REQUEST for PROPOSAL # 927

PROFESSIONAL, TECHNICAL AND EXPERT SERVICES

Clark County Washington

RELEASE DATE: WEDNESDAY, JUNE 4, 2025
DUE DATE: WEDNESDAY, JULY 9, 2025 by 11:00 am

Request for Proposal for:

2025 SYSTEM WIDE SIGNAL ENHANCEMENT

Federal Aid Project Number CM-9906(060)

SUBMIT:
One (1) Original
Four (4) Complete Copies
One (1) USB Flash Drive Copy

of the Proposal to:

Shipping Method of your Choice or Hand Delivery	**United States Postal Service**
Clark County ATTN: Office of Purchasing 1300 Franklin Street, 6th Floor, Suite 650 Vancouver WA 98660 564-397-2323	Clark County ATTN: Office of Purchasing PO Box 5000 Vancouver WA 98666-5000 564-397-2323

Office Hours: 8:00 am – 3:00 pm, Monday – Friday, except Legal Holidays.
No electronic submissions.

Proposals must be delivered to the Purchasing office – No Exceptions
Proposals must be date and time stamped by Purchasing staff by 11:00 am on due date – No Exceptions
****Proposal shall be sealed and clearly marked on the package cover with RFP #, Title & Company Name**

Refer Questions to Project Manager:

Ali Pilkington
Capital Project Manager II / Clark County Public Works
Ali.Pilkington@clark.wa.gov
Phone 360-989-6153

ADMINISTRATIVE REQUIREMENTS - Contractors shall comply with all management and administrative requirements established by Washington Administrative Code (WAC), the Revised Code of the State of Washington (RCW), and any subsequent amendments or modifications, as applicable to providers licensed in the State of Washington.

ALL proposals submitted become the property of Clark County. It is understood and agreed that the prospective Proposer claims no proprietary rights to the ideas and written materials contained in or attached to the proposal submitted. Clark County has the right to reject or accept proprietary information.

AUTHORSHIP - Applicants must identify any assistance provided by agencies or individuals outside the proposers own organization in preparing the proposal. No contingent fees for such assistance will be allowed to be paid under any contract resulting from this RFP.

CANCELLATION OF AWARD - Clark County reserves the right to immediately cancel an award if the contractual agreement has not been entered into by both parties or if new state regulations or policy make it necessary to change the program purpose or content, discontinue such programs, or impose funding reductions. In those cases where negotiation of contract activities are necessary, Clark County reserves the right to limit the period of negotiation to sixty (60) days after which time funds may be unencumbered.

CONFIDENTIALLY - Proposer shall comply with all applicable state and federal laws governing the confidentiality of information.

CONFLICT OF INTEREST - All proposals submitted must contain a statement disclosing or denying any interest, financial or otherwise, that any employee or official of Clark County or the appropriate Advisory Board may have in the proposing agency or proposed project.

CONSORTIUM OF AGENCIES - Any consortium of companies or agencies submitting a proposal must certify that each company or agency of the consortium can meet the requirements set forth in the RFP.

COST OF PROPOSAL & AWARD - The contract award will not be final until Clark County and the prospective contractor have executed a contractual agreement. The contractual agreement consists of the following parts: (a) the basic provisions and general terms and conditions, (b) the special terms and conditions, (c) the project description and goals (Statement of Work), and (d) the budget and payment terms. Clark County is not responsible for any costs incurred prior to the effective date of the contract. Clark County reserves the right to make an award without further negotiation of the proposal submitted. Therefore, the proposal should be submitted in final form from a budgetary, technical, and programmatic standpoint.

DISPUTES - Clark County encourages the use of informal resolution to address complaints or disputes arising over any actions in implementing the provisions of this RFP. Written complaints should be addressed to Clark County – Purchasing, P.O. Box 5000, Vancouver, Washington 98666-5000.

DIVERSITY IN EMPLOYMENT AND CONTRACTING REQUIREMENTS - It is the policy of Clark County to require equal opportunity in employment and services subject to eligibility standards that may be required for a specific program. Clark County is an equal opportunity employer and is committed to providing equal opportunity in employment and in access to the provision of all county services. Clark County's Equal Employment Opportunity Plan is available at http://www.clark.wa.gov/hr/documents.html. This commitment applies regardless of race, color, religion, creed, sex, marital status, national origin, disability, age, veteran status, on-the-job injury, or sexual orientation. Employment decisions are made without consideration of these or any other factors that are prohibited by law. In compliance with department of Labor Regulations implementing Section 504 of the rehabilitation Act of 1973, as amended, no qualified handicapped individual shall be discriminated against in admission or access to any program or activity. The prospective contractor must agree to provide equal opportunity in the administration of the contract, and its subcontracts or other agreements.

MUNICIPAL RESEARCH and SERVICE CENTER - Clark County (WA) contracts with the Municipal Research and Service Center (MRSC) to maintain our Consultant, Small Works and Vendor rosters. To be eligible to participate in this Clark County public solicitation and the resulting contract, your business must be registered with the MRSC Rosters. Failure to register may result in your proposal being marked nonresponsive. Be sure to select Clark County in your application. If you have questions about the registration process, contact the MRSC Rosters at 206-436-3798 or https://mrscrosters.org/businesses/business-membership/

INDEPENDENT PRICE DETERMINATION - The prospective contractor guarantees that, in connection with this proposal, the prices and/or cost data have been arrived at independently, without consultation, communication, or agreement for the purpose of restricting competition. This does not preclude or impede the formation of a consortium of companies and/or agencies for purposes of engaging in jointly sponsored proposals.

INTERLOCAL AGREEMENT - Clark County has made this RFP subject to Washington State statute RCW 39.34. Therefore, the proposer may, at the proposers option, extend identical prices and services to other public agencies wishing to participate in this RFP. Each public agency wishing to utilize this RFP will issue a purchase order (or contract) binding only their agency. Each contract is between the proposer and the individual agency with **no** liability to Clark County.

LIMITATION - This RFP does not commit Clark County to award a contract, to pay any costs incurred in the preparation of a response to this RFP, or to procure or contract for services or supplies.

LATE PROPOSALS - A proposal received after the date and time indicated above will not be accepted. No exceptions will be made.

ORAL PRESENTATIONS - An oral presentation may be required of those prospective contractors whose proposals are under consideration. Prospective contractors may be informed that an oral presentation is desired and will be notified of the date, time and location the oral presentation is to be conducted.

OTHER AUDIT/MONITORING REQUIREMENTS - In addition, auditing or monitoring for the following purposes will be conducted at the discretion of Clark County: Fund accountability; Contract compliance; and Program performance.

PRICE WARRANT - The proposer shall warrant that the costs quoted for services in response to the RFP are not in excess of those which would be charged any other individual or entity for the same services performed by the prospective contractor, in a similar socioeconomic, geographical region.

PROTESTS - Must be submitted to the Purchasing Department.

PUBLIC SAFETY - May require limiting access to public work sites, public facilities, and public offices, sometimes without advance notice. The successful Proposer's employees and agents shall carry sufficient identification to show by whom they are employed and display it upon request to security personnel. County project managers have discretion to require the successful Proposer's employees and agents to be escorted to and from any public office, facility or work site if national or local security appears to require it.

ACCEPTANCE or REJECTION OF PROPOSALS - Clark County reserves the right to accept or reject any or all proposals received as a result of this RFP, to negotiate with any or all prospective contractors on modifications to proposals, to waive formalities, to postpone award, or to cancel in part or in its entirety this RFP if it is in the best interest of Clark County to do so.

SUBCONTRACTING - No activities or services included as a part of this proposal may be subcontracted to another organization, firm, or individual without the approval of Clark County. Such intent to subcontract shall be clearly identified in the proposal. It is understood that the contractor is held responsible for the satisfactory accomplishment of the service or activities included in a subcontract.

VERBAL PROPOSALS - Verbal proposals will not be considered in making the award of any contract as a result of this RFP.

WORKERS COMPENSATION INSURANCE – The contractor shall comply with R.C.W. Title 51- with minimum coverage limits of $500,000 for each accident, or provide evidence that State law does not require such coverage.

FOR ALTERNATIVE FORMATS
Clark County ADA Office: V: 564-397-2322
ADA@clark.wa.gov

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Request for Proposal # 927
2025 System Wide Signal Enhancement

Part I Proposal Requirements

Section IA	General Information
1. Introduction	This project will provide a cloud-based dashboard application toolset which will integrate traffic data from traffic signals appliances in the field and ITS systems for Clark County, Southwest Region WSDOT and cities within the county limits of Clark County. The intent of this toolset is to allow engineering staff to work on ongoing needs for the transportation networks. While this toolset provides key information to the users about locations which need to be analyzed due to current operation's needs, the long term goals include time-based trend analysis of safety management, hardware performance metrics, traffic patterns, maintenance needs and other areas of focus as well as how they change over time. Clark County (WA) contracts with the Municipal Research and Service Center (MRSC) to maintain our Consultant, Small Works and Vendor Rosters. To be eligible to participate in this Clark County public solicitation and the resulting contract your business must be registered with the MRSC Rosters. Failure to register may result in your proposal being marked nonresponsive. Be sure to select Clark County in your application. If you have questions about the registration process, contact the MRSC Rosters at 206-436-3798 or https://mrscrosters.org/businesses/business-membership/ If your company contact details ***are not*** on the Plan Holder List at https://clark.wa.gov/internal-services/request-proposal-1 Attachment B, Letter of Interest must be submitted to participate in this RFP. Proposers shall respond to all sections to be considered. Clark County has made this Request for Proposal subject to Washington State statute RCW 39.34 Interlocal Cooperation Act. The proposer may opt to extend identical services and prices to qualified public agencies. Each contract is between the proposer and individual agency binding only their agency, with no liability to Clark County. The 2025 System Wide Signal Enhancement project is funded primarily with a federal grant and must meet federal Equal Employment Opportunity Commission (EEOC) requirements. The Washington State Department of Transportation has assigned this project a mandatory Disadvantaged Business Enterprise (DBE) participation goal of sixteen percent (16%). More information about the DBE program can be found at the following websites as well as in Chapter 26 of the WSDOT Local Agency Guidelines: https://wsdot.wa.gov/publications/manuals/fulltext/M36-63/Lag26.pdf https://wsdot.wa.gov/business-wsdot/equal-opportunity-contracting/diverse-business-programs http://www.wsdot.wa.gov/EqualOpportunity/BDDirectory.htm
2. Background	This project is closely aligned with the previous initiative, SIGNAL TIMING, EVALUATION, VERIFICATION, and ENHANCEMENT v2.0, commonly referred to as STEVE2. During STEVE2, a consultant collaborated extensively with Clark County and relevant data source entities to assess and map the existing data stream architecture, while also planning for its future state to ensure the success of this project. The System Engineering document created during this effort is included as an Exhibit following the RFP and should be reviewed prior to preparing proposals. The issue being addressed is that the current system requires significant manual labor to extract data from individual streams, limiting traffic engineers' ability to comprehensively assess the overall state of traffic systems.

	It has been a longstanding goal for the Traffic department to have advanced analytics, anomalous alerting capabilities and other visually driven tools to enable a more comprehensive approach to traffic management in Clark County.

3. Scope of Project	This project will provide a cloud-based data lake and dashboard application (toolset) which will integrate traffic data from traffic signal devices in the field and ITS systems for Clark County, Southwest Region WSDOT and cities within the County limits of Clark County. The intent of this toolset is to allow engineering staff to work on ongoing needs for the transportation networks, while it provides key information to the users about locations that need to be analyzed due to current operation's needs, the long term goals include time-based trend analysis for safety management, hardware performance metrics, traffic patterns, maintenance needs and other areas of focus as well as how they change over time.
	
	This project will integrate existing Clark County and Washington State Department of Transportation (WSDOT) data streams into a dashboard view of live and near real-time transportation system performance measures. It will also provide historical information and report to Portland State University's (PSU) Portland Oregon Transportation Archive Listing (PORTAL). Data sets that will be integrated into the dashboard and PSU traffic data PORTAL include, but are not limited to:
	
	• WSDOT Next Generation Traffic Management System (NG TMS) data feed
	• Clark County / WSDOT Trafficware ATMS.now data, including:
	  ○ Connected Vehicle Signal Phasing and Timing (SPAT) data
	  ○ Connected Vehicle Basic Safety Message (BSM) data
	  ○ Export of reports and high-resolution Purdue data
	  ○ Split divisions, including reason for end of phase
	  ○ Detector of traffic counts and occupancy data
	  ○ System alarms
	• Opticom Central Management Software (CMS)
	  ○ Emergency vehicle preemption data
	  ○ Railroad preemption data
	  ○ Count data from next-generation vehicle detectors
	• Wavetronix count station data
	• Azure Cloud-Based Data-Lake
	
	The toolset will be able to integrate future data streams, based on a defined data standard, and will utilize the county's cloud-based data lake as well as the WSDOT NG TMS data feed, not poll directly from the County's on premises servers.
	
	Additionally, this dashboard will allow separate login options and give the ability to have custom viewing options for external stakeholders.
	
	The toolset will allow for multiple unique simultaneous logons.
	
	The toolset should allow for customizable dashboards for use by different entities. The individual customized views shall be sharable between users.
	
	Primarily looking at anomalous behaviors, this project will automatically integrate and normalize traffic and transportation data to provide clear indications of the operation of the transportation network. The system will include user-specified Measures of Effectiveness (MOE) for corridors, intersections and mode types, allowing for the users to select different MOE's by time of day or day of week. The toolset shall be able to show the users how the

	current transportation conditions meet, exceed or are below the MOE's, and if the situation is unique, or a recurring situation.
	
	The system shall be able to provide many of, if not all of the following MOE's with supporting data:
	
	• Percent arrival on green
	• Percent arrival on red
	• Pedestrian delay time (time from push of button to WALK service)
	• Travel time on corridors (based on Tom Tom data)
	• Vehicle and pedestrian detector failures based on NTCIP detector status
	• Purdue Split Failure
	• Turning Movement Counts (from Gridsmart and MioVision devices)
	• Traffic Counts (from Wavetronix count stations and vehicle detectors)
	• System Alarms showing count of data points and sum of duration
	  ○ Signals on flash
	  ○ Battery backup status (line power, battery power)
	  ○ Detector failure
	  ○ Coordination fault, failure, transition
	  ○ Cycle fault, failure
	  ○ Detector diagnostics fault, SDLC fault
	  ○ Preemption
	  ○ Internal clock jump
	  ○ Local flash input
	  ○ Ped detector fault
	
	The data for the MOE's shall be available in tabular form, aggregated to a 5,10 or 15 minute interval to show a simplified version of the data. For instance, the percent arrival on green will be available as the average of percent arrival on green for each 5, 10 or 15 minutes as a table and in graphical form. This will be able to be compared on-screen and in reports with the MOE's, where the toolset will flag where the average arrival on green for the time periods are below the MOE.
	
	The toolset will show conditions where the actual MOE is outside the bounds of the MOE standard for that date and time graphically on the screen. The toolset will also create a customizable daily email to users of specific MOE's and locations that the user is interested in.
	
	The data, reports and graphics shall be shown both on screen in tabular or graph format, and also on a map based on Google Earth, Microsoft Bing or other cloud-based mapping toolset.
	
	The toolset focus will be on the current information and the previous twelve months of data. The toolset may allow for older data to be displayed and evaluated; however, the intent is to use PSU Portal as the toolset for archival transportation data analysis.

4. Project Funding	The 2024 System Wide Signal Enhancement project is funded by a grant from the federal Congestion Mitigation and Air Quality (CMAQ) program – Federal Aid Number CM-9906(060), Clark County's Road Fund, and a Partnership with WSDOT. Because of the federal funding, this project must meet federal Equal Employment Opportunity Commission (EEOC) requirements. The Washington State Department of Transportation has assigned this project a mandatory Disadvantaged Business Enterprise (DBE) goal of 16%.

