages, including but not limited to costs of acceleration or inefficiency, arising because of delay, disruption, interference, or hindrance from any cause whatsoever. If performance is suspended or delayed, in whole or in part, due to any of the causes described in this paragraph, after the causes have ceased to exist the Contractor shall perform at no increased cost, unless the Customer determines, in its sole discretion, that the delay will significantly impair the value of the Contract to the State or to Customers, in which case the Customer may (1) accept allocated performance or deliveries from the Contractor, provided that the Contractor grants preferential treatment to Customers with respect to products subjected to allocation, or (2) purchase from other sources (without recourse to and by the Contractor for the related costs and expenses) to replace all or part of the products that are the subject of the delay, which purchases may be deducted from the Contract quantity, or (3) terminate the Contract in whole or in part.

25. Changes. ~~The Customer may unilaterally require, by written order, changes altering, adding to, or deducting from the Contract specifications, provided that such changes are within the~~

general scope of the Contract. The Customer may make an equitable adjustment in the Contract price or delivery date if the change affects the cost or time of performance. Such equitable adjustments require the written consent of the Contractor, which shall not be unreasonably withheld. If unusual quantity requirements arise, the Customer may solicit separate bids to satisfy them.

26. Renewal. Upon mutual agreement, the Customer and the Contractor may renew the Contract, in whole or in part, for a period that may not exceed 3 years or the term of the contract, whichever period is longer. Any renewal shall specify the renewal price, as set forth in the solicitation response. The renewal must be in writing and signed by both parties, and is contingent upon satisfactory performance evaluations and subject to availability of funds.

27. Purchase Order Duration. Purchase orders issued pursuant to a state term or agency contract must be received by the Contractor no later than close of business on the last day of the contract's term to be considered timely. The Contractor is obliged to fill those orders in accordance with the contract's terms and conditions. Purchase orders received by the contractor after close of business on the last day of the state term or agency contract's term shall be considered void.

Purchase orders for a one-time delivery of commodities or performance of contractual services shall be valid through the performance by the Contractor, and all terms and conditions of the state term or agency contract shall apply to the single delivery/performance, and shall survive the termination of the Contract.

Contractors are required to accept purchase orders specifying delivery schedules exceeding the contracted schedule even when such extended delivery will occur after expiration of the state term or agency contract. For example, if a state term contract calls for delivery 30 days after receipt of order (ARO), and an order specifies delivery will occur both in excess of 30 days ARO and after expiration of the state term contract, the Contractor will accept the order. However, if the Contractor expressly and in writing notifies the ordering office within ten (10) calendar days of receipt of the purchase order that Contractor will not accept the extended delivery terms beyond the expiration of the state term contract, then the purchase order will either be amended in writing by the ordering entity within ten (10) calendar days of receipt of the contractor's notice to reflect the state term contract delivery schedule, or it shall be considered withdrawn.

The duration of purchase orders for recurring deliveries of commodities or performance of services shall not exceed the expiration of the state term or agency contract by more than twelve months. However, if an extended pricing plan offered in the state term or agency contract is selected by the ordering entity, the contract terms on pricing plans and renewals shall govern the maximum duration of purchase orders reflecting such pricing plans and renewals.

Timely purchase orders shall be valid through their specified term and performance by the Contractor, and all terms and conditions of the state term or agency contract shall apply to the recurring delivery/performance as provided herein, and shall survive the termination of the Contract.

Ordering offices shall not renew a purchase order issued pursuant to a state term or agency contract if the underlying contract expires prior to the effective date of the renewal.

28. Advertising. Subject to Chapter 119, Florida Statutes, the Contractor shall not publicly disseminate any information concerning the Contract without prior written approval from the Customer, including, but not limited to mentioning the Contract in a press release or other promotional material, identifying the Customer or the State as a reference, or otherwise linking the Contractor's name and either a description of the Contract or the name of the State or the Customer in any material published, either in print or electronically, to any entity that is not a party to Contract, except potential or actual authorized distributors, dealers, resellers, or service

representative.

29. Assignment. ~~The Contractor shall not sell, assign or transfer any of its rights, duties or obligations under the Contract, or under any purchase order issued pursuant to the Contract, without the prior written consent of the Customer. In the event of any assignment, the Contractor remains secondarily liable for performance of the contract, unless the Customer expressly waives such secondary liability. The Customer may assign the Contract with prior written notice to Contractor of its intent to do so.~~

30. Antitrust Assignment. The Contractor and the State of Florida recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by the State of Florida. Therefore, the contractor hereby assigns to the State of Florida any and all claims for such overcharges as to goods, materials or services purchased in connection with the Contract.

31. Dispute Resolution. ~~Any dispute concerning performance of the Contract shall be decided by the Customer's designated contract manager, who shall reduce the decision to writing and serve a copy on the Contractor. The decision shall be final and conclusive unless within twenty one (21) days from the date of receipt, the Contractor files with the Customer a petition for administrative hearing. The Customer's decision on the petition shall be final, subject to the Contractor's right to review pursuant to Chapter 120 of the Florida Statutes. Exhaustion of administrative remedies is an absolute condition precedent to the Contractor's ability to pursue any other form of dispute resolution; provided, however, that the parties may employ the alternative dispute resolution procedures outlined in Chapter 120.~~

~~Without limiting the foregoing, the exclusive venue of any legal or equitable action that arises out of or relates to the Contract shall be the appropriate state court in Leon County, Florida; in any such action, Florida law shall apply and the parties waive any right to jury trial.~~

32. Employees, Subcontractors, and Agents. All Contractor employees, subcontractors, or agents performing work under the Contract shall be properly trained technicians who meet or exceed any specified training qualifications. Upon request, Contractor shall furnish a copy of technical certification or other proof of qualification. All employees, subcontractors, or agents performing work under the Contract must comply with all security and administrative requirements of the Customer and shall comply with all controlling laws and regulations relevant to the services they are providing under the Contract. The State may conduct, and the Contractor shall cooperate in, a security background check or otherwise assess any employee, subcontractor, or agent furnished by the Contractor. The State may refuse access to, or require replacement of, any personnel for cause, including, but not limited to, technical or training qualifications, quality of work, change in security status, or non-compliance with a Customer's security or other requirements. Such approval shall not relieve the Contractor of its obligation to perform all work in compliance with the Contract. The State may reject and bar from any facility for cause any of the Contractor's employees, subcontractors, or agents.

33. Security and Confidentiality. The Contractor shall comply fully with all security procedures of the United States, State of Florida and Customer in performance of the Contract. The Contractor shall not divulge to third parties any confidential information obtained by the Contractor or its agents, distributors, resellers, subcontractors, officers or employees in the course of performing Contract work, including, but not limited to, security procedures, business operations information, or commercial proprietary information in the possession of the State or Customer. The Contractor shall not be required to keep confidential information or material that is publicly available through no fault of the Contractor, material that the Contractor developed independently without relying on the State's or Customer's confidential information, or material that is otherwise obtainable under State law as a public record. To insure confidentiality, the Contractor shall take appropriate steps as to its personnel, agents, and subcontractors. The warranties of this paragraph shall survive the Contract.

34. Contractor Employees, Subcontractors, and Other Agents. The Customer and the State shall take all actions necessary to ensure that Contractor's employees, subcontractors and other agents are not employees of the State of Florida. Such actions include, but are not limited to, ensuring that Contractor's employees, subcontractors, and other agents receive benefits and necessary insurance (health, workers' compensations, and unemployment) from an employer other than the State of Florida.

35. Insurance Requirements. ~~During the Contract term, the Contractor at its sole expense shall provide commercial insurance of such a type and with such terms and limits as may be reasonably associated with the Contract. Providing and maintaining adequate insurance coverage is a material obligation of the Contractor. Upon request, the Contractor shall provide certificate of insurance. The limits of coverage under each policy maintained by the Contractor shall not be interpreted as limiting the Contractor's liability and obligations under the Contract. All insurance policies shall be through insurers authorized or eligible to write policies in Florida.~~

36. Warranty of Authority. Each person signing the Contract warrants that he or she is duly authorized to do so and to bind the respective party to the Contract.

37. Warranty of Ability to Perform. The Contractor warrants that, to the best of its knowledge, there is no pending or threatened action, proceeding, or investigation, or any other legal or financial condition, that would in any way prohibit, restrain, or diminish the Contractor's ability to satisfy its Contract obligations. The Contractor warrants that neither it nor any affiliate is currently on the convicted vendor list maintained pursuant to section 287.133 of the Florida Statutes, or on any similar list maintained by any other state or the federal government. The Contractor shall immediately notify the Customer in writing if its ability to perform is compromised in any manner during the term of the Contract.

38. Notices. All notices required under the Contract shall be delivered by certified mail, return receipt requested, by reputable air courier service, or by personal delivery to the agency designee identified in the original solicitation, or as otherwise identified by the Customer. Notices to the Contractor shall be delivered to the person who signs the Contract. Either designated recipient may notify the other, in writing, if someone else is designated to receive notice.

39. Leases and Installment Purchases. Prior approval of the Chief Financial Officer (as defined in Section 17.001, F.S.) is required for State agencies to enter into or to extend any lease or installment-purchase agreement in excess of the Category Two amount established by section 287.017 of the Florida Statutes.

40. Prison Rehabilitative Industries and Diversified Enterprises, Inc. (PRIDE). ~~Section 946.515(2), F.S. requires the following statement to be included in the solicitation: "It is expressly understood and agreed that any articles which are the subject of, or required to carry out, the Contract shall be purchased from the corporation identified under Chapter 946 of the Florida Statutes (PRIDE) in the same manner and under the same procedures set forth in section 946.515(2) and (4) of the Florida Statutes; and for purposes of the Contract the person, firm, or other business entity carrying out the provisions of the Contract shall be deemed to be substituted for the agency insofar as dealings with such corporation are concerned." Additional information about PRIDE and the products it offers is available at http://www.pridefl.com.~~

41. Products Available from the Blind or Other Handicapped. ~~Section 413.036(3), F.S. requires the following statement to be included in the solicitation: "It is expressly understood and agreed that any articles that are the subject of, or required to carry out, this contract shall be purchased from a nonprofit agency for the Blind or for the Severely Handicapped that is qualified pursuant to Chapter 413, Florida Statutes, in the same manner and under the same procedures set forth in section 413.036(1) and (2), Florida Statutes; and for purposes of this contract the person, firm, or other business entity carrying out the provisions of this contract shall be deemed~~

~~to be substituted for the State agency insofar as dealings with such qualified nonprofit agency are concerned." Additional information about the designated nonprofit agency and the products it offers is available at~~ http://www.respectofflorida.org~~.~~

~~**42. Modification of Terms.** The Contract contains all the terms and conditions agreed upon by the parties, which terms and conditions shall govern all transactions between the Customer and the Contractor. The Contract may only be modified or amended upon mutual written agreement of the Customer and the Contractor. No oral agreements or representations shall be valid or binding upon the Customer or the Contractor. No alteration or modification of the Contract terms, including substitution of product, shall be valid or binding against the Customer. The Contractor may not unilaterally modify the terms of the Contract by affixing additional terms to product upon delivery (e.g., attachment or inclusion of standard preprinted forms, product literature, "shrink wrap" terms accompanying or affixed to a product, whether written or electronic) or by incorporating such terms onto the Contractor's order or fiscal forms or other documents forwarded by the Contractor for payment. The Customer's acceptance of product or processing of documentation on forms furnished by the Contractor for approval or payment shall not constitute acceptance of the proposed modification to terms and conditions.~~

43. Cooperative Purchasing. Pursuant to their own governing laws, and subject to the agreement of the Contractor, other entities may be permitted to make purchases at the terms and conditions contained herein. Non-Customer purchases are independent of the agreement between Customer and Contractor, and Customer shall not be a party to any transaction between the Contractor and any other purchaser.
State agencies wishing to make purchases from this agreement are required to follow the provisions of s. 287.042(16)(a), F.S. This statute requires the Department of Management Services to determine that the requestor's use of the contract is cost-effective and in the best interest of the State.

44. Waiver. The delay or failure by the Customer to exercise or enforce any of its rights under this Contract shall not constitute or be deemed a waiver of the Customer's right thereafter to enforce those rights, nor shall any single or partial exercise of any such right preclude any other or further exercise thereof or the exercise of any other right.

45. Annual Appropriations. The State's performance and obligation to pay under this contract are contingent upon an annual appropriation by the Legislature.

46. Execution in Counterparts. The Contract may be executed in counterparts, each of which shall be an original and all of which shall constitute but one and the same instrument.

47. Severability. If a court deems any provision of the Contract void or unenforceable, that provision shall be enforced only to the extent that it is not in violation of law or is not otherwise unenforceable and all other provisions shall remain in full force and effect.

Exhibit B
Method of Compensation
Contract BE521
CENTRAL FLORIDA REGIONAL INTEGRATED CORRIDOR MANAGEMENT SYSTEM
Financial Project ID No. 436328-1-82-01

1.0   PURPOSE

This exhibit defines the method and limits of compensation to be made to the Vendor for the services for the Central Florida Regional Integrated Corridor Management System (ICMS) and described in Exhibit "A" Scope of Services and Exhibit "C" Minimum Technical Requirements and the method by which payments will be made.

2.0   COMPENSATION

For the successful delivery of the services described in Exhibit "A" – Scope of Services and defined Exhibit "C" Minimum Technical Requirements and authorized under this Agreement, the Department will pay the Vendor the Maximum Limiting Amount of $ 6,873,867.00   . Currently only $ 5,900,000.00 of the Maximum Limiting Amount is available, the remaining $ 973,867.00 will be made available when approved by the legislature. This is a Term Contract for a defined product whereby the Vendor agrees to furnish the services by the prescribed period of time. Subsequent to contract execution the Department will issue Notice to Proceed for the commencement of production and delivery of these services in accordance with Exhibit "A", Scope of Services and Exhibit "C" Minimum Technical Requirements. Execution of this Agreement does not guarantee that the work will be authorized.

The total amount of this agreement is expected to be funded under multiple appropriations. The State of Florida's obligation to pay under this contract is contingent upon Legislative approval. Therefore, it is agreed that the Vendor will not be obligated to perform services or incur costs under this agreement until the Vendor has received Written Authorization from the Department nor will the Department be obligated to reimburse the Vendor for costs or make fee payments for work performed without a Written Authorization.

The Department, based on need and availability of budget, may increase the Contract amount by amendment. At the Department's option additional services may be added to the contract through one or more supplemental amendments, contingent upon legislative appropriation and budget approval. Changes to the requirements described in Exhibit "A" – Scope of Services and Exhibit "C" Minimum Technical Requirements will be made by amendment to this Agreement.

At the Department's sole discretion and contingent upon legislative appropriation and budget approval. The Department may add financial project numbers and/or increase the Contract amount by Task Work Order for the purchase of the Special Services as described in Exhibit "A" – Scope of Services at the unit rates shown in Table 2 of Section 5.0 below. The Department will not authorize work to be performed under any Task Work Order until funding has been secured.

3.0   INVOICING PROCEDURE

The Vendor will be eligible for progress payments under this Agreement at intervals not less than monthly or when individual tasks or milestones defined in the Schedule of Payment Values are completed or reached.

The Vendor shall provide a certificate at the time of each milestone as indicated in the Schedule of Payment Values, certifying the amount of work completed by the Vendor. For payment approval by the Department, all invoices must be in compliance with all requirements of the Contract Documents.

3.1 Required Services

Payments shall be achieved and become eligible for payment in accordance with Table 1, Lump Sum Milestone and Monthly Operations, Maintenance, and Support Payments. The Vendor shall submit with each invoice certification that all requirements of each milestone have been completed and approved by the Department. Milestone requirements are detailed in Exhibit "A" Scope of Services. The Department shall verify that all deliverables meet the requirements of the Contract Documents.

3.2 Special Services

The Lump Sum or Limiting Amount for the performance of the Special Services will be negotiated and agreed to by both the Department and Vendor prior to the issuance of any Task Work Order (TWO). The Lump Sum or Limiting Amount for each TWO will be included in the contract Lump Sum Amount when executed. The Vendor will receive progress payments for Lump Sum Special Services TWOs based on the percentage of services that have been completed and accepted by the Department during the billing period, and properly invoiced. Vendor will be paid the lump sum amount in full for proper completion of all the work identified to be included in the lump sum amount, regardless of the time, effort, or expense of the Vendor in performing that work. Payment of the lump sum amount will constitute full compensation for the work and no additional compensation will be paid for overhead, operating margin, expenses, travel, costs, or any other matter.

The Vendor will receive progress payments for Limiting Amount Special Services TWOs based on the hourly unit rates shown in Table 2 of this Exhibit "B", Method of Compensation for services that have been completed and accepted by the Department during the billing period. Vendor will be up paid up to the Maximum Limiting Amount in full for proper completion of all the work identified to be included in the TWO, regardless of the time, effort, or expense of the Vendor in performing that work. The Vendor may be paid a portion of the Maximum Limiting Amount as a progress payment based on the work that has been completed, accepted by the Department, and properly invoiced by the Vendor during any billing period. Payment of the Maximum Limiting amount will constitute full compensation for the work and no additional compensation will be paid for overhead, operating margin, expenses, travel, costs, or any other matter.

Documentation must be on file with the Vendor and forwarded to the Department to support the invoiced costs. The Vendor shall maintain books and records as related to this Agreement in such a manner that supports each invoice.

3.3 Liquidated Damages

The Vendor acknowledges that failure to complete the services by the completion date designated on the contract document may cause the Department to incur damages that, at present are, and upon the occurrence of the failure to timely complete the services may be difficult to determine. Moreover, the Parties wish to avoid lengthy and expensive litigation relating to failure to complete the services on time. Therefore, in the event the Vendor fails to complete the authorized services by the completion date designated on the contract document, the Department may shall exercise

the remedy of a payment adjustment against the Vendor, in the amount s shown in Exhibit "A", Scope of Services. The Parties agree that if the Department allows the Vendor to continue and finish the services, or any part of it, after the expiration of the time allowed, that the Department's action shall in no way act as a waiver on the part of the Department of the liquidated damages due under this contract. The Vendor shall pay said sum to the Department not as a penalty, but as liquidated damages.

Liquidated Damages will be assessed and deducted from the monthly invoice.

3.3.1 Liquidated Damages Reductions:

Monthly at the time of invoice the Project manager shall verify that no Liquidated Damages reductions are due prior to approving any invoice. In the event that liquidated damages are due, the invoice shall be reduced by the amount defined in Exhibit "A", Scope of Services for the corresponding event. The Department reserves the right to reduce any payment by any amount due under the Liquidated Damages provisions within this contract.