	More information about the DBE program can be found at the following websites as well as in Chapter 26 of the WSDOT Local Agency Guidelines: https://wsdot.wa.gov/publications/manuals/fulltext/M36-63/Lag26.pdf https://wsdot.wa.gov/business-wsdot/equal-opportunity-contracting/diverse-business-programs http://www.wsdot.wa.gov/EqualOpportunity/BDDirectory.htm This federally funded project must meet federal EEO requirements and has an assigned DBE agreement goal of 16%.
5. Title VI Statement	**Title VI Statement** Clark County, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award. El Condado de Clark, de acuerdo con las disposiciones del Título VI de la Ley de Derechos Civiles de 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d a 2000d-4) y el Reglamento, por la presente notifica a todos los postores que se asegurará afirmativamente de que cualquier contrato celebrado de conformidad con este anuncio, las empresas comerciales desfavorecidas tendrán la oportunidad plena y justa de presentar ofertas en respuesta a esta invitación y no serán discriminadas por motivos de raza, color u origen nacional en consideración a un laudo. La políza del condado de Clark es garantizar que ninguna persona por motivos de raza, color, origen nacional o sexo según lo dispuesto en el Title VI of the Civil Rights Act de 1964, según enmendada, sea excluida por participar en, ser negado los beneficios de, o ser discriminado por cualquier programa o actividad patrocinada por el condado. Para preguntas relacionadas con el programa de Title VI de Obras Públicas del condado de Clark, o para servicios de interpretación o traducción para personas que no hablan inglés. O para que los materiales estén disponibles en un formato alternativo, comuníquese con el coordinador del Title VI de Obras Públicas del condado de Clark por correo electrónico a CCPW-TitleVI@clark.wa.gov o por teléfono a 564-397-4944. Las personas con problemas de audición / habla pueden llamar a Washington Relay Center al 711. For questions regarding Clark County Public Works' Title VI Program, or for interpretation or translation services for non-English speakers, or otherwise making materials available in an alternate format, contact Clark County Public Works' Title VI Coordinator via email at CCPW-TitleVI@clark.wa.gov or phone at 564-397-4944. Hearing/speech impaired may call the Washington Relay Center at 711. *Политика округа Кларк заключается в том, что никого нельзя отстранять от* участия, лишать льгот или подвергать дискриминации по признаку расовой принадлежности, цвета кожи и национального происхождения в рамках любой деятельности округа Кларк, как это предусмотрено разделом VI Закона о гражданских правах 1964 г. и сопутствующими законами. Эта политика распространяется на всю деятельность округа Кларк, в том числе на его подрядчиков и всех, кто действует от имени округа Кларк. Эта политика также распространяется на деятельность любого департамента или учреждения, которому округ Кларк предоставляет федеральную финансовую помощь. Федеральная финансовая помощь включает в себя гранты, обучение, использование оборудования, передачу избыточного имущества и другую помощь. Политика Округа Кларк состоит в том, чтобы гарантировать, что ни один человек не зависимо от расы, цвета кожи, национальности или пола - как это предусмотренно Разделом VI Закона о Гражданских Правах от 1964 года с поправками - не должен быть исключён из участия, или получить отказ в выгодах, или в иной форме быть ущемлён в любой программе или деятельности, спонсируемой Округом Кларк. По вопросам,

	связанным с Программой Раздела VI департамента Общественных работ Округа Кларк, или по вопросам перевода для людей, говорящих на ином языке кроме английского, или для получения материалов в альтернативном формате, обращайтесь к координатору Раздела VI департамента Общественных работ Округа Кларк по электронной почте CCPW-TitileVI@clark.wa.gov или по телефону 564.397.4944. Люди с нарушениями слуха или речи могут обратиться в Вашингтонский центр переключения по номеру 711.
6. Timeline for Selection	The following dates are the **intended** timeline:

Deadline for Questions and Answers	June 26, 2025
Final date for Addendum, if needed	June 30, 2025
Proposals Due	July 9, 2025
Proposal Review/Evaluation Period	July 9 – 14, 2025
Interviews/Demonstration (optional)	July 14 – 18, 2025
Selection Committee Recommendation	July 21, 2025
Contract Negotiation/Execution	July 21 – August 8, 2025
Contract Intended to Begin	September 10, 2025

7. Employment Verification	The Proposer, if awarded the Contract, shall register and enter into a Memorandum of Understanding (MOU) with the Department of Homeland Security E-Verify program before execution of the Contract. The Contractor shall ensure all Contractor employees and any sub-contractor(s) assigned to perform work under this Agreement are eligible to work in the United States. The Contractor shall provide verification of compliance upon County request. Failure by Contractor to comply with this subsection shall be considered a material breach. (Sole Proprietors must submit a letter stating such.)
Section IB	**Work Requirements**
1. Required Services	As part of this RFP, the consultant's https://www.sam.gov/portal/public/sam SAM Unique Entity Identifier number and the CAGE code will be required to verify eligibility under federal funding guidelines. The consultants selected here will work closely with designated County personnel. Subcontracting amongst firms is acceptable; however, a single firm must be identified as the "prime" and proposal be presented as a joint team. All proposed subcontracting as well as the approach for meeting the 16% DBE goal must be identified in the proposal. Firms that do not follow this guideline will be eliminated from consideration. Following selection, the contract and subcontracts must include the necessary clauses required by the Clark County contract (WSDOT Local Agency A&E Professional Services Negotiated Hourly Rate Consultant Agreement). Being an IT project, complete Exhibit B Cyber Security Questionnaire and include with your proposal.

2. County Performed Work	The Clark County STEVE2 project stakeholders have collaboratively partnered with a consultant to develop a comprehensive data architecture schema that accurately reflects our current state and vision for this project, the System Wide Signal Enhancement project. This process involved extensive technical team collaboration, totaling numerous hours, along with meetings with business units to gain a thorough understanding of their workflows and operational requirements. The project team will continue to support the effort of the vendor selected to complete this work as county availability allows.
3. Deliverables & Schedule	1. **Milestone Schedule**: Project Milestones and Timeline - actual schedule to be developed between agency and winning bidder. • **Milestone 1:** Initial Research & Planning (September) Please note a system-engineering document is provided here to assist with the process. o Existing Current-State Documentation Review & Utilization – Due: Sept. 30, 2025 • **Milestone 2:** System Architecture Design (October – December 2025) o Cloud-Based Data Lake Design Documentation – Due: Nov. 15,2025 o Dashboard Architectural Design Documentation – Due Dec. 31, 2025 • **Milestone 3:** Initial Data Stream Implementation (January – March 2026) o Initial Data Stream Demonstration and Testing – Due: Feb. 20, 2026 o Stakeholder Review – Acceptance Testing – Due: Mar 6, 2026 o Project Team Feedback Meeting – Due Mar. 9, 2026 • **Milestone 4:** Full Data Stream Integration (March – June 2026) o Expansion to Full Data Stream Integration – Due: Jun. 15, 2026 o Stakeholder Testing – Due: June 22, 2026 o Project Team Feedback Meeting – Due: June 22, 2026 • **Milestone 5:** Advanced Analytics & Dashboard Development (June – Sept. 2026) o Advanced Analytic Dashboards Development – Due: Sept. 4, 2026 o Stakeholder Testing – Due: Sept. 10, 2026 o Project Team Feedback Meeting – Due: Sept. 14, 2026 • **Milestone 6:** Security, User Access, Compliance (September – November 2026) o User Management and License Configuration System – Due: Oct. 16, 2026 o Security and Compliance Implementation – Due: Nov. 6, 2026 • **Milestone 7**: Final Testing, Documentation & Deployment (November 2026) o System Scalability and Performance Testing – Due: Nov. 13, 2026 o Project Team Final Review – Due: Nov. 16, 2026 o Documentation and Training Materials – Due: Nov. 18, 2026 o Deployment and Rollout Plan – Due: Nov. 20, 2026 (Final Deadline) o Documentation: Ongoing Support and Maintenance Plan – Due: Nov. 20, 2026 o The remaining weeks in 2026 are reserved for corrections/modifications/updates. It is expected that Clark County and the winning respondent will establish a more comprehensive schedule and list of deliverables upon contract award. o Performance tuning to guarantee low-latency data processing and smooth dashboard interactivity. **2. Security and Compliance Implementation –** November 12, 2026 o Implement security measures such as encryption, access control, and audit logging to ensure the integrity of data and user access. o Ensure that the solution complies with relevant regulatory standards for data, privacy and security (e.g. GDPR).

	3. Documentation and Training Materials – November 12, 2026 o Provide detailed technical documentation for the system architecture, cloud infrastructure, data flow and dashboard design. o User guides for interacting with the dashboards, configuring user roles, and exporting data. o Training materials for both end-users and administrators to maximize the system's utility and ensure smooth operation. **4. Deployment and Rollout Plan –** November 12, 2026 o Detailed deployment plan that outlines the steps for deploying the cloud-based data lake and analytic dashboards to production. o Ensure smooth transition and system go-live, including user acceptance testing (UAT) and post-deployment support. o A plan for ongoing monitoring and issue resolution after deployment. **5. Ongoing Support and Maintenance Plan –** November 12, 2026 o Provide a roadmap for ongoing support and maintenance of the data lake and dashboards. o Include plans for system updates, performance monitoring, and user support after initial deployment. **6. Stakeholder Testing:** November 16 – 19, 2026 **7. Project team Feedback Meeting:** November 22, 2026 The remaining weeks of 2026 in reserve for corrections/modifications/updates. It is expected that Clark County and the winning respondent will establish a more comprehensive schedule and list of deliverables upon contract award.
4. Place of Performance	Contract performance may take place in the County's facility, the Proposer's facility, a third-party location or any combination thereof as the needs of the project demand for digital/technological development.
5. Period of Performance	A contract awarded as a result of this RFP will be for fifteen (15) months and is intended to begin on September 10, 2025 and end December 31, 2026. The anticipated contract value is $538,000 including extensions. Final contract value will be determined by approved funding. Clark County reserves the right to extend the contract resulting from this RFP for a period of three (3) additional years, in one (1) year increments, with the same terms and conditions, with the exception of cost, by service of a written notice of its intention to do so prior to the contract termination date. Cost for additional option year(s) shall be reviewed prior to extension of the contract. The agency reserves the right to supplement the consultant agreement into future phases. The county also reserves the right to terminate the contract, with thirty (30) days written notice, at any time if the requirements of the contract are not being met satisfactorily, solely in the county's judgment.

6. Prevailing Wage Applicable to all public work as defined in RCW 39.04.010(4) Public Works Definition	Pursuant to Washington State RCW 39.12 PREVAILING WAGES ON PUBLIC WORKS all work identified in this project as a public work requires the contractor to pay Washington State prevailing wages and file all affidavits of intent to pay with the WA State Dept of Labor & Industries. Contractors shall meet the requirements for Prevailing Wage and public works requirements, per RCW 39.04.350 BIDDER RESPONSIBILITY CRITERIA – SWORN STATMENT – SUPPLEMENTAL CRITERIA. For this project select the Clark County rates that apply on the proposal closing date from either of these sites: **http://www.wsdot.wa.gov/Design/ProjectDev/WageRates/default.htm** **http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates** Before payment is made by the Local Agency of any sums due under this contract, the Local Agency must receive from the Contractor and each Subcontractor a copy of "Statement of Intent to Pay Prevailing Wages" (Form L & I Number 700-29) approved by the Washington State Department of Labor and Industries. A fee of $45.00 per each "Statement of Intent to Pay Prevailing Wages" and "Affidavit of Wages Paid" is required to accompany each form submitted to this Department of Labor and Industries. The Contractor is responsible for payment of these fees and shall make all applications directly to the Department of Labor and Industries. These fees shall be incidental to all the proposed items of this contract.
7. Debarred/Suspended	Federally or Washington State debarred or suspended suppliers may not participate in this Request for Proposal. All proposers must fill out, sign and submit the “Certification Regarding Debarment, Suspension, and Other Responsibility Matters” form with their proposal to be eligible to participate.
8. Americans with Disabilities Act (ADA) Information	Clark County in accordance with Section 504 of the Rehabilitation Act (Section 504) and the Americans with Disabilities Act (ADA), commits to nondiscrimination on the basis of disability, in all of its programs and activities. This material can be made available in an alternate format by emailing ADA@clark.wa.gov or by calling 564-397-2322.
9. Public Disclosure	This procurement is subject to the Washington Public Records Act (the “Act”), chapter 42.56 RCW. Once in the County’s possession, all of the RFP Submittals shall be considered public records and available for public records inspection and copying, unless exempt under the Act. If a Respondent or Proposer considers any portion of an RFP Submittal to be protected under the law, whether in electronic or hard copy form, the Respondent or Proposer shall clearly identify each such portion with the word “PROPRIETARY”. The County will notify the Respondent or Proposer in writing of the request and allow the Respondent or Proposer ten (10) days to obtain a court order enjoining release of the record(s). If the Respondent or Proposer does not take such action within the ten (10) day period, the County will release the portions of the RFP Submittal deemed subject to disclosure. All Respondents and Proposers who provide RFP Submittals for this procurement accept the procedures described above and agree that the County shall not be responsible or liable in any way for any losses that the party may incur from the disclosure of records to a third party who requests them.

10. Insurance/Bond	The firm awarded the contract will be required to have insurance in effect as specified in the contract under Section XII Legal Relations see: Local Agency Professional Services Negotiated Hourly Rate Consultant Agreement (PDF 2.3MB)
11. Plan Holders List	All proposers are required to be listed on the plan holders list. ✓ Prior to submission of proposal, confirm your organization is on the Plan Holders List below: To view the Plan Holders List, click on the link below or copy and paste into your browser. Clark County RFP site: https://clark.wa.gov/internal-services/purchasing-overview • If your organization is NOT listed, submit Attachment B - Letter of Interest to ensure your inclusion. • Proposals received by Clark County by proposers not included on the Plan Holders List may be considered non-responsive.

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Part II Proposal Preparation and Submittal

Section IIA	Pre-Submittal Meeting / Clarification
1. Pre-Submittal Meeting	There are no plans to hold a pre-submittal meeting.
2. Proposal Clarification	Questions and Requests for Clarification regarding this Request for Proposal must be directed in writing, via email, to the person listed on the cover page. The deadline for submitting such questions/clarifications is June 26, 2025 by 4:00PM PST. An addendum will be issued no later than June 30, 2025 to all recorded holders of the RFP if a substantive clarification is in order The Questions & Answers/Clarifications are available for review at the link below. Each proposer is strongly encouraged to review this document prior to submitting their proposal. Clark County RFP site: **https://clark.wa.gov/internal-services/request-proposal-1**
Section IIB	**Proposal Submission**
1. Proposals Due	Sealed proposals must be received no later than the date, time and location specified on the cover of this document. **The outside of the envelope/package shall clearly identify:** **1. RFP Number and;** **2. TITLE and;** **3. Name and Address of the Proposer.** Responses received after submittal time will not be considered and will be returned to the Proposer - unopened. Proposals received with insufficient copies (as noted on the cover of this document) cannot be properly disseminated to the Review Committee and other reviewers for necessary action, therefore, may not be accepted.
2. Proposal	Proposals must be clear, succinct and not exceed Twenty (20) pages, excluding resumes, coversheet and debarment form. Proposers who submit more than the pages indicated may not have the additional pages of the proposal read or considered. As this is a Federally funded project there is a (Disadvantaged Business Enterprise) DBE requirement of 16%. For purposes of review and in the interest of the County, the County encourages the use of submittal materials (i.e. paper, dividers, binders, brochures, etc.) that contain post-consumer recycled content and are readily recyclable. The County discourages the use of materials that cannot be readily recycled such as PVC (vinyl) binders, spiral bindings, and plastic or glossy covers or dividers. Alternative bindings such as

	reusable/recyclable binding posts, reusable binder clips or binder rings, and recyclable cardboard/paperboard binders are examples of preferable submittal materials. Proposers are encouraged to print/copy on both sides of a single sheet of paper wherever applicable; if sheets are printed on both sides, it is considered to be two pages. Color is acceptable, but content should not be lost by black-and-white printing or copying. All submittals will be evaluated on the completeness and quality of the content. Only those Proposers providing complete information as required will be considered for evaluation. The ability to follow these instructions demonstrates attention to detail. Additional support documents, such as sales brochures, should not be included with each copy unless otherwise specified.
Section IIC	**Proposal Content**
1. Cover Sheet	This form is to be used as your proposal Cover Sheet. See Cover Sheet - Attachment A
2. Project Team	Please provide descriptions, i.e job titles and a short work-specific bio limited to half a page to one (1) page max per person.
3. Management Approach	• Define governance and role definitions; • Define communication strategy with preferences/best choice per project team member; • Define risk management; • Define quality assurance and testing protocols; • Define post-launch support protocols; • Define coverage and/or escalation strategies to manage emergency absences
4. Respondent's Capabilities	• Provide case studies and testimonials to showcase past success. • Clearly describe the approach and methodology to be used, including timelines and deliverables. • Offer demonstrations (like a proof of concept, mockups, or code samples) to provide concrete evidence of technical expertise. • Address risk management and include a detailed QA plan. • Outline how the solution will meet scalability, security, and performance needs. • Define how the DBE requirement of 16% will be met.

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2025 System Wide Signal Enhancement

5. Project Approach and Understanding	• An agile, iterative approach is preferred for this work. Please describe your project approach with this in mind, as well as: o Breakdown the project into phases with milestones. o Demonstrate a proof of concept for a single data stream and dashboard, or previous project consolidating data streams with analytic dashboards. o Use diagrams and flowcharts or other graphics to visually communicate the solution. o Clearly outline the technical tools and frameworks to be used. o Provide sample code or prototypes to showcase the developer's technical skills. o Address risks and mitigation strategies upfront. o Include relevant case studies or testimonials to demonstrate past successes..
6. Proposed Cost	Do not submit costs, this is a qualifications based selection.

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2025 System Wide Signal Enhancement

Part III Proposal Evaluation & Contract Award

<table>
<tr><th>Section IIIA</th><th>Proposal Review and Selection</th></tr>
<tr><td>1. Evaluation and Selection:</td><td>Proposals received in response to this RFP will be evaluated by a Review Committee, which will include, at a minimum, the project manager, relevant stakeholders, and Clark County IT personnel.

Following the initial review, respondents will be invited for interviews to further assess their qualifications and proposed solutions. Depending on your funding requirements the Committee review results and recommendations may require presentation to an appropriate advisory board prior to the consent process with the Clark County Council.</td></tr>
<tr><td>2. Evaluation Criteria Scoring</td><td>Each proposal received in response to the RFP will be objectively evaluated and rated according to a specified point system.

A one hundred (100) point system will be used, weighted against the following criteria:

<table>
<tr><td>Proposal Approach / Quality</td><td>15</td></tr>
<tr><td>Creativity / Experience</td><td>20</td></tr>
<tr><td>Work History / Examples</td><td>20</td></tr>
<tr><td>Product Demonstration</td><td>20</td></tr>
<tr><td>References</td><td>10</td></tr>
<tr><td>Criteria Specific to this Project Needs</td><td>15</td></tr>
<tr><td>Total Points</td><td>100</td></tr>
</table>
</td></tr>
<tr><th>Section IIIB</th><th>Contract Award</th></tr>
<tr><td>1. Consultant Selection</td><td>The County will determine the most qualified proposer based on the evaluation criteria listed using predetermined weights, the attributes of the Proposers and the overall responsiveness of the Proposal. If the County does not reach a favorable agreement with the top Proposer, the County shall terminate negotiations and begin negotiations with the next qualified Proposer. If the County is unable to reach agreeable terms with either Proposer, they may opt to void the RFP and determine next steps.

Clark County reserves the right to accept or reject any or all proposals received, to negotiate with any or all prospective contractors on modifications to proposals, to waive formalities, to postpone award, or to cancel in part or in its entirety this RFP. Clark County reserves the right to award the contract based on the best interests of the County.</td></tr>
<tr><td>2. Contract Development</td><td>The proposal, TCS created in 2024 – Exhibit A, questions/answers, addendums and and all responses provided by the successful Proposer may become a part of the final contract.</td></tr>
<tr><td>3. Award Review</td><td>The public may view Request for Proposal documents by submitting a public records request at Public Records | Clark County .</td></tr>
<tr><td>4. Orientation/Kick-off Meeting</td><td>A kickoff call is anticipated for the second week of September 2025.</td></tr>
</table>

Request for Proposal # 927
2025 System Wide Signal Enhancement

Attachment A: COVER SHEET

General Information:

Legal Name of Proposing Firm	
Street Address	
City | State | Zip Code	
Contact Person | Title	
Phone	
Program Location (if different than above)	
Email Address	
Tax Identification Number	

ADDENDUM:

Proposer shall acknowledge receipt of Addenda by checking the appropriate box(es).

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐

NOTE: Failure to do so, shall render the proposer non-responsive and therefore be rejected.

I certify that to the best of my knowledge the information contained in this proposal is accurate and complete and that I have the legal authority to commit this agency to a contractual agreement. I realize the final funding for any service is based upon funding levels, and the approval of the Clark County Council and required approvals.

Authorized Signature of Proposing Firm _____ Date _____

Printed Name _____ Title _____

Request for Proposal # 927
2025 System Wide Signal Enhancement

Attachment B: LETTER OF INTEREST

Legal Name of Proposing Firm	
Street Address	
City | State | Zip Code	
Contact Person | Title	
Phone	
Program Location (if different than above)	
Email Address	

- All proposers are required to be included on the plan holders list.
- If your organization is NOT listed, submit the 'Letter of Interest" to ensure your inclusion.

Email Letter of Interest to*: Koni.Odell@clark.wa.gov and Misty.Davis@clark.wa.gov*

Clark County web link: https://clark.wa.gov/internal-services/request-proposal-1

This document will only be used to add a proposer to the plan holders list. Submitting this document does not commit proposer to provide services to Clark County, nor is it required to be submitted with proposal.

Proposals may be considered non-responsive if the Proposer is not listed on the plan holders list.

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Attachment C

Clark County, Washington

Certification Regarding
Debarment, Suspension and Other Responsibility Matters

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal, State or local department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

_____
Company Name

_____
Typed Name & Title of Authorized Representative

_____ _____
Signature of Authorized Representative Date

☐ I am unable to certify to the above statements. My explanation is attached.

2025

System Engineering

System-Wide Signal Enhancement PRJ0001585

Ali Pilkington, Joy Roberts | CLARK COUNTY PUBLIC WORKS

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Introduction

This Systems Engineering Document (SED) provides a formal framework for the Clark County Traffic Coordination System (TCS), aligning with the Federal Highway Administration's (FHWA) 23 CFR 9401.11 and the Washington State Department of Transportation's (WSDOT) Design Manual M 22-01.23, Section 1050. It includes required systems engineering elements such as Concept of Operations, System Requirements, Alternative Analysis, Verification and Validation plans.

1. Regional ITS Architecture Compliance

TCS aligns with the existing regional ITS architecture, and no changes to the architecture are necessary. The system communicates with and aggregates data from other systems without changing the physical infrastructure. The TCS will support regional goals by improving situational awareness and data sharing between Clark County, WSDOT, and Portland State University (PSU).

2. Concept of Operations

2.1 High-Level System Overview

The TCS consolidates dozens of separate traffic monitoring devices from the field into a single data source from which real-time and historical traffic data will be aggregated and displayed into user-friendly, integrated GIS-based dashboard platform for improved monitoring, analysis, and response.

2.2 Operational Scenarios

- Monitoring sensor health and performance
- Responding to real-time congestion alerts
- Performing historical corridor analysis

2.3 Participating Agencies and Responsibilities

- Clark County Public Works: System Owner and Operator
- Clark County Information Technology (IT) and GIS: Infrastructure and analytics support
- WSDOT: Regional data consumer
- PSU: Data partner for research and public access

2.4 Users

- Traffic Operations Staff
- GIS Analysts
- IT Staff
- Transportation Planners

3. System Requirements

3.1 Functional Requirements

- TCS shall ingest real-time traffic and sensor data.

The Traffic Collection System (TCS) shall establish secure, reliable communication with more than 100 roadside units (RSUs) and other sensors deployed county-wide. The system should collect data such as vehicle counts, speeds, classifications, and signal timings, ingesting this information continuously or at defined polling intervals.

- TCS shall visualize sensor health and alert statuses on a web dashboard.

The system should provide an interactive web-based dashboard that displays the operational status of each sensor or RSU, including indicators for device uptime, connectivity, power levels, and data transmission health. Users shall be able to view system-wide status immediately and drill down into individual devices for detailed diagnostics.

- TCS shall store historical traffic data for trend analysis.

The system shall log and archive all ingested data into a scalable Azure Data Lake storage solution, enabling users to perform time-based trend analysis. This includes hourly, daily, weekly, and seasonal traffic patterns, supporting both operational decision-making and long-term planning studies.

- TCS shall allow configurable alert thresholds.

Users shall be able to define and adjust threshold parameters for system alerts. For example, alerts can be generated when traffic volumes exceed expected ranges, when sensors stop reporting for a defined duration, or when specific error codes are detected. These thresholds shall be user-configurable via the dashboard.

3.2 Performance Requirements

- The system shall support polling of RSUs at intervals of 5-10 minutes.
- The dashboard shall refresh health statuses in near real-time (< 1-minute latency)

3.3 Security Requirements

- All data shall be encrypted at rest and in transit.
- Access shall require MFA and comply with the County's IT policy.

3.4 Environmental Requirements

- The system shall operate within cloud and on-premises hybrid environments.

4. Alternative Analysis

4.1 Alternative 1: Cloud-Hosted System (Preferred)

- Scalable and resilient.
- Minimal IT burden.

- Lower risk of data loss or performance degradation.

4.2 Alternative 2: On-Premises Hosting

- Higher cost and infrastructure need which Clark County is unable to support currently.
- Requires expanded IT support and delayed scaling limiting the capabilities of the Traffic Engineers.
- Poses security integration challenges.

The County selected the cloud-hosted model for its scalability, cost-effectiveness, and ease of maintenance.

5. Procurement Strategy

TCS is non-construction in nature and will be procured through a negotiated hourly service contract. A qualifications-based selection (QBS) process will be used to select vendors. This approach ensures flexibility, fairness, and compliance with state procurement standards.

6. ITS Standards Identification

Application Standards include:

- NIST SP 800-53 for security
- SNMP for sensor communication
- MQTT for brokered messaging
- SAE J2735 for Connected Vehicle messages (SPaT/BSM)

7. Verification Plan

7.1 Requirements Traceability Matrix

Requirement ID	Requirement Description	Source (Use Case)	Verification Method
FR-01	Real-time data ingestion from RSUs	Use Case 1: Visualization and Alerting of Sensor Location and Health	Demonstration, inspection
FR-02	Dashboard visualizes health and alerts	Use Cases 1 & 2: Sensor Health and Corridor Alerts	Functional test
FR-03	Historical data available for query	Use Case 3: Historical Corridor Analysis	Demonstration

FR-04	Alerts triggered by sensors or traffic anomalies	Use Cases 1 & 2: Sensor Health and Corridor Alerts	Functional test, simulation
PR-01	Dashboard refreshes < 1 minutes	Use Case 1: Visualization and Alerting	Performance test
SR-01	Data encrypted at rest and in transit	System Security Requirements	Security audit
ER-01	The system supports hybrid cloud/on-prem	Environmental Requirements	Configuration review

Each sprint will include unit and integration testing. End-to-end verification will occur at the end of each phase.

8. Validation Plan

Goal/Objective	**Associated Metric or Outcome**	**Validation Method**
Improved workflow efficiency	Reduction in average time to retrieve and analyze sensor or traffic data via the TCS dashboards, compared to prior manual or multi-system workflows.	Validated through pre-and post-deployment workflow timing studies and stakeholder interviews.
Faster response to real-time traffic anomalies	Time to alert + response after congestion or failure detected.	Dashboard logs and staff interviews
External stakeholder visibility	Number of external logins or data accesses (WSDOT, PSU)	Usage analytics
Automated data sharing with PSU	Number of automated exports to PSU vs. manual prior	System logs

The performance will be validated through:

- Workflow efficiency measurements
- Response time improvements to real-time traffic events
- Visibility of traffic conditions by external stakeholders (e.g., WSDOT)
- Automated data sharing with PSU

A validation matrix will compare objectives with outcomes after system deployment.

9. Operations and Maintenance Plan

9.1 Operations

- Operated by Traffic Operations and GIS staff.
- Vendor support during the initial roll-out

9.2 Maintenance

- Polling server: Maintained by County IT
- Cloud platform: Managed via SaaS agreement.
- Dashboards: Configurable and updatable by trained GIS analysts

10. Risk Assessment

Risk Area	Description	Mitigation Plan
Vendor Collaboration	Lack of documentation or access to vendor systems	Early engagement and contractual language
Data Governance	Unclear cloud policy or compliance requirements	Involve IT early, define governance frameworks
Performance Measures	Lack of clear metrics for alert thresholds	Iterative refinement with Traffic Operations

11. Stakeholder Roles and Responsibilities

Stakeholder	Role	Responsibility
Clark County Public Works	System Owner, Project Sponsor	Owns and operates the TCS system; provides funding
Clark County IT	Infrastructure Support	Maintains polling server, network security, cloud governance
Clark County GIS	Data Integration and App Configuration	Configures dashboards and supports data visualization
Vendor	System Integrator	Supports system configuration, integration of GIS tools, and delivery of technical components under Clark County's oversight
WSDOT	Regional Stakeholder	Data consumer, supports cross-jurisdictional coordination

PSU	Data Partner	Consumes traffic data for research and publication purposes

12. System Engineering Conclusion and Implementation Guidance

This Systems Engineering Document meets the requirements outlined by FHWA and WSDOT for ITS projects. It provides a structured foundation for system deployment, oversight, verification, and validation of the Clark County Traffic Coordination System.

The Clark County Traffic Coordination System (TCS) represents a strategic investment in modernizing how the County collects, manages, and utilizes traffic data to enhance operational efficiency, regional coordination, and public transparency. By leveraging cloud-hosted architecture and integrating advanced communication protocols and security standards, the system is positioned to provide real-time insights, historical trend analysis, and system health monitoring within a scalable, user-friendly platform.

Through alignment with regional ITS architecture and compliance with federal and state systems engineering requirements, this project ensures both technical soundness and stakeholder accountability. The TCS will serve as a foundational tool for traffic operations, planning, and research, enabling Clark County and its partners to make data-informed decisions that improve mobility, safety, and system performance across the region.

The following pages identifies current state documentation, and project implementation and design guidance.