4.0   PROJECT CLOSEOUT

4.1   Final Audit

If requested, the Vendor will permit the Department to perform or have performed, an audit of the records of the Vendor and any or all sub-vendors to support the compensation paid the Vendor. The audit will be performed as soon as practical after completion and acceptance of the contracted services. In the event funds paid to the Vendor under this agreement are subsequently properly disallowed by the Department because of accounting errors or changes not in conformity with this Agreement, the Vendor agrees that such disallowed costs are due to the Department on demand. Further, the Department will have the right to deduct from any payment due the Vendor under any other Agreement any amount due the Department.

5.0 PAYMENT SCHEDULES

The Schedule of Payment Values is shown in Table 1: Lump Sum Milestone and Monthly Operations, Maintenance, and Support Payments. Each Item listed in Exhibit "A" Scope of Services for each milestone must be complete and accepted by the Department prior to submitting an invoice for payment.

Table 1: Lump Sum Milestone and Monthly Operations, Maintenance, and Support Payments

Scope Reference	Task Name	Milestone Data (days after NTP)	Total Cost	Percentage of lump sum
3.5.1	Task 1: Project Management (Accepted PMP, PSEMP documents)	45*	$ 160,026	2.33%
3.5.2	Task 2: System Design (Accepted documents)	105*		
	Requirements Analysis		$ 292,434	4.25%
	Preliminary Design		$ 252,374	3.67%
	Critical Design		$ 510,549	7.43%
	Design Validation		$ 481,523	7.01%
3.5.4.1	Thread 1 Build	392		
	Thread 1 DFE Acceptance		$ 180,440	2.63%
	Thread 1 IEN Acceptance		$ 478,551	6.96%
	Thread 1 DSS Acceptance		$ 278,177	4.05%
	Thread 2 Build			
	Thread 2 DFE Acceptance		$ 177,665	2.58%
	Thread 2 IEN Acceptance		$ 502,474	7.31%
	Thread 2 DSS Acceptance		$ 415,682	6.05%
	Thread 3 Build			
	Thread 3 DFE Acceptance		$ 207,055	3.01%
	Thread 3 IEN Acceptance		$ 557,514	8.11%
	Thread 3 DSS Acceptance		$ 272,094	3.96%
	System Integration System Acceptance		$ 492,843	7.17%
3.5.6	Task 6: System Training	759	$ 160,913	2.34%
	System Deployment		$ 262,002	3.81%
3.5.7	Task 7: Operations, Maintenance, and Support***	760	$ 1,191,551 (Total) $ 49,648 (Monthly)	17.33%
	Grand Total Cost		**$ 6,873,867**	

* Per the Scope of Services provided in Table 5: Contract Deliverable Requirements List
** Percentage of lump sum should equal 100%
***Total amount over Support Period. This will be bid as a total amount and paid monthly from after the deployment to the end of the contract. Include (total) amount in the grand total cost. The monthly amount is for reference only.

*Per the Scope of Services provided in Table 5: Contract Deliverable Requirements List
**Percentage of lump sum should equal 100%
***Total amount over Support Period. This will be bid as a total amount and paid monthly from after the deployment to the end of the contract. Include (total) amount in the grand total cost. The monthly amount is for payment purposes.

Table 2: Hourly Rates for Special Services by Staff Positions by Firm

Labor Category Name for Special Services under task work order:	Time and Materials Loaded Hourly Rate		
	SwRl	Epic Engineering	Metric Engineering
Project Manager	$ 435.16	$ 226.98	$ 245.05
Senior Computer Programmer	$ 284.35	$ 213.51	$ 166.82
Computer Programmer	$ 205.21	$ 197.77	$ 116.20
Junior Computer Programmer	$ 151.87	$ 175.16	$ 92.04
Senior Database Administrator	$ 284.35	$ 235.72	$ 161.07
Database Administrator	$ 205.21	$ 197.77	$ 115.05
Junior Database Administrator	$ 151.87	$ 175.16	$ 92.04
Senior Network Architect	$ 284.35		$ 165.67
Network Architect	$ 205.21		$ 116.20
Junior Network Architect	$ 151.87		$ 97.79
Senior Web Developer	$ 284.35	$ 213.51	$ 103.54
Web Developer	$ 205.21	$ 197.77	$ 80.53
Junior Web Developer	$ 151.87	$ 175.16	$ 69.03
Quality Assurance / Quality Control Manager	$ 410.69	$ 212.15	$ 212.84

6.0   TANGIBLE PERSONAL PROPERTY:

This contract does not involve the purchase of Tangible Personal Property, as defined in Chapter 273, F.S.

Central Florida Regional Integrated Corridor Management System

BE521
Exhibit C
System/Subsystem Minimum Technical Requirements for the
Central Florida Regional Integrated Corridor Management System
Version: *2.0*

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	Clay Packard and David Vickers	11/20/2017
	Clay Packard	1/21/2018
Approved By:		

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

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List of Acronyms and Abbreviations

API	Application Programmable Interface
AVL	Automatic Vehicle Location
CCTV	Closed-circuit Television
CSV	Comma-separated Values
D5	District 5
DFE	Data Fusion Environment
DHSMV	Department of Highway Safety and Motor Vehicles
DMS	Dynamic Message Sign
DSS	Decision Support System
DW	Data Warehouse
ERE	Expert Rules Engine
ETL	Extract, Transform, and Load
EVE	Evaluation Engine
FDOT	Florida Department of Transportation
GEH	Geoffrey E. Havers
GIS	Geographical Information System
GPS	Global Positioning System
GUI	Graphical User Interface
I-4	Interstate 4
ICM	Integrated Corridor Management
ICMS	Integrated Corridor Management System
IEN	Information Exchange Network
ITS	Intelligent Transportation Systems
LCIS	Lane Closure Information System
MOE	Measure of Effectiveness
PRE	Prediction Engine
RDBMS	Relational Database Management System
SOT	Signal Optimization tool
TSM&O	Transportation Systems Management & Operations
UF	University of Florida

1 Overview

The System/Subsystem Minimum Technical Requirements establishes the functional, performance, design, development, and verification requirements for the Central Florida Regional Integrated Corridor Management System (ICMS) project. This document contains requirements gathered from the contractual elements typically consisting of the contract document, scope of work, concept of operations document, request for proposals, etc. The System/Subsystem Minimum Technical Requirements defines the set of requirements to be verified as part of the acceptance of the intelligent transportation systems (ITS) project.

1.1 Identification

This section contains a full identification of the system to which this document applies, including identification number(s), title(s), abbreviation(s), version number(s), and release number(s), as applicable.

2 Reference Documents

The following documents, of the exact issue shown, form a part of this document to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this document, this document shall be considered the superseding requirement.

Table 1: Reference Documents

Title and Date	Publisher
Central Florida Regional Integrated Corridor Management System Exhibit "A," Scope of Services	State of Florida Department of Transportation District 5 Procurement Office 719 S Woodland Blvd Deland, Florida 32720-5834

3 Requirements

This section covers the functional, performance, interface, data, and hardware requirements. It also covers non-functional and enabling requirements and constraints. For the requirements listed below, the requirement ID provides the level of requirement:

Level 1 – ICMS Software System = 1.
Level 2 – ICMS Software Subsystems = 1.X.
Level 3 – ICMS Software Subsystem Components = 1.X.Y
Level 4 – Functions and Data Elements = 1.X.Y.Z

Requirement Types

- F = Functional
- I = Interface (interface between ICMS and external systems)
- D = Data (internal storage, send and receive of data within the ICMS)
- C = Constraint
- P = Performance
- H = Hardware

Verification Method
- **Analysis** = The use of established technical or mathematical models or simulations, algorithms, or other scientific principles and procedures to provide evidence that the item meets its stated requirements.
- **Inspect** = The observation using one or more of the five senses, simple physical manipulation, and mechanical and electrical gauging and measurement to verify that the item conforms to its specified requirements.
- **Demonstrate** = The actual operation of an item to provide evidence that it accomplishes the required functions under specific scenarios.
- **Test** = The application of scientific principles and procedures to determine the properties or functional capabilities of items.)

Requirement Criticality
- H = High
- M = Medium
- L = Low

3.1 System Definition

The concept for the ICMS software is a system of systems that receives data from the data fusion system and SunGuide® software (SunGuide), and utilizes this data in the decision support system (DSS), as shown in Figure Figure 1. Figure Figure 1 shows the overall Florida Department of Transportation (FDOT) District 5 (D5) system of systems.

The DSS receives real-time data and models conditions within the region to select coordinated response plans for events (incidents, congestion) that require a multi-agency response. This data includes freeway, arterial, transit, weather, parking, and other data available in the region that could have an impact on the corridor. When local traffic signal corridors are operating outside of expected conditions, the DSS will provide recommended changes to the timing plans within the active arterial management corridors. For the ramp metering systems along Interstate-4 (I-4), the DSS will utilize the conditions on the approaching arterials and on I-4 to calculate the ramp metering rates. The DSS will also provide multi-agency, pre-agreed response plans for major events within the region, which may overrule the traffic signal and ramp meter recommendations.

The information exchange network (IEN) allows stakeholder agencies to view events within the region and provide information on events in the region. It also provides the notification and interface for coordination of response plans that the DSS generates.

Data collected from stakeholder systems will be integrated into the data fusion environment (DFE) subsystem for use by the ICMS. The ICMS will have an application programmable interface (API) that will facilitate data requests and subscriptions to data stored within the DFE.
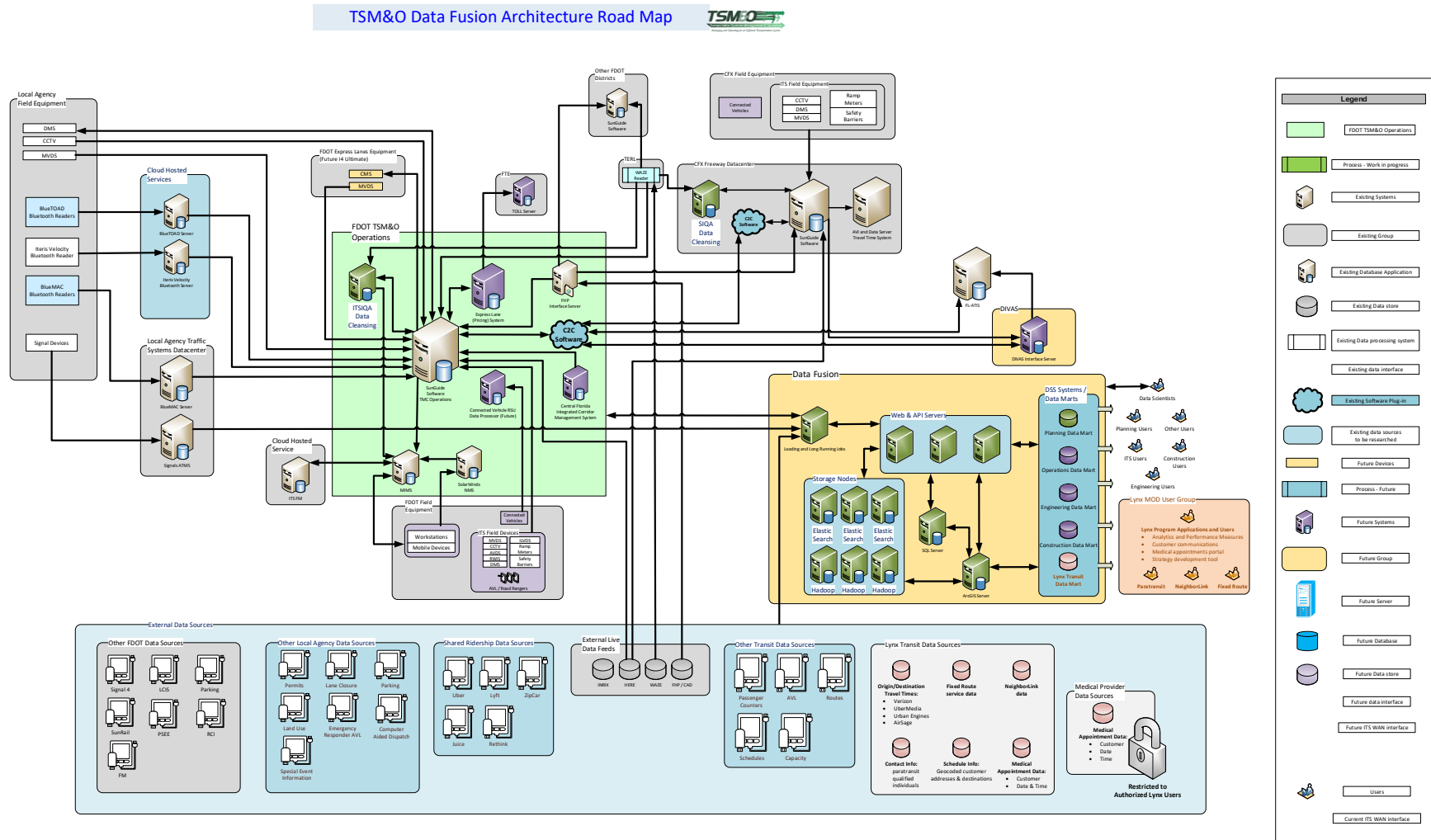
Figure 1: Data Fusion Architecture

3.2 System Requirements

This section itemizes the requirements associated with each of the system's capabilities based on the user needs described in Table 2.

Figure 2 shows the subsystem requirements hierarchy.
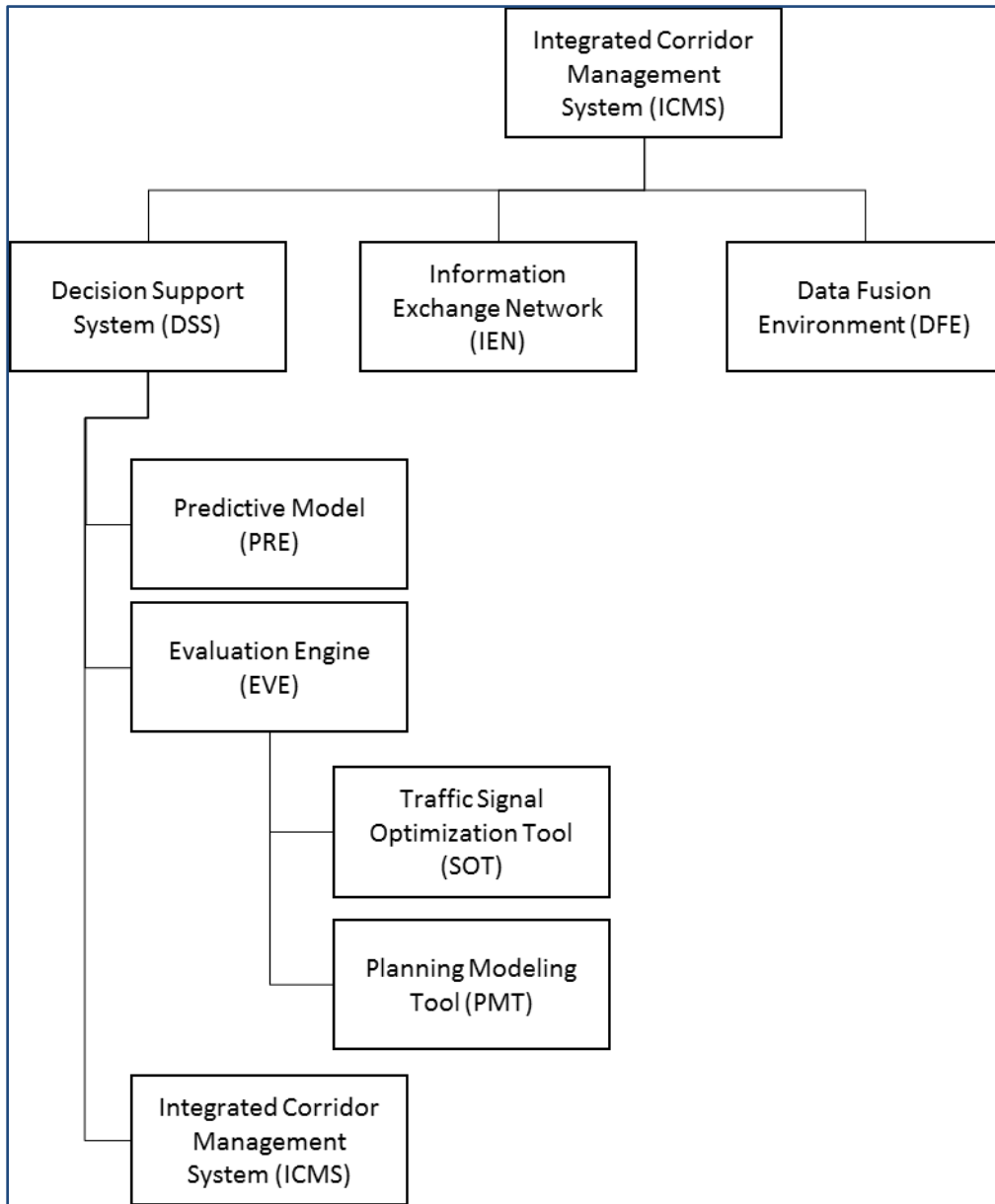
Figure 2: Requirements Hierarchy

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Table 2: User Needs

#	User Needs	User Need Description
1	Need for interactive communication among agencies	Agencies need to work together in order to plan for incident remediation and efficiently execute actions to clear incidents in a timely manner, in order to improve the collective response to events.
2	Need to obtain current status of ITS devices in the region	Agencies need to obtain current status of ITS devices and transportation network information (e.g. speed, travel time) within the corridor in order to make informed decisions on actions to be made to improve performance
3	Need to provide current status of ITS devices to the agencies	Agencies need to provide current status of their ITS devices to other agencies within the corridor in order for corridor agencies to make informed decisions on actions to be made to improve performance
4	Need to provide current performance of the transportation network to corridor agencies	Agencies need to provide current conditions of their transportation network (e.g. speed, travel time) to other agencies within the corridor in order to make informed decisions on actions to be made to improve performance.
5	Need to provide predicted performance of the transportation network to corridor agencies	Agencies need to receive near term predictions of transportation network in order to make proactive informed decisions.
6	Need to develop comprehensive incident response plans	Agencies need a means to develop, collect and store new response plans in order to improve response effectiveness in reacting to events within the corridor.
7	Need to provide roadway event information to travelers	Agencies need to provide event information to the public for planning trips and modifying trip plans enroute, in order to allow travelers to make informed decisions about their trips.
8	Need to provide transit event information to travelers	Agencies need to provide transit information to the public for planning trips and modifying trip plans enroute, in order to allow travelers to make informed decisions about their trips.
9	Need to store pre-agreed incident response plans	Agencies need a means to collect and store pre-agreed response plans in order to understand collective roles and responsibilities, communicate effectively, and improve response times when reacting to events within the corridor.