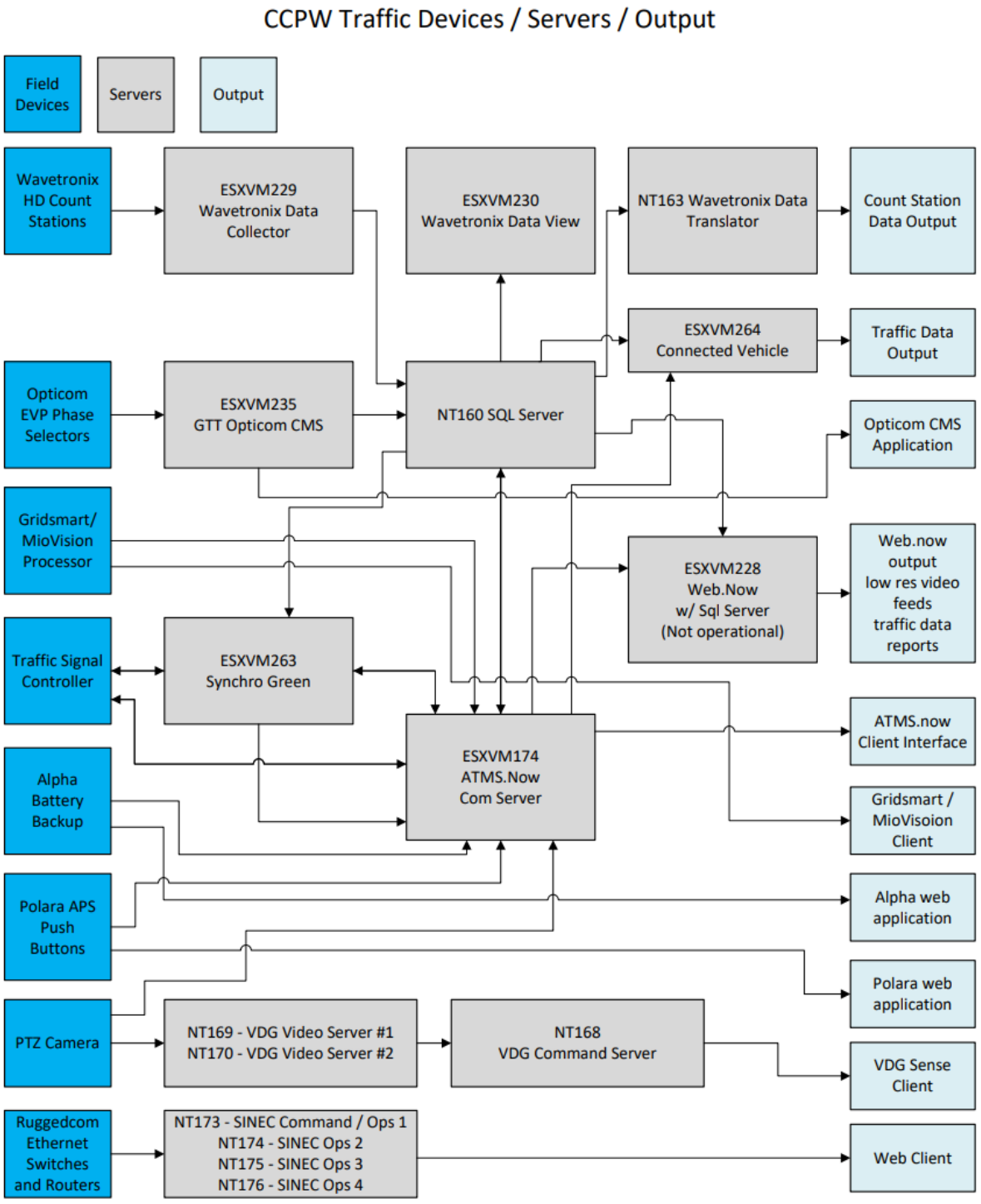

Figure 1 Clark County Current Devices, Servers, and Outputs

GIS

Clark County has a mature GIS with a team dedicated to Public Works. This will help ensure the success of TCS.

- GIS are dedicated to supporting Public Works and the GIS needs of this project.
- Many of the County's traffic devices have been mapped by GIS.
- GIS has its own process automation platform controlled by Python scripts. This can potentially be leveraged for some of the TCS automation.
- GIS has multiple instances of ArcGIS Enterprise supporting the County.
- GIS maintains an ArcGIS Online organization and shares Enterprise data to it through a reverse proxy.

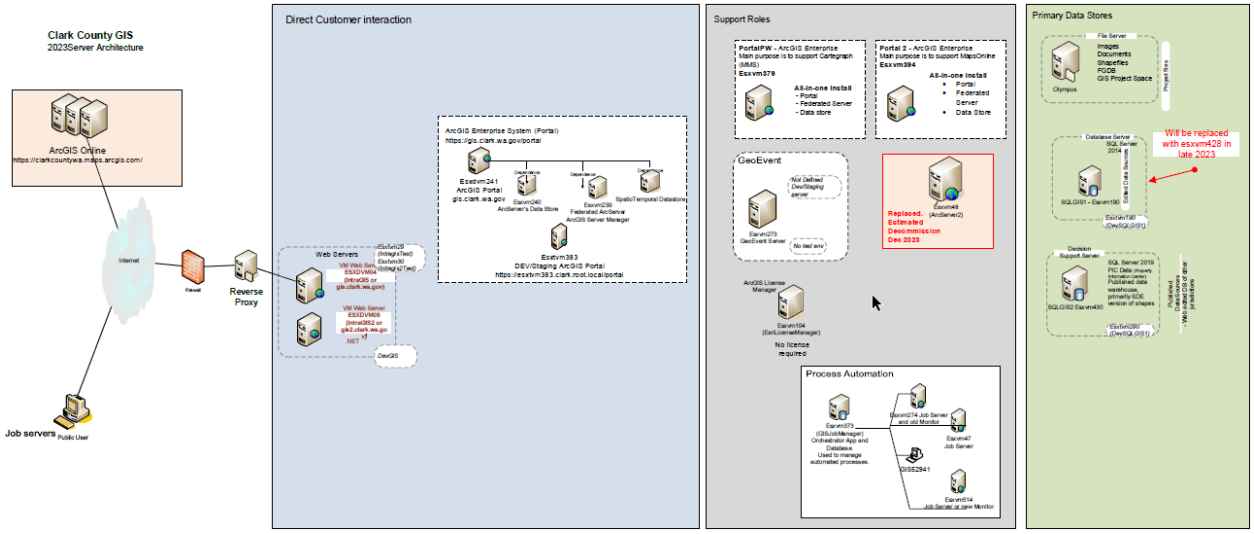

Figure 2 Clark County GIS Infrastructure

Information Technology (IT)

The County's IT department is prepared to support TCS and views this project as an opportunity to develop a full understanding of Traffic's IT needs so they can ensure County security policies are followed, and they can better support Traffic. Discovery identified the following key points that must be considered when implementing TCS.

- County IT infrastructure is all "on-premises".
- Clark County does not have a Cloud policy currently.
- If/When parts of the IT infrastructure are to be housed in the Cloud, the County prefers the Azure platform.
- Whenever possible, Single Sign-On and Multi-Factor authentication is preferred.
- It is difficult for County IT to support all of Traffic's systems, databases, software, hardware, and data sources because they do not understand the complex landscape.
- It is still unclear what type of compliance standard will be required for TCS.

Data Sources

While this project will stay focused on a smaller number of first-stage devices outlined in our CMAQ grant guidance, project discovery identified up to 37 potential sources of data that can be consolidated into the TCS or referenced from it. A subset of these sources will be used to support each of the identified workflows.

See Appendix A for the full list.

Appendix A

Use Case Specifications

The following section introduces use cases captured during the Clark County Discovery Workshop, which forms the foundation of this systems engineering effort.

Use Case 1: Visualization and Alerting of Sensor Location and Health

Objective

To provide Clark County Traffic Operations with a comprehensive and real-time visualization of their sensor locations and their operational health on an interactive map, enabling efficient monitoring and maintenance of the sensor network.

Description

This use-case involves creating a dashboard that displays the locations and health status of various sensors deployed across Clark County. The dashboard will provide real-time updates on sensor health and depending upon the sensor, may include additional information such as operational status, messages sent, messages received, battery life, and any error messages. This will enable the Traffic Operations department to quickly identify and address any issues with the sensors, ensuring continuous and reliable data collection.

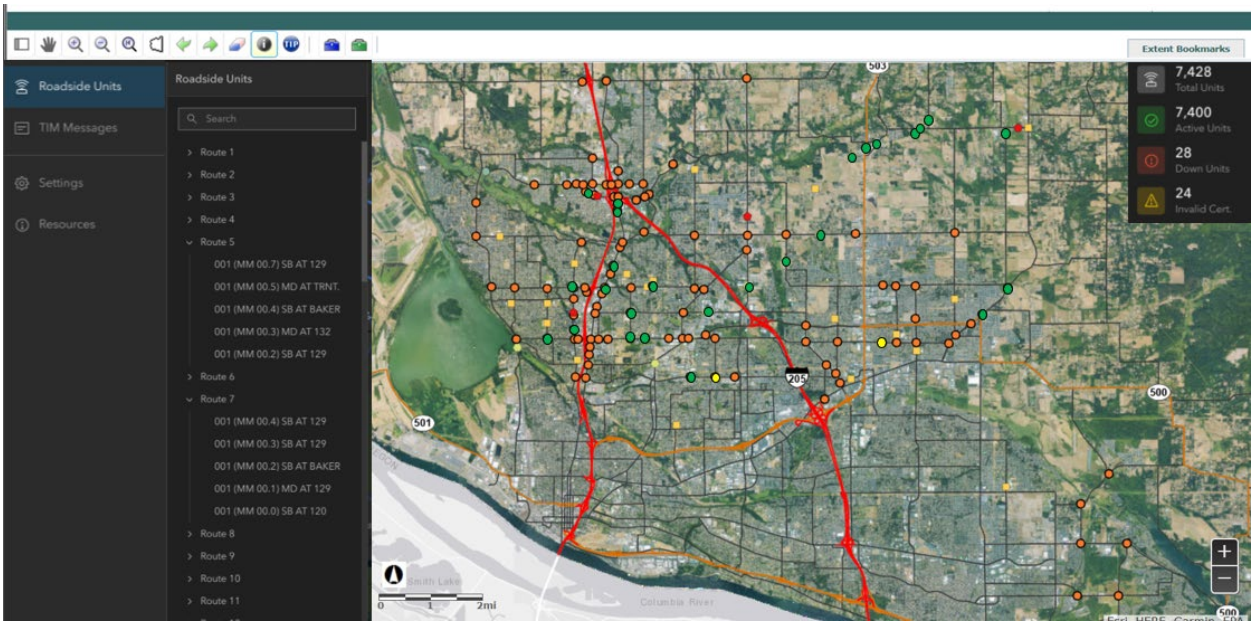

Figure 3 Sample Dashboard Visualization

Actors

- **Primary Actor**: Traffic Operations Staff

- **Secondary Actors**: IT Department, Field Technicians, Traffic Management Team

Preconditions

- Sensors must be deployed and operational across the county.
- The IT infrastructure must support real-time data ingestion and processing.
- Access to the sensor data feeds.
- Access to geospatial data for mapping sensor locations.

Data Requirements

- Sensor Metadata: Information about sensor types, locations, and configurations.
- Health Status Data: Real-time data on sensor health, depending upon sensor type data may include operational status, messages sent, messages received, battery life, and error messages.
- Geospatial Data: Basemap data to visualize sensor locations on a map.
- The table below identifies possible data elements that can be used to develop Use Case 1.

Data Element	Description	Purpose	Source	Method of Access	Data Storage
Adaptive Traffic Signal Control Data	Real-time coordination and performance data.	Monitors sensor health and ensure correct traffic signal timings.	Cubic (SynchroGreen)	Vendor-specific software; confer as needed with Clark County for access and licensing	No
Alert Logs	Logs of alerts that are triggered by sensor performance metrics.	Tracks historical alerts for analysis and maintenance planning.	Clark County Traffic Operations	Internal monitoring and alerting systems.	Yes
Alert Thresholds	Predefined thresholds for sensor performance metrics that trigger alerts (e.g., low battery, signal loss, data transmission errors).	Ensures timely alerts for any sensors reporting errors or out-of-bound thresholds, enabling prompt maintenance actions.	Defined by Clark County Traffic Operations	Configured within the monitoring and alerting systems used by Clark County Traffic Operations.	Yes
Basemap Data	High-resolution map data with accurate geospatial information, including road geometry,	Provides the foundational layer for visualizing sensor locations and road infrastructure.	Clark County GIS	Access through Clark County GIS portal or TCS platform.	Yes

	centerlines, intersections, and lane markings.				
Battery Life	Real-time data on the battery life of sensors.	Ensure sensors are functioning correctly and predict maintenance needs.	Alpha Technologies (RBMS)	SNMP monitoring, vendor-specific software.	No
Device Controlling Signal When Power is Lost	Log files capturing the timestamp when the system switches to battery.	Monitors power status and ensures continuity of operations.	Alpha Technologies (FXM Communication Module)	SNMP monitoring, vendor-specific software.	Yes
Emergency Vehicle, Bus/Transit Preemption Data	Data from detectors monitoring the health of sensors used for emergency vehicle preemption.	Monitors health of preemption sensors and reports on preemption events.	Opticon (CMS)	Vendor-specific software; confer as needed with Clark County for access and licensing	No
Roadside Unit	Communication between vehicles and transportation infrastructure.	Manages the exchange of information, helping manage traffic flow, enhance safety, and provide real-time updates to drivers. RSUs process data from various sources, support safety applications, and integrate with traffic lights and road signs to create a smart, connected transportation network.	Yunex	Direct access to the device	Yes
Sensor Health Data	Real-time status and health metrics of each sensor, such as operational status, error codes, battery levels, signal strength, and data	Allows for monitoring the operational health of sensors and identifying any issues that need attention.	Alpha Technologies (FXM Communication Module, RBMS), Cubic/Trafficware (ATMS, SPM), Wavetronix (Command Collector, Data View)	Alpha Technologies: SNMP monitoring, vendor-specific software. Cubic/Trafficware: ATMS platform, cloud-based SPM tool. Wavetronix: On-premises	No

	transmission rates.			servers, vendor-specific software.	
Sensor Locations	Precise geospatial coordinates (latitude and longitude) of all sensors (e.g., roadside units, Wavetronix RADAR, Topcon, cameras, traffic controllers).	Enables accurate placement of sensors on the map for visualization and monitoring.	Clark County GIS, IP Tracker	Access through Clark County GIS portal or IP Tracker system.	Yes
Sensor Metadata	Information about each sensor, including type, model, vendor, installation date, and maintenance history.	Helps in identifying and managing different sensors within the network.	Various vendors (e.g., Alpha Technologies, Cubic, Siemens)	Vendor-specific management systems or databases.	Yes
Street Network	Geospatial data to visualize the street network.	Provides context for sensor placement and traffic flow analysis.	Clark County GIS	Access through Clark County GIS portal or TCS platform.	Yes
Traffic Cabinet Locations	Locations of traffic cabinets, mapped to intersection polygons.	Provides context for sensor placement and maintenance activities.	Clark County GIS	Access through Clark County GIS portal.	Yes
Traffic Operations Management Platform (ATMS)	Collects traffic data into a single repository, can send alerts to staff.	Centralizes traffic data for analysis and alerting.	Cubic/Trafficware (ATMS)	ATMS platform, data can be sent to the real-time platform.	Yes
Video Detections	Traffic volumes, turning data, and processor counts from video sensors.	Verifies operational status of sensors.	Cubic (Gridsmart), Miovision	Vendor-specific software; confer as needed with Clark County for access and licensing	No
Wavetronix (HD Sidefire RADAR)	Lane-by-lane counts, speed, volume, and classification data.	Monitors sensor performance and health.	Wavetronix	Vendor-specific software; confer as needed with Clark County for access and licensing	No

Triggers

- Scheduled system checks (example: system check query sent every 10 seconds)
- Manual requests from Traffic Operations staff (example: staff select sensors on the map to determine their status)
- Automated alerts from sensors indicate a change in status. (Example: sensor query does not return a result or instead produces an error message or anomalous results outside of set parameters, an alert will be sent to defined staff members.)

Workflows

1. The system ingests real-time data from sensors overlayed on a GIS layer that includes the sensor location. Real-time data feed will supply health status.
2. The data is processed and ingested into the real-time platform where a data feed is created to supply a dashboard with the data on an interactive map.
3. IT staff access the dashboard to monitor sensor locations and health.
4. The system generates alerts for any sensors reporting errors or out at thresholds outside of defined parameters as defined by the Traffic Operations staff. For example:

   Sensor Failure: If a sensor fails to report data, the system generates an alert and logs the incident for further investigation.

   Data Inconsistency: If there is a discrepancy in the data reported by sensors, the system flags the issue for manual review.
5. Field technicians are dispatched to address any issues identified.

Postconditions

- The dashboard provides an up-to-date view of sensor locations and health.
- Any identified issues are logged and addressed by field technicians.
- The system maintains a historical record of sensor performance and incidents.

Data Storage

- Logs of times when the system switches to battery.
- Battery Life logs to perform advanced analytics to predict when maintenance might be needed.
- Traffic Operations Management Platform (i.e., ATMS): This platform collects traffic data into a single repository and can remain in place.
- Data extracted from Video Detections. Data does NOT include video captures.
- Emergency Vehicle, Bus/Transit Preemption Data log files to perform advanced analytics on preemption trends.
- Wavetronix (HD Sidefire RADAR) log files to perform analytics on historic lane-by-lane counts, speed, volume, and classification.
- Adaptive Traffic Signal Control Data can remain in place (SyncroGreen database). Access to this data store can perform analytics on historical traffic signal timings.
- Basemap Data, Street Network, and Sensor Location Data can be stored in the Clark County GIS repository.

Assumptions

- Sensors can report on their health status in real-time.
- The IT infrastructure can manage the data volume and processing requirements.
- Field technicians are available to address any issues promptly.

Constraints

- Network connectivity must be dependable to ensure real-time data transmission.
- The system must comply with IT guidance (NIST 853), defined Clark County data security and privacy regulations.

Success Criteria

- The dashboard accurately displays sensor locations and health status.
- Staff can quickly identify and address any sensor issues.
- The system generates timely and accurate alerts for sensor failures.

Dependencies

- Integration with existing IT infrastructure and various Clark County vendor data sources.
- Availability of field technicians for maintenance and repairs.

Notes

- This use-case can be expanded to include additional sensor types and data sources as needed.
- Future enhancements may include predictive analytics to anticipate sensor failures.

Use Case 2: Real-Time Traffic and Corridor Alerts

Objective

To deliver real-time traffic data visualization, allowing for the identification and analysis of traffic congestion patterns, thereby facilitating timely interventions and traffic management. In addition, detect and alert anomalies such as downed equipment and unexpected congestion, enabling prompt corrective actions and minimizing traffic disruptions.

Description

This use case involves creating a dashboard that displays real-time traffic data across Clark County. The dashboard will provide updates on traffic flow, vehicle counts, speeds, and occupancy rates. This will enable the Traffic Operations department to monitor traffic conditions in real-time, identify congestion, and take necessary actions to manage traffic flow efficiently.

Actors

- **Primary Actor**: Traffic Operations Staff
- **Secondary Actors**: IT Department, Field Technicians, Traffic Management Team

Preconditions

- Traffic sensors and devices must be deployed and operational across the county.

- The IT infrastructure must support real-time data ingestion and processing.
- Access to the traffic data feeds.

Data Requirements

Data Element	Description	Purpose	Source	Method of Access	Data Storage
Basemap Data	High-resolution map data with accurate geospatial information, including road geometry, centerlines, intersections, and lane markings.	Provides the foundational layer for visualizing traffic data and road infrastructure.	Clark County GIS	Access through Clark County GIS portal or TCS platform.	Yes
Sensor Locations	Precise geospatial coordinates (latitude and longitude) of all sensors (e.g., roadside units, Wavetronix RADAR, Topcon, cameras, traffic controllers).	Enables accurate placement of sensors on the map for visualization and monitoring.	Clark County GIS, IP Tracker	Access through Clark County GIS portal or IP Tracker system.	Yes
Traffic Cabinet Locations	Locations of traffic cabinets, mapped to intersection polygons.	Provides context for sensor placement and maintenance activities.	Clark County GIS	Access through Clark County GIS portal.	Yes
Traffic Flow Data	Real-time traffic data, including vehicle counts, speeds, and occupancy rates.	Allows for monitoring real-time traffic conditions and identifying congestion.	Cubic (Gridsmart, SynchroGreen), Wavetronix (HD Sidefire RADAR)	Vendor-specific software, cloud-based platforms.	No
Connected Vehicle Signal Phasing and Timing (SPAT) Data	Provides status updates of traffic signals.	Useful for monitoring real-time traffic conditions.	Cubic/Trafficware (ATMS)	ATMS platform.	No
Connected Vehicle Basic Safety Message (BSM) Data	Data from connected vehicles providing real-time traffic information.	Enhances real-time traffic monitoring and safety.	Cubic/Trafficware (ATMS)	ATMS platform.	No
Live Traffic Information Service	Real-time traffic conditions from traffic	Provides up-to-date traffic information for	Various traffic management platforms	Vendor-specific software.	No

	management platforms.	monitoring and analysis.			
Traffic Count and Occupancy Data	Real-time traffic data, including arrivals on green/red and turning movement counts.	Provides detailed traffic flow information for analysis.	Cubic (Gridsmart), Miovision	Vendor-specific software.	No
Adaptive Traffic Signal Control Data	Real-time coordination and performance data.	Monitors and adjusts traffic signal timings based on current traffic demands.	Cubic (SynchroGreen)	Vendor-specific software.	No
Roadside Unit	Communication between vehicles and transportation infrastructure.	Manages the exchange of information, helping manage traffic flow, enhance safety, and provide real-time updates to drivers. RSUs process data from various sources, support safety applications, and integrate with traffic lights and road signs to create a smart, connected transportation network.	Yunex	Direct access to the device	Yes
Congestion Metrics	Travel time reliability, delay hours, and segment speeds.	Provides metrics for analyzing traffic congestion and performance.	Cubic (ATMS, Signal Performance Measures)	ATMS platform, cloud-based SPM tool.	Yes
Historical Traffic Data	Past traffic data for trend analysis and comparison.	Enables analysis of traffic patterns over time and identification of trends.	Clark County GIS, Cubic (ATMS)	Access through GIS portal, ATMS platform.	Yes
Event Data	Information on incidents, construction activities, and special events.	Provides context for traffic anomalies and helps in correlating traffic issues with external events.	Clark County (Work zone permit), RTC Web Page	Access through internal systems, RTC web page.	Yes

Anomaly Detection Parameters	Criteria for detecting unexpected congestion or other anomalies (e.g., deviation from average speeds, sudden traffic build-ups).	Ensures timely alerts for traffic anomalies, enabling prompt corrective actions.	Defined by Clark County Traffic Operations	Configured within the monitoring and alerting systems used by Clark County Traffic Operations.	Yes
Street Network	Geospatial data to visualize the street network.	Provides context for sensor placement and traffic flow analysis.	Clark County GIS	Access through Clark County GIS portal or TCS platform.	Yes

Triggers

- Scheduled system checks (example: system check query sent every 10 seconds).
- Manual requests from Traffic Operations staff (for example: staff select traffic sensors or intersections on the map to determine their status).
- When traffic volumes hit a certain threshold, the color intensity at intersections that represent the density of data points in each area can be changed to reflect traffic volumes.
- Automated alerts from sensors indicating a change in traffic conditions (example: sensor query detects congestion; an alert will be sent to defined staff members).

Workflows

1. The system ingests real-time traffic data from sensors and connected vehicles, overlayed on a GIS layer that includes the sensor location.
2. The data is processed and ingested into a real-time platform, where a data feed is created to supply a dashboard with the data on an interactive map.
3. IT staff access the dashboard to monitor real-time traffic conditions.
4. The system generates alerts for any detected congestion or traffic anomalies defined by the Traffic Operations staff. For example:
    - **Traffic Congestion**: If traffic congestion is detected, the system generates an alert and logs the incident for further investigation.
    - **Data Inconsistency**: If there is a discrepancy in the data reported by sensors, the system flags the issue for manual review.
5. Traffic management actions are taken to address any identified issues. (i.e., signal phase adjustment).

Postconditions

- The dashboard provides an up-to-date view of real-time traffic conditions.
- Any identified traffic issues are logged into and addressed by the Traffic Operations staff.
- The system maintains a historical record of traffic conditions and incidents.

Assumptions

- Traffic sensors and devices are capable of reporting real-time traffic data.
- The IT infrastructure can handle the data volume and processing requirements.
- Traffic Operations staff are available to monitor and manage traffic conditions.

Constraints

- Network connectivity must be dependable to ensure real-time data transmission.
- The system must comply with IT guidance (NIST 853), defined Clark County data security, and privacy regulations.

Success Criteria

- The dashboard accurately displays real-time traffic conditions.
- Staff can quickly identify and address any traffic issues.
- The system generates timely and accurate alerts for traffic congestion.

Dependencies

- Integration with existing IT infrastructure and various Clark County vendor data sources.
- Availability of Traffic Operations staff for monitoring and managing traffic conditions.

Notes

- This use case can be expanded to include additional traffic data sources as needed.
- Future enhancements may include predictive analytics to anticipate traffic congestion.

Use Case 3: Historical Corridor Analysis

Objective

To provide Clark County Traffic Operations with the ability to analyze historical traffic data along key corridors, enabling the identification of trends, patterns, and areas for improvement in traffic management and infrastructure planning.

Description

This use case involves developing a system that collects and analyzes historical traffic data from various sensors and sources along major corridors in Clark County. The system will provide insights into traffic flow, congestion patterns, and the effectiveness of traffic management strategies over time. By leveraging historical data, Clark County can make data-driven decisions to enhance roadway efficiency, safety, and planning.

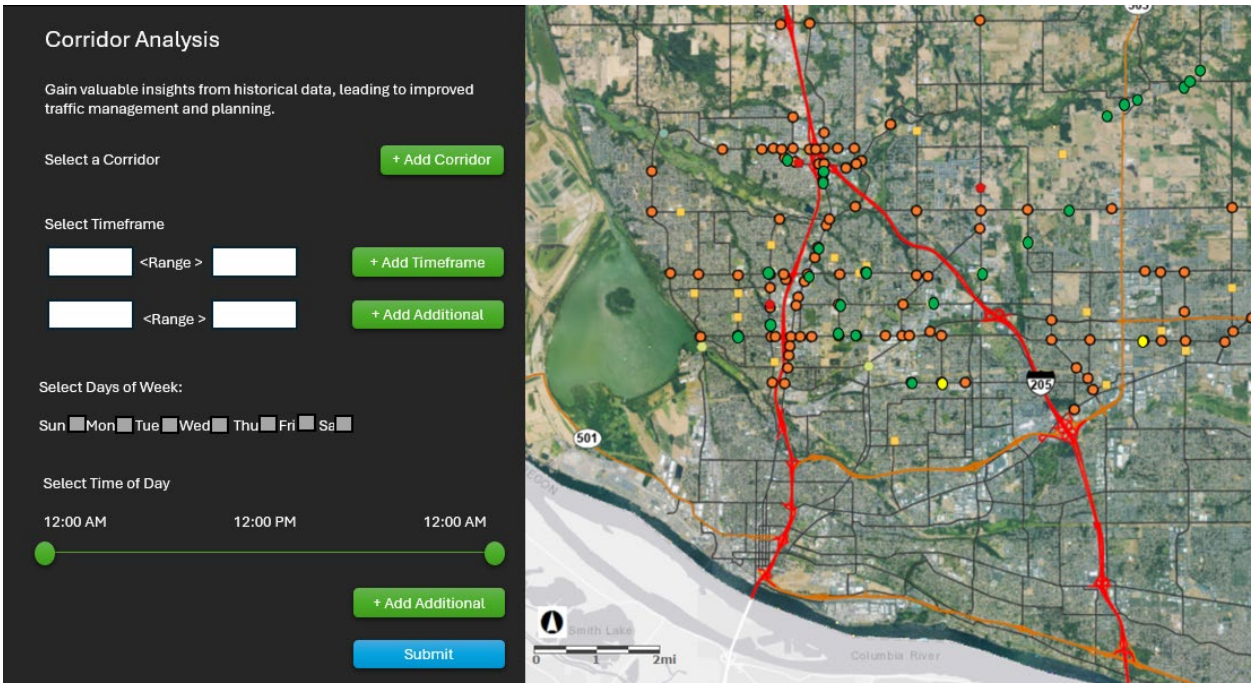

Figure 4 Conceptual view of Use Case 3

Actors

- Primary Actor: Traffic Operations Staff
- Secondary Actors: Urban Planners, Transportation Engineers, IT Department, Data Analysts

Preconditions

- Historical traffic data must be collected and stored from various sensors and sources.
- The IT infrastructure must support data storage, processing, and analysis.
- Access to historical data feeds and geospatial data for mapping corridor locations.

Data Requirements

Data Element	Description	Purpose	Source	Method of Access	Data Storage
Historical Traffic Volume Data	Data on the number of vehicles passing through specific points over time.	Analyzes traffic flow and congestion patterns.	Traffic sensors (e.g., Wavetronix)	Vendor-specific software; data export	Yes
Speed Data	Historical speed data of vehicles	Identifies areas with frequent speed variations and	Traffic sensors (e.g., RADAR, LIDAR)	Vendor-specific software; data export	Yes

	along corridors.	potential bottlenecks.			
Incident Data	Records of traffic incidents and accidents along corridors.	Analyzes the impact of incidents on traffic flow and identifies high-risk areas.	Traffic management systems	Internal databases; data export	Yes
Signal Timing Data	Historical data on traffic signal timings and adjustments.	Evaluates the effectiveness of signal timing strategies over time.	Traffic signal controllers (e.g., SynchroGreen)	Vendor-specific software; data export	Yes
Environmental Data	Historical weather and road condition data.	Assesses the impact of environmental factors on traffic patterns.	Environmental sensors	Data export; integration with weather databases	Yes
Geospatial Data	High-resolution map data with corridor locations and attributes.	Provides the foundational layer for visualizing historical traffic data.	Clark County GIS	Access through Clark County GIS portal or TCS platform	Yes

Triggers

- Scheduled data extraction and analysis (e.g., daily, weekly, monthly).
- Manual requests from Traffic Operations staff for specific historical analyses.
- Automated alerts for significant changes or trends in historical data.

Workflows

1. Historical traffic data is collected from various sensors and stored in a centralized database.
2. The data is processed and analyzed using a real-time platform and other analytical tools to identify trends and patterns.
3. The results are visualized on a dashboard, providing an interactive map and analytical reports.
4. Traffic Operations staff and other stakeholders access the dashboard to review historical data and insights.
5. The system generates reports and alerts for significant trends or anomalies in the historical data.
6. Urban planners and transportation engineers use insights to inform infrastructure planning and traffic management strategies.

Postconditions

- The dashboard provides a comprehensive view of historical traffic data along key corridors.

- Identified trends and patterns are documented and used for decision-making.
- The system maintains a historical record of traffic data and analysis results.

Analytic Requirements

- Historical Traffic Volume Data: Data on vehicles count over time.
- Speed Data: Historical speed measurements of vehicles.
- Incident Data: Records of traffic incidents and accidents.
- Signal Timing Data: Historical traffic signal timings and adjustments.
- Environmental Data: Historical weather and road condition data.
- Geospatial Data: High-resolution map data for corridor visualization.

Data Storage

- Historical traffic data logs for volume, speed, and incidents.
- Signal timing data logs for analysis of traffic signal effectiveness.
- Environmental data logs to assess the impact of weather and road conditions.
- Geospatial data stored in the Clark County GIS repository.

Assumptions

- Historical data is available and accurate.
- The IT infrastructure can manage the storage and processing of large datasets.
- Stakeholders have access to the necessary tools and training to interpret the data.

Constraints

- Data quality and completeness may vary.
- Network connectivity must be dependable for data access and analysis.
- The system must comply with data security and privacy regulations.

Success Criteria

- The dashboard accurately displays historical traffic data and analysis results.
- Staff can identify and interpret trends and patterns in the data.
- The system generates timely and accurate reports and alerts.

Dependencies

- Integration with existing IT infrastructure and data sources.
- Availability of historical data from various sensors and systems.
- Collaboration with urban planners and transportation engineers.

Notes

- This use case can be expanded to include additional data sources and analytical capabilities as needed.
- Future enhancements may include predictive analytics to forecast traffic patterns and identify potential issues.

System Requirements

When developing a system to leverage spatial data with the fusion of real-time and historic data, it is essential to define clear engineering specifications. These specifications will outline the technical and data requirements, data integration points, and identified workflows that are needed to provide reliable and actionable insights into trends, predict future outcomes, and offer real-time situational awareness for Clark County traffic operations.

System Description

The system will be built to support the above-referenced use cases. It will leverage cloud-based real-time data ingestion, processing, and analysis, as well as a cloud-based data management and sharing platform. The system will offer flexibility in data storage options. This approach ensures that the County can maintain control over their data while leveraging the capabilities of TCS.

The vision for TCS includes the following key capabilities:

- **Real-time data ingestion from multiple sources**: Data will be aggregated from the County's traffic server network and directly from roadside units and other sensors.
- **Transformation of data**: As data is being ingested, it will be cleansed and normalized, standardizing data types and date formats, in preparation for analysis.
- **Persistent Data Storage**: Data will then be stored in a cloud data object store when it can be retrieved for exploration and analysis.
- **Real-time data feeds**: Real-time updates on sensor health and traffic conditions will be published securely for use in situational awareness after ingestion and normalization.
- **Alert Notifications**: Configurable alert thresholds for sensor performance metrics and traffic anomalies allow operators to adjust or react in near real-time.
- **Historical Analysis**: Stored data will be analyzed for trend and pattern detection and in the future, predictive analytics.
- **GIS-Based Visualization**: Interactive web map applications provide better situational awareness.