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

#	User Needs	User Need Description
10	Need to coordinate incident responses among agencies to ensure that conflicting responses are not enacted	Agencies need to coordinate responses and understand roles and responsibilities as well as jurisdictional boundaries, such that conflicting responses are not enacted and the correct information is being provided to the public.
11	Need to coordinate incident responses among agencies to ensure prompt response to events	Agencies need to coordinate responses such that agencies understand roles and responsibilities and jurisdictional boundaries in order to ensure prompt response to events and accurate information is provided to the public.
12	Need to coordinate ramp metering systems	Agencies need to be able to view ramp meter system status, and when requested, implement ramp meter rate changes.
13	Need to generate transportation system performance reports	Agencies need to be able track the overall performance of the network through the generation of summary reports to better understand the historical operation of the system.
14	Need to generate transportation system performance dashboards	Agencies need to be able to track current performance on multiple levels of the system through the use of dashboards.
15	Need to track and store history of enacted response plans	Agencies need to be able to track and store history of actions associated with a pre-approved response plan after they have been enacted to determine if any changes are required to improve the response plans.
16	Need to assess the impact of an enacted response plan on the transportation network	During the response to an event in the corridor, agencies need to be able to determine if the pre-agreed response plan is effective and if is having the intended effect. This includes verifying what conditions exist after implementation of the response plan. If the operators of the systems determine that their response is not effective, they should be able to change components of their response plans or implement a new response plan.
17	Need to maintain and modify enacted response plans	As an event progresses and conditions change, agency operators should be able to modify the current response, and communicate changes with other agencies within the corridor in order to effectively adjust to changing conditions and improve conditions in the corridor.

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

#	User Needs	User Need Description
18	Need to maintain and modify stored pre-approved response plans	Agencies need to be able to make recommendations and modify pre-approved response plans, and communicate ideas with other agencies within the corridor, in order to improve response to conditions that will impact the corridor.
19	Need to coordinate traffic signal systems	Agencies need to be able to view traffic signal system status, and when requested implement signal timing plans.
20	Need to optimize traffic signal operations.	Agencies need a tool to be able to optimize traffic signals along pre-defined routes.
21	Need to provide current performance of the transportation network to the public	Corridor agencies need to provide transportation network performance information to the public for use by 3rd party applications.

Table 3: Business Requirements

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.1	The ICMS shall provide interactive communication among agencies.	F	1	IEN	
1.2	The ICMS shall receive current status of the transportation network in the region.	I	2	DF, DSS	
1.3	The ICMS shall send current status of ITS devices to the stakeholder agencies, as available.	I	3	IEN, DF	
1.4	The ICMS shall provide current performance of the transportation network to stakeholder agencies.	F	4	IEN, DF	
1.7	The ICMS shall provide roadway event information to travelers.	I	7	DF	Send to 511 and dynamic message sign (DMS)
1.8	The ICMS shall provide transit event information to travelers.	I	8	DF	Send to 511 and DMS
1.9	The ICMS shall store pre-agreed incident response plans.	D	9	DSS	
1.10	The ICMS shall send incident response plans to agency users to insure appropriate response time.	F	10, 11	DSS	
1.15	The ICMS shall store history of enacted response plans.	D	15	DSS	

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.16	The ICMS shall evaluate the impact of enacted response plans on the transportation network.	F	16	DSS	
1.17	The ICMS shall send updated incident response plans to agency users.	I	17	DSS	
1.18	The ICMS shall store updated pre-approved response plans.	D	18	DSS	
1.19	The ICMS shall coordinate the activation of traffic signal timing plans.	F	19	TSC	
1.20	The ICMS shall recommend a set of response plans based on a pre-determined set of rules, and current and predicted network conditions for the user to review.	F	4,5	DSS	A design detail will determine if the user has the ability to select or if the user can only approve the DSS-recommended response plan.
1.21	The ICMS shall coordinate the activation of ramp meter metering rates.	F	12	TSC	
1.22	The ICMS shall provide the capability to develop and store new response plans.	F	6,9	DSS	
1.23	The ICMS shall provide the capability to generate and manage reports.	F	13	IEN	
1.24	The ICMS shall provide access to system dashboards.	F	14	IEN	
1.25	The ICMS shall provide an offline signal optimization tool	F	20	SOT	

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.26	The ICMS shall provide a data dissemination service	F	21	DFE	

Table 4: System Constraint Requirements

Requirement Number	Requirement Description	Type	ICMS	Notes
1.31	The ICMS shall be hosted in the FDOT D5 hosting environment.	C	All	
1.33	The ICMS shall provide evaluation data to the DFE Subsystem.	C	DSS, DF	
1.37	The Prediction Engine shall calculate and store model accuracy.	C	DSS	

3.2.1 Performance

This section identifies a required system capability and itemizes the requirements associated with the capability. The requirements specify the required behavior of the system and include applicable parameters, such as response times, throughput times, other timing constraints, sequencing, accuracy, capacities (i.e., how much/how many), priorities, continuous operation requirements, and allowable deviations based on operating conditions. The requirements will include, as applicable, required behavior under unexpected, unallowed, or "out-of-bounds conditions; requirements for error handling; and any provisions to be incorporated into the system to provide continuity of operations in the event of emergencies.

Table 5: System Performance Requirements

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.41	The ICMS shall provide 99.5 percent availability.	P		ALL	99% for first 90 days
1.42	The ICMS shall provide data latency of less than or equal to three seconds from the time a new value for a status currently being shown on a user display screen is available to the DFE to the time the status is available from the DFE for display on the user's screen.	P		ALL	
1.43	The ICMS shall provide automated monitoring capabilities to alert operators of outages.	P		ALL	
1.44	The ICMS shall provide failover capabilities within 45 minutes.	P		ALL	This assumes the Department provides sufficient hardware and network infrastructure to support the failover.
1.45	The Decision Support Subsystem shall send the Information Exchange Network a response plan recommendation within five minutes of incident conditions that trigger a response plan recommendation.	P	20	DSS	This assumes the prediction modelling engine meet its respective performance requirements.

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.47	The ICMS shall not recommend a change to a signal that has changed within the last 15 minutes	P	20	DSS	
1.48	The ICMS shall not recommend a change to a ramp meter that has changed within the last 5 minutes.	P	20	DSS	
1.49	The DFE shall track system usage, size of data being transferred and the data sets that were requested	P		DSS	
1.50	The usage data collected shall be available to an administrator via a report	P		DSS	This would be one of the six reports the initial system has to support.

3.2.2 Physical Characteristics

Table 6: Physical Characteristic Requirements

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.51	The ICMS shall be hosted in the FDOT D5 hosting environment.	C		All	
1.52	The ICMS shall follow FDOT D5 standards for hosted systems.	C		All	

3.3 Subsystem Requirements

This section identifies a required system capability and will itemize the requirements associated with the capability. The requirements will specify the required behavior of the system and will include applicable parameters, such as response times, throughput times, other timing constraints, sequencing, accuracy, capacities (i.e., how much/how many), priorities, continuous operation requirements, and allowable deviations based on operating conditions. The requirements will include, as applicable, required behavior under unexpected, un-allowed, or out of bounds conditions; requirements for error handling; and any provisions to be incorporated into the system to provide continuity of operations in the event of emergencies.

3.3.1 Data Fusion Environment Subsystem

3.3.1.1 Definition

The purpose of the DFE is to provide the data processing, fusion, and data dissemination functions for the ICMS. The DFE receives data from and provides data to the other ICMS subsystems – the IEN and DSS. The DFE also receives data from external interfaces described in this document. The DFE is the data layer for the ICMS and other transportation systems management and operations (TSM&O) in simplest terms.

The main functionality of the DFE needed for the ICMS is:

- Retrieve data from specified data sources available to TSM&O including real-time data streams and less frequently and even manually updated data;
- Catalog data received in an electronically accessible data catalog;
- Transform data received into a format suitable for storage, further processing, and retrieval by users and other applications;
- Secure data to only be accessible according to the usage policy of the data and authorization of the DEPARTMENT;
- Provide user and application account management, authentication, and authorization for accessing the DFE using user authentication and authorization systems provided by the DEPARTMENT;
- Provide encryption of communications and data between the DFE and its users external to the ICMS using industry standard tools and functions;
- Provide access to the catalog of all data available specific to the user making the request;
- Provide data available to authenticated and authorized users, including data in storage and real-time data streams;
- Provide availability and performance as specified to support TSM&O; and
- Produce and provide status and diagnostic information to support the operations, maintenance, and management of the DFE.

The specific functionality of the DFE needed for the DSS and IEN is:

- Receive the current status of specified devices and roadway and transit network within the corridor;
- Provide roadway link information to external systems to include link speeds, volumes, travel times, and weather conditions;
- Provide event, and special event information to stakeholder agencies and to external systems;
- Store inventory of specified ITS devices, network data, and device ownership for the corridor network;
- Store pre-agreed incident response plans developed and approved by corridor stakeholders;
- Store history of implementation of pre-agreed incident response plans;
-
- Provide transit information to external systems to include routes, schedules, and current location of transit vehicles for the calculation of alternate routes and modes.

The DFE includes the following underlying components for retrieving, transforming, storing, and disseminating data as well as relaying response plan recommendations and approvals:

- Extract, Transform, and Load (ETL) Component – retrieves data from sources, transforms the data, and loads the data into the DFE
- Data Warehouse (DW) Component – stores the data within the DFE
- Application Programmable Interface (API) Component – provides security and access to data within the DFE

3.3.1.2 Inputs/Outputs

- ETL extracts data from external sources in as input into the DFE;
- API provides TSM&O users and applications with access to data as the primary outputs of the DFE;
- API provides the DFE administrators with administration and management of the DFE as an input and an output to the DFE
- The DFE will contain specified additional internal data management and processing functions directly accessible by users with appropriate access for additional data analytics and processing.

3.3.1.3 Data Stores

The DW within the DFE will contain the following data store types:

- Structured data – relational database management system containing data in a relational format, typically from existing external databases
- Unstructured data – file system of data not stored in a relational database management system

- Geographical information system (GIS) data store – data stored in GIS and formatted to support GIS-specific data applications, analytics, and presentation

To support the ICMS specifically, the DFE data stores will contain the dynamic and static data records listed in Table 7:

3.3.1.4 Dependencies/Constraints

- Data sources must be available and accessible to the DFE via the network
- Data source interface protocol must be defined
- The presence of data must not be provided to users who are not authorized to have disclosure of the data's presence within the ICSM
- Data must not be provided to users who are not authorized to have access to the data
- Data must not be provided to users whose identity is not authenticated
- Data and communication between users and the DFE must be encrypted if being provided to users outside of the FDOT network

3.3.1.5 Interfaces

External User Interfaces represent components external to the DFE and their respective interaction within the DFE. There are many external interfaces required for the DFE. These interfaces are divided into three types supported by the DFE:

1. Data Providers: Provides data to the DFE; the provider dictates these data interfaces and the DFE must develop the interface to meet the process, protocols, and formats of the provider. The provider must have an associated schema or data definition for the DFE to follow.

2. Data Subscribers: Receives data from the DFE; the DFE dictates these data interfaces and the provider must develop their interface to meet the process, protocols, and formats developed by the DFE. The DFE must provide the subscriber an associated schema or data definition.

3. Data Providers/ Subscribers (bi-directional): Receives data and provides data to the ICMS; SunGuide is one planned interface; SunGuide already has defined processes, protocols, and formats for data subscriber and data publishing. The DSS is also a planned interface. It is internal and the interfaces will be defined as a part of the ICMS development.

The following sections describe the interfaces for the DFE; there are several existing data interfaces.

3.3.1.6 High-Level Logical Architecture
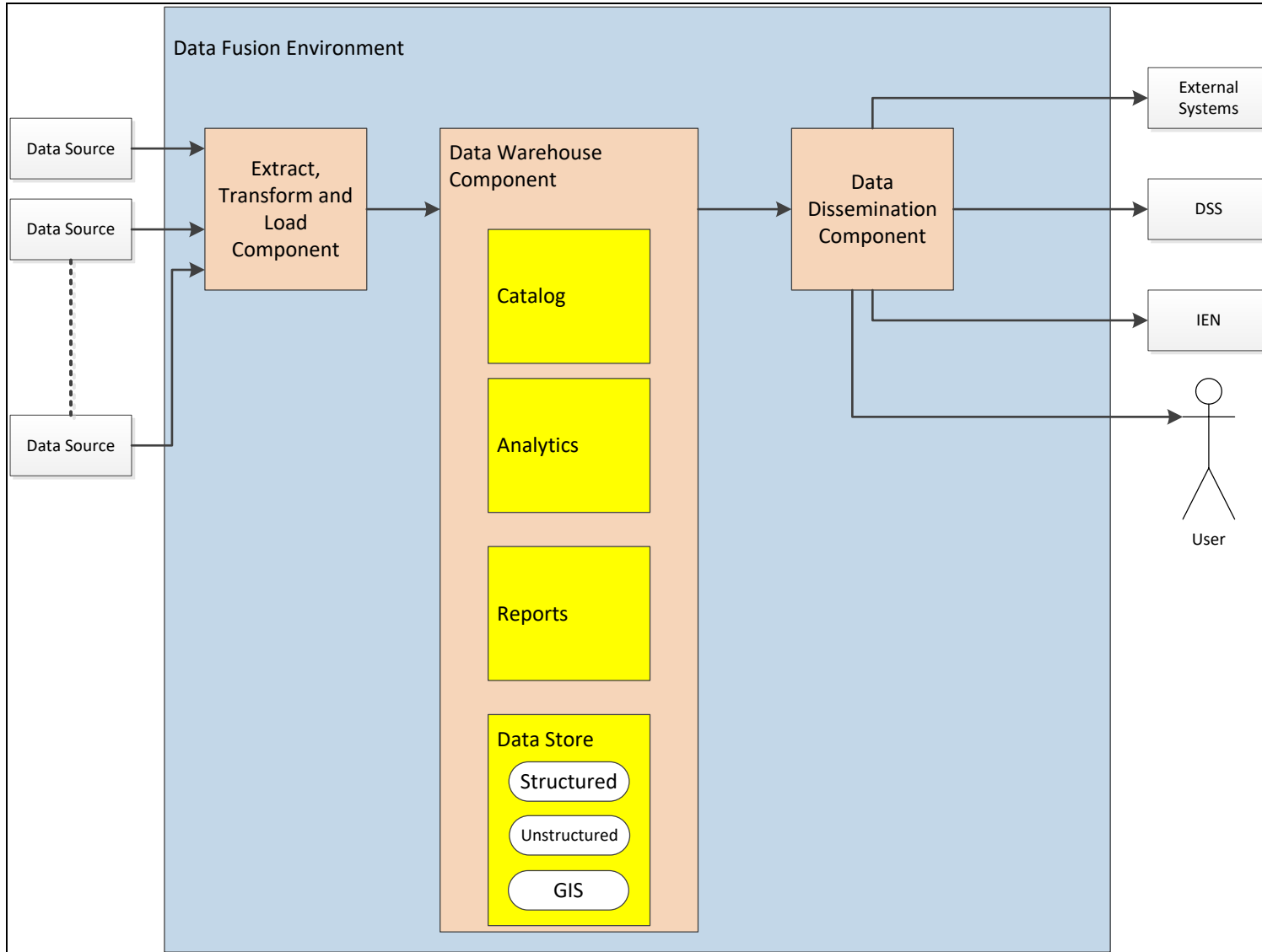
Figure 3**: Data Fusion Environment**

Table 7: TSM&O Data Sources

Data Source	Data Source Detail	Data Source availability mechanism	When Available	Update Interval
District 5 SunGuide System	Traffic Conditions Data	ITSIQA	9/1/2017	1 min
District 5 SunGuide System	Traffic Incident Data	SunGuide / Databus / EM	now	real-time
District 5 SunGuide System	CCTV Status	SunGuide / Databus / CCTV	now	real-time
District 5 SunGuide System	Ramp Meter Status	SunGuide / Databus / RMS	now	real-time
District 5 SunGuide System	Dynamic Message Signs Status	SunGuide / Databus / DMS	now	real-time
District 5 SunGuide System	Connected Vehicle Roadside unit status	SunGuide / Databus / CV	now	real-time
Signal Performance Measures	Volume for each movement	ATSPM D5 Deployment	9/1/2017	
Signal Performance Measures	Arrival timing per movement	ATSPM D5 Deployment	9/1/2017	
Transit AVL	Bus AVL data from Lynx (Clever and Trapeze), Votran, Space Coast Area Transit (SCAT), Lake Express, SunTran, SunRail	GTSF-RT only (from IBI app)	12/31/2017	real-time
Transit Routes and Stops and Schedules	Transit Routes from Lynx (Clever and Trapeze), Votran, Space Coast Area Transit (SCAT), Lake Express, SunTran, SunRail	GTSF only (from IBI app)	12/31/2017	quarterly
Weather	National Weather Service Watches and Warnings	NOAA; Is there capability to do weather radar for map overlay for IEN	TBD	real-time
Parking Data	Garages, surface lots, weigh stations, rest areas, beaches, on-street parking	SunGuide / Databus / TPS or Parking Subsystem	TBD / March 2018	real-time
base map "backdrop"		HERE Navstreets or ESRI ArcGIS system	now	quarterly
base map links		FDOT (manually corrected version of HERE.com basemap)	9/1/2017	quarterly
Roadway Characteristics Inventory (RCI)	# lanes at intersection	FDOT RCI	now	
Predictive Engine Data		PRE	ICMS Schedule	
Expert Rules Engine – Response Plans		ERE	ICMS Schedule	
Evaluation Engine		EVE	ICMS Schedule	
Intersection Geometry Data		TBD	TBD	

Intersection Plans and Schedules		TBD	TBD	
Intersection Movement Counts Data	turning movement counts	IMC	TBD	
Intersection Movement Counts Data	approach/direction	IMC	TBD	
Intersection Movement Counts Data	# lanes	IMC	TBD	
Intersection Movement Counts Data	saturation flow rates	IMC	TBD	
Intersection Movement Counts Data	bike detection	IMC	TBD	
Intersection Movement Counts Data	pedestrian detection	IMC	TBD	
Intersection Movement Counts Data	vehicle detection	IMC	TBD	
Intersection Movement Counts Data	turning movement counts	IMC	TBD	
Intersection Movement Counts Data	saturation flow rates	IMC	TBD	
Origin Destination	BlueTOAD	SunGuide D4 Enhancement	TBD	
Origin Destination	BlueMAC	SunGuide	TBD	
Controller or ATMS	Signal Phasing	ATMS Software or SunGuide	TBD	
Controller or ATMS	Detector Status Data (Vehicular and Pedestrian)	ATMS Software or SunGuide	TBD	
Controller or ATMS	Controller Data	ATMS Software or SunGuide	TBD	
Controller or ATMS	Available Controller Timing Patterns with timing plan details	ATMS Software or SunGuide	TBD	
Controller or ATMS	Controller Timing pattern status	ATMS Software or SunGuide	TBD	
Controller or ATMS	Corridor Plan	ATMS Software or SunGuide	TBD	
Special Event Information		AAM Dashboard	9/1/2017	
School locations		FDOT provided GIS layer	12/31/2017	
School zones		FDOT provided GIS layer	12/31/2017	
School schedules		FDOT provided data	12/31/2017	
Express lanes status	status, current price, current pricing model, if the system has any dynamic features such as changeable toll rates, changeable lane configurations	Express Lanes Software	TBD	

3.3.1.7 Data Fusion Environment Requirements

Table 8: Data Fusion Environment Subsystem Requirements

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.1	The DFE shall receive data from external systems shown in the TSM&O Data Sources Table.	D	1.2	DF	Demonstrate
1.2.2	The DFE shall ingest data from the data sources shown in the TSM&O Data Sources Table 7.	F	1.2	DF	Demonstrate
1.2.2.1	The ETL component shall retrieve data from each data source specified in the TSM&O Data Sources Table.	F	1.2.2	DF	Demonstrate
1.2.2.2	The ETL component shall follow the protocol of each data source specified in the TSM&O Data Sources Table.	F	1.2.2	DF	Demonstrate
1.2.2.3	The ETL component shall receive data from data sources specified in the TSM&O Data Sources Table according to the update interval specified	F	1.2.2	DF	Demonstrate
1.2.2.4	The ETL component shall re-establish a lost connection to the data sources specified in the TSM&O Data Sources Table where appropriate.	F	1.2.2	DF	Demonstrate
1.2.2.5	The ETL component shall request data not received due to temporary lost connections if the data source supports such a request.	F	1.2.2	DF	Demonstrate
1.2.2.6	The ETL component shall request data on the specified interval for data within that interval if the data source does not support a data feed.	F	1.2.2	DF	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.2.7	The ETL component shall transform the data received from each data source into the format specified for that data in the Data Sources Table.	F	1.2.2	DF	Demonstrate
1.2.2.8	The ETL component shall use the fields specified in the Data Sources Table from the data received from each data source .	F	1.2.2	DF	Demonstrate
1.2.2.9	The ETL component shall append the data with a date and time stamp that the data was received from the server's system clock, when appropriate.	F	1.2.2	DF	Demonstrate
1.2.2.10	The ETL component shall append or associate the data with a geolocation reference or region corresponding to the location represented by the data when appropriate.	F	1.2.2	DF	Demonstrate
1.2.2.11	The ETL component shall load the transformed data received from each data source into the DW destination specified for the data source.	F	1.2.2	DF	Demonstrate
1.2.3	The DW component shall store specified data received from external systems.	F	1.2	DF	Demonstrate
1.2.4.1	The DW component shall store data across reboots of the DFE equipment.	F	1.2.4	DF	Demonstrate
1.2.4.4	The DW component shall store unstructured data in an internal file system data store.	F	1.2.4	DF	Demonstrate
1.2.4.5	The DW component shall store GIS data in a GIS data store.	F	1.2.4	DF	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.4.6	The DW component shall be able to expand the capacity of data stores.	F	1.2.4	DF	Demonstrate
1.2.4.7	The DW component shall organize data within a data store.	F	1.2.4	DF	Demonstrate
1.2.4.8	The DW component shall use the source of the data as an element in the organization of the data within a data store when appropriate.	F	1.2.4	DF	Demonstrate
1.2.4.9	The DW component shall use the date interval of the data as an element in the organization of the data within the data source's hierarchy within a data store when appropriate.	F	1.2.4	DF	Demonstrate
1.2.5	The DW component shall provide the capability for administrators to create a report from specified collected data.	F	1.2	DF	Demonstrate
1.2.5.1	The DW component shall collect and store availability status information of each data source within the DW.	F	1.2.5	DF	Demonstrate
1.2.5.2	The DW component shall monitor the availability of the data store.	F	1.2.5	DF	Demonstrate
1.2.5.3	The DW component shall collect and store errors detected by each data store.	F	1.2.5	DF	Demonstrate
1.2.5.4	The DW component shall collect and store available data storage capacity for each data store.	F	1.2.5	DF	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.3.1	The Data Dissemination component shall publish data.	F	1.3	DF	Demonstrate
1.3.1.1	The Data Dissemination component shall provide a secure interface to TSM&O data resources using industry standard tools and best practices such as token and role-based, SSL layer, and RESTful endpoints.	F	1.3.1	DF	Demonstrate
1.3.1.9	Data Dissemination Component user credential information, along with last successful authentication token, shall be stored in a secure database.	F	1.3.1	DF	Demonstrate
1.3.1.10	The Data Dissemination Component support staff shall have the ability to revoke user access if misuse of the system is detected.	F	1.3.1	DF	Demonstrate
1.3.1.11	The Data Dissemination Component shall have the configurable ability to log usage statistics for users.	F	1.3.1	DF	Demonstrate
1.3.1.11.1	The Data Dissemination Component shall have the configurable ability to log computer resource usage statistics for users	F	1.3.1	DF	Demonstrate
1.3.1.11.2	The Data Dissemination Component shall have the configurable ability to log data transfer usage statistics for users	F	1.3.1	DF	Demonstrate
1.3.1.15	The Data Dissemination Component shall be provided on a non-production test platform for verifying system changes before being applied to production.	F	1.3.1	DF	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.6	The DFE shall use user accounts provided by the authentication system.	F	1.2	DF	Demonstrate
1.2.6.1	The DFE shall provide the capability for an administrator to define up to two types of access permissions specific to a data source for real-time and non-real time data.	F	1.2.6	DF	Demonstrate
1.2.7	The DFE shall provide the capability for an administrator to manage user accounts.	F	1.2	DF	Demonstrate
1.2.7.1	The DFE shall provide the capability for an administrator to modify permissions specific to a data source.	F	1.2.6	DF	Demonstrate
1.3.2	The Data Dissemination component shall authenticate users.	F	1.3	DF	Demonstrate
1.3.2.1	The Data Dissemination component shall use a token-based authentication and authorization protocol.	C	1.3.2	DF	Demonstrate
1.3.3	The Data Dissemination component shall deny requests from unauthenticated users.	F	1.3	DF	Demonstrate
1.3.4	The Data Dissemination component shall verify that users making requests to data sources have appropriate permission to that source.	F	1.3	DF	Demonstrate
1.3.4.1	The Data Dissemination component shall deny requests from users who do not have the permission to access the requested resource.	F	1.3.4	DF	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.3.4.2	The Data Dissemination component shall verify that users making requests to modify data sources have permission to modify the requested resource.	F	1.3.4	DF	Demonstrate
1.3.4.3	The Data Dissemination component shall deny requests to modify data sources from users who do not have the permission to modify the requested resource.	F	1.3.4	DF	Demonstrate
1.3.5	The Data Dissemination component shall provide an interface to the data stored in the DW specified in Table 7.	F	1.3	DF	Demonstrate
1.3.6	The Data Dissemination component shall provide a representational state transfer web services interface if appropriate.	C	1.3	DF	Demonstrate
1.3.6.1	The Data Dissemination component shall return the data requested by a data access request.	F	1.3.6	DF	Demonstrate
1.3.6.2	The Data Dissemination component shall support the specified filters defined for specified data sources in the TSM&O Data Sources Table.	F	1.3.6	DF	Demonstrate
1.3.6.3	The Data Dissemination component shall filter the data requested by the filter parameters used in the request.	F	1.3.6	DF	Demonstrate
1.3.6.4	The Data Dissemination component shall provide a push interface to provide data feeds to user.	F	1.3.6	DF	Demonstrate
1.3.6.5	The Data Dissemination component shall provide a subscription service interface to provide data feeds to user.	F	1.3.6	DF	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.9	The DFE shall provide a data catalog.	F	1.2	DF	Demonstrate
1.2.9.1	The Data Catalog shall store a list of data sources.	F	1.2.9	DF	Demonstrate
1.2.9.2	Data Catalog shall provide the capability for a user to insert entries into the data catalogs.	F	1.2.9	DF	Demonstrate
1.2.9.4	Data Catalog shall provide the capability for an administrator to view access permission for each data source entry in the catalog.	F	1.2.9	DF	Demonstrate
1.2.9.5	Data Catalog shall provide the capability for an administrator to modify access permissions for each data source entry in the catalog.	F	1.2.9	DF	Demonstrate
1.2.9.6	DFE shall provide the capability for a user to create new data sources.	F	1.2.9	DF	Demonstrate
1.2.9.7	DFE shall provide the capability for a user to access permitted data sources.	F	1.2.9	DF	Demonstrate
1.2.9.8	Data Catalog shall provide the capability for a user to modify permitted data sources.	F	1.2.9	DF	Demonstrate
1.2.9.9	The Data Catalog shall provide users the requested permitted data catalog entries.	F	1.2.9	DF	Demonstrate
1.2.9.10	The Data Catalog shall provide the ability for a user to modify permitted catalog entries.	F	1.2.9	DF	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.3.7	The Data Dissemination component shall report status information of permitted data sources.	F	1.3	DF	Demonstrate
1.3.7.2	The Data Dissemination component shall report the first date and time represented by the data loaded for each data source.	F	1.3.7	DF	Demonstrate
1.3.7.3	The Data Dissemination component shall report the last date and time represented by the data loaded for each data source.	F	1.3.7	DF	Demonstrate
1.3.7.4	The Data Dissemination component shall report the ranges of missing data based on temporal coverage for periodic data sources greater than a configurable number (with a default of 10) of periods of contiguous missing data.	F	1.3.7	DF	Demonstrate
1.3.7.5	The Data Dissemination component shall alert when data is not received for a data source for greater than a configurable number (with a default of 10) periods.	F	1.3.7	DF	Demonstrate
1.3.7.6	The Data Dissemination component shall alert when data is first received after being alerted as missing data.	F	1.3.7	DF	Demonstrate
1.2.11	The DFE shall provide a data analytics toolset.	F	1.2	DF	Demonstrate
1.2.12	The DFE shall index specified unstructured data sets to be searchable without scanning the entire contents.	F	1.2	DF	Demonstrate
1.2.13	The DFE shall provide the capability for a user to query unstructured data.	F	1.2	DF	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.13.1	The DFE shall provide requested indexed data resources with a latency of no more than1 second.	P	1.2.13	DF	Demonstrate
1.2.13.2	The DFE shall make current traffic condition updates available to the other components of the ICMS, including the external Modeling Engine, at a rate and volume sufficient to support the well-designed use of that data to provide status to users and to predict future traffic conditions within five minutes.	P	1.2.13	DF	Demonstrate
1.2.13.2	The DFE shall allow queries to specify a date range, time range, and spatial range as appropriate.	P	1.2.13	DF	Demonstrate
1.2.14	The DFE shall be modular and provide the capability for an administrator to install additional tools such as data analytics tools.	C	1.2	DF	Demonstrate
1.2.15	The DFE shall provide specified static Transportation Network data to the ICMS.	F	1.2	DF	Demonstrate
1.3.8	The DFE shall provide specified dynamic transportation network data to the ICMS.	F	1.3	DF	Demonstrate
1.3.9	The DFE shall monitor the available bandwidth of the communication network.	F	1.3	DF	Inspect

3.3.2 Decision Support Subsystem

3.3.2.1 Definition

The Decision Support System (DSS) provides candidate response plans to the region based on network conditions received from the DFE, prediction analysis, and on a rule-based assessment of the recommended response plans. The DSS consists of three major components:

- Expert Rules Engine,
- Prediction Engine, and
- Evaluation Engine.

3.3.2.2 Inputs/Outputs

- Current network conditions data, such as highway link speeds and volumes, arterial speeds, and event data, will be provided by the DFE.

- The DSS shall provide modeling engine current network conditions data , such as highway link speeds, and volumes, arterial speeds, and event data.

- The results of model executions will be provided to the DSS by the modeling engine.

- Recommended response plans will be provided to the DSS agency user interface for distribution to agency users.

- Expert rules, response plans, and results of modeling engine runs will be provided to the DFE

- The results of previously saved expert rules, response plans, and modeling engine runs will be provided by the DFE.

3.3.2.3 Data Stores

The DSS is the business layer of the ICMS and does not store data locally. Some data may be stored in the external Modeling Engine.

3.3.2.4 Dependencies/Constraints

- All current network data for the transportation system performance and operations will be provided by the DFE;
- Non-modeling engine static data for network representation, rules, and other parameters will be updated periodically by the DSS in the DFE.

3.3.2.5 Use Case Diagram

The use case shown in Figure 4 illustrates the basic high-level activities of the DSS.
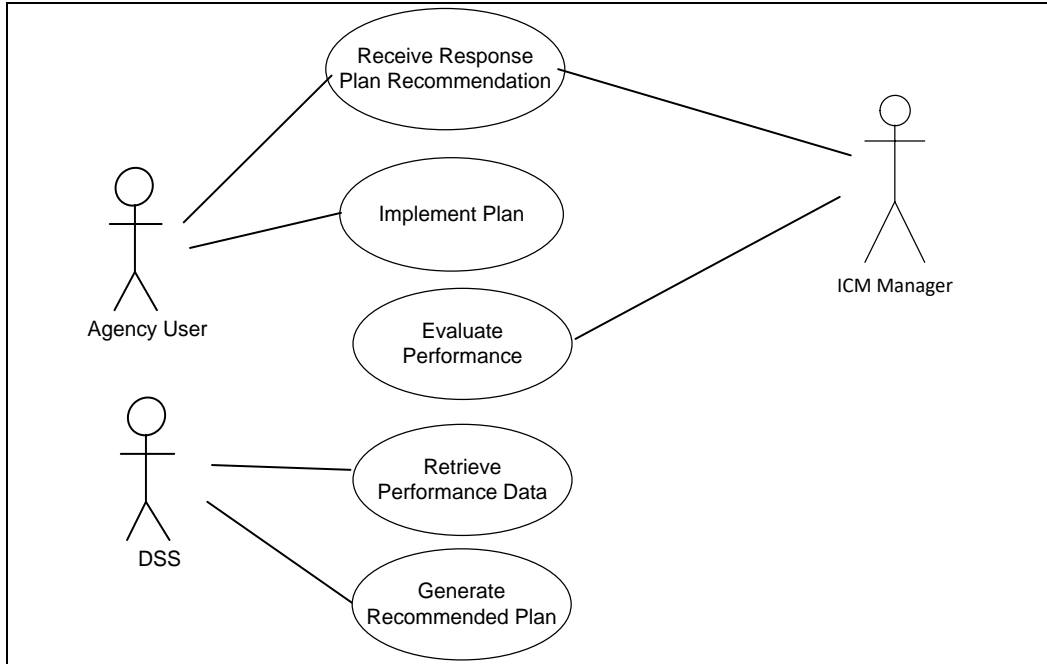
Figure 4: DSS Use Case

This use case includes the following activities:

- Receive response plan recommendation – Response plan is generated by the DSS and provided to the Integrated Corridor Management (ICM) manager and agency users through the DSS Agency Interface of the IEN, and more specifically the Plan Coordination user interface.
- Implement plan – The agency user will implement a recommended plan via the IEN once the ICM Manager approves the plan.
- Evaluate performance – The DSS develops metrics that represent the performance of the system and provides it to the ICM Manager via the IEN.
- Retrieve performance data – The DSS will retrieve performance data including current network conditions from the DFE.
- Generate recommended plan – The DSS will generate recommended response plans based on performance data and prediction analysis.

Table 8: DSS Use Case Description

Use Case ID	1.1.1.01
Description	The DSS selects candidate recommended response plans for the ICM Manager based on existing and predicted roadway network conditions.

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Actors	ICM Manager and agency users
Preconditions	ICM Manager and agency users are authenticated users. The DSS is collecting and fusing roadway data.
Post Conditions	Recommended response plan is selected and provided to Agency Operators for implementation.
Normal Course of Events	1. Operators logs in. 2. Expert Rules Engine collects roadway conditions data from the DFE. 3. Prediction Engine uses roadway conditions data to assess existing roadway conditions and predict the impact of candidate response plans. 4. Expert Rules Engine selects a set of recommended response plans. 5. DSS distributes recommended response plans via the IEN Interface to the ICMS Manager who selects a plan for distribution to the Agency operators.

3.3.2.6 Interfaces

The DSS has the following interfaces:
- Data Interface to DFE – the DSS will receive data from the DFE and send data to the DFE.
- Recommended Response Plan Generation Interface to DSS Agency Interface via the IEN – Once the expert rules subsystem determines that a response is needed based on conditions and events within the transportation network, a response plan request is generated. The DSS will interface to the DSS Agency Interface via the IEN so that agency users receive alerts from the system to select and implement one of the recommended response plans.

The interfaces to the DSS include the data defined in the System Requirements document, and further defined in the data dictionary.