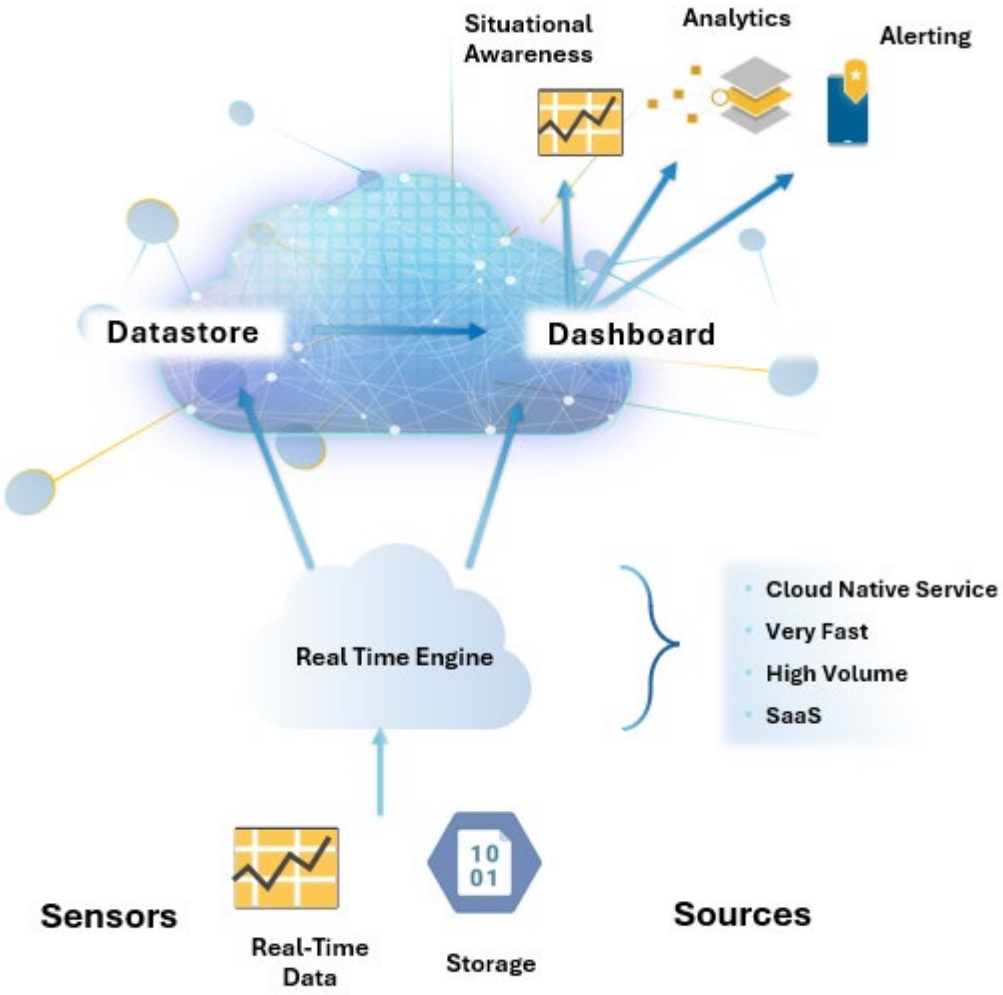

Figure 5 TCS Components

Key Components and Integration

Clark County desires a cloud-based system that minimizes their maintenance and upkeep responsibilities. The recommendation is to use a SaaS (software-as-a-service) platform with the addition of a cloud store.

The following are the key components of the proposed system, each playing a crucial role in ensuring efficient data ingestion, processing, storage, and visualization. These components are integrated to create a seamless workflow that supports the operational needs of the Traffic Operations department, enabling them to monitor and manage traffic conditions effectively.

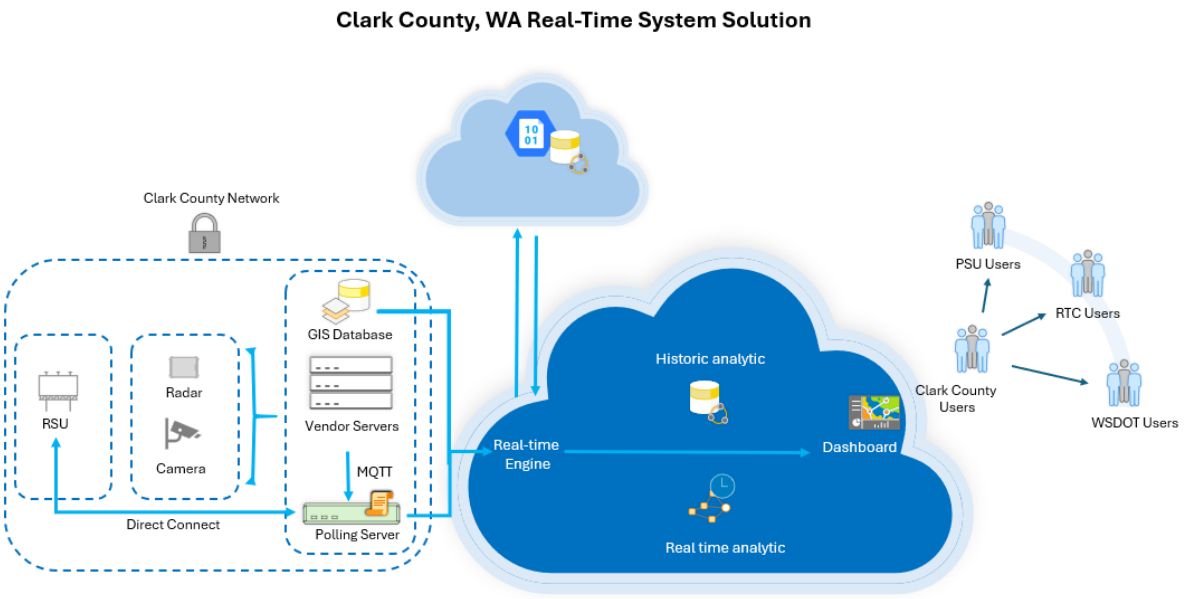

Figure 6 Clark County Specifications and Workflow for Sensor Integration

Polling Server

A Polling Server will be developed and installed in the Clark County network. It is the only new[1] component of TCS that resides within the County network. It feeds data into the real-time engine and serves two primary functions. First, it directly polls Roadside Units (RSUs) for their status at intervals of 5 to 10 minutes. This ensures minimal traffic and reduces the computational load required to monitor many intersections. Second, it extracts information from the broker that stores all other roadside data, typically in the form of MQTT or SNMP messages.

Polling for uptime and status is conducted from the Clark County data center to the intersections, while the actual data is sourced from edge intelligence within the intersection cabinets and then forwarded to the broker where all data are assembled. When the dashboard needs data from an intersection, aside from the polling responses, it retrieves the necessary messages from the broker system. This setup ensures efficient and reliable monitoring of not only the RSU status but also data flow from other roadside devices.

Real-Time Engine

The remaining TCS components reside in the cloud. A cloud-native real-time engine enables TCS to ingest data from the Internet of Things (IoT) platforms, message brokers, sensors, and third-party APIs. Users can process, visualize, and analyze real-time data feeds; store those feeds as big data; and perform fast queries and analysis. Real-time data can be configured to be used as a live map layer. Real-time data can

[1] Most of the TCS data sources already reside in the Clark County network.

be integrated with historical data via stream and feature layers to analyze change over time. The engine should be highly scalable and capable of processing massive volumes of spatial data at very high speeds.

Cloud Storage

While not all TCS data must be stored, some need to be retained to enable historical analysis. A component of TCS will include a highly scalable cloud native object store of the County's choosing.

Traffic System Operations Dashboard

This dashboard will combine Use Cases 1 and 2 into a single application. It will display the locations and health status of various sensors deployed across Clark County. The dashboard will provide real-time updates on sensor health and depending upon the sensor, may include additional information such as operational status, messages sent, messages received, battery life, and any error messages. This will enable the Traffic Operations department to quickly identify and address any issues with the sensors, ensuring continuous and reliable data collection.

Real-time traffic data can be explored and interacted with to determine root causes and make data-driven decisions. Users will be able to identify and analyze traffic congestion patterns and detect and alert on anomalies such as downed equipment and unexpected congestion, enabling prompt corrective actions and minimizing traffic disruptions.

Corridor Analysis Tool

This web application will be used by signal engineers to make planned changes to the traffic that mitigate known problems in given areas. Data powering this dashboard comes from analysis of the historical, normalized, cloud-stored traffic data from various sensors and sources along major corridors in Clark County. The system will provide insights into traffic flow, congestion patterns, and the effectiveness of traffic management strategies over time. By leveraging historical data, Clark County can make data-driven decisions to enhance roadway efficiency, safety, and planning.

Sharing Platform

Rounding out the cloud components is the sharing platform. This platform allows data and analytics to be stored and shared, publicly, or securely. Users are granted access to this platform where authentication to all the TCS components is controlled. Microsoft Entra can be integrated with this platform to enable a single sign-on experience for users.

Security Requirements

The security of the Clark County TCS system is paramount to ensure the integrity, confidentiality, and availability of traffic management data. As the system integrates various data sources and supports real-time monitoring and decision-making, it is essential to implement robust security measures to protect against potential threats and vulnerabilities. This section outlines the security requirements necessary to safeguard the system and its data, ensuring compliance with county security policies and industry best practices.

The security requirements for the TCS system encompass several key areas, including:

Data Encryption

To ensure the security of data within the Clark County TCS system, all stored data, including basemap data, sensor locations, traffic cabinet locations, sensor metadata, and alert thresholds, must be encrypted at rest. Additionally, secure protocols such as HTTPS and TLS should be used to encrypt data transmitted between sensors, servers, and the dashboard, ensuring data protection during transit.

Access Control

Strong authentication mechanisms, including multi-factor authentication, should be implemented for accessing the dashboard and related systems. Role-based access controls (RBAC) must be defined and enforced to ensure that only authorized personnel can access, modify, or manage sensor data and configurations, thereby maintaining data integrity and security.

Network Security

To protect the network perimeter and limit access to sensitive data, it is essential to work with Clark County IT to leverage firewalls. These firewalls will help segment the network, providing an additional layer of security against potential threats.

Physical Security

Physical security measures must be placed to protect sensors from tampering or damage. Additionally, server locations should be secured with access controls, surveillance, and environmental controls to prevent unauthorized access and ensure the physical safety of the infrastructure.

Incident Response

An incident response plan should be developed and maintained to address any security breaches or data loss. Continuous monitoring for security incidents is crucial, and prompt responses to any detected threats will help mitigate potential damage and ensure the system's resilience.

Compliance

Compliance with relevant regulations and standards, such as NIST and ISO/IEC 27001, is necessary for data security and privacy. Regular security audits and assessments should be conducted to identify and mitigate vulnerabilities, ensuring that the system remains secure and compliant with industry’s best practices.

Data Handling

Data handling refers to the process of managing data throughout its lifecycle, from collection and storage to processing and analysis. It involves ensuring data integrity, security, and accessibility while adhering to relevant regulations and standards. Effective data handling practices are crucial for organizations to derive meaningful insights, make informed decisions, and maintain the trust of stakeholders. This encompasses a range of activities, including data entry, validation, transformation, and archiving, all aimed at optimizing the use and value of data.

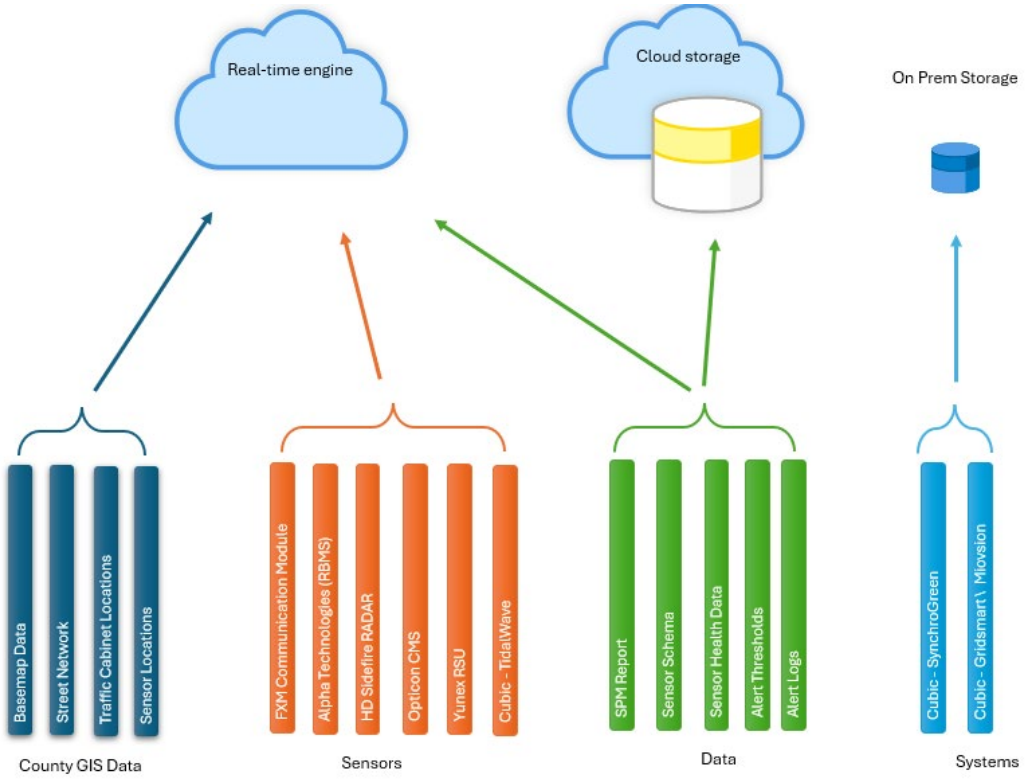

Figure 7 Integration of sensors and cloud storage.

Data Ingestion

The data ingestion process for the system will be designed to ensure seamless and efficient integration of various traffic data sources into a unified platform. This process involves the collection, normalization, and storage of data from multiple sensors and systems, enabling real-time monitoring and analysis of traffic conditions.

The real-time data collection, processing, and analysis tools will allow the system to ingest data from a wide range of sources, including traffic sensors, connected vehicles, and other relevant systems. The data ingestion process will be automated to ensure continuous and reliable data flow, minimizing the need for manual intervention.

Data Collection

Data will be collected from various traffic sensors deployed across Clark County. These sensors will provide real-time information on traffic flow, vehicle counts, speeds, occupancy rates, and other critical metrics. Additionally, data from connected vehicles, such as Basic Safety Messages (BSM) and Signal Phasing and Timing (SPAT) data, will be ingested to enhance real-time traffic monitoring and safety.

Data Normalization

Once collected, the data will be normalized to ensure consistency and compatibility across different sources. This process will involve standardizing data formats, units of measurement, and time stamps, allowing for seamless integration and analysis. The normalized data will be stored in a cloud datastore, making it accessible and searchable through the TCS web application dashboards.

Data Storage

The ingested and normalized data will be stored in a secure cloud environment. This storage solution will provide scalable and reliable data management, ensuring that all traffic data is readily available for analysis and decision-making. The proposed system ensures that Clark County traffic operations can maintain control over their data while benefiting from the advanced capabilities of the GIS platform.

Real-Time Processing and Analysis

The system will continuously ingest data from sensors through the real-time cloud capabilities. Data will be processed as the data is ingested. This capability will enable traffic engineers to monitor current traffic conditions, identify anomalies, and respond promptly to incidents. The system will also generate automated alerts and notifications for any detected issues, ensuring timely interventions and improved traffic management. Results can be forwarded to cloud storage platform for long-term storage.

Data Visualization

Dashboards play a foundational role in the system by providing interactive maps and visualizations. These dashboards enable operators to monitor sensor health and traffic conditions in real-time. Through the dashboards, operators can engage with various data elements displayed on the map, allowing them to gain additional information and insights. Furthermore, operators can set thresholds for alerts, ensuring they are promptly notified of any significant changes or anomalies in the traffic data.