3.3.2.7 Decision Support System Requirements

Table 9: Decision Support System Requirements

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.1	The ICMS shall receive ITS infrastructure status data from the DFE.	D	1.2	DSS	Demonstrate
1.2.2	The ICMS shall receive event data from the DFE.	D	1.2	DSS	Demonstrate
1.2.3	The ICMS shall receive transit data from the DFE.	D	1.2	DSS	Demonstrate
1.2.4	The ICMS shall receive transportation network data from the DFE.	D	1.2	DSS	Demonstrate
1.4.1	The DSS shall evaluate the current performance of the network.	F	1.4	DSS	Demonstrate
1.9.1	The DSS shall store pre-agreed incident response plans as defined in the data dictionary.	F	1.9	DSS	Demonstrate
1.9.2	The DSS shall provide an interface to the IEN to allow the ICM Manager the capability to add pre-agreed incident response plans for a specified incident.	F	1.9	DSS	Demonstrate
1.9.3	The DSS shall provide an interface to the IEN to allow the ICM Manager the capability to query pre-agreed incident response plans.	F	1.9	DSS	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.9.4	The DSS shall provide an interface to the IEN to allow the ICM Manager the capability to edit pre-agreed incident response plans for a specified incident.	F	1.9	DSS	Demonstrate
1.9.5	The DSS shall provide an interface to the IEN to allow the ICM Manager the capability to delete pre-agreed incident response plans for specified events.	F	1.9	DSS	Demonstrate
1.10.1	The DSS shall send a proposed response plan to the ICM Manager via the IEN.	I	1.10	DSS	Demonstrate
1.10.2	The DSS shall initiate the distribution of proposed response plans to agency users.	I	1.10	DSS	Demonstrate
1.10.3	The DSS shall receive response plan coordination data from the IEN.	I	1.10	DSS	Demonstrate
1.10.4	The DSS shall send response plan requests to the IEN.	I	1.11	DSS	Demonstrate
1.15.1	The DSS shall send the history of actions enacted during response plan implementation to the DFE for storage.	D	1.15	DSS	Demonstrate
1.16.1	The DSS shall evaluate the impact of enacted response plans.	F	1.16	DSS	Demonstrate
1.16.2	The DSS shall evaluate the impact on the transportation network of not enacting a response plan.	F	1.16	DSS	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.16.3	The DSS shall evaluate the impact on the transportation network of alternative response plans not enacted.	F	1.16	DSS	Demonstrate
1.17.1	The DSS shall monitor the performance of enacted response plans.	F	1.17	DSS	Demonstrate
1.17.2	The DSS shall provide an interface to the IEN to allow it to send a proposed updated response plan to the ICM Manager.	I	1.17	DSS	Demonstrate
1.17.3	The DSS shall provide an interface to the IEN to allow it to send a proposed updated response plan to agency users.	I	1.17	DSS	Demonstrate
1.18.1	The DSS shall send updated response plans to the DFE for storage.	D	1.18	DSS	Demonstrate
1.18.2	The DSS shall send the history of changes to response plans to the DFE for storage.	D	1.18	DSS	Demonstrate
1.19.15	The DSS shall evaluate traffic signal timing plans for specified arterial corridors.	F	1.19	DSS	Demonstrate
1.20.1	The DSS shall receive agency status from the DSS Agency Interface of the DFE as defined in data dictionary.	D	1.20	DSS	Demonstrate
1.20.2	The DSS shall receive historical data from the DFE.	D	1.20	DSS	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.20.3	The DSS shall provide the information to the IEN to allow a user to select a response plan recommendation based on the response plan list.	F	1.20	DSS	Demonstrate
1.21.1	The DSS shall evaluate ramp metering strategies for metered on-ramps.	F	1.21	DSS	Demonstrate
1.22.1	The DSS shall allow users to develop new response plans via the IEN and send the response plans to the DFE to be added to the response plan repository.	F	1.22	DSS	Demonstrate
1.22.2	The DSS shall evaluate new response plans.	F	1.22	DSS	Demonstrate
1.40.1	The DSS shall sent the prediction model accuracy to the DFE to be stored.	F	1.40	DSS	Demonstrate
1.45.1	The DSS shall provide a set of recommended response plans within 2 minutes of receiving a trigger to select alternative response plans from the modeling engine exclusive of time spent simulating the results of applying the response plans,	F	1.45	DSS	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.45.2	The DSS shall store the following time stamps: • Start of evaluation of conditions • Evaluation completion, • Response plan set selection, • Simulation completion, • Simulation results stored in the DFE, • Response plan set display to the ICM Manager, • Response plan selection, • Response Plan delivery to agency operators, • Response plan approval, • Delivery of response plan to the SunGuide software for any iterations that result in a response plan implementation.	F	1.45	DSS	Demonstrate

3.3.3 Expert Rules Engine

3.3.3.1 Definition

The expert rules engine provides the rules that are used to dictate the logic for selections made by the DSS. The primary software component of the expert rules engine is the DSS manager. The DSS manager is essentially the liaison between the DFE, the prediction engine, and the rules engine software component.

The expert rules engine provides recommended response plans based on network conditions, predicted conditions, and a defined set of rules.

The expert rules engine begins with an assessment of existing roadway conditions. It develops that assessment based on monitoring of incidents through the DFE and through monitoring of roadway conditions (such as speeds). The prediction engine also uses this assessment of roadway conditions by submitting modeling tasks to the Modeling Engine. Candidate response plans may also be evaluated using the Modeling Engine. The expert rules engine selects the recommended response plans based on existing roadway conditions, predicted future system performance, and potentially the predicted performance of candidate response plans.

Once a recommended candidate response plan has been developed and authorized by the ICM Manager via the IEN, that plan is communicated to agency users through the IEN.

3.3.3.2 Inputs/Outputs

- Current network conditions data, such as highway link speeds and volumes, arterial speeds, and event data, will be provided by the DFE.
- Recommended response plans will be provided to the IEN for distribution to agency users.
- Expert rules, static plan information and static network needed for DSS will be provided by the DFE.

3.3.3.3 Data Stores

- The ERE is a component of the business layer of the ICMS and does not store data locally. Data is provided by the DFE and sent to the DFE for storage.

3.3.3.4 Dependencies/Constraints

- All current network data for transportation system performance and operations will be provided by the DFE.

- Static data for the network representation, rules, and other parameters will be updated periodically in DFE.

3.3.3.5 Expert Rules Engine Requirements

Table 10: Expert Rules Engine Requirements

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.1.1	The ERE shall receive DMS status data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.2	The ERE shall receive traffic signal status data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.3	The ERE shall receive parking availability data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.4	The ERE shall receive weather alerts from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.6	The ERE shall receive ramp meter status data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.7	The ERE shall receive advanced transportation management systems detector status data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.2.1	The ERE shall receive incident data from the DFE.	D	1.2.2	ERE	Demonstrate
1.2.2.3	The ERE shall receive special event data from the DFE.	D	1.2.2	ERE	Demonstrate
1.2.2.5	The ERE shall receive planned special event data from the DFE.	D	1.2.2	ERE	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.3.1	The ERE shall receive bus (transit) global positioning system (GPS)/ AVL data from the DFE.	D	1.2.3	ERE	Demonstrate
1.2.3.2	The ERE shall receive SunRail GPS/ AVL data from the DFE.	D	1.2.3	ERE	Demonstrate
1.2.4.1	The ERE shall receive link speed data from the DFE.	D	1.2.4	ERE	Demonstrate
1.2.4.2	The ERE shall receive link travel time data from the DFE.	D	1.2.4	ERE	Demonstrate
1.2.4.3	The ERE shall receive link volume data from the DFE	D	1.2.4	ERE	Demonstrate
1.9.1.1	The ERE shall send pre-agreed response plans to the DFE for storage.	F	1.9.1	ERE	Demonstrate
1.9.1.2	The ERE shall provide the Prediction Engine with pre-agreed response plans.	F	1.9.1	ERE	Demonstrate
1.9.1.3	The ERE shall provide the Evaluation Engine with pre-agreed response plans.	F	1.9.1	ERE	Demonstrate
1.9.2.1	The Expert Rules Engine shall provide the DSS Administrator via the IEN the capability to add pre-agreed incident response plans for a specified incident to the DFE.	F	1.9.2	ERE	Demonstrate
1.9.3.1	The Expert Rules Engine shall provide the DSS Administrator via the IEN the capability to query pre-agreed incident response plans.	F	1.9.3	ERE	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.9.4.1	The Expert Rules Engine shall provide the DSS Administrator via the IEN the capability to edit pre-agreed incident response plans for a specified incident.	F	1.9.4	ERE	Demonstrate
1.9.5.1	The Expert Rules Engine shall provide the DSS Administrator via the IEN the capability to delete pre-agreed incident response plans for specified events.	F	1.9.5	ERE	Demonstrate
1.19.15.1	The Expert Rules Engine shall send recommended traffic signal timing plans to the Prediction Engine for evaluation.	F	1.19.15	ERE	Demonstrate
1.19.15.2	The Expert Rules Engine shall send recommended traffic signal timing plans to the Evaluation Engine.	F	1.19.15	ERE	Demonstrate
1.19.15.3	The Expert Rules Engine shall provide the Prediction Engine with identified corridors for optimization of traffic signal timing plans.	F	1.19.15	ERE	Demonstrate
1.20.3.2	The ERE shall get response plans from the DFE.	F	1.20.3	ERE	Demonstrate
1.20.3.3	The ERE shall determine if and which response plans should be evaluated by the Prediction Engine.	F	1.20.3	ERE	Demonstrate
1.20.3.4	The ERE shall send a set of recommended response plans to the Prediction Engine for evaluation.	F	1.20.3	ERE	Demonstrate
1.20.3.5	The ERE shall receive predicted network condition from the Prediction Engine.	F	1.20.3	ERE	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.20.4.1	The ERE shall send a set of recommended response plans to the IEN.	F	1.20.4	ERE	Demonstrate
1.20.4.2	The ERE shall receive agency status data from the IEN.	F	1.20.4	ERE	Demonstrate
1.20.4.3	The ERE shall send an agency status request to the IEN.	F	1.20.4	ERE	Demonstrate
1.22.1.2	The ERE shall make the engine parameters configurable to the system administrators through a graphical user interface (GUI) via the IEN.	I	1.22.1	ERE	Demonstrate

3.3.4 Prediction Engine Requirements

3.3.4.1 Definition

The PRE provides prediction of the transportation network within the Orlando region. The PRE will utilize an external Modeling Engine component to predict the conditions of the transportation network. The external Modeling Engine will return two types of prediction including future conditions (30 minutes) without any change in strategies implemented, and future conditions (30 minutes) with different response strategies.

3.3.4.1.1 Inputs/Outputs

- Inputs include data from the DFE. Some inputs may go directly from the DFE to the Modeling Engine.
- Outputs include Model Engine run outputs that are provided to the expert rules engine. Modeling Engine outputs may also be provided directly to the DFE.

3.3.4.1.2 Data Stores

The PRE is a component of the business layer of the ICMS and does not store data locally. Data is provided by the DFE and sent to the DFE for storage. The Modeling Engine may store historical data and network data to optimize simulation times.

3.3.4.1.3 Dependencies/Constraints

The prediction engine will use the external Modeling Engine validated during the project.

3.3.4.1.4 Use Case Diagram

The following use case diagram in Figure 5 illustrates the major activities of the prediction engine.

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS
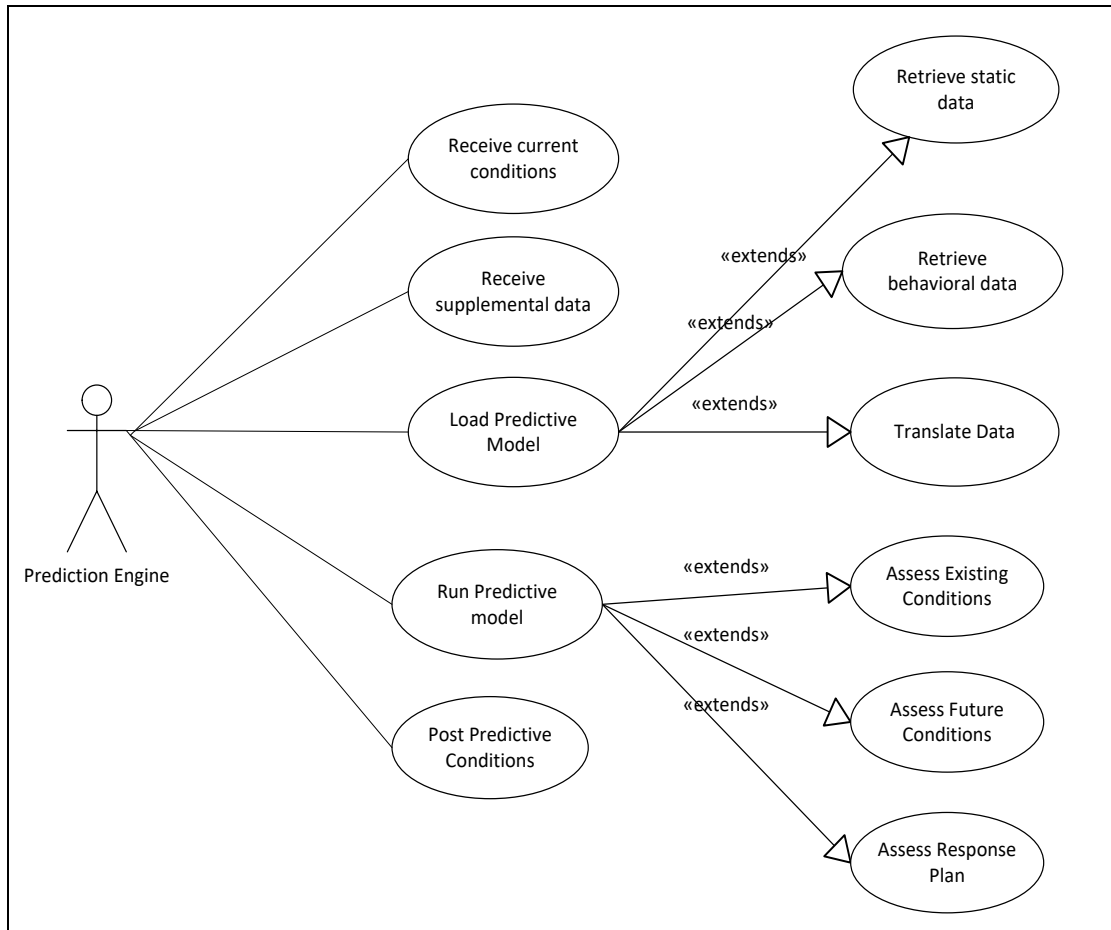
Figure 5: Prediction Engine Use Case Diagram

- Receive Current Conditions – The prediction engine receives dynamic data, such as link speeds and incident data, from the fused data in the DFE.
- Retrieve Plan Data – The prediction engine receives additional model parameters (such as recommended response plan and traffic signal plan and schedule) from the expert rules engine.
- Load Predictive Model – The Modeling Engine requires static data (such as a model specific network description), behavioral data (for instance, to represent the amount of driver diversion based on reading a DMS), and current roadway conditions data. This function populates the Modeling Engine with roadway conditions information. Some of this data may be stored in the Modeling Engine for efficiency.
- Run Modeling Engine – The prediction manager software component calls the Modeling Engine to assess current and future conditions and future conditions if plans are enacted.

3.3.4.2 Data Interfaces

3.3.4.3 Prediction Engine Requirements

Table 11: Prediction Engine Requirements

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.2.1.8	The Prediction Engine shall receive DMS status data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.9	The PRE shall receive traffic signal status data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.10	The PRE shall receive parking availability data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.11	The PRE shall receive weather alerts from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.13	The PRE shall receive ramp meter status data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.14	The PRE shall receive static SunGuide data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.15	The PRE shall receive static traffic signal data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.2.2.6	The PRE shall receive incident data from the DFE.	D	1.2.2	PRE		Demonstrate
1.2.2.8	The PRE shall receive special event data from the DFE special.	D	1.2.2	PRE		Demonstrate
1.2.2.10	The PRE shall receive planned special event data from the DFE.	D	1.2.2	PRE		Demonstrate
1.2.3.3	The PRE shall receive bus (Transit) GPS/ AVL data from the DFE as defined in the data dictionary.	D	1.2.3	PRE		Demonstrate
1.2.3.4	The PRE shall receive SunRail GPS/AVL data from the DFE as defined in the data dictionary.	D	1.2.3	PRE		Demonstrate
1.2.3.5	The PRE shall receive static SunRail data from the DFE as defined in the data dictionary.	D	1.2.3	PRE		Demonstrate
1.2.3.6	The PRE shall receive static LYNX data from the DFE as defined in the data dictionary.	D	1.2.3	PRE		Demonstrate
1.2.4.4	The PRE shall receive link speed data from the DFE as defined in the data dictionary.	D	1.2.4	PRE		Demonstrate
1.2.4.5	The PRE shall receive link travel time data from the DFE as defined in the data dictionary.	D	1.2.4	PRE		Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.2.4.6	The PRE shall collect segment travel times from the simulation engine for mapping and evaluation.	D	1.2.4	PRE		Demonstrate
1.2.4.7	The PRE shall receive link volume data from the DFE as defined in the data dictionary.	D	1.2.4	PRE		Demonstrate
1.19.15.4	The PRE shall send traffic signal timing plan recommendations to the Expert Rules Engine.	D	1.19.15	PRE		Demonstrate
1.19.15.5	The PRE shall generate traffic signal timing plan recommendations for defined alternative arterial corridors.	D	1.19.15	PRE		Demonstrate
1.20.1.1	The PRE shall receive agency status from the DFE as defined in the data dictionary.	D	1.20.1	PRE		Demonstrate
1.20.2.1	The PRE shall receive historical data from the DFE.	D	1.20.2	PRE		Demonstrate
1.20.3.3	The PRE shall request future network conditions for the "do nothing" case from the external Modeling Engine.	F	1.20.3	PRE		Demonstrate
1.20.3.4	The PRE shall request future network conditions for a set of proposed response plans from the external Modeling Engine.	F	1.20.3	PRE		Demonstrate
1.20.3.5	The PRE shall evaluate the predicted transportation network conditions to compute the performance measures.	F	1.20.3	PRE		Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.20.3.6	The PRE shall compare the forecasted performances against field measurements received once the prediction period has passed.	F	1.20.3	PRE		Demonstrate
1.20.3.7	The PRE shall provide operational measures of effectiveness (MOE) with each response plan prediction to Evaluation Engine.	F	1.20.3	PRE		Demonstrate
1.20.3.12	The PRE shall request predictions with a rolling horizon of 30 minutes in the future from the external Modeling Engine.	F	1.20.3	PRE		Demonstrate
1.20.3.13	The PRE shall request the evaluation of response plans developed for the area near an incident.	F	1.20.3	PRE		Demonstrate
1.20.3.14	The PRE shall provide MOEs for each evaluated response plan for a 10, 15, and 30-minute time horizon.	F	1.20.3	PRE		Demonstrate
1.20.3.16	The PRE shall send data between the DFE and the simulation engine to include response elements, and changes thereof, of the following types: ○ Signal Timing Plans ○ DMS messages ○ Connected Vehicle Travel Information Messages ○ Ramp Metering ○ Lane Control Sign (Hard Shoulder Running)	F	1.20.3	PRE		Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.20.3.17	The PRE shall provide prediction quality summary reports.	F	1.20.3	PRE		Demonstrate
1.22.1.3	The PRE shall include a planning tool to develop new response plans.	I	1.22.1	PRE		Demonstrate
1.22.1.4	The PRE shall be capable of requesting that the external Modeling Engine evaluate new response plans.	F	1.22.1	PRE		Demonstrate
1.40.1.1	The PRE shall receive a calculated Geoffrey E. Havers (GEH) statistic for each prediction.	F	1.40.1	PRE		Demonstration
1.40.1.3	The PRE shall calculate the travel time accuracy for each prediction for the mapped traffic time route segments.	F	1.40.1	PRE		Demonstration

3.3.5 Evaluation Engine Subsystem

The evaluation engine uses historical data, static network data, and real-time data to calculate the various MOEs that are used to evaluate the performance of the system.

3.3.5.1 Inputs/Outputs

- Inputs: Past, current, and predicted network conditions, such as highway link speeds and volumes, arterial speeds, plan decisions, and event data, will be provided by the DFE.
- Outputs: MOEs for response plans.

3.3.5.2 Data Stores

- The EVE is a component of the business layer of the ICMS and does not store data locally. Data is provided by the DFE and sent to the DFE for storage.

3.3.5.3 Use Case Diagram

The use case shown in Figure 6 illustrates the basic high-level activities of the evaluation engine.
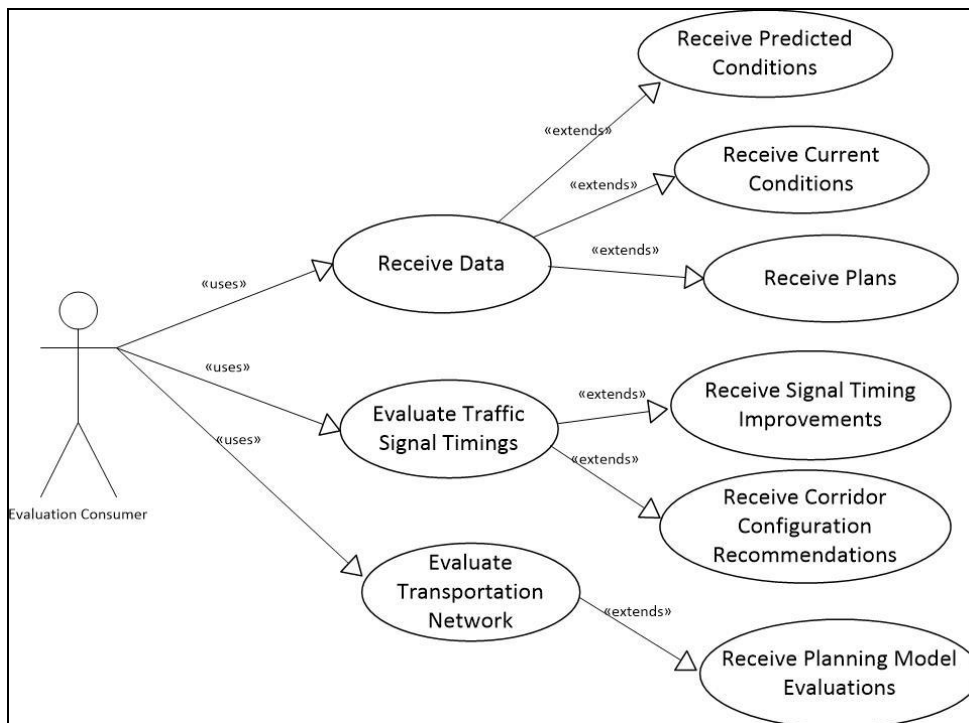
Figure 6: Evaluation Use Case

The evaluation engine retrieves historical data from several sources and makes it available to others for analysis.

- Receive Data – The evaluation engine provides a unified interface for evaluation consumers to receive data.
- Receive Predicted Conditions – At the request of an evaluation consumer, the evaluation engine retrieves stored prediction data from the DFE.
- Receive Current Conditions – At the request of an evaluation consumer, the evaluation engine retrieves current condition data from the DFE.
- Receive Plans – At the request of an evaluation consumer, the evaluation engine requests the disposition of response plans from the DFE.

Table 12: Evaluation Engine Use Case Description

Use Case ID	1.1.4.01
Description	The evaluation engine provides performance measures on the effectiveness of response plans that were implemented as part of the system.
Actors	Evaluation Consumer
Preconditions	1. The DFE provides fused current roadway conditions data. 2. Model-specific static and behavioral data are provided by the DFE. 3. The evaluation engine develops or receives performance measures.
Post Conditions	The evaluation engine is provided an assessment of the effectiveness of response plans implemented.
Normal Course of Events	1. Existing conditions data is collected from the DFE. 2. The Evaluation Engine evaluates the current and predicted conditions 3. The Evaluation Engine provides the evaluators, via the IEN, an the information neede to evaluate candidate response plans.

3.3.5.4 Sequence Diagram

The sequence diagram shown in Figure 7 describes a high-level sequence of activities performed by the evaluation engine.

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS
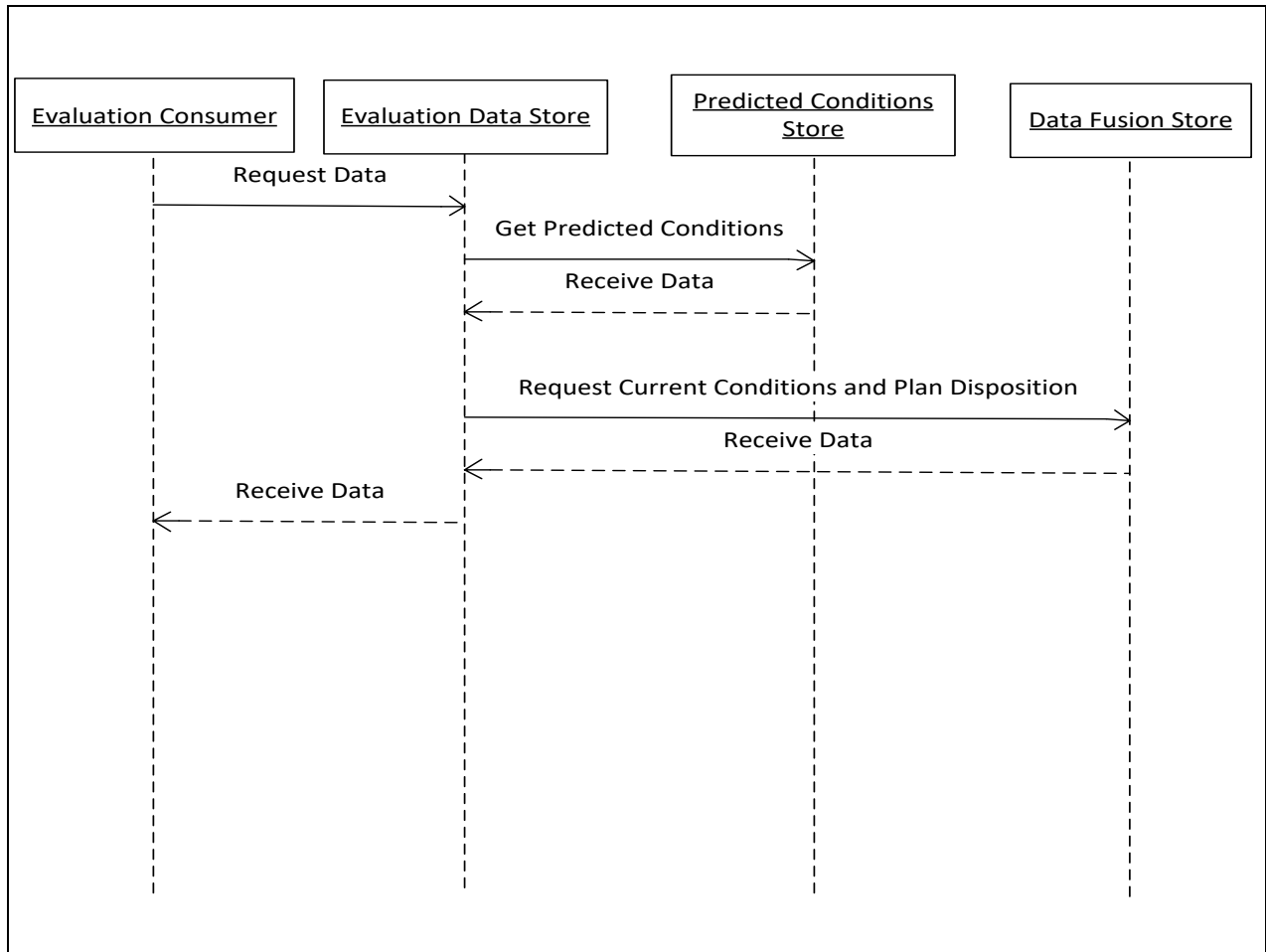
Figure 7: Evaluation Engine Sequence Diagram

The evaluation engine performs the following sequence of activities to evaluate a plan response to existing conditions:

1. The evaluation software component (evaluation consumer) requests data from the evaluation data store.
2. The evaluation data store requests predicted conditions from the prediction data store.
3. The evaluation data store requests current conditions and plan dispositions from the data store engine.

3.3.5.5 Evaluation Engine Requirements

Table 13: Evaluation Engine Requirements

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.16.1.1	The EVE shall receive ITS infrastructure status data from the DFE.	F	1.16.1	EVE	Demonstrate
1.16.1.2	The EVE shall receive event data from the DFE.	F	1.16.1	EVE	Demonstrate
1.16.1.3	The EVE shall receive transit data from the DFE.	F	1.16.1	EVE	Demonstrate
1.16.1.4	The EVE shall receive transportation network data from the DFE.	F	1.16.1	EVE	Demonstrate
1.16.1.5	The EVE shall evaluate the measures of performance for enacted response plans.	F	1.16.1	EVE	Demonstrate
1.16.1.6	The EVE shall send calculated performance measures to the DFE.	F	1.16.1	EVE	Demonstrate
1.16.2.5	The EVE shall evaluate the measures of performance for the transportation network without implementing a response plan.	F	1.16.2	EVE	Demonstrate
1.16.2.7	The EVE shall receive predicted link status data from the Prediction Engine for the do nothing scenario.	F	1.16.2	EVE	Demonstrate
1.16.2.8	The EVE shall receive predicted node status data from the Prediction Engine for the do nothing scenario.	F	1.16.2	EVE	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.16.3.5	The EVE shall receive the predicted node status data from the Prediction Engine for the response plan scenarios.	F	1.16.3	EVE	Demonstrate
1.16.3.6	The EVE shall receive the predicted link status data from the Prediction Engine for the response plan scenarios.	F	1.16.3	EVE	Demonstrate
1.16.3.7	The EVE shall receive the predicted route status data from the Prediction Engine for the response plan scenarios.	F	1.16.3	EVE	Demonstrate
1.16.3.8	The EVE shall evaluate the measures of performance for the transportation network for alternative response plans.	F	1.16.3	EVE	Demonstrate
1.16.3.9	The EVE shall send calculated performance measures to the DFE.	F	1.16.3	EVE	Demonstrate

3.3.5.6 Signal Optimization Tool

The Signal Optimization Tool (SOT) analyzes pre-defined corridors to determine if a new, more efficient timing plan is required. The tool can be used to view recommended timing plans as well as allow users to analyze and create a new timing plan.

Table 14: Signal Optimization Tool Requirements

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.1	The SOT will allow users to enter comments.	F	1.25.1	SOT	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.2	The SOT will automatically analyze Corridors to determine a more efficient set of timing plans.	F	1.25.1	SOT	Demonstrate
1.25.1.2.1	The automation cycle shall be configurable by a user with the appropriate permissions.	F	1.25.1.2	SOT	Demonstrate
1.25.1.3	The SOT shall have varying level of user groups	F	1.25.1	SOT	Demonstrate
1.25.1.3.1	Users can be added to the different group by a system administrator	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.2	The user groups shall include, but not be limited to Traffic Signal Engineer, ICM Manager, Operator, Analyst, and others.	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.3	Each user group shall have an assigned set of permissions.	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.4	The ICM Manager shall be able to modify and read permissions.	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.5	The ICM Manager and the Traffic Signal Engineer shall have the right to approve or deny recommended changes.	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.6	Analysts shall have the right to change signal timing plans and submit them for approval.	F	1.25.1.3	SOT	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.4	Approved plans must be digitally signed by a Professional Engineer.	F	1.25.1	SOT	Demonstrate
1.25.1.4.1	PE Digital signatures must be in accordance with Florida State law.	F	1.25.1.4	SOT	Demonstrate
1.25.1.5	Subscribed users shall receive notifications about recommended signal timing plans via email as well as the information feed.	F	1.25.1	SOT	Demonstrate
1.25.1.6	Clicking on the recommended signal plan on the information feed will take the user to that specific timing plan.	F	1.25.1	SOT	Demonstrate
1.25.1.7	The SOT will have a home page	F	1.25.1	SOT	Demonstrate
1.25.1.7.1	The SOT home page will display a table of corridors with the latest set of recommendations.	F	1.25.1.7	SOT	Demonstrate
1.25.1.7.1.2	The recommendation table shall include the name of the corridor, requested by, analysis date/time pattern, FIT, applicability, level of service, delay MOE and associated agencies.	F	1.25.1.7.1	SOT	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.7.1.3	The "requested by" column shall display by whom the recommended plans were created. i.e., by the system or by an individual user.	F	1.25.1.7.1	SOT	Demonstrate
1.25.1.7.2	The SOT home page shall include a scalable map feature displaying corridors with optimization recommendations	F	1.25.1.7	SOT	Demonstrate
1.25.1.7.3	The SOT home page shall provide the ability for users to perform additional analysis via a corridor analysis interface.	F	1.25.1.7	SOT	Demonstrate
1.25.1.7.4	The SOT home page will provide the ability for the user to select a corridor.	F	1.25.1.7	SOT	Demonstrate
1.25.1.8	The SOT will have a corridor recommendation page.	F	1.25.1	SOT	Demonstrate
1.25.1.8.1	The corridor recommendation page shall display a heat map for the following MOE: • FIT Improvement% • Travel Time • Speed • Queue • Delay • Level of Service (LOS).	F	1.25.1.8	SOT	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.8.2	Metrics shown on the page shall correspond to the period selected by the user.	F	1.25.1.8	SOT	Demonstrate
1.25.1.8.3	The page shall display a table which consists of intersection, FIT improvement, applicability, level of service, delay, agencies, and action.	F	1.25.1.8	SOT	Demonstrate
1.25.1.8.3.1	The first row of the table shall display the aggregate corridor results.	F	1.25.1.8.3	SOT	Demonstrate
1.25.1.8.3.2	The aggregated corridor row shall include an action to allow the user to navigate to the Offset details page.	F	1.25.1.8.3	SOT	Demonstrate.2
1.25.1.8.3.3	Rows after that shall display the individual intersection details.	F	1.25.1.8.3	SOT	Demonstrate.3
1.25.1.8.3.4	Each intersection shall have a details button linked to the intersection details page	F	1.25.1.8.3	SOT	Demonstrate
1.25.1.8.3.5	Detail buttons shall be color coded to display the state of the review.	F	1.25.1.8.3	SOT	Demonstrate
1.25.1.8.4	The corridor recommendation page shall provide a way to generate summary reports.	F	1.25.1.8	SOT	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.8.4.1	The corridor summary report shall allow users to select elements to include in the report. Elements shall include but not be limited to MOEs, Metrics, individual intersections within the corridor, and agencies.	F	1.25.1.8.4	SOT	Demonstrate
1.25.1.8.4.2	The user will have the ability to select the time of day pattern from AM, PM, off-peak, or 24 hours as part of the report.	F	1.25.1.8.4	SOT	Demonstrate
1.25.1.8.4.3	Selected timing plan details will be displayed in the report.	F	1.25.1.8.4	SOT	Demonstrate
1.25.1.9	The Corridor Offset Details page shall provide a drop-down menu for selecting a recommended or existing timing plan	F	1.25.1	SOT	Demonstrate
1.25.1.9.1	The Corridor Offset Details page shall include a scrollable Time Space diagram.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.2	The corridor intersection offset details shall be provided in a table, include but not limited to name, offset, and agency.	F	1.25.1.9	SOT	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.9.3	The Time Space Diagram should provide users the ability to modify individual intersection offsets.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.4	Users will be able to recommend, approve and digitally sign the signal offset recommendations or modifications.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.5	If modifications have been made to the recommended plan by a user with the appropriate permission, it must be submitted for review.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.6	When the user clicks save, an alert is displayed providing them the option of re-running the calculations.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.7	When a modified plan is submitted for review, a notification is sent to the identified approvers for the corridor.	F	1.25.1.9	SOT	Demonstrate
1.25.1.10	The SOT shall contain a details page for each intersection.	F	1.25.1	SOT	Demonstrate
1.25.1.10.1	The intersection details page shall provide a detail geometric layout.	F	1.25.1.10	SOT	Demonstrate
1.25.1.10.2	The user will have the ability to select the time of day pattern from AM, PM, or off-peak.	F	1.25.1.10	SOT	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.10.3	For the selected time period, a table shall present the recommended plans compared to the existing plans. It will provide activate time, the FIT and the applicability of each plan, where applicability is the percentage [of the intervals for which that plan will be used] of the total number of intervals.	F	1.25.1.10	SOT	Demonstrate
1.25.1.10.4	By selecting a time plan from the table, a split diagram is displayed for the signal within that plan.	F	1.25.1.10	SOT	Demonstrate
1.25.1.10.4.1	Split diagram will display both the effective green time and the available green time, and provide the present breakdown for each phase.	F	1.25.1.10.4	SOT	Demonstrate
1.25.1.10.4.2	The user will be able to make modifications to the split diagram by sliding the splits.	F	1.25.1.10.4	SOT	Demonstrate
1.25.1.10.4.3	The user will be able to save or undo the modification.	F	1.25.1.10.4	SOT	Demonstrate
1.25.1.10.4.4	Previous versions of the timing plan shall be added to the table allowing the user to revisit.	F	1.25.1.10.4	SOT	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.11	The SOT main page will provide the ability for users to request a new optimization from the SOT.	F	1.25.1	SOT	Demonstrate
1.25.1.11.1	Users will be able to select the time window for source data to be analyzed, examples – last week, last month, last quarter.	F	1.25.1.11	SOT	Demonstrate
1.25.1.11.2	Users will be able to select the time period to be analyzed, examples – AM, PM, Off-Peak, 24-hour.	F	1.25.1.11	SOT	Demonstrate
1.25.1.11.3	Users will select the corridor to be analyzed through the use of a drop down list.	F	1.25.1.11	SOT	Demonstrate
1.25.1.11.4	Users will select whether special days will be included in the source data or not	F	1.25.1.11	SOT	Demonstrate
1.25.1.12	Newly analyzed corridors will be added to the recommended table on the main page should an improvement be found.	F	1.25.1	SOT	Demonstrate
1.25.1.13	Recommended corridor plans should be archived and retrievable by users.	F	1.25.1	SOT	Demonstrate

3.3.6 Information Exchange Network Subsystem

3.3.6.1 Inputs/Outputs

Inputs represent event data, object status and inventory updates, plan recommendations
and approvals. Outputs represent the same data as inputs. All data received in the data
store is made available to the DSS Agency User Interface Subsystem and includes:

- Operational user input of incidents;
- Inputs received from the data store including incidents and special events;
- Inputs received from the plan decision associated with recommended response
plans.