Alerting and Monitoring

TCS will trigger alerts based on predefined thresholds, notifying operators of any anomalies or issues. These alerts and data associated with them are logged and stored for further analysis and maintenance planning.

Future Vision and Options (Optional Inclusion)

The future vision for Clark County Traffic Operations encompasses the continuous enhancement and expansion of the proposed system to further improve traffic management and operational efficiency. As technology evolves and new data sources become available, the system will be adapted to incorporate these advancements, ensuring that Clark County remains at the forefront of smart traffic management.

Key elements of the future vision may include:

- **Integration of Additional Data Sources**
    - **Connected Vehicles**: Incorporate data from connected vehicles to provide more granular and real-time traffic information, enhancing the accuracy of traffic flow and congestion analysis.
    - **Public Transportation Data**: Integrate data from public transportation systems to monitor and optimize bus and transit operations, improving overall traffic flow and reducing congestion.
    - **Crowdsourced Data**: Leverage crowdsourced data from platforms like Waze to gain insights into real-time traffic incidents, road conditions, and driver behavior.
- **Advanced Analytics and Machine Learning**
    - **Predictive Analytics**: Implement predictive analytics to forecast traffic patterns and potential congestion, allowing for greater insight into traffic management and interventions.
    - **Machine Learning Models**: Develop and deploy machine learning models to detect anomalies, predict equipment failures, and optimize traffic signal timings based on historical and real-time data.
- **Enhanced User Interface and Experience**
    - **Additional Dashboards**: Provide users with the ability to build functionality to their dashboards based on needs, enabling them to focus on the most relevant data and metrics for their specific roles and responsibilities.
    - **Mobile Access**: Develop mobile applications to allow traffic operators to access real-time data and alerts on the go, ensuring continuous monitoring and quick response to incidents.
- **Expanded Alerting and Notification Systems**
    - **Multi-Channel Alerts**: Implement multi-channel alerting systems that can send notifications via email, SMS, and mobile apps, ensuring that operators are promptly informed of critical issues.
    - **Automated Response Systems**: Develop automated response systems that can take predefined actions based on specific alerts, such as adjusting traffic signal timings or dispatching maintenance crews.
- **Collaboration and Data Sharing**
    - **Interagency Collaboration**: Foster collaboration with neighboring jurisdictions and regional traffic management centers to share data and coordinate traffic management efforts.

- **Open Data Initiatives**: Participate in open data initiatives to share traffic data with the public and third-party developers, encouraging the development of innovative traffic management solutions.

- **Sustainability and Environmental Impact**
  - **Green Traffic Management**: Implement strategies to reduce traffic-related emissions, such as optimizing traffic signal timings to reduce idling and promoting the use of public transportation.
  - **Energy-Efficient Infrastructure**: Invest in energy-efficient traffic management infrastructure, such as solar-powered sensors and LED traffic signals.

These future options will position Clark County to continue enhancements and grow their capabilities to ensure a safer, more efficient, and sustainable traffic management workflow. This approach will contribute to the overall progress of the County to meet their operational goals.

System Engineering Approach

The approach to implementing TCS must utilize the FHWA Systems Engineering and ITS Project Development "Vee" Model.

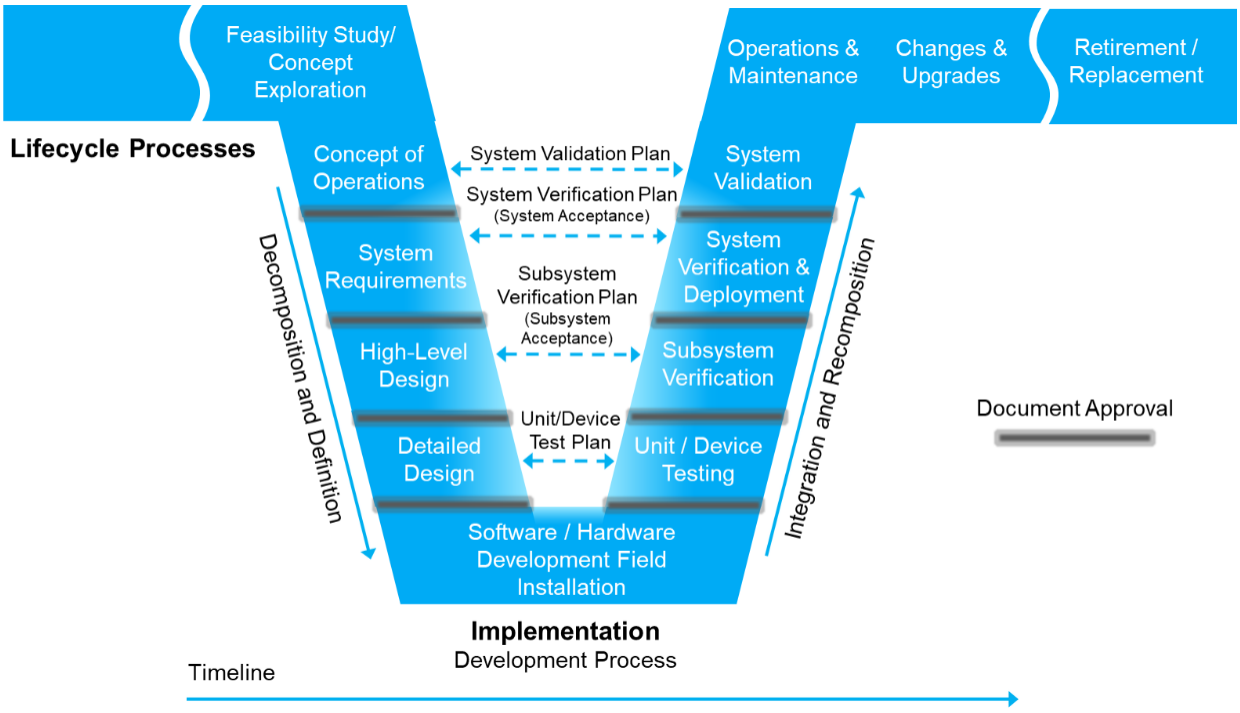

Figure 8 FHWA Systems Engineering and ITS Project Development "Vee" Model

System Verification

TCS will be completed in phases, and each phase should have defined functional and nonfunctional goals. Requirements to complete the target functionality for each phase should be documented in user stories, each with a set of acceptance criteria. At the beginning of each iteration, the team will determine which user stories will be completed during that iteration. At the end of the iteration, the vendor shall demonstrate the completed functionality for the County to verify.

Near the end of each phase, the vendor shall make completed functionality available to the County for testing and final verification of that phase. After acceptance of the final phase, the vendor shall assist the County in performing end-to-end workflow testing for all workflows identified. Once the end-to-end workflow testing has been completed and verified, the System will be accepted.

System Validation

A high-level validation plan will describe how to assess the system's performance against the goals and expectations set by County leadership and stakeholders. The vendor and the County will collaborate on measurable objectives and how to evaluate the system's ability to achieve them. This may include, but is not limited to:

- Efficiency improvement in performing workflows.
- Improved response time to real-time traffic conditions.
- Visibility into current County traffic conditions by outside stakeholders, such as WSDOT.
- Faster, automated data transfer to stakeholders.

This plan will also outline the operations and maintenance requirements of the system. Since the system will be cloud-based, infrastructure and software maintenance will be minimized. The most important component of the system, connectivity to data feeds, will require regular maintenance because the data feeds have external dependencies (such as device connectivity, device health, battery backups, etc.).

Phased Deployment

A phased approach to the Clark County TCS deployment offers tangible benefits, ensuring a structured and manageable deployment process. By breaking down the project into smaller, more manageable phases, the County can focus on specific use cases, such as the Sensor Health Dashboard and Real-Time Traffic and Corridor Alerts, one at a time. This phased strategy enables thorough verification and validation of each increment before progressing to the next, reducing the risk of integration errors and ensuring that each functional component operates as intended. The iterative approach supports continuous improvement, allowing stakeholder feedback from each phase to inform and refine subsequent deployments. Ultimately, this method enhances the system's quality and ensures alignment with Clark County's evolving traffic management needs.

Clark County Traffic Coordination System Milestones

Phase 1 (3 months)	Phase 2 (3 months)	Phase 3 (3 months)	Phase 4 (3 months)	Phase 5 (3 months)
• Procure software & cloud storage • Document system requirements • Develop Concept of Operations • Document high-level design • Acquire security and compliance approvals • Detailed design documentation for Polling Server • Detailed data documentation of ATMS server data • Develop testing, deployment & verification plan • Establish and verify access to Dev/Test environment	• Develop Polling Server and establish connection to real-time platform • Implement Polling server connections to ATMS server • Implement Real-time connectors for ingesting ATMS data • Test & verify data ingestion, normalization & storage • Detailed data documentation for RSU data	• Prototype sensor health visualization and alerts dashboard with ATMS data • Trigger alerts • UI/UX design for all apps • Implement RSU connection to Poller and Real-time platform • Test & verify data ingestion, normalization & storage • Detailed data documentation for Trafficware and Gridsmart data	• Implement Trafficware and Gridsmart connections to Poller and Real-time connectors • Test & verify data ingestion, normalization & storage • Complete implementation of sensor health dashboard • Develop corridor analysis app • Test apps and provide feedback • Detailed data documentation for TomTom, Opticon CMS, VMS, Tidalwave	• Implement app changes • Integrate TomTom • Integrate Opticon CMS • Integrate VMS • Integrate Tidalwave • Test & verify data ingestion, normalization & storage
Milestones - Environments established - Secure connectivity confirmed	Milestones - Polling Server framework built - Polling server successfully retriving data from ATMS - Polling server successfully pushing data to real-time platform - Data successfully normalized and stored	Milestones - Sensor health dashboard sending alerts - RSU data successfully retrieved and stored - Beta release of Sensor Health dashboard	Milestones - Trafficware and Gridsmart sources successfully retrieved and stored - Beta release of Corridor Analysis app	Milestones - Final release of Sensor Health dashboard - Final release of Corridor Analysis app - TomTom and Optican sources successfully integrated - VMS and Tidalwave sources successfully integrated

Figure 9 TCS Phased Development

Phase 1

The project will begin by establishing a project management framework and writing the required documentation. In addition, the foundational cloud components can be installed and configured. Critical to this phase is the establishment of security protocols (ports, certificates, standards, etc.) that enable the consultant team to access the County Development and Testing (sandbox) environment and for that environment to communicate with the cloud environment. Finally, the consultant will work with the County and the vendor of the first data source to be integrated to develop detailed documentation of the data required for TCS and how to retrieve it.

It is during this phase that Clark County should acquire access to the Azure Online Data Lake through their Azure portal.

Phase 2

Once the foundational elements are in place, development can commence in phase 2. The objective of this phase is to demonstrate that data can be polled from County servers and transmitted to the real-time platform in the cloud. While this work is in progress, comprehensive data documentation for the RSU data can be created simultaneously.

Phase 3

This phase is when the data comes to life in the Real-Time Sensor Health dashboard. Threshold alerts are established and displayed on the dashboard. The user interface for both apps will be designed by a design expert and County SMEs. During this time, the team will prepare for Phase 4 by documenting the detailed data design for Trafficware and Opticom and Wavetronix data.

Phase 4

In phase 4, both apps are developed and released to the County SMEs for testing. The apps should include ATMS, RSU, all in-scope device data sources as prescribed by the use case requirements. Additional data sources may be documented for future system deployment in phase 5 and “N”.

Phase 5

Feedback from app testing will be incorporated as appropriate in preparation for the final release.

Phase N

Additional phases may be deployed, if possible, to integrate additional data sources or to make adjustment as needed through the end of 2026.

Project Management Approach

The recommendations presented in this plan are based on consultant and stakeholder experience with GIS technology to create modern business systems. However, deploying technology is insufficient to ensure system success. Equally important is ensuring that the system enhances business processes, that users are engaged with changes to their workflows, and that leadership is informed. This project management approach supports those objectives by integrating structured stakeholder collaboration, phased system delivery, and adaptive planning.

Developing a Comprehensive Adoption Strategy

Communicating the Vision and Benefits

A clear and compelling narrative will be developed that explains the purpose of the new system, its expected outcomes, and how it will improve current processes. This communication should be consistent and delivered through various channels to reach all stakeholders, including those who were not part of the initial workshop.

Organize and Align Teams

The success of the system deployment relies on engaged, well-organized, and aligned teams. The Agile project management methodology provides a flexible and iterative framework to guide this effort. Agile enables adaptive planning, continuous improvement, and sustains collaboration among stakeholders. This approach is especially important for large initiatives like TCS, as it allows the County to respond to evolving requirements and user feedback throughout the systems engineering lifecycle.

Engage Key Stakeholders Early

While the subject matter experts are already on board, it is crucial to engage other stakeholders such as PSU, WSDOT, RTC, and other County departments early in the process. Their early involvement will help build momentum and ensure their support as the project progresses.

Establish a Dedicated Project Team

A core project team will be established, composed of the vendor and County staff, to jointly oversee the deployment and systems engineering lifecycle of the TCS. A governing steering committee made up of County leadership will provide sponsorship, enable cross-division collaboration, develop communications, and set expectations with stakeholders. The vendor will provide a Project Manager, Product Owner, Technical Lead, and other staff necessary to conduct the work. The County should have its own Project Manager who is empowered to make key decisions for the project. County GIS and IT staff will represent the County's security and sustainability needs, ensuring TCS is protected and maintainable. The combined team will operate within the Agile framework, utilizing two-week sprints to develop functional components incrementally, ensuring early and continuous delivery of valuable system capabilities. Below is a suggested project team structure:

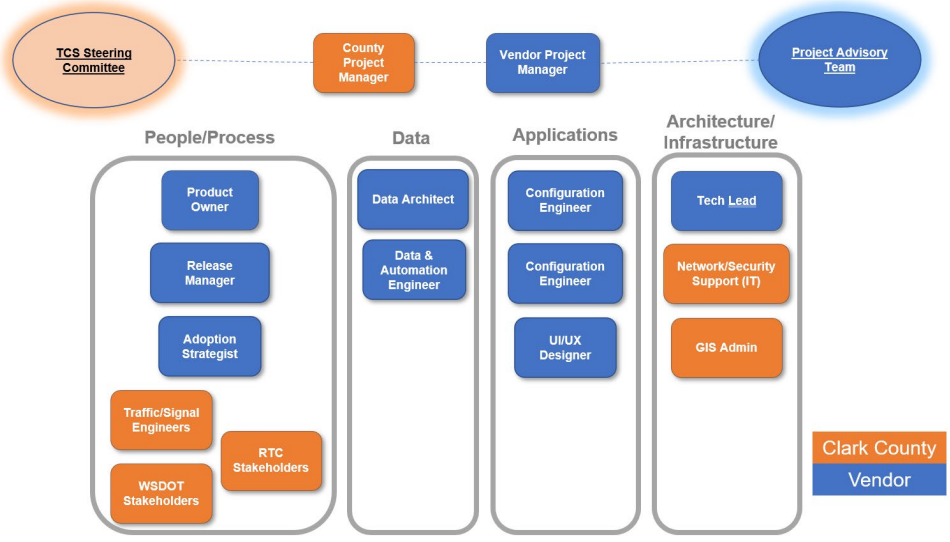

Figure 10 Project Team Structure and Stakeholder Alignment

Project Management using Agile.

Agile project management is recommended as the guiding framework for deploying and iteratively developing the TCS. The Agile method supports flexible, incremental progress, enabling the County to adapt quickly to evolving requirements, incorporate stakeholder feedback, and continually refine the system throughout the systems engineering lifecycle.

Azure DevOps

Since the County prefers the Microsoft platform, utilization of Azure DevOps is recommended as an industry-standard software development process management system, that provides version control, reporting, requirements management, project management, testing and release management capabilities. It covers the entire application lifecycle and enables DevOps capabilities. Through Azure DevOps, the County will be able to track project work and progress, assess team cadence and velocity, and respond quickly to changing priorities, all while focusing on the long-term vision and goals.