3.3.6.2 Data Stores

The IEN is the presentation layer of the ICMS and does not store data locally. Data is
provided by the DSS and sent to the DSS for storage within the DFE. Some data may be
accessed directly from the DFE.

Data accessed by the IEN include the following:
- Events and associated status, and alarms;
- Organization settings;
- User settings including login and password information;
- Event, object, and static network data for the CFR-ICMS system.

3.3.6.3   Sequence Diagram

The sequence diagram shown in Figure 8 describes a high-level sequence of activities
performed by the IEN.

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS
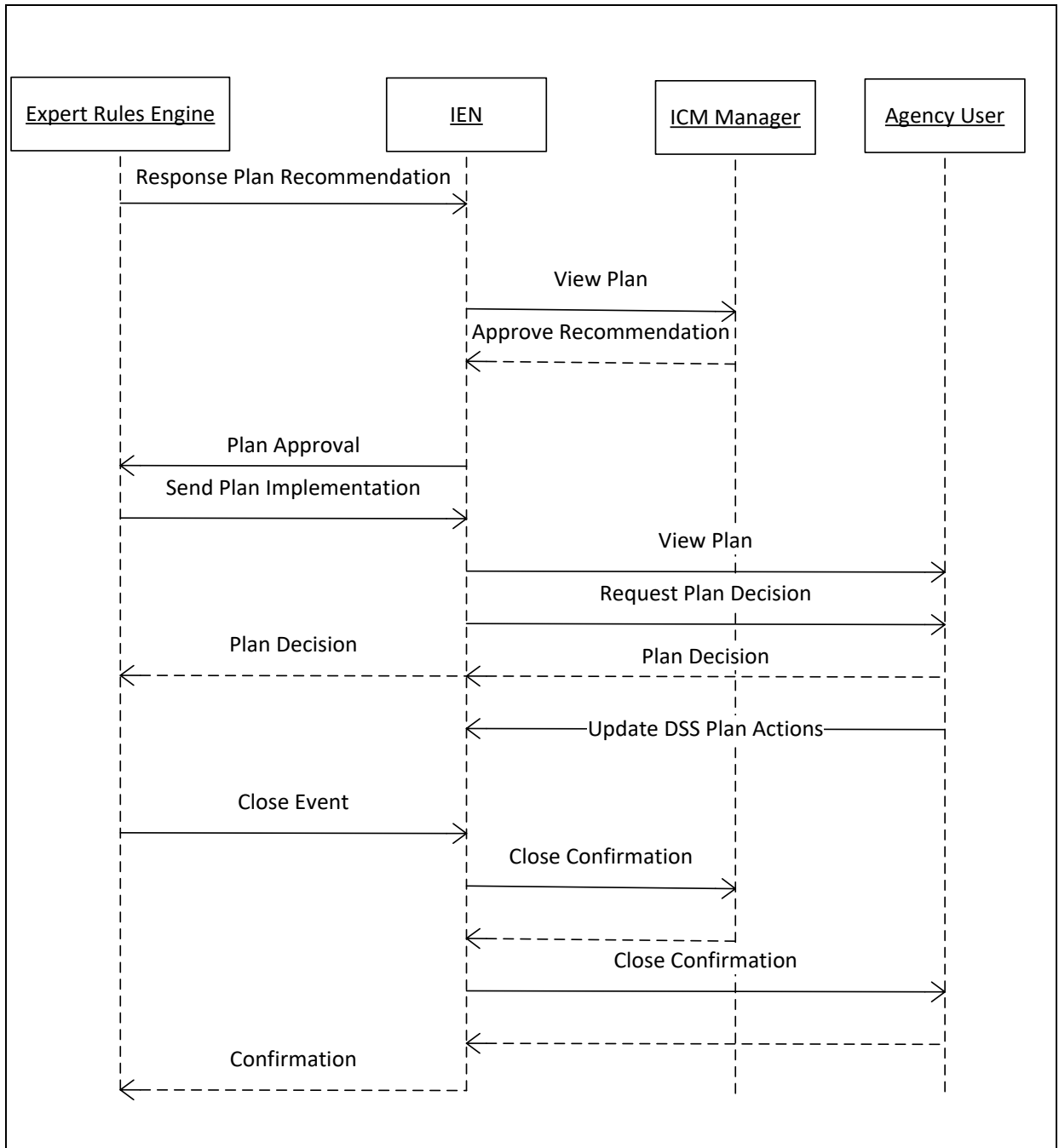
Figure 8: IEN Sequence Diagram

3.3.6.4 Information Exchange Network Requirements

Table 15: Information Exchange Network Requirements

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1	The IEN shall provide agency users the capability to view current status of the transportation network.	F	1.1	IEN	Demonstrate
1.1.1.1	The IEN shall provide an event list that shall allow an agency user the capability to view open, unconfirmed, and recently closed incidents in the region on the covered facilities.	F	1.1.1	IEN	Demonstrate
1.1.1.3	The IEN shall provide an event list that shall allow an agency user the capability to view all open and recently closed special events in the region on the covered facilities.	F	1.1.1	IEN	Demonstrate
1.1.1.4	The IEN event list shall contain the following fields, as available: • Status • Location • Start and End Date • Organization • Owner • Type • Severity • Code • Description	F	1.1.1	IEN	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.5	The IEN event list shall allow for a user to select an event from the list and view it on the map.	F	1.1.1	IEN	Demonstrate
1.1.1.6	The IEN event list shall allow for a user to select an event from the list and view/edit events in the event detail form.	F	1.1.1	IEN	Demonstrate
1.1.1.7	The IEN event list shall allow a user to filter events by the following categories, as available: • Dates • Organization • Event Category • Event Type • Severity	F	1.1.1	IEN	Demonstrate
1.1.1.8	The IEN event list shall allow for a user to create custom filters to filter events into/from their event list.	F	1.1.1	IEN	Demonstrate
1.1.1.9	The IEN event list shall allow for a user to search the event list for a specific string of text.	F	1.1.1	IEN	Demonstrate
1.1.1.10	The IEN shall refresh the Event list in real time, based on event updates on the system.	F	1.1.1	IEN	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.11	The IEN shall allow an agency user to create an event list report from the event list tab.	F	1.1.1	IEN	Demonstrate
1.1.2	The IEN shall receive current status of the transportation network.	F	1.1	IEN	Demonstrate
1.1.2.1	The IEN shall receive DMS data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.2	The IEN shall receive CCTV data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.4	The IEN shall receive transit vehicle location data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.5	The IEN shall receive weather data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.6	The IEN shall receive incident data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.7	The IEN shall receive parking data from the DFE.	F	1.1.2	IEN	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.2.9	The IEN shall receive link dynamic data from the DFE	F	1.1.2	IEN	Demonstrate
1.1.2.11	The IEN shall receive special event data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.3	The IEN shall allow an agency user to login via a web browser.	D	1.1	IEN	Demonstrate
1.1.4	The IEN shall provide the capability to administer user privileges.	F	1.1	IEN	Demonstrate
1.1.4.1	The IEN shall notify an agency user when the user's login request is rejected due to invalid credentials.	F	1.1.4	IEN	Demonstrate
1.1.4.3	The IEN shall allow for single sign on for authentication requests.	F	1.1.4	IEN	Demonstrate
1.1.4.4	The IEN shall allow an agency user to modify their password.	F	1.1.4	IEN	Demonstrate
1.1.4.5	The IEN shall require minimum password requirements, such as alphanumeric characters, minimum length, special characters, and password expiration.	F	1.1.4	IEN	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.4.7	The IEN shall provide an administrative user the capability to configure at least 32 agencies in the system.	F	1.1.4	IEN	Demonstrate
1.1.4.8	The IEN shall provide an administrative user the capability to roll the list of configured agencies up to a list of eight groups with up to 16 agencies per group.	F	1.1.4	IEN	Demonstrate
1.1.28	The IEN shall provide the capability to select an approval profile for each agency.	F	1.1	IEN	Demonstrate
1.1.28.1	The IEN shall provide the capability to select a jurisdiction for each agency.	F	1.1.28	IEN	Demonstrate
1.1.28.1	The IEN shall provide the capability to add asset permissions to a jurisdiction.	F	1.1.28	IEN	Demonstrate
1.1.5.1	The IEN shall provide an administrative user the capability to create an agency user profile in the DFE.	F	1.1.5	IEN	Demonstrate
1.1.5.2	The IEN shall provide an agency user the capability to modify an agency user profile in the DFE.	F	1.1.5	IEN	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.5.3	The IEN shall provide an agency administrator the capability to deactivate an agency user profile in the DFE.	F	1.1.5	IEN	Demonstrate
1.1.1.1	The IEN shall provide agency users the capability to view current roadway conditions.	F	1.1.1	IEN	Demonstrate
1.1.1.2	The IEN shall provide agency users the capability to view current status of managed lane facilities in the corridor.	F	1.1.1	IEN	Demonstrate
1.1.5	The IEN shall provide an agency user the capability to manage events.	F	1.1	IEN	Demonstrate
1.1.6	The IEN shall provide an agency user the capability to send via email the incident description as defined in the data dictionary.	F	1.1	IEN	Demonstrate
1.1.5.1	The IEN shall provide an agency user the capability to create an incident event.	F	1.1.5	IEN	Demonstrate
1.1.5.6	The IEN shall provide an agency user the capability to modify an incident.	F	1.1.5	IEN	Demonstrate
1.1.5.7	The IEN shall provide an agency user the capability to close an incident.	F	1.1.5	IEN	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.5.10	The IEN shall provide an agency user the capability to create associated response plan actions for an incident.	F	1.1.5	IEN	Demonstrate
1.1.7	The IEN shall provide an agency user the capability to send via email the incident description as defined in the data dictionary.	F	1.1	IEN	Demonstrate
1.1.1.3	The IEN shall provide an agency user the capability to view information layers on a GIS-based map as defined in the data dictionary.	F	1.1.1	IEN	Demonstrate
1.1.1.4	The IEN GIS-based map shall allow for static and dynamic layers to be added or removed as necessary.	F	1.1.1	IEN	Demonstrate
1.1.1.4.1	Information icons on the GIS-based map shall be grouped when they overlap to avoid cluttering on the map.	F	1.1.1.4	IEN	Demonstrate
1.1.1.4.2	When information icons are grouped on the GIS-based map, the parent/grouped icon shall contain the number of nested icons that have been grouped to form the parent icon.	F	1.1.1.4	IEN	Demonstrate
1.1.1.4.3	A parent/grouped information icon shall, when clicked, display the nested icons along with color coding.	F	1.1.1.4	IEN	Demonstrate
1.1.1.4.4	Nested icons, when clicked, shall show the nested sub-icons, along with color coding.	F	1.1.1.4	IEN	Demonstrate
1.1.1.4.5	A nested icon, when clicked, shall display information associated with the clicked icon in the IEN.	F	1.1.1.4	IEN	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
	Icons representing devices shall display the status of the device they represent.				
1.1.1.5	The IEN shall provide an agency user the capability to view incident information in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.5.1	The IEN shall provide an agency user the capability to filter incidents based on specified data fields	F	1.1.1.5	IEN	Demonstrate
1.1.1.8	The IEN shall provide an agency user the capability to view active special event information in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.8.1	The IEN shall provide an agency user the capability to filter special events based on specified data fields.	F	1.1.1.8	IEN	Demonstrate
1.1.1.9	The IEN shall provide an agency user the capability to view planned special event information in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.9.1	The IEN shall provide an agency user the capability to filter planned special events based on specified data fields.	F	1.1.1.9	IEN	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.8	An event icon, when clicked, shall provide the following event information: • Timeline of Event (Event Start) • Lanes Affected • Last Updated Date/Time • Event Type • Event Location • Nearest CCTV	F	1.1	IEN	Demonstrate
1.1.9	The nearest CCTV to an event, when displayed in the event information GUI, shall be determined by searching a configurable radius X miles from the event, where X is a configurable value.	F	1.1	IEN	Demonstrate
1.1.11	The IEN shall provide an agency user the capability to view signal status information in the corridor as a selectable layer on a GIS-based map as available.	F	1.1	IEN	Demonstrate
1.1.13	The IEN shall provide agency users the capability to view transit vehicle locations as a selectable layer on a GIS-based map for passenger rail providers, denoted as a unique icon located at the last known position of the vehicle.	F	1.1	IEN	Demonstrate
1.1.16	The IEN shall provide agency users the capability to view transit vehicle locations as a selectable layer on a GIS-based map for transit providers, denoted as a unique icon located at the last known position of the vehicle.	F	1.1	IEN	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.19	The IEN shall provide agency users the capability to view the vehicle locations of up to 8 bus provider agencies in the region as a selectable layer on a GIS-based map.	F	1.1	IEN	Demonstrate
1.1.19.1	The IEN shall provide agency users the capability to view the location of bus transit vehicles for LYNX.	F	1.1.19	IEN	Demonstrate
1.1.19.2	The IEN shall provide agency users the capability to view the location of bus transit vehicles for Votran.	F	1.1.19	IEN	Demonstrate
1.1.20	The IEN shall provide agency users the capability to view the vehicle locations of up to 8 rail provider agencies in the region as a selectable layer on a GIS-based map.	F	1.1	IEN	Demonstrate
1.1.20.4	The IEN shall provide agency users the capability to view the location of rail transit vehicles for SunRail.	F	1.1.20	IEN	Demonstrate
1.1.23	The IEN shall provide agency users the capability to view on-street parking data in the region as a selectable layer on a GIS-based map, grouped by block, per direction.	F	1.1	IEN	Demonstrate
1.1.23.1	The IEN shall provide agency users the capability to view parking garage/surface lot data in the region as a selectable layer on a GIS-based map.	F	1.1.23	IEN	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.23.2	The IEN shall provide agency users the capability to view rest area/weigh station parking data in the region as a selectable layer on a GIS-based map.	F	1.1.23	IEN	Demonstrate
1.1.23.3	The IEN shall provide agency users the capability to view parking data in the region as a selectable layer on a GIS-based map.	F	1.1.23	IEN	Demonstrate
1.1.23.4	On-street parking shall be presented on the GIS-based map as polyline segments on the roadway at the corresponding geographic location.	F	1.1.23	IEN	Demonstrate
1.1.23.5	Sections of on-street parking shall be combined to form sections greater than a block if zoom level/resolution does not support the ability for a user to differentiate locations	F	1.1.23	IEN	Demonstrate
1.1.23.6	on-street parking spaces initially shall be grouped by block, and display the number of spaces and number of available spaces.	F	1.1.23	IEN	Demonstrate
1.1.23.6.1	For overlapping icons representing blocks of on-street parking, rather than grouping the icons, group the total number of spaces and available spaces	F	1.1.23.6	IEN	Demonstrate
1.1.23.7	Garage parking shall be presented on the GIS-based map as approximations of the representations of the building dimensions at the corresponding geographic location.	F	1.1.23	IEN	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.23.8	If a garage parking lot is too small to discern based on approximations of the representations of the building dimensions, the garage parking lot shall be presented on the GIS-based map in the form of an icon.	F	1.1.23	IEN	Demonstrate
1.1.23.10	Upon clicking a parking garage icon, garage color, or on-street parking block, the following information shall be provided: • Total number of spaces • Number of occupied spaces	F	1.1.23	IEN	Demonstrate
1.1.23.11	On-street parking segment polylines on the GIS-based map shall be color coded with up to 5 system-wide configurable values to indicate current occupancy, least occupied to most occupied.	F	1.1.23	IEN	Demonstrate
1.1.23.12	For rest areas, the number of spaces and the number of occupied spaces shall displayed with the same color scheme as above	F	1.1.23	IEN	Demonstrate
1.1.23.13	Beach parking shall be grouped by access points and shall conform to the requirements of a parking garage.	F	1.1.23	IEN	Demonstrate
1.1.23.14	Weigh station and rest area truck parking shall conform to the requirements of a parking garage.	F	1.1.23	IEN	Demonstrate
1.1.1.2	The IEN shall provide agency users the capability to view dynamic link data as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.3	Each link shall be clickable in the IEN GIS map and when clicked, shall display currently available data for speed, travel time, occupancy, or volume for the link – traffic conditions data as available	F	1.1.1	IEN	Demonstrate
1.1.1.4	The IEN shall provide an agency user the capability to view location, current status, and current message of DMS in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.5	The IEN shall provide an agency user the capability to view location, current status, and current image snapshot of CCTVs as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.6	The IEN shall provide an agency user the capability to view location, current status, and timing plan of traffic signals as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.7	The IEN shall provide an agency user the capability to view current weather alerts from the National Weather Service as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.7.1	National Weather Service weather alerts shall be color coded to indicate the following alert types: • Fire • Flood • Hurricane • Thunderstorm • Tornado	F	1.1.1.7	IEN	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.7.2	The IEN shall provide an agency user the capability to view a weather radar overlay as a selectable layer on a GIS map.	F	1.1.1	IEN	Demonstrate
1.1.1.7.3	The IEN weather radar overlay shall be provided in a motion loop, indicating changing weather conditions in real-time.	F	1.1.1.7	IEN	Demonstrate
1.1.1.7.4	The IEN shall include a legend describing the weather alert types, and associated color codes.	F	1.1.1.7	IEN	Demonstrate
1.1.1.7.5	The weather alert legend color codes shall be configurable in the system to allow for changes to colors for the different conditions.	F	1.1.1.7	IEN	Demonstrate
1.1.1.7.6	The IEN shall include a legend describing the weather radar overlay rainfall intensities and associated color codes.	F	1.1.1.7	IEN	Demonstrate
1.1.1.7.7	The weather radar overlay legend color codes shall be configurable in the system to allow for changes to colors for the different conditions.	F	1.1.1.7	IEN	Demonstrate
1.1.3.1	The IEN shall provide an agency user the capability to create an approval profile.	F	1.1.3	IEN	Demonstrate
1.1.3.2	The IEN shall provide an agency user the capability to configure the system to automatically approve a response request after a period of time defined by the user.	F	1.1.3	IEN	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.3.3	The IEN shall provide an agency user the capability to configure the systems to automatically reject a response request after a period of time defined by the user.	F	1.1.3	IEN	Demonstrate
1.1.3.4	The IEN shall provide an agency user the capability to configure the system to automatically approve a response request during defined hours of the day after a period of time defined by the user.	F	1.1.3	IEN	Demonstrate
1.1.5.1	The IEN shall provide a logged on agency user with an alarm indicator when a response plan recommendation is made by the DSS	F	1.1.5	IEN	Demonstrate
1.1.5.1.1	The IEN shall provide a logged on agency user with a pop-up indicating when a response plan recommendation is made by the DSS.	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.2	The IEN shall create an alarm once a response plan has been recommended by the DSS	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.3	The IEN shall provide a user the capability to view an alarm	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.4	The IEN shall provide a user the capability to confirm an alarm	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.5	The IEN shall provide a user the capability to ignore an alarm	F	1.1.5.1	IEN	Demonstrate

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.5.1.6	The IEN shall provide a user the capability to acknowledge an alarm	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.7	The IEN shall provide a user the capability to open the event associated with the alarm	F	1.1.5.1	IEN	Demonstrate
1.1.1.7.8	The IEN shall provide an agency user with a pop-up indicating a National Weather Service weather alert.	F	1.1.1.7	IEN	Demonstrate
1.23.1	The IEN shall allow an agency user to run custom reports.	F	1.23	IEN	Demonstrate
1.23.2	The report component of the IEN shall be accessible via main menu navigation.	F	1.23	IEN	Demonstrate
1.23.2.1	The report component of the IEN shall be initially configured with, at a minimum, 6 report templates.	F	1.23.2	IEN	Demonstrate
1.23.2.2	The report component of the IEN shall allow for an administrative user to be able to add new reports after the system is deployed.	F	1.23.2	IEN	Demonstrate
1.23.2.3	The report component of the IEN shall provide the capability for a user to apply filters to filter data when running a report in the system.	F	1.23.2	IEN	Demonstrate
1.23.2.4	The report component of the IEN shall provide the capability for a user to generate a report in PDF, HTML, and Excel formats.	F	1.23.2	IEN	Demonstrate
1.24.1	The IEN shall provide the capability for a user to select a pre-defined dashboard.	F	1.24	IEN	Demonstrate

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Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.24.1.1	The IEN shall provide the capability for a user with the ability to configure the data displayed on a dashboard.	F	1.24.1	IEN	Demonstrate
1.25.1.15	The IEN shall include a menu item to open the SOT module.	F	1.25.1	IEN	Demonstrate

4 User Definitions

This section defines the terms and definitions used in the requirements document.

Real-time – receipt or calculation of conditions within 2 minutes of occurrence

Near real-time - receipt or calculation of conditions more than 2 minutes of occurrence, but within 30 minutes of occurrence

Status – condition of infrastructure

Active - not marked as out-of-order or in-maintenance

Link - the portion of a model connecting two nodes. The link is defined within the model as:
- Facility type
- Number of lanes
- Capacity per lane
- Speed limit
- Average jam density

Node – point of branching of physical connections, or terminating a physical connection within a simulation model

Average jam density - the maximum number of vehicles per unit length of the highway link

Intermodal network conditions – current status and state of modes of travel within the network

Consistency – the system's estimation error will fall within a pre-determined range

Real-world conditions – model capabilities to match conditions of actual network

Corridor management strategy – management plan for an event or incident within the corridor. These strategies include:
- Pre-trip and en-route traveler information provision
- Congestion pricing
- Traffic signal timing modification
- Transit service modification
- Transit signal priority
- Parking management and pricing
- Combinations of the above

Traffic management scheme – a traffic management scheme consists of the different actions that will be implemented by all agencies to manage the corridor. These actions are:

- List of DMS to be activated along with their messages
- Transit vehicle service pattern including any route and headway modifications
- Traffic signal timing plan(s) of all signalized intersections

Environment-oriented – factor relating to the environment of the system

4.1 Action Verbs and Terms

This section defines the action verbs and terms and definitions used in this requirements document.

Table 16: Action Verbs

VERB	DEFINITION
Accept	to receive (e.g. data feed from another system)
Activate	to make active; cause to function or act (e.g. to make a planned event an active incident)
Add	to add (e.g. add a timestamp to a record)
Aggregate	to bring together; collect into one
Allow	to give permission to or for
Authorize	to give authority or official power to (associated with security authentication requirement)
Collect	to get from source; assemble
Compare	to examine (two or more objects, ideas, people, etc.) in order to note similarities and differences
Compute	to determine or ascertain by mathematical or logical means
Confirm	to make valid or binding by some formal or legal act; sanction; ratify
Determine	to settle or decide (a dispute, question, etc.) by an authoritative or conclusive decision
Display	to output (data) on a monitor or other screen
Evaluate	to judge or determine the significance, worth, or quality of; assess
Execute	to run (a program or routine) or to carry out (an instruction in a program)
FIT	FIT is used as a calculation of nearness between a timing plan and an optimal timing plan for a given interval.
FIT Improvement	The difference between the FIT of two timing plans
Filter	to remove by the action of a filter
Generate	to bring into existence; cause to be; produce (erg. generate a log file)
Import	to bring (documents, data, etc.) into one software program from another, implies translate
Index	a value that identifies and is used to locate a particular element within a data array or table
Manage	to handle, direct, govern, or control in action or use (e.g. manage the add, change, delete of an object)
Merge	to combine or blend
Monitor	to watch closely for purposes of control, surveillance, etc.; keep track of; check continually
Notify	to inform (someone) or give notice to
Parse	to analyze (a string of characters) in order to associate groups of characters with the syntactic units of the underlying grammar
Predict	to declare or tell in advance; prophesy; foretell
Provide	to make available (e.g. provide a function to a user)

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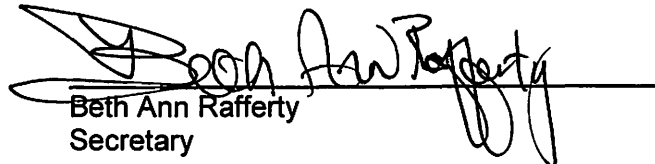| VERB	DEFINITION
Publish	to make generally known (e.g. publish to center-to-center)
Receive	to get or be informed of
Recommend	to advise, as an alternative; suggest (a choice, course of action, etc.)
Refresh	to read and write (the contents of dynamic storage) at intervals in order to avoid loss of data
Remove	to get rid of; do away with (e.g. remove from User Interface display)
Reside	- Hardware constraint - e.g. reside in a controller cabinet
Restore	to bring back to a former, original, or normal condition
Restrict	to confine or keep within limits, as of space, action, choice, intensity, or quantity
Retrieve	to locate and read (data) from storage, as for display on a monitor
Save	to copy (a file) from RAM onto a disk or other storage medium
Search	to examine (one or more files, as databases or texts) electronically, to locate specified items
Select	to make a choice; pick
Send	to cause to be transmitted to a destination
Simulate	to create a simulation, likeness, or model of (a situation, system, or the like)
Sort	to arrange according to sort, kind, or class; separate into sorts; classify
Start	to set in operation
Store	to put or retain (data) in a memory unit
Translate	to convert (a program, data, code, etc.) from one form to another
Update	to incorporate new or more accurate information in (a database, program, procedure, etc.)
Use	- Constraint Only - to utilize a specific technology
Validate	to substantiate

CERTIFICATE OF RESOLUTION

I, Beth Ann Rafferty, Secretary of Southwest Research Institute®, a Texas nonprofit corporation, certify that R. B. Kalmbach, as Executive Director of Contracts, is duly authorized by the Board of Directors to sign, on behalf of Southwest Research Institute, all contracts and agreements for research services or related to research services to be performed by Southwest Research Institute. Such authority was granted in Board of Directors Resolution No. 2017-10, which states in part:

> All contracts and agreements for research services or related to research services to be performed by Southwest Research Institute for or with other organizations, groups, or individuals, shall be executed by any one (1) of the following Institute officers: Chief Executive Officer; Chief Operating Officer; President; Executive Vice President; Chief Financial Officer; Senior Vice President-Finance; Vice President-Finance; Treasurer; Assistant Treasurer; Vice President and General Counsel; General Counsel; or by one (1) of the following Institute staff: Executive Director-Contracts; Director-Contracts; Assistant Director-Contracts; Group Leader-Contracts; Director-Business Services; Manager-Contracts; Assistant Manager-Contracts;Principal Specialist-Contracts; Staff Specialist-Contracts; Senior Specialist-Contracts; Senior Counsel; Deputy General Counsel; Associate General Counsel or Senior Attorney and, when required, attested to by the Corporate Secretary or Assistant Secretary.

Resolution 2017-10 was duly adopted at a meeting of the Board of Directors called and held as required by law and the bylaws of the corporation, at the corporation's principal offices located at 6220 Culebra Road, San Antonio, Texas 78238, on September 25, 2017, at which meeting a quorum of the Board of Directors were present.

EXECUTED by me, as Secretary of the corporation, on the 6th day of March 2018.

Beth Ann Rafferty
Secretary

2017 FOREIGN NOT FOR PROFIT CORPORATION ANNUAL REPORT

DOCUMENT# F97000000885

Entity Name: SOUTHWEST RESEARCH INSTITUTE INC.

Current Principal Place of Business:

6220 CULEBRA ROAD
SAN ANTONIO, TX 78238

Current Mailing Address:

6220 CULEBRA ROAD
SAN ANTONIO, TX 78238 US

FEI Number: 74-1070544

Certificate of Status Desired: No

Name and Address of Current Registered Agent:

C T CORPORATION SYSTEM
1200 SOUTH PINE ISLAND ROAD
PLANTATION, FL 33324 US

The above named entity submits this statement for the purpose of changing its registered office or registered agent, or both, in the State of Florida.

SIGNATURE:

_____

Electronic Signature of Registered Agent   Date

Officer/Director Detail :

Title	PRESIDENT		Title	TREASURER
Name	HAMILTON, ADAM L.		Name	BOEHME, LINDA
Address	6220 CULEBRA ROAD		Address	6220 CULEBRA ROAD
City-State-Zip:	SAN ANTONIO TX 78238		City-State-Zip:	SAN ANTONIO TX 78238
Title	DIRECTOR		Title	DIRECTOR
Name	HAMILTON, ADAM L.		Name	PFEIFFER, PHILIP J.
Address	6220 CULEBRA ROAD		Address	6220 CULEBRA ROAD
City-State-Zip:	SAN ANTONIO TX 78238		City-State-Zip:	SAN ANTONIO TX 78238
Title	DIRECTOR		Title	DIRECTOR
Name	ALEXANDER, WAYNE S.		Name	AMES, GENE
Address	6220 CULEBRA ROAD		Address	6220 CULEBRA ROAD
City-State-Zip:	SAN ANTONIO TX 78238		City-State-Zip:	SAN ANTONIO TX 78238
Title	DIRECTOR		Title	DIRECTOR
Name	HEMMINGHAUS, ROGER R.		Name	RANKIN, MARY ANN
Address	6220 CULEBRA ROAD		Address	6220 CULEBRA ROAD
City-State-Zip:	SAN ANTONIO TX 78238		City-State-Zip:	SAN ANTONIO TX 78238

Continues on page 2

I hereby certify that the information indicated on this report or supplemental report is true and accurate and that my electronic signature shall have the same legal effect as if made under oath; that I am an officer or director of the corporation or the receiver or trustee empowered to execute this report as required by Chapter 617, Florida Statutes; and that my name appears above, or on an attachment with all other like empowered.

SIGNATURE: ADAM L. HAMILTON   PRESIDENT   04/14/2017

_____

Electronic Signature of Signing Officer/Director Detail   Date

Officer/Director Detail Continued :

Title	DIRECTOR		Title	DIRECTOR
Name	BATES, J. DAN		Name	KORBELL, JOHN C.
Address	6220 CULEBRA ROAD		Address	6220 CULEBRA ROAD
City-State-Zip:	SAN ANTONIO TX 78238		City-State-Zip:	SAN ANTONIO TX 78238
Title	DIRECTOR		Title	DIRECTOR
Name	ROMO, RICARDO		Name	DOWNING, WALTER D.
Address	6220 CULEBRA ROAD		Address	6220 CULEBRA ROAD
City-State-Zip:	SAN ANTONIO TX 78238		City-State-Zip:	SAN ANTONIO TX 78238
Title	DIRECTOR		Title	DIRECTOR
Name	LEE, MILTON B.		Name	ZACHRY, DAVID S.
Address	6220 CULEBRA ROAD		Address	6220 CULEBRA ROAD
City-State-Zip:	SAN ANTONIO TX 78238		City-State-Zip:	SAN ANTONIO TX 78238
Title	DIRECTOR		Title	SECRETARY
Name	DUNCAN, A. BAKER		Name	RAFFERTY, BETH ANN
Address	6220 CULEBRA ROAD		Address	6220 CULEBRA ROAD
City-State-Zip:	SAN ANTONIO TX 78238		City-State-Zip:	SAN ANTONIO TX 78238

To: Ashley.Henning@dot.state.fl.us

FLORIDA DEPARTMENT OF TRANSPORTATION
FUNDS APPROVAL

BE521

12/21/2017

CONTRACT INFORMATION

Contract:	BE521
Contract Type:	B1 - OTHER CONTRACTUAL SERVICE (OTHER CS)
Method of Procurement:	P - INVITATION TO NEGOTIATE
Vendor Name:	SOUTHWEST RESEARCH INSTITUTE
Vendor ID:	F741070544001
Beginning Date of This Agreement:	12/19/2017
Ending Date of This Agreement:	12/31/2024
Contract Total/Budgetary Ceiling:	ct = $6,886,770.00
Description:	Central Florida Regional Integrated Corridor Management System

FUNDS APPROVAL INFORMATION

FUNDS APPROVED/REVIEWED FOR ROBIN M. NAITOVE, CPA, COMPTROLLER ON 12/21/2017

Action:	Original
Reviewed or Approved:	APPROVED
Organization Code:	55054030511
Expansion Option:	AH
Object Code:	139900
Amount:	$5,900,000.00
Financial Project:	43632818201
Work Activity (FCT):	683
CFDA:	
Fiscal Year:	2018
Budget Entity:	55150200
Category/Category Year:	088866/18
Amendment ID:	O001
Sequence:	00
User Assigned ID:	
Enc Line (6s)/Status:	0001/04

Total Amount: $5,900,000.00

To: Ashley.Henning@dot.state.fl.us

FLORIDA DEPARTMENT OF TRANSPORTATION
FUNDS APPROVAL

BE521

12/19/2017

CONTRACT INFORMATION

Contract:	BE521
Contract Type:	B1 - OTHER CONTRACTUAL SERVICE (OTHER CS)
Method of Procurement:	P - INVITATION TO NEGOTIATE
Vendor Name:	SOUTHWEST RESEARCH INSTITUTE
Vendor ID:	F741070544001
Beginning Date of This Agreement:	12/19/2017
Ending Date of This Agreement:	12/31/2024
Contract Total/Budgetary Ceiling:	ct = $6,886,770.00
Description:	Central Florida Regional Integrated Corridor Management System

FUNDS APPROVAL INFORMATION

FUNDS APPROVED/REVIEWED FOR ROBIN M. NAITOVE, CPA, COMPTROLLER ON 12/19/2017

Action:	Future Year
Reviewed or Approved:	*REVIEWED
Organization Code:	55054030511
Expansion Option:	AH
Object Code:	139900
Amount:	$986,770.00
Financial Project:	43632818201
Work Activity (FCT):	683
CFDA:	
Fiscal Year:	2019
Budget Entity:	55150200
Category/Category Year:	088866/19
Amendment ID:	A001
Sequence:	00
User Assigned ID:	
Enc Line (6s)/Status:	/04

Total Amount: $986,770.00

*Reviewed Funds Approval and encumbrance processing is contingent upon Annual Legislative appropriation.

Attachment 7: Performance Bond

TRAVELERS

One Tower Square
Hartford, CT 06183

March 3, 2017

State of Florida
Department of Transportation
Procurement Office
719 South Woodland Blvd, MS 4-524
DeLand, FL 32720

RE: Central Florida Regional Integrated Corridor Management System
ITN-DOT-16-17-5004-ICMS

To Whom It May Concern:

This is to advise that if Southwest Research Institute is a successful bidder to
the above captioned project, then we, Travelers Casualty and Surety Company
of America, are prepared to write the required Performance Bond in the amount
of the contract.

However, the issuance of any Performance bond will depend on the
underwriting conditions which exist at the time the bond is requested and the
final review of the negotiated contract and its terms and conditions.

Sincerely,

Travelers Casualty and Surety Company of America

Lisa A. Ward
Attorney-In-Fact

ID	784
Advertisement Date	2/10/2017
Vendor Name	Southwest Research Institute, Inc
Contract Manager	☐ Patel, Tushar
Contract Category	Contractual Services
Advertisement Type	ITN
Advertisement Number	ITN-DOT-16-17-5004-ICMS
District	D5
County	DISTRICTWIDE
Description	Central Florida Regional Integrated Corridor Management System
Scope	The ICMS will consist of, but not be limited to; commercial off-the-shelf (COTS) modeling software, a custom built decision support system (DSS), and a custom built information exchange network (IEN) subsystem
Estimated Contract Start Date	1/1/2018
Estimated Contract End Date	12/31/2023
Federal Funds	No
Estimated Contract Amount	$7,000,000.00
Approved By Executive Office	Yes

Version: 3.0
Created at 4/6/2017 3:38 PM by ☐ Henning, Ashley
Last modified at 12/22/2017 10:46 AM by ☐ Carpenter, Amanda

Enhanced with DFFS

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