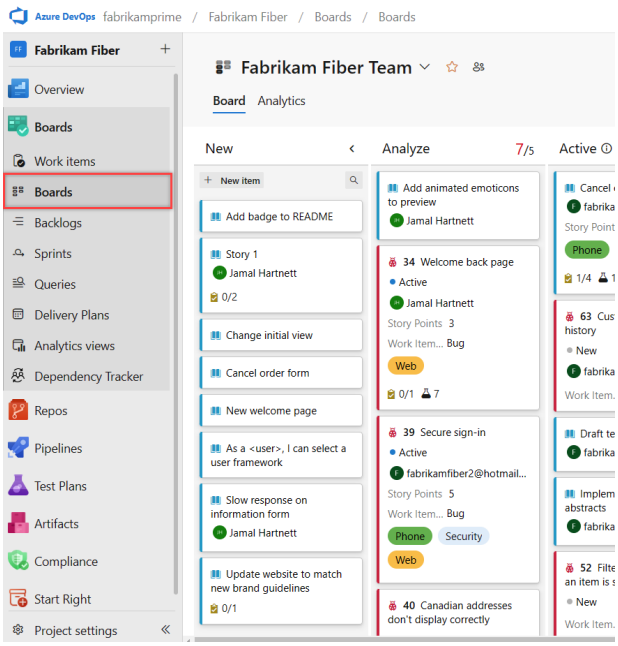

Figure 11 Azure DevOps Kanban board.

Agile's iterative cycles will enable early identification and mitigation of risks. Risks are registered in Azure DevOps and tracked along with all other item types, such as user stories, features, tasks, bugs, etc., each iteration.

Risks and Challenges

Like all technology projects, risks and challenges must be identified and mitigated as early as possible. Discovery has identified the following potential risks currently:

- **Vendor Collaboration**
  - Accessing the data feeds from multiple vendor systems is the crux of the entire TCS system.
  - Garnering cooperation and collaboration from vendors can sometimes be a challenge.
  - Consultants during discovery met with 2 of the primary system's vendors who seemed eager to support the TCS project, but there are several others.
  - Lack of clear documentation of vendor's systems and data could cause delays in the project.
- **Transferring Data to the Cloud**
  - Traffic has made it clear that TCS should be hosted in the Cloud.

    - IT is not necessarily opposed to this, but doesn't have experience with it, so they are not sure what kind of security and governance policies must be met.
    - Getting compliance can often be very time-consuming and could cause delays in the project.
    - Competing priorities with project team members and IT staff may result in delays.
- **Performance Measures**
    - As mentioned, the team faces challenges in developing performance measures due to data gaps, multiple and disparate access points.
    - Therefore, sending notifications when conditions are out of tolerance may be tricky because the performance goals are not clear.
    - The country may experience several iterations of analyzing data, establishing metrics, and getting notified of conditions out of tolerance to optimize the metrics.

Appendix A – Complete List of Data Sources(for reference)

Data Element	Source	Description	Purpose
Adaptive Traffic Signal Control Data	Cubic (SynchroGreen)	Real-time coordination and performance data.	Monitors sensor health and ensures correct traffic signal timings.
Alert Logs	Clark County Traffic Operations	Logs of alerts are triggered by sensor performance metrics.	Tracks historical alerts for analysis and maintenance planning.
Alert Thresholds	Defined by Clark County Traffic Operations	Predefined thresholds for sensor performance metrics that trigger alerts (e.g., low battery, signal loss, data transmission errors).	Ensures timely alerts for any sensors reporting errors or out-of-bound thresholds, enabling prompt maintenance actions.
Anomaly Detection Parameters	Defined by Clark County Traffic Operations	Criteria for detecting unexpected congestion or other anomalies (e.g., deviation from average speeds, sudden traffic build-ups).	Ensures timely alerts for traffic anomalies, enabling prompt corrective actions.
AVL Data	GeoTab	Data from Clark County vehicles (e.g., sweepers, striping vehicles).	Monitors vehicle locations and activities.
Basemap Data	Clark County GIS	High-resolution map data with accurate geospatial information, including road geometry, centerlines, intersections, and lane markings.	Provides the foundational layer for visualizing sensor locations and road infrastructure.
Battery Life	Alpha Technologies (RBMS)	Real-time data on the battery life of sensors.	Ensures sensors are functioning correctly and predicts maintenance needs.
Cabinet Door Openings	Medeco (Key)	Data on cabinet door openings detected by digital keys.	Monitors maintenance activities.
Congestion Metrics	Cubic (ATMS, Signal Performance Measures)	Travel time reliability, delay hours, and segment speeds.	Provides metrics for analyzing traffic congestion and performance.
Connected Vehicle Basic Safety Message (BSM) Data	Cubic/Trafficware (ATMS)	Data from connected vehicles providing real-time traffic information.	Enhances real-time traffic monitoring and safety.

Connected Vehicle Signal Phasing and Timing (SPAT) Data	Cubic/Trafficware (ATMS)	Provides status updates of traffic signals.	Useful for monitoring real-time traffic conditions.
Crash Data	Clark County Sheriff Office	GIS layer with crash reports.	Analyzes traffic safety and incidents.
Device Controlling Signal When Power is Lost	Alpha Technologies (FXM Communication Module)	Log files capturing the timestamp when the system switches to battery.	Monitors power status and ensures continuity of operations.
Emergency Vehicle, Bus/Transit Preemption Data	Opticon (CMS)	Data from detectors monitoring the health of sensors used for emergency vehicle preemption.	Monitors health of preemption sensors and reports on preemption events.
Event Data	Clark County (Work zone permit), RTC Web Page	Information on incidents, construction activities, and special events.	Provides context for traffic anomalies and helps in correlating traffic issues with external events.
GIS Layer	Clark County GIS	Geospatial data for arterials.	Provides context for road network analysis.
Historical Traffic Data	Clark County GIS, Cubic (ATMS)	Past traffic data for trend analysis and comparison.	Enables analysis of traffic patterns over time and identification of trends.
IP Tracker Data	IP Tracker	Data on RSUs, batteries, controllers, and other IP devices.	Monitors and manages networked devices.
LiDAR Data	TBD	High-resolution LiDAR data.	Enhances geospatial analysis and mapping.
Live Traffic Information Service	Various traffic management platforms	Real-time traffic conditions from traffic management platforms.	Provides up-to-date traffic information for monitoring and analysis.
Pedestrian System Data	Polara APS / ICU2 / INS	Data from pedestrian systems (e.g., sound, volume).	Monitors pedestrian infrastructure.
Ramp Metering Data	Washington DOT	Data on ramp metering operations.	Monitors and analyzes ramp metering effectiveness.
RTC Web Page Data	RTC	Data on highest volume intersections and congestion management.	Provides traffic statistics and analysis.

Sensor Health Data	Alpha Technologies (FXM Communication Module, RBMS), Cubic/Trafficware (ATMS, SPM), Wavetronix (Command Collector, Data View)	Real-time status and health metrics of each sensor, such as operational status, error codes, battery levels, signal strength, and data transmission rates.	Allows for monitoring the operational health of sensors and identifying any issues that need attention.
Sensor Locations	Clark County GIS, IP Tracker	Precise geospatial coordinates (latitude and longitude) of all sensors (e.g., roadside units, Wavetronix RADAR, Topcon, cameras, traffic controllers).	Enables accurate placement of sensors on the map for visualization and monitoring.
Sensor Metadata	Various vendors (e.g., Alpha Technologies, Cubic, Siemens)	Information about each sensor, including type, model, vendor, installation date, and maintenance history.	Helps in identifying and managing different sensors within the network.
Street Network	Clark County GIS	Geospatial data to visualize the street network.	Provides context for sensor placement and traffic flow analysis.
Surveillance Cameras	AXS	Video camera data with PTZ capabilities.	Monitors traffic and infrastructure.
Traffic Cabinet Locations	Clark County GIS	Locations of traffic cabinets, mapped to intersection polygons.	Provides context for sensor placement and maintenance activities.
Traffic Count and Occupancy Data	Cubic (Gridsmart), Miovision	Real-time traffic data, including arrivals on green/red and turning movement counts.	Provides detailed traffic flow information for analysis.
Traffic Flow Data	Cubic (Gridsmart, SynchroGreen), Wavetronix (HD Sidefire RADAR)	Real-time traffic data, including vehicle counts, speeds, and occupancy rates.	Allows for monitoring real-time traffic conditions and identifying congestion.
Traffic Operations Management Platform (ATMS)	Cubic/Trafficware (ATMS)	Collects traffic data into a single repository, can send alerts to staff.	Centralizes traffic data for analysis and alerting.
Video Detections	Cubic (Gridsmart), Miovision	Traffic volumes, turning data, and processor counts from video sensors.	Verifies operational status of sensors.
Video Management System (VMS)	WADOT/Clark County	Shared video management system for traffic monitoring.	Centralizes video data for analysis.

Wavetronix (HD Sidefire RADAR)	Wavetronix	Lane-by-lane counts, speed, volume, and classification data.	Monitors sensor performance and health.
Weather Data	HSE (RWIS)	Real-time weather data from remote sensors.	Provides weather context for traffic analysis.
Work Zone Data	Clark County PIO	Data on work zones and public information.	Provides context for traffic disruptions.

Third Party Cyber Security Questionnaire

This questionnaire is used to assess the control environment of a third party that may handle, store or process sensitive data provided to them by Clark County. This questionnaire is one component of Clark County's ongoing due diligence and risk management process. This review will evaluate if proper information security controls are in place at the third party location in order to protect the confidentiality, integrity and availability of data.

INSTRUCTIONS

1) Complete the "Business Information" tab.
2) Answer all questions on the "Cyber Security Questions" tab.
3) If applicable, answer all questions on the "Data center" tab.

All answers and supporting documentation will be reviewed by Clark County's Security Committee, who may request further clarification. If Clark County enters into an agreement with you, some or all of the information provided in response to these questions may be incorporated into the agreement. The agreement will also contain a representation by you that all such information is accurate and complete as of the date you are signing the agreement and that no changes are planned as of such date except as specifically set forth in the agreement.

Business Information

Responders Name	
Responders Job Title	
Date of Response	
Clark County may have follow up questions to your responses. Please provide the name, email and phone of the person we should contact for more information.	
Company Profile	
Company name	
Location of data	
Location(s) where scoped systems and data is stored	
Name of third party data center, if applicable	
Provide location	
Name of any other location(s) where scoped system and data is stored	

ISO 27002:2013 Control Family	Questions	Responses
Physical and Environmental Security	Describe what physical security controls are deployed to protect your corporate and data center operation facilities.	
Physical and Environmental Security	Describe the organization's approach to ensuring storage media is wiped and/or destroyed prior to disposal and/or reuse.	
Physical and Environmental Security	Describe policies and controls in place for securing and protecting unattended infrastructure devices and network connections.	
Ops Security	How are the development, test, and production environments separated?	
	What is the process for introducing changes to the environment? Please address how changes are planned and tested; this should include hardware, software, and configuration changes.	
Ops Security	What controls are in place to prevent malicious code from executing on information systems? Describe the approach to both prevention and detection of successful execution.	
Ops Security	Describe your organization's service and data backup strategy? When was your last successful test recovery of that environment?	
Ops Security	What kind of audit and event logs are being stored and reviewed? In your answer please address: What constitutes an event What systems are included	
	How are audit logs protected and stored? Do they include authorization and access authentication logs?	
Ops Security	What tampering prevention and detection controls are in place over log collection systems?	
Ops Security	How are SysAdmin/operator actions and sessions monitored and reviewed on a regular basis?	
Ops Security	What are the controls in place to control and manage the installation and modification of installed software?	
Ops Security	Describe the process in place to handle vulnerability discovery and management? Please be sure to include how endpoint or "client-side" vulnerabilities are included in the process.	
Ops Security	What policies exist governing the installation of software by non-admin users on company assets? For this question, please focus on local administration privileges on end-user devices and software.	

Communication Security	Please describe control and monitoring systems in place to protect the information residing within your system. Scope should include mechanisms such as IDS and IPS systems.	
Communication Security	What controls are in place to ensure confidentiality and availability of inbound and outbound data?	
Communication Security	Describe how systems, applications and processes are segregated from each other to ensure data integrity and confidentiality.	
System Acquisition, Development, and Management	How are modifications to installed systems and software monitored, restricted, and controlled?	
System Acquisition, Development, and	Please indicate whether or not an Enterprise Information Security Policy exists within the organization and what frameworks went into the development?	
System Acquisition, Development, and Management	How is security testing conducted during the development of an application or piece of software?	
Information Security Incident Management	Describe your organization's approach how information security incidents/events are reported.	
Information Security Incident Management	Describe the incident response plan's process flow from initial incident reporting to closure.	
Human Resource Security	Describe your organization's background screening process as it pertains to employees, contractors, consultants, etc. .	
Human Resource Security	Describe the organization's approach to providing information security awareness training to all users of their corporate network (employees, contractors, consultants etc.)	
Asset Management	Describe how the organization maintains an hardware inventory of all the devices on the network.	
	Describe how the organization maintains an software inventory of all the software that is allowed for use on the network.	
Asset Management	Describe how the organization controls and manages the use of removable media on the network.	
Access Control	Describe how the organization's Access Control policy is utilized in the provisioning and de-provisioning of access to their information systems.	
Access Control	Describe how the organization establishes the appropriate levels of access for its users.	
Access Control	Describe the approval process for granting privileged access.	
Access Control	Describe the organization's password reset procedures.	
Access Control	Describe the organization's approach to user access reviews.	
Access Control	Describe the organization's termination and/or role change process as it pertains to access control.	
Access Control	Describe what guidance is given users in regards to managing their authentication credentials.	

Access Control	Describe the authentication mechanisms used in order for a user to log onto the organization's network (locally and remotely).	
	Describe the authentication mechanisms in which privileged users log onto the organization's network (locally and remotely).	
	Describe the organization's approach to handling session inactivity.	
Access Control	Describe the organization's password management system: Number of characters? Complexity? History/Reuse? Frequency of change? Visible when enter? Encrypted in storage? Encrypted in transit?	
Access Control	How is access to program source code controlled/restricted?	
	Is that access logged?	
Supplier Relationships	Describe what security controls are in place for suppliers/vendors/consultants who will have access to information systems that contain data	
Information Security Aspects of Business Continuity Management	Describe what processes, procedures and controls your organization will leverage during a disaster recovery/business continuity event in order to safeguard data and resume their contracted support services.	
Information Security Aspects of Business Continuity Management	Describe how your organization will review and tests processes, procedures and controls leveraged to safeguard data during a disaster recovery/business continuity event.	

Questions	Responses
Data Center Network Security:	
Are up to date network diagrams maintained? If so, how is access to them restricted	
How is access to network devices (routers, hubs, etc.) controlled	
Do situations exist where the User ID and password are shared between individuals? If so, provide your controls.	
Do formal documented, detailed procedures for handling security incidents exist?	
Are established, documented, procedures in place for patching against vulnerabilities	
Are security violation events logged, monitored/reviewed/reported and followed up on	
How many security violations were investigated in the last 12 months	
Briefly explain the procedures used to perform vulnerability assessments.	
Are external penetration/vulnerability tests performed internally or by a third party on a regular basis?	
Are automatic alerts generated when critical systems reach specific thresholds (for instance, a sustained and unexpected spike in traffic)	
What solutions are used to provide remote access to your network? Please provide details.	
Are the security services that provide protection from the Internet owned and administered by your company?	
Please describe the solution used to protect servers and workstations from viruses.	
Are procedures in place to facilitate configuration change management? If yes, please explain.	
Data Center Physical Security:	
Please provide the address for all locations where Clark County data will reside if a contract is entered into with your company. Then answer the following questions as they pertain to those locations.	
How is physical access to rooms and buildings controlled	
How is physical access to network devices and systems controlled	
Is disk storage media ever sent offsite for any reason? If so, state each reason or circumstance for which such media may be sent offsite (such as for repairs) and state what precautions are taken to protect information contained on such media.	
Are visitors required to sign guest logs indicating purpose of visit and arrival/departure times	
Are visitors escorted at all times by authorized security personnel	
Do other tenants reside in your building? If so, what physical security separates the tenants	